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Key RFID Developments

Clear evidence of economically driven project delays. Discussions with our contacts in the RFID space suggest an increasing number of economically driven project delays despite pilot activity that has demonstrated a good ROI. Economic delays also include obtaining project funding, which is contingent upon access to credit. We are seeing elements of delay in retail, consumer products, apparel, transportation and logistics and industrial manufacturing, most notably automotive.

Nonetheless, we continue to expect increased activity in 2009. We see several key factors that will drive incremental growth in 2009 and expect some of the currently delayed projects to resume in 2H09. In our view, many of the RFID pilots have proven business benefit, and most delays are currently in favor of cost cutting initiatives, which have a limited benefit. In addition, history has demonstrated that downturns tend to expose business problems. We note that bar code companies perfomed well following the 2001-02 cycle as corporations sought operational improvement. We expect RFID programs will see a similar benefit.

Some projects less economically sensitive. As we discussed last edition, we are aware of several projects in the healthcare arena, which appear to have traction as funding is somewhat more defensive. We see several projects moving forward, and are not hearing of any delays. We also see progress in Financial Services, were the industry needs to increase its asset utilization efficiency and views RFID as a key tool. Several projects in the public safety area also seem to be moving forward.

Positive software traction. As we have discussed in several of our past editions, software has been viewed by the market as the key weak point in developing reliable and scalable applications. We have also indicated that we have been encouraged with the entrance of Microsoft and IBM into the market, not only in terms of credibility, but also to provide stable development platforms. More recently, we have indicated that an increasing number of companies and independent software providers have dedicated more resources towards software development. In this edition, we are pleased to see an increase in the amount of software news flow around new product platforms, particularly with the increased level of product integration.

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RFID Hardware News and Comment

Tags & Readers

Avery Dennison unveiled its AD-902 Durable Gen 2 tag, which is embedded in a ruggedized polycarbonate case with an IP65 rating. The tag comes with 240 bits of EPC memory and 512 bits of user memory. It can be used in on-metal applications and is targeted at applications in logistics, inventory management, container and asset tracking, including personnel tracking, and assembly verification. The tag has already been used in an industrial asset and personnel tracking application. The tag application can be done via bolt or rivet. The tag has two separate part numbers, one for the US (FCC compliant at 902MHz- 928MHz) and Europe (ETSI compliant at 868MHz-869MHz).

UPM Raflatac announced the opening of a new tag and inlay production facility in Guangzhou, China. The facility is currently capable of producing roughly 100M units annually of HF and UHF tags and inlays, and UPM indicates capacity can be ramped to several hundred million units. The production capacity is targeted at the apparel, ticketing, pharmaceutical, supply chain, transportation and industrial markets in Asia. UPM also produces tags in inlays in both the U.S. and Europe.

UPM Raflatac has also unveiled three new NFC based tags, which are now generally available. The tags offer integrated circuits which are compliant with NFC Forum Tag Types 1, 2 and 4. The MiniTrack NFC, which has a coil size of 14 mm x 31 mm, is intended for toys, electronics parting and authentication. The RaceTrack NFC is coil sized at 45 mm x 76 mm and targeted towards ID card, ticket and asset tracking applications. The BullsEye NFC is coil sized at 35 mm for CD, DVDs and posters. German media provider CDA has a CD and DVD product offering that as fully integrated the BullsEye product. The tag is read/write. We see this as an innovative way to combine multiple use cases, including inventory management/location and point of sale for store operators, and marketing campaigns with end users, who can access product specific information over their cell phones.

Infineon announced a new chipset, PJM Light, for lower memory applications using 13.56MHz technology. Compared to the current Infineon offering of 10 kilobits, the PJM light version has only 1 kilobit of memory. The solution uses Magellan's Phased Jitter Modulation (PJM) technology and is targeted for document management, supply chain and a wide variety of medical applications, including pharma. Our discussions with industry personnel suggest PJM technology is very useful in applications where objects are in close proximity and might be near metals, liquids and other RF unfriendly material. Samples for the new chip will be available in early 2009 with production levels by 2Q09. Infineon will ship the chips in several formats, including unsawn, sawn or NiAu bumped wafers.

Infeneon also announced additional terms for its intellectual property agreement with Magellan to include a license to develop PJM based readers. Infineon will also be able to sublicense the reader IP to other parties.

BlueStar announced it will carry several Gen 2 tags from Confidex. Included in the BlueStar portfolio will be the Confidex Ironside, which as passed the Aerospace Standard AS5678 and is commonly used with steel pallets; the Confidex Survivor for construction, transportation and petrochemical applications; the Confidex Steelwave and Steelwave Micro, which are low profile and intended for IT asset management; and the Confidex Halo, which offers a tethered solution for IT asset management.

Sirit indicated that its IDentity 5100 reader received ETSI certification in Europe. The IDentity 5100 is based on Gen 2 technology and designed for on road vehicle tracking applications at freeway speeds.

ThingMagic announced its Astra integrated reader has been certified for use in Europe, meeting all ETSI and CE requirements. The Astra reader uses a Mercury 5e embedded Gen 2 reader. The Astra product has an integrated reader and antenna and offers power over Ethernet

for a low cost solution targeted towards office and light commercial markets.

I.D. Systems announced it has added Wi-Fi communications as an option to its existing Industrial Vehicle management system to work on existing networks. According to the company, several customers have already deployed the Wi-Fi system, including the DoD.

SOKYMAT Automotive introduced the availability of 125kHz and 13.56MHz contactless cards. The credit card sized products are ISO 7810 compliant and made of white PVC and allow for application specific printing.

Solutions

We had the chance to speak with several end-users and system integrators about the RF Controls Intelligent Tracking and Control System (ITCS), and we believe interest has expanded with the technology since its introduction last spring. End users seem to have an interest in the product for tracking many product sets over a large area, such as a retail floor, receiving/shipping docks or a warehousing space. However, they would like to see pricing come down further before making any meaningful investments. We expect new product pricing will be introduced in the coming months, which will make the ITCS offering more compelling given it is an alternative to portal set up and offers strong location accuracy. Recall, we view alternative product offerings and further product segmentation as a market positive, suggesting greater maturity. The ITCS solution provides the ability to capture tag inventory location in 2D or 3D, and thus can determine inventory by zonal location and can track movement between zones. Target markets include retail, DoD and industrial.

