A Supplement To
Integrated Solutions
FOR WIRELESS, MOBILITY & RFID

M2M 101:

The Basics Of Machine-To-Machine Communication

INSIDE:

- An overview of the basic building blocks of an M2M technology solution, including wireless connectivity options
- Real-world business success stories chronicling how companies like yours are benefitting from M2M technology
- ABI Research analyst Sam Lucero discusses how the poor economy will affect future M2M deployments
- A glossary of acronyms and terms common to the M2M industry

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Welcome To M2M 101

Knowing the basics of M2M (machine-to-machine) communication and your options when deploying technology can help you develop a successful solution.

Classic science fiction films and television shows such as *Star Wars* and *Buck Rogers* often portrayed a world where machines verbally communicated with humans and other machines. Back when these programs originally aired, it seemed the technological wonders depicted were too far-fetched to ever resemble reality. Little did we know how quickly some of these once-futuristic concepts would come to be.

While not as fantastic as a droid carrying on a conversation with its owner or a computer system, machines all over the world are currently communicating with one another. Take, for example, a copy machine that automatically uploads usage, toner levels, and system malfunctions to the manufacturer or dealer database, enabling support and maintenance to be delivered proactively. Or, consider an electricity meter that can transmit consumption figures to the energy provider's accounting system for automated and more accurate billing. Or, a mobile handset that can allow a homeowner to activate his alarm system or turn his lights off from a thousand miles away. All of these applications are in use today, and they are all made possible by M2M communication technology.

THE BASICS

M2M communication refers to technology that enables machines to be networked so data can be freely exchanged among these assets. M2M works by embedding a communication module, sensor, or tag in a physical asset (e.g. service vehicle, finished product, production machine, etc.) so that information about its status and performance can be sent to a computer information system. M2M can also be accomplished in the software world by linking disparate software assets to a centralized database for universal observation and control. This information flow is automated and allows a corporation to remotely monitor, maintain, and track these machines. Furthermore, the data received can be used to automate a corresponding business action. All of this can save a company time and money because important data about a machine or contained within a machine can be uploaded to a computer system from the machine itself rather than being manually collected and uploaded by a human being.

The concept of networking machines is not necessarily new. In fact, the manufacturing and utility industries have deployed systems that connect machines to an IT network using sensor technology for several years. These systems include closed-loop plant-floor automation solutions as well as wide-area remote monitoring solutions such as SCADA (supervisory control and data acquisition). The primary difference between these legacy systems and M2M is the telemetry networks that enabled SCADA and similar applications were specifically built for and were the exclusive domain of the organizations that implemented these systems. M2M communication, on the other hand, is accomplished using existing public wireless data networks and access methods such as wireless cellular and ethernet. In recent years, the cost to access public wireless data networks has declined, while the technical capabilities of these networks has steadily increased. This trend is providing businesses in all industries with a cost-effective way to network, not only their most important production assets, but also just about any other machine that offers value to the business or its customers.

M2M Wireless Access Options

M2M deployments that are limited to a local area such as an office building or small complex can use privately owned Wi-Fi, wireless WAN, or wireless LAN. However, M2M deployments that cover wide areas leverage existing public wireless data networks for wireless transport. In essence, there are three wireless-access standards for M2M communication in American markets — GSM (global system for mobile communication), CDMA (code division multiple access), and iDEN (integrated digital enhanced network). See the glossary located in this supplement for more detailed descriptions of these wireless access standards.

While fairly equal in terms of users in the United States, GSM is the most widely used wireless standard in the world, representing 82.4% of all global mobile connections. Since GSM is a proven global system, it is a preferred wireless access method for companies looking to establish an M2M solution that will work internationally. CDMA, on the other hand, only provides limited global coverage (in markets such as Japan, Korea, and India). However, CDMA offers more significant broadband wireless footprints.

Coverage & Cost Considerations

Unless your M2M implementation is truly global, other considerations will likely determine whether your M2M solution is built on a GSM, CDMA, or iDEN platform. The most important of these considerations is network coverage. You need to ensure your M2M-enabled devices have the best network connectivity possible — whether used in a major metropolitan area or in an extremely rural location. Ask to see the coverage maps of competing network providers, and choose the one that provides the best coverage for the solution being deployed. Remember, your M2M solution will be useless without good connectivity.

