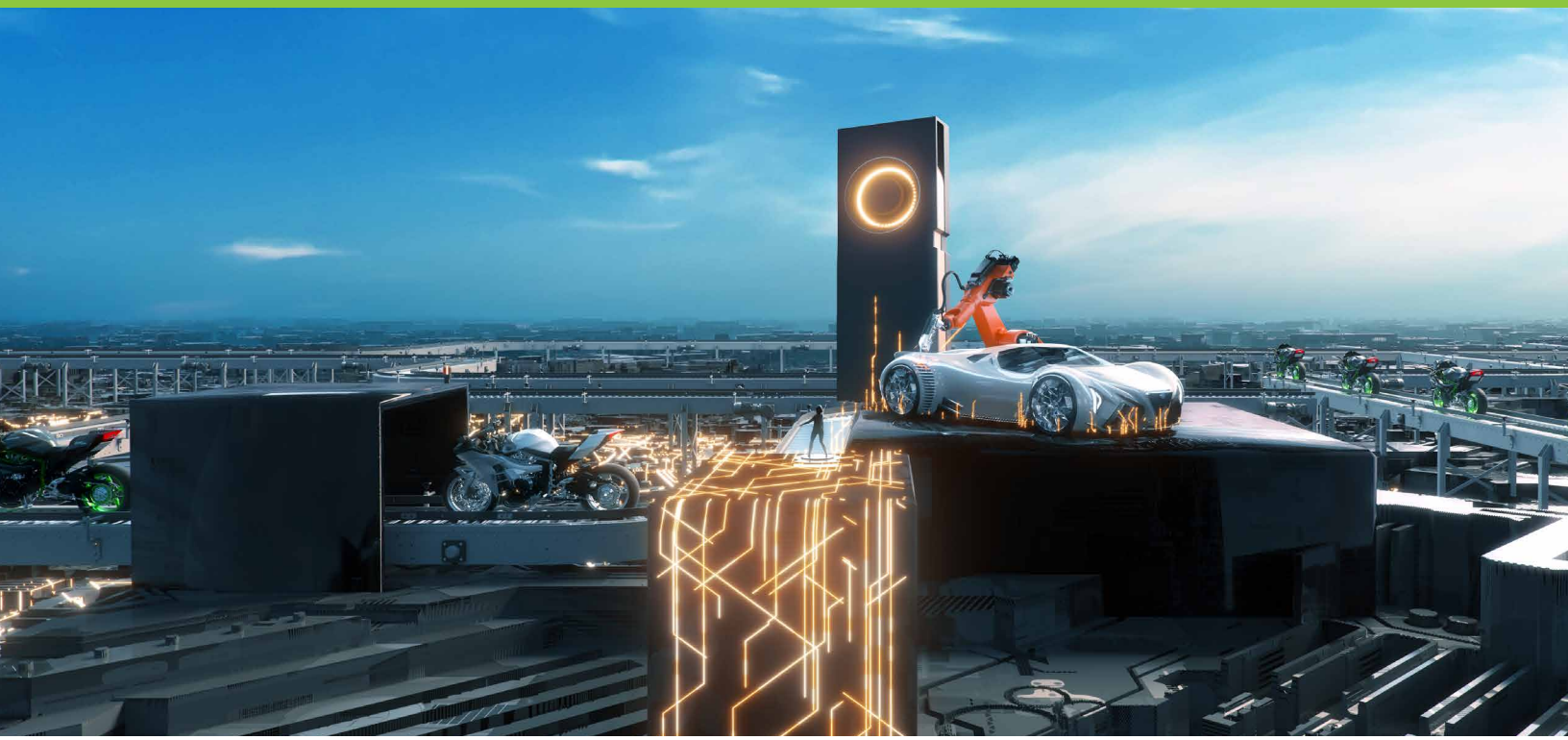
ADVANCING PRODUCT DESIGN WORKFLOWS IN MANUFACTURING

Radically Improve Design, Collaboration, and Time to Market with the World's Most Advanced Visual Computing Platform



