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M2M Pioneers

With M2M adopters focused on providing smart services for their customers, a new field of leaders is beginning to emerge.

When a new technology is introduced, it's not uncommon for industry to overestimate its speed to market and underestimate its long-term impact. That can be said for M2M (machine-to-machine) connectivity.

It has been reported that currently there are more than 50 billion machines in the world. If this number seems to be a bit overpowering, consider the market's most widely accepted growth projections: 32% annual growth and $290 billion in total revenue by 2011. If these predictions are correct, then nearly all machines will one day benefit from M2M communications.

Ironically, and perhaps not surprisingly, in the business world these numbers really don't amount to much if industry doesn't understand what the underlying technology can do or how it will impact their day-to-day operations—let alone enhancing their ability to communicate with customers.

Traditionally, when machine-to-machine first started being talked about, it was a question of traditional telemetry applications being converted into Internet-based or solution-based applications. They tended to be network add-ons, easily identified applications that were said to be high-cost and low-volume.

Now we are seeing the introduction of regulation-based applications, such as things like smart meters, explains Robin Duke-Woolley, a principal analyst with Harbor Research Inc., www.harborresearch.com, San Francisco, Calif.

Moving forward, we will begin to see the industry branch out, making itself known in the world of enhanced services. Much like the Internet has created many new opportunities, M2M is creating new business models and opportunities. Harbor Research's Duke-Woolley insists, "M2M is the third wave of the Internet with a host of new capabilities and applications."

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Smart Services

What does M2M really mean for global business? If you set aside the basic discussion about devices and machines being able to talk to each other, M2M technology is offering what is being coined as "smart services." These "smart" services are just another step in the evolution of M2M and what it is enabling businesses to accomplish in a global market.

Smart services refer to the concept of networking finished products and monitoring them throughout their lives. By networking the equipment they make and service, product-based businesses such as OEMs (original-equipment manufacturers) and service organizations can add value to their products, ensure optimal performance, and create additional service revenue.

With M2M as the underlying technology foundation, these smart services will create a plethora of new relationships between businesses and customers. As M2M gains in popularity and as more companies unleash its power, these new service offerings will shape a new movement that will spark new partnerships between business-to-business and business-to-consumer.

Companies and businesses that embrace M2M solutions will have a real shot at differentiating themselves from their competition, while at the same time ensuring asset integrity, productivity, and uptime of their partners' assets. Customers, in turn, will continue to seek out products that live on the network and that have the ability manage, track, and service their most valuable assets.

As a result of M2M's capabilities, there is a movement afoot that is creating a shift from a product-centric environment to a service-centric world.

Underlying Approach

It's no surprise that the shift to low-cost, high-productivity environments has led to many manufacturing operations being outsourced. As a result, the only way some manufacturers will survive and thrive is by enabling a host of smart services.

M2M is the umbrella under which these new services will be provided. Adopting an added-value service model will be the key differentiator for manufacturers in the coming years. As a result, new smart services will decrease downtime, improve profitability and most importantly, create peace of mind for businesses and their customers.

To truly understand what smart services have to offer, it's important to understand we are talking about machines and devices talking to machines and devices. Whether providing a service or tracking a product, it's still about gathering data to make realtime decisions in a networked environment. As Glen Allmendinger, president of Harbor Research, puts it, "With M2M, the basic plumbing is in place."

The New Pioneers

Not surprisingly, many of the M2M industry's thought leaders are helping companies embrace the idea and application of smart services. In fact, in the course of selecting this year's field of M2M Pioneers, smart services emerged as a common theme running throughout many of the most successful companies in the space today.

This is the third edition of the M2M Pioneers, and each year the message of those selected becomes more refined. The first edition of Pioneers was all about market awareness and championing the cause,

and the second edition was all about competitive positioning. This year, the message of the Pioneers is shifting to the adopters and how to help them harness the power of machine-to-machine.

The nine men and one woman that have been selected for the 2007 M2M Pioneers designation have been focusing all of their attention on helping customers really grasp the fundamental benefits of machine-to-machine connectivity. These individuals see the power of M2M.

