LANTRONIX®

CONNECT SMART. DO MORE.

Enabling Business Intelligence with M2M:

An Introduction to Device Networking Solutions

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Introduction

The incredible advancements in the computer industry, networking technology and the Internet have forever changed the way we live and the way we do business. In this information age, there is an unprecedented level of communication and data collaboration. Despite these advancements, there remain literally billions of pieces of equipment in virtually every business sector — from inventory management and point-of-sale equipment to physical security and facilities management systems — that operate as stand-alone devices, without the ability to be accessed or controlled over a network or the Internet. Ironically, the majority of businesses that use these devices could benefit significantly by adding network intelligence to those products.

According to the Forrester report *Apps for Dynamic Collaboration*, 72% of firms with non-networked devices agree that collaboration is "critical to their product development success." To offer value in today's marketplace, these applications must be populated with up-to-the-minute, relevant, and accurate information to create a business intelligence that improves operations and the bottom line.

The challenge facing businesses with non-networked equipment lies in determining the most effective and affordable way to achieve this collaboration. In this regard, solutions built on networking technologies that follow open standards are currently prevailing. Conversely, rigid architectures and proprietary interfaces were identified by Forrester as factors that "limit interoperability and cramp collaboration." All agree, however, that without networking capabilities, suppliers of legacy (non-networked) devices are not only unable to participate in bids for new installations, but risk losing their loyal customer base to competitors who can provide more modern equipment.

Fortunately, the advent of machine-to-machine (M2M) communications coupled with advances in device-networking technology now provide a way to connect almost any peripheral device to a network or the Internet. By connecting isolated devices, the data in these individual pieces of equipment can be accessed, evaluated, shared, and utilized interactively in real time. It also means that managers can monitor, diagnose, and control devices and their performance from any location at any time.

Device networking is the technology that makes M2M possible. It enables serial-based devices throughout a facility to communicate over a Local Area Network/Wide Area Network (LAN/WAN) or the Internet, making communication with those devices instantly accessible from any computer anywhere.

M2M communication made possible through device networking technology streamlines operations, maximizes efficiency, reduces overhead, and improves service. Adding networking capability to previously isolated devices also makes them "future-ready," increasing their functionality and extending their shelf life and return on investment (ROI). It also makes "predictive maintenance" a reality, preventing downtime by using automated alerts and self-healing technology.

This paper provides an overview of M2M technology and its importance to the business world. It goes on to detail the benefits of device networking and discusses some of the challenges faced by organizations looking for solutions to network-enable both new and legacy equipment. This paper concludes with information about how Lantronix's complete line of wired and wireless networking solutions are perfectly suited to bring your products and your customers into the M2M age.

Why is M2M Happening Now?

In the 1980s, the demand for a personalized computing environment gave rise to the rapid proliferation of personal computers (PCs) in the workplace In the 1990s, cost-effective networks and open systems drove the need for connecting PCs to corporate networks. These factors, along with the need for real-time access to information, ushered in a new Information Era that witnessed an explosion in personal productivity, and became the cornerstone for connecting people to people and building the structure of the Internet.

The PC and information eras focused largely on making people more productive in the office and field. The technology built to support that goal primarily focused on facilitating the process of people interacting with other people. We are now poised at the next revolution — a revolution focused on the issues of how machines communicate with other machines and with people, how they are managed, and most importantly, how the world (people, businesses, and society) can process and utilize the information generated and collected in M2M interaction. This M2M revolution will connect and empower a huge variety of devices — including building and industrial automation equipment, medical devices, and products used in transportation, security systems, retail/POS equipment, IT/telecom, A/V equipment, power/utilities, and more.

On a broader scale, M2M will promote an environment where different types of devices can be connected through the Internet to share virtually any type of information, making for a seamless and automated flow of data and services and remote management and device control. Because M2M communications can exist in practically any machine, environment, and market, it holds the potential to reshuffle entire industry structures, creating a windfall for technology enablers in the arena and enabling an array of solutions that deliver new levels of “smart services” and commerce.

What are the Stakes?

The stakes in the evolving M2M era are enormous. Some estimate that nearly 50 billion devices around the world can benefit from M2M communications. That figure is nearly 10 times the number of people on Earth. According to ABI Research[1], these figures are attracting intense interest as businesses and equipment manufacturers begin to understand the multi-billion dollar potential they represent. It is predicted that through the end of the decade, the M2M market will increase by a staggering 40% annually. Interestingly, it is expected that only 5% of networked devices will be computers by the year 2010. Given the scale and scope of M2M opportunities, companies are beginning to position themselves for wide-scale adoption.

M2M is also leading to significant opportunities for technology companies. By network-enabling their products, equipment makers can now offer unprecedented levels of customer service and support at a fraction of the cost required for non-networked devices. With the ability to maintain a continuous tap into a device’s data stream, companies can now track and service a device through its entire lifecycle. This technology is redefining the scope of customer relationships and business operations, where companies can ensure better and more appropriate service to customers by anticipating and responding to problems as, or even before, they arise. Some of the most innovative companies have discovered new revenue-generating opportunities by connecting to their devices. In all, M2M has the potential to unleash productivity gains and economic growth unlike any previous technology wave.

[1] * **ABI Research** -- www.abiresearch.com

Companies are looking beyond the opportunities that will arise from new product sales, and aiming to capitalize on the benefits of being able to finally own customer relationships. By tracking a device through its lifetime, a company can acquire significant data and insight not only into its product's performance in different scenarios and stages, but also into the customer's needs and behaviors. This information can yield optimized services and solutions for customers, significant profit gains for the companies involved, and improved relationships between companies and their customers.

