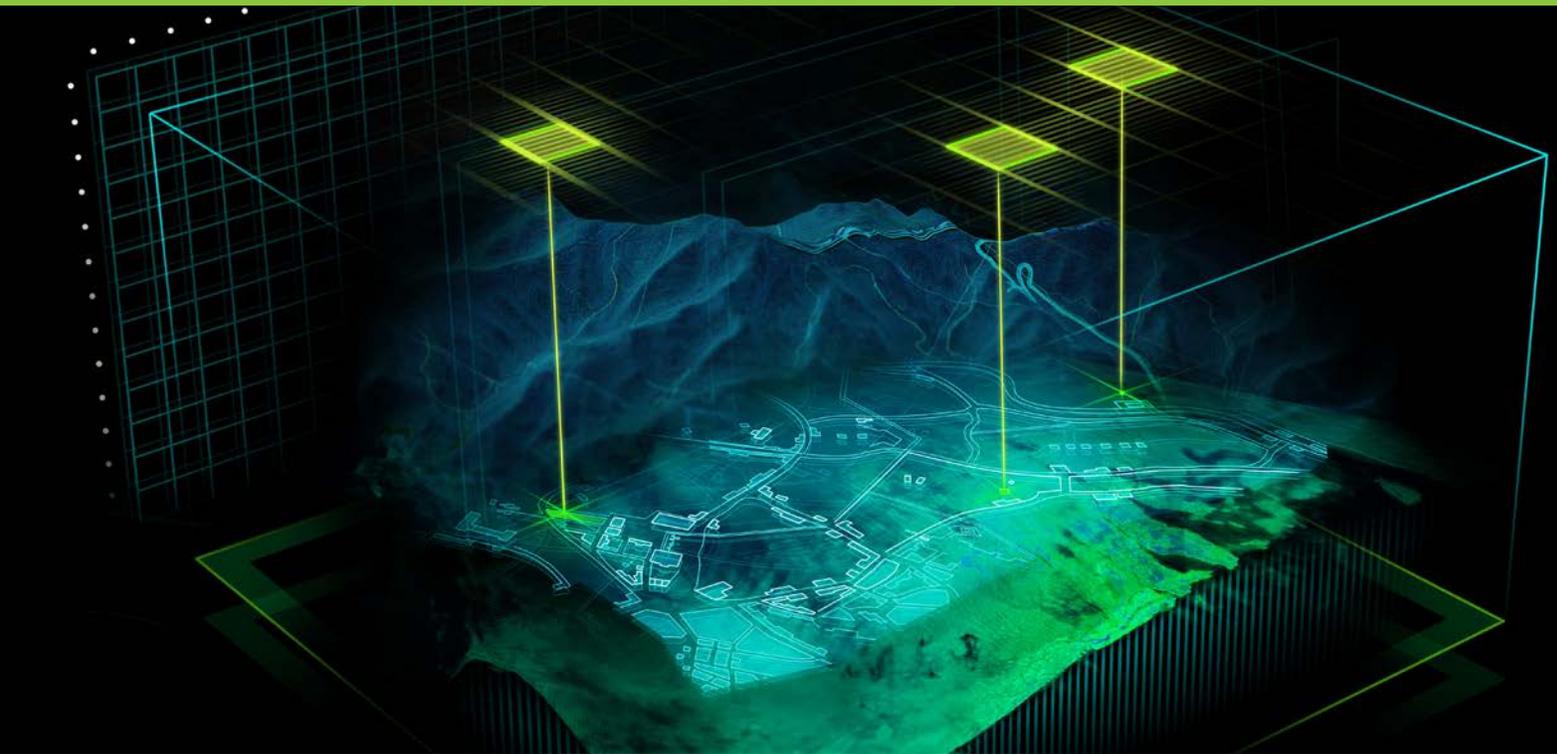


# ACCELERATING VIRTUALIZATION IN GOVERNMENT

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



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

- > 90% 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>
- > Some federal employees will permanently work from home, even after it's safe to return to offices.<sup>3</sup>
- > Artificial Intelligence (AI) could free up 30% 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 TO SUPPORT 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), 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 smart cities, the ability to identify flu outbreaks, and helping health departments analyze thousands of tweets to identify possible food poisonings. And they can accomplish this while increasing security, 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> Government Executive "Extolling Productivity During Pandemic, Agencies Say They'll Make Some Telework Permanent" Nov 18, 2020. <https://www.govexec.com/workforce/2020/11/extolling-productivity-during-pandemic-agencies-say-theyll-make-some-telework-permanent/170165/>

