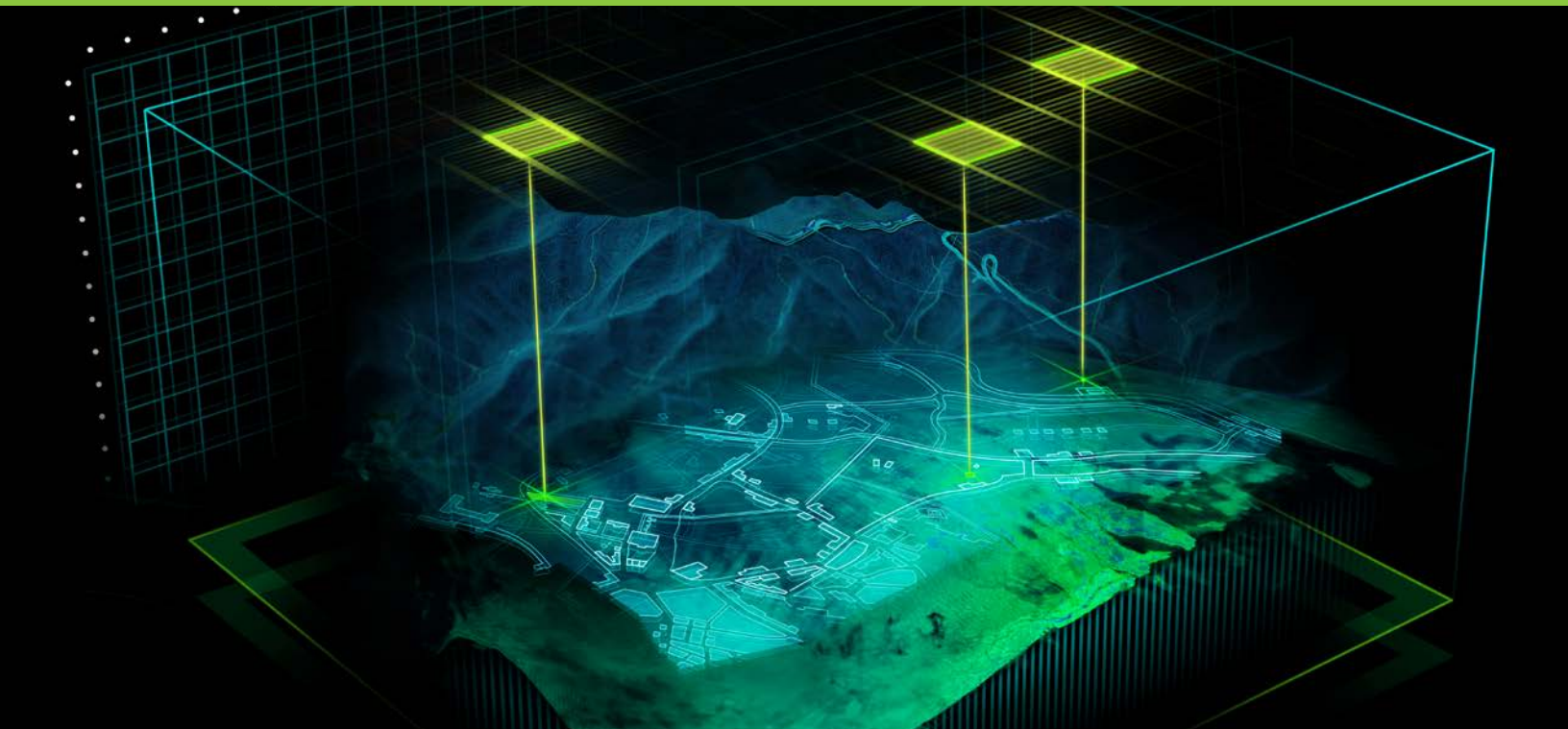


# ACCELERATING VIRTUALIZATION IN GOVERNMENT

Increase Security, Improve Mobility,  
and Lower Maintenance Costs with  
NVIDIA Virtual GPU Solutions



**NVIDIA**

As government agencies look to support an increasingly mobile workforce, ensuring the security of sensitive data is a primary concern. In addition to strengthening their cybersecurity posture against an ever-growing number of cyber threats, federal CIOs and CTOs are faced with data center consolidation initiatives and mandatory migration to Windows 10, all while operating within the limits of tight budgets.

