



# **Desktop Virtualization: Colleges and Universities Reach a New Horizon as They Cut Infrastructure Spending and Improve Computer Services**

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## **WHITE PAPER**

Sponsored by: VMware

Shawn P. McCarthy  
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## **IDC GOVERNMENT INSIGHTS OPINION**

Call it a virtual revolution.

A wave of interest in desktop virtualization is percolating upwards on college campuses thanks to the growing number of high-profile implementations that have successfully cut costs, improved end-user PC services, and streamlined computer maintenance. IDC Government Insights has noted rapidly accelerating deployments of virtualized desktops at institutions of higher learning across the globe.

Catalysts for this change include significant reductions in overall PC spending and improved system performance among educational organizations that have switched to virtualized PC desktop solutions. This success is real and measurable and thus has sparked growing interest among other institutions.

We have noticed a shift in investment priorities at some institutions, where the recent focus on network and storage improvements has given way to growing investments in virtualization, especially desktop virtualization. This switch is sparked by a growing understanding that desktop virtualization can provide a greater and quicker return on investment (ROI). Some of the interest in virtual desktops also has to do with the replacement cycle of aging desktop machines and the growth and affordability of available enterprise desktop virtualization solutions at a time when organizations have to face making choices about their aging Windows XP systems. The interest spike also is the result of growing interest in software as a service (SaaS) and cloud computing, which promote a thin-client environment.

For these and other reasons, desktop virtualization is a technology whose time has come for cost-conscious institutions. It follows on the heels of server virtualization, which has helped educational institutions worldwide realize significant cost savings by reducing the number of servers they maintain and reducing the overall physical and

energy-related footprint of their datacenters. This success makes desktop virtualization the next logical target for many schools, but the goal is ultimately to reduce costs and enhance IT service delivery and the end-user experience.

## **IN THIS WHITE PAPER**

This White Paper was written by IDC Government Insights and sponsored by VMware. It explores the potential advantages of using desktop virtualization for PCs rather than taking the traditional approach where every computer in an educational institution has its own operating system, resident applications, memory, processing power, and storage.

The methodology for this document is based on in-depth customer interviews. We talked with IT managers at five colleges and universities that have made a commitment to desktop virtualization. We asked them what worked, what proved to be a challenge, what they might do differently, and what specific benefits they've experienced. All of the IT managers who were interviewed said they achieved a positive ROI and improved services for end users. All are in the midst of expanding their initial commitment to desktop virtualization.

