
Radio Frequency Identification:

How Microsoft is bringing RFID
to the world and the one little company
they're relying on to do it

Trinity Investment Research

What is RFID?

Radio Frequency Identification (RFID) is defined as an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is a small object that can be attached to or incorporated into a product, animal, or person. RFID tags contain (silicon chips) and antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver. Passive tags require no internal power source, whereas active tags require a power source.

RFID is expected to be a \$12 billion market by 2010, up from \$1.03 billion at the end of 2003, according to market-research firm Venture Development and brokerage house Robert W. Baird.

The History of RFID

RFID was first developed during World War II by the British Royal Air Force in order to distinguish enemy aircraft from friendly aircraft. Today, it is revolutionizing the way we live our lives, from the supply chain all the way to the consumer. With companies like Microsoft and Wal-Mart on the front lines of innovation and application, RFID is the future.

It wasn't until the 1990s that radio frequency technology gained national attention. IBM engineers developed a patent real world application for RFID called, ultra-high-frequency (UHF.) Working with Wal-Mart, IBM focused on bringing this technology to the retail supply chain. Unfortunately IBM fell into some financial trouble and the program was sold to Intermec, a bar code system provider. From that point the technology was brushed off and put into the dark.

It regained momentum, in 1999, when Wal-Mart, teaming up with Gillette and the U.K. based supermarket chain Tesco, tested specifically designed shelves (smart shelves), that allow for real time tracking of inventory levels. Piloted in a Wal-Mart store in Brockton, Mass., shelves of Gillette razors have been equipped with technology that reads radio frequency waves emitted by microchips in millions of Gillette razors and other products.

Wal-Mart says the RFID chips are only used to track merchandise in store and will remove the tags when the items are purchased.

Applications

The purpose of the RFID systems is to allow data to be transmitted by a portable device, called a tag, which is read by a RFID reader then processed, according to the particular application. This data is then transmitted by the tag and can provide specific identification, information and location about the product; such as price and date of purchase.

The key feature is the ability of RFID-tagged items to be tracked instantly anywhere around the world in real-time, provided there is a reader in range. There are two types of readers; passive and active. A passive reader can read items up to 33 feet away. While an active reader can read up to 330 feet. This is obviously far superior to bar code technology, where the item has to be placed in front of a scanner within a few inches.

In a typical RFID system, individual objects are equipped with a small, inexpensive tag that contains a transponder with a digital memory chip that is assigned a unique electronic product code. The interrogator, an antenna packaged with a transceiver and decoder, emits a signal activating the RFID tag so it can read and write data to it. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.

RFID systems enable the use of interactive programs that give business owners the ability to have real-time access to inventory information, more importantly, a broader and more in depth view of customer buying habits. With products embedded with RFID tags that constantly transmit data ranging from the electronic product code (EPC) identifier, to information about the products itself, businesses can link the product information from the data processing system to the customer. This information is far more advanced than the traditional use of bar code scanning or even customer loyalty cards, giving

valuable insight into customer habits that until now have been off limits.

The Market

Currently RFID tags are not common in consumer products because the cost is too high, roughly 30 cents a piece. But with the push by companies looking for highly developed means to track their products and enhanced methods in consumer profiling, the price of tags is expected to drop to as little as 3 cents in the next three years.

To the untrained eye the most common application of RFID technology is in state toll booths. In New York state for example, 'EZ-pass' allows for drivers to drive through the toll station without stopping to pay a cashier. In your car there is a RFID enabled device that you place on your windshield, so when you drive through the toll RFID readers record into a database your transaction.

Companies and Governments around the world have been testing RFID technology, using a wide range of applications to enhance their systems. In Singapore, Alexandra Hospital began a new tracking system mandated by their accident and emergency (A&E) department in wake of the SARS scare. Under the system RFID chips will be embedded in ID cards given to all staff and visitors entering the hospital. The card is read by sensors positioned in the ceiling and records exactly when a person enters or leaves a department, and stores the information in a Computer for up to 21 days. The technology enables health care officials to keep tabs on personnel and visitors in case they are later diagnosed with SARS; the hospital has concrete records of individuals whom they have been in contact with and can immediately isolate those people.

RFID technology has been utilized in payments systems since the late-90s. In 1997 Exxon Mobile developed a wireless payment application (Speedpass). Since inception, over six million customers have utilized the system at 7,500 Speedpass-enabled locations. Other companies have caught on, incorporating contact-less card technology, with the fear that the magnetic strip on the back of your credit card could become extinct in the next decade. The RFID chip is placed on your card, instead of a magnetic strip, and has proven to be more time efficient to the customer. All they have to do is

place their card within a few inches of a RFID reader and their sale will be completed automatically with no signature required.