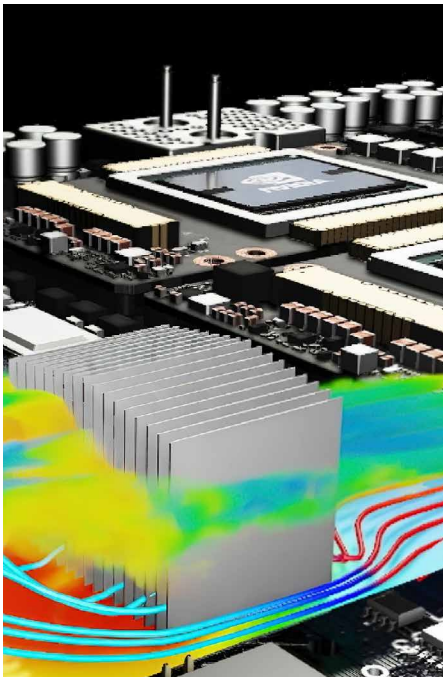
NVIDIA

ADVANCED TECHNOLOGIES KEEP INDUSTRY PLAYERS COMPETITIVE

With the advent of Industry 4.0—the transformation of manufacturing by automation and big data—forward-thinking product manufacturers are engaging with a broad spectrum of pioneering technologies to reduce costs, optimize products, speed development cycles, and improve project team efficiency. These technologies include **AR & VR**, photorealistic rendering, real-time engineering simulation, graphics virtualization, and artificial intelligence (AI). Together, they contribute to an advanced product design workflow that enables manufacturers to create innovative, highly differentiated products and remain competitive.

While these technologies are becoming mainstream, projects are becoming more complex and team members are increasingly working remotely, complicating workflows, communication, and collaboration. Enabling efficient and cost-effective work in teams across regions is vital to an organization's success. But when, for example, remote team members need to work together on a large assembly model and version control is lost or when downloading massive datasets from the cloud stalls, productivity and employee morale falter.

A new, streamlined way of tackling these challenges is needed to boost productivity, team collaboration, design review efficiency, and customer engagement.



NVIDIA AI-accelerated simulation toolkit

A REVOLUTIONARY APPROACH TO DESIGN

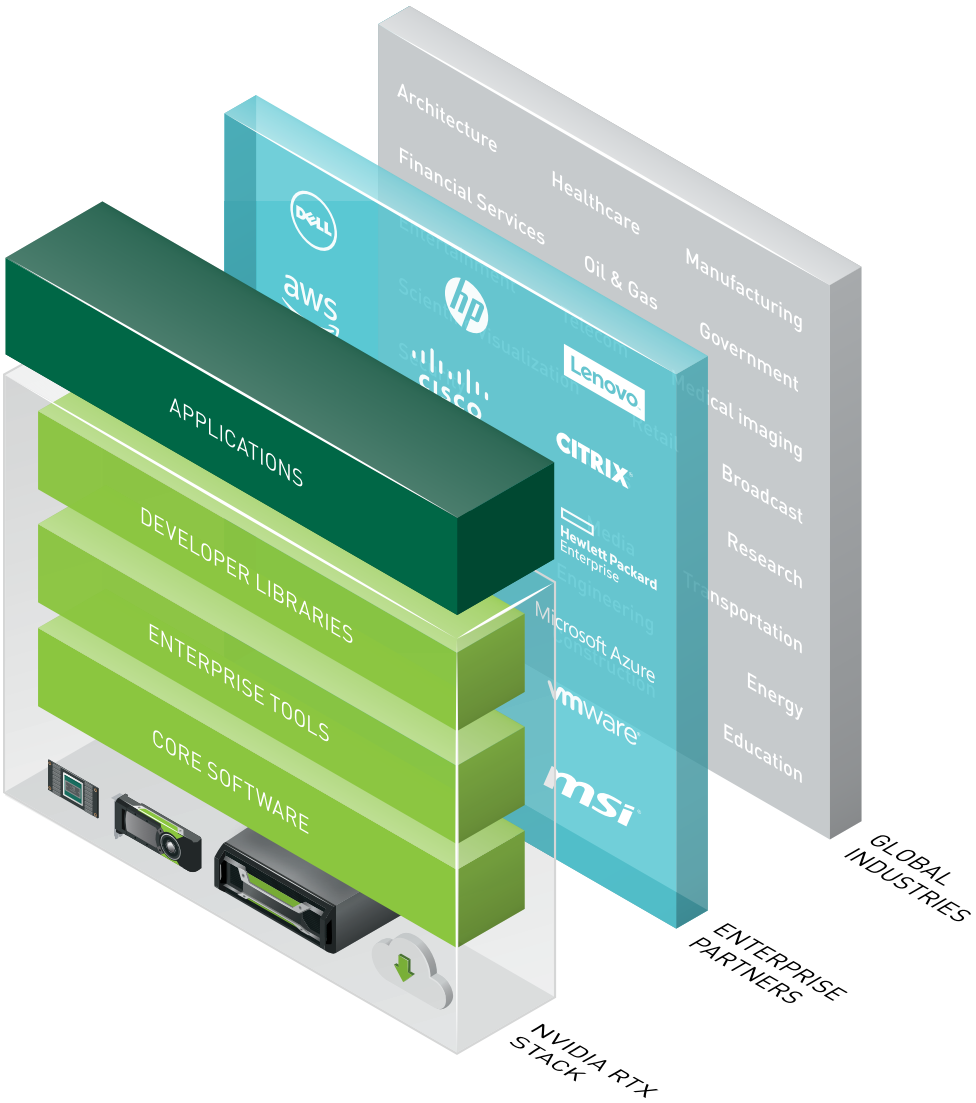
As a trusted technology partner for Product Development professionals worldwide, NVIDIA is continually enhancing solutions to tackle these complexities and streamline workflows.