Who Will Benefit from M2M and Device Networking?

M2M holds tremendous potential for technology suppliers. Following the burst of the Internet bubble, which adversely affected technology suppliers and forced companies to tighten their belt on capital expenditures, M2M is poised to unleash a wave of productivity and efficiency and trigger a greatly-increased level of corporate investment. Companies that survived the "bubble years" can make significant gains by selling the hardware, software and services that will keep the M2M world running. Device manufacturers and service providers will profit from the new-found ability to keep devices up and running and to attend to customer needs in a highly competitive market. End users will benefit from knowing that their products and devices are always accessible and functioning properly.

The synergy derived by combining M2M technology with device networking adds an unprecedented level of intelligence to business, helping to reduce maintenance costs and open opportunities for additional revenue streams. With a typical equipment service call, for example, a customer has to call for a repair. The call is taken by a call center, logged into a database, sent to the service center and a technician is deployed — hopefully with the correct parts and equipment. With M2M device server technology, a problem can be automatically detected and often remotely diagnosed and repaired. If a service call is required, the technician leaves with the knowledge of exactly what is wrong and equipped with the proper parts and equipment to fix the problem.

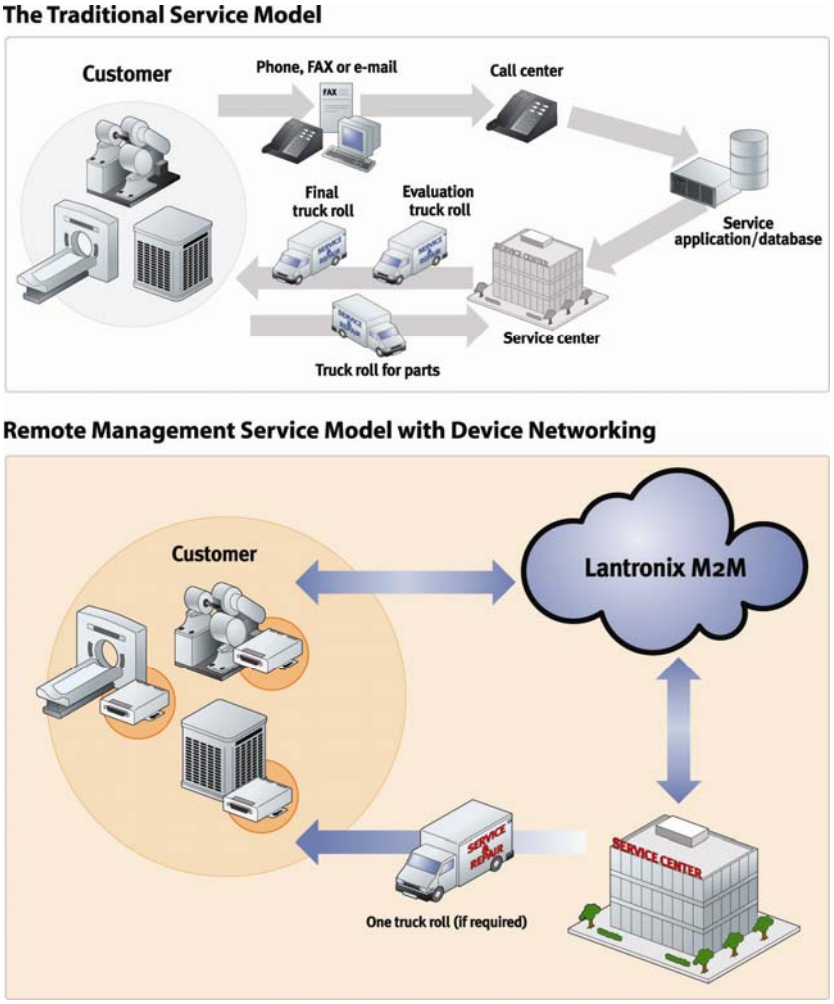

Figure 1. With M2M, Truck Rolls and Service Costs Can be Reduced Dramatically

This new level of intelligence and control delivers a wide range of tangible benefits. For example, imagine an electronic device such as a security system, commercial refrigeration unit, or medical diagnostic equipment with the technology to perform self-diagnosis and self-healing. Enabled with device networking technology, the equipment can connect to a network to essentially monitor itself and ensure that it's functioning properly. Often when something is wrong, a simple setting or switch adjustment is all that is required. When something irregular is noted, it can frequently be diagnosed and corrected over the network. This negates a time-consuming and potentially expensive service call for a trivial issue.

With this forward-thinking technology:

- Companies can be alerted to equipment failures before they happen, enabling you to save time and money with proactive maintenance.
- Unnecessary service calls can be eliminated.
- When service technicians are deployed, they leave the service center knowing exactly what needs to be repaired and have all the necessary equipment and parts to fix the problem.

- Service technicians in a central location can determine the status and operating conditions of remote equipment located anywhere in the world,
- Organizations can increase customer satisfaction, and even generate an additional revenue stream, through up-sale marketing offering remotely managed, value-added field service.

The following sections describe how large and small companies in various business sectors are using device networking to achieve their own real-world objectives.

Medical/Healthcare Applications

Device networking is particularly attractive to industries where certain functions are difficult to perform because of large areas, harsh operating conditions, or other restrictions. For example, networked applications are ideally suited for pharmaceutical applications, where an ultra-clean environment is required. Rather than risk contaminating the environment to monitor, control, and configure equipment — or go to great lengths and incur extra costs to avoid doing so — many of these tasks can be performed remotely with network-enabled equipment.