While all of these pioneers and the companies they work for contribute to the M2M value chain in their own unique way, they all believe the result is the same: the connection of people, devices, and systems. They see the future of connectivity with machines and devices becoming networked over the Internet. Discover what these pioneers have been teaching us: the future of M2M is here and now.

The Art of Product Service

There is a major shift toward services for product-based businesses. Enabled by M2M technology, "smart services" will change the relationship that businesses have with their customers. The art of smart services will be where businesses win or lose the game. This movement will cut across business-to-business and business-to-consumer players in all markets.

Industries are forced to change when their current situation becomes untenable due to commoditization. This happens when technology or other political or economic changes drive a shift in supply and demand. The shift in manufacturing to low-cost, high-productivity outsourcing, coupled with the strengthening and downward cost of cellular wireless communications as transport, is driving a major shift for manufacturers and industries that have the fortitude to rethink their business model or otherwise face eventual commoditization.

The pervasive Internet will drive a "nodes on the network" reality around the world. Old, reactive business models for service and support of assets outside the network will seem wasteful and non-responsive. Realtime behaviors and responses to asset needs worldwide will become the expectation and reality of successful enterprises. Smart services will become a key differentiator, and value creation will become the art of what is possible.

Businesses that embrace M2M solutions will begin to recognize that their assets have a personality, which they can create based on their business model, their business needs, and their customers' demand for reliability, service, and support—each of which has a dollar value and return on investment.

What will distinguish one product maker from another, however, will lie in the art of their solution. While many industries and businesses have reached a point of maturation where their products are not perceived as unique, the possibilities of M2M-enabled services will continue to be rich with opportunity for value creation and differentiation. M2M technology provides the means to connect standalone assets so that their personality can be accessed, permitting them to perform and communicate remote functions as part of the community they serve.

As a result of having connected products, a manufacturer becomes a valued partner to its customers by revealing realtime intelligence about how customers are using its products. The assets become part of a network between the enterprise and the asset owners, the service worker and the maintenance crew, and most importantly, the

end users.

As global competitiveness increases, product providers will want information about their global assets and will look for ways to achieve it without adding human capital. Initially, remote assets will find the widest use for applications of M2M, especially in mobile applications or where wireline is less prevalent or perceived to be too expensive or onerous to install. Examples include transportation and the supply chain, oil and gas, utilities such as water and power, alarm monitoring, intelligent buildings, construction and agriculture, healthcare support, and assets that can track and trace visibility as well as benefit from preemptive-maintenance service or enhanced productivity management. Insurance and financial-lending agencies will want to benefit from the visibility and ability to respond more intelligently and with greater speed and will pass the resulting savings on to the industries they serve. As a result, efficiency and reliability of operations will increase, security will strengthen, environmental conditions will improve, and consumers will have more options.

M2M technology changes the relationship that people have with their assets, resources, and employees. Because of the benefits that come with transparency, consumers and enterprises will begin to demand information in near realtime. They will find that data relevance, timeliness, and information management are important elements to running their business. They will change the nature of their business, such as how much inventory to have on-hand and where it has to be stored, based on knowing where everything is at all times. They will come to expect data reporting and knowledge management in the form of business intelligence.

Manufacturers that adopt an added-value service model will be differentiated as key partners, and those that do not will be further commoditized. Customers will look for products that live on the network; this will be the foundation of relevance. In order to respond preemptively to asset needs and availability, realtime service and maintenance support will grow to support an asset-based community. This will improve the overall economy through increased productivity and efficiency of machine and manpower utilization.

M2M is about business reinvention and all that it implies: technology innovation that leads to productivity, new ways of communicating, customer focus, and stepping away from commodity business models. Those that choose the M2M model and embrace it fully will have the opportunity to gain tremendous advantage, while traditional manufacturers and industries struggle to understand it. In this model, business combines with technology to form a seamless web of information, knowledge, and action. The underlying framework is driven by internal information transparency, which allows for preemptive services, decreased downtime, improved profitability, and ultimately peace of mind for businesses and their customers. From this, a new set of winners will emerge in business. The art of their solution will be the deciding factor.

