

Based on RFID Food Supply Chain Traceability System Framework Design

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Abstract: With the people's attention to food safety issues, And RFID used in the field of the traceability of food safety. Design a system of based on RFID that used to trace the information of food safety. This paper talks about the layers of the system, as well as analyzes every layer's function, and describes the operating mechanism of this system.

Introduction

In recent years, food safety is the focus of social and public problems. RFID (Radio Frequency Identification) technology and wireless communication technology has been greatly developed, in order to record the process of food production to achieve food security in the back, many food companies are planning will be introduced to radio frequency identification RFID Among companies, RFID is the field of modern information technology has great prospects for the development of high-tech one. RFID traceability system of food safety in food production through the use of RFID tags to every product with a unique identifier in the information into their production, processing, storage, transport of the whole process of comprehensive monitoring and management, with a very great advantage and convenience. Which, RFID applications will be used to minimize the previous record of food safety labor costs, and to manufacturers and vendors to better monitor the entire supply chain ^[1].

Therefore, the use of RFID as a data carrier, with real-time wireless communications, information feedback, we can supply chain in food production using these technologies to achieve an effective food safety issues and dynamic management. This study and explore the food supply chain of a distributed system designed to process the entire food supply with greater control, the system processes the different providers have their own monitoring information for traceability.

RFID framework for distributed systems

RFID technology. Radio Frequency Identification RFID is the acronym for radio frequency identification, commonly known as RFID. Radio Frequency Identification RFID is a non-contact automatic identification technology, radio frequency signal through the automatic target recognition and access to relevant data, to identify work without human intervention, can work in a variety of harsh environments ^[2]. RFID technology can identify the high-speed moving objects can also identify multiple tags, the operation quickly and conveniently. The basic composition of RFID: Tag - by the coupling components and chips, each tag has a globally unique electronic code, attached to the object identifying the target object; reader one by one to read or write tag for a device that can be designed for handheld or desktop computer; antenna - between the tag and the reader to pass RF signals.

Because of its long-range RFID identification, storage capacity, environmental adaptability, each costing only global code labels have the advantages of security in the goods sector has a very wide range of applications^[3].

The application of food safety is to discuss the current hot topic in the food industry, many companies are back on RFID applications in the food safety for active demonstration and testing. RFID-related manufacturers are also developing more low-cost electronic tags, making food with the RFID information records into the market faster.

The concept of a distributed tracking system. Most of the food industry in the acquisition of raw materials, the production and processing, the product reserves, the distribution of product sales to all parts of the country and even around the world. Even if only in the production and processing to them, the complex production process but also the many factories located in different among. Construct a different production process and collaboration between the distributed traceability information recording system, which has a capacity for itself^[4-7]: If there is a supply chain in the sector to enter or exit the system, the system can easily and quickly to achieve reconstruction, so that we can easily manage all available information resources; when there is some reason to pull out the supply chain system, the system can maintain a good working condition.

System Architecture. In the RFID-based distributed system architecture will be designed for three, including the underlying infrastructure for the RFID data layer, in this layer, the food industry and various related enterprises within a good agreement between the application data space, because of modern society Specialization, food from production to the procurement of raw materials to the final market is bound to be many links, a completion of an enterprise is difficult to separate these areas, so the relevant information among enterprises, co-recorded in an RFID, this storage space data distribution and stability of the rationality is particularly important.

Middle-tier structure for the information of the conversion, each enterprise can be individually developed conversion standards that must be done to minimize redundant information, but must ensure the integrity of information, mostly related to food safety information as confidential and can not be tampered with the problem, so good standards which should contain the encryption mechanism to ensure data security.

Top-level structure should be designed to facilitate user friendly interface, because some information should be automatically recorded, so the interface is not visible to include such top-level operation. Should be included within the enterprise product information database records, then the top-level connections in addition to the middle layer of the system, it also should be connected within the enterprise information system of record, but this information recording system is not within the scope of this paper, this point does detail.