If your coverage options are comparable among several network carriers, another consideration that may drive your M2M decisions is cost. CDMA modules generally cost twice as much as GSM modules due to the lack of global volume on CDMA networks and the number of components necessary to build a module in the CDMA architecture. However, these up-front costs are sometimes offset by M2M network usage fees and certification costs. While both CDMA and GSM modules are typically precertified by the FCC (Federal Communications Commission) and other standard-enforcing organizations, the finished M2M device will need to be recertified by these organizations before deployment. For example, GSM-based M2M solutions need to complete PTCRB (PCS Type Certification Review Board) certification. CDMA-based solutions need to complete CDG1, CDG2, and CDG3 testing. Both GSM and CDMA solutions may also need to be certified for use on a network by the carrier itself. All of this testing can add considerable cost and time to the implemention cycle. You'll want to investigate each of these components carefully to ensure you build the most cost-effective solution for your business.

THE VALUE PROPOSITION OF M2M

Selecting a platform for your M2M solution is only one piece of the puzzle. Linking your remote assets to an existing information system requires expertise in several fields including communication technologies, software development, and hardware integration. If you don't possess these skills internally, you may want to contract the support of an experienced vendor or integrator. Finally, since most M2M projects are often one-off solutions, tailored to meet specific business demands, you'll want to ensure someone with specialized knowledge of the business environment is involved in the M2M project. If deployed correctly, M2M solutions can provide value to both solution end users and manufacturers/application developers.

M2M End User Advantages

By integrating the assets of an organization, including those in the field and around the world, M2M end users can cut costs, increase efficiency, improve customer service, and gain a competitive edge. For example, operational costs can be reduced when needless site visits for service, maintenance, and machine updates can be avoided thanks to the real-time data connections being monitored from all machines. Human labor can therefore be deployed more productively, and machine downtime can be reduced.

The delivery of real-time machine information also enhances the decision-making processes of businesses. In other words, with relevant machine information at your fingertips, more accurate decisions can be made at a faster pace, allowing you to operate with more agility and efficiency than your competitors.

Manufacturer/Application Developer Advantages

Whether a company is a manufacturer of home appliances, office equipment, or utility meters, M2M technology can offer countless business benefits. For example, manufacturers have the possibility of embedding wireless modules or sensors into their products during the manufacturing process to enable wireless transmission of real-time data. This action prevents the manufacturer or client from having to retrofit products in the field with M2M technology down the road, simplifying the overall implementation.

M2M solutions can help a product manufacturer or application developer deliver more cost-effective maintenance and after-sales service, as the deployed product can automatically report their status. Furthermore, M2M solutions can help a manufacturer gain a better understanding of both its product performance and its customers.

M2M SUCCESS STORIES

It's one thing to tout the benefits of M2M technology in theoretical statements, but it's quite another to read about how businesses like yours are actually using the technology to their advantage. The following are a few case study briefs that illustrate the real-world business value of M2M.

Cooper Power Systems is a manufacturer and distributor of faulted circuit indicators to electric utility companies. Faulted circuit indicators have been used by electrical utility companies for years to detect faulty currents at particular points on an electrical system. Historically, electrical field workers regularly examined these devices to identify a cable failure (indicated by a blinking light or flagging mechanism). This process took time and impeded the speed with which power outages could be addressed. Cooper Power decided to embed an M2M cellular radio in its faulted circuit indicator to provide its utility clients with the ability to monitor and immediately identify points of

failure on their electrical systems remotely. The resulting solution eliminates the need for utility field personnel to physically examine each fault indicator for a flashing light or flag to find points of failure. Instead, this information is uploaded automatically to a central database. The real-time data transmitted via the solution enables the utility to respond more quickly to outages and gives field workers more time to work on actual repairs. Moreover, through proactive cable monitoring and responding more quickly to potential problems, the occurrences of outages can be decreased. Read the entire case study at www.isminfo.com/jp/5834.

Varian Medical Systems manufactures hardware and software and provides software services for the radiation therapy industry. As a company whose products save lives, maintaining and supporting these products is a crucial aspect of Varian's business. Historically, Varian handled support using a combination of field service agents and limited remote access to installed software systems via analog phone lines and modems. This solution didn't deliver the real-time data Varian required. To combat this issue, Varian installed a Web-based M2M software solution to remotely access and monitor Varian software being used in any of the company's 3,000 customer sites. The Internet-based M2M solution is a firewall-friendly software, meaning connectivity can be established between a Varian representative and a hospital without having to change the hospital's firewall. By monitoring its software in use at client locations, Varian can proactively identify software issues and correct many of these problems remotely via desktop connection. This capability reduces the need for field service visits, eliminating travel expenses. Read the entire case study at www.isminfo.com/jp/6030.