Joan Waltman is president of Qualcomm Wireless Business Solutions, www.qualcomm.com/qwbs, San Diego, Calif., a provider of M2M solutions that help companies increase productivity, reduce costs, and increase asset utilization. In her 16 years at QUALCOMM, Waltman has served in multiple program management, engineering and operations roles.

M2M Is as Exciting as the Internet
Seventeen years ago, some of the discussions focused on the coming

opportunities for doing business on the Internet. At the time, a very small percentage of the population knew what the Internet was or how it was going to affect their lives. In the next few years, the Internet business climate could have been likened to the Wild West or the Gold Rush. Companies entered the space from every background and from every direction, each trying to grab a piece of the Internet pie.

Eventually the industry experienced consolidation where the strongest players with the best business models and financing began to emerge. Many of those companies are successful and integral parts of our economy today. Seventeen years later, businesses are having the same discussions about M2M. The telemetry opportunity today is as exciting as the Internet was then. We are at the point of the exploding business climate where network pricing, module pricing, and applications are all joining together to create the perfect business environment.

Growth in the next few years will be exponential, as M2M becomes an important part of everyday life. Every family's home will have multiple devices working to improve their lives, from monitoring vehicles to meters to perhaps family members themselves.

Business appeal: With technological advances, the first applications to see the largest growth are those that appeal to the business community because they are able to justify the return on investment more quickly then the average consumer. Asset tracking and monitoring appear to be the best solutions for business. Companies have been exploring this space for a while but are now moving forward with deployment of long researched strategies.

Consumer adoption: On the consumer side, the applications that will take hold first are those that appeal to very specific and unique solutions. Products with an emotional tie, like tracking a pet, will get traction first. With the tremendous growth that will occur, M2M solutions will become as commonplace for consumers as their laptops or DVD players. There is no better time or even a more exciting time to be involved in M2M!

John Horn is national director of T-Mobile USA Inc., www.t-mobile.com, Bellevue, Wash., and has been in the telecommunications industry for more than 18 years. He has been specifically focused on the machine-to-machine space for the last four years. Horn has lead T-Mobile to drive forward into the M2M world and aggressively provided much-needed carrier support the space requires.

Beyond the Data Service Provider
The most widely used applications in machine-to-machine will be pervasive commerce, remote monitoring and control of machines and systems, and tracking, communicating with, and controlling mobile assets.

Pervasive Commerce: E-commerce applications will continue to expand, leveraging both wireline and wireless backhaul. However, wireless technology will drive exponential growth by providing flexibility, portability, and direct customer access. Unmanned transactions will expand, driven by payment processing and realtime inventory management. The customer's needs will be more closely managed, understood, and acted upon as applications become more integrated. Dynamic advertising and content delivery will also be increasingly deployed to simplify the purchasing decision, the transaction itself, and the delivery of goods and services to the

customer.

Remote Monitoring and Control: Remote monitoring and control of machines and systems span both vertical and horizontal markets and will continue to drive growth across all sectors including industrial, commercial, and consumer. Realtime data will facilitate operational efficiencies, safety, security, and an enhanced product for the end user. Deployments will become more highly integrated and automated, creating pervasive adoption and driving the need for intelligence on both ends of the applications.

Tracking and Controlling Assets: Tracking, communicating with, and controlling mobile assets will continue to see significant growth across many verticals. Intelligent dispatching and deployment of mobile workers will continue to add efficiencies that directly contribute to the corporate bottomline. Improvements to supply-chain management derived from realtime inventory and location data will shorten the overall cycle, reduce inventory risks, automate resource planning, and reduce operational costs for the entire ecosystem.

M2M will have major effects and positive influences on society including improved delivery of good and services, enhanced public safety, security and disaster recovery, and a positive impact on the environment.

M2M enhances efficiency throughout the supply chain and will improve the delivery of goods and services and drive costs down. Automated decisions and data from the network will drive optimization.

