

3DELIGHT 9.0 AND 3DELIGHT FOR MAYA 5.0

December 2009

New Unlimited-threads License

- A new unlimited-threads license is now available for both the *3Delight* stand-alone renderer and the *3Delight for Maya* plug-in. Clients that purchased the 8-thread license (and under yearly support) are automatically upgraded to unlimited-threads. The 8-thread license will no longer be available, but the 4-threads and 2-threads will continue to be available at a reduced pricing.

3Delight For Maya

- Introducing RIB Fragments: a user-friendly and flexible way of creating and managing RIB archives. This feature is useful to accelerate re-renders.
- The display drivers UI has been improved and simplified making it easier to manage and visualize output variables (AOVs). “Primary Displays” and “Secondary Displays” have been collapsed into the same UI.
- Major performance improvements to the *3Delight Relationship Editor* which make it responsive even with very large scenes.
- Improved UI in the *3Delight Relationship Editor* by using distinctive icons for different shaders and attributes.
- Added support for many useful Hypershade nodes, most importantly: miss shaders, car paint, metallic paint, glossy reflection and glossy refraction.
- Scene parsing optimizations reduce RIB output time by 20%.
- It is now possible to render *Shave and a Haircut* nodes without loading the *3dfmShave* plug-in: *3Delight for Maya* automatically uses *Shave* plug-in’s RIB export function in that case.
- Maya sprite particles can now be rendered as “volumes” for correct shadowing.
- Maya fluids implementation enters a beta stage. All current limitations are listed in the user’s manual in the Rendering Guidelines chapter.
- Added *Maya 2010* support and dropped *Maya 8.0* support.

3Delight Features

- Introducing multi-camera rendering. This feature enables the output of many camera views from a single render. This functionality is especially useful for stereo rendering as it saves rendering time.
- Improvements to point-based occlusion quality: concave corners are rendered more accurately.
- The subsurface shadeop can proceed from a point-cloud file. This can save a potentially costly pre-processing step when rendering sequences.
- Billboard particles can now be rendered with a “thickness” for correct shadow casting.
- Network caching, a feature unique to *3Delight*, is now available on Windows systems.
- Added detailed memory statistics to *3Delight* to better track memory usage.

3Delight Performance

- Improved performance of `occlusion()` and `indirectdiffuse()` shadeops when rendering dense meshes. Speedups can reach 200%.
- Improved multi-threading performance on scenes containing procedural geometry (such as delayed read archives). Procedurals are now allowed to execute in parallel which can lead to speed improvements linear to the number of threads used.
- Accelerated point-based occlusion as it now supports the “irradiance shading-rate”. Speedups with default settings are in the range of 200% to 300%.
- Improved multi-threading performance and memory consumption of subsurface scattering algorithm.
- Improved deep shadow map creation performance. On large shadow maps, performance increases linearly with the number of cores. Temporary disk space usage during DSM creation has been reduced three-folds.
- A new memory allocation scheme in the ray-tracer significantly lowers memory consumption when rendering object: only one object instance is kept in memory at any time. This feature is enabled through a special variable.
- Improved point-cloud loading time. This has a positive performance impact on effects such as point-based occlusion and color bleeding.

Shader Compiler

- RSL 2.0 improvements including resizeable arrays, better supports for shader classes and more efficient execution.

Pipeline & API

- Introducing the “VolumeTracer” API. This RSL plug-in allows user to easily write volume renderers.
- The “Sx” shader evaluation API is now embedded with the *3Delight* library (takes a single *3Delight* license when used).
- Added “Implicit Field” plug-in support (extension to the `RiBlobby` primitive).
- Display drivers can now access *3Delight*’s deep frame buffer which provides the list of visible surfaces for each pixel sample.
- Added new entries to the `Ptc` API and fixed compatibility issues.
- `RiNuCurves` now support vertex normals.

