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Application of RFID Technology for Logistics on Internet of Things

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Abstract

Radio Frequency Identification RFID is a non-contact automatic identification technology, which signals through radio frequency automatic identification and access to relevant target data, no need for manual intervention to identify job can work in a variety of harsh environment. Because the logistics in the production control flow with information not to match, more and more can not satisfy a realistic and future demand. Internet of Things overcome traditional the blemish of the form code, be subjected to international logistics field and international community business enterprise biggest concern and research.

1.Key Technologies in IOT

Internet of Things (The Internet of things) is defined as: The radio frequency identification (RFID), infrared sensors, global positioning systems, laser scanners and other information sensing device, according to the agreed protocol, to any article connected to the Internet up to information exchange and communication, in order to achieve intelligent identify, locate, track, monitor and manage a network. Internet of Things concept is put forward in 1999. Internet of Things is the "material objects connected to the Internet". This has

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two meanings: first, the core of networking and infrastructure continues to be the Internet, is in the Internet on the basis of the extension and expansion of the network; second, the user-end extended and expanded to any article and articles, information exchange and communication.

RFID is a technology with important business value and huge potential. RFID promises to replace the old barcode and contributes to the real time visibility of the goods, regardless of the location of the supply chain. We find RFID applications in various fields, but its main use is in tracking objects (assets).

2.About RFID technology

In its simplest form, RFID is a concept similar to barcode technology, but without requiring a direct visibility of the monitored entities. Just like bar code systems require a proper optical reader and special tags applied on products, RFID needs a reader equipment and special tags or cards attached to the products in order for the products to be tracked.
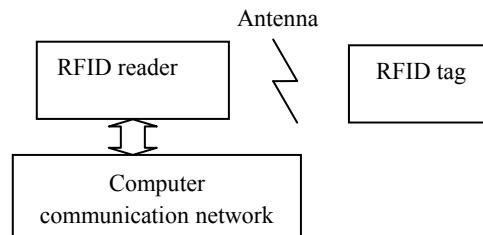

Fig 1   RFID Reader Block Diagram

Radio Frequency Identification (RFID) has a long history and is part of the technological revolution both current and past. RFID enables quick payment of tolls and quick identification of items. In addition, RFID provides benefits, such as tracking assets, monitoring conditions for safety, and helping to prevent counterfeiting. RFID plays an integral part in the technological revolution along with the Internet and mobile devices, which are connecting the world together All RFID systems, contain three basic components. The first is the RFID tag that is attached to an asset or item. The tag contains information about that asset or item and also may incorporate sensors. The second component is the RFID interrogator, which communicates with (also called interrogating) the RFID tags. The third component is the backend system, which links the RFID interrogators to a centralized database. The centralized database contains additional information, such as price, for each RFID tagged item.

RFID technologies can be classified into three categories: passive RFID, active RFID, and semi passive RFID. Based on the radio frequency used, the passive RFID technologies are usually categorized into low frequency (LF) RFID, high frequency (HF) RFID, ultra high frequency (UHF) RFID, and microwave RFID.
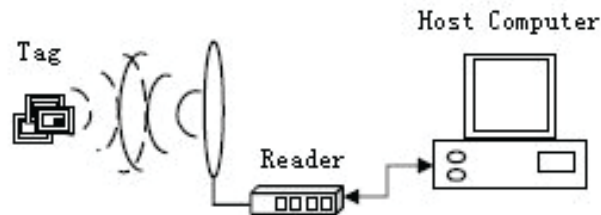

Fig 2   Tag, Reader and Host Computer

RFID technology has been widespread and nowadays, it can be found in many applications. Some of RFID applications are RFID printer, RFID scanner, RFID reader and RFID antenna. Radio frequency identification or better known as RFID describe a system that transmits the identity of an object or person wirelessly using radio waves in the form of a unique serial number.

