



REMOTE WORK SOLUTIONS FOR HIGHER EDUCATION AND RESEARCH





REMOTE WORK CHALLENGES IN HIGHER EDUCATION AND RESEARCH

Schools, colleges, and universities are grappling with a transformative phenomenon: continuing instruction in times of national emergencies or extended closures. Educational institutions are beginning to recognize that remote teaching and learning is an essential way to expand education to anyone, anywhere, anytime, on any connected device.

This dynamic environment demands flexible ways for researchers, students, faculty, and staff to teach, learn, and collaborate. Remote learning isn't a new phenomenon in higher education. However, distance learning at scale introduces a new set of challenges.

The growing number of mobile devices, coupled with the expectations that these devices will have access to the same tools and applications involved in day-to-day work demands that education be highly mobile, interactive, and personalized. Professors often use rich multimedia to enhance the learning process. Researchers and design and engineering students need to run computationally intensive workloads, including professional graphics, AI, data science, and high-performance computing (HPC).

Finally, IT administrators face a number of challenges when managing distributed deployment—from network operations to security. Existing networks may not be able to support the surge in users. And since data is stored on personal devices, concerns about data security arise.

NVIDIA SOLUTIONS: PERFORMANCE FROM ANYWHERE

NVIDIA's remote work solutions such as virtual GPU technology and GPU-powered laptops and workstations ensure mobility and performance in a fast-paced environment.

By adding NVIDIA virtual GPU (vGPU) technology to virtual desktop infrastructure (VDI), educational institutions can extend virtualization across the entire campus at scale. Virtual GPUs also bring graphics acceleration to the data center, enabling IT to virtualize any application, from Windows 10 to graphics-intensive engineering applications, and deliver them through virtual labs that allow students and faculty to work from anywhere, on any device.

NVIDIA GPUs are supported in the large public clouds, so users can run graphics-intensive applications such as computer-aided engineering (CAD), simulation, rendering, video editing, and data science from any location.

Some students and faculty may prefer having a personal PC with the compute and graphics power they need to work from anywhere. For these users, NVIDIA's GPU-powered laptops combine portability with large memory capacity and robust visual computing capabilities to deliver workstation-level performance on the go. But if they're looking for even more processing power, they can build their own custom workstations with NVIDIA TITAN RTX™ or purchase an out-of-the-box solution like the NVIDIA data science workstation.



COMMON QUESTIONS, ANSWERED

Remote work technology opens up infinite opportunities for educational institutions. When developing their technology roadmap, institutions have to assess their current infrastructure needs, goals, and how to best utilize cloud and virtualization. Here are a few high-level questions that can help guide that journey.

> What is vGPU?

NVIDIA virtual GPU (vGPU) software enables multiple users or virtual machines (VMs) to share access to a single NVIDIA GPU, including the same NVIDIA graphics drivers that are deployed on professional workstations. By doing this, NVIDIA vGPU provides virtual desktops with unparalleled graphics performance, compute performance, and application compatibility, together with the cost-effectiveness and scalability brought about by sharing a GPU among multiple workloads. Additionally, users requiring more GPU performance can access multiple GPUs from a single VM, enabling GPU resources to be right-sized for every workload.

NVIDIA vGPU software is available in four editions to meet the needs of multiple virtualization use cases: NVIDIA Virtual Compute Server (vComputeServer), NVIDIA® Quadro® Virtual Data Center Workstation (Quadro vDWS), and NVIDIA GRID® Virtual PC (GRID vPC) and Virtual Apps (GRID vApps).

> My institution has VDI. Why do I need vGPUs?

Today's students are more tech savvy and increasingly made up of digital experts who expect a dynamic, multimedia-rich experience. New ways of learning that heavily utilize multimedia are becoming more popular, from professors using online videos to supplement classroom lectures to students creating animated presentations to better articulate ideas. With traditional CPU-only VDI, these methods often have a poor remote-user experience and can add substantial overhead to the CPU resources on the virtualized servers. GPU-accelerated VDI with NVIDIA vGPU offloads the graphics and media workloads, resulting in a better end-user experience and utilization of resources.

> What is the cost benefit?

New graphics-accelerated virtual labs offer huge benefits across multiple use cases. Virtual labs are easier to deploy and maintain than their physical counterparts, drastically simplifying IT management and reducing overall cost. For example, moving from on-campus labs to virtual labs saved Stevens Institute of Technology in Hoboken, New Jersey, over \$1 million per year in infrastructure costs and management overhead.

