

SOLIDWORKS® 2023 VISUALISATION

A guide to getting the most out of design visualisation in SOLIDWORKS® 2023
and SOLIDWORKS® Visualize 2023 with AMD Radeon™ PRO GPUs.



AMD
RADEON
PRO

Technical report sponsored by AMD

AMD.COM/RADEONPRO

Produced by

DEVELOP3D

DEVELOP3D.COM

FOUR WAYS TO VISUALISE A SOLIDWORKS MODEL

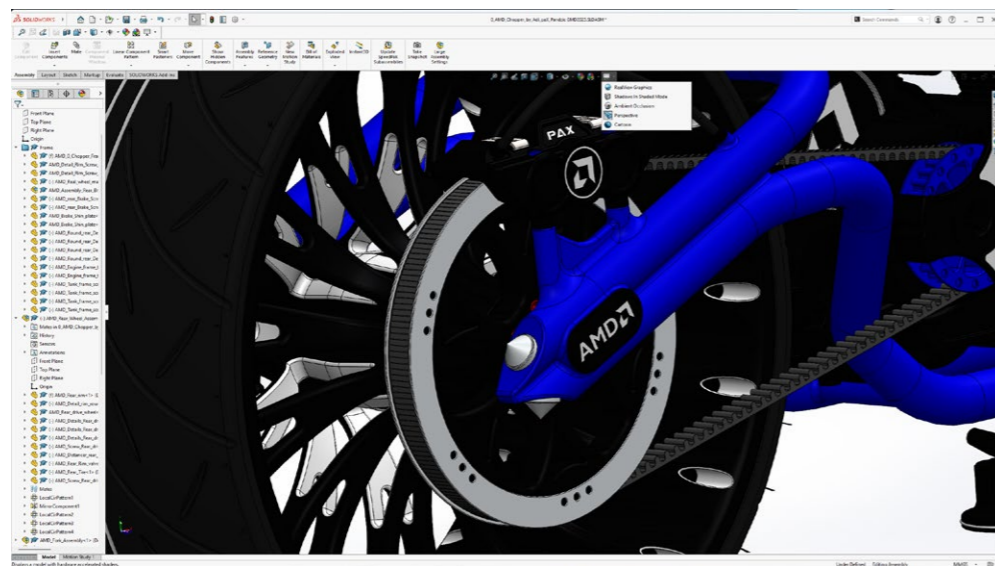
Designers and engineers have several options when it comes to visualising SOLIDWORKS designs – from enhanced realism in the viewport with RealView and Ambient Occlusion to photorealistic stills and animations with SOLIDWORKS Visualize. Then, for a fully immersive experience, models can even be taken into Virtual Reality (VR) with SOLIDWORKS eDrawings Professional.

SOLIDWORKS viewport (shaded with edges)

Shaded with edges is the most popular real-time display mode used in SOLIDWORKS. It may not be the most visually attractive, but it does a great job of highlighting the topology of a model, clearly showing how parts interact with each other.

Most modern professional graphics cards, including the AMD Radeon PRO W6400 (4GB GDDR6), should deliver good 3D performance in this mode.

For particularly large assemblies, a more powerful graphics card with more memory, such as the AMD Radeon PRO W6600 (8GB GDDR6), should offer an even smoother interactive experience.



SOLIDWORKS Visualize (Radeon ProRender)

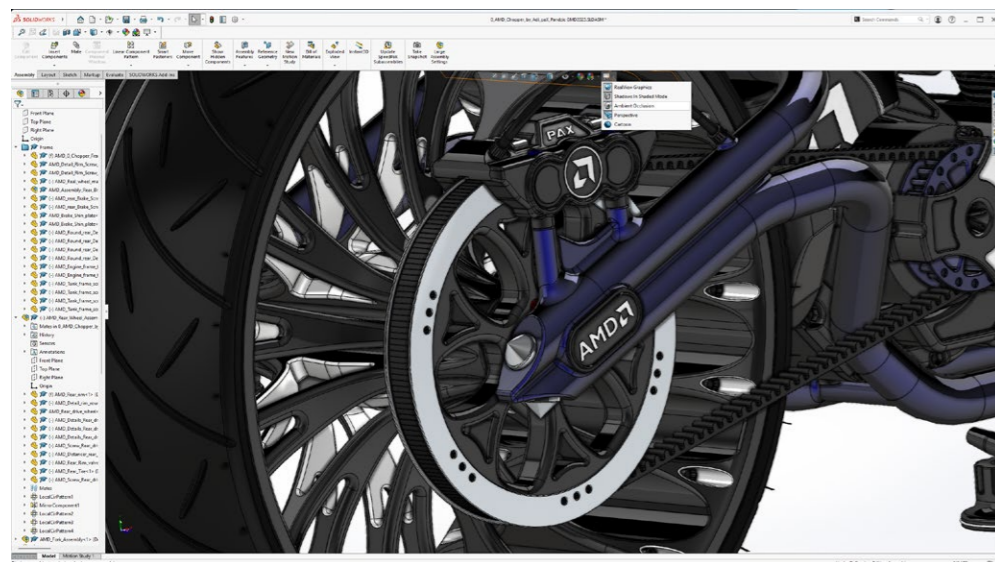
SOLIDWORKS Visualize is a powerful physically-based renderer that lets designers and engineers produce stunning photorealistic images and animations with a few simple mouse clicks. It features Radeon ProRender, a raytracing engine that is designed specifically to run on AMD GPUs.

