

DE

Desktop Engineering®

MAKING THE CASE

FOR VISUAL COLLABORATION

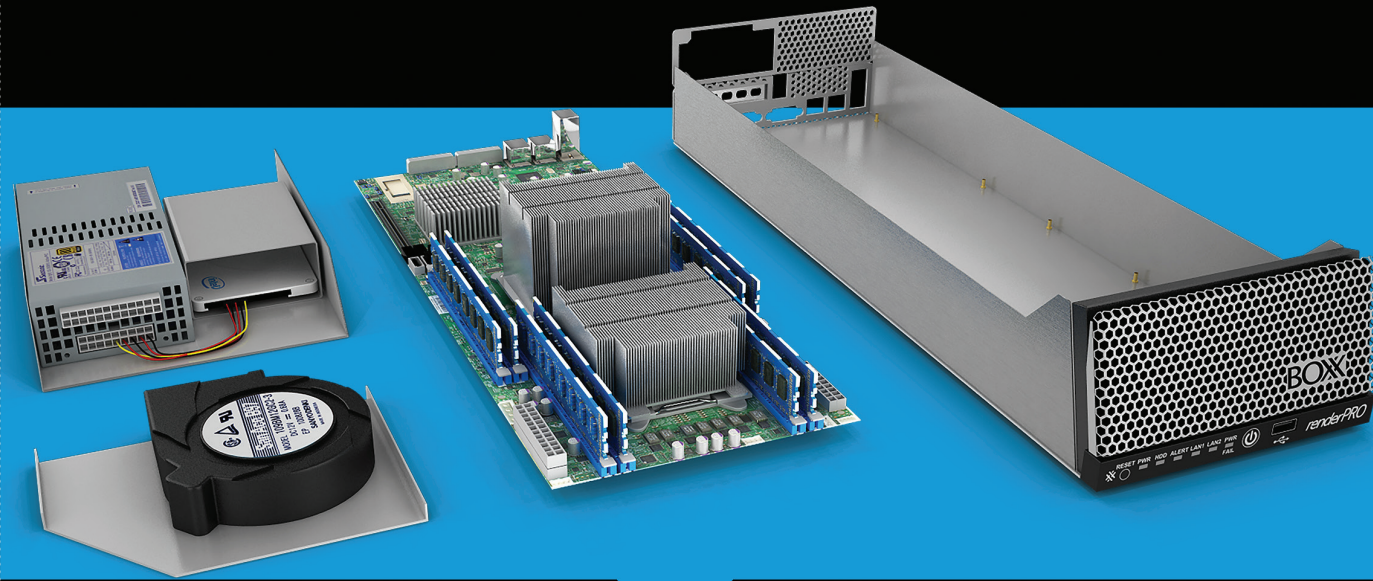
Show, don't tell
when it's time
to explain
design intent.