MasterCard has developed their "PayPass" system and rolled out production in certain states in conjunction with Chase, MBNA, Citibank, HSBC, Citizen's Bank, and Key Bank, using special RFID credit and debit cards. The cards can be used at any location with applicable RFID technology. American express has their own "ExpressPay" system in place on their new blue and clear cards. As well as Visa who has RFID enabled systems (sans-cash and sans-swipe). Visa's new system allows for customers to pay for small items, such as fast food, convenient store items, and even movie tickets by waiving their card within 4 inches of a RFID enabled terminal.

USA Technologies has taken RFID application one step further with their E-port generation six, the worlds first cashless transaction vending machine. G6 utilizes both magnetic strip and tap and go technology. You can use American Express' ExpressPay, MasterCard's PayPass and Visa's contact-less cards.

For years RFID chips have been implanted in animals for a variety of projects. One of the most common applications is used with domestic animals. For instance, owners want to ensure that if they ever lose their pet that the animal can be traced back to the owner. God forbid you lose your precious cat Fluffy and he turns up in an animal shelter with no tag around its neck; the animal shelter can scan the RFID chip embedded in the animal and trace it back to its origin. In a more practical use, RFID chips have been used to track cattle and other livestock across the country. With the discovery of bovine spongiform encephalopathy (BSE), better known as 'mad cow' disease, there has been a great deal of interest in RFID technology. The main goal of the program is to protect the health of these animals, and in any instance an animal contracts (BSE), or any other disease, they can be traced back to its origin.

The future is now. The FDA has just approved the use of VeriChip's implantable RFID chips for humans. Produced by Applied Digit-a company based out of Delray Beach, Florida, The 11-millimeter RFID tags are implanted in the

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fatty tissue of the upper arm. There is a lot of controversy surrounding the use in humans, but it is important to weigh the positives against the negatives in this situation. One argument is that the use of RFID implantable chips will save lives. A doctor can scan the RFID chip implanted underneath the skin of a patient and gain access to their medical history. And there is no doubt that this critical information, when time is of the essence, will save lives, especially, if a patient is seriously injured. On the other hand, some of these same advances create a new potential for the invasion of consumer privacy. With RFID readers becoming more advanced it is likely that the information stored on the RFID tags can be viewed by unauthorized people, who have RFID readers. This information can, in fact, be used to gain valuable insight into a person's history. The responsible development and deployment of RFID technology can enable its many benefits, while justifying or eliminating these difficulties.

The Healthcare sector looks to RFID technology to improve the operational safety of patients. The healthcare industry contributes around \$1.7 trillion to the U.S. economy. In 2004 the North American market for prescription drugs accounted for 47% of the global market, which was nearly half a trillion dollars. With roughly 10 billion units being shipped from drug manufacturers to doctors, hospitals and pharmacies in the United States and Europe alone, there is tremendous upside potential for RFID applications in the pharmaceutical industry. Investments by pharmaceutical companies in RFID technology is expected to reach \$2.3 billion by 2011.

There are nearly 100,000 fatalities every year as a result of errors in dispensing medicine and counterfeiting of prescription drugs. An efficient and well monitored supply line is crucial for the pharmaceutical industry. The FDA has issued guidelines and recommendations for using RFID to prevent the counterfeiting of prescription drugs in America. Counterfeiting of drugs is a billion dollar a year industry and is anticipated to be worth a whopping \$75 billion by 2010.

The pharmaceutical industry has also taken initiative to implement item-level tagging because pharmaceutical products have a much higher value

compared to the cost of the tags. Pfizer began tagging all packages containing Viagra at the end of 2005. Viagra is one of the most popular drugs targeted by counterfeiters. Wal-Mart has mandated that all class II narcotics be tagged with RFID chips, and has set a standard in the industry, which most pharmaceutical companies are soon to follow. Drug supplier Purdue Pharma was the first company to comply with Wal-Mart in respect to the painkiller OxyContin, which they manufacture.

The Chinese market is also driven by the standard set forth by Wal-Mart and is expected to supply over 5 trillion tags, annually, to Wal-Mart.

