

THE M2M REVOLUTION IS UPON US.

From its earliest roots as 'telemetry', machine-to-machine communications has grown to become not merely a new technology but an entirely new concept for doing business. And as our society's demand for mobility and access to data continues to grow, companies are finding ingenious new ways to integrate wireless connectivity into their devices.

Sprint has become an established leader in the machine-to-machine and embedded device marketplace, enabling partner solutions through its Open Device Initiative. To date, Sprint has certified hundreds of non-Sprint branded M2M devices for use on the Sprint network. And we believe that this is only the beginning.

But like all new things, there may be confusion on how to proceed for your business. So we offer the accompanying articles, each from a different point-of-view.

The first is a step-by-step guide to M2M deployment. Provided by M2M Magazine, it helps define the current state of best practices on the part of the M2M industry to help potential adopters to get their applications off the ground and take some of the complexity out of M2M.

The second is a complete case history of how just one innovative company partnered with Sprint to power their ideas, and become a leader in their industry.

For nearly a decade, Sprint has been bringing M2M solutions to life for companies large and small. We have the network, the experience, the people and the passion to bring your M2M inspiration to life

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STEP BY STEP: A GUIDE TO M2M TECHNOLOGY DEPLOYMENT

Wouldn't it be nice if M2M applications came with a user manual? A simple, straightforward, and preferably illustrated guide showing how to connect assets to networks and integrate the resulting machine data into business applications.

Unfortunately, such a document doesn't exist—but not for lack of trying. In 2005, a group within the telecom association CTIA known as the M2M WIC (Wireless Internet Caucus) began an ambitious "Best Practices" document designed to accelerate adoption and help companies bring solutions to market. It covered everything from activation and error handling to application design and technology selection. The document eventually grew to 21 pages and included input from many of the most knowledgeable people in the industry.

Eventually, though, the work had to be abandoned. It was admittedly an uphill battle from the beginning—with multiple competitors involved, it was only natural for contributors to promote their own perspectives and initiatives, and in some cases, withhold sensitive information.

Nevertheless, the exercise of trying to define best practices—not to mention the collective agreement that they are needed in the first place—awoke a concerted effort on the part of the M2M industry to make it easier for potential adopters to get their applications off

the ground and take some of the complexity out of M2M.

That's where we come in. As an independent resource for adopters, M2M magazine understands how important the group's work was and wants to pick up where it left off. To do that, we invited all of the current members of the consortium, now known as the M2M SIG (Special Interest Group), to each provide their own step-by-step guides to deployment of machine-to-machine technology. Armed with that collective input, we then filtered it down to its most important (and vendor-agnostic) elements.

"Wouldn't it be nice if M2M applications came with a user manual?"

First, we had to establish the proper framework. Specifically, in M2M, there's a fault line that divides two main types of adopters: companies networking the assets they make, and companies networking the assets they own. Those two groups have inherently different needs, so to give instructions on deploying M2M, you first have to take both into consideration.

Of course, you could also sub-divide those groups even further. There's wired versus wireless adoption, and within wireless there's wide-area versus local-area. All of these nuances result in a different set of best practices.

But at the end of the day, there are two sides of the fence: adopters and providers—and both need to understand M2M best practices... step by step.

M2M Customers

Adopters of machine-to-machine technology come in several forms, with each one representing its own link in technology value chain. M2M customers can be generally grouped into two main categories: adopters that network their own assets, and providers that network assets for other companies.

1) End Users:

Companies that use networked machines and other assets in their own operations.

2) Product

Manufacturers:

Companies that connect M2M technology to the products they make so products can be monitored at customer locations.

3) Developers:

Companies that make M2M hardware product such as terminals and external modems.

4) Integrators:

Companies that sell M2M systems, including application software, directly to end users.

5) Distributors:

Companies whose primary business is to sell other companies' M2M products/services to their customers.

Source: M2M magazine, 2007

 M2M Providers

 M2M Adopters

Deployment Steps

The following pages break down 12 of the most important steps involved in successfully deploying an M2M application. The list could have easily been twice as long and twice as complex, but to keep it as practical as possible, we've opted to focus on the most essential elements of deployment.

Out of the steps covered on the following pages, some pertain only to adopters and others only to providers, while most must be traversed by everyone deploying M2M. To show which ones pertain to which adopter types, we've included a color bar under each step.

