Monitoring Educational Networks: Ensuring Benefits, Containing Costs

nterMapper

Network Monitoring Software
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Like their corporate counterparts, network managers in school districts and on educational campuses are being pressed to implement the latest, fastest, most reliable network technologies. Students and teachers rely on the Internet for teaching tools and research. Administrators require network access to student records, financial information, and state and federal data repositories. Parents want to be sure that their kids graduate knowing how to use technology to forward their future educational efforts or career aspirations.

Unlike their corporate counterparts, educational network administrators know that their budgets will always be tight; that staffing levels will never be high and that they can't argue that improved network infrastructures will pay for themselves by increasing revenue. Rather, they must look for technology that truly forwards educational goals and increases educational efficiency all while fitting into the budget structure.

Educational resources including the internet, email, and distance learning rely on easy, reliable network access and operations to be beneficial. Technology infrastructures like wireless networks and voice over IP (VoIP) and tools such as laptops, handhelds, and cell phones are needed to expand access to and use of educational resources.

Taking advantage of new technology is typically costly. Front-end costs include evaluation and purchase. Back-end costs include implementation and maintenance. Front-end costs are easier to quantify and budget. Pricing and educational discount opportunities are known values. Evaluation time can be easily estimated. Back-end costs can pose an unsettling mystery. What is the cost of a slow network – either in lost educational opportunity or endless troubleshooting? What is the cost of multiple support calls for the same problem? What is the cost of missed distance learning classes?

This whitepaper reviews current trends in educational technology, costs and benefits, and the use of network monitoring tools as a way to ensure benefits and hold down costs.

Current Trends

According to Jeanne Hayes in "Educational Technology Trends: Back to Business" (Scholastic, May 21, 2006), "the new educational mantra is drive improved administrative productivity and reduce Total Cost of Ownership (TCO) by obtaining a good return on investment with such technologies as videoconferencing, web conferencing, and other voice over IP to reduce telephone costs." Of course, those technologies, and others, require network access and reliable connectivity.

Internet access

Use of the internet in educational settings is certainly not a new trend. In 1999, the US Department of Education and Institute for Education Sciences reported that "99 percent of full-time regular public school teachers reported they had access to computers or the Internet somewhere in their schools."

However, the number of high quality access points to the internet is rapidly growing. While in 1999 teachers had access to the internet "somewhere in the school," they are now more likely to enjoy access from the classroom, and the library, and the faculty room, and administrative offices. Schools are finding ways to share high-quality equipment on school campuses. Again, according to Hayes, "COWS (computers on wheels) are a cost-effective and instructionally effective way to deliver laptops to classrooms for 'just in time' computing. The typical district of 1,000 students has three traveling computer cars and plans to purchase one more in the 2004-2005 school year."

As access to the internet moves to ubiquity – all students, all teachers, and all administrators have access throughout the school day – demand for reliable network connectivity will continue to increase.

Email

Like the Internet, email can now be considered "old" technology. But it's only recently become the defacto method for administrators and teachers to communicate with parents, students, alumni, and one another. Email transmissions keep school communities informed of everything from field trips to board meetings, sporting events to test dates.

Schools have invested in email systems with school wide access. Administrative staffs and teachers invest time in list maintenance and message creation and transmission. When email fails, classroom and extracurricular events are in placed in jeopardy. Meanwhile, parents are learning that the easiest way to contact teachers and coaches and administrators is via email – a communication conduit that doesn't need to fit already complicated schedules.

The prevalent use of email has made network reliability, or lack thereof, extremely noticeable.

Distance learning

Distance learning provides numerous opportunities to share teaching resources across a campus, district, or wide geographic area. Many colleges and universities open classes to people who can't commute long distances and school districts are exposing students in rural settings to information their own teaching staff might lack.

Distance learning requires video conferencing capabilities. Those include streaming video and ISDN, ATM, or IP services. Voice over IP videoconferencing requires a computer that is specifically configured. More and more, schools are relying on the

H.323 standard which outlines the components, protocols, and procedures for implementing multi-media communications.

Like physical classes, distance learning sessions are carefully scheduled to bring together students and teachers from many locations. Slow or down network connections might deprive students of clear reception or class time, which devalues distance learning technology.

Wireless

Given the tendency for schools to move classrooms and reconfigure space, wireless networks make great economic sense. Money doesn't have to be allocated to new wiring and drilling and the placement of network outlets doesn't dictate the place where learning occurs.

Some schools or districts use a wireless service provider (WISP) to access wireless connections. Many districts and campuses are installing their own fixed wireless networks in anticipation of rapid future expansion. Both strategies represent significant investments and, once in place, earn quick converts who want constant access. Teachers tote wireless devices outdoors for field learning. Students complete assignments on the comfort of the school lawn.

Voice over IP (VoIP)

Many network administrators are looking forward to the educational and financial promises of VoIP. As discussed above, VoIP is an important component for distance learning. It's also a way to add cell phones and other communications equipment to the educational toolkit.

