The Increasing Importance of Choosing the Right RFID Middleware

A whitepaper from Sybase iAnywhere

SYBASE® iAnywhere®

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INTRODUCTION

RFID middleware exists to allow you to make the best use of your resources and expertise to build powerful and flexible RFID and sensor solutions. By providing device interfaces, development frameworks, and integration capabilities, this class of software products plays an increasingly strategic role in any RFID project. This paper discusses the role of middleware in more detail, and highlights its importance for system integrators, application developers, hardware vendors, and end users.

RFID Anywhere™ is the RFID middleware offering from Sybase. Its rich feature set and advanced architecture are discussed, highlighting the value it brings to projects for developers, system architects, and administrators. RFID Anywhere is an ideal choice for a foundation on which to build any RFID project that requires intelligent decision-making in a distributed environment, or any system that combines RFID with barcodes, RTLS, sensors, mobile devices, or other automatic identification technology.

THE ROLE OF MIDDLEWARE

When designed and used properly, RFID middleware should address challenges that come from working with RFID and sensor technologies, while providing a flexible foundation on which to build solutions. The hardware abstraction, APIs, and supported deployment architectures should allow developers to truly focus on the specific business requirements of each solution.

Technology challenges arise from the inherent complexities of building intelligent sensor network solutions that involve a variety of RFID and sensor devices. Varying hardware interfaces and protocols, multiple tag data standards, physical setup requirements, and distributed configurations all add complexity to a given project. Hardware and software running at non-traditional locations at the edge of the network—enabling mobile, remote, and distributed systems—adds network management complexity and highlights the need for a scalable and robust foundation. Integrating processed RFID and sensor data into existing heterogeneous enterprise systems often requires using a variety of data formats and communication channels. If a developer is to write and maintain code to work with all of these options, there is ultimately less time to write code to support the specific business scenario. To meet performance requirements, it is also important to decouple the edge logic that provides real-time responses to data from the enterprise system.

The best RFID middleware provides a foundation that lets developers focus on the business requirements of the company's desired solution. A robust hardware abstraction layer with broad device support lets the company choose the best hardware while the developer focuses on writing the business logic, not low-level hardware interaction code. This minimizes the learning curve for new devices and minimizes required code changes when new devices and hardware classes are introduced. Flexible options for solution architecture—including mobile, remote, and distributed deployments based on a proven framework and reliable messaging—allow the company to pick the architecture that is best for each solution, with the ability to grow easily. Enterprise integration should be flexible and straightforward to allow support for existing systems and processes.

In all, the best RFID middleware should provide the built-in developer-productivity features, management tools, and solution building blocks to shield developers and administrators from technical complexities, while providing the utmost in flexibility to address a wide range of business requirements.

RFID ANYWHERE INTRODUCTION AND VALUE

RFID Anywhere from Sybase is a software infrastructure that simplifies the development, deployment, configuration, and management tasks for highly distributed, multi-site, intelligent sensor networks, and abstracts the interaction with the physical network of devices. By exposing the raw data from sensors in an event-driven architecture and providing a powerful service-oriented architecture layer, developers and integrators can focus on writing business logic, not low-level hardware interfaces. RFID Anywhere supports a broad array of hardware, standards, and development models, and can be deployed to the edge of the network, reducing the flow of data across the network and enabling real-time reactions to important RFID, location, and sensor events.

RFID Anywhere is more than just middleware. It is a complete *Intelligent Sensor Network Management System* that provides tremendous value for developers, system architects, and administrators.

Valuable For Developers→ Productivity

RFID Anywhere provides device independence that is not "lowest common denominator"

Because RFID devices are rarely used on their own, RFID Anywhere supports and abstracts a wide range of passive/active RFID, mobile devices, sensors, PLCs, GPIO, barcodes, and location tracking systems. Its hardware connector and controller architecture provides a powerful layer of device abstraction for developers, while exposing a wide range of device-specific management properties for specific tuning and configuration. Plug-and-play support for new devices and hardware families ensures flexibility and future-proofing for any project built on top of RFID Anywhere. Lastly, to allow businesses to get the most out of any hardware investment, RFID Anywhere makes it possible to integrate data from a single piece of hardware into multiple enterprise applications in a true publish/subscribe model.

