

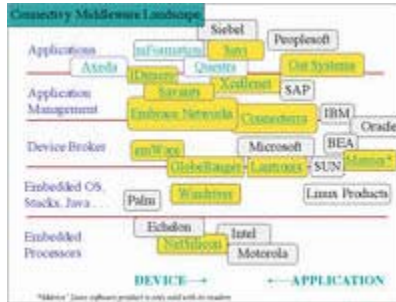
# RFID JOURNAL

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## RFID to ERP: The Land Between

**The focus has been on tags and readers, but the middleware that processes data from RFID readers and passes it to enterprise systems is critical. Eric Ipsen looks at the trends and key vendors in this crucial area.**

April 14, 2003 - There's a tendency, particular in the business press, to look at information technology as a series of advances -- some large, some small -- in computing. In fact, IT has evolved steadily with one purpose: To get more accurate, timely information to the workers who need it, so they can make better decisions. RFID is simply the next phase of this evolution. It has many people excited, and rightly so, because of its ability to capture accurate, real-time data.



There's only one problem. Most of the advances in RFID over the past couple of years have been around lowering the tag costs and improving reader performance. This focus on hardware is important, but RFID hardware isn't of much value without software that can process data from readers and pass it on to enterprise systems. The good news is there is an increasing amount of activity in the all-important area of "connectivity middleware." This software layer, which resides between the RFID readers and the enterprise applications, is critical because without it, companies have no way to take advantage of low-cost RFID tags and readers. The aim of this article is to provide an overview of the RFID middleware landscape, explain who the key players are and describe the products that they offer.

RFID has been around for a long time, and it's no accident that it has become the focus of attention now. The IT evolution has reached a stage where companies need accurate, real-time data and have the infrastructure in place to cope with it. For those who would like to understand this in more depth, I've produced a sidebar that explains the role of enterprise resource planning (ERP), supply chain management (SCM) and customer relationship management (CRM) software (see [RFID and the Evolution of IT](#)).

Generally speaking, companies have been trying to sew together all of the data gathering, data processing and analysis and data delivery systems into a seamless whole. RFID readers will capture data, but companies need middleware to process the data and feed it to enterprise systems in a way they can use it. Completely new protocols are evolving to provide for dynamic near-real-time communication between readers and software using the Internet or other networked platforms.

There is also a new market segment comprising software vendors that manage data collection and other computing devices connected to corporate networks. Sometimes this market is called intelligent device management (IDM), device relationship management (DRM) or some other term. These terms can mean various things, but in general, they cover products that enable companies to do some or all of the following:

- >Schedule unattended outbound data exchange, transparent to end-users.
- >Provide hands-free maintenance, remote control and diagnostics.
- >Support and configure a variety of connection transports and protocols.
- >Deploy applications enterprise-wide or to a select group of locations.
- >Capture and store hardware and software asset information.
- >Deployment, automate and management anti-virus detection systems.
- >Create detailed audit trails with logging and reporting to easily identify failed polling or communications sessions.

Broadly speaking, companies want to gather data about their operations in real time or near-real time. They want to process this data in some way and pass it on to enterprise systems so it can be analyzed and acted upon in some productive way. This is generally achieved in three stages:

**Basic connectivity** is the simple connection of a device, appliance, or tag to a local or wide area network. Functionality is limited, and historically, this has been a closed-loop or point connection within a particular part of an enterprise.

**Value-added connectivity** includes basic connectivity, but also provides for easier remote or local installation. Applications residing within a device can be expanded or updated. Data can be transferred to "distributed hosts" for automated processes, alarms, notifications and monitoring. And value-added connectivity allows for remote device management, diagnostics and repair.

**Full enterprise connectivity** is the next stage companies are currently striving to reach. In this phase, all of the above capabilities exist, but companies also use peer-to-peer communications, automated or self-healing software features and potentially very limited

human intervention in the connectivity process. An important aspect of this phase is the ability of devices to pass business event content to other applications inside and outside the enterprise. This requires open data standards and the highest levels of persistence, low latency and very robust security with the ability to manage who has access to the data.

At this time, most enterprises are in either phase one or phase two. They have probably undertaken internal projects in areas where there is a clear return on investment. The evolution of DCOM, CORBA, .NET, Java, XML and SOAP are at the heart of achieving full enterprise connectivity. There are additional directory protocols like UDDI that will play an important role. These will also be recognized within the architectural goals of Web Services. It is here that a new "distributed intelligence" and decision-making paradigm is being born. This shift will allow for the enterprise to move from centralized control to a distributed model.