M2M enhances public safety by providing public sector workers (e.g. emergency responders) access to data for better decisionmaking. Wide-area wireless networking is critical for these applications given the mobility element. M2M solutions provide portability and reliability benefits in security and disaster recovery applications as well.

The solution is complex and has many core components, including machines, management/control intelligence, communications devices, communications services, machine-network management services, and host applications. As higher levels of integration are required, the deployment path must be simplified for mass adoption to occur. End-to-end intelligence will facilitate these solutions, going beyond the application itself to include installation, management, maintenance, and control of unmanned and remotely deployed device networks.

With no single entity providing an entire M2M solution, partnerships must run deep, driving more creative collaborations and innovative business models such as OEM (original-equipment manufacturer), vertical integration, extensive joint development, and technology licensing.

Reliable, secure, and economical communication services are critical to adoption, which provides an opportunity for targeted service MVNOs (mobile virtual network operators) and resellers. To reduce upfront capital expenditures, solution providers will increasingly provide leased equipment and communications services as part of long-term targeted customer engagements. All of these factors will help create opportunities in the value-ecosystem beyond just the data service provider.

Since 2004, Andy Berman's unique background and leadership experience has been driving the growth of AirLink Communications

Inc., www.airlink.com, Hayward, Calif. Berman introduced a product roadmap that includes next generation wireless technologies and platforms to improve AirLink's marketshare through expanded channel and customer relationships.

Personal Navigation Finally Gets Wheels

For nearly a decade, one highly anticipated application for M2M connectivity involved the burgeoning market segment of LBS (location-based services). Carriers debated the economics of pushing location content (restaurants, movie theaters, special events) to a user on his mobile phone. How much would the user pay, how would the information be delivered, what information is relevant, etc.? After nearly a decade of discussion, the industry is finally starting to see the emergence of LBS in personal navigation applications.

Companies like TomTom, Garmin, and Dash networks have all recently introduced personal navigation devices that accompany vehicles with access to maps with pertinent information on shopping, places to eat, local sites, and entertainment. Today the majority of these devices deliver content from an onboard CD and GPS (global positioning system) receiver. The inclusion of true M2M connectivity across the wireless network is the next major step in providing realtime, personalized information in vehicles.

So, are consumers ready to have their vehicle talk to them? For both consumers and businesses, the answer would be yes, but at the right price and with the right content. Some of the applications could be traffic information, updated and optimized for a specific location and time of day; communication regarding the status of the vehicle; and a host of value-added services targeted at in-vehicle operation.

But, where are the services? Certainly models like OnStar have opened up the possibilities and demonstrated a level of demand. As technology and content hurdles continue to be addressed making it easier to bring information in and out of the vehicle, carriers continue to be more intrigued by the mass-market possibilities. Legislation to limit the use of cellphones in vehicles also makes an impact here. Ultimately, communication with devices connected directly to the vehicle offers a safer and more effective way to travel. And it will be a mass-market reality in the not so distant future.

Jeff Newman is chief strategy officer and senior vice president of business development for Enfora Inc., www.enfora.com, Plano, Texas, a developer of wireless modules and boards that enable rapid development of tracking, location, and remote monitoring solutions for M2M applications. Newman has been leading M2M innovation and growth since 1997.

When Revolutions Collide

Peter Drucker, one of the leading business thinkers of the 20th century, noted that, "Almost everybody today believes that nothing in economic history has ever moved as fast as, or had a greater impact than, the Information Revolution. But the Industrial Revolution moved at least as fast in the same time span, and had probably an equal impact if not a greater one."

While we're not yet through the Information Revolution, increasing demand for energy conservation, the pressures of global competition, and the need to improve business efficiency have created impetus for the next revolution. Today the Information Revolution and the Industrial Revolution are colliding, and M2M companies are ushering in the new Industrial Revolution.

WSN (wireless sensor networks) and M2M technologies provide a bridge between information systems and the physical world. While cost-effective sensors and actuators have been widely available for decades, connecting, installing, and commissioning these sensors and actuators has been difficult and expensive due to the cost of wiring.