The ITCS solution, which is based on Gen 2, leverages specialized antennas, a standard fixed RFID reader and a location processor running on an edge server. The specialized antennas, called Signal Acquisition and Source Location (SASL) modules, can scan an area using an electronically steerable beam to locate specific tags. The SASL modules hang from the ceiling and are about the size of a flat panel TV. One SASL module can provide 2D information, while the addition of a second can provide location in 3D. Each SASL array can scan roughly 10,000-14,000 square feet of space, or enough for up to five dock doors.

According to the company, a recent proof of concept project in an industrial equipment warehouse, ITCS covered five adjacent dock doors concurrently using two SASL antennas. Tagged goods, which included pallets, and containers of parts, were placed in the staging area adjacent to the doors. Goods on tagged pallets going through the doors at speeds between 4-8 mph were read with 96%-98% accuracy. The system confirmed through which door the tagged pallets were either being dispatched or received. The ITCS system did not experience extraneous reads, and was able to demonstrate exception reporting for incorrect movement of tagged goods within the staging area or through a door.

The system allows the scanning beam to search the overall field, or zones within the field, in a raster pattern that essentially searches for tags. Since the beam is very narrow, extraneous or false reads from other zones, such as an adjacent dock door, or from multi-path are eliminated. Zones can be made fairly granular as the location accuracy is +/- 1.5 feet, according to the company. The raster pattern can also be programmed to read specific zones within the overall field, while eliminating the scan of others. This can be useful in several business scenarios. For example, in retail, when a large display occupies the center of the store, it is not necessary to scan that zone for inventory, thus allowing the SASL module more time to scan other zones that have large densities of goods. In receiving operations, it is not necessary to scan dock doors that are not in use.

We understand the scanning ranges have been over 60 feet, and the new Higgs 3 and Monza 3 silicon are providing a material increase in

read range. The product is compliant with FCC CFR part 15.247 RF emission regulations. It is not yet certified with ETSI in Europe. In addition, the product meets the ISO 24730-1 standard for connectivity to RTLS systems.

We view the ability to scan specific zones as a key attribute that can help locate missing items, provide real-time out of stock information, improve pick processes and can aid in inventory transfers, all in real-time. We continue to believe the development of application specific software will be the key in leveraging this type of technology.

RFID Software News and Comment

As we have discussed in several of our past editions, software has been viewed by the market as the key weak point in developing reliable and scalable applications. We have also indicated that we have been encouraged with the entrance of Microsoft and IBM into the market, not only in terms of credibility, but also to provide stable development platforms. More recently, we have indicated that an increasing number of companies and independent software providers have dedicated more resources towards software development. In this edition, we are pleased to see a notable increase in the amount of software news flow around new product platforms, particularly with the increased level of product integration.

Microsoft announced the general availability of its BizTalk RFID Mobile platform which enables device communication with the BizTalk server platform and extends key management and event processing capabilities to the mobile device. The BizTalk RFID platform manages devices, filters data, enables business rules and facilitates EDI, and those capabilities are extended to the mobile platform using Windows CE or Windows Mobile 5.0. Tools are provided for system integrators to develop device specific applications. The RFID Mobile platform began piloting in April 2008 along with Intermec, Motorola, Psion Teklogix, Samsung and Unitech. The BizTalk RFID Mobile platform supports the LLRP and TDT standards.

Intermec announced the availability of a downloadable device deployment kit to improve communication between the BizTalk RFID mobile platform and its mobile devices. The Intermec kit provides several tools to more easily integrate devices with the BizTalk platform as well as build vertical market specific solutions. We expect Intermec will target warehousing and postal vertical solutions initially with this offering.

S3Edge introduced its application software products that provide visibility of real-world workflows and execution against those workflows. The S3Edge products are built on the BizTalk RFID Mobile platform, and provides modeling of workflows, and task scheduling and progress on a web-based management platform. The application integrates with a wide number of devices, including Impinj, Intermec, Kenetics, Magellan, Mojix, Motorola, Omron, ThingMagic and Unitech. The product has been beta tested since April 2008, with several customers including Indian based Pharma chain RiteCare Pharmacy chains and manufacturer GKB Hi-Tech Lenses. The product is targeted towards warehouse visibility, work in process and asset management.

IBM introduced an updated version of its WebSphere RFID Information Center platform, which has been renamed to InfoSphere Traceability Server. The software platform is capable of gathering and sharing information from bar code and RFID sources. The information sharing component is EPICS compliant. In addition, the InfoSphere Traceability Server also contains business intelligence as Cognos 8 BI reporting, analysis, dashboards, alerts and notification capabilities are embedded in the platform.

Blue Vector announced it will release version 5.0 of its Blue Vector Platform-a software as well as a software development kit (SDK) in 1Q09. According to the company, the platform builds on security features and greater access control capability. The product will initially become available to a set of system integrators and consultants, who will be developing business specific solutions leveraging the Platform-a product. The associated SDK will help these developers by providing instructions and examples to write business rules and create necessary interfaces with other products. The company believes the system is scalable, with minimal incremental cost for large and diverse systems.

GlobeRanger announced that its iMotion platform achieved integration certification with SAP's Auto ID Infrastructure. The GlobeRanger SAP Solution Accelerator (SA) provides device management and monitoring (RFID and bar code), data filtering, workflow logic and information to the SAP system. The SA product also contains emulation tools. The Visual Device Emulation is a

graphical tool that simulates and tests readers, antennas and associated read fields, and tags all before the system is physically deployed. In addition, the product offers SAP AII Integration Emulation, which simulates message flows to and from the SAP AII system before deployment.

