

Solution Brief

Ray Tracing and 3D Rendering
Visual Computing

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Intel® Graphics Technology Brings Exciting Capabilities to Blender

Blender, a 3D digital creation and animation tool embraced by both professionals and amateurs, benefits from the Intel Arc™ graphics architecture and Intel oneAPI software enabling new, high-performance ray tracing features.

“Pre-release [Intel] hardware — we still get that quite often. That is really cool. We have developers in our studio and they love to have this new stuff to play with and to really stretch the maximum out of the hardware to get the performance.”¹

– Ton Roosendaal
creator of Blender and
chairman of the Blender
Foundation

A mainstay of the digital creation world, Blender is all the more remarkable in that it offers professional-grade features in a free, open-source package that supports design across multiple types of architectures (CPUs and GPUs). Blender 3.3 capitalizes on the architecture of Intel Arc Graphics technology.

Access to Intel Arc and Intel Data Center GPU Flex series through Blender's support of oneAPI cross-architecture programming with C++ through SYCL is now available. Blender takes advantage of the GPU acceleration capabilities for rendering and gains performance advantages in other areas, such as modeling, sculpting, rigging, Eevee rendering and so on.

Forging Collaborations with the Open-Source Community

For many years, Intel has worked closely with the Blender open-source community as part of its commitment to an open software ecosystem to foster innovation. Intel co-engineered operations such as the optimizations for CPU and GPU rendering in the Cycles viewport — accelerating the overall rendering fidelity, time and performance. Rendering a final still image or individual animation frame tends to be a time-consuming process, particularly because of Blender's use of ray tracing. Ray tracing generates incredibly realistic graphic images by calculating the path of every source of illumination, determining where shadows are cast, mapping reflections and refractions for different types of materials and accommodating different atmospheres through which the light travels.

The complex operations required for ray tracing are well supported by Intel Arc Graphics technology and optimized for the Intel oneAPI Rendering Toolkit libraries integrated into Blender. Performing ray tracing operations on the GPU rather than the CPU can result in considerable time savings in Blender.

Capitalizing on Updates to Cycles

Blender redesigned its rendering engine, Cycles, in 2021 and at the same time ended support for OpenCL. The Blender team and Intel then collaborated on integrating support for SYCL, a heterogeneous software platform, through oneAPI's SYCL implementation, Data Parallel C++ (DPC++), into the application. This provided the ability to leverage oneAPI cross-architecture programming for Intel Arc technology to take advantage of advanced capabilities, including substantial speedup in rendering times.



Rendering with Cycles

Blender's Cycles rendering engine, supports GPU-accelerated ray tracing used through the Intel oneAPI Rendering Toolkit libraries. In combination with Intel Open Image Noise and Intel Embree, artists, 3D designers and other users have access to sophisticated features. With cutting-edge denoising, paths calculated by artificial intelligence (AI) can deliver a clean image in seconds. The real-time viewport uses the GPU to let users try different material values. Without performing a full rendering, the viewport then provides a preview of the scene's appearance with the changes in place.

Delivering Speed and Efficiency: Intel Contributions to Blender

In addition to oneAPI support in Blender 3.3, Intel contributed hardware, testing, ideas and technical support during the development process, as well as much of the actual coding, software and hardware bug tracking, and upleveling oneAPI suitability for deployments targeting client platforms.

"It is refreshing to see a hardware vendor enable support using an open standard and a toolchain that's open source down to the graphics compiler (on Linux, at least)," said Sergey Sharybin, Principal Engineer for Blender.

GPU Rendering with Intel Embree

Blender utilizes [Intel Embree](#), a rendering library that helps graphics application engineers improve the performance of photorealistic rendering applications. The current implementation of Embree (version 3.13.4) supports CPU only, but the upcoming version, Embree4, enables the ray tracing acceleration hardware for ray tracing provided by Intel Arc technology, along with general rendering on GPUs. Embree4 will be integrated into Blender in an upcoming release.

Real-Time Viewport Rendering

One of the most noteworthy features of Blender, supported by Intel Arc technology, is high-speed ray-traced rendering to quickly visualize effects through the viewport (Figure 1).