A SPECIAL SUPPLEMENT IN PARTNERSHIP WITH

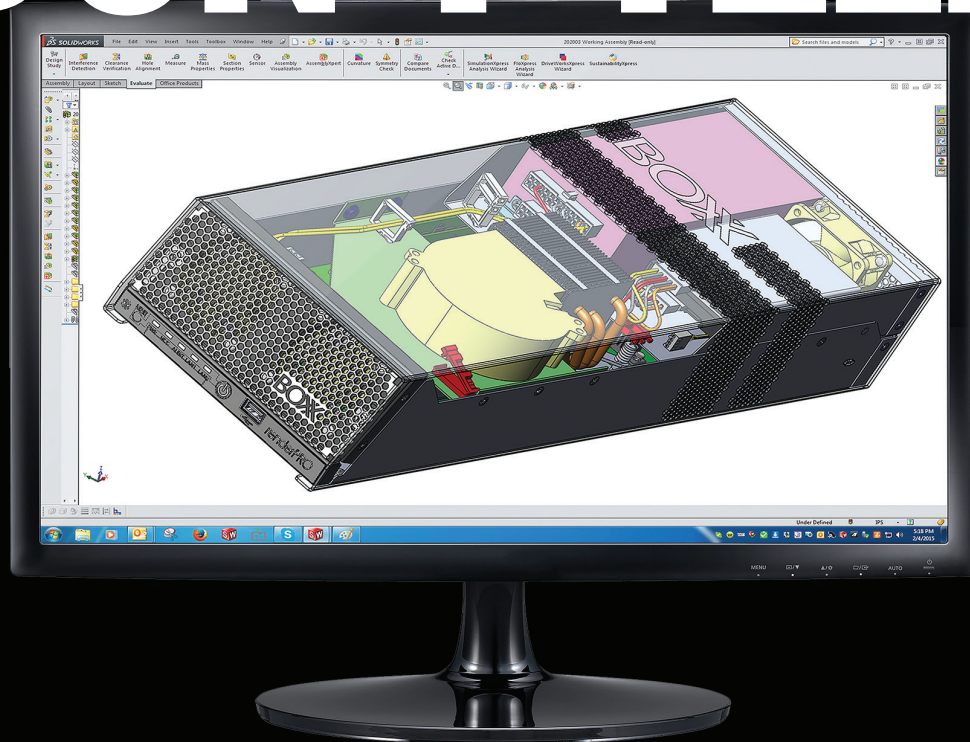
BOXX
THE PROFESSIONAL'S CHOICE





Photorealistic rendering, once the purview of dedicated teams of specialists, has entered the mainstream and is beginning to take its place as the universal language of design and manufacturing.

SHOW DON'T TELL



While advanced CAD and simulation tools have made it possible for engineers to create and develop innovative designs, iterate those designs faster and leverage analysis to accurately predict how an object will perform, the information output by those systems often remains unintelligible to the layman.

Why is this important? Engineers and designers can easily communicate with each other about a design, but it can be difficult to convey that information in a meaningful way to upper management, the marketing team or to clients. Simulation results, mathematical formulas and CAD drawings can leave non-engineers with their heads spinning, and generate more questions than answers. Prototypes, while useful, are expensive to build and usually aren't created until the tail-end of the process when most of the key design decisions have already been made. Lacking the ability to quickly and effectively communicate design intent and the impact of change orders to all stakeholders inhibits collaboration.

Quality rendering, however, can cut through the technical noise, allowing colleagues and clients to experience the "aha" moments that can lead to faster change approvals, clearer communication, and ultimately better and more satisfying designs. Rendering can help you lead colleagues and clients to better decisions with easily understandable visual information. From initial concepts, through multiple design changes, and to the final presentation, rendering provides all stakeholders with a clear view of the project.

The availability of more powerful hardware is supporting the wider adoption of rendering throughout the design process, not just for a final photorealistic image for marketing but for realistic iterations early in the design process.

SEEING IS BELIEVING

➔ Design engineers speak the same language. Tolerances, loads, stresses, thermal envelopes and more make it easy for engineers to communicate design requirements, development issues and engineering changes. However, not all clients and colleagues speak that language, which stymies collaboration and results in inefficiencies and lost opportunities.

Rendering can be the universal language of manufacturing by enabling true visual collaboration among designers, clients, executives and other key stakeholders. Where in the past rendering was a complex, time-consuming task that required expert assistance and expensive computing resources, software and hardware tools now exist that put powerful rendering capabilities into the hands of designers. A picture may be worth 1,000 words, but rendering can be worth much more as it allows you to fully express the intent of your design, help win bids, market products, identify flaws and imperfections, and explore future concepts.

You can use the information in this paper to make the case for investing in visual collaboration to your management team. It will help explain how rendering can improve the design process, enhance collaboration and enable better customer interactions.

VISUAL COLLABORATION AT WORK

Clarifying Design Intent

AT PBK, a Houston-based architectural firm, rendering plays a key role in winning bids, collaborating internally and providing the best designs possible to their clients. The company works primarily with colleges and school systems, and the firm regularly has to present new projects to school boards and other executives for approval.

The company currently has a dedicated division called VIZLab that handles internal rendering and provides high-end illustration services for outside clients. The VIZLab team pulls models from SketchUp or Autodesk Revit into 3ds Max, and then renders high-resolution images using V-Ray. The rendering can be linked directly back to the Revit model so that any changes in the original model can be reflected in the render as they occur.

All of this was made possible by moving from their previous hodge-podge of hardware to the BOXX Technologies renderBOXX, a “render farm on wheels” that helped the firm drastically reduce rendering time. Working in conjunc-

PBK's dedicated VIZLab team efficiently creates massive renders thanks to its BOXX Technologies renderBOXX.



tion with new BOXX workstations, the company says that the hardware has enabled massive productivity improvements. “Hours of rendering time got reduced to minutes, so I could work a lot quicker and get more product out,” says Jose Galindo, director of PBK VIZLab.

Each node in the renderBOXX includes 64GB of RAM, allowing VIZLab to create massive images for construction signage and other applications. “We can use high resolution textures,

and never have to worry about getting the render done on time,” Galindo says. “If anyone asks us for anything, we can get it done.”

Rendering speed improvements also accelerated the workflow of the entire design department. Instead of having their desktops bogged down, they can send the file to the renderBOXX and continue to work. A short time later, they get a finished image back.

