

DIGITAL TRANSFORMATION IN HEALTHCARE

Delivering Cost-Effective,
High-Value Healthcare with
NVIDIA Virtual GPU Solutions



NVIDIA.

Year after year, the healthcare industry is faced with challenges revolving around lowering costs while also improving quality of care. With the shift towards value-based care, initiatives such as mobility, virtualization, and new ways of delivering patient services like telemedicine and virtual care are gaining popularity. As such, healthcare providers must continually find ways to improve care delivery and scalability, while ensuring continued security and regulatory compliance.

- > Doctors spend 2X more time working on patient records than with patients themselves¹
- > Inefficiencies across clinical workflows costs \$1.75 million per US hospital per year²
- > 70% of U.S. healthcare organizations report they have been breached at any point in their history, the highest of any U.S. vertical.³
- > Artificial intelligence in healthcare is expected to expand at a compound annual growth rate of 43.5 percent from 2018 to reach \$27.6 billion by 2025.⁴

NVIDIA VIRTUAL GPU OPENS NEW POSSIBILITIES IN OPTIMIZING PATIENT CARE

Digital Transformation for healthcare providers has resulted in deep VDI penetration within the industry to lower costs while also enabling improved security. However, many of these traditional VDI solutions didn't include GPU virtualization and are challenged to keep up with modern applications which are more graphics intensive. Furthermore, big data analytics and AI in healthcare is becoming more prevalent - from AI based resource scheduling of patient appointments to AI-assisted annotation of radiographic images to analyzing DNA sequences for early detection of disease. By adding NVIDIA virtual GPU solutions to their VDI environments, healthcare organizations are realizing significant benefits including improved performance and increased productivity at lower cost. The impact of NVIDIA virtual GPU has been extensive:

- > **Enhance Productivity and Mobility.** More healthcare professionals can now be untethered and access data from any location, at any time, and on a variety of devices with a native-like PC experience. This portability and rapid access to information results in faster decision-making and improved diagnostic accuracy. Furthermore, mobility improves the completeness and accuracy of patient records and speed of input, improving clinical workflows.
- > **Reduce Infrastructure Costs.** Healthcare organizations can now virtualize electronic medical record (EMR) and PACS applications and deliver them 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 zero clients without compromising on user experience, and support the BYOD movement. Total cost of ownership is further reduced by simplifying enterprise data management with visibility across your entire virtualized infrastructure, including end-to-end management of your virtual GPU infrastructure.



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.

¹ Ramsey, Linda (2016, Sept. 6). Doctors spend more time with patient records than patients themselves - and it signals a major problem. Retrieved from <http://www.businessinsider.com/doctor-patient-time-ehr-2016-9>

² The Imprivata Report on the Economic Impact of Inefficient Communications in Healthcare (July 2016). Retrieved from <http://www.healthforum.com/connect/resources/imprivatac-2016-0107-w-pomemon.shtml?>

³ Thales. 2019 Thales Data Threat Report - Healthcare Edition. Retrieved from <https://www.thalesecurity.com/2019/data-threat-report-healthcare>

⁴ Lagasse, Jeff. Healthcare Finance. March 27, 2019. Artificial Intelligence in healthcare projected to be worth more than \$27 billion by 2025. Retrieved from <https://www.healthcarefinancenews.com/news/artificial-intelligence-healthcare-projected-be-worth-more-27-billion-2025>

- > **Uncompromised Security.** The healthcare industry is faced with continued explosion of data coupled with the rising trend to support a more mobile workforce and BYOD programs. IT can now expand virtualization to more users with secure access to critical clinical applications on any device, and still adhere to federally-mandated Health Insurance Portability and Accountability Act of 1996 (HIPAA) and Health Information Technology for Economic and Clinical Health (HITECH) Act.
- > **Improve Quality of Care.** Allowing healthcare professionals to access information anywhere, on any device enables better collaboration between doctors and specialists, as well as better information sharing with patients. Physicians no longer have to waste significant amounts of time during patient rounds accessing, retrieving, and recording data, as information is now readily available at their fingertips. This increased efficiency frees up more time for direct patient care.
- > **Support Any Workload.** IT can leverage the same infrastructure used for VDI to run compute intensive workloads - including AI, data science, and HPC - to support the needs of researchers, as well as other hospital departments such as radiology, neurology, and cardiology.



NVIDIA VIRTUAL GPU SOLUTIONS

NVIDIA® Quadro® vDWS

The NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS) is ideal for virtualizing PACS images used by radiologists, physicians, and specialists.

BENEFITS

- Remote access for 3D volumetric viewing and editing of images
- Ability to support large and complex medical images with support for up to two 8K monitors and large frame buffer sizes
- Ability to remotely supplement diagnostic work (US) and perform diagnostic work (UK)
- Extend accessibility to images secured in the data center
- Increase doctor/specialist mobility
- Lower IT management costs
- Support latest RTX-enabled applications for real time ray tracing

NVIDIA GRID®

NVIDIA GRID Virtual PC (vPC) and Virtual Apps (vApps) are positioned for general-purpose VDI in the healthcare setting for doctors, clinicians, nurses, and staff.