Curtis Smith, Director of Technology and IS at Nevada Joint High School District in Grass Valley, California points out that VoIP could save schools a bundle on phone charges. As Smith points out, schools are required to keep a phone in every classroom for security purposes. Those phones are supported with business lines. "Right now we're spending money on both business and data lines. With VoIP, we could put cell phones in each class and get rid of the business line."

Of course, as reliance on wireless networks and IP expands to mandated devices and services, the pressure on network reliability increases.

Controlling Costs – The Role of Network Monitoring

The technologies listed above are implemented with benefits in mind - but they come with many associated costs. Certainly the initial price tag is the first hurdle to cross and budget. After that, it's difficult for tax and tuition payers to routinely absorb unforeseen costs for technology that doesn't seem to be delivering new educational benefit. Wireless networks that suffer frequent outages or internet connectivity that comes with a high tech

support cost might not seem worth the expense. The challenge for network managers is to deliver the benefits while keeping costs in check and projects on budget.

Proactive network management is key to ensuring cost-effective, network-dependent, technology deployments. Noticing and fixing network problems before slowdowns and stoppages occur, before end-users notice, and before classroom activity is postponed saves time, money, and staff resources.

- There are fewer support desk calls.
- There is less down-time and lost productivity (classes don't have to be constantly rescheduled, student work can keep pace with the syllabus, notifications allow meetings to happen on time, etc.).
- Support staff spends bits of time tuning network elements rather than days and weeks chasing critical issues and replacing equipment.

How is this accomplished?

The only efficient way to keep tabs on network elements and connections is through automated network monitoring. Network monitoring tools use pings or SNMP probes to check the presence of a device (is it working) and collect identification (name, port, type, DNS name, addresses) and performance information (utilization, transmit and receive traffic counts, uptime, packet loss, spanning tree information) that are critical for regular maintenance and problem diagnosis.

Not all network monitoring tools are equal. The greatest benefit comes from those that include location data – Exactly where is the server located? Which school building? Which closet? – along with status and trend information. This is much more efficient than checking on routers one by one or polling server by server. Mapped, real-time, network-wide data enables network technicians to find and fix problems quickly.

Some network teams keep their network monitoring tool visible all the time so that problems can be noted immediately. More often, network technicians who are rarely in one location all day, rely on alerts to keep them informed of network conditions. Alerts might trigger a page, an email that can be received in a remote location. Alerts often trigger sounds inside the network operations center or on a support staff laptop.

The combination of a network-wide view presented on a map with easily accessible underlying data makes it possible to proactively manage networks and realize the benefits of network-dependent technologies.

- High-traffic from a student record server triggers an alert at midnight. A technician is paged and, alarmed that the server is so busy sending out privileged data during off-hours, shuts down the process.
- An ISP server appears red on the network map. The school's network support team notifies the ISP who restores the server before the school day begins.

- The network team takes a network health check one hour before a distance learning class begins. If there's trouble, it is fixed in time. If it can't be fixed quickly, students and teachers can be notified and class time rescheduled.
- A technician notes that the email server is sending out the school-wide message about the week's events is transmitting very slowly. He notifies the administrator who notes a problem with the email list. The process is shut down before it affects the network.

InterMapper

InterMapper network monitoring and mapping software is developed by Dartware LLC. Dartware's founders developed InterMapper while on the network management staff at Dartmouth College.

InterMapper was designed to provide a network big picture and quickly answer these basic, network management and maintenance questions:

- Is there a problem with the network?
- What element(s) or connection(s) are responsible?
- Where are it located?
- What is its status?
- What it its performance trends?

Armed with that data, technicians are able to deliver reliable network operations to increasingly demanding end-user communities.

With backgrounds in educational technology, InterMapper developers also realize the importance of return on investment. Hard won funding must show quick reward. InterMapper is developed for ease of use which reduces the time and money needed for evaluation, implementation, and training. And, as InterMapper requires no regular human involvement, it adds no staff overhead.

InterMapper's feature set includes:

- Color-coded network maps that display all network devices, connections, and status.
- Underlying status and trend reports for all mapped elements and connections.
- Default and configurable alerts (sound, email, pager, etc.) that are triggered by set network conditions (undetected device, high/low traffic levels, slow response times, etc.).
- Packaged and custom probes (using pings, SNMP, other protocols) that automatically and on schedule detect devices and collect data

InterMapper RemoteAccess allows network teams to access InterMapper maps and reports from any connected, remote location. Relying on its own interface rather than a

browser, InterMapper RemoteAccess always presents real-time data without requiring page refreshed. Permissions authorize map and data access.

InterMapper Wireless Probe Pack extends the main feature set to wireless equipment including backhauls, access points, and radios from leading vendors.

InterMapper in Schools

"InterMapper is like having another full-time employee I don't have to pay."

Rick Hillman Mercer County Special Services District

Educational institutions make up a large portion of InterMapper's user base. These brief case studies highlight InterMapper's is currently contributing to proactive to network management at several sites.