3DELIGHT 8.5 AND 3DELIGHT FOR MAYA 4.5

May 2009

3Delight For Maya

- Introducing the *3Delight Relationship Editor*. This new user interface replaces the now deprecated *Shader Manager* and *Attribs Node Manager* and makes it much easier to view, assign and modify 3DELIGHT shaders and attributes, in a centralized location. The usability of shader and attribute *collections* is substantially improved thanks to this same feature and one can inspect, for each pass and at a glance, what attributes and shaders are in effect.
- Introducing “Pass Templates” It is now possible to save a given render pass as a template and create new passes based on existing templates.
- A new "round edge" features enables automatic edge rounding of sharp geometric features. Using this feature, one can round edges at render time (such as a table edge) instead of performing a costly modeling-time operator.
- Added a dicing camera attribute in the geometry attributes node (in the Culling and Dicing section). This features is useful to stabilize popping displacement during animation.
- Updates to HyperShade:
 - The “useBackground” node is fully supported.
 - Checker node with much better anti-aliasing.
 - 3D texture nodes now use texture reference objects if these are exported.
- Scene export has been optimized and runs twice as fast for certain scenes.
- The following MEL bindings have been added: `RiBound`, `RiDetail`, `RiDetailRange`, `RiOrientation` and `RiShadingInterpolation`.

3Delight Performance

- An overall speed increase of 20% is to be expected on all scenes thanks to SSE2 optimizations.
- Ray-tracing speed on displaced surfaces has been substantially improved. The increase can reach tenfold with large displacement.
- Cubic curve primitives take up to 20% less memory and can render up to 50% faster when using Ray-tracing.
- Improved performance of RIB reading on Windows to match that of other operating systems.
- Procedurals generated through `RiProcRunProgram` require much less peak memory, especially for very large primitives.

Improvements to multi-process rendering include:

- Multi-machine rendering is fully supported on Windows platforms.
- Baking 3D point-clouds using many machines is now possible.
- “Ri Filters” are supported in multi-host rendering.
- Improved behaviour with unresponsive or crashing rendering hosts.

Pipeline & API

- Array support has been added to the Ptc API. This also means that `texture3d()` and `bake3d()` accept array parameters.
- Helper functions have been added to the Display Driver API.

Shader Compiler

- 3Delight now supports co-shaders (as per RSL 2.0) and completes the implementation of shader classes.

3DELIGHT 8.0

October 2008

3Delight For Maya

- The way 3Delight attributes are connected and interpreted has been much improved for greater flexibility and ease of use: it is now possible to connect only a small subset of attributes to any given node. This feature enables a hierarchical attribute interpretation scheme in which undefined attributes for a given object/node are looked up higher in the scene hierarchy.
- Images can now be rendered in background so artists can still use *Maya* while rendering frames.
- The Coordinate System node can now display an environment dome in Maya's view for easier image based lighting.
- Added render-time CSG support (boolean modeling operators).
- Improved HyperShade translation and support:
 - The following nodes exactly match Maya's look: `cloth`, `ramp` and `contrast`.
 - Added support for `mia_material`, `mib_ambient_occlusion` and `particleSamplerInfo`.
 - Photons can trigger HyperShade shader evaluation to get the correct surface color.
- The plug-in now honors *Maya* object visibility attributes ("Render Stats") in case no 3Delight visibility attributes have been defined.
- Added more control on how particles are rendered. For example, particles can now have a sub-pixel size.
- Added support for area lights.
- Advanced features include:
 - RenderMan shader writers gain control on how parameters are presented in the AE using a new parameter grouping functionality.
 - User definable light nodes gives the necessary flexibility to customize RenderMan commands output when issuing light sources.

3Delight Performance

- Ray-tracing performance, especially for specular rays, has been significantly improved.
- Multi-threading performance has been further improved, in both memory use and speed. 3Delight implements a true multi-threaded rendering core meaning that all threads share as much memory as possible.
- The photon casting algorithm has been multi-threaded.
- Improved performance and memory use on subdivision surfaces with many texture coordinates and vertex variables. Such geometry uses up to 5 times less memory.
- *Atmosphere* and *interior* shaders run much faster (up to an order of magnitude) and are controlled using an independent "volume shading rate".