In other industries, RFID is a major competitive advantage, especially in the shipping industry. Having the technology to track, in real-time, your trucks and merchandise, not only will increase time efficiency, but will generate an overall better quality of service. With an emphasis on mobile technology RFID applications fall into four categories by fleet owners; basic driver information, value-added information collection, automatic vehicle location, and vehicle sensors. Fleet owners believe RFID technology gives them a better return on investment (ROI) than traditional commercial applications.

In a report released by Venture Development Corp., the global RFID market in the automotive industry sector reached \$312 million in 2005, and will experience an annual growth rate of 20% through 2010. Revenue shipments will exceed \$765 million within five years. In short, RFID application will affect every aspect of the automotive industry from support supply chains, to showroom floor and asset management. Hardware accounts for nearly 56% of the automotive RFID market.

One of the biggest supporters of radio frequency technology is the Department of Defense (DOD). Using RFID for over a decade, the DOD moves items worth around \$29 billion every year in order to facilitate its operations around the world. They maintain an inventory of \$80.5 billion. In June

2004, the DOD outlined a mandate for passive RFID in which its objective was to add visibility to the DOD logistics operations worldwide. The DOD looks upon RFID as a tool to help in the reliable delivery of the items to the right place and to provide relevant data to management, so that they make informed decisions.

It is important to note that the logistics of a civilian supply chain and that of a military supply chain are different in some respects. Since war can erupt anytime and anywhere, the destination of products in a military supply chain is not fixed, rather it keeps changing. It is imperative to have accurate, real-time, information so the commanders on the ground can make informed decisions. The U.S. military has invested over \$100 million in RFID technology.

The DOD has announced they will supply RFID tags to all medical supplies along the supply chain in hopes it will improve logistic efficiency within all branches of the U.S. military. By 2007, the DOD will require suppliers to apply RFID tags to all cases, pallets and all packages shipped to any DOD location. According to Defense Link News; the 'RFID in hospital' market will boom to \$8.8 billion by 2010. It will be segmented into four categories: hardware and software integration (\$1.3 billion); infrastructure support for RFID enablement-Wireless networks (\$1.3 billion); enterprise related software (\$1.4 billion); and Hospital connectivity (\$4.8 billion).

Consumer packaged goods (CPG) look upon RFID as a means to improve the visibility of goods in the supply chain, and thereby improving inventory management. In contrast, retailers are keen to utilize RFID to reduce out-of-stock and shrinkage problems. According to the FDA, as much as 20% of food items have to be discarded due to spoilage. Item-level tagging helps to locate the causes and the points in a supply chain where spoilage occurs. This benefits the company by effectively reducing their margins.

Wal-Mart has revolutionized the RFID industry by setting the standard for future applications. According to Lee Scott, president and CEO of Wal-Mart, RFID will help to improve visibility in the supply chain, which will reduce inventory costs by \$1 billion. According to analyst

Erwin De Spielgelere, Wal-Mart could save up to \$8.35 billion. The elimination of manual scanning at the pallet-level will result in labor savings worth \$6.7 billion; reduction on out-of-stock items will save \$600 million; \$575 million will be saved due to reducing shrinkage, all of which, in turn, lead to better administration.

With the realization that major companies like Wal-Mart mandating this technology. Microsoft had created a platform where partners can create RFID solutions. The thousands of smaller suppliers Wal-Mart has will apply RFID technology to their supply chains, thus creating a need for an affordable 'out-of-the-box' RFID solution that they can plug into their systems. Microsoft is providing that solution. Microsoft is also working to add RFID to its backend so that other companies can develop services for larger firms. Microsoft's strategy is to focus on the software infrastructure that will sit between the RFID readers and enterprise applications.

Microsoft has identified three areas where it will provide infrastructure elements built around the Windows CE operating system; SQL Server Accelerator for Business Intelligence (data-mining software used with SQL database) and BizTalk, a middleware that uses the extensive markup language (XML) to enable incompatible software applications to share data.

They have deployed various types of RFID devices: dock door readers, handheld readers, and RFID controllers. Microsoft's program manager for industry solutions, Javed Sikander says, "they require better solutions to manage these devices," "RFID readers [from different vendors] function differently and communicate differently, so there is no single way to manage them as network devices, no one way to turn them on and off, check their health and so on." The second part of Microsoft's strategy is to provide middleware that can take data feeds from a reader, collect the data, do data smoothing and filtering, and then store the data. This will provide a level of intelligence by interpreting the data in basic ways, such as determining which applications to route data to.