<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 more cyberthreats, coupled with supporting a more mobile workforce and bring-your-own-device (BYOD) programs, government IT departments have to secure their data centers. 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 RTX™ Virtual Workstation (vWS) provides GPU-accelerated virtual desktops and applications that untether the government workforce from physical PCs and workstations for 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 next level portability and rapid access to information results in increased efficiency. Professionals save hours since they don't have to download data from remote locations, and teams across the globe can collaborate on the same files that stored safely in the data center.
- > **Lower maintenance costs.** Government organizations are rolling out data-center-consolidation initiatives to combat 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 lets engineers 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 expensive—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 RTX vWS 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 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 vWS 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>RTX vWS</h2> <p>NVIDIA <b>RTX Virtual Workstation</b> (vWS) 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>vPC/vApps</h2> <p>NVIDIA <b>Virtual PC</b> (vPC) and <b>Virtual Applications</b> (vApps) 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>vCS</h2> <p>NVIDIA <b>Virtual Compute Server</b> (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> <h3>BENEFITS</h3>
<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>	<ul style="list-style-type: none"> <li>Provides virtualized access to online training, teleconferencing, Skype, and other graphics-intensive applications</li> <li>Supports 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</li> <li>Enforces security in the data center</li> <li>Increases employee mobility</li> <li>Lowers IT management costs; quickly cascades updates across the enterprise</li> <li>Supports Linux or Windows applications</li> </ul>	<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>
<h3>COMMON APPLICATIONS</h3>	<h3>COMMON APPLICATIONS</h3>	<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

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 vPC, poor performance of streaming videos and productivity applications prevented widespread system rollout. By adding NVIDIA vGPU, 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 vPC, we saw that we could deliver an unparalleled user experience that rivaled the physical desktop.”

City of Davenport  
Davenport, Iowa, USA

Responsible for the welfare of millions of acres of U.S. land, this organization helps people enjoy the environment while also conserving and protecting natural resources. To achieve its mission, it relies on a combination of specialists on the ground, digital imagery, and geographic information systems (GIS). NVIDIA vGPU-accelerated infrastructure was deployed to reduce the organization’s data center footprint and improve IT performance at remote locations. Implementing a solution leveraging NVIDIA vGPU enabled staff to efficiently collaborate and remain productive working from anywhere. Additionally, NVIDIA vGPUs increased server density compared to the old infrastructure, resulting in eight data centers being consolidated into two.

Land Management Organization

One of world’s largest defense contractors runs an aerospace systems integration business segment that develops pilot training systems. Its IT team specializes in customizing hardware and software to match a wide array of aircraft for the defense industry. These flight simulators are used by 20,000 pilots at 40+ global training centers annually. To reduce the total hardware required for simulations and simplify the hardware and software management, the IT team deployed NVIDIA GPU-accelerated virtual workstations. With NVIDIA vGPU, data center hardware was reduced by 83 percent because one 2U node could accommodate the equivalent of 12U in the company’s old infrastructure.

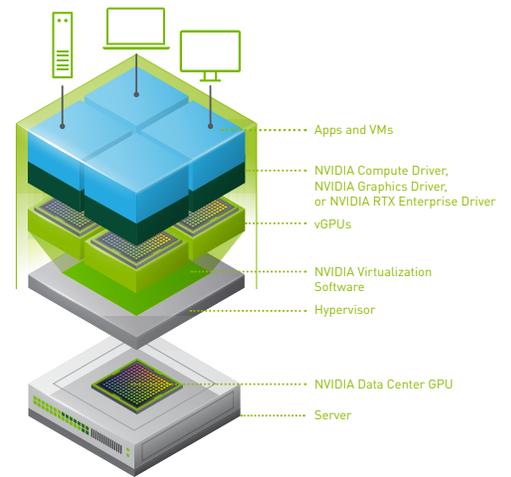
Aerospace Systems Integrator

## GOVERNMENT KEY USER GROUPS

	Analysts, data scientists, developers	Engineers, simulation, and training	Knowledge workers
<b>USE CASES</b>	For using AI-based applications and data science to analyze vast amounts of data	For remotely viewing and editing very large 3D models and images. For vehicle flight simulator, collective, individual, and cyber training	For general purpose VDI using virtualized Linux and Windows 10 common office productivity apps
<b>RECOMMEND</b>	NVIDIA vCS on NVIDIA A100, A30, A40, A10 or T4	NVIDIA RTX vWS on NVIDIA A40, A10, RTX 6000, RTX 8000, or T4 (supports up to two 8K or four 5K displays)	NVIDIA vPC on NVIDIA A16 or T4 (supports one 5K, up to two 4K, or four HD displays)

## 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 multiple physical GPUs. The NVIDIA virtualization software includes a graphics driver for every VM. NVIDIA vWS includes, for example, 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. 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



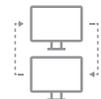
### PREDICTABLE PERFORMANCE

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 64 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 RTX Enterprise drivers



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

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