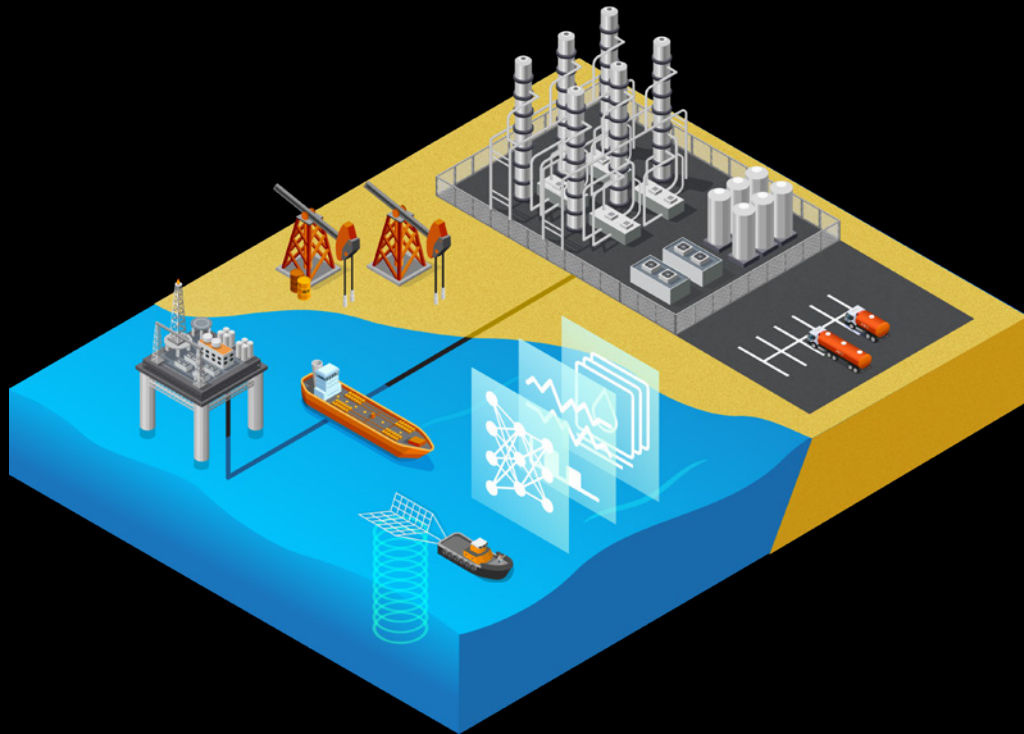


# ACCELERATING INNOVATION IN ENERGY

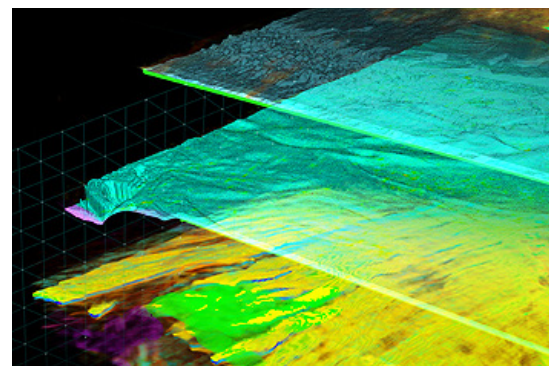
Quickly Access Massive Compute Resources,  
Secure Data, and Enhance Collaboration



## With new energy projects costing tens of billions of dollars, decisions affecting infrastructure performance rely on critical insights generated by sophisticated modeling and simulation technology.

Understanding the importance of protecting these valuable data sets, energy firms have increasingly focused on better management and security, typically relying on remote systems to keep data backed up in local data centers. This creates long project load- and save-times and tethers engineers and geoscientists to traditional workstations or one-to-one data center workstations. Moreover, simulating and analyzing petabytes of data can be slow when real-time access is critical to success.

NVIDIA virtual GPU (vGPU) solutions help energy firms overcome these challenges to processing, analyzing, and securing large data sets, while enabling engineers, geophysicists, and geologists to work from anywhere, by enabling performance indistinguishable from traditional workstations, accelerating the migration to the data center. With NVIDIA, firms can transform their IT infrastructure, maximize compute resources, and increase user mobility to stay agile in an intrinsically volatile industry that demands efficiency.



