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DESKTOP VIRTUALIZATION IN K-12 SCHOOLS:

REDUCING COSTS, SAVING TIME AND DELIVERING ANYTIME, ANYWHERE ACCESS FOR STUDENTS AND STAFF

INTRODUCTION

Rick Schliemann is passionate about virtualization — and rightfully so. Through the use of thin client computing and desktop virtualization, the nearly 10-year veteran of Babylon School District in New York and self-proclaimed "computer dude" has managed to transform the district's IT department by lowering the cost and extending the life of hardware; reducing unnecessary work for IT staff and providing students and staff with the most up-to-date programs and applications in minutes. By all accounts, Schliemann has converted the district's technology department into a model of sustainability.

Sustainability is an important word for Schliemann. For years — like many school districts across the country — Babylon had to contend with a constrained technology budget, relying on increases in public funding to get things done. Short-staffed and with desktops that were quickly becoming dinosaurs, Schliemann fondly recalls beginning the technology transformation by incrementally "sneaking in" thin clients — or terminals stripped of software and devoid of data storage that rely on servers to deliver applications.

"I sort of snuck it under the radar," he says of his replacing conventional desktops with thin client terminals.

The thin clients, with their small price tag and lower total cost of ownership, saved the district much-needed money — but there were a few problems. Teachers were familiar with their home computers, and tried to bring that "home computer mentality" into the enterprise. The thin clients alone didn't deliver.

Schliemann wanted to move to the next step with desktop virtualization. Initially, district leaders were ambivalent about virtualization; they didn't understand it. But Schliemann's use of the thin clients paid off — once he explained that the school had essentially been utilizing the virtualization concept with servers on the backend for years, Schliemann was able to get the decision-makers' buy-in. And that's when the true benefits began to emerge.

Throughout this paper, we'll explore the numerous benefits Babylon School District has achieved through the use of desktop virtualization. The aim of this paper is to show how desktop virtualization can positively position educational institutions like Babylon for the future, enabling them to reduce expenses through hard dollar savings and time efficiencies while delivering the experience that students, faculty and staff need and desire. Through the experiences of Babylon, as well as Manchester Essex Regional School District in Massachusetts and Rockford Public Schools in Michigan, we'll paint a picture of how desktop virtualization can revolutionize education's approach to delivering technology — an approach schools can actually afford.

SOMETHING OLD IS NEW AGAIN

Before we explore the benefits desktop virtualization can bring, it's important to have a firm grasp on the actual technology itself. Virtualization is fraught with misunderstanding. Because of this — as in Rick Schliemann's case — it can be difficult to receive implementation buy-in from district leaders and the public. In order to see where technology is headed, it's important to look at where it has been. In doing this, it becomes clear that the technology behind virtualization isn't really new at all.

Fifty to sixty years ago computers were centralized because processing power was limited and expensive. That meant

that every computation cycle had to be fully utilized to make economic sense. Back then, if someone wanted to use a computer he or she had to have the specific project vetted. Decisions on who had access and for how much time were made depending on whether the project was critical and how much computer time was available. Once determined, computer access to the mainframe was scheduled. With more people wanting access than the mainframe computer could accommodate, access was severely limited and only key personnel could benefit from computing.

In the 80s we saw a shift as the personal computer enabled every individual access to computing. The cost of computer processing power was drastically reduced and computational resources were placed in the hands of individuals. Local area networks evolved to tie those computers together in a way that allowed the sharing of resources — first within a building and later with computers around the world via the Internet. This decentralized approach to computing has been the norm for business and education for over two decades as the mainframe has diminished in importance.

We are at the dawn of a new age in computing. We can now leverage the best of the two previous eras and create a more effective desktop computing model. The virtualized desktop takes the efficiencies offered through a centralized processing environment and merges it with the flexibility and easy access of a PC. Desktop virtualization separates software from the hardware that provides it, putting the focus on what is being delivered, making the user unconcerned about how it is being delivered or from where it is coming.