In this motorbike assembly, metals, tyres and body paint, together with shadows and reflections, are much more realistic than when displayed in the native SOLIDWORKS viewport.

Physically-based rendering is computationally intensive so can take minutes to render a scene at high resolutions. Radeon ProRender works with a range of GPUs. For light workloads try the AMD Radeon Pro W6400. For more complex scenes and animations the AMD Radeon W6600 (8 GB) and W6800 (32 GB) are better options.



SOLIDWORKS viewport (RealView + shadows + Ambient Occlusion)

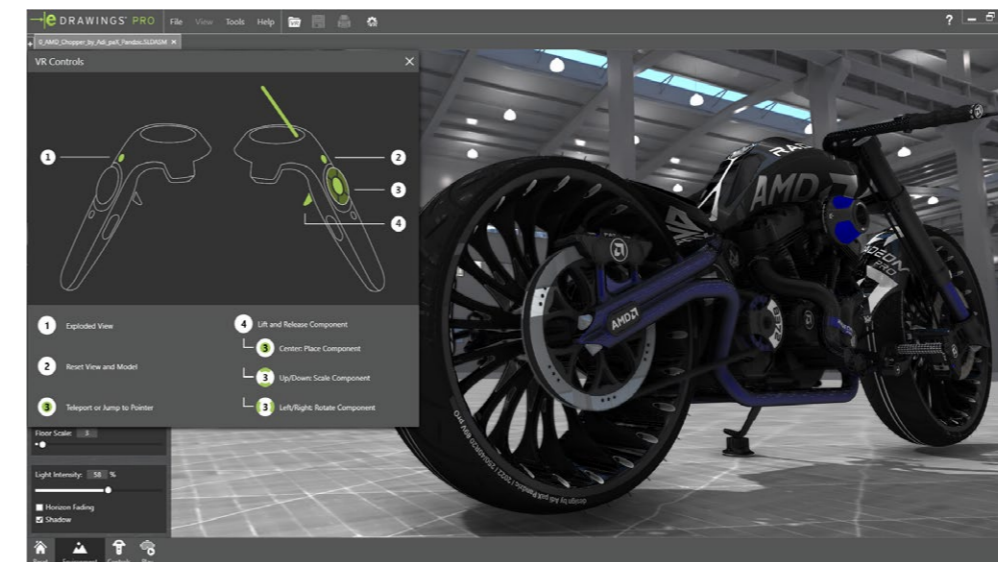


RealView delivers much more realistic effects inside the viewport, which helps bring SOLIDWORKS models to life in an interactive 3D environment.

This OpenGL-accelerated viewing mode supports floor shadows, and environment reflections. In this motorbike assembly, Ambient Occlusion (AO) is also enabled to enhance the shadows and add more depth and realism to the scene. This is particularly noticeable around the alloy wheels where darker shadows appear in more occluded (hidden) areas.

RealView is only supported on a professional graphics card such as AMD Radeon PRO. It puts much bigger demands on the GPU, so a higher-end card like the Radeon PRO W6600 (8 GB GDDR6) is recommended.

SOLIDWORKS eDrawings Professional (VR)



SOLIDWORKS eDrawings Professional allows designers and engineers to take their SOLIDWORKS designs into VR in just a few clicks. Immersive VR can give a completely different perspective to a 2D display. Models can be inspected from any angle at 1:1 scale. It is very useful for design validation, design review or for customer communication.