Device networking also opens up a whole new world of remote monitoring in hospitals, clinics, laboratories, doctor offices, and patient homes. With a network-enabled diagnostic device, a physician, nurse or laboratory technician can essentially "dial in" to the device via the network or the Internet — from anywhere at any time — and instantly get an update on a patient's condition.

Improving the data collection and dissemination process is another challenge in the medical arena. By connecting medial equipment directly to the network, information collected can be transmitted securely from the device to electronic medical records located virtually anywhere, such as the nurses' station, central laboratory, pharmacy, or even an off-site physician's office or home. With this capability, the time required for record keeping is reduced, and inaccuracies caused by handwritten information or erroneous transcription are eliminated. And because the information can be securely accessed locally or remotely by doctors and specialists, diagnosis time is reduced, offering the most valuable benefit of all — the potential to save lives.

Real-world example: A global health care company develops, manufactures, and markets blood gas analyzers, clinical chemistry, immuno diagnostics, diabetes, hematology and urinalysis systems for the central laboratory and point-of-care segments. One group of products the company has on the market is a range of blood gas analyzers, which offers laboratory-quality results on blood gasses, metabolites, electrolytes, and hemoglobin. These analyzers measure quickly and conveniently.

In a hospital setting, where the amount of time to test blood can determine the course of treatment, most testing is performed in a central lab. This involves taking the sample, rushing it to the lab, analyzing the sample, and returning the results to the Critical Care area. To improve turnaround time from diagnosis to treatment by expediting this process, hospitals are moving towards testing blood in the Critical Care area. While this process accelerates treatment, it creates challenges because the central lab still needs to know the testing process and results.

To address this problem, the company developed network-enabled equipment that lets hospital staff perform blood analysis at the point-of-care site to improve quality and speed, while allowing the central lab to review and control the results. Positioning instruments in near-patient test sites, such as the Emergency Room or the ICU, allows clinicians to receive test results much faster than before, while the network connectivity allows the central lab to retain control over the results.

Building Automation and Security Applications

Building-automation personnel are faced with a challenging mandate: improving efficiency while reducing energy and maintaining security. In the quest to create truly "Intelligent Buildings," facility managers need to enhance the functionality of many different systems, including HVAC, security and access control, without the expense of upgrading equipment.

Building device-networking capability into physical security systems adds an entirely new dimension of intelligence and dependability. For example, a network-enabled fire alarm system can continually monitor itself to ensure that everything is functioning correctly at all times. If any irregularity is detected, it can be diagnosed and often corrected remotely, reducing service calls and their related costs. Plus with remote, 24/7 access to each networked security device, users can always see what's going on and respond quickly.

Real-world example: A global company needed to connect security access-control equipment to the organization's LAN for real-time access from any computer on the network. Using device servers, the organization was able to deliver Internet Protocol (IP) connectivity to its access-control panel, badge I/O reader and cameras so they could all be accessed and managed remotely over the corporate network or the Internet. It also eliminated dependence on modems and long-distance telephone charges to transmit data in dial-up applications.

The solution worked so well for these serial devices that shortly after this implementation, the HVAC and climate-control systems were placed on the network to allow for remote management. By enabling the equipment to be monitored, managed, and in many cases repaired remotely, the solution facilitated more efficient use of onsite personnel resources. It also enabled the company to maximize its investment in existing legacy equipment, regardless of make or manufacturer.

Retail Applications

In an increasingly competitive environment, smart retailers are continually seeking new ways to improve productivity, reduce costs, and increase revenue. Device networking offers proven solutions in the retail sector. Examples include device servers for networked control and management of multimedia kiosks and self-service displays that employ audio, video, animation, and graphics to run Point of Sale (POS) and information applications. Device networking improves the timeliness and flow of information, leading to better overall customer satisfaction and increased profitability.

Real-world example: A major music chain set up networked kiosks in its many stores that provide real-time streaming of music videos, seasonal fashion displays, ticket-selling services, local Web access, on-line music sampling, and other content residing on a central server. The introduction of IP to the POS environment via device servers allowed the stores to integrate terminals and peripherals to its network for selling music and tickets. Device servers at each store enabled the kiosks to interface with the store's inventory system on the central server (just as if the kiosk was one of the desktop workstations behind the counter). In this way, the entire self-service transaction is managed at the kiosk level instead of waiting for a store attendant to process at a cashier or customer-service station, with the kiosks communicating in real-time with the local inventory system. The kiosks' only function is that of messenger: they serve as the information input devices for the customer and as the information output device for the central server. Minimizing human intervention improved transaction times, slashed costs and eliminated the chance for human error.

Industrial Automation Applications

Productivity improvements. Inventory management. Quality control. All are common challenges faced by virtually every manufacturing facility. From automotive to warehouse environments, the need to attach essential devices (new or legacy) such as PLCs, CNC/DNC equipment, process and quality control equipment, pump controllers, bar-code operator displays, scales and weighing stations, printers, machine-vision systems and many other types of manufacturing equipment is common. The migration of networking into automation (and automation into Ethernet) will have profound benefits for industrial automation applications.

Unfortunately, the serial devices used in today's plants and buildings communicate using a myriad of protocols, such as Modbus, Profibus, BACnet, EtherNet/IP, DF1, and many others. A limiting factor is the absence of any 100% reliable way to mix multiple protocols on a single physical wire. Differences between packet framing, timing, and the treatment of character sequences require each protocol to operate on its own wire. This limitation is a prime cause of the challenges posed to multi-vendor systems, as well as successive generations of products from a single-vendor.

