



RFID Update

We are providing this document to keep you informed on our latest activities and observations related to RFID technology. Please let us have your comments and feedback. Thank you.

In This Issue:

RFID Middleware	2
Privacy, Trust & Security	3
Standards & Mandates	4
About Our Company	6

Recent Activities at Big Chief Partners

- Defining strategy for TimesTen a data and event management software developer seeking to capitalize on opportunities related to RFID. <http://www.timesten.com>.
- Providing advice to pharmaceutical industry service provider looking to leverage RFID. Included recommending technology, assessing market timing and extending company's patent portfolio.
- Big Chief Partners is the developer and systems integrator for the "Auto ID Experience" at the Frontline Solutions International Supply Chain Week Conference and Exposition on September 13 – 15 in Chicago. The Auto ID Experience will be an exclusive showcase for the latest in RFID technology. In addition, Peter Winer is a member of the Executive Advisory Committee for the conference. <http://show.supplychainweek.com>.
- Moderating "Middleware Requirements for Supply Chain Integration" at the RFID World Conference, April 22 in Denver, CO.
- Presenting "RFID 101 to Warp Speed" at the Council for Logistics Management, April 22, in Santa Clara, CA.
- Presenting "Infrastructure Issues and Standards for RFID/GTIN Deployment" at the Global Supply Chain Standards Conference, April 14, in Toronto, Canada.

"Tracking the Explosive Growth of RFID"

On Tuesday May 11 at 7:00 PM, Peter Winer is moderating a panel discussion at the MIT Club of Northern California in Palo Alto. The topic will be, "Tracking the Explosive Growth of RFID". The panelists for this discussion will be Blair La Corte from Savi Technology, Richard Swan from T3Ci, Raymond Blanchard from The Mayfield Fund and Jon Chorley from Oracle.

Summary of the Discussion

Radio Frequency Identification (RFID) is an enabling technology that has been used in various applications for over twenty years. During the past several years, RFID has captured increased attention and investment. Today, business imperatives and technology advances and have combined to spark potentially explosive growth in the RFID space.

As a result, a large number of vendors are moving into RFID, including startups and

established companies. Pure-play vendors are developing entirely new products for RFID. Opportunistic vendors are adapting their existing products to RFID, hoping to ride the wave. Established applications include: access control, toll collection and public transport fare collection. Wal-Mart and the Department of Defense are driving wide scale deployment of RFID by mandating use of the technology in their supply chains. RFID is also being considered for various types of high tech identity cards and convenient mobile shopping uses.

This panel will present an overview of applications and technology in the RFID space. Consumer acceptance and privacy issues will be covered as well. A panel of vendors and customers will present their perspectives and emerging high-growth opportunities will be revealed.

For more information:
<http://www.mitcnc.org>

A recent report from Forrester Research summarized the functions and need for RFID Middleware as follows:

“The bulk of the return on investment for RFID tagging will come from intelligent use of the generated data. But the question is how will companies capture clean data they can use? The answer is a new kind of software called RFID middleware. It manages the flow of data between tag readers and enterprise applications and is responsible for the quality, and therefore usability, of the information.”

RFID Middleware Companies to Watch

Blue Vector Systems

<http://www.bluevectorsystems.com>

T3Ci

<http://www.t3ci.com>

OAT Systems

<http://www.oatsystems.com>

Xterprise

<http://www.xterprise.com>

Connecterra

<http://www.connecterra.com>

Data Brokers

<http://www.databrokers.net>

RFID Middleware

From our perspective, RFID middleware functions are divided into three groups:

Reader interface: Control, configuring and monitoring readers, receiving reader events and providing a library of adapters for popular readers.

Core processing: Filtering, smoothing and aggregation, persistent storage, enhancing and translating, implementing business rules and process management.

Enterprise application interface: Routing and integration, deciding which data is passed to which recipient, providing a library of adapters for popular Supply Chain Management (SCM) and Enterprise Resource Planning (ERP) platforms.

On April 22, Peter Winer moderated a panel at the RFID World 2004 conference titled, “Middleware Requirements for Supply Chain Integration”. The panelists were Anurag Mendhekar from Blue Vector Systems, Pam Carpenter from webMethods and Mike Liard from Venture Development Corporation.

