

RFID Manager - Providing a General-Purpose RFID Platform

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Abstract

Two years have now passed since the shipment of RFID Manager began and the RFID market has just begun. Interpreting the present market status as the phase of establishing a foothold in advance of the coming breakthrough, NEC is now beginning to see results in this field. Therefore, it is now promoting the *de facto* standardization of its RFID middleware. This paper introduces the efforts made by NEC for the development of this market. These include: a description of the merits of introducing the RFID Manager, details of the original function of NEC, progress in winning advantages over competitors by instant tracking of EPCglobal specifications and support for the expansion of solutions development departments and activities adopted to seek markets. An appraisal of future development perspectives is also provided.

Keywords

RFID (Radio Frequency Identification,) middleware, small start, demonstration experiment, EPCglobal, WORKS, overseas deployment, UHF band

1. Introduction

The introduction of RFID and the development of RFID systems are both accompanied with some problems. It does not seem unusual for the users to give up the intention to introduce RFID due to the time and cost that might be required to solve problems. These might include; 1) When the user wants to find optimum read/write devices for his system, the available application interfaces (APIs) vary according to manufacturers, even though they comply with ISO15693. Moreover, a development of applications is required for each interface (this constraint results in an increase in the time and cost involved); 2) development of new operations management functions (monitoring of read/write devices and countermeasures against high loads are necessary); 3) situations of compliance with industry standards (a long time is required before the support of the APIs provided by the device vendors becomes available).

The RFID Manager has been developed as the middleware for solving the above problems and improving the efficiency, term and costs of RFID systems development.

2. Functions and Application Development Environment of RFID Manager

2.1 Function Outline

The RFID Manager absorbs the differences in specifications between read/write devices and tags from various vendors so that the application developers can develop device independent systems efficiently by linking web services or using .NET by means of the common APIs (Application Program Interfaces) defined by the RFID Manager. In addition, the ease of replacement of devices also helps select the optimum device for the system and thereby reduces the time before the start of operation (**Fig. 1**).

At the trial introduction, small start using the minimum product called RFID Manager Lite made it possible to extend the system gradually while checking the RFID introduction effects at each step.

Even when multiple devices are connected in a hierarchical structure under the RFID Manager, the operation management function available as standard enables centralized monitoring of all devices in all layers so that smooth operations, maintenance and problem analyses are possible (**Fig. 2**).

For the devices, the RFID Manager currently supports five kinds of read/write devices (available as device compatible sets) officially, covering all of the bandwidths (13.56MHz,

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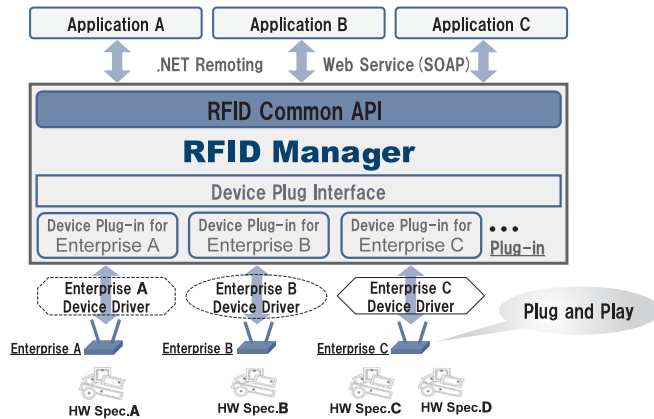


Fig. 1 Introduction in short period and at low costs.

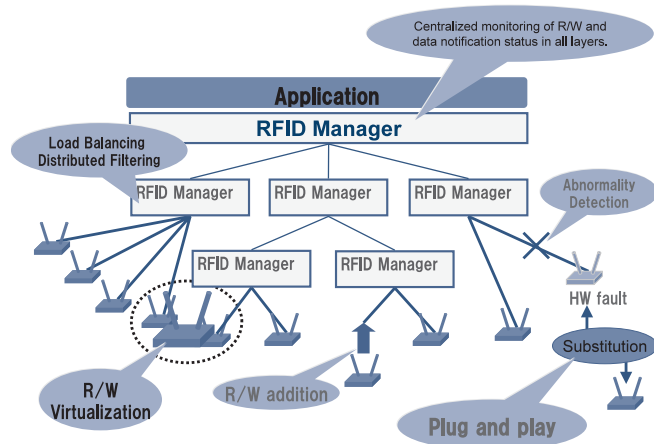


Fig. 2 Indispensable management functions for system operation.

900MHz and 2.45GHz).

The RFID Manager has already been applied to six individual users. Furthermore, a Pocket@-compatible version that has been prototyped for a major automobile manufacturer has also been released as an official compatible device after introducing some functional extensions.