“NVIDIA virtual GPU technology is giving our people the performance they need to do their jobs more flexibly and effectively than ever before, and is also making it easier for us to maintain data security and overall control over our network.”

—Corey Elliot, Director of Information Technology  
Legacy Reserves

## VIRTUAL GPUS FOR GREATER PRECISION AND EFFICIENCY

With NVIDIA vGPU technology the performance of graphics and compute-intensive applications in a virtualized environment is improved, IT management is streamlined and sensitive data is protected in the data center. While different use cases require different remote computing needs, there is a vGPU solution to fit every type of workload. Leading energy firms trust NVIDIA RTX Virtual Workstation (vWS) software to provide the compute power and speed that enables interpretation, simulation and modeling applications, while NVIDIA vPC accelerates their office productivity applications and provides access anywhere, on any device. NVIDIA vCS enables the acceleration of virtualized AI workloads that can help automate energy operations to reduce costs and ensure consistent performance.

## Provide Remote Access to Secured Data

NVIDIA RTX vWS allows for migration of the traditional workstation into the data center. Not only does this reduce project load- and save-times, it also safeguards critical operational data. All teams can access files from home, out in the field, or while traveling. And geographically dispersed teams can collaborate on files without any performance degradation, confident that data is protected and that they're working on a single master file.

## Speed Time to Insights

With multi-GPU support for NVIDIA RTX vWS, a single virtual machine can harness the power of multiple NVIDIA GPUs to boost scalability for applications requiring heavy computation resources for data visualization. With the speed up of model processing cycle times, and RTX features like ray-tracing and rasterization that refines and sharpens visuals, NVIDIA RTX vWS helps teams create clearer images, faster. Calculations of seismic trace attributes and visual analysis of complex basins can now be done in real-time, which leads to more effective lease bidding, higher service revenues, and more efficient hydrocarbon discovery and recovery.

## Minimize Downtime and Delays

In the oil and gas industry, every day of production represents millions of dollars in investment. NVIDIA's industry-proven stability for both Windows and Linux drivers provides continuous uptime to minimize delays. Plus, live migration of GPU-accelerated VMs means high system availability—IT can perform critical services like workload leveling, infrastructure resilience, and server software upgrades without end-user disruption or data loss.

## Maximize Compute Resources

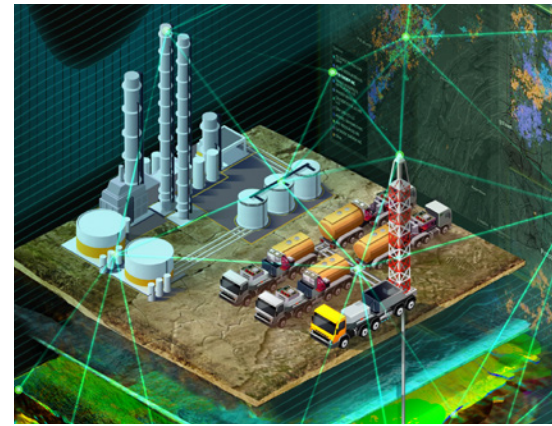
With NVIDIA, teams can utilize the same pool of virtual workstation resources in shifts, ensuring seismic interpretation, reservoir modeling, and engineering tasks can all be completed around the clock with no idle resources. When additional resources are needed to power compute-intensive processes like batch calculations, users can have instant access to additional compute and graphics resources with RTX vWS technology in the cloud.

## Better Utilize the Data Center

With live migration, data center resources are always optimally distributed to improve performance and maximize ROI. During the workday, virtual desktops run workloads like seismic interpretation to streamline system functionality and provide faster data for decision-making. After hours, the same compute resources can be dedicated to completing compute-heavy tasks like seismic processing or flow simulation.

## Increase Scalability and Manageability

IT administrators can set up virtual desktops for users in geographically dispersed locations in minutes. Rapid scaling of IT resources accelerates production schedules, ensuring productivity is enhanced from Day One and ongoing costs are avoided when projects are complete. Troubleshooting and upgrades can be handled remotely.



# TESTED AND CERTIFIED FOR ENTERPRISE CLASS RELIABILITY

NVIDIA virtual GPU solutions set the industry standard for virtualized creativity. To maximize performance—and to get the best possible experience from your IT investment—NVIDIA Quadro® and RTX professional graphics solutions are tested and certified by all the leading workstation OEMs and have received ISV certifications for more than 700 professional applications and IT management tools.