For the purposes of this exercise, adopters are companies that use M2M technology to network their own assets, while providers are companies that network assets for their customers. For a guide to M2M adopter types, see the sidebar to the left.

Define Business Objectives

Every M2M deployment must begin with clearly defining business objectives. M2M is often extremely disruptive to existing business processes and cultural acumen, making it crucial that the entire enterprise is onboard.

"To ensure project focus, it is critical that the business objectives be understood," says Peter Stone, M2M SIG chairman and vice president

of corporate development, Aeris Communications Inc., www.aeris.net, San Jose, Calif. "This includes identifying the problem to be solved, the data to be communicated, the costs to be reduced, and the time to be saved. Most important is the identification of the existing business processes that will be affected and identifying the necessary changes. The definition of the business application is critical to ensure a quick and profitable deployment."

Customization Requirements

It wasn't very long ago that almost every M2M application was customized. As the industry matured, technology providers created off-the-shelf components that made it possible to streamline portions of the deployment. However, it's likely that in any medium-to-large-scale project some customization will be required.

"With an understanding of business requirements, a location-service provider can determine if the solution can be provided 'off the shelf' or if any customization or integration is required," says Steve Hudson, vice president of business development, Omnilink Systems Inc., www.omnilinksystems.com, Alpharetta, Ga. "Any customization may take the path of professional services to scope out capability gaps and deliver those on a schedule with deployment."

Budgeting and Bandwidth

M2M applications tend to be cost sensitive and open ended, which makes this step the one most likely to stall deployments. The most volatile aspect of creating a budget for M2M are data communications costs. As the SIG explains in its Best Practices document, “network services costs can be the most significant single recurring cost item for an M2M application. As a result, once the specific communication requirements of an application are determined, methods for optimizing communications cost are quite important to achieving the desired ROI (return on investment) and, in some cases, to determining the economic viability of the application.”

In an M2M application, communications cost takes the form of bandwidth, which is only affordable if the application uses just what it needs to not waste the resource. As far as the cost of deploying and managing M2M during its lifecycle, Patrick Sweeney, director of marketing, Mobile and M2M, Sierra Wireless Inc., www.sierrawireless.com, Richmond, B.C., advises, “Adopters need to ask: how much are we willing and able to spend on the deployment, and within what time period do we expect and need to see a return on investment?”

Select Communications Model

Today in M2M, too much is made of the choice of network communication. For most deployments, the choice is straightforward depending on the specific bandwidth and service requirements. Meanwhile, the hierarchy continues to evolve, beginning with wired versus wireless and then delving into wide-area versus local-area. Whatever the case, network service providers, including cellular operators and MVNOs (mobile virtual network operators), are becoming increasingly adept at meeting connectivity needs.

For the specific requirements of transmitting data, the network speed is often an afterthought. According to SIG Best Practices, “Bandwidth is only one—and not necessarily the most important—requirement in determining which network(s) and communications technologies to use. Other requirements may include realtime delivery of data, consistent performance, reliability of data delivery, acknowledgement of data delivery, and perhaps most important, availability of network coverage of the machines that need to communicate.”

Site Survey

If network coverage is the most important aspect when selecting a communications model, then this next step is vital for end users that will actually operate the assets being networked. A site survey consists of verifying that ample coverage is available where the machines will operate throughout the lifetime of the deployment. This feature is becoming a service-portfolio staple of M2M application providers and system integrators.

“A site survey needs to be conducted in order to determine network coverage, yield, power, and location accuracy,” Omnalink Systems’ Hudson says. “A site survey is warranted to select the network carrier and validate coverage for providing wireless transmission of data from a device to a backend server. Controlled testing won’t cover every variable, but should be included for every deployment to set proper expectations internally and with the customer on performance and cost.”

Hardware Selection

For end users, purchasing communications hardware for either wired or wireless connectivity has reached the plug-and-play stage. That’s because the burden of making the hardware ready for deployment falls on the application

and hardware providers. The development process for this group, by comparison, is infamous in M2M for having a steep and costly learning curve.

For end users, the greatest challenge may be figuring out which hardware options meet the requirements of the application. "Size, battery life requirements, sensor features, location technology, wireless network technology, and cost are all key factors in determining the ideal device for deployment," Hudson says. "There are hundreds of devices now to choose from and in many cases with similar feature functionality."