## **SITUATION OVERVIEW**

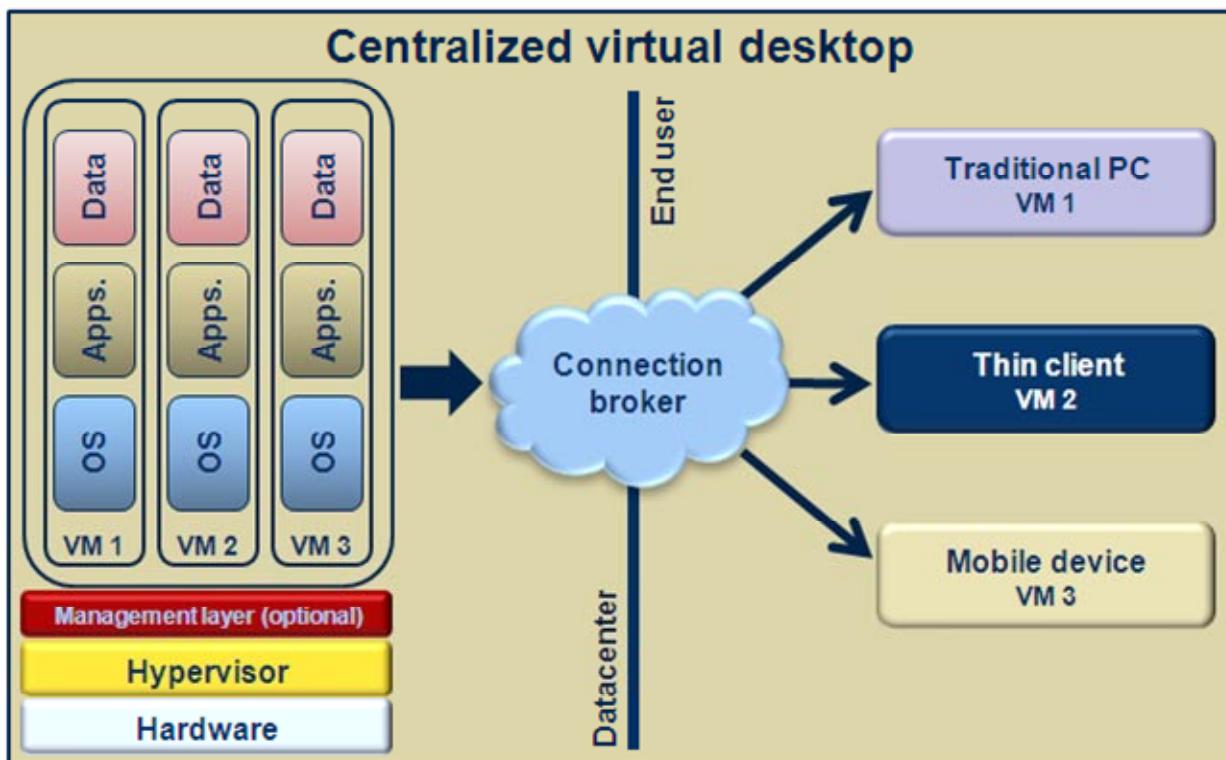
PCs have become nearly ubiquitous at colleges and universities over the past 25 years. From the laptops carried by students and professors to the desktop machines located in computer labs and libraries to the office machines used by staffers, multiple PCs can be found in every part of a modern college campus. But this widespread presence of PCs has become a double-edged sword at many facilities. While the wide array of computers has increased student, instructor, and staff access to information and computing resources, the presence of many machines has also become a management challenge for IT staffers. Managing PCs — maintaining the machines, updating software, dealing with security issues, installing patches, and troubleshooting the problems associated with individual PCs — has become a full-time job for a slowly growing set of employees and contractors. There is also the associated issue of security and privacy because of the wide range of data that resides on these PCs. Simply put: People need their computers. Thus, it's not practical to reduce the numbers of machines at most institutions, but it is quite possible to take a significantly more efficient approach to how these machines are managed.

## What Is Desktop Virtualization?

Virtualized desktops effectively separate a PC's desktop environment from the physical machine that's displaying and interacting with the user. "Virtualization" of a desktop means that the person using the computer will experience a traditional PC look and feel while interacting with the computer, but the individual is actually interacting with a client machine. The desktop is a window that loads from a remote central server. The operating system, data, applications, storage, backup, data, and processing are all handled by a server that resides in the datacenter (see Figure 1).

FIGURE 1

Desktop Virtualization



Source: IDC, 2011

The end users may access the virtual desktop from a zero- or thin-client machine, which has zero (or minimal) local storage, processing power, or software, or they may open a virtual window on a traditional PC. In the latter scenario, the PC acts like a thin client when interacting with the virtual environment, but the end user also has the

ability to use the machine as a regular PC. When all applications reside on a central machine, the result is a reduction in application sprawl. For example, over the course of multiple semesters, students many find that they acquire more and more applications, which are required for various courses but which often are incompatible with each other. With desktop virtualization, controlling everything from a central server reduces the chance of this happening.

### **Budget-Driven Computing Decisions**

Today's economy has made for very tight budget times for many colleges and universities. They are under great pressure to do more with less. Virtualized desktops have proven to be one arena where costs can be cut for the long term, without sacrificing the end-user experience. Some organizations have found that they can keep older PCs in operation an extra year or two by taking the computing pressure off individual PCs and moving it to a server. Others have chosen to replace PCs with thin-client machines for all users — in an effort to reduce maintenance issues related to those PCs. Both approaches seem effective at helping IT staffs reduce costs and overall maintenance.

"Basically, you don't need staff to go around your clients anymore," said George Wraith, head of systems at New College Durham in England. "All of the actual maintenance is done remotely at the center, and to date, it's been by one person."

Likewise, David Hjalmquist, IT technical director at Northeast Wisconsin Technical College, said, "It came down to the scalability — where we could provide better access to our students as well as reduce costs in our infrastructure."

Still other managers expressed satisfaction that students, teachers, and staffers are now able to access their desktops from multiple devices and even via different types of devices, such as PCs, tablet computers, smartphones, or thin-client machines located in various places around campus.