To help companies manage this real-time data, Microsoft may offer a new server software

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that will enable companies to route RFID data to the real-time database and business applications. "This piece of software will have an extraction layer that allows you to communicate with all the readers, gather the data, do the product lookups, and stage the data in SQL databases," Sikander says. "We are engaged in pilots with customers using our technology and have seen some interesting results."

An Industry Leader

I.D. Systems, Inc. (NASDAQ: IDSY) has formed a strategic certified partnership with Microsoft. This partnership exemplifies I.D. Systems ability to lead the industry in the development of RFID technology, along with Microsoft's ongoing commitment to the success of their partnerships worldwide.

"Microsoft Partner status reflects our expertise in crafting innovative software solutions, as well as hardware systems, for RFID-based mobile asset management," said Joey Pinzon, I.D. Systems' vice president of software solutions. "In addition, as a Certified Microsoft Partner, we can pass along the full power of Microsoft's support for the SQL Server database platform to our customers. We are proud that Microsoft recognizes our database technology as an industry best practice."

Together they have formed a unique blend of I.D. Systems' patented wireless access, net equipment tracking, and management systems with Microsoft's innovative and powerful SQL server database engine to provide customers with information about material handling, vehicle and other industrial equipment. I.D. Systems works with the U.S government and some of the world's largest corporations to provide cost efficient, time saving tools that will increase productivity, reduce cost and ensure safety across the board.

I.D. Systems is a leading provider of advanced wireless solutions for tracking and managing enterprise assets. The company's patented RF (radio frequency) technology and proprietary software allow automated, intelligent, cost-effective monitoring and analysis of virtually anything; including vehicles,

materials, and people- in real time. The Company's principal activities are to design, develop and produce wireless monitoring and tracking products for securing enterprise assets.

The Company utilizes radio-frequency-based system and Internet-based data management systems in its solutions. The products are designed to enable users to reduce operating costs, increase security, improve safety, enhance service and increase profits. The main components of the wireless monitoring and tracking system are miniature computers called asset communicators that are attached to the objects that are being tracked or monitored. The products are focused to monitor, control and manage mobile assets such as industrial vehicles, rental vehicle fleets, railcars, packages and letters.

I.D. Systems was ranked as number 147 in the 2005 Deloitte Technology Fast 500 List. The ranking is based on percentage revenue growth over five years (fiscal year revenues 2001-2004.) Their revenue growth over the last five years was an impressive 1,354%.

In accordance with I.D. Systems web page; Here are some of their solutions:

Material handling: *Wireless fleet management for material handling of vehicles focuses on the cost and safety issues associated with handling forklifts, tow tractors, and other material handling equipment. The system calculates fleet utilization by monitoring each vehicles movement, who is driving, where, when, and how long. Productivity is measured through historical data and identifies which vehicles are being underutilized for potential elimination. Wireless Asset Net system also ensures compliance with vehicle safety regulations and significantly enhances fleet security management by providing active driver access control, automated electronic vehicle inspection checklists, and impact sensors to establish driver accountability and reduce the costs of abusive driving.*

Airport Equipment: *I.D. Systems, Inc. has patented a driver tracking and control system that prevents unauthorized use of aircraft ground support equipment. With*

the company's technology, anyone who wishes to operate a vehicle that services aircraft must present an access control ID badge and, optionally, enter a PIN code. Only if the person is authorized for that particular vehicle, in that particular area of the airport, at that particular time of day, will they be able to start the vehicle. The technology also allows equipment to be instantly deactivated via radio frequency.

Rental Vehicle Fleet: In a pilot system with Avis Rent A Car System, Inc., in which the system automatically uploaded mileage and fuel data from rental vehicles and demonstrated a significant impact on both rental revenues and the quality of customer service. With two major benefits, one: by accurately reporting fuel levels car rental companies can increase fuel revenues on average by \$2 per rental. Two: The average car return transaction, specifically customer wait time, was reduced by 5 seconds. This allows for rental companies to devote more time to vehicle inspection and could ultimately reduce the number of staff needed at each location.

Railcar Tracking: The tracking and management system is unique for the railcar industry because it communicates data from an entire train for railcars to one satellite link compared to the traditional system which relies in satellite transmitters on every railcar. It generates significant savings in ongoing communications costs by providing more information than the railroads' existing railcar tracking system, which cannot provide data in real time and relies on railcars to be moving past certain mileposts in order to obtain location information. Working with Union Pacific Railroad and FMC Corporation, I.D. Systems has successfully completed a real-time railcar tracking pilot, in which the integration of web-based data management with GPS location tracking, radio frequency communications, and cellular communications to report real-time location and status of trains carrying hazardous, high-value chemicals. The benefits

include on-demand train location updates to enable more accurate planning throughout the railroad supply chain.