Presentation slides are available for download from the Big Chief Partners Web site at <http://www.bigchief.com/whitepapers>.

Middleware and related infrastructures are keys to successful RFID deployment and many vendors are competing in this space. Contenders include pure play companies that focus exclusively on RFID, as well as opportunistic vendors looking to extend their reach from other areas of strength into the RFID arena.

The pure play companies focusing on middleware include reader manufacturers, specialized network appliance vendors and software vendors betting that the special demands of RFID-generated data will create the need for new products.

The opportunistic companies include major players from many adjacent categories including database management, messaging infrastructure, application server platforms and supply chain management. Giants such as SAP, IBM, Oracle, Microsoft and Sun

Microsystems have all staked claims to the RFID middleware territory.

Even Cisco Systems is getting in the game. At a recent presentation a representative from Cisco stated that by 2009, the predominant traffic on Cisco networks would be EPC-related and that by 2014 the worldwide population of EPC-compatible readers would reach 300 million. To reinforce their view of RFID middleware and infrastructure, the Cisco rep described the Savant middleware standard from EPC Global as an “EPC Router.”

Three Alternatives for RFID Middleware

From an architectural perspective, companies have three alternatives for implementing RFID middleware:

1. Focus on new applications and platforms from RFID-focused pure play companies.
2. Focus on extending legacy applications and platforms with new adapters for RFID.
3. View the infrastructure for RFID as an extended distributed network and employ routers and appliances to handle RFID-based data.

In the near term, we expect most deployments to take the second approach, focusing on extending legacy systems with new adapters. As larger deployments become common, we expect RFID-specific network devices to play a growing role.

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Privacy, Trust and Security

Privacy, trust and security continue to be major issues simultaneously driving and dogging RFID emergence. RFID is viewed both as a key to strengthening security and as a threat to personal privacy. RFID can be used to improve efficiency and reduce errors by pinpointing the location of items with embedded RFID tags. RFID can also be used to track people and their activities through their belongings.

RFID and Consumers' Privacy

Early concern was aroused in March 2003 when clothing manufacturer and retailer Benetton announced their intention to tag garments at retail. They quickly scrapped their plans when the outcry grew too loud. Concern was then transferred to Gillette and Wal-Mart who planned to tag individual products and track their whereabouts throughout Wal-Mart's stores. In late 2003, this issue was sidestepped as vendors discovered that tagging individual retail items was neither practical nor cost-effective.

In early 2004, Metro Group introduced their Store of the Future initiative in partnership with SAP, Intel, IBM, Philips and others. The initiative included RFID in various capacities, including loyalty cards that would be issued to Metro customers. After numerous consumer protests, Metro was forced to back down and eliminate RFID from the loyalty cards.

The common thread is that in each case, consumers objected to embedding RFID in objects they would actually own and carry. In each case, consumers protested until the vendors decided not to attach tags to personal possessions. Today, major initiatives from Wal-Mart, the FDA and the Department of Defense do not include tagging items that consumers will own. As long as consumers have a voice, tagging of possessions will be limited and the use of captured data will be constrained.

At the same time, certain other initiatives involving RFID in possessions are gaining significant traction. Of these, the most

widespread initiatives include toll roads and public transportation, where it is becoming common to tag cars and personalized tickets. Beyond this, numerous vendors are experimenting with systems that make purchasing easier and faster using RFID-enabled credit cards and payment tokens. In these deployments, there has been relatively little outcry and eager adoption. Consumers are influenced by the pure convenience offered by such self-service schemes.

RFID and Citizens' Privacy

Governments are also getting into the game. The Chinese government plans to purchase RFID-enabled identity cards for every citizen. This will require 1.3 billion cards for the initial deployment and a stream of 50 – 100 million additional cards per year to replace damaged cards and issue cards to newborns. The government will also equip its 3 million-member police force with handheld RFID readers. The U.K. government is also planning to deploy RFID-enabled identity cards to its citizens.