BENEFITS

- Virtualize EMR applications for accessing medical records remotely
- Support increasing graphical requirements of Windows 10 and modern productivity applications
- Support up to four HD monitors for increased productivity
- Cost-effective solution to scale VDI across your organization
- Extend accessibility to images and patient data secured in the data center
- Increase doctor/clinician/staff mobility
- Lower IT management costs

NVIDIA Virtual Compute Server

NVIDIA Virtual Compute Server (vCS) is ideal for data and laboratory scientists running computationally intensive workloads – including AI, data science and High-Performance Computing (HPC) applications.

BENEFITS

- Run containerized applications for machine learning, deep learning, scientific computing or cryo-electron microscopy in a virtualized environment
- Harness the power of multiple GPUs in a single VM to scale application performance, important for high-throughput and real-time processing of medical imaging studies
- 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



CUSTOMER EXAMPLES



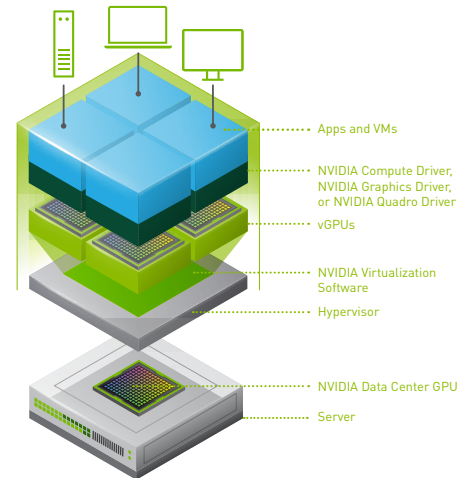
Metro Health Grand Rapids, MI, USA	The Polyclinic Seattle, WA, USA	ZGT Group Twente, Netherlands
<p>Deployed a VDI powered by NVIDIA virtual GPUs to enable healthcare professionals to seamlessly access medical imaging and graphics intensive applications from any location. Fast access and better performance resulted in a time savings of 30 minutes per day to each doctor and 50 minutes per day to nurses and other professionals. Service call volume to the IT department has remained flat while the total number of endpoints has grown by 35%. "NVIDIA GRID technology marks a turning point in our evolution toward delivering a virtual desktop to every user at Metro Health."</p>	<p>The Polyclinic has rolled out several initiatives to improve organizational efficiency, including a centralized EMR system, as well as published resources and apps on VDI. However, increasingly slow system performance impacted the productivity of doctors and patient service representatives (PSRs), making them resistant to an upgraded thin client. By upgrading their legacy VDI to Windows 10 with NVIDIA Tesla GPUs and GRID Virtual PC software, The Polyclinic was able to double their user density at 2/3 the cost while delivering a consistently great experience and improving VDI adoption across departments.</p>	<p>Virtualizing their radiology desktop and applications with NVIDIA virtual GPU saved time and increased productivity. Radiologists can now work from other locations or from home, without suffering quality loss or imbalance of images. Without the addition of NVIDIA virtual GPU, the performance and quality of their virtual desktops would not have met the needs of the radiologist. NVIDIA virtual GPU extended the possibilities of VDI, enabling radiologists to operate much more flexibly, achieve just-in-time diagnostics, and expand the scope of work.</p>

KEY HEALTHCARE USER GROUPS

TARGET PERSONA	DATA SCIENTISTS, RESEARCHERS	RADIOLOGISTS, MEDICAL IMAGING SPECIALISTS	DOCTORS, CLINICIANS, NURSES, STAFF
USE CASES	For using AI-based applications to analyze medical images, extrapolate DNA sequences, conduct drug discovery, or predict outcome of disease	For remotely interacting with large medical images (PACS) with high resolution and multi-monitor support on Windows 10	For general purpose VDI, using virtualized EMR apps and common office productivity apps
RECOMMEND	NVIDIA vCS on NVIDIA T4, V100S, or RTX 6000/8000 and P6 for blades	Quadro vDWS on T4, P40, V100S, RTX 6000/8000, or P6 (supports up to two 8K displays)	GRID vPC/vApps on T4, M10, or P6 (supports up to four HD or two 4K or one 5K displays)

HOW NVIDIA VIRTUAL GPU WORKS

In a virtualization environment powered by NVIDIA virtual GPU, the NVIDIA virtual GPU software is installed at the virtualization layer along with the hypervisor. The NVIDIA virtual GPU software creates virtual GPUs enabling 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 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 and 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.



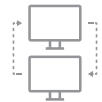
PREDICTABLE PERFORMANCE

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 physical 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 deliver 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 ensures you stay on top of the latest features and enhancements.



BROADEST ECOSYSTEM SUPPORT

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



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