Another noticeable advantage of desktop virtualization is that it can give an organization a universal approach to information access, including better integration of technology into the classroom. Giving every person easy access to a standardized PC desktop effectively levels the playing field on who has access to which resources. All can be controlled at the server with a permissions-based set of tools. The result is expansion of appropriate technologies to whichever end-user base needs the available functionality.

## CASE STUDY HIGHLIGHTS

Making the case for desktop virtualization in a college setting means demonstrating that the proposed solution will do two things:

1. Improve overall service levels and functionality for students and staff
2. Reduce overall costs associated with maintaining machines and services

The following case studies provide details on how individual organizations of higher learning have addressed these two issues and how they made the decision to move toward virtualized desktops.

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### New College Durham, Durham City, England

New College Durham is a leading college of further and higher education in England with performance and success rates placing the school in the top 10% of colleges nationally. The college received an "outstanding" rating following its 2009 Ofsted inspection. New College Durham provides classes for learners aged 16 to 19 in preparation for university or after-college careers, as well as higher education programs and further education and continuity courses. It has roughly 10,000 students, 500 full-time staff members, and an "agency staff" of 500 on-call or part-time workers. The facility has one main campus and a few off-campus "outreach sites," which offer specialty programs such as engineering.

New College Durham virtualized most of its servers a few years ago. Satisfied with those results, IT managers decided to explore desktop virtualization for the client machines connecting to those servers. "We were looking for an easier way to manage the number of desktops that we have," said Wraith, head of systems at the college. We were finding it quite awkward and quite resource intensive to keep up to date — mainly with the software on the desktops around the estate."

"We have a three-phase project plan based around the PC replenishment cycle," Wraith said. "We've completed phase one, and we're moving into phase two. Basically it's going summer by summer. We lease the PCs, all Dells, on a four-year cycle." In the first year, the college also installed 400 Wyse P20 zero-client machines.

Sometimes approval for technology investments can be a multistep process. "The decision to go with VMware View initially came from the college IT department," said Wraith. In such cases, ideas are discussed at operational meetings and then taken to a strategic meeting to discuss feasibility. If an idea receives buy-in from strategic and technology groups, Wraith or someone else in the IT group is usually tasked with putting together a business justification. "Is it going to

save money? Is it going to give us better efficiencies, better end-user experience?" Wraith asked. Those are the factors they consider. For the virtual desktop investment, the idea was presented to the college's finance director, including justifications for up-front costs. "Once he's agreed to the money, agreement is then sought from senior management. Once we've got that, away we go," said Wraith.

Ultimately the capital implementation cost for the virtualized desktops was between £200,000 and £250,000 per annum over the three years. The payback period is a matter of months, with the college expecting to save over a million pounds by the time it hits the 10-year ROI mark. That's a significant payback compared with the initial investment. As part of the ongoing project, the college expects its PC replacement cycle to climb to at least six years from the traditional four years, and the IT department's desktop maintenance team is expected to drop from 5 people to 2 people with the extra resources then being able to be redeployed in other underresourced areas. Associated savings include reduced power consumption, reduced hardware costs because zero clients are cheaper than PCs, and improved boot time. Older PCs took over 3 minutes to boot, while most units now boot in 30 to 40 seconds.

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#### **University of Toledo, Toledo, Ohio**

Established in 1842, the University of Toledo is located in the city of Toledo in Ohio. The university provides undergraduate courses ranging from liberal arts to business administration; graduate degrees in nursing, education, medicine, and law, among others; adult and lifelong learning courses; and online learning options. The school has roughly 24,000 students studying in multiple buildings across three campuses, including a medical center. The University of Toledo maintains about 14,000 machines and has over 5,000 staffers.

"The real thing that made me decide to choose virtualization was cost," said Godfrey Ovwigho, Ph.D., the university's vice president for information technology and CIO. He was familiar with remote deployment from previous jobs and found it to be a better way to streamline operations. "I was looking for ways to hold down costs and to make IT more responsive when it comes to provisioning desktops and being able to provide adequate support," he said. "Ownership on individual desktops was becoming too expensive, and I was looking for better ways to provide support."

The university researched desktop virtualization solutions from VMware, Citrix, and Microsoft, eventually choosing VMware based on pricing and functionality. At that point, the university also realized that it could get discounts by buying through a prenegotiated statewide contract, giving it significant savings on thousands of licenses. Most of the university's PC hardware is from Dell, and most of its thin clients

(200 to 300 so far) are Wyse terminals. When the implementation is complete, the university will support about 50% thin clients and 50% PCs with a virtual desktop window. The university already supports PCs, Macintosh computers, and Linux computers, in many cases squeezing an additional year or two out of the machines.

