NVIDIA Gelato 2.0 Features and Benefits

Feature	Gelato 2.0	Gelato Pro 2.0
Image Quality		
Unlimited Resolution	☑	☑
High-quality Antialiasing	☑	☑
True Displacement	☑	☑
High-Quality Motion Blur	☑	☑
Depth of Field	☑	☑
Automatic Adaptive Tessellation	☑	☑
Rich Geometry	☑	☑
Shading & Lighting		
Sorbetto Interactive Shading & Lighting		☑
DSO Shadeops		☑
Programmable Shading & Lighting	☑	☑
Layered Shaders	☑	☑
Antialiased Texture, Environment, & Shadow Maps	☑	☑
Volumetric Shadows	☑	☑
Atmospheric Effects	☑	☑
Caustics	☑	☑
Subsurface Scattering	☑	☑
Average-Z (“Woo” or “Midpoint”) Shadow Maps	☑	☑
Cube-Faced Shadow Maps	☑	☑
Vertex Variables	☑	☑
Unlimited Lights	☑	☑
Global Illumination	☑	☑
Ambient Occlusion	☑	☑
Efficient Raytracing	☑	☑
Sparse Spatial Databases	☑	☑
Shader Library	☑	☑
Performance		
Multithreaded		☑
Native 64-bit Support		☑
Hardware Acceleration	☑	☑
Efficient Handling of Complex Scenes	☑	☑
Efficient Memory Use	☑	☑
Selective Raytracing	☑	☑
Fully Selective Lighting	☑	☑
Production Readiness		
Comprehensive Support		☑
Network Parallel Rendering		☑
Holdout Matte Objects	☑	☑
No Eyesplits	☑	☑
Low-Cost Sampling	☑	☑
Multiple Cameras	☑	☑
Saved Queries & States	☑	☑
Geometry Sets	☑	☑

Preview Mode	☑	☑
User-Priority Rendering	☑	☑
Stereo Rendering	☑	☑
Interleave Utility	☑	☑
Multiple Operating Systems	☑	☑
Flexible Licensing	N/A	☑
Royalty-Free API	☑	☑
Plug-In I/O Architecture & Multiple Formats	☑	☑
Multiple Scene File Formats	☑	☑
Python Binding	☑	☑
RIB Scene File Reader	3rd Party	3rd party
Alias Maya Plug-In	☑	☑
Autodesk 3ds Max Plug-In	☑	☑
Image Viewer	☑	☑

Image Quality

Unlimited Resolution. Gelato imposes no limit on the resolution of your final render; images can be as large as you like.

High-quality Antialiasing. Gelato has sub-pixel anti-aliasing, resulting in smooth surfaces. "Jaggies" are nowhere to be seen.

True Displacement. Gelato shaders support true displacement, creating accurate representations of rough or uneven surfaces. Displacement occurs at frequencies as high as are visible in the image, not merely at object control vertices. Using displacement on objects has virtually no effect on rendering time.

High-Quality Motion Blur. Gelato can realistically simulate movement through a still frame by blurring moving objects in 3D.

Depth of Field. Gelato can mimic the focus of a camera lens, creating the illusion of depth by blurring objects outside the focal range.

Automatic Adaptive Tessellation. Gelato tessellates the geometry on the fly, and does not require you send pre-tessellated polygons to the renderer. This creates smooth lines and curves without artifacts or aliasing, no matter how closely or from what angle you view the geometry.

Rich Geometry. Gelato supports a wide range of geometric primitives, not just polygons. These include:

- NURBS
- Bicubic/Bilinear Patches
- Subdivision Surfaces
- Curves (hair)
- Wide Curves (ribbons, feathers)
- Points (particles)
- Procedural Geometry

Shading & Lighting

Sorbetto Interactive Shading and Lighting
With Gelato Pro you get fast relighting. Rapidly recompute changes to lighting.

