

ACCELERATE INNOVATION IN MANUFACTURING

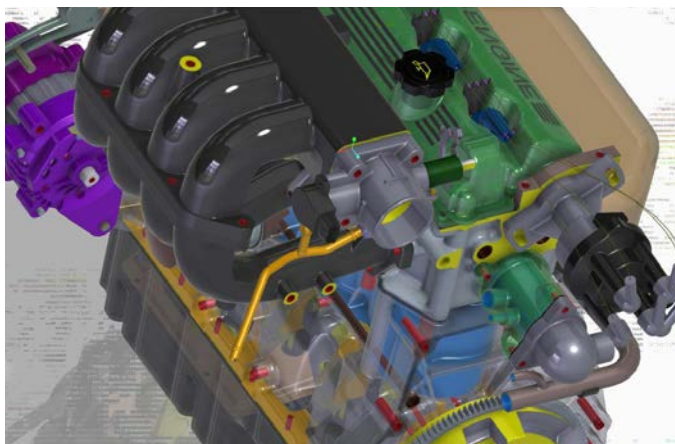
Boost Productivity, Enhance Collaboration,
and Protect Intellectual Property with
NVIDIA Virtual GPU Solutions



Compressing design cycles and reducing unit costs are crucial for maintaining the competitiveness of any manufacturer. Designers face growing pressure to rapidly deliver innovations, respond to market demands, and support an ever-expanding product range—often in geographically dispersed teams. With virtualization, manufacturers can now better meet the needs of users who can't afford to wait for multiple hour-long downloads of data before they begin the real design and engineering work.

At the same time, ensuring data security is of paramount concern as manufacturers look to protect intellectual property. This is further compounded by the growing need for remote workers, external suppliers, and partners to quickly and securely access the right data—posing significant IT challenges for enterprises. Manufacturers need solutions that support mobility and collaboration, allowing teams to be productive on any device without sacrificing the security of intellectual property.

- > 21% of manufacturers are victims of intellectual property theft.¹
- > Intellectual property theft is responsible for approximately \$300 billion in annual losses for U.S.-based manufacturers alone.²
- > By 2020, 80% of supply chain interactions will happen across cloud-based commerce networks, dramatically improving participants' resiliency and reducing the impact of supply disruptions by up to one-third.³



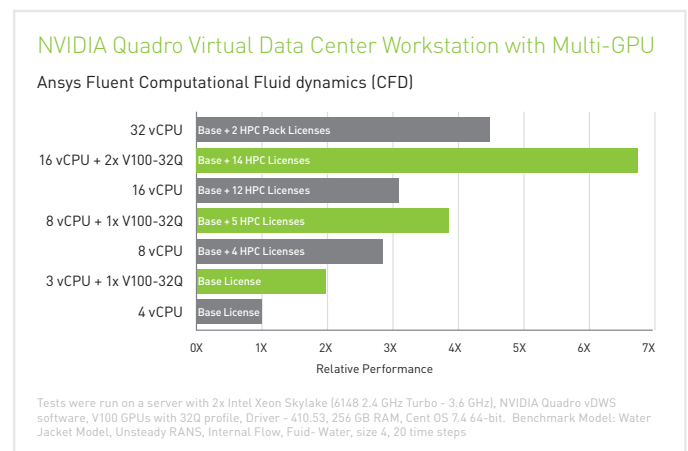
NVIDIA VIRTUAL GPU TECHNOLOGY FREES MANUFACTURING TEAMS FROM PHYSICAL WORKSTATIONS, EMPOWERING SECURE COLLABORATION FROM ANYWHERE

Manufacturers are looking to virtualization solutions to help mobile and distributed teams collaborate on designing and producing a wide range of products—from aerospace and aviation to automotive and industrial machinery. However, the sheer size of the 3D models required for this work, combined with workstation performance and network limitations, means that loading times can be excessive. This can result in lost production time. By adding NVIDIA virtual GPU (vGPU) technology to their virtual desktop infrastructure (VDI) environments, manufacturers are realizing significant benefits, including improved productivity, more effective collaboration with distributed teams, and increased data security.

The value of virtual GPUs has been considerable:

