



# Big Chief Partners, Inc.

## RFID Update

October, 2003

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.

### Recent Big Chief Activities

Our recent activities include:

- Continuing work on commercial applications for the WebLink system developed by Big Chief for Philips Semiconductors GmbH.
- Three working visits to Europe in 2003 and ongoing work in the United States with entrepreneurs, senior managers and investors focusing on RFID.
- Moderating "Enabling RFID Solutions with Middleware" panel discussion at Frontline's International Supply Chain Week in Chicago, September 17, 2003.
- Attending EPC Symposium in Chicago, September 15-17, 2003

### Panel Discussion: "Enabling RFID Solutions with Middleware," Chicago, Sept. 2003

In today's RFID deployments, systems integration and custom software development are dominant costs with significant uncertainty. Many RFID experts believe infrastructure software or "middleware" is the key to reducing these costs and to fostering broader RFID adoption. As further validation, middleware components such as Savant, ONS and PML are keys to the initiatives of the MIT Auto ID Center, a leader in defining the future of RFID technology.

Recently, a group of new companies has emerged that is focused on RFID middleware as a solution to this problem. Established enterprise software vendors have also weighed in, positioning their existing products as keys to the management of RFID-generated information flows. Finally, manufacturers of RFID readers and other hardware are expanding their offerings into network edge appliances that incorporate certain key middleware functions.

In this middleware arena, every vendor has a distinct approach. Also, various RFID-centric applications have different data management, security and authentication requirements as well as potential links from RFID devices to environmental sensors and smart devices.

As a result, the industry map of companies, partnerships and solutions is complex. Standards have been proposed, but they are not fully mature or widely adopted. The potential for significant change in this emerging technology is large.

Companies considering RFID deployments in the next 1 – 3 years need to understand the current landscape and also be able to anticipate future trends. This is critical for making the correct technology and vendor choices that can deliver long term return on investment with minimum risk.

Our panel discussion was titled, “Enabling RFID Solutions with Middleware” and was moderated by **Peter Winer** from Big Chief Partners. The Panelists were:

**Prasad Putta** – Founder of OATSystems (<http://www.oatsystems.com>) and architect of Savant, the middleware solution from the MIT Auto ID Center.

**Bryan Tracey** – Director of Engineering at Globe Ranger (<http://www.globeranger.com>), a leading provider of network edge software that manages information in RFID deployments.

**Mike Schnoll** – Director of North American Sales at Alien Technologies (<http://www.alientechnology.com>), owner of the Fluidic Self Assembly (FSA) process that promises to deliver very low cost RFID tags and other components, enabling new RFID applications.

**John Shoemaker** – Vice President of Corporate Business Development at Matrics, Inc. (<http://www.matrics.com>) producer of RFID tags and readers that read farther and faster while costing less than comparable systems.

In preparation for the panel discussion, we also consulted with representatives from SAP, IBM, Sun Microsystems and various RFID middleware startups, market research companies and early-stage venture investors.

Loosely stated, RFID middleware is the hardware and software required to transport information from RFID tags and readers to the centralized enterprise applications that can deliver return on investment. RFID middleware should collect, filter and aggregate information. In addition, information should be enhanced from external sources, transformed for compatibility with upstream components and routed to the proper recipients. All these functions should be provided under a canopy of strong security and authentication.

The panelists all contended that RFID middleware could be designed to apply horizontally, with one technology platform applying equally

well across various industries and applications. We challenged the panel by citing the diversity of potential RFID applications with diverse memory and security requirements as well as different interfaces with physical environments. The panelists each felt that general-purpose RFID middleware platforms could be developed with the ability to customize for any environment or application.

The stated intentions of huge, entrenched middleware vendors were also discussed. Our contacts at IBM have explained their view that middleware for RFID consists of WebSphere, DB2 and Tivoli. We get the sense that Microsoft and Sun Microsystems have similar views, with their own platforms playing dominant roles. SAP expects to extend their infrastructure out toward the network edge as well.

In these company views, most RFID middleware functions are provided by existing widely installed general-purpose products that are not RFID-specific. This view has some merit because the larger players are capable of making huge investments in service, support and optimizing their products for the unique demands of RFID-generated information. Also, these products have well-tested application development environments and interfaces to existing commercial applications.

Generally, the representatives from Alien and Matrics were comfortable with this view. Mike Schnoll from Alien explained that his company was investing to build Intelligent Readers. Such readers offer interactive web-based interfaces for information flow and management functions. They also provide Web Services (XML) based interfaces. In addition, they can provide some filtering, aggregation and routing functionality with the ability to support application-specific customization.

John Shoemaker from Matrics supported this view and indicated that Matrics RFID-specific middleware solution – known as Matrics Visibility Manager – was an interim solution. In the longer-term future, Visibility Manager will be replaced by a combination of intelligent readers and robust middleware from other vendors.