RFID Anywhere offers the framework, tools, and API for project focus

The best RFID middleware allows developers to focus on business logic, not low-level integration of hardware or other tasks that are very specific to the physical layer of the RFID and sensor network. RFID Anywhere provides a flexible, event-driven framework for intelligent data handling, meaning that the first line of code a developer writes is to handle an event from a piece of hardware.

Support for a number of development models allows developers to choose the architecture that best fits their solution, from custom business logic at the edge, XML reporting, location mapping, plus on-device/mobile applications. To enable these various models, RFID Anywhere offers a custom business module architecture built on .NET, Application-level Events (ALE), Report Engine MP, Location Information System, and an on-device framework for mobile/embedded logic. RFID Anywhere also provides its Data Protocol Processor (DPP) framework to simplify the encoding and decoding of common tag formats and custom data stored on RFID tags.

Valuable For System Architects → Flexibility

RFID Anywhere enables mobile, remote and distributed systems

RFID Anywhere's small footprint and .NET-based runtime has been designed for mobile, remote, distributed, occasionally-connected sites requiring local business logic. This allows system architects to choose the architecture that best fits each specific project, factoring in real-time requirements, location of supporting systems, network latency/availability, and requirements for edge logic. By leveraging these flexible deployment options with seamless communication between RFID Anywhere nodes, architects can place hardware and business logic where it makes sense, without having to rely on the fastest hardware, central data storage, or an always-available, high-speed network connection.

RFID Anywhere simplifies enterprise integration

To make integration with backend systems straightforward, RFID Anywhere offers a flexible Service Oriented Architecture (SOA) layer. This SOA interface to the entire sensor network, with its support for Web Services, backend systems such as enterprise databases and application servers, and industry standards such as SAP AII, simplifies the process of sending processed data to its ultimate consumer, or integrating with systems to help with local decision-making.

Messaging connectors abstract common messaging systems such as MSMQ, JMS, TCP, SMTP, and files, decoupling the delivery of business logic output or reports from the business logic itself. These connectors also eliminate the need for developers to build and maintain the low-level messaging code, thus freeing more resources to focus on the business-level code required for the specific solution.

Valuable For Administrators → Ease of use

RFID Anywhere provides centralized system and device management

As projects grow from pilots and proof-of-concepts to deployed solutions, the need to support hardware and business logic across multiple sites introduces challenges for administrators. To enable this remote management of the sensor network, RFID Anywhere provides centralized configuration, monitoring, and provisioning across the distributed network. RFID Anywhere has two tools to help make the lives of administrators easier. First, its web-based administrator console provides detailed node-level management and monitoring with the ability to set properties on both hardware connectors and business logic, and also to perform management tasks such as installing new hardware support, updating business logic, or even installing device firmware updates remotely.

These tasks can also be performed on many nodes at once from RFID Anywhere's Enterprise Manager, a centralized tool built using secure Web Services that provides a complete view of the sensor network, with the ability to manage the entire network at once, streamlining the deployment of hardware support and business logic, and using profiles to enforce required settings on remote systems.

CHOOSING THE RIGHT MIDDLEWARE IS IMPORTANT NO MATTER WHO YOU ARE

If you are a System Integrator ...

... RFID middleware is your toolkit to simplify prototyping while maintaining hardware flexibility. In addition to the importance of being able to quickly build straightforward demonstrations, prototypes, and proof-of-concepts, you don't want to have to throw away code. With RFID Anywhere, all the code you write is application-specific business logic, not low-level code to integrate with a specific device or decode a common tag type.

By building on RFID Anywhere you are able to focus on your business, domain expertise, customer relationship, and project management, without getting bogged down in all of the technical complexities inherent in working with RFID and sensors. You also get the utmost in flexibility for application design, architecture, and enterprise integration. Your customers will benefit from your ability to give them solutions that meet their specific requirements with a very efficient time to market and return on investment.