The latest NVIDIA RTX™ professional GPUs, based on the new NVIDIA Ampere GPU architecture, fuse AI, real-time ray tracing, and programmable shading to speed up and optimize the building design process. As part of an advanced ecosystem of hardware, software, and tools, RTX accelerates new design workflows—such as 3D graphics virtualization, VR, interactive physically based rendering, and AI-enabled applications—and improves how teams collaborate by creating effective work-from-anywhere capabilities. With these powerful capabilities, teams today, can tackle complex 3D CAD and CAE workflows or iterate on models in real time across regions on the RTX visual computing platform that is flexible and scalable.

> Learn more about NVIDIA RTX

NVIDIA RTX VISUAL COMPUTING PLATFORM

The world's most widely used hardware and software companies partner with NVIDIA to bring the power of RTX to manufacturing industry.

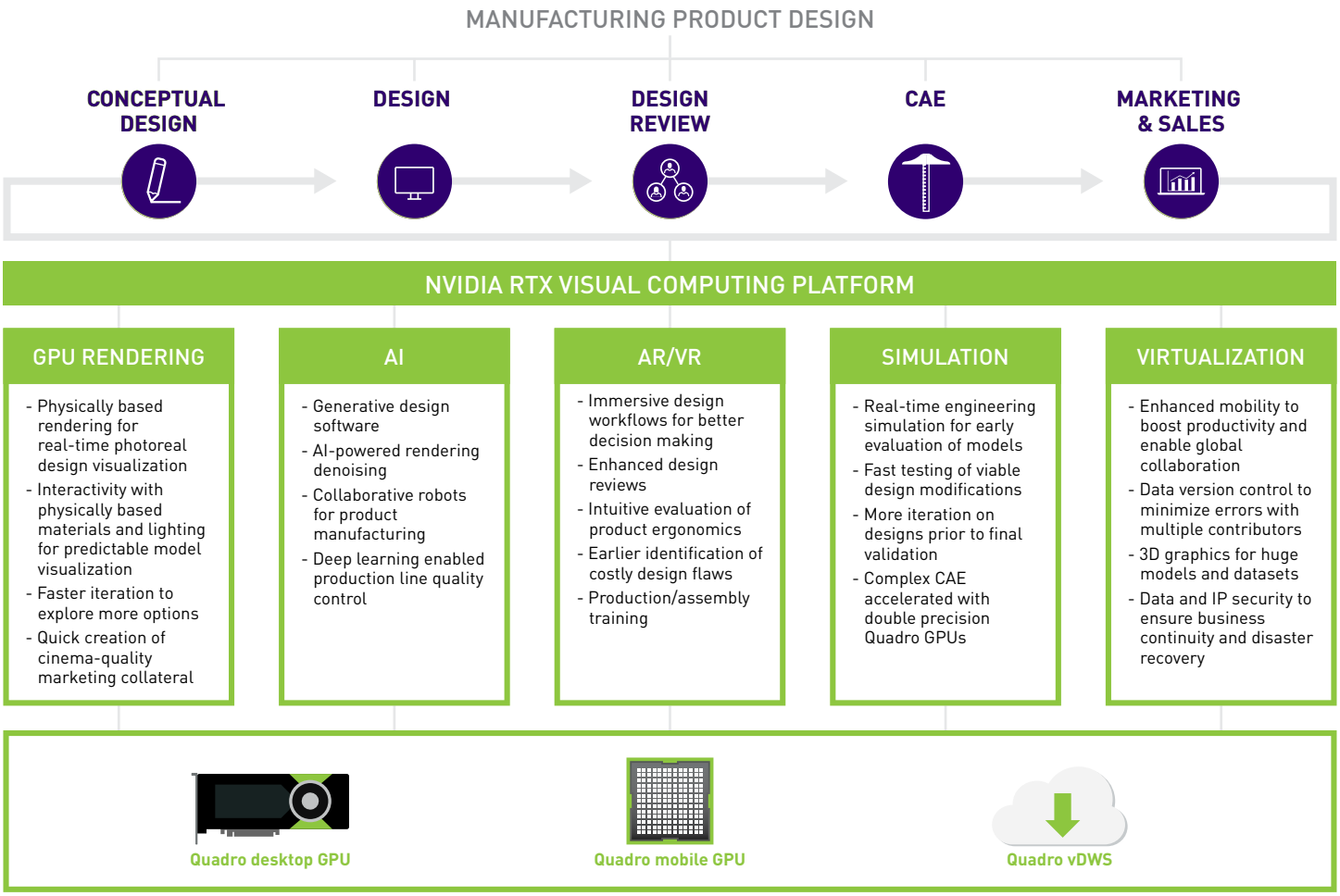


NVIDIA RTX ADVANTAGES FOR MANUFACTURERS

- More effective collaboration among extended product design teams
- Rapid design iteration, evaluation, and optimization for better products
- Real-time engineering simulation earlier in the design workflow for faster, more frequent evaluation of design options
- AI-enabled functionality through generative design software and interactive physically-based rendering
- Accelerated creation of photorealistic marketing and sales collateral
- Immersive VR experiences to enhance design reviews, collaboration, training, and product presentation

CREATING NEW WORKFLOW OPPORTUNITIES

Manufacturers know they must take advantage of the latest technological innovations to stay ahead of the competition.



NVIDIA RTX solutions can assist in five key categories:

GPU-ACCELERATED, INTERACTIVE PHYSICALLY BASED RENDERING

Physically based rendering for accurate, predictable visualization of models. Image courtesy of Aixsponz