Device networking enables manufacturers to achieve greater efficiency and productivity on the factory floor by providing centralized access and control of all types of industrial automation equipment. With device networking, a master or slave device can be polled using the specific non-networked industrial protocol tunneled through networked TCP/IP connections via a network or over the Internet from anywhere, any time. For example, a power meter or controller can be queried by Modbus/TCP, Profibus under IP, Foundation Fieldbus under IP (HSE), ControlNet/DeviceNet under IP (CIP), and many other protocols. In addition, multi-protocol slaves/servers no longer have to fully implement each protocol — only the portions required to read and write real-time data.

Real-world example: A major facility control center operated process-control equipment on a legacy network that was independent of the LAN. To network-enable all of the process control equipment at the support center would have required more than 1,500 feet of wiring and conduit spanning multiple buildings, both a costly and time-intensive project. Instead, wired and wireless device servers have been integrated to Ethernet-enable all of the equipment in the support center. This solution delivers significant time-savings, as over 500 PCs in the support center have access to real-time information as the process control equipment generates it. This solution also eliminates the need for a technician to patrol the floor and monitor each device individually, speeding response times if a failure occurs.

Identifying the Challenges of Network-Enabling Devices

Integrating serial devices into a network infrastructure offers distinct advantages for businesses that want to centralize their operations, overcome the distance limitations of standard serial communications and lower costs associated with hands-on administration of these devices. However, integrating serial communications into a network is challenging.

Prior to the advent of widespread networking, devices communicated using a standard serial RS-232 or RS-485 interface. Despite the many advancements of the computer industry, serial communications remain well established, with a large number of off-the-shelf and inexpensive hardware devices and software applications that continue to be designed without networking in mind.

Serial communication was designed to provide a direct connection between two devices using a point-to-point connection that is limited in cable length. It was never

designed for long-distance communications over a network, to be routed, or to go over the Internet. Similarly, Ethernet is not capable of directly transmitting serial data from one device to another. The challenges of enabling serial-Ethernet communications go well beyond the obvious differences in the physical and electrical interfaces. They extend to the protocols being communicated over these interfaces.

A simple example is an American trying to talk to someone in France. There are several ways that you can connect to someone in France (telephone, e-mail and fax machine) and these connections are the equivalent of RS-232, RS-485 and Ethernet. But just because you can call (connect with) someone in France does not mean that you can communicate. If the American does not speak French or the French person does not speak English, there may be a connection, but no real communication. The language that serial devices speak is more commonly know as a "protocol." So it takes both a connection and a protocol to communicate successfully.

Overcoming the Challenges

Fortunately, there is a simple and economical way to meet these challenges using device servers. Compact enough to fit almost anywhere, device servers and their embedded counterparts contain the necessary components for delivering complete network connectivity to virtually any kind of serial device. Device servers typically consist of a TCP/IP protocol stack, remote management features and serial and network interfaces.

Initially, the job of the device server may seem to be a straightforward and simple process of connecting serial and Ethernet interfaces. Dig a little deeper, however, and you'll find that the device server's job does not end at the serial-Ethernet interface, but includes the transporting of serial data across the Ethernet network — a task much broader and more complex than merely converting data between disparate interfaces.

To understand this complexity, it is important to realize that TCP/IP consists of a suite of transparent mechanisms. These transparent mechanisms methodically define how information moves from sender to destination. The following steps summarize the multifaceted procedure involved with transporting data across a TCP/IP network.

1. Data is divided into packets.
2. A destination address is added to the packet.
3. The packet is enclosed in an IP datagram.
4. A datagram header and trailer are inserted into the packet.
5. The packet is sent either directly to a destination or to a gateway.
6. The Network Interface layer of the TCP/IP protocol suite accepts the IP datagram and transmits it as a frame over a specific network (such as Ethernet).
7. The destination device receives the data and reassembles it.

The steps are basic, but there is a particular challenge when they are applied to serial data because serial data was never meant to be divided. It was designed to be transmitted as a continuous data stream going directly from one device to another. The intricacies associated with transporting serial data over a TCP/IP network become even more daunting when you consider that different devices have their own requirements for receiving data. For example:

- One device might have stringent timing constraints that require all data packets to be received within a particular timeframe.

- Another device might require a particular number of bytes in every message it receives.
- Still another device may not care about the number of bytes received, but require that the packet be complete and have a particular start or terminating character

In all three cases, if these expectations are not met, the data may be rendered unintelligible or even discarded by the destination device.

Device servers take the complexity out of transporting serial data over Ethernet. Without the need for additional software, configuration or customization, they execute the steps shown above to ensure that the serial data can be transported across the TCP/IP network and reassembled into meaningful information once it reaches its destination.

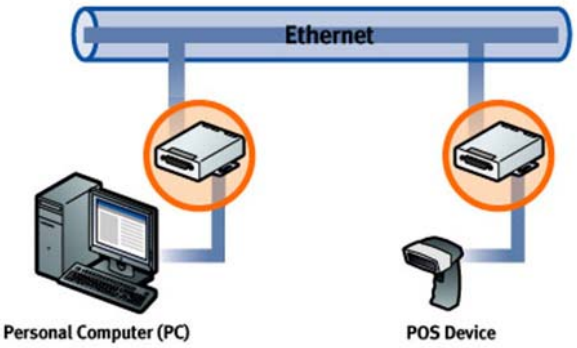

Figure 2. Serial Tunneling Extending the Serial Connection between a PC and a POS Device

Device Servers from Lantronix

Lantronix device servers enable machine-to-machine (M2M) communications between a computer and serial device or from one serial device to another over an Ethernet network or the Internet. The device server acts as an intermediary that connects to the serial interface (RS232, RS422, or RS485) of each piece of equipment and to the local network.