Rendering Features

- Improved point-based occlusion and global illumination delivers higher quality results without loss of performance.
- Photon mapping quality has been improved:
 - Photons can trigger surface evaluation for both caustics and color bleeding to get correct reflectance and transmittance.
 - Caustics rendering quality has been improved.
 - It is now possible to cast photons from high dynamic range environment maps.
- Displacement shaders can run on vertices (instead of micro-polygons) for better ray-tracing efficiency. Additionally, many displacement shaders can be assigned to a specific object and be evaluated sequentially.
- *Dicing cameras* can be used to heal “pops” in displacements during animation.
- Specular highlights from area lights are correctly rendered (e.g. square area lights will produce square shaped highlights).
- Improved filtering of blurred cubic environment map lookups.
- Edge detection has been further enhanced and outlines can now be composited directly over an output variable.
- Improved the accuracy of NURBS and conics.
- Implemented `RiScopedCoordinateSystem`.

Pipeline

- Introducing a new shader evaluation API and library: `Sx`. This API exposes methods to load and execute RenderMan shaders, in SIMD.

Shader Compiler

- Initial support of “Shader classes”.
- Functions can have multiple exit points.

Tools

- `tdlmake` supports a new output file format: directory textures. A directory texture (or “dirtex” in short), is a standard directory with all mipmaps saved as TIFF files. This new texture format enables a more fine grained data transfer between the server and the network cache.
- `ptcview` can load and display photon map files.

3DELIGHT 7.0

November 2007

3Delight For Maya

- The plug-in is better integrated into *Maya*. It now registers itself as a standard Maya renderer and is thus accessible through the Render Settings. Batch rendering and command line rendering (through the standard *Maya Render* command) is now possible.
- Improved HyperShade Translation:
 - *3Delight For Maya* tracks HyperShade network modifications and only translates and compiles shaders which have changed.
 - The following hypershade nodes are now supported: `ocean`, `remapValue`, `lightInfo`, `layeredTexture` and `volumeLight`. The Image Sequence options of the File texture node are now supported.
 - HyperShade networks for light sources are correctly translated into their RenderMan SL equivalent.
 - The RenderMan Code shader can now declare output variables and those can be output using secondary displays (advanced).
- Support for RIB archives creation and reading using a user friendly, yet flexible, interface.
- Out-of-the-box support for *Shave & a Haircut* and much improved *Maya Fur* support.
- Object Instancers are fully supported.
- Shadow Maps can be rendered using arbitrary cameras. This allows for better shadow map view framing and thus better quality.
- More output variables added to secondary displays.
- *Maya* 2008 support.

Rendering Features

- New Image Based Lighting Algorithm. A more flexible and powerful approach to image based lighting is introduced.
- Point Based Occlusion and Color Bleeding.
- Brick Maps (3D Textures) for efficient and anti-aliased 3D data lookup.
- Display subsets. A unique feature that enables rendering of many layers, each with its own alpha channel and output variables, in one render pass.

3Delight Performance

- Multi-threading efficiency has been improved for scenes with high depth complexity.
- Point cloud files are not read in memory all at once any more: proper caching enables memory-efficient access to point cloud data.
- Subsurface scattering has been optimized and the pre-processing step is now run in multi-threaded mode.
- Deep Shadow Map creation is now multi-threaded.

- `occlusion()` and `indirectdiffuse()` have been accelerated through the use of adaptive sampling.

Texture Converter (tdlmake)

A new `-preview` option makes `.tdl` textures appear as TIFFs of lower resolution to software such as *Maya*; this enables you to use a single texture for both *Maya* previews and final renders. Additionally, `tdlmake` now supports the TARGA file formats.

New Tools

- `ptc2brick` is a tool to convert point cloud files to brick maps.
- `ptcview` is a tool to view point cloud files.
- `ptcmerge` is a tool to merge point cloud files.

Pipeline

- A new API to access point cloud files has been added.
- A C++ API for DSO plug-ins is now available.

