

W H I T E P A P E R

**Systems Management in Education:
A Best Practice Guide**

By Tim Clark and Kathy Stershic

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Executive Summary

As information technology increasingly drives the educational system, managing an expanding technology base in a perennially budget-constrained environment is a constant challenge. IT managers must corral literally a thousand moving parts, as students employ mobile computers in various authorized and unauthorized ways. New deployments, re-imaging, maintenance and upgrades, and overstretched bandwidth at many IT departments in K-12 or higher education schools are just some of the obstacles. Add high expectations from teachers, administrators and of course parents; short, seasonal purchasing cycles; licensing compliance requirements; and the endless pressure to do more with less, and it's enough to drive any IT manager out the door.

This white paper outlines best practices for systems administration and IT professionals in K-12 schools and higher education environments in managing their IT environments. Based on real-life experiences of IT professionals at school districts and colleges, it outlines a series of best practices for IT professionals from IT professionals who have not only overcome these varied obstacles but have thrived, using IT as an enabler of their personal and their students' success.

IT in the Education Landscape

"We had lots of computers and no idea of how many we exactly had or what's on them."

***—Rich Battin, IT Support Services,
Academy School District, Colorado Springs***

Information technology has become an integral part of the modern education system, from kindergarten to higher education. Faculty and students increasingly rely on technology for classroom instruction, homework and administrative operations, but ever-tightening budgets don't keep pace with the requirements of managing large, heterogeneous and often mobile environments.

IT departments in educational institutions are grossly understaffed and underfunded. "A recent national survey shows that school districts average about one technician for every 400 computers, compared to one technician for every 100 computers in the corporate environment," says Doug Prouty of the Contra Costa County (Calif.) Office of Education.¹

IT administrators in educational institutions continually balance limited budgets and staffs against the need for secure, current technology. Further, there are constituencies with differing needs—students, faculty, administrators and parents. High expectations mean these groups often compete and sometimes conflict. For most, system downtime is not an option.

"We need to reach out to their [teachers'] computers, usually while they are sleeping. Often teachers are coaching or driving buses after the school day. We have retrained students and faculty to leave computers on overnight," said Michael Williams, IT manager at Dexter & Southfield Schools, independent K-12 day schools in Brookline, Mass. Williams and a colleague manage 500 desktop and laptop computers, a dozen servers and three computer-based learning labs.

As at other schools, Dexter-Southfield teachers and parents consider any lost learning time unacceptable, and neither students nor teachers have free time during the school

day for IT to handle computer issues. That challenges Williams' goal to virtually eliminate student and teacher downtime due to computer issues.

In many education environments, IT staff also must move around geographically dispersed campuses to troubleshoot problems. For example, Academy School District's IT department in Colorado Springs, Colo., supports 7,000-plus computers in 29 schools.

Further compounding these challenges, school calendars affect the cycle for systems management processes. New implementations should be done over summer vacation, but technology purchases usually come right before or shortly after the July 1 fiscal year begins. This leaves a tight window for upgrading, imaging, testing and repairing potentially hundreds of systems before students return in late August. At Dexter-Southfield, for example, the IT team has only 45 days in its spring budget cycle to evaluate, select, get spending approval and prepare to deploy any new IT solution.

The Human Factor

In many education environments, IT exercises little control over student computers but is responsible to keep them running. Students in higher education generally own their own computers, and increasingly secondary students do too, with the growing popularity of "One-to-One" programs, in which secondary students are given a laptop for the school year (or longer).

That creates security problems, particularly when IT doesn't know what's been added or changed on student machines. Students readily download the latest, 'coolest' freeware. Peer-to-peer networking sites such as LimeWire are popular for file sharing. Social networking sites are havens for downloadable content from literally anywhere. Computer labs create special problems. Students may use lab computers to visit unsavory Web sites and download dangerous or corrupted files. Students may alter prescribed system settings to enable unsanctioned laptop uses. These actions can bring down individual computers or even the entire school network.

Curtailing these behaviors on school-owned assets is a huge challenge—for student-owned PCs, it's virtually impossible. Faced with a significant increase in network instability because of spyware and malware, Dexter-Southfield's IT team first tried locking down all student PCs. But it abandoned that approach when it found that adding new printers or other approved software became prohibitively time-consuming for IT.

Specific software applications often are needed by students in specific classes. At Battle Ground Academy, a K-12 institution in Franklin, Tenn., biology students need a specific curriculum-based application for the class, creating a complex software deployment project for IT. At the U.S. Merchant Marine Academy in Kings Point, NY, engineering classes require IT to install a specific design application for students enrolled in the class—and then remove that program when the term ends.

Unfortunately, IT's many customers—school administrators, students, teachers, and parents—tend to focus on hardware and software and discount the need for systems management. That leaves IT departments feeling unappreciated and short-handed.