Using a method called serial tunneling, Lantronix device servers extend serial connections beyond the limited distances supported by RS232, RS422 or RS485 communications. Because it is not bound by typical point-to-point serial connection distance limitations, this ‘tunnel’ can extend across a facility or around the world.

With serial tunneling, each serial device is connected to its own device server. The device servers allow the attached serial devices to communicate with each other over a network or the Internet just as if they were connected to each other by a serial cable. The device servers work “behind the scenes,” encapsulating the serial data into TCP or UDP packets and transporting it over the network. The data flows from the serial port on one device server through the serial port of the second device server and to the connected equipment. This serial tunneling process can occur in both directions for bi-directional communication, creating a virtual serial connection that is transparent to most devices and application software.

Selecting the Right Device Server

Device-server technology is a highly technical and highly specialized field. Unless networking is your core competency, it is in the best interest of your organization to investigate the various off-the-shelf options for network-enabling either the existing equipment used in your business operations, or in the case of equipment manufacturers, the new products you will bring to market. The following sections provide tips for choosing the right device server solution.

Easy Setup and Management

A device server can have an impressive list of state-of-the-art features, but without a simple installation and straightforward configuration, users may be reluctant or unable to make the product work with their applications. Therefore, be sure the device server provides a simple out-of-box installation that lets you get the device up and running in a matter of minutes. It should also provide an intuitive, point-and-click graphical user interface (GUI) that lets you customize the device server to meet your requirements as quickly as possible. Device servers that provide a Web-based interface empower users to access the unit from any location using Web browsers. However, users who prefer typing to clicking may opt for a command-line interface (CLI). The GUI and CLI should be sufficiently intuitive to allow users to get the device server up and running in a matter of minutes, without having to learn another interface.

Going Wireless

In today's WiFi world, device networking has also evolved to the wireless network. The term "wireless network" refers to technology that allows two or more devices to communicate through the air using standard network protocols, without network cabling.

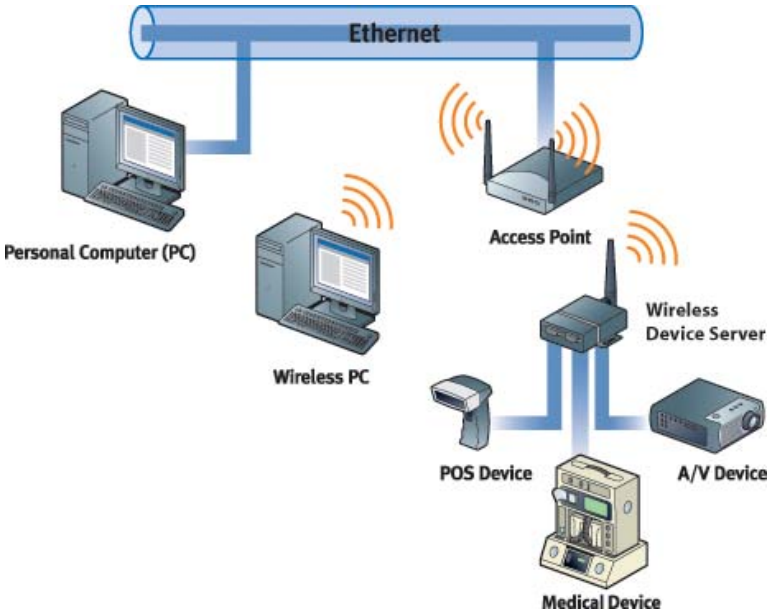

Figure 3. Devices Connected to the Network Via a Wireless Device Server

Strictly speaking, any technology that accomplishes this can be called wireless networking. The current meaning of the buzzword, however, generally refers to wireless LANs (WLANs). This technology, fueled by the emergence of standards such as IEEE 802.11, has produced a number of affordable wireless solutions that are growing in popularity with business, as well as sophisticated applications where network wiring is impossible, such as in medical, building automation, warehousing, or POS handheld equipment.

There are many advantages to cutting the cord and network-enabling your equipment wirelessly. A wireless network is perfect for places where it is impractical or inconvenient to connect devices with traditional Ethernet wiring. Even if your facility can accommodate cabling, wireless saves the cost of deploying cables in the first place.

Wireless is a great way to get a network connection to an infrequently used location. It also provides a whole new level of flexibility and mobility by allowing users of notebooks and PDAs to remain connected as they move un-tethered from one location to another.

Real-world example: For example, before WLANs, checking in a rental car could be a lengthy process involving paperwork at the checkout desk and manual data entry. Car-rental companies needed a real-time solution to help improve these processes. WLANs have made returning a car rental as easy as leaving your car with an attendant and walking away.

Attendants now commonly carry hand-held units that access your account information from a wired LAN through access points around each lot, and print a receipt on the spot after checking in the car. This solution not only expedites transactions, it also ensures that crucial customer information and signatures are not lost. Thrifty customers can also book car rentals using PDAs by downloading a free program from the company's web site.

Real-world example: For several years, Toronto's Air Canada Centre has been operating a WLAN to deliver in-seat services to as many as 7,000 premium seat-holders at sporting events. Order-takers use wireless ordering pads that tie into the company's traditional LAN in four pantries on the mezzanine. The signal is picked up by four transmitters in the bulkhead around the premium seating area and routed into the pantries. Runners pick up the orders there and serve them to the guests.

Wireless applications are particularly attractive to industries where certain functions are difficult to perform because of large areas, harsh operating conditions, or other restrictions. From automotive to warehouse environments, the need to attach essential devices (new or legacy) such as PLCs, CNC/DNC equipment, process and quality control equipment, pump controllers, barcode operator displays, scales and weighing stations, printers, machine vision systems, and many other types of manufacturing equipment is common. Wireless networks offer unique and flexible capabilities beyond the typical wired networks. Mobility, access to remote areas and easy deployment are benefits of wireless device network.