- **API-based.** All Sorbetto functions exposed in the Gelato API and not dependent on any particular modeling or animation software.
- **Relighting on final pixels.** Including full antialiasing, motion blur, transparency, displacement, and production shaders. What you manipulate is always identical to the final rendered image.
- **Fully Adjustable Lighting.**
  - Add/delete lights
  - Move/reorient lights
  - Change any light shader parameter
  - Change light linking (what lights shine on what surfaces)
- **Recomputes Reflections Automatically.**
- **Selective Relighting.** Recompute lighting for a crop window or specified object for even faster results.
- **Interruptible.** Make changes on the fly before the last render is finished.
- **Plug-in Support.** Supported by plug-in for Maya and soon by the plug-in for 3ds Max

DSO Shadeops. Gelato Pro allows you write functions in C++ that can be called from your shaders, implemented as DSOs (called DLLs under Windows). This allows you to extend the Gelato Shading Language with any functionality that is available in C++, including file access and system calls.

Programmable Shading & Lighting. Gelato uses its own C-like shading language, to create surface textures and lighting for scenes using the renderer. Gelato Shading Language provides the flexibility required for the most complex scenes.

Layered Shaders. Instead of allowing only a single surface, displacement, volume, or light shader per object, Gelato allows you to assign multiple shaders of each type to an object. You may call several shaders in turn, specifying that one shader's outputs be connected to the next shader's inputs. This allows you to compose the operations of component shaders without modifying (or even having access to) the source code of any of the shaders involved, creating complex shaders without coding. For example, you can make any surface glossy by layering a "gloss" shader atop any other shader, without needing the source code to either.

Antialiased Texture, Environment, & Shadow Mapping. Gelato can apply its high-quality anti-aliasing to the surface features and shadows of objects, not just to the geometry.

Volumetric Shadows. Provides realistic shadowing for fine and detailed geometry, like hair and fur, and for translucent objects.

Atmospheric Effects. Gelato realistically renders effects such as fog and smoke.

Caustics. Gelato can render caustics, patterns of light focused via reflective or refractive objects onto surfaces.

Subsurface Scattering. Gelato can use subsurface scattering, diffusing light beneath a surface and allowing it to re-emerge, realistically creating the translucent look of materials such as skin.

Average-Z ("Woo" or “Midpoint”) Shadow Maps. Instead of storing depth of the nearest surface in a shadow map, this alternative shadow technique stores the average depth of the first and second surfaces. This can greatly reduce self-shadowing artifacts and the need to adjust "shadow bias."

Cube-Faced Shadow Maps. Look up shadows from any direction with a single query.

Vertex Variables. Gelato allows the assignment of arbitrarily named and typed data to geometric vertices and will automatically interpolate the values across the surface and make the interpolated values available to shaders.

Unlimited Lights. Gelato does not impose an arbitrary limit on the number of lights in a scene.

Global Illumination. Gelato can mimic the subtle interactions of natural light sources by computing all the possible light interactions within a scene, tracing the light bouncing between objects and carrying their diffuse color properties with them. These colors are, in turn, transferred onto other neighboring objects. This results in much more accurate tones and shadows.

Ambient Occlusion. Gelato can be used to render an ambient occlusion pass of a scene, calculating the amount of ambient light that reaches any given point on a surface. This data can be used to recreate the contribution of ambient light in a scene.

Efficient Ray-Tracing. Gelato is capable of efficient ray tracing of large scenes, including raytraced shadows, reflections, indirect global illumination, and ambient occlusion visibility queries.

Sparse Spatial Databases. Gelato shaders can create their own such databases to store the results of arbitrary computations, save them to disk, or read existing databases to disk for quick interpolation.

Shader Library. Gelato comes with a library of basic shaders, suitable for the most common surfaces and lights.

Performance

Multi-threaded. Gelato is multi-threaded on the CPU and, with PCI-Express, on the GPU. Thus it is able to harness all the computing power in a single node, resulting in maximum performance under a single license.