THE VALUE OF VIRTUALIZATION IN EDUCATION

Like Babylon, school districts across the country must con-tinually operate in an environment of constrained budgets, where resources are scarce and where there never seems to be enough time to accomplish what needs to be done. The education scene continues to become increasingly complex — students and staff are armed with smart phones, laptops and other portable devices — and this complexity puts more pressure on IT staff as they attempt to provide schools with

the infrastructure of a 21st-century learning environment. Security risks are increasing and it's critical that IT staff ensure the safety of sensitive student records.

These are a few of the most challenging problems educational leaders face today; let's take a look at the benefits virtualization can offer.

UNDERSTANDING THE LANGUAGE:

Desktop Virtualization — A server-centric computing model that separates a personal computer desktop environment from a physical machine by decoupling the underlying operating system, applications and dat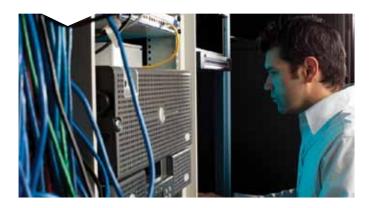a from the end user's device and by moving these components into the data center where they can be secured and centrally managed. This approach allows users to access their "virtual desktop" with a full PC experience across devices and locations.

Thin Client — Computer terminals stripped of software and devoid of data storage that rely on servers to deliver applications.

Clone — A copy of the virtual machine made from a snapshot of the parent image that can be quickly provisioned, refreshed and reloaded, and that can be used to reduce the overall storage required for each virtual machine.

COST SAVINGS, COST AVOIDANCE AND GETTING MORE OUT OF WHAT YOU ALREADY OWN

Hardware costs have traditionally taken a significant chunk out of an IT shop's budget, with traditional machines needing to be replaced every three to four years. But the real expense has been in maintaining these machines. The most substantial costs of providing traditional desktops for staff and students is not in the actual hardware purchase, but instead in keeping that hardware running smoothly until it reaches end of life. Research shows that for every dollar spent on hardware, an organization will spend three dollars on troubleshooting and patching.

Desktop virtualization allows districts to utilize lower-cost thin clients that can be purchased for half the cost of a traditional PC. These bare bones machines not only consume less energy and require less maintenance, they also have a longer refresh cycle — a thin client can last between five to seven years or more.

Manchester Essex Regional School District in Massachusetts has doubled its computer fleet without increasing its budget, deploying over 328 thin clients for student and staff use. While the amount of hardware increased, the IT support needed to maintain this hardware decreased because of the flexibility a virtual environment can provide. Stephen Kwiatek, the district's network administrator, says that if a user experiences a hardware problem, he or she can log off of that terminal and log into the same virtual desktop on another device. According to Kwiatek, students and teachers have close to 100 percent uptime.

Schliemann marvels at the agility of the virtual environment. "With (desktop) virtualization, you can have an old machine that is running slow and is out of warranty," he says. "I can take that machine and pull the whole configuration into the virtual world and make it software and server agnostic. I can connect this virtual machine to a terminal, and now this system can stay for an eternity." By converting existing physical desktops to virtual desktops, Schliemann has been able to increase productivity on machines the district already owns. Schliemann says desktop virtualization has not only increased hard dollar savings, but has cut down on unnecessary work associated with maintaining and deploying systems by about 50 to 75 percent.

EASIER DEPLOYMENTS, FASTER UPGRADES AND BUILDING DESKTOPS ON DEMAND

For district IT staff, the demand for software installation — particularly in K-12 — can be overwhelming. Students and faculty need and want increasing numbers of applications to enhance the classroom experience — but for IT departments short on staff, this can be a tall order.

The beauty of desktop virtualization is that it allows the IT administrator to manage a diverse range of applications and user data easily from a central location and quickly provision them to users on an as-needed basis. The increased productivity of staff is invaluable to school districts looking to do more with less. Rockford Public Schools in Michigan is able to support 8,000 students, 1,000 employees and 2,500 desktops with only a staff of seven through central management of desktops on a server.