Real-world example: Prior to implementing a wireless solution, one company had adopted a complex procedure for measuring and reading the concentration of contaminants in water samples. This process involved transferring a signal from a water analyzer to a programmable logic controller to a human/machine interface (HMI). When reading this information, the opportunity for error increased as the signal passed through each separate device, with measurements so small that any degree of error can be detrimental. Going wireless enabled this company to measure contaminants directly at the source of the water sample. A device server

communicates directly with the HMI, reducing the risk for errors and providing information on the process in real time.

Selecting the Right Device Server Vendor

Selecting the right device-server vendor is as important — sometimes more important — than selecting the right device-server products. Given the number of choices in the market, selecting the right vendor can be a difficult task. The following sections describe factors to consider when selecting a vendor for your device-server requirements.

Client-First Philosophy

First and foremost, examine how your prospective vendor does business. Does the vendor understand your application, recognize your needs and put them first? You need a vendor that is aware of the issues and concerns you face. Look for a company with experience in your industry that is willing to listen to your needs and provide recommendations on creating a complete solution. Ask whether the vendor offers technical support, training and maintenance.

Breadth of Product and Vendor

Despite how crowded the industry has become, some companies have established themselves more firmly than others. Be sure the vendor will be able to provide you with support and quality solutions that will span the lifecycle of your products and your business as your needs change and grow. Ask your prospective vendor how long the company has been in business, how many clients it serves, how many devices they have network-enabled and how much the company has grown. Be sure the device server is covered under warranty and that the vendor will be able to provide you with support that will span the lifecycle of your products and grow with you your business needs change.

Experience Developing Custom Solutions

No two networks and applications are exactly alike. The combination of serial devices, protocols, transport layers, networks and operations-support systems is virtually unlimited. Similarly, factors such as costs and manufacturing can determine the type of device-server solution best suited for a particular user. A system integrator who is tying solutions together may want an external “box” solution that accelerates his time to market. An original equipment manufacturer (OEM) may prefer an embedded solution that can be integrated into the product design. Design engineers that want to conduct high-volume transactions at the lowest cost possible may prefer a chip solution. Look for a vendor that has the engineering resources, experience and wired and wireless products to develop a perfect-fit solution.

Dedicated to Device Networking

Is device networking the vendor's core business or just a small part of a different business? If a small part of another business, consider where their R&D, support and market focus will be. Are they actively investing in device networking? Selecting a vendor that is dedicated to and focused on device networking will result in continued support, active R&D investment and technology improvement.

Technical Support

Technical support is a crucial factor to be considered when purchasing device servers. You need to be confident that you will get the help they need, when they need it, so that your operation will not suffer. To ensure that you obtain the highest value for your device networking investment, choose a vendor that backs up its products with a staff of knowledgeable and reputable technical-support staff and offers a variety of convenient technical support options.

Stability in an Unstable Environment

Financial stability means more in the technology sector than ever before. Since the general shakeout of high-tech industries, many firms have discovered the true costs of dealing with companies that don't have a solid financial base. Be sure you're dealing with a company that can continue to support you for years ahead. Consider the history and stability of your prospective vendor.

How long has the company been in business? Who runs the company? Is the shape and direction of your vendor company determined by anonymous investor, or is it run by a board of directors and shareholders who have a stake in the company's direction and success? A company with a long-term, cohesive direction and a deep commitment to the networking industry will be there for you year after year.

Does the vendor overcome your objections by slashing prices? Being too willing to offer a bargain is a warning sign that a vendor can't meet all your needs. Networking is such a crucial capability; you can't afford to have anything less than complete security for your network. A solution that cannot fully protect your revenue-generating network is no bargain, no matter what the price.

Lantronix's Comprehensive Line of Device Server Solutions

Lantronix is a strong, stable, publicly held company dedicated and focused on device networking and M2M technology Market-leading companies in nearly every industry category rely on Lantronix technology to enable their products and equipment to communicate over the network and Internet. With thousands of customers worldwide, our reliable, proven solutions include external (box-level) and embedded (board, module and chip-level) device servers, wireless solutions and real-time software.

- **External "box" solutions** add Ethernet and IP network access to most any electronic device with a serial port (RS-232, RS-422/485) in a matter of minutes.
- **Embedded modules and board solutions** enable manufacturers to add device networking and Ethernet to their products quickly and easily, without the hassles typically associated with product development.
- **Wireless solutions** add wireless connectivity inside or out of the box.
- **Single chip solutions** offer small and economical ways for manufacturers to design network connectivity directly into new product designs.

With these solutions, Lantronix is uniquely qualified to lead you, your products and your customers into the M2M age. Moreover, the diversity of our products establishes a strategic and flexible migration path that maximizes your growth opportunities.

End-users can network-enable their existing serial devices in minutes, without incurring the time and expense of major system overhauls or upgrading equipment. OEMs can add networking capability to their products, often without any hardware or software changes to their existing devices. Systems integrators can enable any device with a serial port in a matter of minutes, at any point in the design cycle.

