Issue Brief
Smart Technology: Automating Processes in K–12 Education

As K-12 education institutions seek to improve efficiency and lower costs, many have embraced process automation, implementing systems that manage workflow and create efficiencies in a number of areas. Educators and administrators alike have experienced the benefits of using student information systems (SIS), course management systems (CMS) and other solutions that automate education and administrative processes.

One emerging solution uses broadband mobile wireless networks to enable real-time, two-way communication with any network-ready device to remotely monitor and control business systems. By using machine-to-machine communications, or M2M, to achieve their goals with fewer resources, K-12 schools and school districts can increase productivity, save money and create a positive environmental impact. For example, M2M school security solutions automate the process of keeping students and valuable campus assets safe by allowing video surveillance systems to be deployed in all areas of the campus, even those without access to the wired Internet.

This issue brief by the Center for Digital Education will define M2M, describe potential use models and benefits, and recommend key steps for successful M2M implementations for K-12 schools and districts.

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What is M2M?

Wirelessly connected devices might seem like science fiction, but the technology has been around for decades.[1] An early application was the use of sensors to control water heaters, refrigerators, air conditioners and streetlights by measuring and responding to variables such as temperature or light. Later, communication devices placed in cars automated payments at gas stations and pay tolls.

Fast forward to the present. Device-embedded sensors capture information about an event — such as time, temperature, light or motion — and transmit it wirelessly to a database for remote analysis. M2M allows machines such as parking meters, temperature controls, security cameras, vending machines, in-home appliances, information kiosks, cash registers and vehicles to communicate with each other and with end users, and to be monitored, controlled and managed remotely.

Welcome to the "Internet of things," as it's sometimes called. How did we get here? Improvements in technology, infrastructure and economic conditions are pushing M2M to the brink of mass adoption.

First, the widespread adoption of wireless and mobile broadband technologies eliminates the need for wired Internet connections, simplifies the control of remote or mobile assets and lowers deployment cost. In addition, advancements in sensor technology have resulted in the development of extremely small and cost-effective sensors that can be embedded in virtually any device. Finally, the emergence of cloud computing enables the migration of secure communication from enterprise networks to the Internet, and open standards make it easy for devices, networks and software to exchange data.

M2M isn't just for gearheads. Stratecast, a division of Frost & Sullivan, expects that the number of connected machines in the year 2020 — 60 billion — will be 10 times the number of connected people (6.8 billion) and 15 times the number of connected mobile handsets (4.1 billion).[2]

K-12 M2M Use Cases

M2M communication can be adapted to meet the specific applications and needs of K-12 institutions. Four use cases illustrate the technology's versatility in the K-12 market: student and school safety, student attendance, facility management and electric utility metering.

Student and school safety. M2M enables video surveillance, expanding a school's ability to keep students safe and monitor valuable assets throughout a campus. It's difficult or impossible to maintain a wired connection in remote and outdoor environments, such as football stadiums or parking lots, but wireless video surveillance can be rapidly deployed in these areas for surveillance of large events or in disaster situations. Mobile networks allow schools to deploy this functionality to remote locations much more quickly and cost effectively than if using traditional wired networks.

M2M also has the capability to tap into pre-existing video management systems and install wired cameras to offer a mobile view of camera feeds on a tablet or smartphone. This expands the reach of campus police departments to better handle the responsibility of security across multiple schools.

Student attendance. M2M communications can help streamline the process of managing student class and event attendance. Many schools already use barcoded badges for scanning students in and out of campus buildings. Some schools are adopting RFID (radio-frequency identification), a passive tracking technology that doesn't require the student to physically scan the card. RFID readers, placed strategically throughout school property, automatically detect the card, even when it's in a pocket or a backpack.