On a more global scale, the International Civil Aviation Organization (ICAO) is promoting a standard for RFID-enabled passports within its 188 member countries. Such documents would include RFID-enabled chips that store biometric information such as fingerprints, retinal scans or facial scans. They could be used to precisely identify holders as they pass into and out of member countries. The U.S. Congress has supported this initiative, incorporating certain provisions into the Patriot Act of 2002. Starting some time in the next 2 years, certain people entering the United States will be required to carry so called, Machine Readable Travel Documents (MRTDs) and subject themselves to biometric scans.

It's easy to see how MRTDs can impact homeland security. These documents are presumably difficult to counterfeit and they unambiguously connect an individual to a specific travel document and identity. If the

Privacy, Trust and Security Companies and Organizations to Watch

Electronic Frontier Foundation
<http://www EFF.org>

American Civil Liberties Union
<http://www ACLU.org>

International Civil Aviation Organization
<http://www ICAO.org>

Electronic Privacy Information Center
<http://www EPIC.org>

Vivotech
<http://www Vivotech.com>

Dexit
<http://www Dexit.com>

Mastercard Paypass
<http://www Paypass.com>

Powerpay
<http://www MyPowerpay.com>

Transcore
<http://www Transcore.com>

“Implementing organizations must refrain from storing biometric information in centralized databases that could be used to track personal movement and degrade personal privacy.”

Privacy, Trust and Security (contd.)

biometric information is only stored in the document and only used to compare the document to a single individual, then the threat to privacy is reduced.

Personal privacy becomes compromised when biometric information is stored in centralized databases and when scanning is more widespread, authorized or not. It is incumbent on governments and standards organizations such as the ICAO to insure that guidelines for scanning are enforced and that documents have adequate security to prevent unauthorized companies and organizations from scanning travel documents.

RFID and Supply Chain Security

Today, the RFID world is focusing on supply chain mandates from Wal-Mart, the Department of Defense and others. Simultaneously, these sensitive and security-dependent applications are emerging and

gaining momentum. In addition to purchasing and identity applications, RFID is emerging for the tracking of critical, expensive items such as pharmaceuticals, patient records and equipment for the healthcare industry.

Keys to such sensitive applications include:

They must be implemented with strong encryption and authentication to ensure that unauthorized parties cannot obtain sensitive information.

Implementing organizations must refrain from storing biometric information in centralized databases that could be used to track personal movement and degrade personal privacy.

Vendors should emphasize end-to-end security, encompassing tags, readers and all network devices that convey information to centralized applications. Today's EPC standards do not include adequate end-to-end security or authentication.

Standards and Mandates

From 1999 until late 2003, the Auto ID Center was the beacon for RFID in supply chains. The Auto ID Center developed software and hardware specifications. They also established the business case for RFID in supply chains and gathered sponsorships from over 100 key companies and organizations.

Recently, the specifications and the development of standards has been turned over to EPC Global, a new organization dedicated to building standards fostering collaboration focused on RFID. Since its inception, EPC Global has struggled to move the standards process forward.

At the same time, mandates have captured the spotlight. It is not surprising that the mandates from Wal-Mart, the Department of Defense, the Food and Drug Administration the International Civil Aviation Organization and others are focused more on solving practical problems than on defining

ubiquitous standardized technology.

This seems like a natural evolution, but it is not without risks. The original standards from the Auto ID Center provided a useful benchmark for RFID system architecture. They served to focus discussion on key issues and helped educate many organizations in charge of solving problems and delivering ROI with RFID. What they lacked was a practical connection to legacy architecture and existing business solutions. Now the future adoption of these standards is not assured.

Savant Middleware

Savant is the middleware architecture developed by the Auto ID Center. Among the standards, the Savant middleware now seems like little more than a theoretical vision. Most commercial players are adopting some of the terminology from the Savant architecture but nothing more. Most

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Standards and Mandates Companies to Watch

Sparkice Labs

<http://www.ipcode.cn/en/>

EPC Global

<http://www.epcglobalinc.com>

Ubiquitous ID Center (Japan)

<http://www.uidcenter.org>

Uniform Code Council

<http://www.ean-ucc.org>

Electronic Commerce Council of Canada.

<http://www.eccc.org>

Verisign

<http://www.verisign.com>

Matrics RFID

<http://www.matrics.com>

Alien Technology.