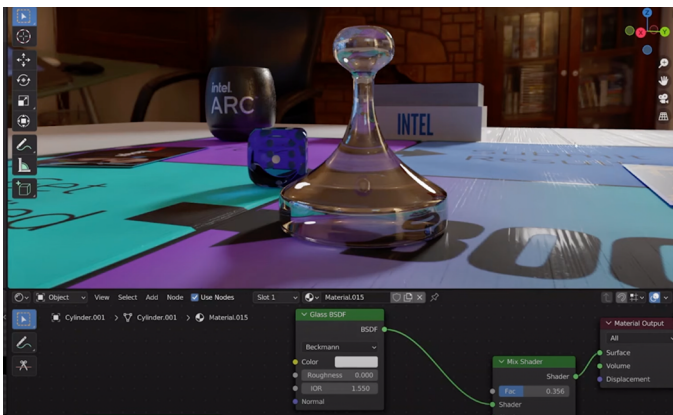


Figure 1. Near real-time rendering of scenes in the Blender viewport takes advantage of Intel GPU performance.

New Program Features of Blender v3.3

Blender v3.3 includes general performance improvements of numerous features as well as powerful new features that enhance use of the program.

These include:

- **New hair grooming system**, based on high-performance curves objects, is faster and offers flexible options using Geometry Nodes, for building very realistic figures, both human and other assorted animals.
- **Procedural UV unwrapping** makes it possible to create and adjust UV maps procedurally with Geometry Nodes.
- **Three new Geometry Nodes** simplify path-finding across mesh edges. Other new nodes strengthen the options for building 3D environments.
- **Large-scale performance improvements** were added to a number of program features, including the grease pencil line-art tool (up to 8X faster), data management tools, importing operations for very large files and more.
- **Sculpting workspace is enhanced** to achieve cleaner images when using high ISO values and improve the rendering that takes place in Eevee, with faster real-time lighting changes.
- **Shade smoothing and auto-smoothing of objects** simultaneously is now possible, resolving the need to accomplish these operations manually (which has been a long-term complaint from Blender users).

Ongoing Blender Improvements

The vibrant open-source development community for Blender is particularly strong. Continued sponsorship by Intel promises to bring the advances of Intel CPUs (Intel Xeon® processors and Intel Core™ processors) and Intel Arc and data center GPUs to future releases of this application. Blender is uniquely crafted by committed individuals who have successfully brought it from conception to one of the leading 3D animation platforms currently available.



Figure 2. Blender can create polished, 3D-animated movies, such as *Spring*, produced by Blender Studios.

Resources

As proudly proclaimed on its website, Blender is free and based on open-source licensing. It is free to use, share, sell and modify. The application does modeling, animation, visual effects and more, providing an unusually full-featured program. [Download Blender v3.3](#) for Windows, Linux or macOS and learn more about the new features.

Intel Deep Link Technology

Learn more about [Intel Deep Link technology](#) and the ways in which it can improve content creation and productivity.

Intel Arc Graphics Solutions

Explore the latest developments and upcoming releases slated for [Intel Arc Graphics solutions](#).

oneAPI

[oneAPI](#) is an open, cross-architecture programming model that frees developers to use a single codebase across multiple architectures. The result is accelerated compute without vendor lock-in.

Intel oneAPI Tools

Build, analyze and optimize high-performance, cross-architecture applications on Intel CPUs and GPUs with best-in-class compilers, performance libraries, frameworks, and analysis and debug tools. The [Intel oneAPI Rendering Toolkit](#) is a suite of advanced open source ray tracing libraries and components used to create high-fidelity, photorealistic experiences. Learn more about these libraries integrated in Blender.

[Intel Embree](#) improves the performance of photo-realistic rendering application with this library of ray-tracing kernels.

[Intel Open Image Denoise](#) increases image quality with machine learning algorithms that selectively filter visual noise. This independent component can be used for noise reduction on 3D rendered images.



About Blender

The Blender Foundation (2002) is an independent public benefit organization. Its spin-off corporation Blender Institute (2007) hosts the foundation offices and employees who work on the Blender software and creative projects to validate and test Blender in production environments.

In 2020 the Institute split into two companies: Blender Institute now solely functions as the working company for the Blender Foundation, and the new Blender Studio will contribute to the Blender mission producing content and testing production pipelines.

[Blender.org](#)

Intel Arc Graphics Rendering in Blender

“The value is being able to see this [depth of field in the viewport] because you have a powerful discrete GPU that allows you to see all these settings without doing a lot of rendering work.”²

– Bob Duffy, *Rendering Cycles in Blender*

1. Intel. *Blender on Intel with Ton Roosendaal* [Video] Retrieved October 10, 2022, from <https://www.intel.com/content/www/us/en/products/creative-pro/blender-ton-roosendaal-video.html>

2. Intel (2022). Intel Arc Graphics | *Rendering Cycles in Blender* [Video] Retrieved October 10, 2022 from <https://www.youtube.com/watch?v=v=qJEWOTZnFeg&t=167s>

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