In order to achieve this, new software is needed. Since this article is focused on connectivity middleware in the broadest sense, the vendors described below cut across all industries and include both horizontal and vertical applications and platforms. We've organized the vendors by the type of products they offer. While not fixed, a hierarchy of solutions is emerging. There are several ways it can be visualized. For simplicity, we have chosen to use a vertical model that places embedded solutions on the bottom and customized vertical applications at the top.

### Middleware Software Hierarchy

Here is a general description of the software categories that make up the vertical hierarchy of middleware products today.

**1. Software Applications** that solve specific vertical market connectivity and monitoring requirements. The most powerful of these applications will allow for rapid development and interaction with other specific applications with the goal of solving problems in particular verticals or processes across verticals.

**2. Application Management** are focused on taking full advantage of the open data standards and protocols to connect disparate applications within the enterprise. This is the place where devices and databases come together. At its highest level this is where transparency and near-real-time information is available to the enterprise, often being provided autonomously. These are features that will be seen in the third phase of connectivity where function is maximized and user interface is standardized around the browser.

**3. Device Brokers** allow for open data protocols but tend to be more segmented in solving specific areas of the enterprise such as ERP, CRM or IDM.

**4. Embedded Operating Systems, Communication Stacks and Java** are enhanced to bring distributed intelligence to devices, RFID readers and appliances. As new products are rolled-out much of the functionality required to liberate legacy hardware (see No. 3 above) will continue to move to the device itself.

**5. Embedded Processors** are increasingly becoming powerful computers in their own right. In this case much of the software is right on the chip and allows for very low cost efficient addition of "intelligence" at the edge of the network. Ultimately this will facilitate devices functioning in a distributed peer-to-peer mode.

### The Middleware Vendors

We've put each company in the segment they most closely fit, but many products cross into other areas. So we've designed a "landscape graph" to help you visualize how the vendors fit into these segments of the market (to download the graphic, [click here](#)). We've also created a convenient Excel spreadsheet with information on the key players in the RFID markets and other players whose software could be used to deploy and manage RFID reader networks. (To download the spreadsheet, [click here](#).)

Our list is not exhaustive, but it is highly representative. Some of the companies are startups; others have been around for some time. Those that have been around are upgrading their offerings to keep up with the rapidly expanding product possibilities being created by new RFID hardware and the network standards that are evolving. The vendor description table is in an order that generally moves from more specific applications down toward embedded chip vendors.

Keep in mind, that other companies will have an important role to play. Accenture, for example, has created a [Silent Commerce](#) platform that it uses to integrate RFID across the enterprise for its customers. SAP is working on a product for managing RFID data, and I expect that BEA Systems, IBM, Microsoft, Sun Microsystems, Hewlett Packard and other major IT vendors will likely offer products and services. In the meantime, here's a list of some of the key vendors offering products today.

### Software Applications

**IDmicro:** Tacoma Washington-based ID Micro sells both hardware and software. Its Avera Visibility product is an application development platform for creating custom asset tracking applications using a variety of automatic data collection and control devices. System integrators and application developers can use the product to integrate RFID readers with core business systems. Avera Visibility monitors system performance, and tracks and reports real-time mission critical events. It's designed to simplify the development of secure enterprise applications that are transactional, scalable, and portable.

**OAT Systems:** This startup, based in Watertown, Mass., did some of the development work for the Auto-ID Center's Savants (see next page). It then developed its own product, called Senseware, which is designed to handle large volumes of retail data. The company has built interfaces to readers from most of the leading manufacturers. Senseware is designed to process data from RFID readers and turn it into useable information. It can be used to automatically replenish stocks, to send alerts when a theft might be in progress, or to track assets and inventory with RFID tags, including returns and special orders. The information can be integrated with existing ERP, SCM, CRM, and other enterprise systems. The software also generates status reports about the products, thefts, and assets that it tracks.

**Savi Technology:** Sunnyvale, Calif.-based Savi is one of the leaders in this market. Its SmartChain Platform aggregates and integrates logistical data from RFID and bar code readers and other data collection devices. SmartChain has a highly scalable architecture based on the open Universal Data Appliance Protocol (UDAP) that provides a Web interface for network management,

and the ability to transmit data to partners securely. The Savi Asset Management System, Transportation Security System and SmartChain Logistics Portal sit on top of the SmartChain Platform and provide global security and real-time management and monitoring of supply chain assets.

