

Trends, Overview and Vision for RFID and a Society Benefiting from Ubiquitous Network Technology

RFID makes it possible to observe the movements of people, locations of goods, and the flow of processes, within the so-called "ubiquitous network society." The introduction of RFID into the supply chain and the standardization of RFID are taking place simultaneously. NEC is a participant in the organization in charge of standardization, and has achieved tangible results by applying the technology to its own business. We are providing solutions based on our own know-how gained through experience in offering various types of products and services. From now onward, EPCglobal Network will provide a foundation upon which partners in the global supply chain can share their information in real-time, thereby enabling RFID to offer newly added value.

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1 Introduction

NEC positions RFID (Radio Frequency Identification) as a technology that is key to achieving the so-called "ubiquitous network society", and has been involved in the establishment and dissemination of this technology from early on. With RFID it is possible to record several dozen to several hundred bytes of information on a small IC chip, as well as wireless reading and writing of such information using specialized devices. In the distribution sector, reading the RFID tags attached to cases and pallets in the general workflow has resulted in more efficient product receiving and inspection. And at manufacturing facilities, changing work order sheets from paper to RFID has led to improved work efficiency and quality. The application of RFID is steadily increasing in a variety of ways, such as in improving work efficiency by virtue of the high visibility of products, people and processes, as well as the application of RFID in product shipping and receiving jobs, and the use of production and distribution histories in management.

In the following, we would like to introduce you to the trends of RFID and how NEC is involved.

2 The Role of RFID in a Ubiquitous Network Society

We are seeing the spread of ubiquitous network technology throughout society, creating a "ubiquitous network society." An environment in which computers exist all around us, and those computers can be used anytime and anywhere based on wireless communication technologies, is taking root. Also, since miniature RFID tags with wireless communication functions can be embedded into various products, it will be possible to keep track of the changing conditions of a product or its user more precisely. RFID will play an important role in offering the visibility to enable observation of a product's location, storage status, and movement history, which were all extremely difficult and time-consuming to discern in the past (**Fig. 1**).

3 Trends for RFID

The application of RFID to the supply chain and the standardization of RFID are taking place concurrently. RFID is being implemented at a rapid pace due to its adoption by retailers in Europe and the U.S.

In North America, mass retailers such as Wal-Mart and Best Buy have requested that their suppliers attach RFID tags on their product cases or pallets, and this system is currently being

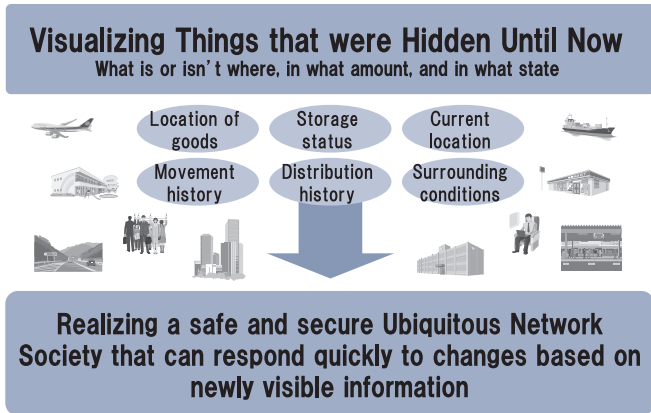
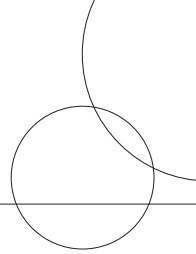


Fig. 1 The role of RFID in a "ubiquitous network society."

phased-in. Wal-Mart started implementing this RFID-based system in January 2005 with the cooperation of the top few dozen of their suppliers. They have successfully reduced stock shortages and have increased their order placement efficiency. They plan to get more suppliers on board as well as increase the number of RFID-implemented stores in the future.

In Europe, retailers such as Tesco Metro are in the process of running viability tests aimed at the full-scale implementation of RFID. The retail industry's objectives for implementing RFID include increasing supply chain efficiency, reducing unnecessary inventory, and minimizing the loss of sales opportunities

due to stock shortages.