Mercer County Special Services School District

Rick Hillman

Mercer County Special Services School District serves about 750 students (ages 3-21) through a faculty of 500 and four building campus and a wireless network connects teachers, students, and administrators. Hillman leads a team of 4 that builds, watches, and maintains the network while supporting end-users.

"We have InterMapper maps for each wireless point and watch for high traffic and to see if our Apple Airports are up or down," explains Hillman. "InterMapper allows us to be proactive. We know where the problem is before we go running."

One staff member supports 800 end-user computers. He uses InterMapper to see which computers are "on" the network which helps speed support call resolution. Over 30 servers are monitored 24 hours a day and issue alerts when certain conditions are present.

Hillman and his team see more work for InterMapper in the future. "We're looking into VoIP for the cell phones we support and are also looking at putting closed circuit cameras on the wireless network. InterMapper will help us keep track of that technology too."

Nevada Joint Union High School District

Jeanine Atkins, Curtis Smith

Curtis Smith is the Director of Technology and Information Services for the Nevada Joint Union High School District. Along with Jeanine Atkins, Network Coordinator, and seven other team members, he's responsible for internet service provision to 28 county schools and the "whole IT shebang" for the 9 schools in his district – desktop, network, internet service.

The district serves 5,000 students in 9 schools. Wireless networking is available at one school now and two more schools will be wireless in the near future. Meanwhile, Curtis anticipates that VoIP will be in use within the next two years and distance learning is on the horizon.

"All teachers have laptops right now and our goal is to get more technology out to the kids," says Smith. With such significant reliance on their network, Curtis and Atkins use InterMapper to stay ahead of support calls. Smith reports, "We know what's going on before our customers do." As more and more students come on line, he worries about the chance for increases in network problems. "Students can be very creative." He'll rely on InterMapper's alerting capabilities to keep him appraised of performance issues or high-traffic conditions that might indicate hacking or security breaches.

Smith is also hoping that InterMapper will help the district save money on phone costs. California law requires a phone to be placed in every classroom. Right now, that requirement is met with regular business lines. "But I'd like to eventually use only data lines for telephone and network services," says Smith. "InterMapper could tell us which of the required classroom phones are off-line."

NewNet 66

Mike Pennell

NewNet 66 is a non-profit, inter-local consortium that provides networking services to schools across the sate of Oklahoma. "Inter-local consortium means that we play by the same rules as the schools we serve," explains Mike Pennell, NewNet 66 Executive Director. Governed by a board that represents member districts, NewNet 66 provides distance learning, internet connectivity, distance learning bandwidth, content filtering, network design and consulting, and network monitoring to 77 school districts that serve 50,000 students and include 4,900 staff members.

Pennell watches over his statewide network responsibilities from an operations center in Claremont. Installed on a high-end Mac, InterMapper watches telco connections, internet connections, and managed switches. "We monitor switches right down to the port," says Pennell.

"InterMapper checks devices every 60 seconds. If there's a problem that requires an alert, InterMapper waits 60 seconds to make sure the problem persists and then alerts us. That means we know about a problem 2 minutes or so after InterMapper finds it. We call the school right away and, in many cases, the school doesn't even know that a server is down. The home run is that we're proactive."

According to Pennell, giving schools early warning on problems is one of the biggest services NewNet 66 provides. The network is almost always tuned or back up in time to preserve lesson plans and keep classes on schedule.

Broward County

Paul Del Prete, JDL network engineer (information reported in eSchool News on-line)

JDL Technologies has helped Florida's Broward County School District build a state-of the-art technology infrastructure that is paying education dividends. Students get extra help or instruction through chat and email services or take an additional year of foreign language through online offerings. A virtual high school serves 200 students, mostly athletes or others who need access to online courses that accommodate complicated schedules. Broward County now exceeds the state averages in reading and math and the McFatter Technical High School was named one of the top 30 high schools in the nation by the Council of the Great City Schools.

InterMapper helps the 3-member JDL team support all the connections that the Broward County district community counts on. Every few seconds, InterMapper sends a ping to all devices on the network. If the device is up and running, it appears green on a map. If the device is down, it appears red. Orange and yellow point out conditions that might indicate a problem.

Traffic is also monitored closely. Mapped, color-coded connections show where traffic is at 50, 75, or 90 percent of capacity. "You could tap into each router individually to get this information, but the software provides it all at once," says Paul Del Prete, Senior Network Engineer from JDL.

InterMapper feeds daily network outage reports that are given to network technicians every morning. Those reports enable the staff to maintain routers, switches, and other equipment in the district's 244 schools as soon as they get to work – usually before they impact classroom productivity.

About Dartware – www.dartware.com

Dartware, LLC develops the InterMapper® family of network monitoring software. InterMapper earns quick return on investment by proactively alerting administrators to potential slow-downs, crashes, other business interruptions. Its real-time, color-coded maps and other data displays provide users with an instant view of their network and device status. Dartware's software is installed in financial services, healthcare, retail, education, government and non-profit, WISP, and ISP organizations around the world.