3DELIGHT 6.5

February 2007

3Delight For Maya

- *Maya Fur* support using efficient procedural geometry.
- Enhanced Hypershade support. Hypershade networks that contain animated attributes are now handled correctly.
- Secondary displays can now output many useful components from Hypershade materials, such as diffuse, specular, etc.
- A “rendermanCode” Hypershade node has been added. It can be used to execute RenderMan SL code in Hypershade networks.
- Support for *Maya 8.5*.

3Delight Performance

- Ray tracing speed is greatly improved. Some heavy scenes will render up to 50% faster.

64-bit Support

- *3Delight* now supports Windows 64-bit.
- *3Delight For Maya* now supports *Maya* 64-bit.

3DELIGHT 6.0

November 2006

3Delight For Maya

- HyperShade support. 3DFM now automatically converts HyperShade networks to RenderMan shaders. 3DFM produces clean, human readable code and is easily extensible to support specific HyperShade nodes.
- Shader collections. A powerful feature that enables a per-pass RenderMan shader assignment mechanism.
- Complete geometry support. Paint effects, Maya hair, Maya subdivision surfaces and particles (including blobby particles) are now supported.
- Direct rendering to Maya's render view.

RenderMan

- Output variables can now be output in "exclusive" mode: each output variable can have its own alpha, independent from all other output variables.
- `RiNuCurves` can be used to render curves specified as NURBS.
- `RiHierarchicalSubdivisionMesh` to render hierarchical subdivision surfaces.
- `RiPoints` can be rendered as patches or smooth blobbies.
- `RiResource` can be used to save and restore the graphics state in whole or in part.

Rendering Features

- Photon mapping to render caustics and to accelerate global illumination (final gathering). Photon mapping can be performed in a single pass or using a two pass approach.
- 3D data baking using `bake3d()` and `texture3d()` shadeops.
- Ray tracing `hider` to trace primary rays instead of using REYES.
- Multiple shadow maps can be *aggregated* into one single shadow map file for easier access. This can serve, for example, to store six shadow maps in one file for point light shadows.
- 3Delight offers a powerful and flexible interface to render outlines such as those necessary for toon rendering.

Pipeline

- Ri Filters add extra flexibility to the RenderMan pipeline, enabling the user to modify the Ri commands stream at will.
- Conditional RIB commands contribute to create re-usable, context sensitive, archives.
- Network Cache has been extended to support network *writes*, drastically improving server load on large render farms.
- A filtering mechanism has been introduced to filter out specific error messages.

Shading Language

- Shaders can communicate with light sources using *forward message passing*.
- Variable length arrays are supported.

New Display Drivers and File Formats

- `i-display` framebuffer is now available for Mac OS X platforms.
- Added reading and writing capabilities for *Photoshop* PDF files. Outputting image channels to layers is supported.
- Added support for IFF, SGI and *Softimage* files.

3DELIGHT 5.0

3Delight For Maya

The package now comes with a Maya plugin (*3Delight For Maya*) that uses 3Delight for rendering. The plugin provides a user friendly interface to many 3Delight features and comes with a RenderMan MEL binding for increased flexibility.

3Delight For Maya is developed in conjunction with soho vfx (www.sohovfx.com). It is based upon their Build A RIB File (BARF) tools developed by Berj Bannayan and used in production since 2003.

Multi-Threading and Multi-Processing

- 3DELIGHT can now render images using threads. This automatically speeds up renders on multi-cpu, multi-core and hyperthreaded machines.
- Multi-processing and network rendering now use a load-balancing algorithm for improved efficiency.

RenderMan

- Area lights are implemented through the `RiAreaLightSource` call. Area light sources can be specified using arbitrary geometry.
- Arbitrary output variable functionality has been extended for greater flexibility. See `RiDisplay`'s documentation for details.
- The `gather()` shadeop can now return arbitrary variables for ray hit positions.
- `RiGeometricApproximation` now accepts a 'focusfactor' parameter to control the shading rate of out of focus geometry.
- Network cache functionality is available through the Rx library. This enables users to cache arbitrary network files using 3DELIGHT's powerful caching system.
- The `hider` can render scenes without motion blur but with correct time derivatives. This is useful for performing motion blur as a post-processing step.

