

CASE STUDY | VIRTUALIZATION AT UMASS LOWELL

# DELIVERING HIGH-PERFORMANCE VIRTUALIZATION AT UMASS LOWELL



# Untethering Students and Faculty for A New Way of Learning

## AT A GLANCE

**Company:** UMass Lowell

**Industry:** Education

**Location:** Lowell, MA

**Size:** 17,800 Students

## SUMMARY

- > UMass Lowell has more than 17,800 students with plans to grow to 20,000 by 2020.
- > Building new buildings on campus required massive capital undertaking.
- > Students required access to applications from anywhere.
- > Launched vLabs program with GRID Software and M60 vGPUs to deliver high performance VDI to all students and faculty.
- > Over 80% of the students agree that vLabs and 63% percent thought that vLabs had helped their academic success.

## SOFTWARE

- > NVIDIA GRID™

## HARDWARE

- > Tesla M60

## 5 REASONS FOR NVIDIA GRID

- 1 Workstation-like performance.
- 2 Ease of upgrades and maintenance.
- 3 Eliminates capital expense for new building and infrastructure projects.
- 4 Increased student access to key modern applications from any device.
- 5 Ability to meet IT demands of a quickly growing campus.



**Cover:** South Campus Quad  
All Photos © Sue Potter

## CHALLENGE

### The Future of Education

UMass Lowell is a national research university with more than 17,800 bachelor's, master's, and doctoral degree students. Named the #10 Best Value College in America by Forbes, the campus is well on track to reach 20,000 students by 2020. To keep up with the explosive growth, the University recently built new social science and business school buildings along with an emerging technology and innovation center. It has also expanded floor space and renovated existing space to accommodate new students. However, building new buildings is a massive capital undertaking. The campus turned to Steve Athanas, Director of Platforms & Systems Engineering, for a different approach.

“We needed a place to put everyone,” said Athanas. “At the end of the day you can only fit so many students into so many square feet; you can't stack students on top of each other in class. We needed a better solution.”

In addition to the explosive growth, a new generation of students with increased expectations, and a mission to provide education to all drove the school to think differently about the campus experience. “We wanted to provide the students with anytime, anywhere access to applications and data,” explained Athanas. “We always ask ourselves if we are making things better for our students. In 2013 the model was, ‘I have to go to the lab and do my work unless I happen to be fortunate enough to have that software on my personal computer.’ In a lot of cases that is not possible. Things like SPSS or Stata are not things that most people just have on their home computer. Colleges all over the world operate in the same way. Students are coming on campus now with an expectation of mobility and accessibility everywhere they go. By pinning them to a room, we were pigeonholing ourselves into this inflexible delivery of applications.”



Photo Left: Tsongas Center at UMass Lowell



Photo Right: Health and Social Sciences Building

**“We had it fully upgraded to the new software the next day without damaging our image. It was not 24 hours of labor either. We went home at five, came back the following morning, and a day later we had upgraded. Immediately, we saw a 20 to 30 percent performance improvement just by updating the code. It was the same board and same hardware. There were no hardware changes. It was incredible.”**

## SOLUTION

### Graphics Accelerated VDI

Athanas and his IT team turned to virtualization in 2013 to meet student demand. Called vLabs, the introduction of virtualization was an instant success and transformed teaching across the campus. With this great success came a few bumps in the road. The team quickly realized VDI alone was not enough to deliver the high-performance virtual environment the students and their applications required.

“We found out very quickly that our environment was robust and pretty decent computationally. In other words, SPSS or Mathematica was running pretty well on it. But there is a whole host of applications that require visual acceleration. They required graphical acceleration, and we could not support them. Things like ArcGIS or SolidWorks—we simply couldn’t support. The irony is that the way the programs of study were using ArcGIS required absolutely no 3D rendering. They were simply doing heat maps of crime statistics for a criminal justice program. But the application does a check for a GPU when it starts up. If it doesn’t have that, it won’t run, so we couldn’t run it,” Athanas explained.

To deliver the needed graphics requirements, Athanas and his team deployed NVIDIA GRID™ Software and Tesla M60 vGPUs to deliver high-performance VDI to all students and faculty. “The program that is experiencing the most growth is our College of Engineering. We have probably the best plastics engineering program in the world, and the software they use is just monstrous. It is apps like SolidWorks, the full AutoDesk suite, Moldflow, and Mastercam, not to mention the Mathematicas and all those pieces of software. The challenge was how to deliver this workstation-caliber experience to students with VDI.”

