

CASE STUDY | VILLANOVA UNIVERSITY

# DELIVERING HIGH-END 3D APPLICATIONS TO STUDENTS ON THEIR OWN DEVICES

NVIDIA GRID™ technology allows Villanova University to provide BYOD access to high-end 3D applications from any location with full workstation performance.



# VDI powered by NVIDIA GRID technology delivers full functionality, accuracy, and display/render fidelity to students accessing 3D applications on their own devices.

## AT A GLANCE

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### CUSTOMER PROFILE

**Company:** Villanova University

**Industry:** Education

**Location:** Villanova, Pennsylvania

**Size:** 10,697 total enrollment; about 1,000 users in the Engineering department

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### SUMMARY

- > University with approximately 1,000 Engineering students, faculty, and staff and a total enrollment of more than 10,000 students at all levels
  - > Used to issue laptops to individual Engineering students for them to use running various 3D applications
  - > Legacy VDI without GPU support exhibited slow performance and loss of model and rendering details
  - > Rolling out an NVIDIA GRID K1 VDI that is delivering full fidelity graphics while outperforming laptop computers
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### SOFTWARE

**Hypervisor:** VMware vSphere with the NVIDIA vGPU GRID K180Q profile

**Desktop and Application Remoting:** Citrix XenDesktop and Windows Server 2012 R2 with the RDS role enabled

**Key applications:** Autodesk AutoCAD and SketchBook Designer, PTC Mathcad, MathWorks Matlab, Dassault Solidworks

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### HARDWARE

**GRID boards:** dual K1 per server

**Servers:** Dell PowerEdge R720

**Clients:** Various desktop, mobile, and thin clients

Located in a suburban community 12 miles west of Philadelphia, Pennsylvania, the six colleges at Villanova University offer a rigorous academic experience to more than 10,000 undergraduate, graduate, and law students. The Villanova community is dedicated to providing a personalized experience that fosters every student's intellectual and spiritual well-being. As part of their education, students are encouraged to enrich their own lives by working for those in need. Through academic and service programs, students use their knowledge, skills, and compassion to better the world around them.

## CHALLENGE

The College of Engineering has approximately 1,000 students, faculty, and staff. Many of these users require access to a number of graphics-intensive 3D applications, including Autodesk AutoCAD and SketchBook Designer, PTC Mathcad, MathWorks Matlab, and Dassault Systèmes Solidworks. Since 2006, the College has provided access to these applications by issuing a Windows laptop to each student; however, the growing trend toward BYOD and the ongoing expense of purchasing, supporting, and replacing laptops prompted Villanova to begin looking at a Virtual Desktop Infrastructure (VDI).

"We implemented a standard VDI with Windows 7 virtual desktops that relied on the CPU to process and render graphics," said John Powell, Desktop Management Administrator at Villanova University.

"Performance was pretty slow, but that wasn't the main problem.

Comparing the same model side by side in both a standard workstation and the virtual desktop revealed that the virtual desktop was missing both a lot of details and rendering effects, such as shadows and reflections. For the College of Engineering, there is no such thing as an 'extra' feature. Every application must run with all features enabled and with full display fidelity. You need a real graphics card to make that happen. There is no alternative."

To be successful, the VDI deployment must deliver 3D graphics performance that is at least equal to that of a laptop computer equipped with a mid-line graphics card with zero loss of detail or material/



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Desktop Management  
Administrator  
Villanova University

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#### 5 REASONS FOR GRID

- 1 Improved graphics fidelity over previous VDI and local laptops running applications
- 2 Performance equal to or better than laptops with local GPUs.
- 3 Students can access the VDI from any location on or off campus.
- 4 Simplified IT management.
- 5 Scalable to meet future needs.

rendered effects. Users must be able to quickly and easily access this environment both on and off campus.

#### SOLUTION

“This project was mostly done through the Department of Information Technology with the College of Engineering very closely involved,” explained Powell. “The College set the bar very high for our VDI implementation. Basically, they need larger amounts of power, performance, and scalability. We learned about NVIDIA GRID technology through the Citrix forums and then saw a presentation about GRID. Getting started with GRID was easy because we were planning to upgrade our existing Dell servers anyway, so why not add a couple of NVIDIA GRID K1 cards per server while we were at it?”

In June of 2014, Villanova embarked on implementing VDI using three dual-socket 8-core Dell PowerEdge R720 servers, each equipped with two NVIDIA GRID K1 cards. VMware vSphere with NVIDIA GRID™ vGPU™ is the hypervisor layer, while Citrix XenDesktop manages the virtual machines. Each host runs eight virtual machines that use the GRID K180Q vGPU profile to run Windows Server 2012 R2 with the RDS role enabled. User logins are balanced evenly across all virtual machines, allowing for nearly 100 concurrent users with an expected load of up to five users per GPU. RDS sessions ensure that each physical GPU will be constantly and evenly used.

“A lot of people helped us out with getting this started,” Powell continued. “We worked with Dell, Citrix, VMware, and NVIDIA to find just the mix of hardware, drivers, and software that would deliver peak performance while also maximizing the number of concurrent users that each server can support. We used various benchmarking tools to verify that the NVIDIA GRID GPUs were being used and to optimize our settings to ensure peak performance.”

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So far, NVIDIA GRID K1 is working flawlessly. We are even seeing details in the GRID renderings that don't show up when we look at the same model on a laptop using the integrated graphics. This is actually a very big deal because slight differences in the design can have a huge impact on the entire project up to and including the final building and its surroundings. Thus, there is no substitute for accurate rendering.

John Powell  
Desktop Management  
Administrator  
Villanova University

To learn more about NVIDIA GRID visit  
[www.nvidia.com/vdi](http://www.nvidia.com/vdi)

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Building and deployment has continued throughout the summer and fall semesters, with the current goal being to deploy the first NVIDIA GRID-powered desktops and applications to students, faculty, and staff between the Spring 2015 and Fall 2015 semesters. When the rollout begins, new students enrolled in the College of Engineering will no longer be issued laptops. Instead, they will use their personal devices to connect to the VDI and select either a GRID-enabled or standard virtual desktop or application. Villanova will begin the deployment to cover the College of Engineering.

## RESULTS

"So far, NVIDIA GRID K1 is working flawlessly," declared Powell. "I've run tests from my home in Boston almost 300 miles away and the performance is great using DirectX 11 and manipulating 3D models. We are even seeing details in the GRID renderings that don't show up when we look at the same model on a laptop using the integrated graphics. This is actually a very big deal because slight differences in the design can impact the entire project up to and including the final building and its surroundings. There is no substitute for accurate rendering."

Going forward, Villanova plans to spread the NVIDIA GRID deployment organically by word of mouth, using the superior performance of the GPU-enabled VDI as the main selling point. That plus the push toward BYOD and the resulting influx of a wide assortment of devices should be enough to ensure wide adoption of the VDI.

"One of the Engineering professors tried the new VDI implementation with NVIDIA GRID technology and said that we had met his expectations," concluded Powell. "That is high praise, given how stringent their requirements are. Right now, we are continuing our research, testing, and tweaking to make extra-sure that everything is rock-solid before turning this loose. This excellent feedback plus the impressive results we continue to see gives me confidence that, for the first time ever at Villanova, our Engineering students will be able to leverage the full power of AutoCAD and Solidworks on any device without the expense and time commitment of giving out laptops."