- > **Enhance Productivity with Real-Time Performance.** Manufacturers can deliver superior graphics performance to designers and engineers on virtual desktops from the data center. They now have the same responsive experience that they would expect from a physical workstation. Users can also view and work with large 3D models and graphics-intensive applications without lag or delay. This translates to increased efficiency and productivity, ultimately helping manufacturers bring products to market faster. Multi-vGPU support—the ability to assign multiple NVIDIA GPUs to a single virtual machine (VM)—makes it possible for engineers to work with even larger models and achieve exponentially faster processing of computations.⁴
- > **Collaborate Anywhere on Any Device.** Engineers and designers can now be freed from their physical workstations and use thin clients—or the device of their choice—to access the applications and data they need, regardless of their location. Also, geographically dispersed teams no longer need to wait for large file transfers and model loading. With files and data centralized in the data center or cloud, teams can securely access the information they need to work together from anywhere.
- > **Protect Intellectual Property.** Manufacturers no longer need to issue company laptops to external contractors or remote workers and assume the risks associated with supporting that model and application. By centralizing data and moving mission-critical files into the data center, manufacturers can protect their IP while speeding the design process. Employees gain mobility and autonomy through secure and instant access to the applications they need to deliver products to market as quickly as possible.
- > **Consolidate PLM Data for Greater Consistency.** As design and engineering resources become more dispersed, maintaining consistent and uniform data in product lifecycle management (PLM) databases becomes increasingly difficult. Centralizing PLM solutions in the data center allows for greater consistency and consolidation of data, as well as control over design changes. Moreover, virtualized desktops enable faster access and response times to PLM databases, letting PLM administrators shave seconds off numerous database transactions, which results in time savings that equate to real business dollars.

7X FASTER SIMULATIONS






Engineering simulations can run almost 7 times faster, and more smoothly and securely. In some cases, they can be run for significantly less cost than a vCPU only solution.

What is gpu virtualization? GPU virtualization enables every virtual machine to get the benefits of a GPU just like a physical desktop has. Because work that was typically done by the CPU has been offloaded to the GPU, the user has a much better experience and more users can be supported.

NVIDIA VIRTUAL GPU SOLUTIONS

<h3>NVIDIA Quadro vDWS</h3> <p>NVIDIA® Quadro® Virtual Data Center Workstation (Quadro vDWS) provides traditional physical workstation graphics users access to a secure, data center delivered virtual workstation for their 3D CAD/CAE applications in a virtualized environment with all of the required performance.</p>	<h3>NVIDIA GRID</h3> <p>NVIDIA GRID® Virtual PC and Virtual Applications (GRID vPC/ GRID vApps) enable a high-quality virtual desktop experience for knowledge workers in finance, human resources, marketing, and other users of office productivity applications. Electronic Design Automation (EDA) engineers and designers that require Linux-based development environments can also increase productivity by utilizing the like-native experience that NVIDIA GRID software provides.</p>	<h3>NVIDIA Virtual Compute Server</h3> <p>NVIDIA Virtual Compute Server (vCS) is ideal for data scientists and analysts running computationally intensive workloads —including artificial intelligence (AI), data science and high-performance computing (HPC) applications.</p>
BENEFITS	BENEFITS	BENEFITS
<ul style="list-style-type: none"> Faster 3D model loading access and response for engineers and designers PLM data consolidation for more consistency Support for multiple NVIDIA GPUs in a single VM, to power the most demanding workflows More secure access for external suppliers and contractors Better protection for data and intellectual property Higher user acceptance for virtual workstations Faster applications performance due to reduced data movement Data version control enforced in the data center Performance scalability Support for multiple and high-resolution displays, including up to two 8K or four 4K displays Increased employee mobility Central management of business continuity and disaster recovery Cloud readiness 	<ul style="list-style-type: none"> Anytime, anywhere access to virtualized graphics design applications for an increasingly mobile workforce Support for increasing graphical requirements of Windows 10, streaming video, and modern productivity applications Support for multiple high-resolution displays, including up to four HD monitors, two 4K monitors, or a single 5K monitor, for increased productivity. Cost-effective solution to scale VDI across your organization Lower IT management costs Security enforced in the data center Increased employee and contractor mobility Business continuity and disaster recovery managed centrally Reduced downtime, even during maintenance with live migration 	<ul style="list-style-type: none"> Run containerized applications for machine learning and deep learning in a virtualized environment to isolate workloads and securely support multiple users Harness the power of multiple GPUs in a single VM to scale application performance, important for deep learning training workloads Eliminate data center silos and leverage the same hypervisor management tools for both compute and graphics workloads Maximize infrastructure utilization by running compute-intensive workflows during the night when utilization of VDI is lower
COMMON APPLICATIONS	COMMON APPLICATIONS	COMMON APPLICATIONS
<p>ANSYS Fluent, Autodesk AutoCAD, Autodesk 3ds Max, Dassault Systèmes CATIA, Dassault Systèmes SOLIDWORKS, PTC Creo, Siemens NX</p>	<p>Adobe® Creative Cloud®, Microsoft Office</p>	<p>NVIDIA RAPIDS™, TensorFlow, Caffe2, OmniSciDB, MXNet, Theano, Torch, Keras, Microsoft CNTK, Kinetica</p>