> Which operating systems and application experiences does this support?

With GPU virtualization, students in engineering, sciences, and other technical and artistic disciplines can have a high-quality experience on any device, even when accessing graphics-intensive 3D software traditionally only provided in on-campus labs. At the same time, the general student body, faculty, and staff can enjoy Windows 10 and modern productivity applications, which have increasing graphics requirements, to collaborate on projects in real time. GPU virtualization helps educational institutions broaden accessibility of resources and cost-effectively scale with exceptional performance and improved manageability. NVIDIA vGPU also supports Linux operating systems such as Ubuntu and Red Hat Enterprise Linux, which are widely adopted in research computing and machine learning labs.

REMOTE WORK WITH NVIDIA: SOLUTIONS OVERVIEW

NVIDIA remote work solutions are optimized for educational institutions and come with special pricing for universities and other educators. From laptops and desktops to workstations, servers, and the cloud, GPUs provide greater student and faculty mobility and flexibility with accelerated performance for distance learning, along with improved security and IT management capability.

> NVIDIA Quadro Laptops

With NVIDIA Quadro GPU-powered laptops, students and researchers can accelerate projects in cutting-edge fields like data science and design and visualization. Users can leverage the most powerful visual computing capabilities, boost productivity, and speed up time to insight without being tethered to their desks.

> NVIDIA Data Science Workstation

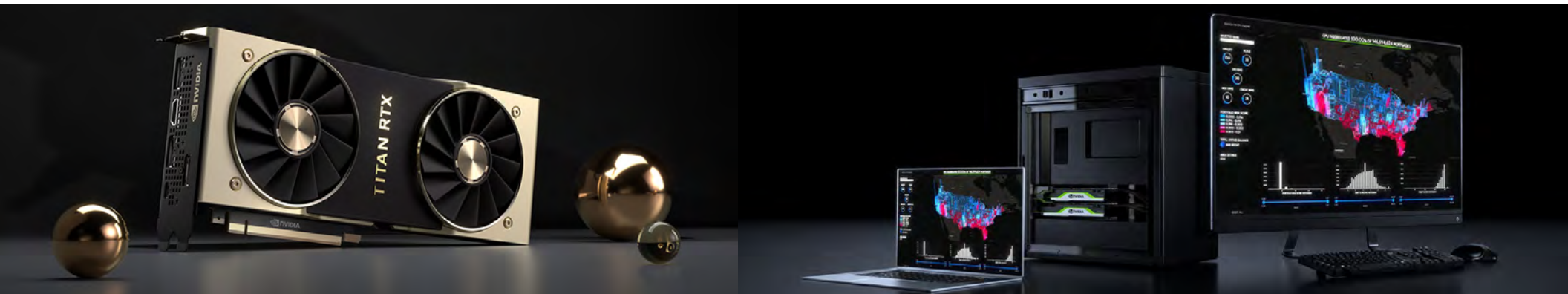
Researchers can achieve a performance boost and transform massive amounts of data into insights with NVIDIA-powered data science workstations. Built on Quadro RTX™ GPUs with accelerated CUDA-X AI™ data science software, it delivers a new breed of fully integrated desktop and mobile workstations for data science. With support for leading data processing and machine learning libraries, researchers can speed up data preparation, model training, and data visualization.

> NVIDIA RTX Studio Laptops

NVIDIA RTX™ Studio Laptops give creators and artists the ability to transform their home into the creative studio of their dreams. With support for premiere creative applications and next-generation AI and ray-tracing technology, these laptops deliver power and performance in thin, light designs for effortless content creation—whenever and wherever. NVIDIA RTX Studio Laptops are a part of the NVIDIA Studio Education Partner Program in which members, including the world's top digital media schools, receive technology guidance, access to NVIDIA's technical expertise, special discounts, and invitations to exclusive events.

> NVIDIA TITAN RTX

NVIDIA TITAN RTX™ brings the power of the world's fastest PC GPU to the home office. With NVIDIA Tensor Core and RT Core technology for accelerating AI and ray tracing and 24 gigabytes (GB) of memory for handling large models and datasets, it enables developers, researchers, and creators to work faster and deliver better results.