Automated vehicle location (AVL) solutions for school buses ensure that students get on and off at the right bus stop and communicate their whereabouts to parents and educators.
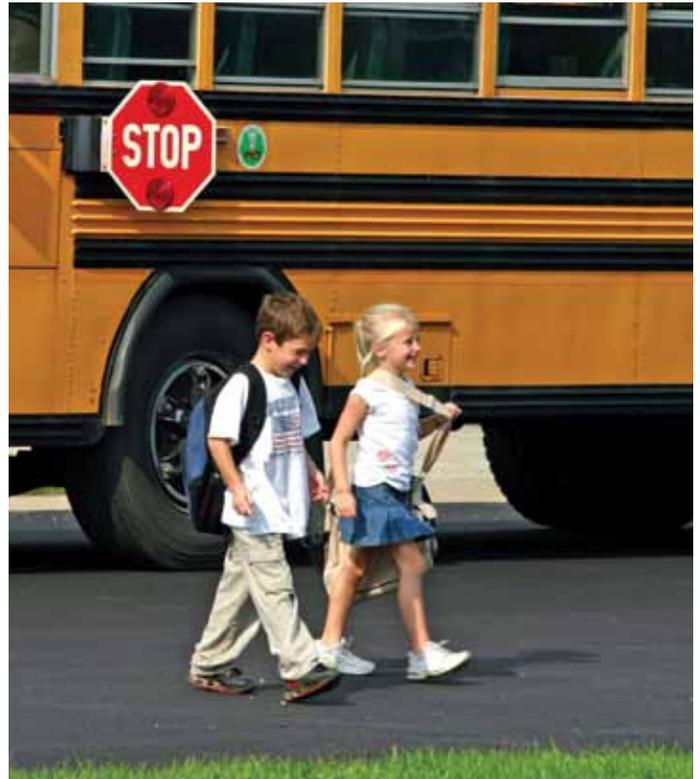
Automated vehicle location (AVL) solutions for school buses ensure that students get on and off at the right bus stop and communicate their whereabouts to parents and educators. This can be helpful for managing the attendance of special education students. Some AVL solutions also have GPS capabilities to inform parents and students when the bus arrives, which is critical in inclement weather. Future possibilities include the use of video and panic buttons that would stream video to dispatch in the case of an emergency.

Facilities management. Drive by most schools at night and through the windows you're likely to see empty, well-lit classrooms and the blue glow of unused computers, projectors or other audio-visual (A/V) equipment. Powered-on but unused equipment and building lighting are a black hole that uses enormous amounts of energy and budget dollars.

Using Internet-connected occupancy sensors, timers, dimmers and other technologies, M2M communication allows schools to remotely automate and manage building systems. This can include HVAC and lighting and equipment such as A/V, computers and printers. A building management system can be remotely configured and automated to manage classroom reservations, control A/V equipment, adjust HVAC thermostats, manipulate window shades and control lighting.

Electric utility metering. M2M-based smart electric utility meters record electricity usage hourly and send it to the utility company daily for real-time monitoring, billing and notification of power outages or other quality problems. Smart meters are the foundation of demand-based variable-pricing programs that can help electricity consumers lower energy use and save money.

Access to real-time information about electricity demand enables utility organizations to set the price according to demand, discouraging the use of electricity during peak periods. Smart meters notify customers when demand (and pricing) is high so they can take conservation measures. Schools and districts, especially those with multiple building assets, can benefit from adjusting HVAC temperatures (also using M2M communication) when notified of peak demand periods.

Benefits: When Machines Talk

When machines can communicate with each other, especially via mobile broadband networks, schools and districts can reap many benefits. Let's examine how the use of M2M technology in the four use cases we've described can help increase productivity, realize cost efficiencies and create a positive environmental impact.

Increase productivity. Automating workflow leads to productivity increases by reducing the amount of time that faculty and staff spend on non-critical tasks that do not advance the educational mission. For example, M2M applications for student classroom attendance allow teachers to spend more classroom time educating students. And M2M-based facilities management frees teaching, IT and maintenance staff from powering down PCs, lights and A/V equipment.

Find cost efficiencies. M2M communication technology can help schools save money. For example, the use of automated facilities management systems and smart electricity meters reduces energy consumption, makes it more cost effective to manage and maintain facilities, and eliminates thousands of dollars wasted on energy costs.

In addition, M2M-based campus-wide video surveillance eliminates the cost of hiring security personnel to protect students, staff and school property. And school districts can use automated student tracking systems to recover attendance funding. By discovering that students counted absent by teachers were in fact in other areas of the campus, a Texas school district has recovered $194,000 in state funding since the end of 2008.[3]

Decrease environmental impact. The ability to tout environmentally friendly policies can help schools and districts bolster their public perception. M2M communications help institutions decrease their environmental footprint, particularly in the case of facilities management and electric utility metering.