The ability to rapidly perform rendering tasks enables designers to show clients design ideas, or illustrate how parts might fit into an existing system. This type of visual collaboration can help clarify design intent and quickly get projects green-lighted by management.

High quality images produced while designs are still being developed can also settle time-wasting disagreements about design features, textures or illumination that might otherwise go unresolved until after the first prototype is produced.

Improving the Design Process

MotoCzysz is an award-winning, Portland, OR-based design firm that specializes in innovative motorcycles, including a series of electric racing bikes that the company has entered in the dangerous Isle of Man TT race.

The company has reduced the need for prototyping its electric E1pc bikes through simulation-driven design powered by BOXX workstations equipped with NVIDIA Quadro graphics cards and Tesla GPUs. As the firm took on more and more complex surfacing projects, they realized that their single GPU systems couldn't be enlisted to spend the time needed to render designs at full quality.

“IT'S NICE TO HAVE THE FREEDOM TO THINK ABOUT THE DESIGN, FOCUS ON THE ASPECT OF THE PROJECT I'M WORKING ON AND NOT THINK ABOUT WORKING ON THE MACHINE. THE MACHINE WORKS FOR YOU.”

— MOTOCZYSZ LEAD ENGINEER NICK SCHOEPS CREDITS

Lower resolution renders led to design errors. For example, MotoCzysz engineers had developed a new fairing shell design but discovered too late that it included surface imperfections requiring additional body fillers. Had they been able to complete a more detailed render during the design process, the team could have detected the imperfections and altered the design before the part went into production.

The company upgraded to the 3DBOXX 4920 XTREME workstation that features an overclocked Intel Core i7 processor running at 4.75GHz, liquid cooling, a solid-state drive, along with NVIDIA Quadro K5000 graphics and a Tesla K20 GPU accelerator. MotoCzysz also added



PBK VIZLab uses high-resolution renders to show design ideas to clients and avoid disagreements about design features early in the development process.

BY THE NUMBERS

2 weeks

Time PBK designers would wait to get animations before updating their hardware.

1 hour

Time it took PBK to get up and running with its new RenderFarm On Wheels.

360

Maximum number of cores available in the 10 renderBOXX nodes that will fit in a single 4U workspace.

28

Maximum number of cores available in the renderPRO.

2 days

Time it took PBK to render a 5x8-ft, 150-dpi image before upgrading to a renderBOXX, which reduced that time to a matter of hours.

2,880

Maximum number of cores available in the RenderFarm On Wheels.

20-30

Percentage of time MotoCzysz saves via the real-time feedback it gets with rendering.

the Bunkspeed 3D rendering tool to its design suite, alongside SolidWorks. The new design environment has reduced the time to perform renders by as much as 30%.

The company can create fully rendered images of the bike before they build it, an important consideration for a small firm that can't afford to create clay models or prototypes as designs are being refined.

With their previous workstations, the team was forced to shut down a number of graphics features and simplify their models to make the rendering workflow more manageable. With the new hardware and software, the engineers can use all the graphics features and create physically accurate renders.

MotoCzysz engineers use SolidWorks Real View Graphics to look at the curvatures of a surface with no lag, and clients and supervisors can make design decisions earlier in the process.

Lead engineer Nick Schoeps credits faster rendering for improving designs and productivity. For example, he can create a motion animation in SolidWorks while Bunkspeed Pro performs raytrace renderings in the background.

"I don't have to think about the number of files I have open," Schoeps says. "I've had as many as 20 or more parts files open along with a large assembly and there are no problems, no lag in performance. It's nice to have the freedom to think about the design, focus on the aspect of the project I'm working on and not think about working on the machine. The machine works for you."

That type of speed and responsiveness can help marketing and engineering become a more productive team, thanks to rendering's ability to visualize a product long before the first prototype is created. The rendering can be updated as development continues, which allows everyone to stay in the loop, provide more informed input and update their own plans to accommodate design changes.

MotoCzysz no longer has to reduce graphic quality to make their rendering workflow more manageable.

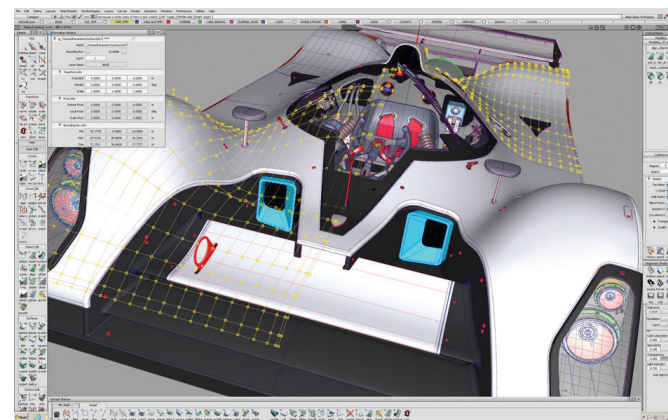


Daniel Simon's team can explore more "what-if" scenarios with rendering before deciding on a final design.