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Industry Commentary

While the excitement level around many new RFID pilot programs and the potential for rollout activity remains strong, we hear of an increasing number of project delays, which appear to be directly related to the current macro economic challenges. Our view is that many players, particularly on the retail side, are primarily concerned with trying to bolster sales in the last few weeks of the year. We also see a good number of players focusing most of their energy on easy cost reduction efforts, such as personnel reductions and operating expense controls.

Economic Overview

Given this, we wanted to provide some insight on the key economic drivers and the potential near-term impact on the RFID market. With respect to the broader economy, stability in housing sector appears to be a key pre-condition for any type of meaningful recovery. In our view, banks will continue to face capital problems, and asset values will continue to decline without the housing sector becoming more stable. And, we believe improvement in the credit markets, hinges bank stability. Some estimates indicate that banks will lend as much as $8-$10 for every $1 in capital they hold. Therefore, weak underlying bank capital creates a meaningful economic headwind.

We believe housing will continue to be challenged into at least the first part of 2009. According to the Case-Shiller index, prices for its 20-city composite housing index are down about 22% from the June 2006 peak as of September 2008, which is the most recent period for reporting the Case-Shiller data. But it is in the last year where most of the decline has occurred with prices down 17%. Many estimates suggest that roughly eleven months of housing inventory exists, well above the six months of "normal" inventory levels. We expect downward price pressure on housing to occur until these levels rebalance. While this will take several more months to play-out, we see two encouraging signs. First, housing starts continue to plummet, down 47% in the last year and down 72% since the June 2006 peak. This large reduction in housing output will be helpful in reducing the overall housing inventory. Second, not all markets are seeing continued price weakness. Seven markets in the Case-Shiller data appear to see some reasonable price stability, suggesting they are close to a bottom. These include Atlanta, Boston, Charlotte, Cleveland, Dallas, Denver and Minneapolis. Problem areas remain New York, Phoenix, Las Vegas, and most of California and Florida.

The next big issue to be aware in housing is the second wave of housing related resets that will occur in 2010-11, where adjustable rate mortgage rates will reset from their initial rates. In 2007 and 2008, resets occurred with sub-prime borrowers, which accounted for the current wave. Beginning in 2010 mortgages in the Alt-A (mortgages that require reduced documentation) and option adjustable rate (very low initial rates) categories will reset for the first time. Combined, these loans currently represent about 1.25x the size of the sub-prime market. Homeowner refinancing of these loans, and the ability to remove them from banks books, will largely be contingent upon the value of the underlying asset and the income stream of the housing owner. We expect a portion of these loans will be refinanced prior to 2010.

Impact on Auto-ID and RFID

With respect to the auto ID space and RFID, we see the broader economy having an adverse impact. Recall, we had discussed last edition our recent bar code reseller survey data suggested project push backs, even for projects having a reasonably good ROI. Based on continued discussions with these resellers, we believe the pace of delays has increased.

Given discussions with our contacts in the RFID space, we also see an incremental level of project push-back. Our view is that these delays are related to economic or credit issues as we hear from end users that an increasing number of RFID projects solve real business problems, and are delivering a good ROI. We are seeing elements of delay in retail, consumer products, apparel, transportation and logistics and industrial manufacturing, most notably automotive. While these delays

will create some near-term softness, we note several positives, and we continue to expect increased activity in 2009. These positives include:

- **Downturns tend to expose and exacerbate problems**. During the 2001-02 downturn, we saw a meaningful number of supply chain related inventory and efficiency problems that were exposed. As a result, end users invested meaningfully in auto-ID technology to correct these issues. We expect this downturn, which has now been underway for the last year, will expose incremental sets of problems, and that RFID will be well positioned as a technology.

- **Current cost cutting initiatives are limited**. Many companies are focused on cost reduction by eliminating people and expenses. However, those approaches are limited and companies tend to invest in productivity enhancing technologies after initial cuts are completed in a downturn. Again, in 2001-02 we saw investment improve in auto-ID technologies once companies completed initial cuts. In our view, this can be seen most clearly in stock prices. Stocks in auto-ID related companies bottomed and began recovery roughly one-year in advance of the broader S&P 500 market average.

- **Industry credit is available**. While we are concerned about some projects not receiving funding given lack of credit, we are encouraged with potential sources of industry funding, most notably from Microsoft, which we discussed last edition. We also see an increased emphasis from vendors on lease options or more fee based models.

- **Continued investment**. We see end users continue to invest in smaller RFID projects, and existing pilot programs seem to have good momentum. In addition, RFID companies continue to make product investments, which is important during a downturn. Note during the last downturn, both Intermec and Zebra made meaningful investments in new products and saw strong recovery growth as a result. Symbol, by contrast, had cut R&D funding, which exacerbated its management problems and delayed recovery from those problems.

- **Some projects less economically sensitive**. As we discussed last edition, we are aware of several projects in the healthcare arena, which appear to have traction as funding is somewhat more defensive. We are not hearing of delays and see several projects moving forward. We also see progress in Financial Services, were the industry needs to increase its asset utilization efficiency and views RFID as a key tool. Several projects in the public safety area also seem to be moving forward.

- **Positive pilots**. We are hearing a good number of positives of existing project pilots that are solving key business problems, and expect that many will see meaningful expansion in 2009. In many cases, the only real impediment is the broader economic concerns. Some of these pilots are with larger companies that could bring good attention to the technology in 2009. We learned that several electronic manufacturing service (EMS) providers, including Jabil and Flextronics, have begun to use RFID to provide increased visibility into its work-in-process and finished goods inventory. Such projects could prove to be very valuable given that EMS providers are generally a key starting point in the supply chain and therefore, their efforts would provide increased opportunity for source tagging.

Standards, Government, Policy

GS1/EPCglobal continues to develop application standards through several EPCglobal industry work groups. The Transportation and Logistics Services (TLS) Industry Action Group RFID Pilot Program will conduct its third phase with a shipment between Tokyo and Amsterdam, which began earlier this month. The pilot will test the ability of EPICS to provide real-time product and shipment information of 50 containers to a wide number of supply chain participants and customs officials as the shipment moves throughout its four week journey.