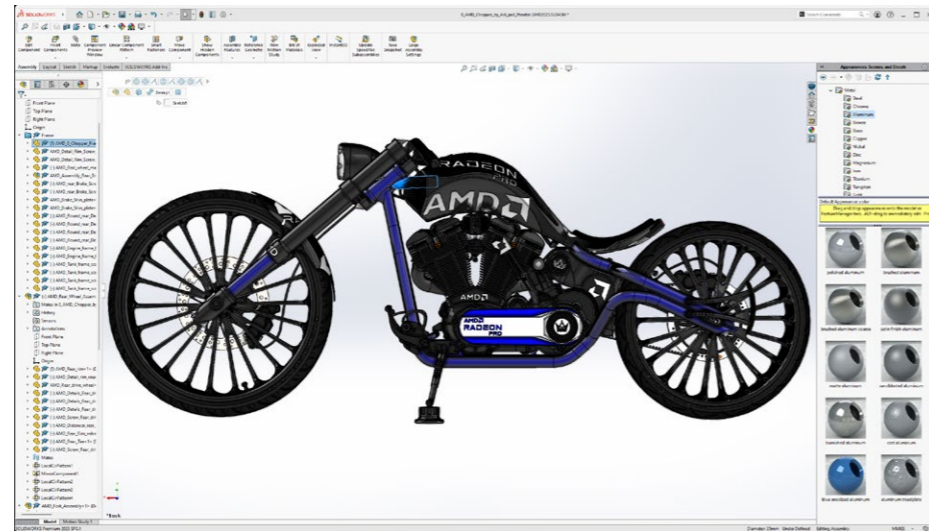
Inside VR, users can walk around or teleport, view metadata, move objects, explode assemblies or take them apart one component at a time.

To deliver results in real-time, the software can place a big demand on the GPU. A "VR Ready Creator" graphics card such as the AMD Radeon PRO W6800 or AMD Radeon PRO W6600 is recommended. For smaller SOLIDWORKS assemblies, the AMD Radeon PRO W6400 is also VR Ready.

BOOST 3D PERFORMANCE IN SOLIDWORKS FOR FREE



AMD Software: PRO Edition now includes a re-architected OpenGL driver for AMD Radeon PRO GPUs that can dramatically boost 3D performance in SOLIDWORKS.



Each quarter AMD updates its AMD Software: PRO Edition, which includes a driver for its Radeon PRO workstation GPUs. The no-cost software is designed to deliver new features, boost performance, and increase stability in professional applications, such as CAD. AMD Software: PRO Edition 22.Q3 (and all subsequent releases since September 2022) has a specific relevance to users of SOLIDWORKS. It includes a completely re-architected driver for OpenGL, the graphics API used inside SOLIDWORKS 2023. With brand new, highly optimised code, the driver delivers a significant boost to 3D performance within the SOLIDWORKS viewport.

The re-architected 22.Q3 driver is designed to boost performance in both current

generation and older AMD Radeon PRO GPUs. This includes the AMD Radeon PRO W6400 (4 GB), W6600 (8 GB), W6800 (32 GB), W5500 (8 GB) and W5700 (8 GB). For the 22.Q3 driver, AMD reports up to 115% performance improvements in SOLIDWORKS from the previous driver, streamlining the handling of large assemblies. Users can expect improvements in enhanced model visualisation and graphics, streamlined interaction and manipulation of models, improved handling of large assemblies and a better overall experience.