Diverse Technology Challenges

At the typical educational institution, IT resources are so stretched that any major change to operations or infrastructure pressures IT. Battle Ground Academy, in Franklin Tennessee, for instance, implemented a “One-to-One” student computing program. Battle Ground’s two-person IT staff had to configure 300 new computers in 30-45 days in the summer, on top of its existing workload.

IT teams are often asked to manage new deployments, upgrades or unexpected maintenance procedures without money for additional help. Many times as a result, systems maintenance suffers, application and operating system patching gets neglected, and security vulnerabilities arise. Even the core IT work of routine imaging and re-imaging computers typically gets done only twice annually.

In addition, IT frequently manages a widely diverse set of systems. For instance, the 125-person IT team at Portland Community College in Portland, Ore., must manage 6,000 PCs and dozens of servers across multiple locations with a host of software applications on them. Their environment includes Novell Netware, Microsoft Windows on Dell PCs, Apple Macs and Windows, HP-UX and Linux-based servers hosting ERP, financial and student enrollment applications built on Oracle database technology. Mixed operating systems environments, especially Windows and Macintosh computers, are common in education. Sometimes, as at Battle Ground Academy in Tennessee, the inventory included white-box desktops built by a prior IT regime.

One-to-One Pitfalls

“One-to-one” programs, in which secondary students are given laptop computers for the school year (and sometimes longer), are increasingly popular. But they also stress overtaxed IT departments:

- A large number of new PCs arrive as the school year begins. They must be imaged, delivered to students and maintained.
- Students control the machines so IT cannot govern student-owned assets.

Such diversity makes systems management very difficult at best. But uncontrolled environments can also carry more serious consequences. For instance, the IT team in a small California high school district took 48 hours to discover that a teacher’s unauthorized Mac had caused a two-day network outage.

Amid these problems, IT professionals at educational institutions have learned from experience the best ways to tackle problems specific to their domain and share them as follows:

Top 20 Best Practices For IT Professionals in Education

Automate, automate, automate: The most productive, cost-effective and time-saving steps involve automating IT processes. For example:

- Automate imaging and re-imaging of machines on the school's optimal schedule.
- Automate software updates and patches on all machines.
- Automate inventory of machines on the network.
- Automate anything else that can be automated.

Leverage existing tools: Instead of ripping and replacing older technology, evaluate new solutions based on how they work with what's already in-house. Seek the capability to target software builds based on the role of a computer user to enable better management of software licenses, keeping licensing fees down.

Don't be a road warrior: Insist on remote management capabilities from a central location. Otherwise IT staffers waste too much time cruising the hallways (or the roadways) to access the physical machines they manage.

Manage multiple OSes: Standardizing on a single operating system—whether Windows, Mac or Linux— is simply not an option for many educational institutions. With the prevalence of mixed Windows-Macintosh environments and the rise in popularity of alternative OSes such as Ubuntu, IT administrators should prepare for the multiple-OS inevitability if they are not already there.

Hold down headcount: Opt for technology, not more bodies to address systems management issues. As a rule of thumb, a remote management solution (including training) should cost less than a single full-time equivalent (FTE) employee.

Know thy inventory: Too many educational institutions have no idea what's on their network. Look for auto-discovery capabilities that can quickly catalog what's connected to a network. If IT doesn't know what's on the network, how can it manage those devices?

Keep dirt off the network: Automatically check every machine as it signs onto the network to be sure it's not infected. A dirty laptop that picks up a virus from a wireless WiFi hot spot can infect other equipment and disrupt network functions.

Seek self-service: Create a library of approved software downloads, device drivers and other software where users can download for themselves new programs that carry the IT-approved label.

Avoid solutions that require excessive training:

Don't let a systems management solution become another management headache. Solutions that require lengthy training will have a higher total cost of ownership (TCO).

Demand solutions proven in education: In evaluating technologies, leading IT departments should demand flexible solutions that can adapt to the unique situation of each school system. In rare cases, schools may find it's better to adjust school processes to accommodate the technology—when the business processes embedded in the software offer an improvement over existing practice.

"The benefit of an appliance is that there is a limited amount of system administration required. Backups and release upgrades are fully automated."

*--Michael Heuer,
Technology Support Manager,
Portland Community College*

Create a plan to replace old hardware and software: A systematic plan to refresh outdated technology can make it easier for IT managers to win support of those who

hold school purse strings. Also, technology planning is federally mandated for local school agencies seeking technology funding from federal programs.

Buy big: Because annual budgets in education are so uncertain, the Consortium for School Networking² recommends that schools get the most their money can buy in purchasing computers. Buy the most memory and processing power your budget can bear, since the computers may have to last for years beyond their expected life.