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The initial phase of the pilot program was to validate that both passive and active tags could be used on sea-shipment containers. These tests were conducted by reading tags on shipments between Hong Kong and Japan. Phase two confirmed that base standards enabled sufficient visibility for goods shipped between Chinese factories and distribution centers in the U.S., including at the ports of Shanghai and Los Angles.

The TPL 3 pilot will use the Global Shipment Identification Number, which is a customs compliant unique consignment reference, and allows a group of transported containers to be identified with one commercial purchase order. In an effort to help define standards for conveyance asset tags and passive e-seals, the TPL 3 Pilot will use active Extended Conveyance Asset Tags (XCAT) and e-seal tags on sea containers. Active tags will also be tested at the pallet level. The passive e-seals combine mechanical bolt seals with Gen 2 tags, which allows for electronic detection of a tampered seal as the tags cease operation. The TPL 3 pilot program includes a wide number of supply chain partners as well as product vendors, including Allumis, Canon, Confidex, Marubeni, Mitsubishi Electric/Alien, IBM, Motorola, NEC, Nippon Express, NTT, NYK Logistics, NXP, Oracle, SATO/UPM Raflatac, Secura Shield, Toppan and Vue. The ports of Tokyo and Rotterdam as well as associated customs officials were supporters of the pilot program.

GS1 also announced the completion of its pilot of wooden pallets in Europe. The pilot began in July 2008 and essentially served as a proof of concept validation and provided insight on key issues to be addressed. Meaningful lab testing was conducted and many pallets were equipped with Gen 2 tags for field testing. Swiss based Holliger Pallet Logistics provided the tagging. The European Pallet Association (EPAL), which serves as the key licensing body in Europe for 400 providers to produce more than 60M pallets annually, was a key sponsor in the pilot. EPAL views RFID as potentially helping improve visibility to control production, repair and counterfeiting of product in addition to improving supply chain operations. Phase two will begin in 2009 and will address several key issues, including number of tags to be fixed on a pallet, data stored on the tag, and disposition of the Serial Shipping Container Code (SSCC), and various IT infrastructure and associated processes.

U.S. Customs and Border Protection (CPB) completed its initial RFID implementation at the Pacific Highway and Peach Arch border crossings with Canada (Blaine, Washington) and at the Mariposa and DeConcini crossings with Mexcio (Nogales, Arizona). CPB remains on plan to have all 39 sites (354 lanes), representing 95% of all cross border travel into the U.S., complete by June 1, 2009. Recall, the CPB is installing this infrastructure to read issued U.S. Passports and Enhanced Drivers Licenses equipped with RFID tags to facilitate faster processing with respect to the Western Hemisphere Travel Initiative. Unisys provided the system development and integration.

The Department of Homeland Security announced standards for freight and passenger rail systems which could present opportunity for RFID. One rule relates to the location of freight cars that contain hazardous materials, such as chemicals, explosives or radio-active elements. The rule requires that the location of individual cars be provided to the Transportation Security Administration within minutes of a request and the location of all cars containing any “security-sensitive” material within 30 minutes. We believe RTLS technology is a logical tool in helping operators, rail yards and shippers comply with such a rule.

To study how RFID can be used for crime scene security, The federal government awarded a $900,000 grant to Delaware State University, the Delaware State Police, and the Delaware Department of Safety and Homeland Security. The University of Delaware and VUANCE will establish an advisory board that will develop a solution featuring active and passive RFID, to track personnel entering and leaving a crime scene as well as the chain of evidence from crime scene to processing. VUANCE is slated to receive roughly 80% of this funding. Recall, we reported last month that the Netherlands Forensic Institute has already

implemented a Gen 2 based chain of custody solution to track roughly 100,000 crime scene items annually through the forensic process.

Passive Applications

Japanese book publisher Shogakukan is piloting a Gen 2 based system to better track and manage returned books. Shogakukan allows book stores to take inventory on a consignment basis, where books can be returned for no fee, or non-consignment, which offer higher margin, but also add a fee for returned books. The system is designed to incent bookstores to plan purchases more in alignment with purchasing volumes, thus improving sales and reducing waste. Customer return rates can be as high as 20% and Shogakukan has seen significant waste as a result of excessive returns that require inventory disposal under the existing system. To help manage the process, the publisher will use Gen 2 based tags to highlight key information, including which books were sent out on consignment and which are on a non-consignment basis. This is critical information to have with the Shogakukan system, where the same bookstore could choose to receive one shipment on consignment and one non-consignment, both with the same title. The system will also provide better visibility and automation in the shipping and receiving functions. The initial test will be on about 50,000 copies of Home Medical Dictionaries. Suuri-Keikaku developed the overall system, while UPM Raflatac supplied the tags. We understand several similar projects are underway that track CDs/DVDs, primarily in Europe.

Sure-Reach Records Management, based in Malaysia, is using a Gen 2 based system to manage its document storage operations in its facility in Shah-Alam, which stores roughly 500,000 cartons of documents and 1.1 million file folders. A UPM Raflatac FlagTag is attached to all individual documents and Dog Bone tags are attached to cartons that hold documents. Cartons and documents are more easily received and stock taking is completed faster and more accurately, improving the storage, auditing and retrieval processes. H-P developed and installed the solution.

The Finnish Road Administration announced a pilot program to improve the traffic efficiency for regular travelers on its carry ferry to and from Hailuoto Island. Local residents and professional drivers are provided with a priority driving lane that was being misused by unauthorized drivers. To solve the problem, these drivers were provided with a Gen 2 enabled drivers license, which they use to gain access to the lane. The Gen 2 based license, which uses UPM Raflatac Dog Bone tags, allows drivers to be scanned without opening windows and thus provides faster access. Vilant Systems developed the overall solution, which began piloting in June 2008.