An RFID system may consist of several components: tags transponders, tag readers, antenna, and interface. In a typical RFID system, individual objects are equipped with a small, inexpensive tag. The tag contains a transponder with a digital memory chip that is given a unique electronic product code. The interrogator, an antenna packaged with a transceiver and decoder, emits a signal activating the RFID tag so it can read and write data to it. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit and the data is passed to the host computer. The application software on the host processes the data, and may perform various filtering operations to reduce the numerous often redundant reads of the same tag to a smaller and more useful data set.

3.The application of RFID in IOT

Although RFID has been around for more than a half century, it is only in recent years that this technology has been gaining significant momentum due to the convergence of lower cost and increased capabilities of RFID tags. Currently, RFID is emerging as an important technology for revolutionizing a wide range of applications, including supply chain management, retail, aircraft maintenance, anti counterfeiting, baggage handling, and healthcare. It also heralds the emergence of inexpensive and highly effective pervasive computers that will have dramatic impacts on individuals, organizations, and societies. Many organizations are planning or have already exploited RFID in their main operations to take advantage of the potential of more automation, efficient business processes, and inventory visibility. For example, recent news shows that Wal-Mart has reduced out-of-stocks by 30 percent on average after launching its RFID program. Many predictions agree that RFID will be worth billions of dollars in new investments.

With IOT enterprises can supervise their every product in real time, and manage their logistics architecture. They not only supervise the circulation in supply chain and share information, but also analyze the information generated from every procedure and forecast. By forecasting the information from the current procedure of their products, the future trend or the probability that accident happens is estimated, remedy measures can be adopted or the warning can be given ahead. This can improve enterprises' ability of responding to the market.

IOT can affect the whole supply chain. Firstly it can optimize the supply chain management; secondly it can make sources to be used effectively; thirdly it can make the whole supply chain to be visible so that it can improve the information of supply chain transparency; fourthly the supply chain can be managed in real time; the lastly it can make the supply chain high agility and complete integration.
IOT affects the supply chain management in manufacturing link, warehousing link, transportation link and selling link. It makes enterprises even all the whole supply change response to the varied market quickly so that the adaptability of the supply chain to market verification changes is improved.

4.The future of RFID in IOT

While RFID has previously been considered a forward looking technology, its adoption across a variety of industries has seen it become a lot more commonplace. As RFID is being more prevalent across a variety of industries, logistics organizations seeking to gain a competitive advantage are already utilizing the technology in a variety of innovative ways the industry has not seen before. The question that many providers are now asking is: where is RFID going? The answer, it seems, is that the technology has a bright future with more value added features appearing at similar costs.

Now, utilities are revolutionizing their operations using smart meters to collect and transmit the amount of power consumed in a household. Smart meters are an example of a technology that is fundamentally changing business operations in electric utilities by recording consumption at regular intervals and communicating it back to the utility for monitoring and billing.

One may be tempted to think invoking data will be limited to niche applications, but like RFID in its infancy, it will blossom over time. As networks become more extensive and less expensive, more devices can be attached to the network to transmit data.

Despite extensive networks, some devices may not have network connectivity or the device may not be configured to the network yet. For unconnected devices, the new technology behind RFID is a superb mechanism for ensuring that the information being gathered by the device is still transmitted, ensuring up-to-date information and streamlined deployment times.

By itself, transmitting tiny amounts of data is not particularly powerful, but RFID offers the lowest cost and lowest power which enables a device with the capability to invoke data, without adding substantially to the cost of the device. As an addition, transmitting the data can be performed even when the device is off since RFID can be self-powered.

In the system, the enterprises will distribute their products information such as RFID anti-counterfeiting labels information, directory of services and directory of products to the public platform of the RFID anti-counterfeiting through the Internet. When the consumers receive the product with RFID anti-counterfeiting label, they use the label code to access to the corporate anti-counterfeiting information services address through RFID-enabled mobile phones or Internet-connected computers equipped with read-write RFID tags, and then call the services to attain product-related information to identify the authenticity of the product.