2.2 Application Development Environment

The interfacing between applications and the RFID Manager is provided by the XML Web Service (SOAP/HTTP) interface and the category library used by the Windows applications in the .NET framework.

The RFID common APIs interface the applications with devices, and provide platforms allowing the applications to use the RFID devices.

The RFID Manager facilitates applications development by absorbing differences in specifications between individual read and write devices and integrating the interfaces for both Windows and Java applications (Fig. 3).

Thus the APIs make it possible to execute the device control that follows without being unduly influenced by the differences between devices.

(1) Filtering Control

This control notifies the application of only the required information by extracting it from a huge amount of tag information. The application is notified of the filtered information in real time. An example of filtering is the tag appearance/disappearance filtering. When an RFID tag is located in the range detectable from the read/write devices for a certain period of time, the tag appearance/disappearance filter detects the timings of the tag appearance and disappearance to notify the application of only the required information in order to prevent the ID of the same tag from being read out several times.

(2) On-Demand Type Control

When the application sends a processing request, this control returns either a return value or the information or processing result as the argument output information. Examples of on-demand type controls include readout of a tag ID and read/write of the tag memory.

3. Expansion of the Fields of Application and Dealing with Industry Standards

3.1 Efforts for Solutions

The Introduction of RFID for each business type is achieved by providing a vertical integration solution containing a set of hardware and middleware job package (applications). The

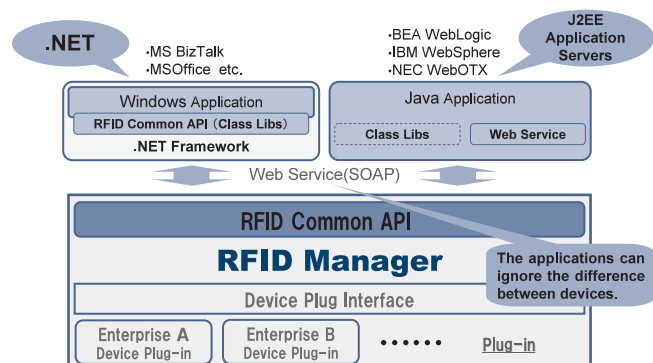


Fig. 3 APIs: Application Interfaces.

functions that are variable depending on the job application are provided in the form of linkage modules, while the functions common across the various jobs are incorporated in the RFID Manager. The linkages of databases common to different jobs are commercialized as the Database Access Linkage Set. In this way, our development support provides compatibility with a wide range of jobs (Fig. 4).

The same measures are also applied in solutions provided by some overseas subsidiaries (in China, Singapore, etc.) as well as in Japan. We also provide positive support to the individual cases handled by these subsidiaries by transferring technologies or participating in their studies whenever required. Our ultimate objective is to deploy domestic and overseas businesses to operate mutually by applying domestic solutions to overseas ones and vice versa.

The solutions we have applied to actual operations include those for asset management, production management, document management, temperature management and customer management, and we are determined to enhance our proposal capabilities by accumulating actual results and providing support for improving the recognition (brand force) of the RFID Manager. The following are some examples of introductions.

(1) Production Management: NEC Personal Products, Ltd.

AS part of the assembly and inspection process in a PC production plant of NEC, we succeeded in the automatic readout and display of the production indications recorded in RFID cards. This has improved productivity by more than 10% compared to the previous readout using bar code readers (see page 116 of this issue).

(2) Customer Management: A Chinese Department Store “Company A”

We issued membership cards with RFID tags in order to attract and retain customers.

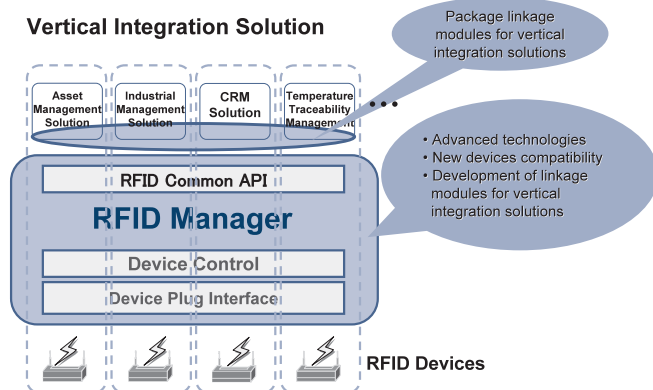


Fig. 4 Development of vertical integration solution.

(3) Temperature Management: A Perishable Food Wholesaler “Company B”

To support the pioneering of overseas sales channels for Japanese high-quality fresh foods, we adopted temperature sensor RFID tags (which record temperature changes at specific intervals) as the tool for consistent temperature management, aiming at the optimization of export distribution and risk control.

(4) Asset Management: A Precision Equipment Manufacturer “Company C”

We provided the real-time movement situation identification and location management of research equipment using active tags.