Physically based rendering lets designers take advantage of predictable model visualizations in CAD applications. NVIDIA RTX™, powered by the latest NVIDIA Ampere GPU architecture, brings these capabilities to life by enabling the instant creation of cinematic-quality renders. Teams can quickly iterate on designs, even when working with massive 3D models. And marketing teams can easily create professional collateral before products are manufactured. RTX-powered server solutions scale from small installations to the largest data centers, at one quarter of the cost of CPU-only render farms.

> Learn more about GPU rendering

AI/DEEP LEARNING FOR ADVANCED PRODUCT DESIGN

Driving design innovation with AI and deep learning

Product designers and engineers are beginning to take advantage of deep learning-enabled generative design software that's been trained on NVIDIA GPUs. This promises to drive productivity and innovation. AI-powered rendering denoising running on RTX GPUs or RTX Virtual Workstation (vWS) software speeds up noiseless visualization of photorealistic renders. And the new RTX GPUs are built for AI inferencing to power the next generation of visual computing for manufacturing applications.

> Learn more about AI for content creation

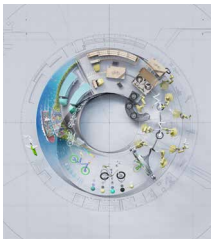
EXTENDED REALITY

Learn more about NVIDIA XR and CloudXR

Extended reality (XR) will change the way we train our employees and get our jobs done. From product design to immersive collaboration, NVIDIA delivers groundbreaking solutions for AR and VR—including leading GPUs, drivers, and SDKs. Now with NVIDIA CloudXR, a technology for streaming virtual reality (VR), augmented reality (AR), and mixed reality (MR) content from any OpenVR XR application – you can stream immersive VR to anyone, anywhere.

> Learn more about XR

COLLABORATION WITH OMNIVERSE

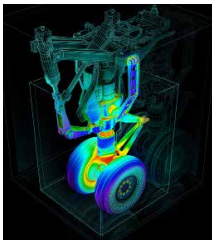


Transforming remote team collaboration with Omniverse

NVIDIA RTX professional GPUs deliver the performance needed to take full advantage of NVIDIA Omniverse for Manufacturing and transform how project teams collaborate. Desktop and mobile RTX GPUs enable individual users to harness the RTX Renderer in Omniverse, while NVIDIA RTX vWS software and the NVIDIA EGX Platform offers the ultimate in visual computing power for Manufacturing teams.