## Application Management

**Auto-ID Center:** The Auto-ID Center is designing and building a layer integrated with the Internet that will make it possible for computers to look up Electronic Product Codes and get associated data. As part of that effort, the center has developed something it calls Savants, computer applications that are distributed across an enterprise and organized in a hierarchy. Savants gather data from readers and pass on only relevant information to existing business applications, such as which products are about to expire on a store shelf. Savants have a Task Management System that enables companies to set triggers. For instance, a Savant in a distribution center could be set up to alert a replenishment system when the DC only has two pallets of a certain product left.

**ConnecTerra:** Cambridge, Mass.-based ConnecTerra has developed what it calls a Device Computing Platform (DCP). The software platform is designed to enable companies to deploy and centrally-manage a wide range of device and computing applications that run on them. DCP provides secure communications for large deployments with diverse devices, networks and applications. By creating a central system for identifying and managing devices, the platform helps companies to manage and apply policy across the entire enterprise system. The platform also helps to simplify application deployment and backend integration by streamlining the common patterns of device applications.

**Embrace Networks:** Embrace Networks of Sunnyvale, Calif., has developed a Device Brokerage Platform, which is designed to help companies incorporating devices, machines or appliances into the operational infrastructure of an enterprise via the Internet. The platform lets companies connect virtually any device, along with its associated host application, to a standard IP network. The software helps to integrate devices with IT infrastructures so they can be incorporated into business systems, such as CRM, ERP and data mining. The company claims its customers can manage "dozens to millions" of devices by providing deployment, provisioning, status monitoring, upgrades and extensible administration services.

**XcelleNet:** For more than 14 years Alpharetta, Georgia-based XcelleNet has been focusing on the challenges of distributed networks. Its flagship product, RemoteWare, enables enterprises to securely deliver and maintain mission-critical applications and content to fixed remote locations. From a central site, organizations can perform key system-management tasks to ensure the proper operation, connections and data transfers of its branch offices, stores and restaurants, as well as unattended kiosks, ATMs and public access terminals. The company's Afaria product lets companies automatically install and maintain business applications, distribute and update content (such as price lists, product information and sales data), capture hardware and software configurations, and monitor and manage mobile devices from a central site.

## Device Brokers

**GlobeRanger:** Richardson, Texas-based GlobeRanger is about connectivity without the wires. The company's iMotion platform has a universal wireless interface that makes it possible to gather data from a variety of wireless devices and over various network technologies. The platform has a Web-based "dashboard" that lets system administrators manage the network and users, as well as monitor and debug devices. Users can set up business rules to identify critical events and provides alerts and notification. iMotion's distributable architecture supports hosting, clustering, load balancing, and fault tolerance, and it supports Web services for easier development and integration of devices into existing and new applications.

**Lantronix:** Based in Irvine, Calif., Lantronix offers both hardware and software. Its products range from systems that let users remotely manage network infrastructure equipment to technologies that network-enable devices and appliances. Lantronix's Device Servers enable companies to integrate older serial (RS-232, RS-422 or RS-485) technologies with Ethernet networks. By network-enabling these devices, companies can make data from RFID readers, bar code scanners and other devices more widely available over the network. This allows other devices, servers, and hosts to use the information in enterprise applications. The system makes it easier to monitor and remotely manage devices that only have serial ports.

**Matrics:** This Columbia, Maryland-based startup sells RFID tags, readers and software called the Matrics Visibility Manager. This middleware product handles the complexities of collecting data from what could eventually be millions of RFID tags in a company's supply chain with a dedicated data appliance and software. The Visibility Manager enables companies to setup, configure and later modify or upgrade readers. The software buffers, cleans, and filters information from the RFID readers and passes "event" data on to the enterprise systems. Visibility Manager also monitors the reader network and helps isolate problems via the Simple Network Management Protocol (SNMP).

## Embedded Operating System

**WindRiver Systems:** Alameda, Calif.-based WindRiver has been around since 1981. The company's Platform ID is an embedded enterprise platform that provides developers with the technologies needed to build connected industrial devices, including smart sensors, RFID readers, and motion controllers. The platform includes software capabilities including development tools, real-time operating system, connectivity, management and graphics with reference hardware and training services.

## Embedded Processor

**NetSilicon** Founded in 1984, Waltham, Mass.-based NetSilicon offers integrated hardware and software for intelligent, networked devices. Its "Solution-on-Chip" approach combines a microprocessor specifically designed for use in intelligent networked devices and Internet appliances with software for managing the devices. The company's NET+Works product family is a development platform that helps integrate Ethernet connectivity into devices or products. It includes development tools, a target board and debugger, a royalty-free runtime environment, and a complete set of networking protocol and applications software.

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