The selection process goes well beyond technology features. For example, as Hudson points out, developers should also weigh such things as the manufacturer's purchase-order process, volume discount schedule, lead time for orders, warranty and return material authorization process, willingness and ability to make firmware changes for business opportunities, general rapport with the company, and track record of defects in the market.

"Always seek referrals, because at the end of the day the device may be the only tangible piece of your solution, and the customer associates this with you," he says.

Hardware developers, meanwhile, have to consider a number of options for their communication modules. SIG recommends: "If you

can use a certified device without modification, then you may avoid the need to have your device certified. If your application requires features that are not available on certified devices, then your next approach would be to build the hardware to your specification and add wireless capability to that hardware. This is done by embedding a module into your device."

Perhaps the most important thing to keep in mind is choosing the right hardware comes down to far more than price alone.

"Purchase price matters, but project leads may one day regret choosing a unit savings of \$3 a piece only to find a certification or maintenance issue later on that ends up costing them \$100 per unit," says Brad Teeter, manager, field application engineering, Wavecom SA, www.wavecom.com, Cedex, France.

Integration and Testing

During the last two years, M2M technology providers have made substantial gains in the areas of integration and provisioning. Previously, these were two areas where the end user was either on its own, or a great deal of customized integration was required from an application provider or consulting firm. Now, with specialized application providers establishing best practices and even network service providers managing the go-live process for adopters, standard

procedures are emerging for integration and testing.

"Once the application components and system modifications are completed everything is integrated into a complete system," explains Aeris' Stone. "At this stage the data flow through the system is enabled to ensure connections and processes were properly designed and developed. The complete system is tested to ensure it is able to satisfy all of the business objectives. This includes full load and environmental testing and data auditing. At the completion of this stage, the system is fully functional and ready for deployment except for the completion of carrier approvals."

Certification

Unfortunately, the "completion of carrier approvals" remains more than just an afterthought. Certification refers to the process of getting wireless M2M products approved for operation on a cellular network.

"In North America, much is made of carrier device certification," says Macario Namie, director, product marketing, Jasper Wireless Inc., www.jasperwireless.com, Sunnyvale, Calif. "As you may have experienced, this process can be time consuming (6-12 weeks per carrier) and costly (up to \$10,000 per device per carrier). The prevailing theory is the carriers want device manufacturers to conform to their standards to reduce the risk of rogue devices running amok on their network."

M2M IN ACTION: Hardware development

Each type of M2M adopter has its own set of best practices. Here is an example of a typical deployment process for a hardware developer bringing a product to market for use on wireless networks., courtesy of Telit Wireless Solutions Inc., www.telit.com. Raleigh, N.C.

- 1) Select U.S. operator.
- 2) Test product in U.S. markets with module containing the correct operator approved software version.
- 3) Perform precertification lab testing.
- 4) Contact approved test house for quotes on FCC testing.
- 5) Select test house.
- 6) Open project with CTIA for approval.
- 7) Submit product samples and proper documentation to test house and CTIA for testing.
- 8) Complete FCC testing and receive approvals.
- 9) Present business case to operator.
- 10) Schedule time with the operator lab for testing of the integral application.
- 11) Wait for operator approval.
- 12) Start selling product in the U.S.

Source: M2M magazine, 2007

contingent of M2M technology providers trying to change the way companies view the certification process.

“What would happen, however, if the goal of certification shifted from one of defensive protection to one of performance optimization and partnership?” Namie asks. “Communications providers focused exclusively on the M2M market have begun to make this shift for device service providers all over the world by providing reports on how the application performs on the network. With highly detailed reports, comprehensive diagnostics, and usage scenario testing conducted by M2M experts, adopters are able to fine tune their applications to operate more efficiently and cost effectively.”

Still, certification remains an arduous step in the development process that needs to be allocated in the original budgeting process.

“To protect the integrity of their networks, each carrier may (and does) specify its own set of requirements before allowing a piece of equipment to activate on the network,” says Wavocom’s Teeter. “These vary widely between carriers and can be relatively simple or involved. Customers are wise to engage with their carrier early on to accurately understand the requirements, steps involved, and time and cost considerations necessary to gain access to the network.