Taking the RFID-enabled mobile phone for example to show the specific anti-counterfeiting steps when the consumer wants to identify the authenticity of the product.
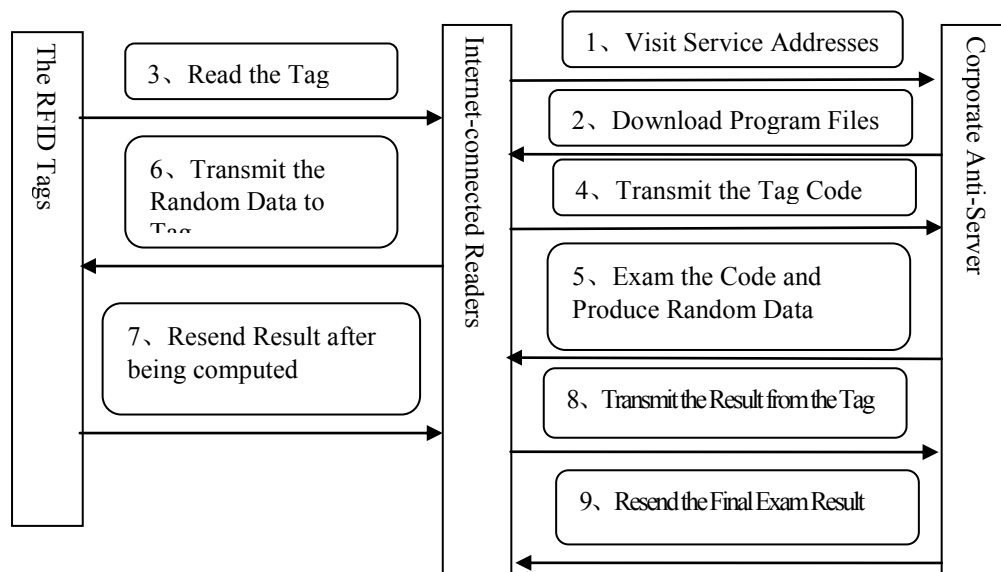

Fig 3   The process of anti-counterfeiting for products

Firstly, the consumer gets the corporate anti-counterfeiting server address from the product description or other identifications directly. When receiving the RFID-tagged products, the consumer uses the RFID-enabled

phone to visit the Web address and download program files that interact with the server following the prompts. After running and connecting with the server, the phone goes into the interactive process.

Secondly, the consumer uses the phone to read the product tag to attain the product's RFID code and pass it to the anti-counterfeiting server. Once the code matches with the RFID coding standard of the corporate products, the server queries its cryptographic algorithm to produce the random data and passes to the client phone, at the same time the server computes the random data according to the cryptographic algorithm and conserves the computing results.

Thirdly, the client phone sends the random data to the tag when it received from the server, after the tag's internal calculation, the result will be sent to the mobile phone and finally be sent by the mobile phone to the server to check.

Finally, the server will check the data received from its own conservation previously, and resend the information "the product is genuine" to the mobile phone if they are consistent.

5. Conclusion

RFID is a prospective automatic identification method, being considered by many as one of the most pervasive computing technologies in history. RFID is based on storing and remotely retrieving data using devices called RFID tags or RFID transporters. An automatic identification technology such as an Auto-ID system based on RFID technology is an important asset for inventory systems for two reasons. First of all, the visibility provided by this technology allows an accurate knowledge of inventory level by eliminating the discrepancy between inventory record and physical inventory. Secondly, RFID technology can prevent or reduce sources of errors. Benefits of using RFID technology include the reduction of labor costs, the simplification of business processes and the reduction of inventory inaccuracies.

In recent years, with the upsurge of the second generation of the Internet of Things, integrating the RFID technology and the Internet of Things and using them to the monitoring and anti-counterfeiting for products in the supply chain can make the most use of the advantage of the RFID technology, and the enterprises can achieve real visualization management in products. Therefore, our country enterprises should actively promote the development process of the RFID technology and the Internet of Things and make them as boosters in the management of supply chains.

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