Computing power, memory, and sensors are all showing the exponential decrease in size, cost, and power consumption associated with Moore's Law. The labor cost required to install, connect, and commission new sensors, however, doesn't ride that technology-cost curve—these costs are increasing yearly. With the introduction of reliable WSN technology, the cost of installing, connecting, and commissioning sensor or actuator devices is reduced by 90% or more in typical applications.

We often ask companies, "If sensing and control were free, what would you measure and use this data?" While the answers vary from business to business, they make one thing clear: the visibility into physical assets—whether power plants, refineries, manufacturing facilities, or homes—is extremely limited today, and organizations are realizing the value that wireless sensor networking technology can provide. For example:

- BP plc, www.bp.com, London, U.K., recently awarded Emerson Process Management, www.rosemount.com, Chanhassen, Minn., its Helios award for its work with wireless sensors at the Cherry Point refinery in Washington State, which is used to improve plant safety and reliability. Sensor networks reduce the cost of installing monitoring points by an order of magnitude, enabling extensive monitoring for safety, plant reliability, and overall operational efficiency.
- Streetline Inc., www.streetlinenetworks.com, San Francisco, Calif., is using wireless sensor networking technology to build "smart cities," helping to manage a city's most vital assets: streets, parking, and public spaces—with detailed, realtime information.

The ramifications of WSN and M2M go far beyond these few applications to a whole host of emerging solutions, fundamentally impacting business processes and profitability. Just like the Industrial Revolution and the Information Revolution, the New Industrial Revolution will happen—and is happening—faster than we could have ever imagined.

Rob Conant is co-founder of Dust Networks Inc., www.dustnetworks.com, Hayward, Calif., a provider of wireless sensor networking products. Conant is passionate about bringing the Information Revolution to the physical world.

Perspectives from the Sidelines
Wirelessly enabled data services are not new. For more than 15 years, we have seen businesses improve their own differentiation this way.

For example, in 1987, FedEx envisioned a world where immediate proof of delivery was available to the customer support desk. By 1998, the company harnessed the Internet to make it available to customers too.

Another example is The Hertz Corp., www.hertz.com, Park Ridge, N.J., which pioneered "roving check-in" for autos, eliminating counter returns in the early '90s, bringing a change in business practices

almost ubiquitous today. These new approaches were rewarding, yet challenging for these leader, for reliable and low-cost wireless data networks were proprietary and in their infancy.

Fast forward to 2007 and beyond. Great commercial data networks are in place and widely used for these services. Yet we are only scratching the surface of innovatory applications. Within a few years, literally hundreds of millions of wireless devices will be attached to commercial cellular networks, quietly performing the things you want them to do and things businesses want to do in their quest to be more efficient. But it doesn't stop there—regulatory initiatives will also drive adoption of wireless-based data gathering as we seek to control more of our environment.

The numbers are staggering in many markets that wireless data can rapidly demonstrate economic, social or safety advantages. Some examples:

- There are 145 million homes in North America. Managing utilities (gas, electricity, and water) is a multibillion-dollar industry simply in metering and monitoring use. Wireless devices automate this, remove safety-at-work issues, improve cashflow by prompt billing, and streamline billing changeovers when homes change hands.
- There are 29 million automobile sale transactions every year. A large percentage is made for high-value vehicles or to marginal creditworthy customers. The cost of loss is something we all pay in our lease costs. Improvements in tracking and recovery using GPS-enabled, wireless-tracking devices can lower finance costs for all.
- Homeland security drives many new innovations, from HazMat (hazardous materials) load tracking to container control—a current hotly debated matter of national security. Some 800,000 HazMat loads are in transit on any given day; tracking these as needed is seen to be most desirable.
- We are all interested in protecting our environment, and preventative control as well as compliance needs are increasingly wirelessly enabled. From landfill emissions to pipeline monitoring for maintenance, realtime data checked round the clock is preventing expensive accidents from happening.