In Asia including Japan, RFID was introduced internally into businesses, chiefly in the manufacturing sector. In Japan the Radio Law was revised in January 2005 as a result of the radio open policy put forth by the Ministry of Internal Affairs and Communications (MIC). As a result, it became possible to use UHF band compatible RFID systems in actual environments existing in Japan. From here on in, it is expected that compatible products will be marketed one after the other, and the UHF-band RFID system will enter a new stage of full-fledged implementation. As we can see from Japanese electronics retailer Yodobashi Camera's request to their suppliers to affix RFID, there is a trend here driven by major retailers.

RFID is spreading throughout the entire supply chain (Fig. 2). At factories it provides transparency in their manufacturing processes, at warehouses it improves efficiency of product inspection and inventory management, and at retail stores it raises the quality of customer service and helps provide safety and comfort to consumers.

4 NEC's Activities

NEC has positioned RFID as a device that will play a key role in making a ubiquitous network society a reality, and is involved in the research and development of this leading edge technology. This

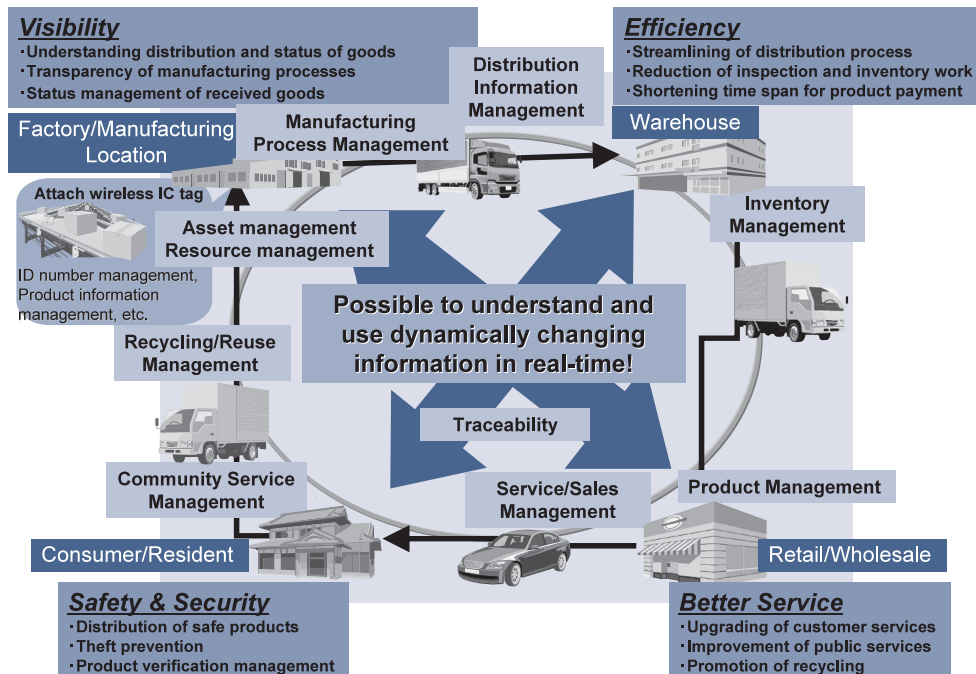


Fig. 2 Application of RFID in the supply chain.

edition will introduce a few examples of the results we have attained.

NEC is bolstering its capability to support the introduction of RFID into our customers' environments through activities related to RFID standardization as well as accumulating the know-how gained through implementing RFID in our own company and applying that knowledge towards providing products and solutions to our customers. Our device, wireless and software technologies are contributing to the standardization of RFID, namely through our participation in the Low Power Radio System Committee of the Japanese Ministry of Economy, Trade and Industry (METI), as well as cooperation with the Hibiki Project, participation in EPCglobal as the first Japanese system integrator, and our membership in the Ubiquitous ID Center.

NEC's unique advantage is in its ability to provide total support for system integration through devices such as the "NET-LABEL" RFID chip, wireless communication technology, and the middleware "RFID Manager" (Fig. 3).

Moreover, we are also proactively using RFID and are achieving favorable results. These include usage in the cafeteria cashier system at our Tamagawa office, in the visitor management system at our exhibition halls, and in the production management system at NEC Computer Techno. What's more, at the NEC Personal Products Yonezawa office which is involved in PC manufacturing, their order sheets were switched to RFID as part of their revamping plan, yielding an improvement in quality as well as a 10%+ increase in productivity. In this way, we are providing common solutions using RFID, garnered from the know-how that we have gained from self-application.