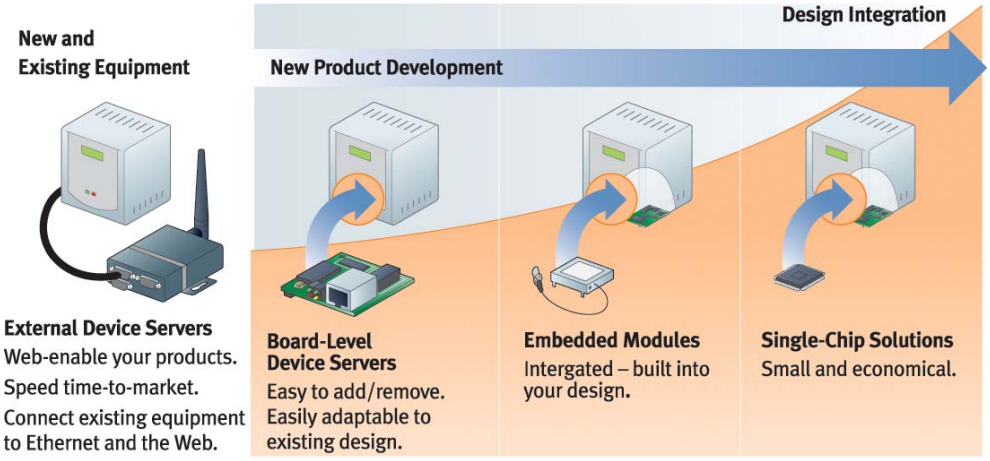

Figure 4. Lantronix's Family of Device Server Solutions

Simple Setup and Configuration

Lantronix's external device servers can be up and running in minutes, right out of the box, by connecting to the serial device and the network. With an intuitive Windows-/Web-based GUI interface or text-based command line interface, our device servers can be configured quickly and easily to manage virtually any piece of electronic equipment. The Windows-based configuration software and Web interface include online help that minimizes setup time and configuration questions.

For environments and applications that require additional fine-tuning, Lantronix's device servers provide in-depth configuration capabilities for optimizing operation and performance. For example, you can set up timing constraints, conduct character viewing, specify TCP packet sizes, and have packets sent or received according to the requirements of the attached device and the network.

Customization

The ultimate objective of the M2M environment is to move intelligence down the chain to the edge device, so the device can start making decisions on its own.

Out of the box, Lantronix device servers provide the physical connectivity, mechanisms and tools to transport serial data from an attached device to the network. Beyond that, our device servers provide customization using development tools that enable end-users and OEMs to customize according to their requirements and applications.

If a device server is used to remotely monitor and control temperature settings on an industrial refrigeration unit, for example, the Web pages might be designed with the look and feel of a thermostat that shows the current temperature. This thermostat might have buttons that can be clicked to perform functions such as raising or lowering the heat or air conditioning. A more complex example might have device servers monitoring the air-ventilation controls for individual thermostats in several rooms. In this scenario, the air conditioning for one room can turn on automatically when a certain temperature is reached, without affecting the other thermostats. This setup is especially useful when a particular room, such as a conference room, tends to get hotter than other rooms.

Robust Security

A top priority for all companies is to protect critical information, whether medical records, financial transactions, confidential communications, etc. However, any networked device can potentially provide access to unauthorized and unwarranted users. Therefore, protection of IT resources and secure connections are top concerns for companies today. A device server must effectively balance the need for easy, fast and convenient access to authorized users, while at the same time preventing access to unauthorized and keeping out intruders. To walk this balancing act, device servers with security features such as authentication and encryption are essential.

Lantronix device servers provide integrated security features that include authentication, encryption, and IP filtering to safely manage and access assets. For added security, the SecureBox™ SDS1100 and SDS2100 models provide enterprise-class security management feature a NIST-certified implementation of Advanced Encryption Standards (AES) as specified FIPS-197. AES is becoming more important in government facilities and any organization concerned with maintaining an elevated level of security.

Note:
For Lantronix AES-encrypted device servers to provide the highest level of security, they require that:

- the wireless (WEP/WPA) and AES data encryption be enabled and properly configured
- the device server be properly configured to disable all other communication methods

Com Port Redirection

With the proliferation of information in today's electronic world, businesses are more concerned than ever about protecting data from unwanted intrusion as it is transferred over a network or the Internet. Lantronix has addressed this critical requirement with Secure Com Port Redirector (SCPR). SCPR is a Windows-based application that creates a secure communications path over a network between the computer and electronic serial-based devices that are traditionally controlled via a communications (COM) port.

This unique and easy-to-manage product extends the functionality of COM port-based Windows applications. Using standard TCP/IP protocols and advanced encryption algorithms, SCPR maps "virtual COM Ports" to Lantronix device servers and encrypts the data at both ends of the communication. This enables COM-based software applications to communicate securely over a network or the Internet to remote serial devices. Those devices can then be managed from virtually anywhere without the threat of compromising data security. Sensitive information can be transmitted to and from remote equipment over the network or the Internet with the

confidence of the highest level of security. Additionally this enhanced communication from centralized applications to remote devices, without the need to modify the application or device, breathes new life into legacy equipment.

To take advantage of SCPR, device servers must support the Rijndael AES encryption. Currently, Lantronix's SecureBox™ family of external device servers and versions of XPort™ and Mico100 embedded solutions support this advanced Rijndael AES.

SCPR can also be used to create secure COM Port-based connections between PCs over Ethernet. With SCPR installed at each machine, PCs that had been "hard-connected" by serial cables for security purposes or to accommodate applications that only understood serial data can now communicate over an Ethernet network or the Internet.