“If the preceding steps of the process are well executed, the certification phase often goes smoothly with minor software tweaks. If not, customers may find themselves back to the drawing board at the beginning of the development stage.”

In addition to carrier approval, developers must also pass testing by two other groups as well.

“Integrated devices must complete FCC testing by an approved test house,” says Roger Dewey, president and CEO, Telit Americas, www.telit.com, Raleigh, N.C. “The amount of required testing will depend on the application. The module’s FCC ID can be reused by the customer application if certain requirements are met. Re-using the FCC ID can save time and money. The FCC test house will help determine what is required for the application and device.”

The remaining step in the certification process is to gain approval from a testing lab that handles specific requirements for wireless communication.

“Integrated devices must complete testing by an approved test house,” Dewey explains. “The exact amount of testing and cost is determined by an approved test house. Typical testing can include the following areas: audio interface testing; power interface testing; SIM interface testing; RF interface testing; MMI interface testing; and other testing including TRP/TIS radiated performance testing.”

Activation/ Provisioning

The activation and provisioning process can be one of the most simple steps in an M2M deployment. However, if the M2M equipment manufacturer has not paid attention to details, this simple step can easily become a pain point for the customer.

“Activation and provisioning tools should be available to create a seamless user experience for provisioning modems,” Stone says. “An easy-to-use activation wizard must be readily available for the customer in either CD format shipped with the device, or readily available for download on the manufacturer’s Website. Having activation software embedded in the M2M device is the ideal solution for activation/provisioning ease. With an embedded utility there is no software to download, and the M2M device truly become plug and play.

According to SIG, modems and wireless networks should support over-the-air activations. With OTASP (over-the-air service provisioning), little to no user intervention is required to provision a device for use on a carrier network.

“With automatic provisioning from your communications provider, many of the manual steps and activation delays can be eliminated,” Namie explains. “Automatic provisioning means device connectivity works out of the

box. There is no need to manually call the communications provider for activations and deactivations.

Choosing a communications provider that understands the needs of M2M application providers may allow you to conduct end-to-end device tests at the factory stage with no communications charges.”

Training

As a disruptive technology, M2M requires considerable investment on the part of adopters to adapt their business processes. For example, deploying an M2M remote monitoring application requires OEMs (original-equipment manufacturers) to switch from a reactive to a proactive service model. Additionally, managing machine data requires familiarity with tools and performance information that were previously unavailable.

“A significant amount of training could be necessary to ensure the customer receives optimal benefit from the investment,” Sweeney says. “To many customers, this could be a drastic new way of doing business. In many cases, an organization is switching to an M2M solution from manually collecting remote data. Proper training of field service employees is vital to ensure they fully understand new processes and procedures.”

Management and Maintenance

The M2M deployment process isn’t over with the go-live; management and maintenance continue for the full lifecycle of the project. Typical deployments are generally estimated at five years, and the technical challenges can vary depending on the location of the asset and the method of data communication.

“Since M2M applications must outlast many other cellular applications and are expected to operate in the field for five, 10, or even 15 years, long-term reliability and ongoing maintenance should be considered at the outset,” Teeter advises. “The probability of network upgrades, software revisions, and even needing added features over the course of 10 years must be nearly 100%. That said, features like DOTA (download over the air) can be a huge help. Of course, for it to work, the customer must have a way to remotely manage the upgrade process. Here it’s a good idea to partner with a vendor who can assist to minimize costs and manage the backend for you.”

That backend management includes data and physical security as well as firmware updates as the application requirements change.

“It is important to manage ongoing deployments by monitoring the status and operation of the devices and communication traffic,” Stone says. “This is especially important

for mission-critical applications where safety and security concerns are involved. This involves the utilization of a fully capable NOC (network operations center) that operates on a 24/7 basis and has a complete array of automated alarms, diagnostics, and tools for addressing issues throughout the public network ecosystem. As part of this step is both realtime and historical reporting on the application performance to allow for system review against original business goals, as well as opportunities for system improvement.”

Application Enhancement

Many adopters say once they've completed a single M2M deployment, additional projects can also be employed. This approach enables companies to make multiple improvements from a single M2M investment. For some companies, the same application/network infrastructure used for one application can also be used for several others. That's because the application infrastructure serves basically the same function regardless of the specific nature of the application.