We have 220 million cellular phones in use today, or seven for every 10 people in our country. There is a limit to how many we can use. But, imagine a world where you own several wirelessly enabled devices: telematics in your car, including spoken turn-by-turn navigation to replace that pesky distracting screen; a home alarm that switches on a video camera to check an alarm call before dispatching the sheriff; and a tracker to make sure your teenagers go where they say.

Now, add some of the essential public services: keeping track of offenders and marking turf, known as 'geofencing'; ensuring school buses and public transportation has been checked each day; or verifying trucks and railroad tractor drivers are conforming with regulations on rest, speeds, and maintenance checks. The essential list is pretty long.

Irrigation of golf courses and vineyards are being enabled wirelessly, minimizing water use where water is scarce. Harvesting grapes is being managed wirelessly, optimizing the harvesting when certain humidity and temperature conditions prevail.

Suddenly, hundreds of millions of connections doesn't seem so many

after all!

Alex Brisbourne is president and co-founder of Kore Telematics, www.koretelematics.com, Herndon, Va., an independent whole GSM network service provider. Brisbourne is one of the industry's most vocal proponents of the M2M applications that are set to become the next threshold of technology that will change our lives in many ways.

Killer Apps and the Benefits They Bring

M2M technology makes a difference. For example, rather than driving to the doctor's office for ongoing observation, people can wear medical devices that monitor their health conditions, enabling them to live more functional lives. Also, POS (point-of-sale) transactions require a fraction of the time they did in the past. These improvements promise to continue to transform our lives and our way of doing business.

Presently, Internet traffic primarily focuses on email, Web surfing, chat groups, and VoIP (voice over Internet protocol). In this sense, Internet traffic is user-driven. However, as M2M applications continue to grow, more and more devices will exchange data on behalf of the individual, making Internet traffic primarily one machine talking to another.

The ever-larger Internet infrastructure will connect billions of machines and devices around the globe, potentially reaching into space—each device providing a support service that improves efficiency and creates more ease of life. Even now, as we move forward, M2M enables the modern lifestyle, managing the mundane administrative tasks and freeing one's life for other purposes.

This transition has already taken place in the POS market. Here, businesses no longer have to make a paper imprint of customer credit cards. Instead, they are able to gain approval of a purchase immediately via LAN (local-area network), Wi-Fi, or cellular networks. For the customer, this ease of service has resulted in faster cash-register transactions since the speed of connection and resolution between machines takes place in a fraction of the time.

This same leap of efficiency will become the norm for businesses such as stock brokerages, real estate vendors, advertising, as well as many other sales-oriented businesses. Diagnostic services will be much more efficient as the car's electronics will communicate directly with the diagnostic equipment at the dealership, which will be updated automatically.

Control and automation applications will see M2M changes first. Security systems with audio/video remote monitoring, personal medical applications, and home automation will be next. As M2M becomes ubiquitous, driver safety will become common as the cars will communicate with each other, avoiding collisions caused by human error.

M2M technology will give us all valuable tools to help manage our life better, safer, and with less effort. Many administrative chores will be handled automatically, removing mundane tasks from the to-do list. Even now, pioneers on the forefront of M2M technology are gearing up their commitment to secure connectivity to ensure that their solutions can provide the most secure and efficient lifestyle possible.

Amit Resh is vice president of business development for Connect One Ltd., www.connectone.com, Phoenix, Ariz., which provides hardware

for adding IP connectivity to new and existing devices. Resh's focus is on exploring and unveiling new applications for M2M technology.

Satellites: A View of the Sky

Orbcomm is increasingly seeing VARs (value-added resellers), OEMs (original-equipment manufacturers), large multinational end-users, and leasing companies introducing machine-to-machine technology to add features that differentiate their products from their global competitors.

For example, a piece of heavy equipment is now able to communicate diagnostic information to a central office resulting in a replacement part being sent to the company even before the machine needs the replacement. However, in the case of a company that is not taking advantage of what M2M has to offer, the same scenario might result in a machine being out of service for as much as a week.