Innovate at the Speed of Thought

Just as important as improving collaboration, rendering allows designers to innovate more freely to explore future design concepts and more "what-if" scenarios. By being able to quickly evaluate the impact of design changes, or the effects of different colors, textures or materials on a design, engineers can iterate even faster.

Take vehicle designer Daniel Simon, for instance. Simon's fanciful designs include everything from the TRON: Legacy light cycle to the Red Skull's menacing coupe in Captain America. He's also published a book, "Timeless Racer," which features an array of renderings



"I'M AGAIN RENDERING HARD-CORE ON THE GPU FOR SOMETIMES 48 HOURS IN A ROW AND THAT THING IS JUST RUNNING HIGH-VOLTAGE, HIGH WATTAGE. THE MACHINE FEELS LIKE IT IS MADE BY PEOPLE WHO DO WHAT I DO."

— VEHICLE DESIGNER DANIEL SIMON

of imaginative, futuristic vehicles.

His creativity is enabled, in part, by the GPU rendering he is able to accomplish on his 3DBOXXX 8550 XTREME workstation, with 24 cores running in hyper-thread mode. He renders in Iray via Bunkspeed.

"I'm again rendering hard-core on the GPU for sometimes 48 hours in a row and that thing is just running high-voltage, high wattage," says Simon. The machine feels like it is made by people who do what I do."

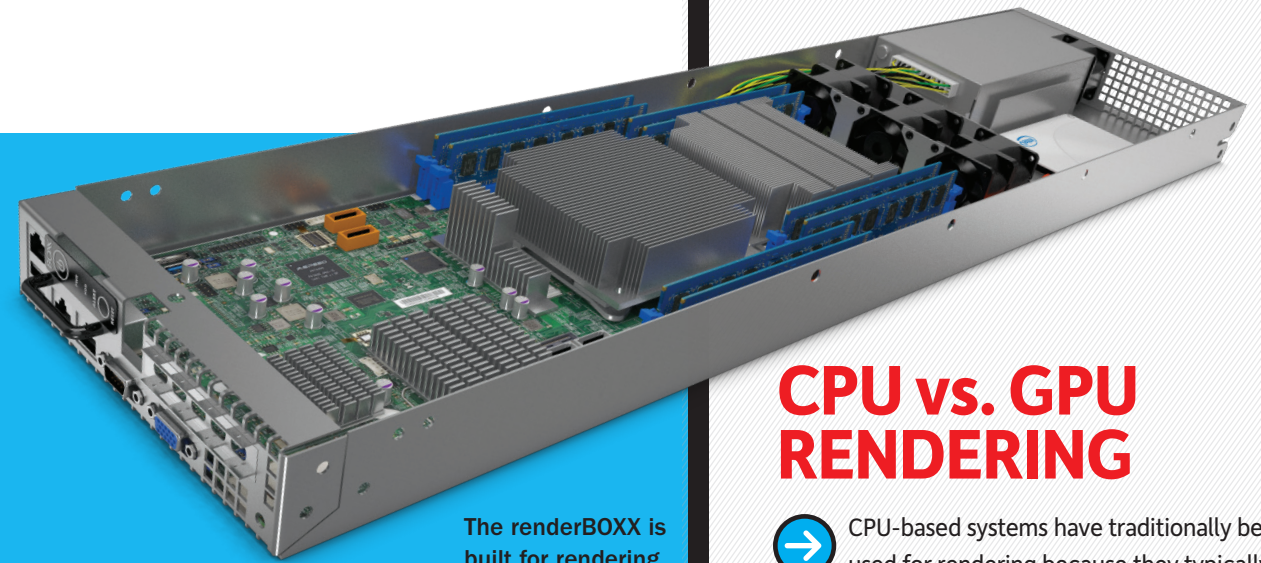
CUSTOMER SUCCESS STORIES

MOTOCZYSZ: <http://goo.gl/LSC87E>

DANIEL SIMON: <http://goo.gl/vSSnkY>

MORE CASE STUDIES:
www.boxxtech.com/customer-stories

THE RIGHT TOOLS FOR THE JOB



The renderBOXX is built for rendering.