3.2 Measures for Compliance with Industry Standards

The RFID Manager achieves quick compliance with the specifications already established (sanctioned) by the SAG (Software Action Group) of EPCglobal. The compliance with the EPCglobal specifications makes possible the summing up of tag information, development of applications using the results and construction of global systems.

In February 2005, we prototyped ALE (Application Level Events)* 1.0 based on the RFID Manager Ver. 1.0 and exhibited it at RETAILTECH 2005. For the subsequent steps, we are planning the provision of compatibility with the Reader Protocol** for connection to EPC globally compatible read/write devices as well as compatibility with other specifications including the EPCIS*** for use in data sharing across private businesses. This strategy aims to enable the development of EPC globally compatible systems using the RFID Manager (Fig. 5).

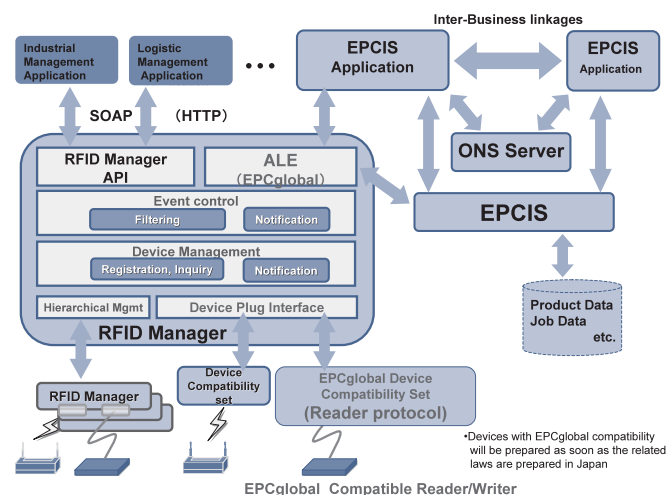


Fig. 5 EPCglobal functions packaged in RFID Manager.

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4. Partnership System

“RFID Manager WORKS” is a business partnership system for SI (Systems Integrators), ISV (Independent Software Vendor) and IHV (Independent Hardware Vendor) that provides products, solutions and services that are linked with the RFID Manager.

It provides the partners supplying products, solutions and services linked with the RFID Manager with various help, such as joint promotion activities in both technical and marketing aspects, which include the exhibition of interface information and provision of test programs, so that they can utilize the RFID Manager to maximum advantage.

We have prepared the following service menu to improve the values of the products, solutions and services of the partners.

(1) Information Service

Provision of product manuals, sales tools and updated information related to the RFID Manager.

(2) Technical Support

- Education for the development of applications and device-compatible settings.
- Lease of the RFID Manager.

We lease the RFID Manager for use in technology assessment and verifications in sales talks.

(3) Joint Solution Developments

Joint development of solutions using the RFID Manager.

(4) Joint Marketing

- Introduction of software, hardware and solutions services of partners and participation in exhibitions and seminars.

Up to the present, we have concluded agreements with 18 partners (as of February 2006), and hold WORKS DAYS for information and technology exchanges with and between partners, promoting information sharing as well as the use of the RFID Manager. The activities for gaining new partners are also in continuous development.

Here are some examples of our collaboration with partners.

① Oracle Corporation Japan

We have developed a location information solution that is

linked with Oracle LBS (Location-Based Service).

② Microsoft Corporation

The linkage with the SQL server allows the RFID Manager to store tag data directly in a database. This function is commercialized as the Database Access Linkage Set.

③ BEA Systems Japan Ltd.

We have developed an SCM solution linked to the WebLogic platform.

RFID is used for real-time visualization of physical distributions at key points.

5. Conclusion

As described in the above, the RFID Manager supports development and expands the utilization of solutions inside as well as outside Japan. Our efforts to manage the construction of a wide range of RFID-based systems also includes the development of EPCIS for EPCglobal, enhancement of high-availability systems for enterprises, and the provision of immediate compatibility with UHF band read/write devices that are expected to be utilized widely in many applications including SCM (Supply Chain Management) as EPC is disseminated.

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*Java is a trademark or registered trademark of Sun Microsystems, Inc. in the United States and other countries.

*WebLogic is a registered trademark of BEA Systems, Inc.

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●The details about this paper can be seen at the following.

Related URLs (in Japanese):
<http://www.ace.comp.nec.co.jp/RFID/>

[†]ALE: These define the API for filtering and tagging the tag data read from multiple readers and for notifying the application of the above results, and the data formats related to it. They can also control the middleware functions such as filtering.

^{**}Reader Protocol: This defines the command system and data format for the readers and the host computer controlling them. The functions supported by it include tag data readout, data write into the tags and tag killing (disabling).

^{***}EPCIS: This defines the API and data format for secure storage and sharing of data associated with tags, IDs (product information, etc.) across corporate applications or across different businesses.