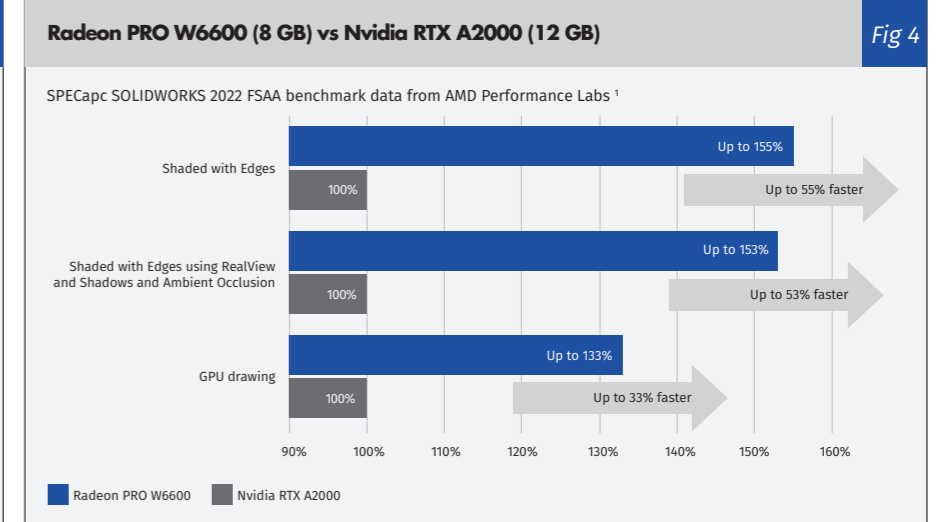
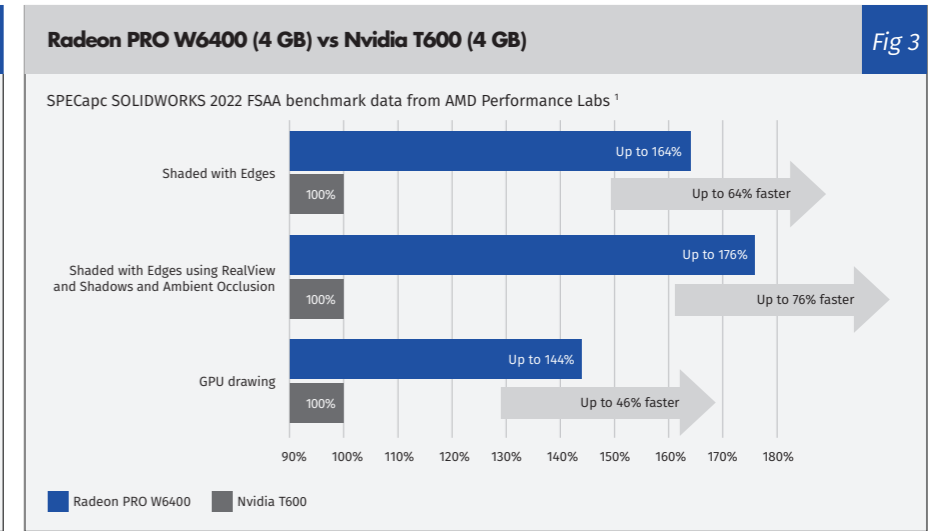
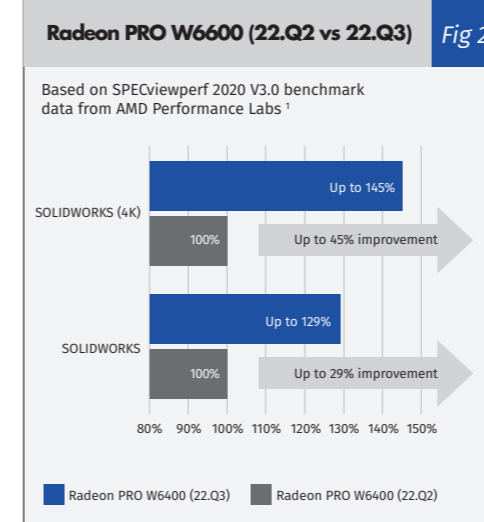
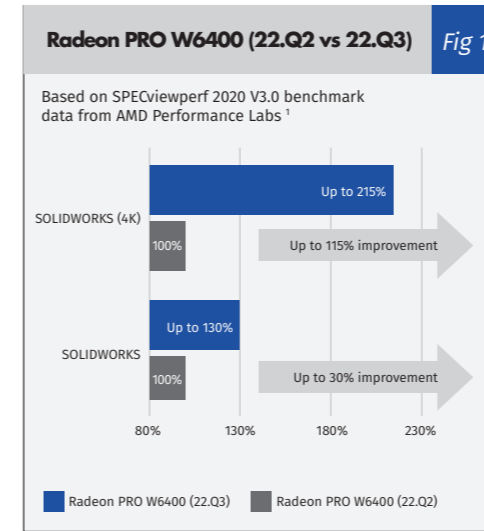
The graphs to the right show AMD published performance data for the two AMD Radeon PRO GPUs most suited to mainstream users of SOLIDWORKS — the AMD Radeon PRO

W6400 (4 GB) and AMD Radeon PRO W6600 (8 GB). Compared to the previous 22.Q2 driver, the biggest leaps in performance come when working at 4K resolution (see figures 1 and 2).

AMD has also published figures comparing AMD Radeon PRO GPUs to the equivalent GPUs from Nvidia. The biggest gains come from viewing modes that stress the GPU the most - when RealView, shadows and Ambient Occlusion are enabled.