In accordance with I.D. Systems webpage; I.D. Systems products:

Vehicle Hardware has a variety of user interface and mounting options available for any vehicle model. It can track the whereabouts and actions of employees and can limit their ability to go in areas where they are not supposed to be, increasing time efficiency and productivity.

Every I.D. System requires at least one gateway to link the mobile assets being monitored with management's computer network. Used in facilities where assets are being tracked and monitored it has an extended communications range up to 1,000 feet. It can accommodate an unlimited number of wireless communicators, and is constantly uploading/downloading data to and from the system components.

Every system is set up with (ARDCS) Automated Remote Distribution & Collection Software, installed on any Windows 2000/NT/XP computer; it has integrated communications/diagnostics/database server software that automatically processes data between RF system components and the regional database.

I.D. Systems client software, referred to as the Wireless Asset Net™ (WAN) Console, provides an instinctive Windows-based interface with an unlimited number of consoles that can be used on the networks. It loads digital full scale views of the facility that in real time shows the location/status/inventory of vehicles in each area of the facility. Historical data can be analyzed and reviewed with a number of different criteria and play modes.

I.D. Systems has deployed web-based software for real-time railcar tracking and is currently integrating a web-based version of its Wireless Asset Net system for managing

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fleets of industrial vehicles, such as forklifts and aircraft ground support equipment.

I.D. Systems has formed partnerships with industry leaders to provide effective and innovative products and solutions, including; Microsoft, Wal-Mart, Ford Motors, U.S. Postal Service, Transportation Security Administration, Boeing, Kimberly-Clark, Kraft Foods, Johnson & Johnson, Gillette, and Coors to name a few.

Wal-Mart has entered into an agreement with I.D. Systems to deploy their patented wireless asset net industrial vehicle management system at a distribution center in Texas. This pilot will serve as a test to evaluate the effectiveness of I.D. Systems' material vehicle operations, productivity, maintenance and safety. If proven effective, this represents a tremendous opportunity for I.D. Systems to integrate their technology with the world's leader in supply chain management and RFID technology.

Ford Motor Company has announced that they are accelerating their company wide deployment of I.D. Systems' industrial vehicle electronic control system (IVECS.) The plan calls for the implementation of (IVECS) for a portion of their material handling vehicles in 20 assembly and stamping plants in North America. The plan will give Ford the ability to control costs in a difficult time in the automobile industry, giving them a distinct advantage over competitors, while increasing productivity and profits. The (IVECS) system benefits Ford by improving safety and security throughout the company. With I.D. Systems patented RFID technology, Ford can restrict vehicle access to authorized or trained operators, provide electronic safety inspection checklists, and in real-time, upload vehicle data that automatically reports any problems found on the checklists effectively reducing maintenance expenses.

The Transportation Security Administration (TSA) awarded I.D. Systems a \$1.6 million grant to integrate their RFID based baggage tracking capabilities into their wireless asset net vehicle security and tracking system. I.D. Systems will develop an automated mobile baggage tracking system in which intelligent vehicle and containers will identify items tagged with

electronic product code (EPC) and relate the information back to I.D. Systems' wireless vehicle management network.

I.D. Systems will join forces with Systems Technology Inc, to provide EPC-compliant RFID tags and readers. The new system has three unique elements providing TSA with greater visibility and efficiency on all levels. First, it will create a new type of container-mounted wireless device that collects data from an unlimited number of RFID tagged items, effectively providing real-time location tracking of not only the tagged items but the containers as well. Second, it will drastically increase the area in which RFID tagged items can be tracked by using baggage handling vehicles as mobile RFID portals. This is significant because it reduces the number of fixed position RFID readers, throughout the facilities, and increases operational visibility and security. Third, it will enhance network communication with a system known as, distributed intelligence, effectively allowing data to be communicated throughout multiply systems, regardless of system availability. Overall, I.D. Systems will not only benefit Homeland security applications, but the entire spectrum of the airport/seaport environment, from baggage tracking all the way through the supply chain.

I.D. Systems has proven their effectiveness in support of the U.S. Postal Service with their original contract to provide wireless asset net powered industrial vehicle management system in eight U.S Postal facilities. The results of which were so great that the U.S. Postal Service has signed a new contract to provide the system in an additional five facilities. Under the terms of the three year contract, up to 460 U.S. Postal facilities can order wireless asset net systems.

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