PeakWorks, a Canadian supplier of safety harnesses for people working at heights, used RFID to increase revenue and lower the amount of non-value added labor associated with inspections required to comply with government safety regulations. The system was rolled-out in June 2008, and PeakWorks is able to charge a premium price for its RFID enabled inspection service. About 15-20 harness inspections occur per day, and historically inspection data was manually recorded on paper, which was then entered into three separate systems to record a charge for the inspection service, to order new parts as necessary and to provide an archive. PeakWorks now uses 13.56MHz RFID tags that allow inspectors to identify each harness, and enter data into a mobile computer to be electronically transmitted to the host data base and applications through the Internet or docking cradle. As a result, in addition to offing a premium service, PeakWorks as eliminated paper and is saving roughly 45 minutes per day per inspector on labor costs. PeakWorks is currently placing roughly 2,000 tags per month on items. The overall solution was composed of N4 Systems Windows Mobile-enabled Field ID platform software and integration services as well as Tracient Technologies Padl-R HF RFID reader and Psion Teklogix's Workabout Pro G2 mobile computer. N4 is also providing the system hosting. Tracient has written up an informative case study, which can be found on the Tracient website, www.tracient.com.

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Active Applications

Areva, which designs and constructs nuclear power plants, has implemented Ubisense's RTLS system at its central archive complex in Erlangen, Germany. The company is responsible for archiving all related documentation, including building plans, for as long as 90 years. To guard against fire, the Areva archive is flooded with nitrogen, a serious human hazard. Areva provides each employee and visitor with an active tag that monitors room location over a 19,000 total square foot area, and accounts for all personnel in the event of an emergency.

Metro Transport, which provides transportation to the Minneapolis / St. Paul area with over 900 buses, plans to install a real-time locating system to reduce labor associated with daily scheduling. With current operations, Metro busses are parked daily in one of five garages. Location is determined by dispatchers walking the floor and manually writing location, which is subsequently entered into a scheduling system. The RTLS will provide location of busses, including changes, in real-time with no labor. Ubisense provided the RTLS system.

The Jan Yperman hospital in Belgium, with over 550 beds, has implemented multiple use cases leveraging active technology. Using 1,000 tags, the hospital has implemented the standard tracking of key equipment, including infusion pumps, wheelchairs and beds. The hospital will also use the technology to monitor Alzhimer's and other disoriented patients. The hospital will also use 40 tags to monitor temperature in critical refrigerated areas, including lab specimen and blood storage. To provide staff efficiency and safety, over 400 tags will be deployed that not only make individual location available, but also provide a call button for protection against patient attack. AeroScout provided the location system and tags which integrated with the existing hospital Wi-Fi system. The solution also required 120 AeroScout exciters.

Partnerships

Power ID announced partnership agreements with five resellers based in Europe, including Bluhm Systeme in Germany, Creative Systems in Portugal, Easy Logic in the Netherlands, RFID Solutions in Romania and Saident in Spain. Power ID began its European effort this past May with the opening of its sales office in the Netherlands.

PC Guardian, which provides enterprise level IT asset management and security solutions, will incorporate Flunesee's asset management solution into a new RFID based IT asset management security solution. The solution is designed to provide real-time tracking, and monitoring of physical IT asset movement. The solution is scheduled to launch in early 2009.

VeriChip announced an agreement with Microsoft that will allow its Health Link system to be accessible through Microsoft's HealthVault. The HealthVault platform enables consumers to securely provide their health information on a universally accessible platform for no charge. Recall, the VeriMed Health Link System allows emergency room personnel to identify incoming patients that cannot communicate.

InnerWireless announced it will provide AeroScout solutions as part of its Horizon product offering. InnerWireless provides wireless solutions for the healthcare, enterprise, hospitality/gaming and government markets.

Corporate News

Sirit announced that Uruguay selected the IDentity 5100 reader for deployment at all of the country's toll collection points for electronic collection. Sirit will also provide tags. Recall, the IDentity 5100 is based on Gen 2 technology. Phase one, which has been completed, included 12 readers deployed along with 20,000 tags, which encompassed the toll segment connecting Montevideo with Punta del Este. Phase two will be completed by mid-2009 and will feature the deployment of an

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additional 28 readers and 10,000 tags. Uruguay hopes to add more use cases with this infrastructure, including parking access and heavy vehicle registration. Telectronica and Telsis provided the system integration.

Zebra acknowledged that Lowry Computer Products, Northrop Grumman and ODIN Technologies will be offering the RF400 RFID printer/encoder as part of the U.S. Army's Product Manager Joint Automatic Information Technology for RFID and AIT solutions. We reported this $75M indefinite delivery/indefinite quantity contract in the October edition.

I.D. Systems announced that Kellogg's will add the I.D. Systems Wireless Asset Net industrial vehicle management system to its facility in Battle Creek, Michigan. This is the second facility that Kellogg's has equipped with the system. The initial Kellogg facility began its project on a stand alone basis, and we believe achieved a nine month payback. This implementation received interest from Kellogg headquarters; we view the implementation as noteworthy and would expect follow on facilities in 2009.

Ekahau announced that the Blanchfield Army Community Hospital at Fort Campbell, KY will deploy its Real-Time Locating System to monitor the location of IV Pumps, wheelchairs and beds at the 241 bed facility. The installation will be performed by GTSI Corp, under its Information Technology Enterprise Solutions-2H (ITES) contract.

AeroScout announced that St. Trudo Hospital, a 310 bed facility in Belgium, began to use AeroScouts Unified Asset Visibility product to track specialty mattresses, IV pumps and wheelchairs. In addition, St. Trudo installed AeroScout's temperature monitoring system in its server room.

IPICO announced an order from CHEP Australia for 480,000 tags, plus reader infrastructure of its IPX technology. The project will equip three service centers in New Zealand and covers CHEPs foldable, returnable packaging (FRPCs). CHEP has been testing this program since late 2007.