## NVIDIA VIRTUAL GPU SOLUTIONS

RTX vWS	vPC/vApps	vCS
<p><b>NVIDIA RTX Virtual Workstation (vWS)</b> NVIDIA RTX vWS is ideally positioned for science and engineering teams in the energy industry that work on graphics-intensive applications for simulation and visualization.</p>	<p><b>NVIDIA Virtual PC (vPC) and Virtual Applications (vApps)</b> enable a high-quality virtual desktop experience for general purpose VDI and Windows 10 or Linux desktops for employees using office productivity applications and streaming video.</p>	<p><b>NVIDIA Virtual Compute Server (vCS)</b> is ideal for data scientists and analysts running computationally-intense workloads using AI, HPC, and data science workloads across operations like Simulation, HSE, and Equipment Reliability.</p>
<p><b>BENEFITS</b></p> <ul style="list-style-type: none"> <li>Supports multiple high resolution monitors, for example, up to four 5K or up to two 8K monitors, and large frame buffer sizes for increased productivity</li> <li>Reduces downtime, even during maintenance, with Live Migration</li> <li>Centralizes data for better version control and more consistency</li> <li>Eliminates the need to move large data sets across the network from servers to client machines—enabling faster load times</li> <li>Improves collaboration for employees across multiple locations</li> <li>Provides more secure access for external suppliers and contractors</li> <li>Enforces security in the data center</li> <li>Increases employee mobility</li> <li>Centrally manages business continuity and disaster recovery</li> </ul>	<p><b>BENEFITS</b></p> <ul style="list-style-type: none"> <li>Provides virtualized access to online training, teleconferencing, Skype, and other graphics-intensive applications</li> <li>Easily manages the increasing increasing graphics requirements of Windows 10 and modern productivity applications</li> <li>Supports multiple high resolution monitors, for example, up to four HD, two 4K, or one 5K monitor, for increased productivity</li> <li>Delivers a cost-effective solution to scale VDI across your organization<sup>1</sup></li> <li>Enforces security in the data center</li> <li>Increases employee mobility</li> <li>Lowers IT management costs and quickly cascades updates across the enterprise</li> <li>Supports Linux or Windows applications</li> </ul>	<p><b>BENEFITS</b></p> <ul style="list-style-type: none"> <li>Run containerized applications for machine learning and deep learning in a virtualized environment to isolate workloads and securely support multiple users</li> <li>Harness the power of multiple GPUs in a single VM to scale application performance, important for deep learning training workloads</li> <li>Eliminate data center silos and leverage the same hypervisor management tools for both compute and graphics workloads</li> <li>Maximize infrastructure utilization by running compute-intensive workflows during the night when utilization of VDI is lower</li> </ul>
<p><b>COMMON APPLICATIONS</b></p> <p>Schlumberger Petrel E&amp;P and INTERSECT, Emerson Paradigm Geo Suite and SKUA-GOCAD, Halliburton DecisionSpace and Nexus, IHS Markit KINGDOM Suite, CGG GeoSoftware, ANSYS Fluent, Autodesk AutoCAD, Dassault Systèmes SOLIDWORKS and CATIA, and ESRI ArcGIS</p>	<p><b>COMMON APPLICATIONS</b></p> <p>Adobe Creative Cloud, Skype, Microsoft Office, and core business applications (including streaming video, online training, and teleconferencing)</p>	<p><b>COMMON APPLICATIONS</b></p> <p>NVIDIA RAPIDS™, TensorFlow, Caffe2, OmniSciDB, Rollos, Abyss, and Avitas Systems</p>

<sup>1</sup> Assumes cost of subscription, NVIDIA vGPU software, and hardware, with three-year amortization of two NVIDIA M10 cards supporting 87 NVIDIA vApps users. NVIDIA vPC for VDI starts at \$6 per user per month.

## CUSTOMER EXAMPLES

### PGS Oslo, Norway

After Hurricane Harvey disrupted core operations for weeks by decommissioning the infrastructure underpinning industry-standard software, such as Petrel and PaleoScan used to model, analyze, and interpret seismic data, PGS wanted to ensure business continuity via disaster resilience. They selected a virtualized workstation solution using NVIDIA RTX vWS to ensure high-performance operation of their modeling tools. The solution came in handy immediately when the COVID-19 pandemic hit. The transition to remote work was seamless and had no impact on operations. PGS' infrastructure is resilience-tested and ready for high performance in all situations.