Thus, once customers get familiar and comfortable with this superior level of service, it will be difficult for them to switch to another supplier. This important connection between the customer and the manufacturer is quickly becoming the norm in high-value assets like heavy equipment, but we are beginning to see it trickle down into other markets as costs come down. For instance, we are now seeing pipeline monitoring and irrigation original-equipment manufacturers offering connected devices that provide information from the remote devices to users located anywhere.

Even though M2M applications are gaining in popularity, they are not always located in major population centers, so the availability of cellular networks can pose a few challenges. This may be acceptable for consumers or other handset users that are not relying on critical data being transmitted, but M2M customers need to know that they can develop one solution and deploy it where it's needed without worrying about coverage, finding a carrier, or whatever might arise. M2M applications that take advantage of satellite technology are helping to ease fears by ensuring the unit will work—the only thing they need is a view of the sky.

This has tremendous benefits for OEMs and multinational companies that are deploying solutions in several countries.

The effort and costs associated with developing a product that takes advantage of several wireless standards, multiple airtime agreements, and possible roaming fees sometime outweighs the benefits. Satellite solutions have been successfully cutting through all of that. Satellite technology enables global M2M communications using a single technology standard and no roaming or coverage issues, which is great for these OEMs and their customers with widely deployed assets.

As the technology continues to advance, we will continue to see an even greater trend of multi-mode communications appear. These are applications that use more than one communications network to provide the best of all worlds. This is beginning to emerge in mobile asset tracking, in particular, but also in many other applications.

Another hot area that is emerging is AIS (automatic identification system) for ships. The system was originally designed as a collision avoidance tool, but U.S. Coast Guard engineers and scientists determined it could be used for tracking ships far out to sea if a receiver were placed on a spacecraft. As part of this project, Orbcomm has been tasked with developing and building the capability

to receive, process, and forward the identification signals from space through a receiver on a communications satellite.

The satellite is scheduled to launch in the second quarter of this year, and the company plans to include the receivers in future satellites. In addition to the Coast Guard, Orbcomm will also be able to offer AIS services to other customers, including other governments. These are only some of the exciting advances being achieved through M2M solutions today.

Marc Eisenberg is chief operating officer of Orbcomm LLC, www.orbcomm.com, Fort Lee, N.J., a provider of M2M data communications services through its low-earth orbit satellite network and global ground infrastructure. Since 2002, Eisenberg has created a strategic vision for Orbcomm to partner with aftermarket resellers, OEMs, and multinational corporations to advance M2M applications.

Putting M2M Into Business Context

RFID (radio-frequency identification), sensor networks, and other M2M technology implementations will fundamentally change business processes and impact our society. Tim Berners-Lee, inventor of the World Wide Web, describes the future by saying, "…daily lives will be handled by machines talking to machines."

Already there are many more devices and assets online than people. The vision of the Internet of Things, a world where physical objects can process and communicate information, seamlessly integrated into enterprise systems and become active participants of the overall business process, is coming. We are working on new generations of smart services able to interact with these "smart objects" over the Internet and retrieve information associated with them or the context they exist in.

We need to make sure, as with all emerging technologies, that concerns like security and privacy issues are addressed accordingly. Enabling the Internet of Things and embedding intelligence into assets can benefit all of us, from faster product recalls to better health and safety monitoring aspects. It also means not only a dramatic increase of the sheer volume of information but also the level of detail, accuracy, and quality.

Our customer base, deliberately or forced by competition, wants and/or needs to change business processes. Emerging sensor and machine-to-machine technologies allow them to increase business value by optimizing existing and establishing new business processes.

It's hard to predict what the most widely used applications will be in the foreseeable future. RFID started out in the supply-chain area driven by mandates, but slowly makes its way to other application areas where the return-on-investment is even more prominent. In the short term, we see a lot of demand for sensor and M2M applications in the environmental, health, and safety industries, defense and security, and remote-asset management domain areas. But we are already working on making impact in other areas such as:

- Sales and service management, where new sales models and streamlined service models can be offered through M2M capabilities (e.g. upselling of features to an asset or a machine).
- Manufacturing and procurement, where compatibility of components in configurable assets needs to be ensured but still allow for last-minute changes, tracking further down in the

value chain "as-built" vs. "as-serviced" aspects.
- Design area, where compatibility information needs to be managed to streamline hardware and software development cycles.