- > Ninety percent of federal CIOs reported an increase in cyberattacks.<sup>1</sup>
- > Data breaches account for an estimated \$637M in fiscal damages annually across federal IT systems.<sup>2</sup>
- > To strengthen their data centers against cyber threats, government agencies are transitioning desktops to the data center and, in some cases, migrating to Windows 10.<sup>3</sup>
- > Artificial Intelligence (AI) could free up 30 percent of the government workforce's time within five to seven years, freeing them to work on more strategic tasks.<sup>4</sup>



By David B. Gleason from Chicago, IL [The Pentagon] [CC BY-SA 2.0 (<https://creativecommons.org/licenses/by-sa/2.0/>)], via Wikimedia Commons

## NVIDIA VIRTUAL GPU TECHNOLOGY BOOSTS SECURITY AND LOWERS MAINTENANCE COSTS FOR SUPPORTING A MODERN, MOBILE WORKFORCE

Government agencies are increasingly turning to virtualization and cloud computing to address security and IT challenges. For example, the Pentagon moved to virtual desktop infrastructure (VDI) to increase security, lower maintenance costs, and enable mobility, but early efforts were challenged by latency on the desktop.<sup>5</sup> With NVIDIA virtual GPU (vGPU) technology, government agencies can implement VDI with a high-quality user experience, especially with graphics-intensive applications, streaming video, and Windows 10. Additionally, NVIDIA vGPU acceleration can help power AI and data analytics enabling everything from Smart Cities to identifying flu outbreaks to helping health departments analyze tens of thousands of tweets in order to identify possible food poisonings. And they can accomplish this while increasing security and mobility and reducing IT maintenance costs.

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<sup>1</sup> DelPrette, George (2015, June 19). 4 Top Challenges for Federal CIOs. Retrieved from <http://www.nextgov.com/ideas/2015/06/4-top-challenges-federal-cios/115801/>

<sup>2</sup> Guerry, Pem (2017, July 18). The 2 Big IT Challenges Facing Federal Agencies. Retrieved from <http://m.nextgov.com/ideas/2017/07/3-big-it-challenges-facing-federal-agencies/139524/>

<sup>3</sup> Pellerin, Cheryl (2016, March 8). DoD-Wide Windows 10 Rabid Deployment to Boost Cybersecurity. Retrieved from <https://www.defense.gov/News/Article/Article/688721/dod-wide-windows-10-rapid-deployment-to-boost-cybersecurity/>

<sup>4</sup> Viechnicki, Peter and Eggers, William (26 April 2017). How much time and money can AI save government? <https://www2.deloitte.com/us/en/insights/focus/cognitive-technologies/artificial-intelligence-government-analysis.html>

<sup>5</sup> Boyd, Aaron (2015, March 9). Feds look to virtual desktops for security, mobility. Retrieved from <https://www.federaltimes.com/it-networks/2015/03/09/feds-look-to-virtual-desktops-for-security-mobility/>

The value of virtual GPUs in government are considerable:

- > **Improve security.** With government agencies facing continued cyberthreats and data breaches, coupled with the rising need to support a more mobile workforce and bring-your-own-device (BYOD) programs, government IT departments need to ensure data centers are secure. NVIDIA virtual GPU solutions enable IT to provide access to files and data on any device while keeping the information centrally hosted in the data center. Engineers and analysts can securely collaborate on classified data, and agencies can expand virtualization to more users with secure access to files and 3D applications.
- > **Enhance mobility and efficiency.** From aerospace and munitions to geospatial analysis and imagery, government employees must be able to access 3D data from any location, at any time, and on a variety of devices. NVIDIA® Quadro® Virtual Data Center Workstation (Quadro vDWS) provides GPU-accelerated virtual desktops and applications that untether the government workforce from physical PCs and workstations, providing a native desktop experience on any device. NVIDIA Virtual Compute Server (vCS) enables researchers and analysts to harness the power of GPU accelerated data center resources to work more efficiently with the highest level of security. This portability and rapid access to information results in increased efficiency. Users save hours by not needing to download data from remote locations, and co-workers across the globe can collaborate on the same files residing safely in the data center.
- > **Lower maintenance costs.** Government organizations are rolling out data-center-consolidation initiatives in the face of budgetary constraints. NVIDIA vGPU technology enables IT to virtualize desktops, saving time and money over physical desktops through simplified management and reduced maintenance. With GPU-accelerated virtualization, modeling and geographic information system (GIS) applications can be delivered cost-effectively to all users. Even data from legacy and siloed IT systems are unified and easily accessible to all users. IT can replace thick clients with thin or even zero clients without compromising user experience, all while supporting BYOD policies. Total cost of ownership (TCO) is further reduced by simplifying enterprise data management with proactive monitoring for large-scale deployments across the IT infrastructure. Live migration enables live VMs to be migrated without end user disruption. This facilitates more efficient data center maintenance, and enables engineers to work with 3D CAD models in a VDI environment by day, and send them to an HPC solver at night, all utilizing the same server infrastructure.
- > **Reduce cost of operations.** Training helicopter pilots to fly and soldiers to operate vehicles can be costly—especially when considering the number of training hours required for hundreds of thousands of geographically dispersed personnel. NVIDIA vGPU technology accelerates the flight and vehicle simulators in a virtual environment, giving government IT departments the potential to purchase half the hardware equipment while reducing the expense of power, space, and cooling. Multi-vGPU support with NVIDIA Quadro vDWS and NVIDIA vCS makes it possible to assign multiple NVIDIA data center GPUs to a single virtual machine (VM), enabling even more powerful, realistic simulation and training as well as demanding AI, deep learning and data science workloads.<sup>6</sup> Government agencies can reduce training costs exponentially and roll out training more efficiently with high-quality user experiences to hundreds of thousands of employees.