Reuse the old: Repurpose old equipment for tasks such as word-processing, dumb terminals for library inventory and catalogs or dedicated machines for a single application. However, older machines may require more maintenance and support. If it gets out of hand, turn them off.

Seek discounts: Most vendors offer deep discounts for educational institutions. Ask for every purchase or service engagement.

Look that gift computer in the mouth: Relying on gifts of old computers often increases labor costs. If the passed-along computers don't meet the district's technology standards, they'll be expensive and difficult to support. If they're old enough to become maintenance problems, direct labor and indirect labor costs will rise.³

Let teachers teach: No matter how tempting, don't make teachers manage systems. The prospect of using computer-savvy teachers to troubleshoot is attractive, but it distracts them from their day job—teaching.

Help teachers teach (with computers): There's a vast library of research on how to help teachers integrate technology in their lesson plans. Consult the literature⁴ (footnote), and then work with willing academics to implement programs aimed to create sharable lesson plans and boost teaching based on computers and the Internet.

Counter computer phobia: Some faculty feel squeamish about using computers. Use tech-savvy faculty members to mentor the squeamish on specific computing tasks and direct them to computing resources they can use. One effective format is study groups, a small group of teachers working collaboratively over the course of several weeks or months on an academic issue of common concern.

Consider TCO: Systems management "solutions" typically include only software but still require separate purchases of hardware or additional software pre-requisites, consulting, weeks of training, time-consuming maintenance and administration, not to mention months to deploy these complex systems. Ask what's included in the "solution."

Look beyond the school environment: Share among K-12 schools or with institutions of higher education. Look beyond educational institutions for IT best practices in other sectors (local government, industry, nonprofits).

Options for Systems Management

School systems have a variety of choices when looking to tackle system administration needs. These choices impose trade-offs and other challenges that IT managers must weigh against benefits.

Solution	Benefits vs. Challenges
Software Packages	The right software can do the job but it's costly and complex. Hiring consultants to configure and enhance software boosts costs. Software can also require lengthy training, dedicated hardware and often a dedicated person to maintain it.
Education-specific point software tools	Point tools solve some problems but exacerbate others. One popular package keeps lab computers clean but turns routine updates on those PCs into big projects.
Free tools	Some free tools from well-known companies such as Microsoft solve some problems, but they pose similar issues to the point solutions. Freeware applications also may service well for specific problems, but their longevity and support are always in question. It's tough to find free tools to manage both Macs and PCs.
Add headcount	Here's the easiest solution – except for the budget!
Students	Many students know more about computers than their teachers. Some schools tap that expertise, but it takes a well-organized program for this approach to work. ⁵
Volunteer labor	Well-meaning parents or other volunteers can be useful for specific problems, but it's not a great long-term solution. Is a volunteer solution reliable? Will s/he follow directions and meet deadlines? What about the next time – where will volunteers come from?

KACE Addresses Education Technology Challenges

“Some of the other tools out there say they automate a bunch, but you still have a lot to learn to get there. KBOX actually does it out of the box.” — Michael Williams, IT Manager, Dexter and Southfield Schools

KACE milestones and metrics in education

Dexter and Southfield Schools

- Photoshop installation drops from 4 hours to just minutes per machine.
- Saved 500 person-hours in one semester on Internet Explorer installs.
- Eliminated lost learning time.

Battle Ground Academy

- Avoided hiring 2-3 new IT staff
- Saves two days/week for IT operations
- IT staff deploys 100 machines in the time it previously took to deploy one.

Holmesdale Technology College

- Deploys 1.2 megabyte application to 1,000 machines in less than three minutes.
- Maintains accurate inventory, warranty data without manual tasks.
- Eliminates student downtime
- Installs printers faster with scripting.

Portland Community College

- Avoided hiring additional IT staff
- Enables better license management and compliance without staff involvement. Sends reports to major ISVs to verify license compliance from.
- Builds applications on top of KBOX.
- Saves substantial time with remote installation of daily fixes.

The KACE Family of Systems Management Appliances offers a simple but comprehensive solution to challenges facing today's education IT teams.

- **Fast, easy deployment:** Unlike traditional desktop management software, KBOX deploys in one day. IT managers simply plug the appliance into the network, give it an IP address, and begin server, asset and desktop software management. Computer inventory, software distribution, patch management, compliance reporting and enforced security settings are available immediately.
- **Minimal training:** KBOX takes only a few hours of training, and online training is standard. The KBOX Web-based, intuitive console allows for advanced administration tasks to be effectively handled by junior administrators. Managers gain more time for strategic initiatives.
- **Cost-effective:** KBOX appliances have the lowest total cost compared to software alternatives. Because KBOX is a hardened and self-healing appliance, it has no hardware or software prerequisites, no professional service fees and no hidden costs.
- **Automated, centralized remote management:** KBOX enables automated installations customized to a user's needs and managed from a central location. KBOX auto-discovers hardware and software and captures detailed configuration inventory. Software license costs are reduced by only provisioning software licenses “as needed.”