**“We put those M60 cards in the machine, and performance was considerably better.”**



Photo Left: University Suites interior



Photo Right: UMass Lowell University Crossing Student Center

**“The NVIDIA GRID piece makes virtualization possible for any application. Before GRID, we could give you access anywhere to your applications, provided your applications fit in this box. Now we can give you access to your applications regardless of what they are - it doesn't matter. I don't have to qualify it anymore; the asterisk goes away.”**

Athanas and his team immediately received positive responses from students and faculty alike. One Ph.D. candidate who has a job in private industry, in addition to achieving her Ph.D., compared the campus vLabs experience to the \$10,000 workstation in her office. “When our cost per seat is below \$2,000, I will take ‘almost as good as a \$10,000 workstation.’ Our solution is even mobile” said Athanas. With NVIDIA GRID, Athanas had also solved his plastics engineering problem. “In fact, when we told a student in plastics engineering that he could access an application on his phone, he didn't understand us. This is a student who has to run calculations in a lab for 11-20 hours at a time. When we showed him, he could run the same work on his iPad the experience was transformative. Now he can check in on his simulations anywhere.”

### Seamless Scaling and Upgrades

With a growing campus, Athanas and his IT department were also seeing an increase in the number of compute-intensive applications. With NVIDIA GRID software's continual upgrades and seamless integrations, Athanas and his team were able to meet the demand of the new applications and increase the access to vLabs to even more students. “When we delivered vLabs, we had about 200 seats, and it took half a semester to get students up and running with it. Then we dropped vLabs: Workstation into the engineering group with 100 seats. By the third day of class, we had 155 concurrent users, and they were running 50-60 percent through their own devices. The uptake was immediate.”

Continuous iteration allows the NVIDIA GRID software to deliver new increases in performance every quarter. With the NVIDIA GRID August 2016 Release, users gained increased speed and performance in graphically intensive applications across the board. Recently, the team looked to upgrade to the new release. “Here's the deal: we had not updated this since we started building it. When the new version came out, I was very nervous. We thought we were going to have to rewind the whole thing, rebuild the cluster, and rebuild the image. We put so much



**Photo Left:** UMass Lowell Mark and Elisia Saab Emerging Technologies and Innovation Center



**Photo Right:** Fox Hall

work into this,” Athanas explained. However, NVIDIA GRID software is designed to make the impossible possible. “We had it fully upgraded to the new software the next day without damaging our image. It was not 24 hours of labor either. We went home at five, came back the following morning, and a day later we had upgraded. Immediately we saw a 20 to 30 percent performance improvement in many apps just by updating the code. It was the same board and same hardware. There were no hardware changes. It was incredible.”

## RESULTS

### Redefining Education

With a goal of ubiquitous access to education for all students, NVIDIA GRID has helped UMass deliver on their promise. Today, students don’t have to buy expensive laptops to achieve an engineering education. Virtualization with NVIDIA GRID allows students to access applications on the devices they currently have. “Allowing them to access these applications on \$199 Chromebooks is literally transformative for their personal situation. They can use whatever they have lying around. I make a point when I present this stuff to use an iPad 2. It has the old 30 pin dock connector from Apple. I can’t even buy a power cord for it anymore, but I can run SolidWorks on it. I have an old Chromebook that I do the same thing with and It cost me \$190 secondhand on Amazon,” Athanas explained.

The real proof is in the results. In a recent student survey, over 80% of the students agreed that vLabs was easy to use, and 62% agreed that it should be used more across campus. 63% thought that vLabs had helped their academic success, according to Athanas. “It’s been a total game-changer,” Stephen Johnston, Associate Professor in Plastics Engineering said, “It not only allows us to maximize our computer lab facilities, but it changes the way people do work. It gives students a lot of flexibility.”

## Back to Class

In addition to all-access from anywhere, NVIDIA GRID has given UMass the opportunity to turn the existing physical lab's spaces back into classrooms. With applications on any device, it has also changed the in-classroom experience. "Now we have the opportunity to start reducing the number of physical labs we have and allow people to use their own devices," said Athanas. "Before, each faculty member was allowed to book the computer lab twice in a semester, but they had to do it at the beginning of the semester. They would lecture for four or five weeks, go to the computer lab, and have one lab day to work through examples. Now faculty can lecture the first half hour or 40 minutes, and say 'okay now let us try it.' All the students have wheels on their desks. They turn into these little study groups and pull out their own device, get onto Wi-Fi, and get into vLabs and practice. Faculty can walk around the room commenting and coaching in real-time. It is a completely new experience for both faculty and students. We have let faculty reduce the time from lecture to recitation from weeks to seconds. That has an impact on student retention of information. They understand the material better because we are reinforcing it immediately instead of down the road a bit. That is huge."

For Athanas the future of education at UMass relies on NVIDIA GRID. "The NVIDIA GRID piece makes virtualization possible for any application. Before GRID, we could give you access anywhere to your applications, provided your applications fit in this box. Now we can give you access to your applications regardless of what they are - it doesn't matter. I don't have to qualify it anymore; the asterisk goes away. I think this all plays a role in giving people access. But what does that access mean? It means it doesn't tether us."

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

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