## WHAT IS GPU VIRTUALIZATION?

GPU virtualization enables every virtual machine to get the benefits of a GPU just like a physical desktop, workstation or server. 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.

GPU virtualization can also be used to run compute-intensive server workloads, including Artificial Intelligence (AI), data science, and High-Performance Computing (HPC) on a virtual machine and leverage the benefits of improved manageability and security.






<sup>6</sup> Multi-GPU capabilities supported with NVIDIA Quadro vDWS software October 2018 release (aka vGPU 7.0) and Red Hat Enterprise Linux 7.5 and Red Hat Virtualization 4.2 KVM hypervisors. Multi-GPU supported with NVIDIA vCS software August 2019 release (aka vGPU 9.0).

# NVIDIA VIRTUAL GPU SOLUTIONS




<h2>NVIDIA Quadro vDWS</h2> <p>NVIDIA <u>Quadro Virtual Data Center Workstation</u> (Quadro vDWS) provides traditional physical workstation graphics users a secure, data center-delivered desktop for their demanding applications, with all of the required performance.</p> <h3>BENEFITS</h3>	<h2>NVIDIA GRID</h2> <p>NVIDIA <u>GRID® Virtual PC (vPC) and Virtual Applications (vApps)</u> enable a high-quality virtual desktop experience for general purpose VDI and Windows 10 or Linux desktops for public sector employees using office productivity applications and streaming video.</p> <h3>BENEFITS</h3>	<h2>NVIDIA Virtual Compute Server</h2> <p>NVIDIA <u>Virtual Compute Server (vCS)</u> is ideal for data scientists and analysts running computationally intensive workloads – including artificial intelligence (AI), data science and High-Performance Computing (HPC) applications.</p> <h3>BENEFITS</h3>
<p>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</p> <p>Reduces downtime, even during maintenance, with Live Migration</p> <p>Centralizes data for better version control and more consistency</p> <p>Eliminates the need to move large data sets across the network from servers to client machines—enabling faster load times</p> <p>Improves collaboration for employees across multiple locations</p> <p>Provides more secure access for external suppliers and contractors</p> <p>Enforces security in the data center</p> <p>Increases employee mobility</p> <p>Centrally manages business continuity and disaster recovery</p> <h3>COMMON APPLICATIONS</h3>	<p>Provides virtualized access to online training, teleconferencing, Skype, and other graphics-intensive applications</p> <p>Supports increasing graphics requirements of Windows 10 and modern productivity applications</p> <p>Supports multiple high resolution monitors, for example, up to four HD, two 4K, or one 5K monitor, for increased productivity</p> <p>Delivers a cost-effective solution to scale VDI across your organization</p> <p>Enforces security in the data center</p> <p>Increases employee mobility</p> <p>Lowers IT management costs; quickly cascades updates across the enterprise</p> <p>Supports Linux or Windows applications</p> <h3>COMMON APPLICATIONS</h3>	<p>Run containerized applications for machine learning and deep learning in a virtualized environment to isolate workloads and securely support multiple users</p> <p>Harness the power of multiple GPUs in a single VM to scale application performance, important for deep learning training workloads</p> <p>Eliminate data center silos and leverage the same hypervisor management tools for both compute and graphics workloads</p> <p>Maximize infrastructure utilization by running compute-intensive workflows during the night when utilization of VDI is lower</p> <h3>COMMON APPLICATIONS</h3>
<p>ANSYS, Autodesk AutoCAD, Dassault Systèmes SOLIDWORKS, ESRI ArcGIS, MATLAB, Siemens PLM NX</p>	<p>Adobe Creative Cloud, Skype, Microsoft Office and core business applications (including streaming video, online training, and teleconferencing)</p>	<p>NVIDIA RAPIDS, TensorFlow, Caffe2, OmniSciDB, MXNet, Theano, Torch, Keras, Microsoft CNTK, Kinetica</p>