IPICO also announced taking a controlling interest (70%) of Mercury Sports, which has been distributing IPICO's technology since March 2007 for event time keeping. The acquired unit will be named IPICO Sports and will focus on the running, cycling and swimming markets. The company expects to expand into fitness, performance enhancement and wellness markets.

IPICO announced 3Q08 revenue of $700,000, down from $1,058,000 last year. EPS came in at ($0.21) versus ($0.07) last year.

VUANCE announced 3Q08 revenue of $5.8M versus $3.5M last year, driven largely by passive electronic access control and international projects. EPS came in at ($1.49) versus ($1.26) last year. Large selling and marketing expenditures are driving the operating losses.

ThingMagic announced it has received additional funding from In-Q-Tel, which is a not-for-profit investment firm that supports technological advances to the U.S. intelligence community. In-Q-Tel was formed by the CIA in 1999, and has engaged with roughly 125 companies. The value of the funding round was not disclosed. In-Q-Tel will also act as a strategic partner in development of related technologies that leverage embedded RFID modules.

SecureRF will receive a Phase I Small Business Innovation Research (SBIR) grant by the U.S. Air Force. The Phase I grant will be used to determine the feasibility of developing a secure global satellite/RFID system to verify the location of in transit assets without allowing enemy forces to access the same information. Phase II will see the development of a prototype active RFID/GPS system.

Awarepoint announced the close of its Series D financing round for $13.3M. The round was led by Cardinal Partners, with Venrock and existing investor Avalon Ventures participating.

RFID Briefs

Avery Dennison RFID announced the promotion of Maggie Bidlingmaier to Director, Global Sales & Marketing. Bidlingmaier, who joined the RFID division in 2004, was previously responsible for sales and marketing efforts in the U.S. and Europe. She will be responsible for sales forecasting, customer application priorities, new business development initiatives and marketing strategies for the RFID Division. Bidlingmaier holds a BS in Economics from the University of Wisconsin – Madison (Go Badgers).

Impinj named Kerry Krause as Vice President of Marketing. Prior to joining Impinj, Krause spent 11 years with Intel, most recently as the Director of Sales and Marketing for Intel's RFID Operation. He came to Impinj with the acquisition of Intel's reader chip business and is now responsible for all product marketing at Impinj. Prior to his RFID position at Intel, he was the Product Marketing Manager for Intel's Pentium and Celeron desktop processor product lines. Mr. Krause holds a B.S. in Computer Science from the US Naval Academy and an M.B.A. from the University of Texas.

NASDAQ informed VeriChip in a letter in November that the company's stockholders' equity at September 30, 2008 was less than the $10 million in stockholders' equity required for continued listing on The NASDAQ Global Market. The letter asked the company to provide a plan to achieve compliance before December 2, 2008. NASDAQ will then determine if the company's plan to meet these requirements is suitable. If not, NASDAQ will provide written notification that the company's securities will be delisted from NASDAQ. The company may appeal NASDAQs delisting determination. Recall, Digital Angel announced the sale of its stake in VeriChip in mid-November given the relatively slow nature of human implantable adoption and continued investments required to drive the market.

Events

RFID Journal will host its first in the Middle East January 5-7, 2009, at the InterContinental Hotel Festival City in Dubai in the United Arab Emirates. The event is designed to help companies across the Middle East gain a good understanding of RFID and how it can be effectively used in their operations. The conference program will focus on how all types of RFID technologies, including active, Wi-Fi, passive UHF and passive HF, with solutions focused on construction, oil and gas and logistics. To learn more, visit http://www.rfidjournalevents.com/middleeast/.

RFID Journal will host its RFID in Health Care event January 22, 2009 at the Rio Hotel in Las Vegas. This event will be co-located with the 3rd Annual Leadership Summit on Healthcare Supply Chain Management. The event features presentations from healthcare providers to discuss case studies with respect to improving patient monitoring and safety, medical error reduction and automated billing. To learn more, visit http://www.rfidjournalevents.com/healthcare/.

The National Retail Federation will host its NRF 98th Annual Convention & EXPO at the Jacob K. Javits Convention Centern in New York City January 11-14. The show features a educational tracks, networking access to a large number of key retail vendors and an overview of the latest technologies impacting the retail market. To learn more, visit the NRF website at www.nrf.com.

Table of Key RFID Providers

Company Name	Ticker	Semi-Conductors	Inlays/Tags	Readers	Printers / Encoders	Networking	Software	Integration Services
3M Company	MMM		X	X			X	X
AbeTech	Private							X
Accenture	ACN							X
Acsis	Private						X	X
Aeroscout	Private		X	X			X	X
Alien	Private	X	X	X				X
Ambient ID	Private							X
Applied Wireless	Private			X				
AssetPulse	Private						X	X
Atmel	ATML	X						
Avery Dennison	AVY		X		X			
Axcess	AXSI		X	X			X	
Bentonville Int'l Group	Private						X	X
BlueStar	Private							X
Blue Vector	Private					X	X	X
BOS	BOSC							X
Brady Corp	BRC		X		X			
Checkpoint Systems	CKP		X	X			X	
CIM Bar Code	Private							X
Cisco	CSCO					X		
Computer Sciences Corp.	CSC							X
Confidex	Private		X					
Danaher (Accu-Sort)	DHR							X
Datalogic	DAL		X	X				
Dover (Datamax)	DOV				X			
Digital Angel	DOC		X	X				
Domino-ISG	Private							X
Ekahau	Private		X	X		X	X	X
EM Microelectronic Marin	UHR.DE	X						
Entigral Systems*	Private						X	X
Feig Electronic	Private		X	X				
Fluensee	Private						X	X
General Electric (Agility)	GE						X	X
George Schmitt & Co.	Private		X		X			
Globe Ranger	Private						X	X
Goliath Solutions	Private		X	X				
Hewlett-Packard	HPQ							X
ASSA-ABLOY (HID)	ASSA		X	X				
HK Systems	Private							X
IBM	IBM						X	X
ID Systems	IDSY		X	X			X	
Identec Solutions	Private		X	X			X	X
Impinj Inc.	Private	X		X				
Infineon	IFX	X						
Intel Corporation	INTC					X		X
Intelleflex	Private	X	X	X				
Intermec	IN		X	X	X			X
IPICO	RFD.TSX	X	X	X				
Lexmark	LXK				X			
Lowry Computer	Private		X		X		X	X
Kennedy Group	Private		X		X		X	X
Magellan Technology	Private		X	X			X	
Manhattan Associates	MANH						X	X
MARKEM	Private		X					X
MIKOH	MIK.ASX		X					X
Miles Technologies	Private							X
Mojix	Private			X			X	