AMD reports the AMD Radeon PRO W6400 (4 GB) is up to 76% faster than the Nvidia T600 (4 GB) and the AMD Radeon PRO W6600 (8 GB) is up to 55% faster than the Nvidia RTX A2000 (12 GB) (see figures 3 and 4).

¹ For more information and benchmark data visit [tinyurl.com/RadeonPro-OpenGL](https://www.tinyurl.com/RadeonPro-OpenGL)



AMD Radeon PRO - the professional GPU for SOLIDWORKS

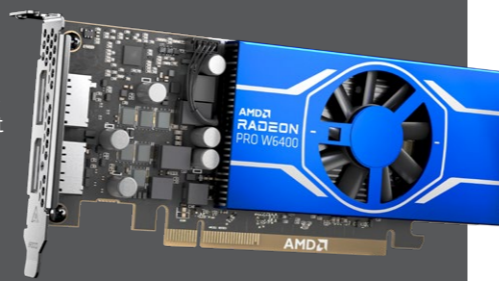
AMD has a long-standing technology partnership with Dassault Systèmes, the developer of SOLIDWORKS. AMD Radeon PRO workstation graphics cards are certified for SOLIDWORKS 2023 (and other versions) on both Microsoft Windows 10 and Windows 11.

Graphics-level certification is a critical part of building a productive CAD pipeline, as it helps ensure that the

user's workstation is stable and compatible with new features and optimisations as new SOLIDWORKS versions come to market. Examples include Order Independent Transparency (OIT) that uses the GPU to render semi-transparent objects faster and more accurately, and Ambient Occlusion (AO), a real-time lighting effect that sits on top of RealView and is designed to

simulate the way light radiates in the real world more accurately. AMD's engineering teams work very closely with Dassault Systèmes throughout the application development and certification processes to help address potential

performance optimisations and bugs before products ship to customers.



Workstations for modelling and viewport visualisation

The Lenovo ThinkStation P358 offers the power of a workstation at a desktop price. It can be configured with powerful AMD Ryzen PRO processors and a choice of AMD Radeon PRO GPUs, including the Radeon PRO W6400 and W6600.

The HP Z2 SFF G9 is a small form factor workstation that offers great performance for SOLIDWORKS and can

be configured with an AMD Radeon PRO W6600 GPU to handle large assemblies. The HP Z2 Tower G9 offers the same core specs, but with more expandability.

The Dell Precision 3660 Tower is a compact, expandable mini tower that offers plenty of power for all types of SOLIDWORKS users. It can be configured with the AMD Radeon PRO W6400 or W6600.

For SOLIDWORKS on the go, the Lenovo ThinkPad P14s Gen 3 (14" AMD) is a lightweight 17.9mm, 1.28kg mobile workstation that combines CPU and GPU onto a single chip. It features AMD Ryzen 5 / 7 Pro 6000 U Series processors and integrated AMD Radeon 680M graphics with Pro APU driver, making it ideal for mainstream

SOLIDWORKS workflows with small to medium sized assemblies.



WAVE GOODBYE TO LoD

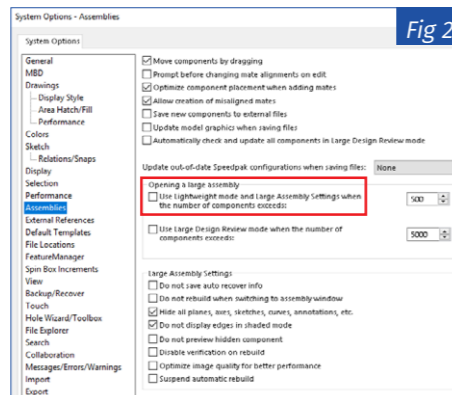
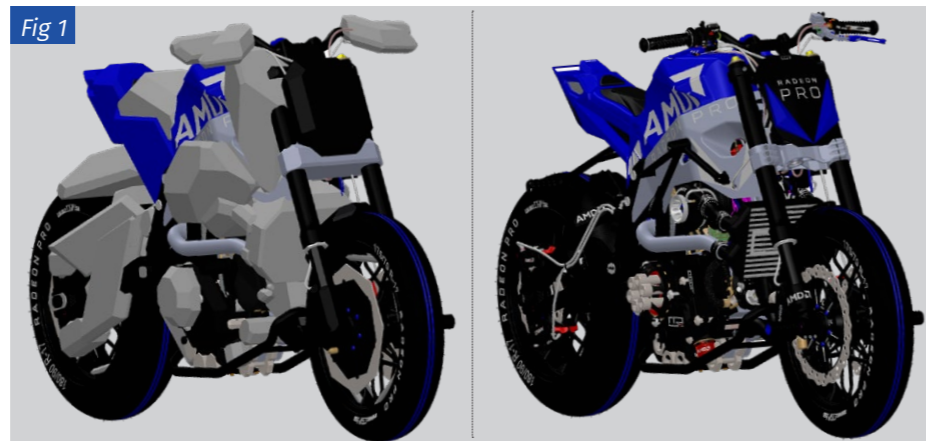
In order to maintain good 3D performance when working with large models, SOLIDWORKS automatically reduces the Level of Detail. With Radeon PRO you no longer have to make this compromise.