NEC has marketed its "Process Monitoring Solution" which utilizes RFID technology in June 2005, followed by the "Temperature-Managed Traceability Starter Kit" which uses temperature sensor-embedded RFID tags in August 2006. As for RFID middleware, we started sales of the "RFID Manager" in 2005,

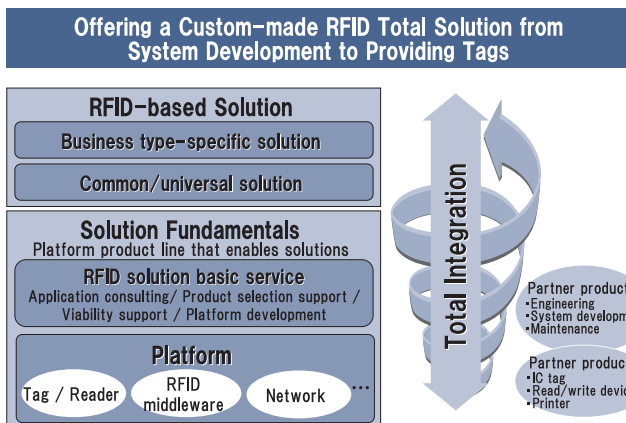


Fig. 3 Offering the RFID Total Solution.

thus providing a system to improve development efficiency and productivity, and a way to compensate for the differences in devices. Furthermore, we were the first company to provide compatibility with EPCglobal's standard protocol in products for the Japanese market.

5 What's Ahead for RFID

Expectations are rising for RFID because of the growing need for real-time operation and overall optimization of the supply chain. Companies are demanding the development of an environment in which goods can be uniquely identified within a global supply chain, where goods and information are inter-linked, and intricate management can be done so that supply chain partners can exchange information in real-time. EPCglobal Network is providing such an environment in which supply chain information can be shared amongst global partner companies with RFID being the key element. For the manufacturing sector various uses become possible such as gaining a real-time understanding of inventory, improving the efficiency of manufacturing methods, improving the efficiency of shipping and delivery, as well as observing an overall view of the entire supply chain until the product reaches the consumer. For the retail sector, real-time understanding of inventory and more efficient shipment receiving become possible (Fig. 4).

6 Conclusion

So that RFID can contribute to real-time management and increased efficiency, NEC is improving the recognition rate for plural RFID tags that are attached to goods that are metallic or include water, and are developing products that meet the needs of our customers. We will provide new added values through the EPCglobal Network and continue to promote collaborative

Sharing of global supply chain information and utilization of data

- Overall optimization creating a supply chain that can react to changes in real-time
- Reformation of intra- and inter-company processes
- Integration of manufacturing and sales

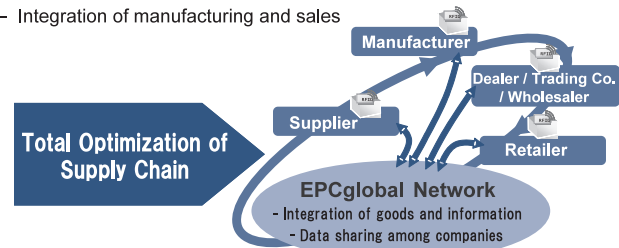
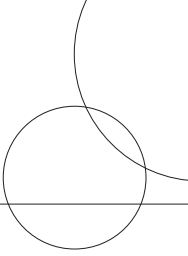


Fig. 4 Anticipated effects of EPCglobal Network.



research activities with our customers as well as the content that we have accumulated through our own operations as a manufacturer. As the accuracy of reading increase, and the cost of tags and read/write devices decrease as a result of standardization and dissemination of RFID, we are likely to see the adoption of RFID spreading as an infrastructure that spans beyond corporate boundaries instead of within each company's specific department as we see mainly today. And as the industry's supply chain shifts toward further automation as a whole, RFID will be able to provide newly added values through expanded use in a networked environment.

In the days to come, RFID will be a key device in realizing the ubiquitous network society, contributing to the creation of a safe and secure society in addition to increasing corporate value.

At NEC, we intend to work together with our customers toward the realization of the ubiquitous network society that RFID makes possible.

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