Native 64-bit Support. Gelato Pro has a version that runs natively on Linux 64-bit systems, enabling you to address more memory space. Gelato Pro support for Windows 64-bit is on the way. (Gelato will run in 32-bit mode on both Linux and Windows 64-bit systems.)

Hardware Acceleration. Gelato is designed from the ground up use the NVIDIA GPU to speed up various internal functions. No special shaders, coding, or configuration is required to use the hardware and it does not affect flexibility or image quality in any way. It does, however, approximately double performance compared to CPU-only renderers. Subsequent releases of Gelato will take greater advantage of the graphics hardware and future graphics hardware will be even faster and more capable. For the past few years, graphics hardware has been doubling in speed every 6-12 months, whereas CPUs have been doubling in speed roughly every 18 months. So renderers based on graphics hardware will not only perform well now, but will over time rapidly outstrip the performance of CPU-only renderers.

Gelato runs on the entire line of NVIDIA Quadro FX boards, GeForce 5200 and higher cards, and Quadro NVS 440 boards. However, support for Gelato Pro is only provided for systems running Quadro FX.

Efficient Handling of Complex Scenes. Gelato is designed for the demands of film and efficiently allocates system resources and is stable while rendering the most complex scenes.

Efficient Memory Use. The components of complex scenes can exceed the memory capacity of even the most advanced systems. Gelato makes extremely efficient use of system memory, so that scenes are accurately rendered quickly.

Selective Ray Tracing. While ray tracing can produce extremely realistic lighting and shadow effects, it is computationally very intensive. Gelato uses scanline techniques where the use of ray tracing is not required, resulting in faster renders.

Fully Selective Lighting. Gelato offers maximum flexibility in lighting by allowing lights to apply to only particular objects if desired.

Production Readiness

Comprehensive Support. NVIDIA offers a comprehensive maintenance and support program for Gelato Pro, ensuring that rendering problems will not critically delay your production schedule.

Network Parallel Rendering. Gelato Pro can use many machines on a network or server farm to render a single frame very quickly.

Holdout Matte Objects. Gelato supports holdout mattes, allowing objects to be composited in later in post-production.

No Eyesplits. Gelato’s algorithms will not create eyesplits. Ever.

Low-Cost Sampling. Pixel sampling in Gelato is cheap in terms of system resources, so you can make the spatial and temporal quality of the pixel settings absurdly high with surprisingly low impact on the overall rendering time.

Multiple Cameras. Gelato allows you to place multiple cameras within a scene, just as you would lights or objects. And since Gelato organizes the scene in "world space," there is no need to treat the camera as the original origin and carefully placing the rest of world with the inverse transformation.

State Queries & Saved States. A program or plug-in making calls to Gelato may ask for the current value of a graphics attribute. There are also calls in Gelato's API to save all or part of the current state, name it, and later restore all or part of that saved state. This makes it easy to transfer collections of attributes from one part of your scene hierarchy to another.

Geometry Sets. In Gelato, it is possible to name groups of primitives, allowing you to specify collections of primitives for ray tracing, for use as area lights, or for other uses.

Preview Mode. Permits ultra-fast rendering with low-quality shading for iterative renders used in scene construction and lighting before the final, high-quality render.

User-Priority Rendering. Select the area of the image you want to render first.

Stereo Rendering. Render stereo images faster than you could by rendering two images separately.

Interleave Utility. Combine alternate scanlines from two images for "field rendering."

Multiple Operating Systems. Gelato runs on Linux (RedHat, SUSE), Linux 64-bit, and Windows XP.

Flexible Licensing. Gelato Pro can make use of floating licenses over a network, permitting many machines to share a pool of licenses, reducing operating expenses. Or alternatively, Gelato Pro can be node-locked to a specific machine. Licensing is also operating system independent, so Windows and Linux machines can share the same pool of licenses.

Royalty-free API. Gelato's main Application Program Interface is a modern, C++-based API. To ease training requirements, the API is simple (few calls) and orthogonal (calls are non-overlapping). The API is available at no charge to encourage and foster the development of a wide range of tools for Gelato.

