

DESKTOP VIRTUALIZATION IN HIGHER EDUCATION



INTRODUCTION

When Florida Atlantic University's College of Engineering and Computer Science started constructing its 'living learning laboratory' building as part of a larger green initiative at the university, leaders sought the latest technology to provide a dynamic computing environment.

The living laboratory — designed to be used for teaching, day-to-day office work and labs — was to be a display of modern engineering itself and the first academic building in the state that qualified for the highly coveted Leadership in Energy and Environmental Design (LEED) Platinum certification.

The college was on the cutting-edge of construction practices, but needed to also provide a technology platform to accommodate everyday use by students while meeting the more robust needs of researchers running large-scale simulations such as data mining and 3D rendering.

Mahesh Neelakanta, director of technology services for the College of Engineering and Computer Science, said the school spent a year researching different types of environments that were available — including software, hardware and storage — to find a solution that would provide a scalable computing and desktop infrastructure.

"We wanted to build a system that would be able to cross the boundaries of day-to-day usage as well as research usage, while also keeping green practices in mind," said Neelakanta.

Ultimately, that is exactly what the college did — and it's not alone in its efforts. Higher education institutions of all sizes — including Indian Hills Community College in Iowa and Lake Land College in Illinois — are leveraging desktop virtualization to improve campus operations.

This paper will discuss how these schools are using desktop virtualization to lower costs; reduce their carbon footprint; provide better access to campus computing resources; quickly deploy and update software; and — most importantly — satisfy the diverse needs of students, faculty and researchers to create an ideal environment for higher education learning needs.

To learn more about Florida Atlantic University and the College of Engineering and Computer Science's initiative, view the links below:

<http://www.eng.fau.edu>

<http://green.eng.fau.edu>

<http://www.fau.edu>

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PHOTO COURTESY OF STUART GOBY, ISLAND STUDIO PHOTOGRAPHY

UNDERSTANDING DESKTOP VIRTUALIZATION

Before we explore the benefits desktop virtualization can bring, it's important to have a firm grasp of the technology itself. Desktop virtualization separates software from the underlying hardware that provides it, putting the focus on what is being delivered, making the user unaware and unconcerned about how it is being delivered or from where it is coming.

Virtualization decouples the underlying operating system, applications and data from an end user's device and moves these components into the data center where they can be secured and centrally managed. This approach allows users to access their "virtual desktop" with a full personal computing experience across devices and locations. Desktop virtualization takes the efficiencies offered through a centralized processing environment and merges it with the flexibility and ease of use found in a traditional PC.

Moving a step further, institutions like the College of Engineering and Computer Science at Florida Atlantic University are

pulling resources into the cloud — in FAU’s case, a private cloud — to utilize an Infrastructure-as-a-Service (IaaS) model. With IaaS, third parties provide computing, storage and network resources in near real time on a pay-as-you-go basis.

THE VALUE OF VIRTUALIZATION IN EDUCATION

The story is the same for higher education institutions across the country: Increasingly mobile students and faculty crave connectivity with constant, reliable access and powerful computing options. But at the same time, budgets and available resources are dwindling. Leaders have multiple choices available to meet student demands, but the cost of the technology itself — combined with the need for a robust infrastructure to support it and dedicated personnel to manage it — can be prohibitive.

This was the situation for Lake Land College in Illinois. “In the state of Illinois, we are in a terrible budget crisis and it looks like it is going to be that way for several years,” said Lee Spaniol, director of Information Systems and Services for the college. “One of the challenges we have is that we continue to add requirements for additional computing power but we certainly cannot add additional staff to support it. We are always asking ourselves, ‘How do we continue to support the computing requirements of our end users without adding staff when those computing requirements are growing astronomically?’”

Indian Hills Community College (IHCC) — also located in the Midwest, in Iowa — faced the same budgetary issues. “The state funding for community colleges keeps getting cut,” said CIO Shane Molyneux. “Since 2009, the funding for the community college system in Iowa has been cut by millions of dollars. We are all tightening our belts and finding better ways to do things and be more inventive with the resources we do have.”

Although funding — or lack thereof — and providing access to connected students and faculty are chief concerns for higher education leaders, they also need to have an awareness of their institution’s carbon footprint and look for ways to reduce it. This was a top priority for Florida Atlantic University, which had a vision to construct an environment that was a model of sustainability with the most cutting-edge technology. Changing operations to be more Earth-friendly was also a key driver for Lake Land College. The college aims to be carbon neutral by 2016.