Company Name	Ticker	Semi-Conductors	Straps / Inlays / Tags	Readers	Printers / Encoders	Networking	Software	Integration Services
Moore Wallace	RHD		X					
Motorola (Symbol)	MOT		X					X
Nashua	NSHA		X					
noFilis	Private					X	X	
NXP	NXP	X						
OATSystems, Inc.	Private						X	
Odin	Private							X
Omni - ID	Private		X					X
Omnitrol	Private					X	X	
Omron Corporation	OMRNF.PK		X	X				
Oracle	ORCL					X	X	X
Panatrack, Inc.	Private						X	X
PINC	Private		X	X			X	X
Plitek	Private		X					
Power ID	Private	X	X					X
Precision Dynamics	Private		X	X				
Printronix	Private				X			
Red Prairie	Private						X	X
Reva Systems	Private					X		
RF Code	Private		X	X			X	
RF Technologies	Private		X	X			X	
Rfid, Inc.	Private		X	X				
RFID Global Solution	Private						X	X
Rush Tracking Systems	Private							X
SAP	SAP						X	X
Sato	Japan		X		X			
SAVR Communications	Private		X					
Lockheed (Savi)	LMT		X	X		X	X	X
ScanSource Inc.	SCSC							X
Sealed Air	SEE		X	X			X	X
Siemens	SI		X	X		X		X
SimplyRFID	Private						X	X
Sirit	SI.TSX		X	X			X	X
SkyeTek	Private			X				
Sovereign Tracking Sys.	Private		X	X			X	X
STMicroelectronics	STM	X	X					
Stratum Global	Private						X	X
Sun Microsystems	SUNW						X	X
Tagsys	Private	X	X	X			X	X
Texas Instruments	TXN	X	X					
ThingMagic	Private			X				
Toppan Printing	7911		X	X	X			
Toshiba TEC	Japan		X		X			
Roper (TransCore)	ROP		X	X				X
TrenStar Inc.	Private						X	X
Tyco (Sensormatic/Vue)	TYC		X	X			X	X
Unitech	Private			X				
UPM Raflatac	UPM		X					
Venture Research, Inc	Private				X		X	X
Verichip	CHIP	X	X					
Verisign	VRSN					X	X	X
Vuance LTD	VUNC		X	X			X	X
Vue Technology	TYC						X	X
Wavetrend	Private		X	X			X	X
WJ Communications	WJCI			X				
Xterprise	Private						X	X
Zebra Technologies	ZBRA		X	X	X		X	X

Source: Company Information and Robert W. Baird & Co.

Glossary of RFID Terms

Active RFID Tag – The tag has an internal power source (i.e., a battery), which allows for significantly longer read ranges. Primarily used to track large, high-value assets such as intermodal shipping containers. Active tags are significantly larger and more expensive ($25-$250 per unit) than passive tags.

Air Interface – The communication protocol between the tag and reader. Passive tags at UHF are standardized around the Generation 2 protocol; HF is seeking a similar standard. Some active tags are increasingly communicating with standardized Wi-Fi networks (IEEE 802.11x), however, active continues to see several proprietary air interface protocols.

Antenna – Attached to chips on tags and an integral part of a reader; antennas are devices that send and receive radio frequency (electromagnetic) energy.

Anti-Collision – A component of the air-interface protocol that prevents tag data from multiple tags in the read area from interfering (colliding) with each other. Also prevents multiple readers in close proximity from interfering with each other. This is a key component to the Generation 2 standard.

Battery Assisted Passive (also semi-passive) – Passive tags that offer a small battery to boost signal strength, or improve tag sensor capability. The battery generally goes into sleep mode until required. Referred to as Class 3 products; a standard is expected in early 2008.

Class 0 – Class 0 refers to a proprietary air interface protocol for passive UHF tags. Class 0 is read only, while a subsequent protocol, Class 0 Plus, offers read/write capability. This protocol is largely obsolete with Gen 2.

Class 1 – Class 1 refers to a proprietary air interface protocol for passive UHF tags. Class 1 offers read/write capability. Class This protocol is largely obsolete with Gen 2.

Closed Loop Solution – Set of readers and tags intended for a particular application having specific, well defined start and end point. Generally seen in tracking work in process or reverse logistics operations.

DoD Mandate – A mandate to all 43,000+ DoD suppliers, announced in June of 2003, to employ RFID. The DoD issued a timetable specifying when RFID will be required (by products into specified DoD depots). The timetable has been somewhat fluid given DoD budget dollars are focused on existing operations in Iraq and Afghanistan.

Dual Di-Pole – A tag that essentially has two antennas, reducing the sensitivity to orientation and increasing read capability.

Electronic Product Codes (EPC) – The code that resides on an RFID tag that is unique to each product. The code contains manufacturer and product information as well as an individualized serial number. EPCs are maintained by EPCglobal.

Encode and Apply – A step up from "Slap and Ship," where labels are encoded and applied on a more automated basis. Slightly more capital intensive, but more operationally efficient than slap and ship.

Encoder – Device that transmits and writes data on to an RFID tag. Used extensively in printers and label applicators for product shipments. Encoders are generally RFID reader modules developed for a printing or other encoding application.

Environmental Factors – Typically discussed with respect to UHF products, which can be affected by many factors including the presence of metal, liquids, significant reader activity, other RF "noise," etc. These factors require process controls in terms of tag and reader placement. Readers also need proper adjustment for a given environment.