Bryan Tracey from Globe Ranger emphasized the need for aggregation and dedicated appliances for collecting information from multiple readers. Globe Ranger's Edgeware solution is designed to be embedded into such collection devices that interface with multiple readers on the network edge and enterprise middleware upstream.

Prasad Putta from OATSystems maintained that existing middleware products from established players lack specific performance and functionality necessary to handle RFID-generated information. More than one commentator from the audience supported this view.

## **Our View of Middleware for RFID**

At Big Chief, we see RFID as an enabling and accelerating technology. In deployments, readers at the network edge collect RFID-related information. There is widely held concern that RFID will generate high volumes of real-time information that cannot be adequately handled by legacy middleware infrastructure. We see the introduction of intelligent readers and collection appliances as a neat solution to this problem. With these devices, dedicated devices at the network edge can handle collection, filtering and aggregation. In principle this averts problems of network congestion at their source. In addition, such configurations will allow deploying companies to use existing middleware solutions from established companies prepared to offer solid staying power and support.

This approach is not without its challenges. It is quite possible that existing middleware will still need enhancement to support RFID. Today most attention is focused on attaching very inexpensive tags on palettes and cartons of Consumer Packaged Goods. In these deployments, RFID tags only store a unique serial number and there is no security or authentication within the tags. More functional tags and more demanding applications will clearly present challenges that cannot be fully anticipated.

In addition, these network edge devices will require powerful and automatic management tools. Information format standards such as Product Markup Language (PML) are a good start, but more investment is required to extend these standards to handle all network edge functions and application specific information formats.

## **The Future of Savant**

Just an hour before our middleware panel, Prassad Putta from OATSystems presented a session on the Savant middleware at the EPC Symposium.

Savant was presented as three-tier architecture. At the edge of the network, Savant includes intelligent device interfaces for connecting to RFID readers. The goal of this layer is to present the same interface for all readers, so the middleware software does not have to implement reader-specific functions.

The middle tier of Savant is a platform for running information processors and accessing external resources. These information processors are responsible for filtering, aggregating, enhancing, transforming and routing information to centralized enterprise applications.

The final tier is a set of application adapters. These adapters shield the information processors from the idiosyncrasies of specific enterprise applications. By using adapters, the information processors

can be free of application-specific functionality.

Object Naming Service (ONS) is one of the external resources available to the middle tier information processors. Presumably, an information processor can invoke ONS to find the application or applications that have an interest in an RFID-generated event. This could be used for routing the event to the appropriate enterprise application.

The session included a lively set of questions and answers. One member of the audience wondered if Cisco would want to compete with Savant since Savant appears to function like a router. Another audience member wondered if IBM would consider Savant to be competitive with its middleware as well.

With Savant, the Auto ID Center has clearly articulated an appropriate template for RFID deployment within many applications. The three-tier architecture is consistent with our view. Indeed the WebLink infrastructure designed by Big Chief for Philips (<http://weblink.philips.com>) is organized in a somewhat similar manner.

Despite this logic, we believe that the commercial future of Savant is not quite so clear. The middle tier of Savant is a platform for running information processors. As the audience member observed, at least some of this functionality could be implemented in a network router. We also believe that Java-based application servers such as WebSphere or WebLogic would fill the need. It has been suggested that the application servers can't deliver adequate performance and that message queue software might be more appropriate.

Regardless of which approach eventually wins, one thing is clear: The nascent companies and standards supporting RFID-specific middleware such as Savant will face stiff competition from a wide array of large, entrenched companies that have established relationships with RFID-deploying customers.

Obviously, customers who deploy more general middleware instead of RFID-specific middleware will have little use for Savant's application adapter layer.

So what remains? We believe the device interface layer in Savant has immense potential for defining standards and reference implementations for intelligent readers and collection appliances. As an independent consortium, the Auto ID Center is well positioned to offer standards ensuring that the majority of intelligent reader vendors will agree on standard interfaces and core functionality. This will help enable more rapid, widespread RFID deployment.

## Auto ID Center Legacy

The EPC Symposium was a major milestone for the MIT Auto ID Center. This conference was the first open gathering focused on the Center's innovative work. The conference also marked the version 1 release of the Auto ID Center's architecture specifications, the launch of Verisign's commercial Object Naming Service (ONS) and the migration of standards management from the Auto ID Center to the Uniform Code Council (UCC). New research and development in this arena will continue at the Auto ID Lab based at MIT and other universities worldwide.

The version 1 release of the Auto ID Center architecture includes four standard components to support the deployment of RFID:

The **Electronic Product Code (EPC)** is a structured numbering system for assigning unique identities to all tagged objects. EPC is also a specification for RFID tags and for readers that are compatible with such tags.

**Product Markup Language (PML)** is an XML-based format for sharing RFID-related information about products across components of RFID-based systems.

**Savant** is a multi-tier middleware architecture that connects RFID tags and readers to networks and enterprise applications that profit from RFID-generated information.