Logistically speaking, technology providers are developing methods to help customers leverage their existing investment in device networking.

“Application enhancement is a periodic review of the system performance versus changes in business requirements, as well as technology, to determine if there are opportunities to define new goals for the business application,” Stone says.

As more companies find ways to profit from machine-to-machine technology, best practices will become more clearly defined. And as best practices become more clearly defined, more companies can find ways to profit from machine-to-machine technology. It's a cycle that continues to develop and build momentum, and in the process, accelerates adoption and helps companies bring solutions to market.

HOW DO YOU REDEFINE LOCATION-BASED SERVICES AND BECOME A LEADER IN SOCIAL IMPROVEMENT?

We spoke with Steve Hudson, Vice President of Business Development and Strategy at Omnilink to discuss how their pioneering advancements in tracking have helped them become the fastest growing company in their market space. Here's what Mr. Hudson had to say.



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How exactly would you define the business that you are in?

“Basically, Omnilink offers a comprehensive location tracking platform that allows consumers, businesses and government agencies to determine the location of people and assets. Most recently, Omnilink has been focused on extending its market-leading offender monitoring platform to provide consumers and businesses with the most robust, hardened location platform possible for the tracking of anything from a teenage driver to a multi-million dollar piece of construction equipment.”

What sparked your latest innovation in tracking and monitoring?

“When Omnilink first entered the location tracking market in 2004, the company was focused on providing a cost-effective way to address the rapid increase in the number of individuals being incarcerated and the cost of keeping those people in prison.

“It cost taxpayers up to \$100 or more a day to keep just one person in jail. There weren’t enough jails, and people didn’t typically get better when they were in jail. The rate of recidivism was actually getting worse.

“However, there were also a significant number of ‘low risk’ offenders who could be placed on home arrest or in alternative programs if the technology was available to give judges complete confidence that these individuals could be monitored successfully.

“One of the key issues that needed to be resolved was the ability to

“We knew that Sprint could give us access to reliable location-based tracking both indoors and out, and nobody else was opening that up.”

track an offender on a nationwide basis, both outside and inside of physical structures. When you’re talking about the need for a public safety solution, there’s no room for something that works when an individual is outdoors but it doesn’t work when they’re indoors.

“We knew that Sprint Wholesale could give us access to reliable location-based tracking both indoors and out, and nobody else was opening that up.

“By combining the location information available through Sprint with our robust software platform, we knew we could prove the advanced monitoring solution that would help meet all of the needs of the market.

“Recently, a wide range of markets have begun to look to ways to apply the same type of intensive, end-to-end monitoring solution to key issues such as loss prevention or child safety.”

Why did you choose to collaborate with Sprint?

“A lot of it had to do with the business model and Sprint’s ability to share our vision. Wind the clock back five years on telemetry solutions in general and non-handset-based devices were pretty much limited to the transportation vertical.

“And these fleet management and alarm-based systems companies were viewed in some ways as a hard market to understand. Mainly because the metric that all carriers looked at then — and still look at today — is average revenue per unit. So when solutions have a lower revenue-per-unit, like many telemetry products, most carriers tend to shy away from them. But Sprint recognized this as an up-and-coming market.

“They saw it as an avenue for growth and they were willing to take



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the risk on by creating a business model to support us – whereas other carriers were less willing to open up their location platforms for these industries.

“We saw a big opportunity with Sprint Wholesale because their network had the capacity we needed, they had the best technology for location-based services, and they viewed us as a different business model – not just another plan that has a lower ARPU. It really allowed us to do what we do. There was a technology and a business model catalyst there.”

Without a collaborative partner like Sprint, what would have been the outcome?

“Most of the carriers didn’t want to spend the time figuring the process out because their priorities were all around their voice and their core business.

“What’s interesting now is that all the major carriers are rallying around connections in this new machine-to-machine or dedicated tracking space. So Sprint had the vision five years ago that this was a market that they needed to help enable. Because of Sprint, we were able to accelerate our time to market with a competitive advantage..”

“We saw a big opportunity with Sprint Wholesale because their network had the capacity we needed, they had the best technology for location-based services, and they viewed us as a different business model – not just another plan that has a lower ARPU.”

What major obstacles did you need to overcome?