EPC Global – The body responsible for RFID standards creation; formed originally as a joint venture between the Uniform Code Council (UCC) and the Electronic Article Numbering Association (EAN). EPC Global is responsible for RFID standards development and for promoting vertical RFID solution development.

EPC Network – Developed by the Auto-ID center, this Internet-based system allows supply chain participants to retrieve data associated with an EPC through the Internet. The network remains in an emerging phase, and is administered by EPC Global.

Fluidic Self Assembly (FSA) – A proprietary process developed to rapidly attach chips to straps. The process uses a fluid bath to place small chips on a substrate for strap attachment. This process continues to be developed.

Generation 2 – The RFID air interface standard for supply chain shipments using UHF. The Gen 2 standard was approved in December 2004 by EPC Global, and has since received international approval by ISO as 18000-6C. EPCglobal is working to create a similar standard for HF.

High Frequency (HF) RFID – RFID products that use the 13.56MHz band, which is not regulated by any government. This frequency generally allows read ranges of 4-8 feet, and is not affected by environmental factors such as liquid due to magnetic coupling. The existing ISO 15963 standard is different from the Gen 2 protocol. We expect a new EPC-based standard by the end of 2007. HF has historically been used in contactless payment and item level tracking applications.

Glossary of RFID Terms

Hybrid (semi-active) RFID Tag – Tag that incorporates a smaller internal power supply, which is triggered by reader action. After interrogation, the tag resumes a passive stance.

ISO – International Organization for Standardization is a network of the national standards institutes of 148 countries, on the basis of one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. ISO is not government affiliated. EPC Global is an ISO member and has received ISO approval for the Generation 2 standard.

Kill Command – A code within the RFID tag that once activated will permanently disable the tag. Intended to limit consumer tracking after purchase for privacy protection.

Low Frequency (LF) RFID – RFID products that use the 125Kz band. Products that use this frequency are generally smaller and cheaper as read ranges are short, typically less than 12 inches. Security access and control and contactless payment are typical applications.

Mandate Requirements – Primarily refers to an edict put in place by retailers, most notably Metro, Wal-Mart and the DoD, requiring that certain types of shipments (mostly deliveries at the case and pallet level) use RFID for tracking purposes. The Metro mandate is the only one that imposes a charge for non-compliance.

Metro Mandate – German based retailer that is piloting Gen 2 based RFID at 229 German based stores. Suppliers are required to tag all pallets by October 1, 2007 or face a charge of approximately 2 euros per pallet. Case level tagging is expected in 2008. Metro, the worlds 5th largest retailer, operates roughly 2,400 stores in Europe and Asia.

Middleware – A specific class of software that offers several levels of functionality. Middleware acts as a data filter, eliminating duplicate reads so that the host system maintains accurate records and is not inundated with excessive data. Middleware also ensures that the RFID data formatting "maps up" with the host system data structure.

Optional User Memory – Additional bits memory available on a tag that can be used by any member of the supply chain as they see fit (i.e., routing information). Intended to allow for increased tracking efficiency.

Parallel Integrated Chip Assembly (PICA) – A proprietary process developed by Symbol (Motorola) to rapidly assemble chips to tags. The process uses small punches to extract a chip from the wafer and attach the chip to the tag antenna using a single motion. The process remains in test stages, and Motorola no longer produces tags.

Passive RFID Tag – A tag that receives its power supply from the reader upon interrogation. Used primarily in supply chain applications, these tags tend to be small in size and relatively inexpensive compared to active tags.

Pilots – Testing done by companies seeking RFID solutions, primarily for supply chain applications. Consumer product companies under mandate requirements are seeking ways to increase the value add to themselves in addition to meeting mandate compliance, which requires evaluation of equipment and internal business processes.

Portal – A door or other point in a facility surrounded by fixed RFID readers to identify and track the flow of product. Dock doors are a typical example.

Reader – Also known as an interrogator. Typically a network-based device and antenna configuration, which reads the information contained on an RFID tag. In passive operations, the reader supplies the tag with power. Readers can be fixed position for dock door or other portal applications, or embedded into mobile computing devices for in store or exception reporting requirements.

Rollout – When pilots provide sufficient evidence of a strong return on investment, companies are expected to deploy (rollout) the technology into greater parts of their internal operations or external supply chain partners. This process is expected to result in significant growth for the RFID industry.

Slap and Ship – Refers to placing an RFID tagged bar code label on products immediately before shipment. The process is typically done on an exception basis for products requiring compliance labeling. Slap and Ship is not labor efficient and allows virtually no incremental value add to the supplier; however, the up-front capital investment is small.

Strap – Component of a tag or inlay that connects the microchip to the antenna. The purpose of the strap is largely to make the manufacturing process of antenna attachment easier and faster.

Tag – Also referred to as transponder or transponder tag, which is typically affixed to an item for tracking purposes. Composed of a semi-conductor chip and antenna held together in a substrate. Each tag has a manufacturer installed unique identification number as well as additional few bits to many kilobits of incremental memory. Passive tags receive energy from the reader, while active tags have an internal power supply.

UID – Unique Identification is a DoD based numbering scheme to identify a broad range of high-value assets. RFID is not necessarily required, but is

Glossary of RFID Terms

preferred in many UID applications. UID applications typically require more than 256 bits of memory.

Ultra High Frequency (UHF) RFID – RFID products that use the 868MHz to 950MHz frequency band, which is regulated by governments. This frequency allows read ranges of 8-30 feet (2x-4x of HF), but can be heavily affected by environmental factors, including liquids and metals.

Wal-Mart Mandate – Wal-Mart mandated that its top 600 suppliers ship products with Gen 2 RFID tags identifying each pallet and case to up to 1,400 stores by the end of 2007. As part of this program, Wal-Mart continues to conduct pilots to determine ROI.

Write Once Read Many (WORM) – Used to describe an RFID tag that allows only one set of data to be written on to it. Typically used in applications where security is a concern.

Appendix – Important Disclosures and Analyst Certification

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