When SOLIDWORKS models reach a certain number of components, Large Assembly mode is automatically enabled. This helps maintain all-important 3D performance but comes at the expense of visual quality.

In Large Assembly mode, RealView, shadows, Ambient Occlusion and anti-aliasing are all disabled. Furthermore, Level of Detail (LoD) is set to 'less', which means faces can disappear while moving the model. This can have a huge impact on productivity as key aspects of the design are temporarily hidden from view, only becoming visible seconds after the model stops moving.

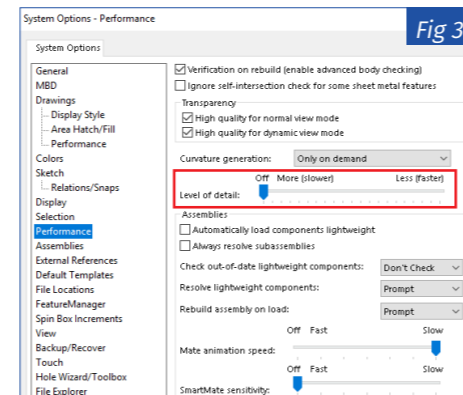
Figure 1 illustrates what can happen when Level of Detail is set to 'less'. The image on the left shows what the model looks like when it is being moved. Several parts are simplified into blocks, hiding important detail and other objects from view. This makes it hard to orient the model precisely. The image on the right shows what the model looks like seconds after it has stopped moving. It is only now that it is fully rendered, revealing important details around the handlebars, brakes and engine.

With the AMD Radeon PRO 22.Q3 pro graphics driver (and later) and a powerful AMD Radeon PRO GPU, it is possible to disable Large Assembly Mode and turn off Level of Detail completely without it negatively impacting performance. It means users can quickly and precisely move a fully detailed model into any desired position. What's more, this can be done with RealView,



shadows and Ambient Occlusion enabled which is great for presentations.

To temporarily disable Large Assembly Mode, go to the Assembly Toolbar or Tools and uncheck Large Assembly Settings.



To permanently disable it, go to Tools > Options > Assemblies and uncheck the box highlighted in Figure 2. Once Large Assembly Mode has been disabled, Level of Detail can be set to off (see Figure 3).

STRIKING PHOTOREALISM

To take visualisation to the next level with ray traced rendering, SOLIDWORKS users can use the power of their workstation's GPU to create stunning photorealistic visuals.

Designers and engineers can get great results in the viewport with SOLIDWORKS RealView and Ambient Occlusion. The views are instant and fully interactive, giving real-time feedback on new design iterations and the ability to explore new forms and materials in tandem.

The one trade off with viewport visualisation is visual fidelity, however. Lighting is approximated, so materials, shadows and reflections are a best guess of how a product will look when manufactured. To take visualisation to the next level, designers and engineers should consider photorealistic ray trace rendering.

Ray trace rendering works by simulating how light behaves in the real world by tracing rays of light as they reflect and refract off objects within a scene. The technique is very computationally intensive, so it typically takes minutes to deliver one high-res rendered image. However, results are significantly more realistic, providing much greater insight into the look and feel of a product, as well as the exact choice of materials.

Users of SOLIDWORKS Professional or Premium have access to ray tracing rendering through SOLIDWORKS Visualize Standard, a standalone application for generating compelling photorealistic imagery that uses a "Live CAD Update" to update SOLIDWORKS models. Scenes are rendered using GPUs or CPUs, but the software works most efficiently with GPUs.

The rendering software includes AMD Radeon ProRender, a raytracing engine that is designed specifically to run on AMD's high-performance Radeon PRO graphics cards, such as the Radeon PRO W6400, W6600 and Radeon PRO W6800.