On the client side, cost savings were substantial, with more than a 50% reduction in related expenses. Meanwhile, the time needed to provision critical applications dropped to less than 30 minutes from about 4 hours per computer. The full implementation, including 5TB of storage, cost less than \$1 million. The investments came out of existing IT department budgets. No special spending was provided or needed. Ovwigho said that the university handled the full implementation in-house and required only a couple of visits from a VMware technician. Prior to the start of the project, his office was spending over 20% of its budget on PCs and PC maintenance. Now that number is under 6%. Most of the savings comes from reduced hardware costs and maintenance costs, said Ovwigho. "The software license is the same whether we're virtual or not," he noted. Ovwigho was able to eliminate a couple of staff positions and also cut computer lab part-time student helper positions through attrition from over 84 positions to under 40 positions.

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#### **Drenthe College, Netherlands**

Drenthe College serves about 11,000 students and a workforce of 700 full-time staffers spread across 18 locations. It maintains about 3,000 computing devices, including 600–700 laptops, about 600–700 thin stations, and 200–300 mobile phones. It will support substantially more mobile devices over the coming year.

The staff was making roughly 30–40 service calls per day, according to Jacco Heikoop, the college's CIO. Because the systems are spread across multiple locations, the main attraction of desktop virtualization was the promise of centralization. "The virtual desktop provides everything you need for cost-effective implementations of IT," Heikoop said. "We use only one master desktop, so it's very easy to manage." He added that the college chose VMware because the licensing was simpler, considering that it had thousands of end users to support.

Most regular PCs are being converted to thin stations. The college has installed a Linux OS for a fast boot. Students see their desktop in about 30 seconds. Students see a virtual desktop that looks and functions like a Windows 7 desktop. The college's annual IT budget is about €400,000, and the college made all investments within its usual annual budgets. The college installed IBM servers to support the virtualized environments, with an investment of around €10,000. It worked with systems integrator The SLTN Group, based in Almere, Netherlands.

In the process of making these changes, the college also was able to retire multiple older servers for an annual savings of several thousand euros as well as some virtualized Citrix systems for an annual savings of about €100,000 in licensing fees.

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#### **Hopwood Hall College, North Manchester, United Kingdom**

Hopwood Hall College, a two-campus facility with over 8,000 students and 650 staff, needed to replace an infrastructure originally built by Research Machines (RM), a company that has built systems for hundreds of schools and colleges in the United Kingdom over the past 20 years. Because it had been a while since the system was updated, according to Simon Evans, director of technology and innovation, the college conducted a full overhaul of all systems over the previous two years.

Students can use their own devices, in addition to the on-campus PCs and systems. However, if they access the college's network using their own devices, they are channeled through the college's proxy server and access to some sites is restricted. "We thought the best way to allow student access to college systems would be through PC virtualization," said Evans. "Our desktop virtualization project was about understanding the requirements of our students [and] where we thought they would need access, and we explored the technologies out there to meet those requirements."

The college had a fleet of legacy PCs, some as much as eight years old, that took several minutes to boot. "We wanted a solution that was quick [and] easy to implement and which was going to give students a fast experience," said Evans, "and an experience that they could share in and out of the college." Hopwood Hall College eventually chose VMware View, which allowed it to roll out Windows 7. "We actually stripped out a lot of components within Windows 7, and we call it Windows 7 lite," said Evans. "It's used as just an operating system to authenticate into the domain and present some thin app shortcuts to the desktop." The real PC functionality is offered via the virtual desktop. The PCs the students access to do their coursework are owned by the college. Now Hopwood Hall College gets students who come in with their own laptops. They have the opportunity to download the View client in order to access the virtual PCs from home.

VMware offers a total cost of ownership (TCO) calculator, which Evans used to explore how much the college could save in power, how much it might reduce CO<sub>2</sub> emissions, and other scenarios. "The TCO calculator allows you to put in your staff salaries and how much that could be reduced over a three- or five-year period," he said. The research showed him that replacing 1,000 PCs would cost about as

much as moving to 1,000 virtual desktops, and the virtual solution would let the college save money in ongoing management costs.