<http://www.alientechnology.com>

Philips Semiconductors

<http://semiconductors.philips.com>

Texas Instruments

<http://www.ti.com>

SAMSys.

<http://www.samsys.com>

Standards and Mandates (contd.)

customers will implement the three layers of Savant with a combination of network routers and appliances plus adapters for their legacy enterprise applications.

Centralized Repositories

Other Auto ID center standards such as the Object Naming Service (ONS), EPC Information Service (EPC-IS) and EPC Discovery Service (EPC-DS) also have cloudy futures. These architectures are all centralized repositories used to satisfy queries as tagged objects travel between trading partners. In theory, the evolution from single-company deployments to industry ecosystems and beyond to universal connected supply chains would require such repositories. The current mandates do not include these centralized repositories. Consequently, they do not appear to play a practical role in the immediate future of RFID implementations. EPC Global created further confusion when they granted a contract to Verisign for implementing the root ONS and EPC-IS. This contradicted the open standard approach.

EPC Numbering System

Until recently, the EPC tag numbering system appeared to be the one standard component with the best chance of receiving widespread adoption. As the mandates and other international initiatives have evolved, other numbering systems are being considered for RFID as well. Some examples and recent developments include:

The Department of Defense will allow vendors to use either EPC or their own proprietary Universal ID (UID) to identify items.

The government of Japan is promoting a different numbering system called UID and the government of China is promoting their National Product Code (NPC).

Global Trade Item Number (GTIN) is an existing standard for identifying companies

and products. GTIN is said to be compatible with EPC, but most retailers are still focused on basic GTIN support and are unable to focus on EPC today.

The United States Food and Drug Administration (FDA) issues National Drug Codes (NDC) for identifying pharmaceuticals.

Internet Protocol version 6 (IPv6) is a new numbering system for nodes on the public Internet and intranets. Proponents view RFID tags as simplified network nodes and argue that IPv6 should be the universal numbering system for RFID tags and readers.

EPC originally promised to be a universal numbering system for items. For this to happen, there needs to be some resolution or compatibility with other competing numbering systems used in various industries and locations around the world. Right now, it appears that each numbering system is on a different, independent trajectory.

EPC Tag Specification

At a high level, the EPC tag specification appears to be gaining wide acceptance. Digging deeper, it's clear that there are two basic specifications backed by two camps. Matrics RFID supports so-called Class Zero tags. These tags have a unique serial number that is programmed at the time the tag is manufactured. Alien Technology supports Class One tags that are programmed by any compatible reader/writer at any time. Class One tags can be programmed, erased and reprogrammed multiple times.

Wal-Mart and the Department of Defense have indicated they will support Class Zero and Class One tags. Both plan evolving to Class One Generation Two tags as they become specified and available.

Unfortunately, there is a lack of agreement among the EPC Global members on the

Standards and Mandates (contd.)

specific Generation Two feature set. In fact a separate group of vendors lead by Philips, Texas Instruments and SAMSys recently announced an agreed specification outside the EPC Global umbrella. Going forward, the EPC tag standards must be expanded to include better security and authentication, read/write memory, environmental sensors, among other features.

Conclusion

Despite all the questions, the mandates are driving rapid adoption of RFID in a wide variety of applications. To some extent, these mandated deployments could proceed without complete standards definition. Some caution is required simply because stitching the deployments together without agreed standards might be difficult down the road.

About Big Chief Partners

Big Chief Partners offers strategic advice, research and software development for organizations that want to capitalize on identification technologies, mobile payments, infrastructure and security and RFID.

Since early 2001, Big Chief Partners has been developing the WebLink RFID system with Philips Semiconductors.

Clients include technology vendors, customers pursuing RFID deployment, conference organizations and venture investors in the U.S. and Europe.

To subscribe to this newsletter, send an email to info@bigchief.com.

Big Chief Partners, Inc.
329 S San Antonio Road
Suite 8
Los Altos, CA 94022
USA

Voice: (650) 917-3832
Fax: (650) 917-3831
Mail: info@bigchief.com
Web: <http://www.bigchief.com>
Blog: <http://www.bigchief.com/weblog>