**Object Naming Service (ONS)** is based on the familiar Domain Name Service (DNS) that powers the Worldwide Internet. ONS is used to link EPC tag numbers to the names of corresponding applications and information recipients.

We support defining infrastructure standards that point to frameworks of functional components. Such standards can also delineate business focus for startups and established players. Specifically, the Auto ID Center has defined standards for tags, readers and the infrastructure for connecting to enterprise applications. These standards will certainly help accelerate development of RFID technology.

The unique numbering system of EPC and the linking system of ONS will receive huge investments and become widely used during the next 2 – 4 years. Under the management of the Uniform Code Council (UCC), ranges of EPC identifiers will be assigned in an orderly fashion. Vendors who wish to embed RFID tags in their products or packaging will be able to use EPC-compatible RFID tags, confident that their numbers are unique and their tags are compatible with readers from multiple vendors.

DNS giant Verisign has committed to providing publicly accessible ONS for linking these tag numbers to applications and information recipients. We understand that Verisign's commitment will increase

momentum. Nevertheless, we are concerned that the ONS specification is not sufficiently robust, versatile or secure for long range use. As the number and variety of deployed RFID applications increases, the limits of ONS could be an inhibiting factor.

The EPC specification for compatible RFID tags is a good reference design for focusing mass production and driving down RFID tag cost. The Auto ID Center, Alien Technology and other groups have focused attention on tags costing 5 cents or less. We wonder how soon that will be possible. On the other hand, we don't see the 5-cent threshold as a critical key to RFID adoption. We see no shortage of RFID applications that can support higher priced tags.

Recently, the Auto ID Center released the Class II, II and IV specifications for tags with more functionality, including read/write memory, security, connection to sensors and peer-to-peer communication. We are glad to see the Auto ID Center acknowledge the value of more capable tags. Indeed, various semiconductor companies such as Philips Semiconductors, Infineon, ST Microelectronics and Texas Instruments are already producing such tags.

Ultimately, RFID tags are nothing more than standardized wireless interfaces to computing devices and environmental sensors. With that in mind, it is possible to over-standardize the specification of RFID tag functions. Standards should not inhibit RFID innovation beyond the imagination of the standards groups. This would be analogous to defining a standard that limits which applications can run on Personal Computers.

Product Markup Language (PML) is a core definition for describing RFID-generated events in XML. As a core definition, PML is a step in the right direction. As specific RFID applications emerge, we expect new XML definitions for information sharing to emerge as well. Realistically, some of these will be based on PML and others will be based on longer established XML standards. PML is a good starting point and a vector pointing to further, more extensive standards. It is impossible for a single markup language to serve the information needs of all applications and industries. We hope the majority of RFID applications will share some core language, offering some level of interoperability.

In summary, we are enthusiastic and supportive of the standards produced by the Auto ID Center. In addition, the Auto ID Center has created a phenomenal consensus among its many influential members. There is no question that the Auto ID Center has succeeded in creating a roadmap for RFID technology that will contribute to multiple applications and accelerate adoption.

Moving forward, we see market forces taking over. There is tremendous interest and investment in RFID today. We see networks of product vendors and systems integrators emerging to serve companies in gaining efficiency and competitive advantage with RFID technology. The Auto ID Center standards will help launch these efforts and lead the way to further innovation beyond.

### **Intelligent Reader Companies to Watch**

#### **Thing Magic** (<http://www.thingmagic.com>)

Developing low cost intelligent readers in partnership with Intel.

#### **AWID** (<http://www.awid.com>)

Provider of multi-protocol reader components and sub-assemblies.

#### **Ntru** (<http://www.ntru.com>)

Provides strong security for Contactless Smart Cards and RFID. GenuID reader software runs on a variety of reader platforms.

#### **SAMSys** (<http://www.samsys.com>)

Recently received a broad patent for a multi-frequency, multi-protocol RFID reader.

### **WebLink from Big Chief and Philips**

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

WebLink is software infrastructure or middleware for RFID focused on the desktop and consumer markets. The WebLink system collects information from RFID tags with filtering, aggregation, routing and reporting while providing security and authentication at all critical points. WebLink also includes development tools for building focused, customized applications.

In September 2002, Philips and Sony jointly announced a partnership to develop Near Field Communications (NFC). This technology will enable new products and services based on industry-standard RF communications and close-range peer-to-peer networking. Big Chief is helping to define the new systems and infrastructure for NFC.

Philips Semiconductors is a member of the Auto ID Center and in September 2003, Philips announced its EPC-compatible tags and readers. More information on WebLink can be found at:

- RFID Journal  
<http://www.rfidjournal.com/article/articleview/404/1/1/>

- Philips Semiconductors  
<http://semiconductors.philips.com/identification/weblink/>
- Big Chief Partners  
<http://www.bigchief.com/spotlight/philips/>

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information**

Big Chief Partners is an organization specializing in software design, architecture and implementation as well as providing technology adoption and investment advice to our clients. Our areas of focus include Internet infrastructure and RFID technology.

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