The ability to automatically and remotely manage lighting, HVAC units, window coverings and other energy-saving devices is one of the building blocks of a successful energy efficiency strategy. A temperature adjustment of a single degree, when notified by a smart meter, conserves tremendous amounts of energy, especially for large schools and districts.

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Keys to Successfully Deploying M2M Technologies

A thoughtful strategy for educating internal and external stakeholders and evaluating technology options ensures that K-12 education institutions are investing in reliable M2M solutions.

Engage school and district leadership. Because M2M is an emerging technology, many administrators may not fully understand the business case. Involve the highest levels of leadership in a collaborative, educational discussion. Bring in technology partners to assist in explaining the technology, potential use models and benefits.

Develop a strategic plan. Once you've engaged critical leaders and stakeholders, work with them to develop an overall strategic plan. Solicit ideas for how wireless technologies can reduce costs or improve services and then prioritize these proposals into a long-term plan spanning multiple years. Use current and anticipated needs as a guide and factor in the likelihood that these solutions will continue to become more diverse and affordable in the years ahead.

Calculate ROI. Calculating return on investment (ROI) is critical to building a business case for any new technology. To calculate cost efficiencies, consider potential fuel savings, energy consumption, attendance-related funding and productivity improvements. Think about the value of public perception when calculating ROI. For example, what is the impact of a severe security incident? What about the impact of an energy-efficient school program?

Communicate with teachers, students and parents. Don't overlook challenges unrelated to technology. School administrators hail the use of devices for improving security and increasing attendance, but some teachers, parents and students may express concerns about security and privacy. An ongoing dialogue about the goals and safeguards of the solutions will help mitigate these concerns.

Evaluate wireless network providers. Find a technology- and vendor-agnostic wireless network provider that offers a top-tier wireless infrastructure with the breadth of coverage and network reliability to provide consistently dependable service. Ask about business continuity and

emergency contingency plans, and make sure the provider can offer coverage in all areas where monitoring and communications devices will be installed. Evaluate security options carefully. Service providers should offer options for data encryption or, for the most sensitive information, the ability to send data over a private wireless network to guard against possible breaches with the public Internet.

Find a comprehensive ecosystem. A successful M2M deployment relies on trusted partnerships among hardware, application and service providers who develop and deploy solutions certified for compatibility. These partners form ecosystems, providing internal certification centers that offer the option to choose hardware and software components from outside the ecosystem, such as a locally owned business. The components can be tested for compatibility with related technology from other partners, allowing schools to choose the solution they need instead of being forced to select a second or third choice.

Where can I find more?

Verizon Education Solutions
http://business.verizonwireless.com/content/b2b/en/wireless-government/education.html

Alcatel-Lucent Education Solutions
http://enterprise.alcatel-lucent.com/?solution=Education&page=homepage

Verizon Solution Partners
http://solutionfinder.verizonwireless.com/

Verizon Machine to Machine
http://business.verizonwireless.com/content/b2b/en/wireless-products-services/machine-to-machine.html

Verizon Private Network
http://business.verizonwireless.com/content/b2b/en/wireless-products-services/private-network.html

Verizon Open Development Initiative
http://opennetwork.verizonwireless.com/aboutOpenDev.aspx

Endnotes

[1] "Machine-to-Machine (M2M) Communications — This Is Going to be BIG!," Stratecast (a division of Frost & Sullivan), May 11, 2010, http://www.slideshare.net/FrostandSullivan/machinetomachine-communications-this-is-going-to-be-big

[2] Ibid.

[3] "Tracking devices in school badges raise concerns," *Houston Chronicle*, October 11, 2011, http://www.chron.com/neighborhood/spring-news/article/Tracking-devices-in-school-badges-raise-concerns-1716571.php

Verizon Wireless operates the nation's largest 4G LTE network and largest, most reliable 3G network. A leader in wireless voice and data services, the company launched the nation's largest 4G LTE network in December, 2010. Verizon Wireless' 4G LTE network now covers more than 200 million people in 195 markets across the country. Additional markets are planned for 2012 and coverage of the entire 3G network footprint planned for the end of 2013.

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