# CUSTOMER EXAMPLES

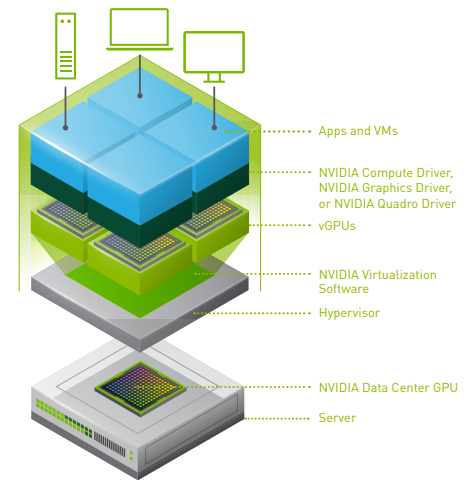
		
<p><b>City of Davenport</b> Davenport, Iowa, USA</p>	<p><b>City of Round Rock</b> Round Rock, Texas, USA</p>	<p><b>Holstebro Municipality</b> Holstebro, Denmark</p>
<p>The city updated its VDI environment with NVIDIA virtual GPUs to lower CPU utilization, improve user experiences, and encourage user adoption at all 34 facilities. Before adding NVIDIA GRID, poor performance of streaming videos and productivity applications prevented widespread system rollout. By adding NVIDIA GPUs, HD videos now run smoothly for municipal employees—from reviewing camera footage in patrol cars, to remote conferencing with colleagues, to watching training videos. In addition, user mobility and productivity have dramatically improved by enabling secure, remote access from any location and any device. “With NVIDIA GRID, we saw that we could deliver an unparalleled user experience that rivaled the physical desktop.”</p>	<p>The city updated its VDI environment with NVIDIA virtual GPUs to deliver better video-training experiences for the city’s firefighters, while enabling remote access with enhanced data security for its employees. With NVIDIA virtual GPU technology, the user experiences on virtual desktops are as close to a physical workstation as possible, and the city’s IT department has been able to simplify management and maintenance. “Adding NVIDIA virtual GPU technology allows true anywhere, anytime, any device capability. Our employees are happier and more productive, and those time savings also add up. We can invest that time to better serve our community.”</p>	<p>The municipality needed to bring together employees from 150 different locations into a single virtualized environment. And they needed to do it while addressing the increasing graphical demands of modern productivity applications and Windows 10 that the legacy desktop and application virtualization could not support. The municipality’s IT department implemented a VDI environment with NVIDIA virtual GPUs, and with tasks offloaded to the GPU, CPU utilization improved by 70 percent, resulting in better performance and improved user experiences. “With NVIDIA GRID, we can bring graphics acceleration to the data center, enabling the benefits of virtualization while also delivering an unparalleled graphics performance and user experiences that rival the physical desktop.”</p>

# GOVERNMENT KEY USER GROUPS

			
<p><b>USE CASES</b></p>	<p>Analysts, Data Scientists, Developers</p> <p>For using AI-based applications and data science to analyze vast amounts of data</p>	<p>Engineers, Simulation and Training</p> <p>For remotely viewing and editing very large 3D models and images. For vehicle flight simulator, collective, individual, and cyber training</p>	<p>Knowledge workers</p> <p>For general purpose VDI using virtualized Linux and Windows 10 common office productivity apps</p>
<p><b>RECOMMEND</b></p>	<p>NVIDIA vCS on NVIDIA T4, Quadro RTX™ 6000, RTX 8000, or V100S</p>	<p>Quadro vDWS on NVIDIA T4, RTX 6000, RTX 8000, or P6 for blades (supports up to two 8K or four 5K displays)</p>	<p>GRID vPC on NVIDIA T4 or M10 and P6 for blades (supports one 5K, up to two 4K, or four HD displays)</p>

# HOW NVIDIA VIRTUAL GPU WORKS

In a virtualization 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. For more demanding workflows, a single VM can harness the power of up to four physical GPUs. The NVIDIA virtualization software includes a graphics driver for every VM. Quadro vDWS includes, for example, 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. Demanding engineering and creative applications, as well as compute intensive server workloads including AI and data science, can now be supported in a virtualized, or cloud environment.



# WHAT MAKES NVIDIA VIRTUAL GPU POWERFUL

## EXCEPTIONAL USER EXPERIENCE

Ultimate user experience, with the ability to support both compute and graphics workloads for every vGPU



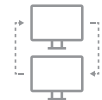
## PREDICTABLE PERFORMANCE

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



## BEST USER DENSITY

Industry's highest user-density solution with support for up to 32 virtual desktops per GPU. 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 for real-time insight into GPU performance. Broad partner integrations so you can use the tools you know and love



## CONTINUOUS INNOVATION

Regular cadence of new software releases to ensure you stay on top of the latest features and enhancements



## BROADEST ECOSYSTEM SUPPORT

Support for all major hypervisors. Most extensive portfolio of professional app certifications with Quadro drivers



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

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