CPU vs. GPU RENDERING

→ CPU-based systems have traditionally been used for rendering because they typically had access to more RAM. However, while still an emergent technology, GPU rendering engines are becoming more popular. The driver here is the potential to accelerate rendering times using the GPU, which can allow an engineer to “offload” the rendering task to the GPU while still using other applications on the same workstation.

Having the option to perform some rendering tasks right on the workstation can enable the type of iterative rendering that can be used to quickly illustrate a design concept or a change.

In fact, if a renderer is programmed to take advantage of parallel processing, then GPUs can deliver comparable performance to CPU systems. Users can also scale up the system’s processing power by adding more GPUs.

How much faster renders can be realized on the GPU depends on a number of variables. In some applications, there may be very little difference in speed, while in others the GPU-based rendering process can produce results significantly faster. How much faster will vary by application. There are also some rendering solutions that don’t support GPU rendering.

Both CPU and GPU rendering will provide quality results. Having the option to perform rendering on the GPU can provide a fast, efficient solution for many designers that will enable a more flexible approach to visual collaboration.

MORE INFORMATION

Learn more about BOXX Technologies’ rendering solutions:

boxxtech.com/products/rendering-and-simulation

boxxtech.com/landing-pages/the-boxx-workflow

The value of high quality renders and visual collaboration is clear, but generating realistic images from models and CAD data requires the right kind of hardware. You can’t make this type of photorealistic rendering happen on a standard-issue laptop.

Those horsepower requirements have traditionally kept rendering firmly in the hands of experts and specialists. In fact, rendering’s voracious appetite for computing power has led some companies to think its everyday use is out of reach because it can bog down CAD workstations.

The answer is to use a mix of powerful workstations for design, while offloading the rendering function to a new generation of affordable appliances and, in some cases, onboard GPUs. With the right hardware, you can accomplish in seconds what used to take hours.

The challenge is that day-to-day design work and photorealistic rendering require different processing approaches. Most design operations that involve creating and manipulating 3D objects are single-threaded operations. For optimal performance, a single-core processor that is overclocked will accelerate these operations. Designers benefit from having the fastest CPU clock speeds available to work at peak productivity. That’s why BOXX Technologies’ workstations are overclocked; single threaded operations are optimized in that scenario.

Rendering, on the other hand, will

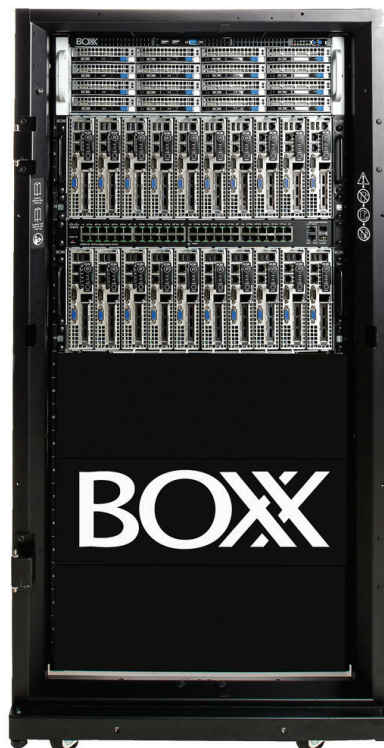
benefit from multiple cores because it is a multi-threaded process. Rendering on CPUs that have been optimized for other processes will bog down the workstation. Luckily, BOXX offers a number of solutions for offloading the rendering function while ensuring you have the right CPU for designing and iterating.

A single system may not be the answer; in fact, BOXX doesn’t recommend trying to configure a workstation that will do everything. Doing so may make it difficult to optimize both rendering and daily design tasks, and compromise performance. Rendering can be offloaded in a number of ways.

For fast, on-the-fly rendering projects — the type of iterative rendering that might be used to quickly illustrate a design change, for example — those operations might be handled via GPU rendering on the workstation. BOXX Technologies’ APEXX workstations, for instance, can be configured with the memory and GPU horsepower to complete these types of rendering tasks without negatively affecting the performance of single-threaded operations.

The BOXX renderPRO, on the other hand, is a desk-side system that allows you to move computationally intensive simulation or rendering tasks from the workstation to a portable render node without having to invest in a full-blown render farm. You can generate high-resolution renders without taxing the workstation at all.

Larger jobs can be handled by a dedicated, purpose-built system like the renderBOXX. This type of render



Multiple renderBOXX nodes can be configured into a BOXX RenderFarm On Wheels. It can include up to 80 modules with up to 2,880 cores in a 42U rack (24U rack shown above).