Issue Brief

Smart Technology: Automating Processes in Higher Education

Tech-savvy higher education institutions are beginning to experiment with a process automation technology known as machine-to-machine communications, or M2M. M2M uses broadband mobile wireless networks to enable real-time, two-way communication with network-ready devices to remotely monitor and control business systems, providing colleges and universities with a variety of cost and productivity benefits. To understand how M2M can improve college campuses, imagine the following scenario in the not-too-distant future.

A student's parents visit campus to watch her play in a sports match. As they approach the campus entrance, digital overhead street signs direct them to parking lots with available spaces. When they park their car, they swipe their credit card into a digital meter. The meter's hourly rate was remotely set a few hours ago based on expected game attendance, and since the meter can detect when a car enters and leaves the parking spot, the parents are charged only for the hours they are parked there.

On campus, the couple approaches a digital information kiosk for directions to the indoor arena. The kiosk picks up a signal from their Spanish-language cell phone and after it automatically serves up language-specific directions, they set off for their daughter's game. At the arena, the heating and lights have been remotely configured to provide energy-saving environmental conditions, and will be automatically shut down after the match is over.

M2M may sound like science fiction, but it's more of a reality than you think. This issue brief by the Center for Digital Education will shed light on its use in higher education. We will define M2M, describe potential use models and benefits for institutions of higher education, and recommend key steps for successfully implementing the technology.

What is M2M?

Sometimes called the "Internet of things," 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.

Recent improvements in technology, infrastructure and economic conditions are now pushing M2M to the brink of mass adoption. Present-day sensors are extremely small and cost-effective and can be embedded in virtually any device. They capture information about an event — such as time, temperature, light or motion — and transmit it to a database for remote analysis. The ubiquitous use of wireless and mobile broadband technologies eliminates the need for this transmission to take place over a wired Internet connection, simplifies the control of remote or mobile assets and lowers deployment cost. 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.

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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).[1] Stratecast also notes that there are applications for M2M in almost every industry: The time is right for colleges and universities to implement M2M communications.[2]

Higher Education M2M Use Cases

Higher education institutions can adapt M2M communications to meet specific applications and needs. Five use cases illustrate the versatility of M2M technology in colleges and universities: research and development, healthcare, reduction of energy use, information automation and fleet management.

Research and development. Many higher education institutions that have adopted M2M are using it to drive innovative research initiatives. For example, North Dakota State University (NDSU) is updating its North Dakota Agricultural Weather Network (NDAWN) program to use M2M technology to collect weather information from 70+ automated weather stations across the state.[3] The weather stations' sensors will transmit critical weather information to a software application that will analyze it and make it available for download to smartphones for farmers and others who rely on accurate weather information.

Healthcare. M2M-based telemedicine has the potential to revolutionize the way that teaching hospitals deliver services to patients and training to medical students. The University of Pittsburgh Medical Center (UPMC) is developing a new telemedicine system featuring a virtual "exam room" that will offer real-time, Internet-based clinical appointments and emergency care to patients, regardless of location. Access will be available through a variety of mobile devices using real-time video and audio.[4]

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Pennsylvania State University's Mashavu telemedicine system relies on M2M to vastly improve the delivery of healthcare in rural Kenya, which suffers from a severe lack of healthcare professionals. Mashavu computer-based kiosks include medical devices that an operator with little training can use to conduct patient exams. Via the mobile network, Mashavu kiosks transmit this information to a secure website, where medical professionals review it and make recommendations to the kiosk operator, who notifies the patient of the results.[5]

Reduction of energy use. M2M-based facilities management and electric utilities enable colleges and universities to gain control over energy consumption. Even though it is a non-critical business function, higher education institutions devote numerous resources to facilities management. That's because the top two generators of energy costs are lighting and content sources such as A/V and projection systems.[6] Further, 200 PCs left in sleep mode overnight annually use about $3,000 of power.[7] By using Internet-connected occupancy sensors, timers, dimmers and other technologies, M2M allows campuses to remotely configure, automate and manage building and outdoor systems. This includes HVAC, indoor and outdoor lighting, window shades and equipment such as A/V, computers and printers.

M2M-based smart electric utility meters help cut energy use even more. Smart meters are the foundation of demand-based variable-pricing programs that can help electricity consumers lower energy use and save money. They 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.

Access to real-time information about electricity demand allows utilities 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 enact conservation measures. Colleges and universities, especially those with multiple building assets, can benefit from adjusting HVAC temperatures when notified of peak demand periods.

Information automation. Digital signage and information kiosks automate the delivery of information in campus housing facilities and classrooms. Other uses include digital menu boards in cafeterias and food courts, interactive kiosks in high-traffic outdoor areas and other common areas that help direct people, parking and traffic signage for special events, and campus-wide emergency alerts. Mobile kiosks eliminate the need to staff events, instead a person interacts remotely via videoconferencing.

Many colleges and universities already use multiple digital signage systems, but they are typically standalone, departmental systems that lack the ability to be managed centrally or remotely. A

departmental system might be updated by locally updating content via external drive or wired Internet connection. Mobile wireless technology is "plug and play" — only requiring power — and allows the campus to connect multiple systems so that they can be managed centrally, remotely and still be customized by the individual department as required.

Fleet management. It is common for higher education institutions to have a fleet of service vehicles, such as for plant or facility maintenance departments. Automated vehicle location (AVL) solutions provide worker safety by tracking when workers get in and out of vehicles. AVL solutions also have automated time management capabilities that reduce overtime and input errors, increasing a campus' ROI.

Benefits: When Machines Talk

In the use cases we described, let's examine how M2M can help campuses increase productivity, develop new revenue opportunities 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. For example, M2M-based facilities management frees staff from powering down PCs, lights and A/V equipment. Similarly, centralizing the management of digital signage cuts down on duplicative tasks across multiple campus departments and makes it faster and more efficient to deliver campus-wide communications.

Create new revenue opportunities. M2M-based research provides new opportunities for grant and foundation funding. Additionally, extending medical services to remote patients via fee-based telemedicine can create new revenue streams for university-run hospitals.

Decrease environmental impact and costs. The ability to automatically and remotely manage building systems and 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 on large campuses, and reduces costs. These and other environmentally friendly policies can help bolster public perception.

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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 colleges and universities invest in reliable M2M solutions.

Engage leadership. Because M2M is an emerging technology, university administration 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 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. It's easier to calculate ROI for new revenue streams than it is to gauge the impact of cost and workflow efficiencies. Consider potential fuel savings, energy consumption and productivity improvements, and assign a value to public perception.

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 and failover 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. The M2M ecosystem includes hardware, application and service providers that partner to develop and deploy solutions certified for compatibility. The best groups offer internal certification centers that offer the option to choose hardware and software components from outside the ecosystem, such as a locally owned business. The ecosystem should then be able to test for compatibility with related technology from other partners. This ensures that educational institutions get the solution they need rather than being forced to select a second or third choice.

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Where Can I Find Out 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. "Network Overview," North Dakota Agricultural Weather Network (NDAWN) Center, http://ndawn.ndsu.nodak.edu/help-overview.html
4. "Alcatel Lucent, Pittsburgh Hospital Team on Telemedicine Platform," Information Week, http://www.informationweek.com/news/healthcare/interoperability/229500026
5. "Mashavu: Networked Health Solutions for the Developing World," National Collegiate Inventors and Innovators Alliance, http://nciia.org/grants/sustainablevision/MashavuNetworkedHealthSolutionsfortheDevelopingWorld%20
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