If you are an application developer or value added reseller ...

... you will benefit from all of the developer productivity and architecture flexibility features that allow you to focus on your application. By letting RFID Anywhere provide the framework and tools, your development efforts are focused on your product, freeing resources to add new features to improve your product and attract new customers. By building on middleware with plug-and-play device support such as RFID Anywhere, you can benefit from the flexible device support without writing any additional code, letting you quickly respond to the requirements of your customers and not limiting the device selection you give them.

If you are a hardware vendor ...

... RFID Anywhere is a product that you can give your VARs and customers as a tool and platform to facilitate fast prototyping and POC projects. RFID Anywhere can be a great addition to an evaluation kit or developer package providing a productive out-of-the-box developer and administrator experience with the ability to minimize the developer impact of hardware model changes. It also opens up paths for future growth, including the ability to easily grow a solution to hundreds of devices after a pilot, or to have your hardware be easily incorporated with complementary hardware and flexible business logic for innovative new projects. A flexible infrastructure can expand the possible application areas your hardware can be applied to.

If you are an end user of an RFID system ...

... you want to be able to use the best hardware for your project, and have business logic and functionality that directly meets your requirements. You want what is best for your business, including hardware flexibility with the ability to update or change as your application or requirements evolve. If you ultimately are to take ownership of the system, you should look for the maintenance of business logic to be done using common industry tools such as Microsoft® Visual Studio and well-defined methodologies as opposed to relying on a proprietary vendor to continually update at a cost to you.

RISKS, LIMITATIONS, AND COSTS ASSOCIATED WITH NOT USING MIDDLEWARE

There are a handful of perceived alternatives to building custom RFID and sensor projects on top of a proven RFID middleware foundation. There are some risks, limitations, and costs of these options and not all of them are obvious during initial pilot stages. Thus, it is important to investigate the implications of choosing one of these methods as early in the project lifecycle as possible.

Some developers choose to write code that communicates directly to the APIs of a specific device, or even go as far as trying to write their own middleware. While investigating this route, it is important to understand the ongoing maintenance costs and the resources required to build a viable infrastructure. You should be aware that this low-level programming is typically outside of the core competence of front-end application developers and should not be the core business of a company trying to build a specific project or application. This model limits your ability to easily support new devices and typically creates a one-to-one relationship between the hardware and the application.

Thinking beyond a simple pilot, this model puts a tremendous burden on developers when it comes to enabling distributed deployments, the incorporation of mobile devices, and ultimately the ongoing management of the entire system. These tasks are better left to the right RFID middleware foundation so developers can focus on the business application itself.

Some middleware platforms are centralized, or require always-on networks to put information into a database. When evaluating these platforms, it is important to think about performance, any requirements you have for logic and decision-making at the edge and on mobile devices, and the benefits of distributed computing.

There are some vertical-focused middleware offerings and off-the-shelf applications with RFID support that may look attractive during initial research or pilot stages. When investigating these options, it is important to understand whether or not the product has the flexibility to meet your specific needs, and if there are any maintenance costs associated with adding new features or changing functionality for your specific project. It is important to ensure that any product you choose has the device support you need today, plus the ability to easily grow to new devices and possible hardware families, including support and strategic direction for mobile devices, intelligent sensors, and location tracking technology, items not usually found in solutions in these categories unless they were built on flexible middleware to begin with.

SUMMARY

Regardless of your role in the building of RFID and sensor technology solutions, and for any type of system you require, RFID middleware plays an increasingly important role in providing the flexible foundation to get started on. The broad device support, developer productivity tools, flexible architecture, and rich feature set of RFID Anywhere make it an ideal infrastructure upon which to build intelligent RFID and sensor solutions.

To learn more about RFID Anywhere, and to download a free copy of the software and technical resources for development purposes, visit **www.sybase.com/RFID**.