BY THE NUMBERS

- Lake Land College is **saving \$80,000 annually** in energy costs by virtualizing 1,800 desktops.
- A thin client **uses about 15 watts of energy** versus a regular desktop using 100 to 250 watts.
- Indian Hills Community College says running a thin client **requires 4 hundredths of a penny** to run per day versus 14 cents per day for a traditional desktop.
- Thin clients **need to be refreshed every 7 years** on average. Desktops need to be refreshed every 3 to 4 years.



These are a few of the most challenging problems educational leaders face today; let’s take a look at some of the ways virtualization can help overcome these challenges.

Lowering Costs, Maximizing Resources and Increasing Storage

Like Lake Land College and Indian Hills Community College, higher education institutions across the nation are continually operating in environments of constrained budgets where resources are scarce and where there never seems to be enough time to accomplish what needs to be done. Because of this, school leaders need to ensure that every technology purchase



will create efficiencies for overburdened staff and that every solution has the potential for a high return on investment.

Desktop virtualization lowers upfront costs for colleges and universities — and saves them money down the road as well. Zero and thin clients are — on average — half the cost of traditional PCs. Indian Hills Community College was able to purchase thin clients at a price tag of \$400, instead of having to pay double that price for traditional desktops. Refresh rates for traditional desktops are three to four years, but thin clients only need to be replaced every five to seven years. However, the real savings — in both dollars and staff time — comes when looking at managing the entire IT environment as a whole and keeping pace with new technology.

Neelakanta said that the College of Engineering and Computer Science is not planning on having to refresh their hardware environment for at least four to five years and will instead add to the existing infrastructure with new computers as the technology improves.

“The beauty of deploying a virtualized infrastructure for desktop computing is that it’s very easy to augment with newer technology,” he said. “It becomes part of our private cloud. We simply buy the newer servers, attach them to our network and move over the virtual machines to the faster equipment and repurpose the older servers for other uses.”

Neelakanta said this is where his college sees the real time and cost savings. “In the past, we physically had to deploy an entire new infrastructure, reformat those new machines and set up

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new operating systems,” he said. “Everything was from scratch. That would take weeks if not months to deploy. Now we can add a new machine in only a day and it becomes part of our cloud.”

The college is also able to dynamically provision storage to users who actually need it. “In the past, we had lots of desktops — each with its own hard drive, memory and CPU,” said Neelakanta. This was a problem for the school because some hard drives would have significant amounts of storage and others would only have a little.

“It was always a difficult juggling act of who needed how much space,” said Neelakanta. “By centralizing storage, we have been able to carve it out on an as-needed basis and divvy it out to whoever needs it. When the person or group is finished, we destroy the space we gave them and return it back to the pool. The ability to dynamically carve out space and provide it to research groups or to students or to faculty — whoever needs it, when they need it — was important to us.”

Meeting Needs with a Dynamic and On-Demand Environment

Colleges and universities are home to diverse groups of individuals — including students, faculty and administrators. Within the student population are different areas of study which demand unique computing requirements. Some students are permanent residents on campus while others make a daily commute to and from school. Faculty may teach at the main campus every day, or they may lecture at a satellite campus many miles away. Regardless of the situation, IT departments must deliver to these diverse populations. Desktop virtualization allows IT staff to have the appropriate storage, software and applications ready regardless of the user’s needs.

This was a critical factor in FAU’s decision to deploy desktop

virtualization at the College of Engineering and Computer Science, as the college serves both students and faculty who have basic computing needs — as well as a research population who require powerful applications with significant amounts of storage. Neelakanta said in the past, the college had sets of computer labs within the college that were used for general computing purposes and separate sets that were used for research. However, oftentimes, one set would run very fast and others would be painfully slow — and it was not always the research computers that would move fast.

“Sometimes the lab machines would be fast and the research machines would be slow,” said Neelakanta. “It was always a battle because technology kept moving forward, but the machines would lag behind.”

Desktop virtualization has allowed the college to make their labs multi-purpose. Students can choose which virtual machine they would like to connect to when they log in, giving them immediate access to the applications and software they need regardless of where they are on campus.

“The labs are completely flexible and can be repurposed to use whatever software we need them to,” said Neelakanta. “Before, we were locked into the applications that were installed. To repurpose the machine for another application took two days to a week because we had to physically install the software. Now if a new application comes along, it only takes an hour or two to deploy it.”

Administrators at Lake Land College are also enjoying the ability to quickly provision software with desktop virtualization. Classroom changes at the college always meant a headache for IT staff.

“We would have to migrate software from one class to another,” said Bill Warfel, network administrator for Lake Land College. “This is a big deal. However, now if a classroom has thin clients, a teacher can teach anything in that classroom. There is no anchor to a physical machine where that software was installed.”