First Multiple Listing Service (FMLS) is a data services provider for real estate professionals in Georgia. For years, the company provided its agents with a property lockbox solution that consisted of a mobile keypad that needed to be cradled every evening in order to upload property access information to and download new property information from the FMLS database. This process was inconvenient for agents and caused delays in the exchange of information between potential home buyers and sellers. To combat this issue, FMLS invested in a GSM-based M2M solution from long-time supplier GE Security. The M2M-enabled mobile keypad allows property information to be transmitted to and from the FMLS database in real time, helping FMLS to increase agent productivity while accelerating the sales cycle. Read the full success story at www.isminfo.com/jp/6018. ●

IMPACT OF THE ECONOMIC CRISIS ON THE CELLULAR M2M MARKET

By Sam Lucero, senior analyst, M2M connectivity, ABI Research

In November and December of 2008 ABI Research undertook a survey of key executives in the cellular M2M value chain in order to learn their thoughts on the impact of the current economic crisis on the M2M industry. The survey revealed some interesting results.

Sam Lucero, senior analyst, M2M connectivity, ABI Research

Respondents were, on the whole, cautiously optimistic about prospects for the M2M industry. In general, equipment vendors and network providers were more positive about prospects for the overall market and their own prospects within the market than were the module makers, who were much more pessimistic, as a whole.

Reasons for the relative optimism were:

Industrial customer base: M2M applications typically are not subject directly to negative trends in consumer spending.

Operational efficiency benefits: M2M applications oftentimes help to save money for corporate end-adopters.

New revenue streams: M2M applications can sometimes represent new revenue streams for corporate end-adopters.

Regulatory mandates: Many M2M applications, such as smart metering, are driven by regulatory mandates.

MECHANISMS OF THE IMPACT

In terms of the actual mechanism by which the economic crisis will likely impact the M2M market from a short-term negative standpoint, respondents cited the following factors:

- Customer access to credit will be interrupted
- Customer R&D budgets will be cut
- Customers will be more cautious about making new investments
- Consumer spending will decline — although this doesn't have as direct an impact on many M2M verticals as other markets (e.g. consumer electronics)
- Currency effects will force contracts written in dollars but paid by local nondollar entities to be renegotiated

APPLICATIONS HARDEST HIT

OEM consumer telematics was the application area seen as most vulnerable to the economic crisis. ABI Research's telematics analysts have lowered their forecast for OEM telematics significantly. Home security was seen by many respondents as the next most likely to be affected application in the M2M market, both from its connection to the global downturn in housing as well as its status as one of the few real "consumer" M2M applications — in an environment where consumer spending is declining sharply. To read Sam's full article visit www.ISMinfo.com/jp/1472.

M2M Glossary

Valuable definitions of acronyms and terms common to the M2M industry.

1xRTT — Acronym for "single carrier (1x) radio transmission technology," a 3G wireless technology based on the CDMA platform. 1xRTT has the capability of providing speeds of up to 144 Kbps and is also known as 1x, CDMA2000, and IS-2000.

AVL (automatic vehicle location) — A system that determines the geographic location of a vehicle and transmits this information to a tracking center.

CDMA (code division multiple access) — A form of multiplexing that allows numerous signals to occupy a single transmission channel, optimizing the use of available bandwidth. The technology is used in UHF (ultra high frequency) cellular systems in the 800 MHz and 1.9 GHz bands. CDMA offers several data bearer options including IS-95, 1xRTT, and SMS (short-message service).

EDGE (enhanced data rates for GSM environment) — A digital mobile phone technology that allows increased data transmission rates and improved data transmission reliability.

EVDO (evolution, data only) — A standard for high-speed wireless broadband in CDMA networks.

GPRS (general packet radio service) — A packet-based wireless communication service that delivers data at rates up to 114 Kbps and continuous connection to the Internet for mobile phones, devices, and computers on GSM networks.

GSM (global system for mobile communication) — A digital wireless system that uses a variation of TDMA (time division multiple access) to digitize and compress data. It then sends this data down a channel with two other streams of user data, each in its own time slot. GSM operates at either the 900 MHz or 1800 MHz frequency band and offers several data bearer options including GPRS (general packet radio service), HSCSD (high-speed circuit switched data), and SMS (short-message service).

HSCSD (high-speed circuit switched data) — An enhancement to CSD (circuit switched data), the original data transmission mechanism for the GSM mobile phone system. HSCSD utilizes up to four 9.6 Kb or 14.4 Kb time slots, for a total bandwidth of 38.4 Kb or 57.6 Kb.

iDEN — A wireless technology from Motorola that combines the capabilities of a digital cellular telephone, two-way radio, alphanumeric pager, and data/fax modem in a single network. iDEN operates in the 800 MHz, 900 MHz, and 1.5 GHz bands and is based on TDMA and GSM architecture.

IS-95 — The first CDMA-based digital cellular standard, also known as cdmaOne and TIA-EIA-95.