"Virtualization is systems on demand," says Schliemann of Babylon School District. "Recently, I needed to obtain a photo identification system. Normally I would have to put in a purchase order, bring the system in, set up and customize it.

WITH DESKTOP VIRTUALIZATION, DISTRICTS CAN FIND COST SAVINGS THROUGH:

✓ *ABOUT 50% LESS MAINTENANCE COSTS ON HARDWARE*

✓ *LONGER REFRESH CYCLES OF 5-7 YEARS VERSUS 3-5 YEARS WITH TRADITIONAL PCs*

This would take about two weeks. With desktop virtualization, I can have the system up in half an hour. We can deploy a system on demand, customize it and make it unique."

The time efficiencies don't stop at individual systems; Schliemann says he can build an entire 30-seat lab within half an hour — and, through the use of thin clients, at a fraction of the cost it would take to provision 30 traditional desktops. "Scalability is pretty much unlimited and flexibility is paramount," Schliemann says. "You can do things in a virtual environment that you just can't do in a physical environment."

There are other benefits as well — since software is centrally managed, the IT department can provide the applications that are needed for a particular user. Schliemann says when a student or faculty member sits down at a terminal, it is possible that he or she could have 20-50 different systems to choose from, although the department narrows it down to 4 or 5. In more simplified terms, if a student wants to work through Windows XP, it's available. If a student wants Windows 7, that's available, too. The options are nearly limitless, keeping students and faculty up-to-speed, equipped with the right tools — and IT staff in the department focused on the enterprise, not traveling from classroom to classroom installing software on individual computers.

When it is time to update a computer, IT administrators can transparently push out changes to any number of virtual desktops in minutes. IT staff at Manchester Essex at one time updated three or four times a year, but can now easily update computers — using the same number of staff — two times per month.

Before implementing desktop virtualization, the small IT staff at Rockford Public Schools would spend after-business hours and weekends testing new applications on district computers. The virtual machines now allow the staff to test the applications quickly during the day, without interfering with student or faculty work.

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INCREASED SECURITY AND BETTER DISASTER RECOVERY

School districts are the keepers of vast amounts of sensitive data, including student data. When this information is stored at the endpoint, perhaps on a district administrator's laptop, problems can occur. Computers can be inadvertently damaged, causing data loss, or an administrator may become a victim of a malicious computer attack, releasing private student data into cyberspace. Since virtual desktops are centralized in the data center, operating systems, applications and data can be more securely managed. No sensitive district data is — or needs to be — stored at the end-point, regardless of whether the user is working on a thin client, mobile device or traditional desktop or laptop.

While virtualization protects schools' most guarded data by storing this sensitive data within the data center, it also reduces the risk of serious damage caused by malicious code, including viruses and worms. When delivering the virtual desktop, school IT employees use a copy — also known as a clone — and retain a clean parent image of the computer. If the clone becomes infected, IT staff can return to the clean parent image and simply make another copy that is free of malicious code, eradicating the problem. The ability to solve the problem quickly — sometimes in as little as 30 minutes — makes anti-virus campaigns a non-issue

But despite popular belief, virtual desktops can provide a familiar and flexible computing environment — and make this available anytime and anywhere.

Rick Schliemann knows all too well how important the user experience can be when trying to turn teachers on to new technology. The district technology manager encountered push back from teachers when he originally implemented thin client technology without desktop virtualization. The users were not satisfied with the thin client's ability to deliver streaming video and concept mapping software. Additionally, Schliemann was unable to accommodate teachers' requests to install applications "on the fly" because the software needed to be specific to the servers on which it was running. This isn't a problem with desktop virtualization — if a teacher requests a new application, Schliemann can have it up and running in minutes. Current desktop virtualization systems also provide capabilities that were once limited to traditional desktops, such as the ability to play rich media content, choose from many different display options, and use locally attached peripherals such as printers or scanners.