“There were solutions in the market that cobbled together multiple device types. For offender tracking, the leading example out there was wearing an ankle bracelet, plugging into a line modem.

“This solution would let the officers know if the person went outside the allowable area of that modem.

Unfortunately, it didn’t work because it would only be allowing law enforcement to know that the person left. If they’ve left and you lose visibility, that’s only marginally helpful.

“A partial fix to the problem was a separate GPS chip. When the person got home, it would download the next day and tell the officers where that person had been. ‘Very passive, very risky.’”

How did Omnilink and Sprint solve this problem?

“We actually brought in a device and certified it on the Sprint network using network cell tower assisted location information that Sprint provided commercially. That changed the game because we got the reliability that judges were demanding thanks to the availability of real-time information. Unlike earlier “passive” applications which could only report offender whereabouts after the fact, thanks to the Sprint network, it is now a ubiquitous, always-on solution. Judges now know exactly where offenders are 24/7.

“But being able to track people in home arrest in pre-trial and probation scenarios was just the tip of the iceberg in terms of making Omnilink a socially relevant company.



"Now we have solutions to control truancy with kids who are skipping school, which becomes a gateway crime and can lead to worse crimes. We're making a huge social difference, especially with gang members, sexual predators and the prevention of other socially damaging behavior.

"In addition, we're also providing the solution of record for the National Alzheimer Association, and we've made great strides in helping the Department of Homeland Security.

"By Sprint being open to our ideas and working with us, we were able to get into markets that otherwise would not have been feasible for us. We didn't have to go build a network ourselves."

What was it like partnering with Sprint?

"I can tell you how it went, it was Sprint that actually had a roll-out plan for their whole location-based services platform. The machine-to-machine component was really more of a beta kind of program.

"The partners that were involved, including Omnilink, understood that Sprint was going to learn at the same time Omnilink was going to learn. And that's not a typical thing for a large Fortune 100 company to actually take on. They weren't interested in saying let's wait until our processes are mature. They saw the market moving and they didn't

hesitate. It put us in business to be a platform enabler, which was really phenomenal for us early on.

"We're very connected with Sprint because we have the ability to take our business, which has done very well for them as we've expanded it into new market, and continually go to Sprint with new, out-of-the-box ideas and have a real conversation with people who truly care about helping us grow this market together.

"It's not about just putting an offer out there to a vendor. It's really about considering new ideas, and we act as a kind of lens to the market for Sprint to say, 'Hey, here's a new business model.' And they sincerely look at it.

"It's not about just getting access to a pipe and paying your bill every month. It's about a partnership that's helping us be a major player in this market."

How much has your company grown since your partnership?

"We have very quickly become the fastest-growing offender management company, and we've done it without dealing with a 20-year-old legacy of technology.

"As a start up organization, to actually make this kind of an impact has been phenomenal. We even took on customers that used to be our competitors in the industry.

"In fact, a particular company won a very large bid and their technology didn't work. They were a competitor

"...we've expanded it into new market, and continually go to Sprint with new, out-of-the-box ideas and have a real conversation with people who truly care about helping us grow this market together."

of ours in the industry using a GSM technology and came to us for help. That became a huge win for us with the Department of Homeland Security space.

"We went on to capture the position as the National Alzheimer Association's application and solution—which is an extremely socially relevant thing. It was a big success for us because we were going up against companies that were highly established.

"By having Sprint join us at the table, we were able to bring true indoor/outdoor location capabilities



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to the solution. This relationship continues to open doors in many different markets, solidifying our position as the leading end-to-end location platform for tracking people and valuable assets.”

What's next for Omnilink and Sprint?

“We'll continue to use our Sprint relationship to deliver location indoors and out. Then we'll provide a platform that allows anybody to add a device to our platform in a very simple way ... assign it to a person or an asset ... make it actionable by creating zones around allowable areas or points of interest, and provide alerts and reports. By having this platform, we combine multiple technologies of Sprint with other technologies and make it easy to use.

“For us, we're looking at the market from personal tracking/asset tracking, and there are a slew of other opportunities in front of us. As long as we can continue to keep it simple, I think we have the best chance of winning in our market space.”

For more information on Sprint Wholesale, visit www.PowerYourIdeas.com



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Ranked a top 100 company by M2M Magazine