REMOTE WORK WITH NVIDIA: SOLUTIONS OVERVIEW

> NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS)

NVIDIA Quadro vDWS provides GPU-accelerated virtual desktops and applications that enable everything from virtual labs to augmented classroom learning. Architecture, engineering, art, and design students can remotely access CAD or 3D software traditionally only provided in on-campus labs, such as Autodesk AutoCAD, Maya, Dassault Systèmes SOLIDWORKS, CATIA, MATLAB, and Adobe® creative apps.

> NVIDIA GRID Virtual PC (vPC) and GRID Virtual Apps (vApps)

Students, faculty, and researchers can leverage NVIDIA GRID vPC and vApps for general-purpose VDI running Windows 10 and modern productivity applications, streaming video and multimedia, and using interactive learning platforms and teleconferencing.



> NVIDIA Virtual Compute Server (vComputeServer)

NVIDIA vComputeServer enables researchers and design and engineering students to run computationally intensive workloads—including AI, data science, and HPC—with virtualized GPUs. With vComputeServer, institutions can harness the power of multiple GPUs in a single virtual machine (VM) to scale application performance, important for deep learning training workloads. They can also run containerized applications for machine learning and deep learning in a virtualized environment and extend compute resources to support multiple users, creating student-accessible AI labs for teaching.

> NVIDIA Quadro Virtual Workstations (Quadro vWS) in the Cloud

With instances of Quadro vWS available in the public cloud, universities can leverage the simplicity and flexibility of AWS, Google Cloud, and Azure Cloud. Desktop-as-a-service (DaaS) solutions like Windows Virtual Desktop and Horizon Cloud ease manageability. This allows new users to be supported quickly and instances to be deprovisioned just as quickly, so universities only need to pay for what they need. With support for the latest NVIDIA GPUs by global cloud service providers, users can run graphics-intensive applications such as CAD, simulation, rendering, and video editing in the cloud.

REMOTE WORK SUCCESS WITH NVIDIA TECHNOLOGY



> University of Arkansas Delivers State-of-the-Art Experiences

The University of Arkansas is ranked among the nation's top public research universities, with 27,000 students attending its 10 colleges and schools. With a bring-your-own-device (BYOD) policy, the university wanted to provide its students with access to graphics-intensive engineering and design applications, anywhere, anytime, on any device.

The central IT organization also wanted to lighten the maintenance workload of the colleges' smaller IT groups, allowing them to focus on higher-value projects. The university rolled out a new graphics-accelerated VDI environment leveraging NVIDIA Quadro vDWS and NVIDIA GRID vPC and GRID vApps to provide access to powerful lab applications and a desktop-like user experience for its students.



> Georgia Tech Trains a Robot to Dress People

Every day, more than one million people in the United States require physical assistance to get dressed, whether because of injury, permanent disability, age, or other debilitating factors. To alleviate the problem, researchers from Georgia Tech built a deep learning-equipped robot that can help people get dressed.

The robot, named PR2, was trained using NVIDIA GPU-powered instances on AWS with the cuDNN-accelerated Keras and TensorFlow deep learning frameworks. The system analyzed nearly 11,000 simulated examples of a robot putting a gown onto a human arm, all done remotely in the cloud.



> University of Cambridge Uses Machine Learning to Write a Musical

University of Cambridge researchers used a machine learning system powered by four NVIDIA GPUs hosted on AWS to analyze what separates a hit musical from a flop. The team looked at factors like cast size, setting, and themes. Then they asked their system questions like whether successful shows always had romance or death or both. It resulted in the new show *Beyond the Fence*, which is the world's first musical conceived and substantially crafted by computer.



> University of Maryland Creates a Digital Manufacturing Powerhouse

The University of Maryland is the flagship campus of the state's higher educational system and a top-ranked public research institution. Its A. James Clark School of Engineering has virtualized all student apps and established Terrapin Works, a world-class digital manufacturing lab that's accessible virtually. Areas of research include robotics, tissue engineering, and energy research. More than \$700 million worth of software powered by NVIDIA GPUs and Citrix Virtual Apps have created a digital infrastructure to transform ideas into products.



WORK FROM ANYWHERE WITH NVIDIA

Fair and equal access for learners is a vital aspect of schools, colleges, and universities. NVIDIA vGPU technology helps educational institutions pursue that goal through the key benefits of virtualization.

Learn more about NVIDIA's remote working solutions at:
www.nvidia.com/remote-work

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