Despite the desire to have a familiar interface with which to work, teachers and students are utilizing a more diverse set of technological tools than ever before. Many of these devices are mobile, creating a more 'on-the-go' style of learning that takes place wherever the student happens to be. With virtualization, the customized desktop follows a student wherever he or she may go — from the classroom, to the library, at home … and everywhere in between. Virtualization ensures that a student receives the same experience whether sitting in an on-site computer lab or accessing work on a laptop at a neighborhood coffee shop.

for school leaders. This quick fix reduces headaches for school leaders and IT employees who might have spent hours problem-solving and repairing virus-plagued desktops and who can now be redeployed to higher value work, saving the district time and money.

Virtualization provides another kind of security — the protection of data should a natural disaster or other type of calamity take place. Despite the myriad and impressive benefits Babylon has achieved through desktop virtualization, Schliemann points to disaster recovery as one of virtualization's most crucial advantages. Virtualization allows schools to build systems in "clusters," and house one of the clusters in a different locale — protecting that information should anything happen to destroy the original.

"We are able to clone the data center into another building. If something happened to the data center here, we would have all of the critical systems needed to keep operations going on a daily basis only a quarter of a mile away," Schliemann says.

THE "HOME COMPUTER" MENTALITY, CONSISTENT USER EXPERIENCES AND LEARNING ON THE GO

When trying to make the transition from traditional PCs, schools can receive pushback from users who have become attached to the independence they possess and the ability to download software and applications when needed. There is a sense of familiarity and comfort with a traditional PC and removing that can be unsettling to staff and students.

> **WITH VIRTUALIZATION, THE CUSTOMIZED DESKTOP FOLLOWS A STUDENT WHEREVER HE OR SHE MAY GO — FROM THE CLASSROOM, TO THE LIBRARY, AT HOME … AND EVERYWHERE IN BETWEEN.**

At Manchester Essex, it's not only students who benefit from virtualization's support of mobility. District Network Administrator Stephen Kwiatek says every one of the district's teachers takes advantage of the virtualized environment to log in at home, creating lesson plans or checking e-mail. Virtualization increases teachers' productivity while they are at the school, too. By eliminating the five minutes it used to take to log students on and off computers at the beginning and end of class, the district has increased teaching time by 90 hours per teacher, per school year.

CONCLUSION: MOVING TO A VIRTUAL REALITY

Schliemann says virtualization can be a hard sell to decision-makers and the public because often people don't understand it. Despite the proven ability to do more with less — and do it better — preconceived notions can be hard to overcome. According to one industry survey of over 100 IT managers last year, the top three barriers to desktop virtualization are all human factors: lack of skills and knowledge, internal political issues and a lack of resources. Schliemann advises painting a picture for leaders by initially bringing in virtualization on a small scale, allowing them to see the benefits first-hand.

At Babylon, leaders were able to experience the cost savings of the thin client terminals. In addition, Schliemann initiated a virtual desktop pilot project with one teacher, building a system with her desired applications and deploying it to her within half an hour. Small-scale success can lead to district buy-in for larger implementations across the campus later.

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It's important for all stakeholders, including administrators, IT staff, teachers and students to come together and have a conversation in a common language (i.e., no technological jargon allowed) to discuss the challenges they share — as well as the challenges that are unique to their group alone. They should discuss any potential problems they feel virtualization — or any new use of technology — might cause in performing the tasks of their day-to-day lives and work to solve those problems. In short, stakeholders must come to a common understanding of what is the best solution in moving forward in a modern-day educational institution.

The examples highlighted in this paper are just a few of the large number of school districts across America that are achieving cost efficiencies and improved productivity through virtualization. At a time when education is facing some of its toughest challenges in recent history, Rick Schliemann sees desktop virtualization as a game-changer for education. The technology has positioned his district well for the future.

"We now have a scalable system that can take us into the next 10 to 15 years," Schliemann says. "The key word is sustainability. We are able — with confidence — to keep our head above water now, without any assistance from the public."

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