Investing in virtual desktops versus a full refresh of PCs and other equipment ended up being more cost-effective "by a few thousand pounds," said Evans. In the process, IT has seen a reduction in its overall number of support calls. But the best part? "We've gone from being a 10-year-old legacy network to a state-of-the-art system, and we've managed to achieve that in roughly two years," said Evans.

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**Northeast Wisconsin Technical College  
Green Bay, Wisconsin**

Northeast Wisconsin Technical College (NWTC) is a four-year institution serving about 7,500 students, 600 employees, and another 600 people who are considered part-time/adjunct teachers or staffers. The facility includes multiple buildings and multiple locations. In addition to cost savings, one of the goals of NWTC's desktop virtualization initiative is to be able to expand the college's access to rural students.

To get started with the implementation, "we did a request for proposal because we knew we couldn't do it ourselves," said Technical Director Hjalmquist. "We chose, and still are utilizing, Paragon Development Systems [PDS] of Milwaukee, Wisconsin." Hjalmquist's office liked the proposal but needed approval from the college's board.

"When we went to the board," Hjalmquist said, "we presented the idea as a four-year plan. The board had a month to think it over. They came back and they said 'We really like this idea; let's do it in two years.' Our goal in this first two-year phase is to virtualize about 2,200 desktop PCs. On top of that, we have a little over 800 software applications collegewide that we're going through and working to virtualize or convert to thin apps."

For the most part, things have gone smoothly and on schedule. However, there were a few minor bumps along the way. "One was an issue with an antivirus solution," said Hjalmquist, "Since we're a Microsoft shop, we're using Microsoft Forefront, but there's a product called Trend Micro, which actually, to me, provides a better solution in the VMware environment, so that was an unexpected cost that we're going to incur."

The college has proceeded in carefully selected stages. "We haven't deployed it out yet to the regional learning centers," he said. "What we anticipate seeing is fundamentally some of the jobs that our help desk and/or computer services teams are doing will be reduced. A lot of that time is going to be saved, we know, going down the road."

## **CROSS-ANALYSIS FINDINGS AND BENEFITS**

After talking with multiple higher education institutions about why they chose to move to virtualized desktops, we detected a few clear patterns:

- In most cases, the new solution cost no more than the existing PC-based solutions that the institutions were replacing. In many cases, the costs were significantly lower.
- Institutions were able to extend the life of existing PCs, often by two or more years, which resulted in significant long-term cost savings.
- Zero- and thin-client solutions are gaining ground in schools, especially for machines located in libraries, labs, and public areas. Thin-client prices continue to drop, which means that implementing thin clients can be a very cost-effective approach to hardware investments.
- A virtual desktop solution is particularly useful when an organization is spread across multiple campuses. Even though many organizations currently are able to manage their traditional PCs remotely, IT departments still find themselves putting in "windshield time" driving to various locations to maintain, upgrade, or change computers. Virtualized desktops reduced this travel by as much as 80%.
- Some institutions have stopped buying \$1,000 PCs and now use thin-client terminals that sell for \$250 yet provide end users with the same Windows 7 desktop experience.
- Several institutions also allow students and some staffers to use their own PCs and handheld devices. This further reduces the hardware investment for the organizations and gives end users more flexibility.
- Operational expenses also have been reduced. We discovered many instances of organizations trimming their IT staffs because they had fewer hardware maintenance and fewer software patches to install.

Teachers and students too have reported productivity gains in certain circumstances. Because computing is centralized and reached through simplified client interfaces, there were fewer instances of machines being out of service. Additionally, because applications and work are stored on central servers, a lost laptop or a broken PC did not result in lost work. End-user desktops could still be accessed, and all data was still available, albeit from a different machine. This new approach provides a level of end-user flexibility that was not available just a few years ago.

The result is that virtual desktops provide a highly flexible computing environment that is more efficient for both IT managers and end users. IT staffers can focus less on maintenance issues and more on other types of system improvements. Teachers and students can focus on teaching, learning, and doing rather than on maintaining systems and helping troubleshoot issues.

Virtualized desktops also are a significantly more efficient way to use a group's computing resources. They also are more secure, not only because desktops are more tightly controlled when they reside on a properly configured central server but also because data that resides on a central server is less likely to be stolen than data that resides on multiple PCs that are located around the campus (or taken home).