Plug-In I/O Architecture & Multiple Formats. Gelato does not require any specific input or output formats. Instead, it is designed to make use of plug-ins that allow Gelato to read any type of scene file or image input or output. Gelato ships with plug-ins for the most common I/O formats; others are available from third parties; and you can create your own using the API.

Multiple Scene Input Formats. Gelato does not prescribe a specific scene file format, forcing you to convert all data into that format. Instead, Gelato has a simple API for the creation of scene format plug-ins. When a file is input, the plug-in (DSO/DLL) for that format is dynamically loaded and told to read the scene file. Thus, you may store your scene in any format for which there is a plug-in and you may freely mix different files in different formats within a single scene. Available scene file plug-ins include:

Python Binding. Gelato ships with a scene format plug-in that reads Python scripts that make calls to the Gelato API. This provides a flexible, fully scriptable method for scene input.

RIB Scene File Reader. A plug-in that allows Gelato to read Renderman scene file formats is available for free.

Maya plug-in. Gelato ships with Mango, a plug-in to Alias's Maya modeling and animation software package that reads scenes and objects created in Maya.

- **Maya 7.0 Support.** Mango runs on the latest version of Maya.
- **Sorbetto Support.** Mango with Gelato Pro supports all Sorbetto features.
- **Familiar User Interface.** Mango uses the Maya GUI, familiar to any Maya user, minimizing training time.
- **Loads Automatically.** Mango loads whenever Maya is launched. No special startup commands are necessary. Once inside Maya, the user simply has to specify Gelato as the renderer.
- **Geometry.** Mango supports the a wide variety of geometry types.
- **Surface Shaders.**
    - **Hypershade Translation.** Mango automatically translates your Hypershade network to a series of Gelato shader layers.
    - **Gelato Shaders.** Mango can use any Gelato shader in your library, allowing you to assign it and set its parameters from within the Maya GUI.
- **Lights and Shadows.**
    - Light shaders behave much like surface shaders
    - Mango supports all Maya's default light types
    - Depth-Mapped Shadows
    - Raytraced Shadows
- **Render Selected Objects.** You can render selected objects in the scene or the entire Maya scene.
- **Python Scripting.** Attach Python scripts to Maya nodes using the Maya GUI for execution during rendering.
- **Multiple Viewers.** You can render to either Gelato's image viewer or Maya's render window

3ds Max plug-in. Gelato ships with Amaretto, a plug-in to Autodesk 3ds Max that reads scenes and objects created in Max.

- **Geometry.** Amaretto supports all 3ds Max geometry objects.
- **Surface Shaders**
    - Supports Gelato shader networks
    - Gelato GSO base material implementation in 3ds Max
    - File parsing and automatic GUI generation of Gelato shaders in 3ds Max
    - 3ds Max standard materials implemented as GSO shaders.
    - 3ds Max maps implemented as GSO shaders
    - Advanced shader preview in the material editor
- **Lights and Shadows**
    - 3ds max direct lights
    - 3ds Max default scene lights supported as direct lights.
    - Omni lights support.
    - 3ds Max spot lights
    - Both raytraced shadows and shadow maps supported
    - Global illumination support

    - Ambient occlusion shader support
- **Cameras.**
    - 3ds Max standard cameras and perspective viewports
    - Orthogonal cameras and viewports
    - Camera and object multi-segment motion blur with shutter angle support, centered, forward and backward alignment, segments and temporal quality controls
    - Depth of field global or camera-specific settings, including explicit, target and custom focus objects support
- **Output**
    - RGBA Output as TIFF, EXR, JPEG files
    - Render Passes output to TIFF, EXR, JPEG for Diffuse, Specular, Ambient, Normals and any custom shader variables

Image Viewer. Gelato ships with a tool, called the Image Viewer or iv, for displaying multiple images in any format for which there is an installed plug-in. iv can correct the gamma of the display, zoom, and playback and loop sequences of frame