Performance

- Accelerated motion blur and depth of field sampling.
- Trim curves render faster and require less memory thanks to an improved algorithm.
- Ray tracing of complex scenes is now faster (up to 10%).
- Overall memory consumption has been reduced.
- `i-display` framebuffer is now faster on Windows.

Image Quality

- 3DELIGHT now offers an improved motion blur sampling that better mimics the shutter of a real camera. This generally produces smoother motion blur when enabled.
- A new 'extrememotiondof' `hider` option improves sampling in scenes combining large motion blur and out of focus regions.
- Cubic environment map lookups now support oversampling for better filtering.
- Shadow map filtering for low resolution shadow maps has been improved.

Image Based Lighting

- `gather()`, `occlusion()` and `indirectdiffuse()` can use arbitrary ray distributions for more realistic renderings using HDRI maps. Ray distributions are specified using an environment map and help produce images with correct shadows and lighting with respect to the environment.
- `tdlmake` can create cubic environment maps from lightprobes or two fisheye lens images.

Shader compiler

- Shaders can contain user defined annotations. This can be used by shader generators to embed information about parameter ranges, comments and other meta data. The SLO library has been augmented to retrieve annotations from shaders.
- `shaderdl` warns when mixing incompatible coordinate systems in arithmetic.
- Additional code optimization is now performed at the `-O2` optimization level. Shaders need to be recompiled.

3DELIGHT 4.5

RenderMan

- 3DELIGHT now fully implements the CSG RenderMan capability.
- Enhanced arbitrary output variables support: each output variable can now have its own filter.
- The `zthreshold` option, useful for shadowmaps, is now implemented.
- Improper displacement bounds are now reported as a warning.

Performance

- 3DELIGHT's performance has been improved with better depth culling and more efficient handling of depth-complex scenes.
- Atmosphere shaders can be evaluated more efficiently, this leads to faster rendering of volumetric effects.
- Improved texture lookup speed and cache usage. This also has a beneficial effect on network traffic.
- Some very complex implicit surfaces (made of thousands of nodes) now render faster.
- Both scene loading and RIB output are about three times faster.
- A new display variable, `__CPUtime`, can be used to identify shading bottle-necks.

Image Quality

- `calculatenormal()` now returns better normals and exhibits more details in finely displaced geometry.
- Smooth derivatives are implemented and contribute to better antialiasing of textures and procedural patterns.
- Improved DSM filtering, those should now be more coherent with conventional shadow maps.
- Atmosphere shaders can now work correctly with layered translucent surfaces.

Shader Baking

A new shadeop, `bake()`, can now be used to easily bake shader computed values into a `.bake` file. Additionally, `tdlmake` can now read `.bake` files and convert them into a texture.

Shader Compiler

The optimizer has been further improved to generate smaller and faster code, especially for very large or automatically generated shaders. This can significantly improve rendering times.

New Tools

- `ribshrink` is a tool to factor RIB archives out of a set of RIB files. The purpose of this tool is to save storage space and network traffic.
- `ribdepends` is a tool to list RIB dependencies such as textures, shaders and archives, it can also be used to create site independent RIB packages.

Linux builds

3DELIGHT is now linked against `glibc 2.3` so issues when linking with other applications (such as `liquid`) should be gone.

3DELIGHT 4.0

Multiprocessing

3DELIGHT is now able to render a single image using multiple processors located on a single computer or on remote computers or a combination of both. This powerful feature makes it possible to distribute rendering of a single image on a render-farm without the need for external software.

Performance

Loading speed and memory usage for complex scenes has been further improved. Additionally, improvements to the shading system yields an overall 20% increase in rendering speed for complex scenes. This is the first step of a continuing optimization of the shading system.

Other features

- Rendering times are now reported in the statistics with detailed information for each part of the rendering process. This eases the identification of performance issues.
- Lightweight particles are now correctly shaded using surface shaders.
- Motion blur of RiAttributes is now properly handled.