SOLIDWORKS Visualize can import SOLIDWORKS files directly and automatically maps SOLIDWORKS appearances to the materials in



Design & render concurrently

One of the challenges of ray traced rendering is its large computational demand. With some CPU-based renderers, unless the workstation is manually tuned, and CPU cores are ring fenced, it can grind to a halt. This can make it hard to do any other work on the same workstation until the render has finished.

This problem doesn't exist when rendering with AMD Radeon PRO GPUs. The GPU's asynchronous compute engine allows compute and graphics tasks to be performed at the same time. Even when the GPU is crunching through a render in SOLIDWORKS Visualize, it will remain snappy and responsive when the designer needs to move the 3D CAD model in the SOLIDWORKS viewport.

SOLIDWORKS Visualize. The software includes an extensive material library and materials can be dragged and dropped directly onto objects within the scene.

Render times vary from seconds to minutes, depending on the desired quality, output resolution, model complexity and the performance of the workstation's GPU(s).

The power of transparency

There are many ways that transparency can be applied to a model to help bring clarity to the design process. It can be used to accurately represent glass and plastics, to reduce the visibility of objects intended for reference only, to view internal components, or to make it easier to edit a part in the context of an assembly.

To help render semi-transparent objects faster and more accurately, SOLIDWORKS uses a display technology

called Order Independent Transparency (OIT).

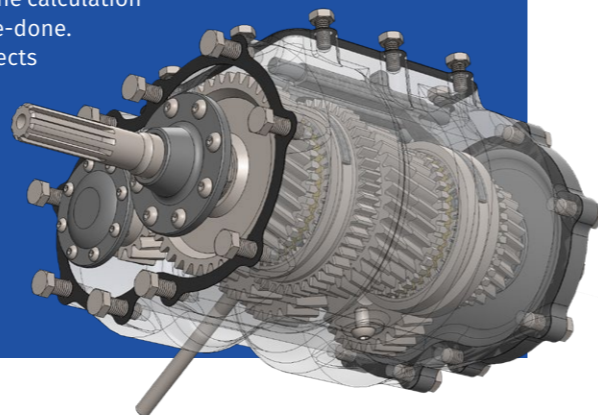
OIT exploits the power of the GPU to help ensure that overlapping transparent faces blend properly, resulting in a much more accurate rendering of the model. As everything happens in real time inside the SOLIDWORKS environment it can help support better decision-making throughout the design process.

Prior to OIT, SOLIDWORKS relied on the CPU to sort

transparent objects into order, but this could be slow and prone to errors. Every time the view changed the calculation needed to be re-done.

With OIT, objects don't need to be sorted before they are rendered and, because everything is done on the GPU and less information

needs to pass between CPU and GPU, the performance is much better.



Workstations for SOLIDWORKS Visualize

The AMD Radeon PRO W6600 (8 GB) and AMD Radeon PRO W6800 (32 GB) are good options for GPU rendering in SOLIDWORKS Visualize. These powerful graphics cards not only deliver the computational performance needed to render scenes quickly but offer plenty of GPU memory to store data for large scenes. This is particularly important when using complex HDR images

and textures, as well as when rendering at high resolutions. The AMD Radeon PRO W6400 (4GB) can also be used for light workloads.

The BOXX APEXX A3 workstation can be configured with one or two AMD Radeon PRO W6800 GPUs and delivers excellent all round performance for SOLIDWORKS thanks to its AMD Ryzen 7000 Series processor.

For users who require more multi-threaded CPU performance or more memory to augment one or two AMD Radeon PRO W6600 or W6800 GPUs, the Dell Precision 7865 Tower (pictured right) offers the AMD Ryzen Threadripper PRO



processor with up to 64-cores. The Lenovo ThinkStation P620, also built around the AMD Ryzen Threadripper PRO processor, gives SOLIDWORKS users the choice of all three current generation AMD Radeon PRO GPUs, the W6400 (quad), W6600 (quad) or W6800 (dual).

THE NEED FOR GPU MEMORY

In SOLIDWORKS and SOLIDWORKS Visualize, GPU memory has never been more important. Without sufficient memory not all data can be loaded onto the GPU, limiting capability and performance.

Both SOLIDWORKS 2023 and SOLIDWORKS Visualize 2023 should benefit from more powerful GPUs. But it's not just the processing power of an AMD Radeon PRO graphics card that's important. GPU memory also plays a critical role.

"Enhanced graphics performance", part of a new graphics engine introduced in SOLIDWORKS 2020, is built around OpenGL's 'retained rendering' mode, where more data is stored on the GPU than in the previous graphics engine's 'immediate' mode.