> Learn more about NVIDIA Omniverse for manufacturing

GPU-ACCELERATED REAL-TIME ENGINEERING SIMULATION



Enabling early design evaluation with real-time simulation

New GPU-accelerated simulation software like ANSYS Discovery and Creo Simulation Live enable real-time simulation and analysis for earlier and more frequent design evaluation. This transforms simulation from just a research tool to a design tool for engineers, resulting in accelerated workflows and optimized products. Other CAE applications from ANSYS such as Fluent, HFSS and Maxwell has GPU acceleration for coupled fluid flow, conjugate heat transfer, electro-magnetics and electromechanical simulations. Altair uses GPUs to improve a wide range of simulation and analysis functions across its portfolio. Hexagon MSC Actran offers GPU acceleration in its suite of noise, vibration and harshness simulation applications.

> Learn more about real-time simulation

GPU-ACCELERATED VIRTUAL WORKSTATIONS

Virtualized 3D graphics for all users.

Global firms often have widely dispersed teams that touch all parts of a project cycle, from design to construction. Virtualized solutions powered by NVIDIA RTX vWS or NVIDIA vApp/vPC software and the NVIDIA EGX Platform enable more productive workflows to help teams meet demanding deadlines. In addition to simplifying IT management and helping protect intellectual property by maintaining data in the data center, NVIDIA vGPU solutions can facilitate designers' creativity by allowing anytime, anywhere access to visual computing power whenever inspiration strikes.

> Learn more about RTX vWS

TESTED AND CERTIFIED FOR ENTERPRISE-CLASS RELIABILITY

To ensure the best possible experience for your IT investment, NVIDIA RTX professional graphics solutions are tested and certified by leading workstation and server OEMs. They've also received independent software vendor (ISV) certifications for more than 100 professional applications.

KEY OEM PARTNERS

KEY ISV PARTNERS

ALTAIR
- AcuSolve
- HyperWorks
- NanoFluidX
- UltraFluidX
- EDEM
- Inspire Render
- OptiStruct

SIEMENS
- NX
- Solid Edge
- Teamcenter
- Simcenter 3D
- STAR CCM+
- Calibre

Ansys
- Discovery Live
- Fluent
- Mechanical
- Optis

AUTODESK
- 3ds Max
- AutoCAD
- Fusion360
- Generative Design
- Inventor
- VRED

DASSAULT SYSTEMES
- 3DEXCITE
- 3DEXPERIENCE
- 3DVIA
- CATIA
- SIMULIA
- SOLIDWORKS

esi get it right
- IC.IDO
- VRify

McNeel North America
- Rhino
- Grasshopper

ptc
- Creo Parametric
- OnShape

Adobe
- Substance Designer/Paint

VIRTALIS
- VR4CAD

RTX-ACCELERATED WORKFLOWS FOR MANUFACTURING

USERS	Product designers, engineers	Designers, marketing departments	Product designers, engineers, executive decision makers, assembly line workers
WORKFLOW USE CASES	For a smooth design experience with leading CAD/CAE software tools, even when working with massive, complex 3D models on 4K displays	For using interactive, physically based rendering to remain in the creative flow while iterating on concepts; for quickly creating compelling visualizations of products for presentations and marketing collateral	For virtual reality design workflows, VR retail showrooms, and assembly, maintenance, and safety training

WHAT OUR CUSTOMERS ARE SAYING ABOUT RTX

"The performance improvements of NVIDIA Ampere architecture will help us realize our vision of the future much faster"

Alexis Bonnet
Design Digital Manager, Alstom

" When we saw that Omnvierse is using USD as the core format, it was the perfect solution to most of our requirements. On top of that, the real-time and path-traced mode with support for MDL is truly standardizing the production process."

Bruno Guerreio
Co-Founder and CTO at Epigraph

"The NVIDIA RTX A6000 GPU and ThinkStation P620 deliver cutting-edge performance and speed to accelerate design processes and production times. We're able to do complex wind drag simulations, mechanical and structural testing, and topology optimizations with AI in near real time—enabling us to show customers design changes with minimal delay."

Aram Goganian
Co-founder and CEO of Predator Cycling

RTX SOLUTIONS IN ACTION

> Discover Manufacturing customer success stories in design and visualization
> Check out additional NVIDIA RTX content to accelerate your Product Design and Manufacturing workflows

For more information, visit **www.nvidia.com/manufacturing**