Providing Remote Access and Reducing ‘Windshield’ Time

For Lake Land College, mobility and the ability to provision services regardless of location is critical. The college has five different locations, each ranging anywhere from 30 minutes to one hour away from the main campus. This meant that if there was a problem at a satellite location, IT staff who worked at the college’s headquarters



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would have to get in their car and drive to fix the issue. Rising gas costs did nothing to help the college’s bottom line.

For Bill Warfel, the question was, “How are we going to effectively support our remote locations knowing that we cannot afford to have all of this windshield time?” The network administrator said that, invariably, IT staff would get to a location and need an additional part to address the issue and would often have to make yet another trip back and forth.

Desktop virtualization was the answer. The college started implementation in two remote locations simply to eliminate the drive time. Ultimately, the school plans to have a total of 1,800 virtual desktops. Warfel said that the college has already seen huge benefits from moving to zero clients — devices with

TIPS AND TRICKS

Taking advice from those who have traveled the same road before can save you time, money and other resources as you begin your own implementation. Below are some of the tips and tricks to consider before getting started.

- Take a training class before you start your deployment.
- Spend at least 3 to 6 months testing and ask a vendor to let you use their software and hardware to test.
- Move IT staff into a virtual environment so they can experience what students and faculty will encounter when they use the technology.
- Find people who are appreciative of new technology and understand that there are always bumps along the road. Work with them first, and then use them to help you get further buy-in.
- Look to other colleges at your university who are already doing desktop virtualization and see if you can piggy back off their efforts.



literally no configuration and nothing stored on them — and centrally managing desktops.

As students and faculty become increasingly mobile, providing remote access was also a key driver for Lake Land College. Many times, faculty members would want to use their laptop to work on their grade book or other materials at another location, on campus or at home. School IT staff had difficulty providing the needed applications to remote users prior to the desktop virtualization implementation.

Going Green and Reducing Carbon Footprint

Higher education leaders realize that green practices not only help the environment, but can go a long way in helping them operate their campuses more efficiently and cost-effectively. Nationally, over 500 colleges and universities have institution-wide sustainability or environmental committees and 300 campuses have conducted campus sustainability assessments, with hundreds more working to implement assessments.

Colleges and universities are demonstrating their dedication to environmentally sound practices and serving as an example to the private sector and the general public. The American College & University Presidents' Climate Commitment (ACUPCC) is a network of over 650 college leaders who are working to eliminate net greenhouse gas emissions from specified campus operations and to promote research and education efforts of higher education to equip society to restabilize the Earth's climate.

Community colleges are also working to be more sustainable despite difficult financial times. Results from the Center for Digital Education's 2010 Digital Community Colleges Survey showed that higher education institutions are continuing myriad efforts to put sustainable practices in place.

According to the survey:

- 54 percent of responding colleges have instruments to measure energy efficiencies;
- 60 percent use e-waste recycling efforts and Earth-friendly disposal; and
- 27 percent of responding community colleges are pursuing transparency about their carbon footprint.

Desktop virtualization allows campuses to utilize zero clients or thin clients, which have no moving parts — such as hard drives — and use very little energy. By using energy-efficient thin clients, Lake Land College is cutting its IT energy usage

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in half and saving \$80,000 a year. “Roughly one-third of campus energy consumption is from technology,” said Lee Spaniol, director of Information Systems and Services at the college. “So if I can turn off technology, it can make a huge impact in our electrical usage.”

CONCLUSION

The challenges higher education institutions face require technology that provides efficiencies for staff who are consistently asked to do more with less. Technology purchases that do not come with high returns on investment are not acceptable during these tight fiscal times. Schools like Florida Atlantic University, Lake Land College and Indian Hills Community College are harnessing desktop virtualization to lower costs, better manage their IT environments and proactively respond to the needs of students and faculty. At the same time, they are moving towards becoming fiscally and environmentally sustainable.

So what does the future hold? The desktop virtualization implementation at the College of Engineering and Computer Sciences has been such a success that leaders are exploring it as a model for the rest of the FAU campus. As success stories such as the ones mentioned in this paper gain in popularity, there is no doubt that higher education institutions across the nation will begin to adopt desktop virtualization technology.

“The troubles that we are facing as an IT organization are so common across corporate and academic environments,” said Neelakanta. “Any environment that allows the IT group to do more with less or to do more efficiently with the same amount is always accepted well.”

ENDNOTES

1. <http://www.edtechmag.com/higher/september-october-2009/5-avenues-to-green.html>



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ACKNOWLEDGEMENTS:



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