M2M capabilities integrated into business context allow us to accomplish two things. First, existing business processes that manage service and maintenance from end to end can be optimized and automated. Since the data is directly sourced from the equipment, the monitoring, tracking, and tracing of goods and assets (and people) can be greatly enhanced. It allows greater service revenue and higher margins for the service provider, while at the same time reduces service and maintenance costs for the customer.

The second accomplishment is the enablement of a new generation of machine-to-business processes. In today's assets, the hardware aspect becomes more and more a commodity and the relevance and amount of software is increasing. Being able to automatically upgrade and version your assets, allow analytic pattern detection, or entitle them with new features and functions remotely is now possible thanks to increased device intelligence and ubiquitous connectivity.

These trends, in combination with enterprise service-oriented architectures, allow new business models for asset owners and operators. Data gathered over the complete lifecycle of physical assets (cradle-to-grave view) allows improvements in end-of-life processes like decommissioning, recycling, and disposal; mid-of-life processes like predictive and proactive maintenance; as well as improvements in the beginning-of-life phases by using the field data from comparable existing assets to make improvements in design specification or procurement.

In our research, we put emphasis on bidirectional data and process logic flow. Innovation in the M2M area needs to be driven into business context and processes. By treating "smart objects" as equal peers in the overall system landscape, enterprise service-oriented architectures provide the platform for centralized data processing of incoming data and also allow to propagate and push business logic and data out to these new "edges."

This decentralization of business processes not only allows local decision making in occasionally connected network environments but also improves scalability and performance by making sure only appropriate information is routed back to the enterprise system.

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Device Networking Is Everyone's Technology

One of the most important trends we see in the future of M2M is the move toward true autonomous control of networked equipment and a greater level of intelligence built into the machine infrastructure. As technology advances, end users will take advantage of programmable device servers. This is the next generation of M2M and the realization of fully automated, programmable remote-device management—the ultimate goal of machine connectivity.

Problems or actions that would normally be fixed by a technician or normally require human intervention will be handled automatically by networked equipment in realtime. Instead of a user having to

manually monitor and respond to a problem, the user can receive an email notifying them of the situation and corrective actions taken—no human intervention required.

Hand-in-hand with device autonomy will be the ability to use existing Web tools to automate reporting and centralize device management, leading to more efficient processes. With Web-server technology and mainstream protocols such as RSS, device servers can monitor attached equipment for relevant data. That data can then be transferred over the network in realtime to the end user, allowing hundreds of devices to be monitored from one RSS-enabled (really simple syndication) Web page. This will greatly simplify the task of equipment monitoring and reporting.

The availability of lower-cost networking components designed specifically for high-volume, cost-sensitive applications will also spur the next wave of M2M adoption. Device-networking technology will expand to a new class of applications such as entertainment, home automation, residential equipment service, and other segments where cost is a major barrier to adoption.

Device networking will soon become everyone's technology. The world of machine connectivity will be a reality for virtually any solution, in any market and as a result, substantially increase the value of the end device.

As more and more equipment is networked, companies will face challenges both in terms of aggregating data, turning that data into useful information, and accessing/managing the attached equipment through various distributed networks. In the future, we believe companies will turn to solutions that enable them to securely and reliably gather relevant data from "edge" equipment and seamlessly have this data merge with enterprise business processes. As this proliferation takes place, the ability to effectively manage those devices through a centralized point will be critical.

With the availability of these tools, we expected new trends to emerge—the ability to offer additional remote-managed services, and a spark of more specialized managed solution providers. This will open additional revenue streams and expand the possibility of increased asset uptime and customer maintenance. Overall this expanded M2M market can evolve into new business models for systems integrators, designers, and original-equipment manufacturers.

Mark Prowten is director of device networking solutions and applications for Lantronix Inc., www.lantronix.com, Irvine, Calif. He has more than 10 years of experience in device networking and is committed to bringing M2M into new industries.

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