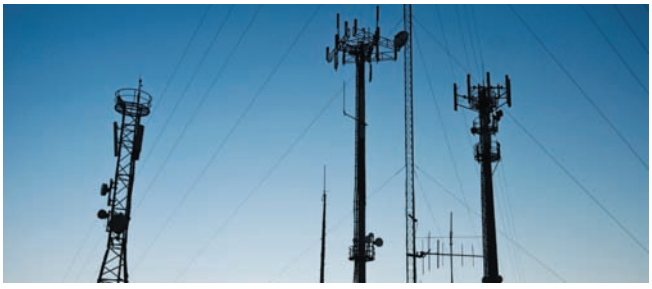
MMO (M2M mobile operator) and MVNO (mobile virtual network operator) — Companies that combine and offer network coverage from multiple cellular operators. Some offer value-added services utilizing their own network infrastructure as well.

Smart Services — The use of advanced sensing, communication, and control technologies to deliver services more effectively, economically, and securely.

SMS (short-message service) — The process of sending short data messages to and from mobile phones and devices.

Telematics — The integration of wireless communication devices (and often location tracking devices) into automobiles for remote engine diagnostics, stolen vehicle surveillance, roadside assistance, etc.

Telemetry — A highly automated communications process by which measurements are made and data collected at remote or inaccessible points and transmitted to receiving equipment for monitoring, display, and recording. Telemetry may also include two-way communication for the purpose of remote machine management and control.



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AT&T's Industry and Mobility Applications consulting practice is focused on delivering enhanced productivity through real-time information, machine-to-machine monitoring and location-based services to large, midsize, and small enterprises across all industries. For more information, visit the company's website at www.att.com/builtforbusiness.

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Enfora was formed in 1999 as a privately held company headquartered in Dallas with satellite offices in Europe, Asia, and Latin America. We are a leading provider of wireless networking solutions that enable enterprises to access, analyze and leverage information from their geographically dispersed assets. Our solutions, consisting of embedded wireless software, network edge wireless platforms — embedded and integrated — and enterprise software, are based on our distributed intelligent architecture that provides a valuable link between an enterprise and its remote assets. Enterprises deploy our solutions for location-based, monitoring and control, and asset management applications. For more information, visit www.enfora.com.

Motorola, the wireless pioneer with over 80 years expertise, offers the M2M market innovative technology and rugged hardware. Motorola's M2M wireless modules are designed with a single form factor supporting various technologies including GSM/GPRS/EDGE, CDMA 1x, iDen, Wi-Fi, and GPS, eliminating the need to redesign. From design to implementation, Motorola enables fast integration into M2M applications, thus allowing its customers to improve their business, while reducing costs. For more information, visit the company's website at www.motorola.com/m2m.

Numerex Corp. (NASDAQ: NMRX) is the machine-to-machine (M2M) provider of choice to some of the world's largest organizations, delivering secure, all-around solutions through a single source. The company's M2M expertise enables its customers to efficiently, reliably, and securely monitor and manage assets remotely whenever and wherever needed, while simplifying and speeding up development and deployment. Numerex is the first M2M service provider in North America to carry the ISO 27001 information security certification. Numerex DNA™ offerings include hardware Devices, Network services, and software Applications offered as individual components or as bundled services. At Numerex, "Machines Trust Us™." For additional information, please visit www.numerex.com.

OnAsset Intelligence Inc. is a leading provider of wireless devices and software solutions focused on helping customers wirelessly locate, track, connect, control, and manage fixed and mobile assets in real time. The company's M2M products and services include its flagship line of SENTRY™ wireless hardware, including the premier FlightSafe™ Air Cargo unit, the OnAsset Platform™, and global wireless connectivity services. The company is an integrated service provider offering best-of-breed products and services for M2M applications. OnAsset serves Fortune 500 companies, government and military operations, and small to midsize businesses by creating guaranteed business value through innovative solutions. Target industries include air cargo, express delivery services, pharmaceutical, cold chain, transportation and logistics, intermodal transportation, shipping containers and ports, process control, mobile inventory control, and security. OnAsset is located in Irving, TX. For more information, visit the company's website at www.onasset.com.

Telemetry Labs is an M2M technology and applications service provider located in Atlanta offering white label technology solutions and services which deliver next-generation web-based remote diagnostic control technologies. Telemetry Labs offers technology, application development, application hosting, network, and technology management services to those bringing Smart Grid, Smart Infrastructure, and Smart Services to market. For more information, visit the company's website at www.telemetrylabs.com.

Telit Wireless Solutions is a leading provider of embedded modules (GSM/CDMA/UMTS/ZigBee) for machine-to-machine (M2M) applications. Telit was the first M2M module supplier to introduce the family concept, in which form factors and logical interfaces are consistent across technologies, meaning customers can develop a single design which will support multiple technologies. For more information, visit the company's website at www.telit.com.