### Legacy Reserves LP Midland, Texas

After rolling out virtual desktop infrastructure (VDI), Legacy found that slow performance and rendering issues on applications like Spatial Energy Petra and ESRI ArcGIS prevented widespread user adoption. In response, Legacy's IT team migrated users to virtual desktops set up on servers equipped with NVIDIA's virtual GPU technology. When users tried the new implementation, they discovered that performance rivaled the firm's highest-end workstations. Legacy now experiences high user adoption, enhanced data security, and simplified IT management.



### Equinor Stavanger, Norway

One of the largest oil and gas companies in the world, Equinor (formerly Statoil) deployed virtualized desktops to its exploration staff as part of an initiative to maximize efficiency across its business. NVIDIA graphics acceleration helped the firm migrate from blade servers to a fully virtualized infrastructure and run its most demanding subsurface and engineering applications from central server facilities. Today, exploration teams across 36 countries can collaborate on projects from anywhere, on any device, and the firm has realized a significant reduction in capital expenditures and operational costs.



### Ouro Preto Óleo e Gás Rio de Janeiro, Brazil

With geologists, geophysicists, cartographers, and engineers in multiple locations, Ouro Preto needed to virtualize 2D and 3D applications like Schlumberger Petrel and Halliburton Landmark to increase mobility and lower IT costs. Using NVIDIA virtual GPU technology, the firm was able to deliver graphics-intensive applications from the cloud to professionals out in the field on their computers, tablets, and even their cellphones. Ouro Preto teams now enjoy local workstation-like performance in the palm of their hands.

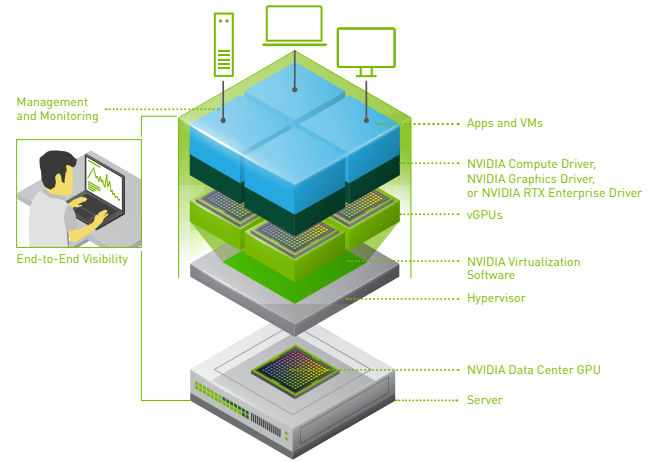


## KEY ENERGY USER GROUPS

	Scientists, Engineers, CAD/CAE Users	Data scientists, Analysts, Operations Managers	Accounting, Marketing, Human Resources, Staff
USE CASES	For remotely viewing and editing massive data sets and complex 2D/3D images	For running computationally-intensive data science or AI workloads for use cases such as predictive equipment health or automation.	For general purpose VDI, using virtualized Windows 10 or Linux desktops and common office productivity applications
RECOMMEND	RTX vWS with NVIDIA A40 <i>(supports up to four 4K or two 8K displays)</i>	NVIDIA vCS with A100, A30, or A40 GPUs	NVIDIA vPC/vApps on NVIDIA A16 <i>(supports up to four HD or two 4K displays)</i>

## HOW NVIDIA VIRTUAL GPUS WORK

In a VDI environment powered by NVIDIA virtual GPUs, NVIDIA virtual GPU software is installed at the virtualization layer, along with the hypervisor. This software creates virtual GPUs that let every virtual machine (VM) share the physical GPU installed on the server, or you can allocate multiple NVIDIA GPUs to a single VM to power more demanding workflows. The NVIDIA software includes a graphics driver for every VM. NVIDIA RTX vWS, for example, includes the powerful RTX Enterprise 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



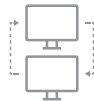
### PREDICTABLE PERFORMANCE

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 64 virtual desktops per GPU, plus lower total cost of ownership (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 NVIDIA RTX Enterprise drivers



For more information, visit [www.nvidia.com/virtualgpu](http://www.nvidia.com/virtualgpu)

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