CUSTOMER EXAMPLES

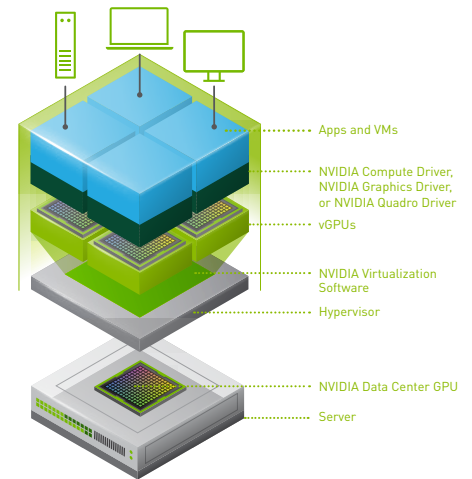
		
Honda R&D Co. Ltd. Wako-shi, Japan	Nordam Tulsa, OK, USA	PSA Peugeot Citroen Paris, France
<p>Honda deployed next-generation engineering VDI powered by NVIDIA virtual GPUs to enhance productivity and operational efficiency for R&D/production centers. With graphics acceleration in the data center, NVIDIA virtual GPUs empower teams to use CAD/CAE applications on any device—even low-cost laptop computers. Additionally, Honda IT can allocate the right level of performance for power users and knowledge workers alike. Across all Honda group companies, more than 4,000 VDI systems are experiencing better application performance and user experience, as well as faster access to data and enhanced security of IP.</p>	<p>Nordam implemented a VDI-based NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS) solution to enable full graphics acceleration and workstation-class performance while enhancing security. Now, engineers and designers can access applications and data from anywhere in the NORDAM network without being tied to multiple workstations per user. Multiple users can share the same desktop, fostering collaboration and training on a level never before seen at the company. By replacing up to two workstations and six monitors per user with an entry-level PC or thin client, NORDAM has freed up valuable desk space while significantly reducing hardware and management costs.</p>	<p>The company deployed a 3D virtualization project powered by NVIDIA virtual GPUs to give designers direct access to high-performance virtual workspaces from anywhere and on any device, while boosting hardware utilization and efficiency. With NVIDIA virtual GPUs, latency was reduced to 15-30 ms at distances of up to 500 kilometers from the Paris data center, letting remote workers run graphics-intensive applications at local-device response times within that radius. PSA design engineers can now run high-end graphics applications on remote devices with no loss in quality, improving productivity while also receiving the security, ease of management, and disaster recovery benefits of a data center.</p>

KEY MANUFACTURING USER GROUPS

	Researchers, Analysts, Data Scientists	Engineers, Designers, CAE/CAD Users	Creative, Design, Knowledge Workers
USE CASES	For generative design, quality control, shortening design times and reducing materials waste via AI and deep learning	For rendering or remotely viewing and editing very large 3D project files and images	For general purpose VDI, using Windows 10 and virtualized design and creative apps such as Adobe Creative Cloud
RECOMMEND	vCS on NVIDIA T4, Quadro RTX™ 6000, RTX 8000, or V100S GPUs	Quadro vDWS on T4, RTX 6000, RTX 8000, or P6 <i>(supports up to two 8K displays)</i>	GRID vPC/vApps on M10, T4 or P6 for blade servers <i>(supports up to four HD or two 4K displays, or one 5K)</i>

HOW NVIDIA VIRTUAL GPU WORKS

In a VDI environment powered by NVIDIA virtual GPUs, the NVIDIA virtual GPU software is installed at the virtualization layer along with the hypervisor. This software creates virtual GPUs that enable every virtual machine (VM) to share the physical GPU installed on the server. The NVIDIA virtualization software includes a graphics driver for every VM. Quadro vDWS software includes the powerful Quadro driver. Because work that was typically done by the CPU is offloaded to the GPU, the user has a much better experience, and demanding engineering and creative applications can now be supported in a virtualized and cloud environment.



WHAT MAKES NVIDIA VIRTUAL GPUS POWERFUL

EXCEPTIONAL USER EXPERIENCE

Superior performance, with the ability to support both compute and graphics workloads for every vGPU



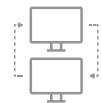
PREDICTABLE PERFORMANCE

Consistent performance with guaranteed quality of service, whether on-premises or in the cloud



BEST USER DENSITY

The industry's highest user density solution, with support for up to 32 virtual desktops per GPU, plus lower TCO with more than 9 vGPU profiles for the most flexibility to provision resources to match your users' needs



OPTIMAL MANAGEMENT AND MONITORING

End-to-end management and monitoring that delivers real-time insight into GPU performance, as well as broad partner integrations so you can use the tools you know and love



CONTINUOUS INNOVATION

Regular cadence of new software releases that ensures you stay on top of the latest features and enhancements



BROADEST ECOSYSTEM SUPPORT

Support for all major hypervisors and the most extensive portfolio of professional apps certifications with Quadro drivers



SOURCES

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3. IDC's Top 10 Predictions for Global Manufacturing. 2018. Retrieved from <http://www.industryweek.com/leadership/top-10-predictions-global-manufacturing-2018-idc>
4. Multi-GPU capabilities supported starting with NVIDIA Quadro vDWS software October 2018 release (aka vGPU 7.0)

For more information, visit www.nvidia.com/virtualgpu

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