Many key algorithms in the modern graphics engine rely heavily on the GPU. These include Ambient Occlusion, for more realistic shadows; Anti-Aliasing, for smoother edges; Order Independent Transparency (OIT), for faster and more

accurate transparent objects; and Occlusion Culling, which means objects that are obscured by others are not rendered.

Buffering more information on the GPU means less time spent waiting for the CPU to feed in data, resulting in better performance. This is one of the major reasons why the previous graphics engine was bottlenecked by the CPU.

In SOLIDWORKS 2023, 'Enhanced graphics performance' is enabled by default (see *tools > options > performance*). When in use, 4GB of GPU memory should be considered a minimum. 8 GB is recommended for larger assemblies.

SOLIDWORKS Visualize can place even bigger demands on GPU memory, as large volumes of data need to be loaded up so

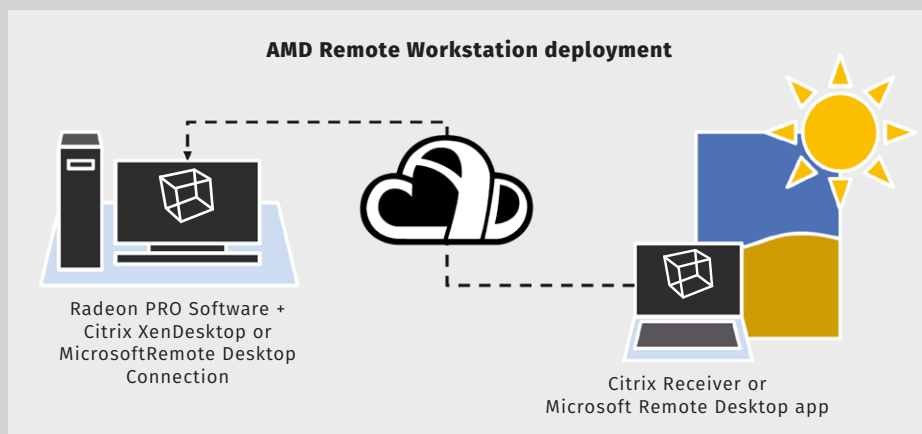
the GPU can crunch through the ray trace rendering calculations. This is particularly critical when using complex HDR images and textures, as well as when rendering at high resolutions. 4 GB of GPU memory is fine for light workloads, 8 GB for more complex scenes and when rendering at higher resolutions. More than 8 GB is recommended for the most demanding datasets. Memory bandwidth is also important as this governs how quickly data can be loaded into GPU memory.



The AMD Radeon PRO W6800 features 32 GB GDDR6 memory

USE SOLIDWORKS FROM ANYWHERE

Designers and engineers are no longer tied to their desks. AMD Remote Workstation gives the flexibility that modern product development teams and hybrid working demand.



Design or engineering is no longer the 9 to 5, Monday to Friday job it used to be. Global teams, and increased time to market pressures mean 24/7 access to 3D CAD is becoming increasingly important. Designers and engineers never know when that moment of inspiration might strike or when a change order or approval will need an instant response. The rise of hybrid working also means designers need access to the same powerful workstation hardware when working from home.

There are many ways to connect to an office PC remotely, but a 3D CAD workstation presents a completely different challenge. SOLIDWORKS users need full 3D graphics acceleration and no lag when working with large assemblies.

AMD Remote Workstation offers an easy way for designers to access their physical workstation from almost anywhere, from almost any device and get the same workstation experience they would expect to get in the design office.

AMD Remote Workstation works with any workstation with a Radeon PRO WX 3200, WX 4100, WX 5100, WX 7100, WX 8200, WX 9100, W5500, W5700, W6400, W6600 or W6800 GPU, paired with the latest version of AMD Radeon PRO Software.

AMD does not charge an end-user licence fee for this technology and provides all the software components you need to work remotely once you have acquired, installed and set-up Citrix Virtual Apps and Desktops or Microsoft Remote Desktop Connection.

Citrix XenDesktop Virtual Delivery Agent (VDA) or Microsoft Remote Desktop Connection needs to be installed on the workstation and Citrix Receiver or Microsoft Remote Desktop app on the client device, which could be a standard home PC, laptop or tablet.

The quality of the connection is also important, so to optimise for high-latency environments, AMD Remote Workstation allows the remote visualisation application to securely access rendered frames directly from the AMD Radeon PRO GPU's frame buffer, which cuts out a layer of latency observed with other remoting applications.