This also helps support a consistent student learning environment, leading to performance improvements, as a result of system reliability. For the first time, staff, teachers, and end users can count on a consistent and reliable look and feel to their desktops and applications, regardless of the age of the devices being used.

There are associated environmental benefits too, such as less power consumption, a slowing of the rate at which PCs head toward landfills, and reduced packaging, including software packaging.

## **LESSONS LEARNED**

Most of the IT managers we interviewed had different opinions about what they learned from the experience. Some focused on the technical aspects of the implementation, while others reviewed the timelines or the political issues associated with the change.

"I initially began the desktop virtualization rollout in July of 2008. This initial rollout was not followed with in-depth education of faculty," said the University of Toledo's Ovwigho. "But I eventually came up with a strategy to aggressively educate and talk more about it and do more demos and show them how everything is designed to be. Currently, I have faculty that are talking more about the solution than I am myself. They think desktop virtualization technology is great. They're beginning to see it as a breakthrough and are embracing it now."

"I would strongly recommend any college that's going to go through this to have either in place, or planned, a way to automate their user provisioning," said Hjalmquist of Northeast Wisconsin Technical College. Without that, staffers will have to spend time manually setting up new accounts for end users.

Evans at Hopwood Hall College offered the following advice: "Don't go full bang immediately. In our college, each department is different, so what we didn't want to do is just say 'Here you go, here's VDI for

everyone.' Instead, we really have tried to work with each department and implement it one department at a time," depending on each department's needs. Evans' other bit of advice: "Make every single bit of technology as light as you can because there will be vast payback."

Heikoop at Drenthe College said to virtualize applications first. That will improve efficiencies and make it simpler to manage and build the virtual solutions for the new environment.

As far as measureable success factors, the reduced need for service calls is a very noticeable improvement. "We had about 1,200 service calls a month," said Heikoop, "and it's now about 600 service calls a month, so it's half." To others, simply improving the time a PC takes to boot was a major milestone, while others like their reduced hardware costs.

## FUTURE OUTLOOK

Desktop virtualization itself has an interesting future. Once an organization has adopted the technology, the servers that provide virtual images to the end users can reside anywhere. As cloud computing evolves, it's highly likely that many universities will get their desktop services from the cloud. However, many organizations require a unique set of computer applications, multiple system access permissions, and data views, which could make it challenging for commercial providers to host all the resources required by the university. For this reason, we expect to see the growth of multiuniversity consortiums — groups of facilities that share computing power in a private cloud.

Individually, some of the institutions we talked to have plans to iteratively improve their virtualized systems. For example, Northeast Wisconsin Technical College currently offers tutoring services, including some remote tutoring. One future goal is to expand remote tutoring, perhaps by offering any student with a Webcam the ability to participate in a remote class. Drenthe College plans to go with 100% virtualized desktops. It will eventually stop supporting individual PCs and will offer only the virtualized desktop environment. Wraith at New College Durham said, "One thing we're trying to do is improve our resource management of the end-user clients. The virtual desktop environment allows us to improve not only the range of functionality on the client but also the speed and efficiency of its delivery."

## ESSENTIAL GUIDANCE

Educational organizations that are considering desktop virtualization should do their own ROI analysis before taking the plunge. They can develop their own cost/benefit analysis tools, use the tool offered by VMware, or look for third-party tools. Luckily, this enterprisewide solution has advantages that are easy to measure.

Price points per seat are available for the software. Servers do not require any special configurations, so commodity servers can be used. The sizes and performance levels of those servers are dictated by the number of end users being served. End-user client costs are predictable because prices are readily available for thin-client machines, or people can use existing PCs if they prefer.

What we are seeing today is nothing short of a revolution when it comes to how institutions of higher learning are handling the computing experience of their end users. A virtualized desktop solution is better, faster, and cheaper —and far easier to maintain in the long run — than a traditional PC. While the virtualized desktop approach may not be the best match for every college or university, it is something every organization should at least consider and investigate. The solution is increasingly flexible and fast, and the majority of people who have taken the plunge are happy with the result.

The PC revolution that unfolded over the past 25 years brought about unprecedented access to information, learning opportunities, and the ability to network with others as part of the university learning process. However, that revolution also created a host of cost and management issues. Desktop virtualization has the ability to address many of the shortcomings of the PC revolution while still giving end users the same familiar and powerful desktop and toolset to which they've grown accustomed. For that reason, it really is a revolution, and educational institutions are taking notice.

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