- **Preserves existing investment:** KBOX can run in standalone mode or easily configured to integrate with existing LAN services, such as LDAP, Active Directory or SAN.
- **Flexible:** KBOX enables self-service user portals through a customizable user service center. This means different users can get at different information or software applications that they specifically need—when they need it. Parents can even access student grades at Academy School District 20 in Colorado Springs.

“We went out with an open mind and we came back with KACE.”

— ***Gareth Waghorn, Information Communication Technology
Strategy Manager, Holmesdale Technology College***

Conclusion

IT professionals in educational institutions, K-12 and higher education alike, face difficult problems in managing ever-growing networks of computers with limited resources. IT teams must keep systems running, meet compliance requirements, keep PCs in service for learning and protect against malware—even on student-owned computers IT doesn't control. Administrators and governing boards, focused on hardware and software, often shortchange the need for systems management.

IT professionals can learn Best Practices from others in similar educational institutions in the areas of procuring hardware and software, helping faculty with resources for learning, and prioritizing their jobs. As with any job, finding the right, easy-to-use tools is critical. Point system management solutions too often resolve some issues and create others. Enterprise software packages, rarely cheap, require big commitments in training for staff that is already stretched thin.

The KACE Family of Systems Management Appliances delivers comprehensive systems management capabilities with ease of use at a fraction of the price of software packages. The appliance form factor means easy installation and reduces maintenance of the device.

End Notes

¹ "Using Students as Campus Technical Support," Contra Costa County (Calif.) Office of Education, Doug Prouty, undated (<http://www.thesnorkel.org/PDF/StudentsTechnicalSupport.pdf>).

²TCO Checklist: Replacement Costs—Computers Don't Last Forever, Consortium on School Networking (CoSN) (1999). http://classroomtco.cosn.org/checklist/replacement_costs.html For other material from the Gartner/COSN K-12 TCO Project, Taking TCO to the Classroom, see <http://classroomtco.cosn.org/index.html>. A useful tool from that Gartner-CoSN collaboration, A Report and Estimating Tool for K-12 School Districts Why Total Cost of Ownership (TCO) Matters (April 2003) is available at https://k12tco.gartner.com/home/homepagepromo/files/TCO_Overview.pdf

³School Business Affairs magazine, Association of School Business Managers, (November 2006).

⁴ Search engines are less than perfect in identifying content about computers in education. However, many of the sites listed include Resources or Links. Sources for research on using computers in education include:

- **KnowledgeLoom** (www.knowledgeloom.org) Research and stories on promising practices, resources.
- **North Central Regional Educational Laboratory** (<http://www.ncrel.org/tech/>) Resources from consultancy Learning Point Associates.

Resources specifically for technical professionals in schools:

- **TechSets** (<http://www.techsets.org/about/about.aspx>): Focused on providing technical professionals in California schools improved access to training, support and other resources.
- **The Snorkel**: (www.thesnorkel.org): This support forum for K-12 technology leaders includes how-to pieces, web resources, current issues and articles, and tools for both PC and Macintosh.

⁵ Outside resources for utilizing students in education include:

- **Generation Yes** (<http://www.genyes.org/>) GenYES students help teachers use technology in classrooms, supporting effective technology integration in schools.
- **SwatWeb** (Students Working to Advance Technology): <http://swatweb.net/>: SWAT teams support teachers and students with technology needs in their schools and communities.
- **Create for MS** (Challenging Regional Educations to Advance Technology in Education). Mississippi project designed to better prepare students and teachers for life in the 21st century through seamless integration of technology into instruction.



Corporate Background

KACE™ is the leading systems management appliance company. The award-winning KBOX™ family of appliances delivers easy-to-use, comprehensive systems management capabilities. KACE customers usually install in one day and enjoy the lowest total cost compared to software alternatives.

KACE is headquartered in Mountain View, California. To learn more about KACE and its product offerings, please visit <http://www.kace.com> or call 1-888-MGMT-DONE.

Corporate Headquarters

1616 North Shoreline Boulevard
Mountain View, California 94043
877)MGMT-DONE

650-316-1050 International
(650) 649-1806 fax

Email & Web

Other Information: info@kace.com

On the Web: <http://www.kace.com>

Support: support@kace.com

About the Authors

Tim Clark is a senior analyst and partner at The FactPoint Group in Los Altos, California. Kathy Stershic is a senior analyst at FactPoint. Clark's specialties include network security, appliances, Software as a Service, data center management software, open source and virtualization. He was previously a senior analyst at Jupiter Research and VP/senior analyst at Net Market Makers. Previously, Tim was a journalist for 24 years. Kathy Stershic is a writer and veteran marketing professional in the Silicon Valley area.

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