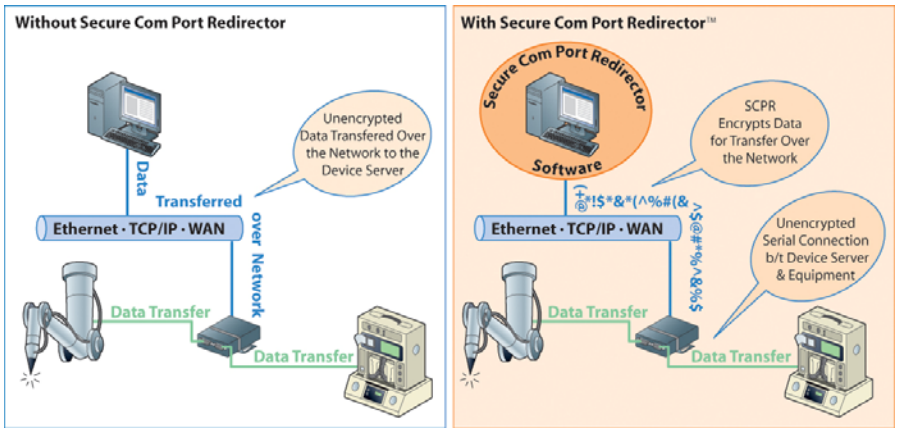

Figure 5. Example of Using Secure Com Port Redirector

XML Web Services

XML Web services are an evolving breed of modular software applications that will allow real-world applications to be located, distributed and invoked across a network or the Internet. Web services will further many fundamental goals of computing in general and device networking in particular. These goals include:

- Creating more interoperable computing assets, combined with a standards-based way to describe and share those assets.
- Achieving integration of disparate systems more quickly.
- Reducing the cost and complexity of not just integration, but also building new applications.
- Providing a faster way for businesses to roll out new goods and services that rely on enterprise computing assets.

For all these reasons, Web services are shaping up to be one of the hottest trends in information technology. When that level is reached, Lantronix device servers will be there to take advantage.

Technical Support

At Lantronix, we know that when a vendor touts “unparalleled technical support,” it has to mean something. The industry is competitive, and it's not good enough to offer vague platitudes and the same promises everyone else is making. For this reason, Lantronix maintains a staff of highly skilled networking specialists who possess in-depth knowledge about serial communications, different protocols and transport mechanisms, and how they relate when operating with a network. With this information, our staff can tell users whether they have all the bits and pieces to ensure hey get the most out of our products and their networks.

Support ranges from basic configuration and troubleshooting to guidance in creating custom Web pages and using configurable I/O pins to read or set triggers for unique signal indicators. Technical support is available to customers at no additional charge via phone, email and the Web. Lantronix also provides an online knowledge base, video-configuration tutorials, chat support and “live assist” — a virtual onsite systems engineer that allows secure, shared control of your personal computer.

Conclusion

Over time, device intelligence and connectivity have advanced from huge mainframes to mobile handheld devices like PDAs, cell phones, and cameras. This migration to more distributed forms of computing has unleashed greater productivity levels in the economy. The next sensible step in this evolution is to deliver the same intelligence and connectivity to everyday machines. With M2M, this step is already a reality.

M2M represents an unprecedented level of networking, communications, and content sharing. M2M provides the opportunity for new forms of services and applications to make our lives and our businesses more productive and fulfilled. With the spread of M2M technology across myriad environments, M2M applications are rapidly migrating from being isolated examples to mainstream applications.

At the core of M2M is the realization that a single device becomes more useful when networked with other equipment. A good example of this is the telephone, a device that has very limited use if only you and a friend have one. If an entire city is on the system, however, the telephone becomes much more useful. If the whole world is connected, the utility of the system becomes colossal.

We have now reached the point where the value of each piece of equipment has become inexorably connected to its networkability. As M2M spurs the growth of networked devices, and as users reach critical mass, the addition of each additional device to the network will increase the incremental benefit of both the individual device and the network.

As the M2M infrastructure and business models converge with network-enabled devices to solve real business problems, Lantronix device servers will be there to provide the collaborative link that empowers companies and people to operate in a world where they have the freedom and ability to access information and assets at any time and from anywhere.

Appendix A: Sample Applications Suited for Lantronix Products

Lantronix device networking products apply to virtually any networking scenario imaginable. With literally millions of products deployed worldwide, our present installations cover the following applications and many more. We're confident that Lantronix has the perfect fit for yours.

Table 1. Sample Applications Suited for Lantronix Products

Security

- Access Control Panels
- Fire Control Panels
- Biometrics
- Time and Attendance Clocks
- Security Screeners
- Surveillance Cameras
- Government Facilities

Industrial Automation

- Programmable Controllers (PLCs)
- Process Controllers
- Motor Drive Controllers
- Human Machine Interfaces
- Robots

Building Automation

- Building Access Controls
- HVAC Controls
- Lighting Controllers
- Elevators
- Irrigation

Professional Audio Visual / Signage

- Video Projectors
- Movie Theater Projectors
- Scrolling Signs
- In-store Video Displays
- Pro Audio Musical Instruments and Recording Equipment

Medical

- Blood Pressure Monitors
- Patient Monitoring Devices
- Blood Chemistry Analyzers
- Glucose Analyzers
- CAT Scanning Equipment
- Ventilators
- EKGs
- X-Ray Equipment
- Breathalyzers

Power/Utilities

- Utility Meters (Electrical, Gas and Water)
- Distribution Substations
- Power Adapters
- Battery Monitors
- Power Quality Equipment
- Uninterruptible Power Supplies

Retail/Point of Sale

- Point of Sale (POS) Terminals
- RFID Readers
- Barcode Scanners
- Cash Registers
- Kiosks/Concessions
- Vending Machines

Transportation

- Digital Signage on Freeways
- Traffic Control
- Automotive
- Railway Equipment

IT/Telecommunications

- IT Equipment
- Printers
- IP Phone Systems
- Storage Management Controllers