Shader Compiler

The shader compiler `shaderdl` now supports variable size arrays. Some optimization options have been moved from O3 to O2 for better code generation. Compilation time has been improved for large shaders.

3DELIGHT 3.0.1

Fixes

1. Fixed a glitch with RiCurves rendering when motion blur was used.
2. Removed some annoying error messages that were displayed during some Windows renderings.

The `i-display` `FrameBuffer`

This utility is now more efficient in terms of CPU usage. ‘Draw as Textured Polygon’ is now the default.

3DELIGHT 3.0

Ray Tracing

The ray tracer uses more accurate ray differentials (derivatives), leading to higher quality filtering. Oversampling can now be specified on a per shadeop basis to improve ray tracing quality.

Level of Detail

LOD is now supported and works for all primitives. This feature, combined with 3DELIGHT's procedurals, can contribute to dramatically lower memory usage.

Particles

In addition to the 'sphere' and 'disk' rendering modes, `RiPoints` can now be rendered using a lightweight primitive suitable for very small particles such as dust. Particles are rendered as circles using a specialized algorithm.

Primitives

Tessellation algorithms have been improved for 'catmull-clark' subdivision surfaces, leading to better quality and performance. `facevertex` variable interpolation has been greatly improved. All quadrics and the torus are now native primitives, resulting in improved performance.

Subsurface Light Transport

The `subsurface()` shadeop has been further improved: it is faster and gives noticeably better results (even with higher shading rates).

RenderMan API and RIB files

The following RenderMan calls have been implemented: `RiArchiveBegin`, `RiArchiveEnd`, `RiArchiveInstance` (Inline archives) and `RiClippingPlane`. Additionally, 3DELIGHT can transparently read and write RIB streams compressed with `gzip`.

New Framebuffer

`i-display` is now the default framebuffer. The old framebuffer can still be enabled by modifying the '`rendermn.ini`' file distributed with the application. (Not available for MacOS X)

Network Caching

This feature now works on MacOS X platforms.

Shader Compiler

Overall compiler's performance has been improved. Script named '`shaderdl`' (and '`shaderdl.bat`' on Windows) has been removed. The binary may now be invoked directly. It is now possible to compile multiple source files at once; specifying a directory will build all contained source files. Additionally, it is now possible to embed the shaders' source file inside compiled shaders, triggering automatic shader "on the fly" recompilation when binary backward compatibility is broken.

3DELIGHT 2.1

New Windows Installer

This should fix all reported path problems.

Motion Blur

3DELIGHT now supports unlimited multi-segment motion blur for geometry deformation, transformation and camera movement.

Improved Image Quality

A new sampling strategy reduces noise when rendering motion-blur, indirect diffuse lighting, ambient occlusion, shadow maps and ray-traced shadows (when blurred). Environment map lookups give smoother looks than in previous releases.

Improved Visibility Culling

3DELIGHT now discards geometry more aggressively with the "opacity threshold" attribute. This proves beneficial for scenes with a large number of layered semi-transparent surfaces (e.g. hair).

Deep Shadow Maps

New analytical filtering of shadow lookups gives beautiful, precise shadows even for very thin geometry such as hair. A new compression algorithm roughly halves DSM storage requirements.

Ray Tracing

The new `gather()` shadeop provides a flexible interface to hemisphere sampling. Ray-tracing performance improved significantly, especially for subdivision surfaces.

Geometry

Algorithms for dicing subdivision and implicit surfaces (blobbies) are three times faster on average. In addition, polygonal models made of triangles render better due to an improved dicing scheme.

Sub Surface Light Transport

`subsurface()` is now more robust, faster and uses less memory. A 'shadingrate' attribute gives more control over algorithm's performance.

Rx Library Calls

The renderer now provides DSOs with access to some useful internal SL functions such as `option()`, `attribute()`, `texture()` and `noise()`.

Network Cache

In addition to its network texture caching functionality, 3DELIGHT now caches RIB archives stored on network drives (e.g. NFS).

Shading Compiler

Error and warning reports are less intrusive and more accurate.