Three-tier distributed RFID food traceability system architecture as shown below:

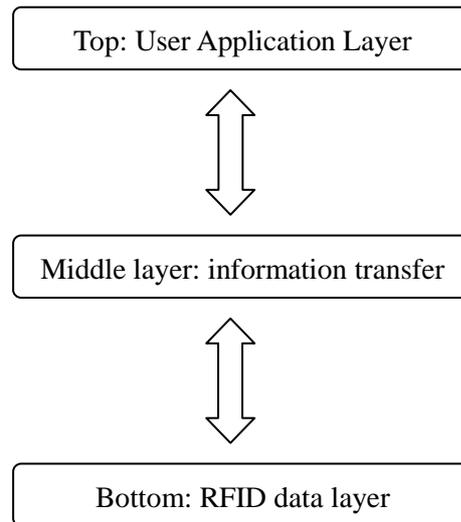


Fig. 1: RFID food traceability system distributed three-tier plans

The operating mechanism of the system

Three-tier architecture based on the basis of messages between all levels communicates with each other through.

The bottom layer of RFID data. In this design the RFID system, RFID system for the layer, i.e. production of beans, such as cake, red bean, as is the case of raw materials to the first processing unit, so each box has a RFID, RFID is the final output small food bag for the unit sales. Then add the RFID layer by layer, the last of each small food bag should contain a RFID. RFID in this process step by step increase, the increase in turnover each must retain the above when the effective layer of the RFID information.

This layer is designed to have two modes, the first one is a small food bag in the final record of all the information on RFID, the benefits of doing so is to use an RFID card can get all the information disadvantage of doing so requires RFID have more storage space, usually the price of RFID, with the capacity to increase and intensify, and the security of this information is difficult to be fully protected.

The second model is only recorded in the RFID unique identifier of the food bags, and if once the problem of food production units in the database can be found in this bag of food in the retrospective information. In doing so, only need to use RFID on a small storage space, and there will be no card security issues, China's second generation ID card is used in this model, but this model would greatly reduce the effectiveness of RFID, should not the economy the same factors or involve a high degree of confidentiality as the identity, this model is not recommended.

This system is the first model to be adopted, I believe that the gradual price cuts in the RFID today, the outbreak of low-cost RFID use is not far off, this mode, the supply chain in all of the manufacturers have to comply with the common good data space allocation protocol agreement and distribution agreement must be reasonable, at the height based on the use of data space, leaving some room for expansion, and record the information for the manufacturer of RFID can be traced to only write lock can not be changed.

In the systems are dynamic link library by calling the method to achieve the bottom layer on the use of RFID devices, the specific code (Visual Basic language):

```
Public Declare Function ISO15693_Inventory Lib "MasterRD.dll" (ByVal icdev%, _ ByRef pData As Byte, ByRef pRLength As Byte) As Long
```

```
Public Declare Function ISO15693_Get_System_Information Lib "MasterRD.dll" (ByVal icdev%, _ ByVal model As Byte, ByRef pUID As Byte, _ ByRef pData As Byte, ByRef pRLength As
```

Byte) As Long

```
Public Declare Function ISO15693_Write_DSFD Lib "MasterRD.dll" (ByVal icdev%, _ByVal model As Byte, ByVal pUID As Byte, _ ByVal pData As Byte) As Long
```

```
Public Declare Function ISO15693_Write_AFI Lib "MasterRD.dll" (ByVal icdev%, _ByVal model As Byte, ByVal pUID As Byte, _ByVal pData As Byte) As Long
```

Because the use of dynamic link library quite frequently, in the design of the dynamic link library needs to be placed among the common modules and designed for the public type, so that not only optimize the code to simplify procedures, and are conducive to the development team of programmers to work for.

The middle layer information conversion. For back issues can be traced back into transparent and opaque back, in the former in the final consumer is free to look up information in the RFID, so, the manufacturers in the supply chain of information transformation mechanism should be unified, and is clearly recorded.

In the opaque back in the factory processes responsible for their own food, but an announcement is not obliged to record information, log information is only released to the responsible departments within the enterprise, and social food safety supervision department, in which case the records of the data should certain encryption.

With the wide application of RFID, the information recorded in the final set to standard, and then just follows the standard uniform of the company to record information. However, a number of food industry categories, record the content to be different, so the standards must be done step by step, before that, opaque back, or you can see part of the RFID information translucent retrospective conversion is still the mainstream of design information mode.

Top user application. In the user application layer, RFID is a need for automatic operation of some of the write operation, some staff data records. Such as food production, temperature and humidity, it is necessary is designed to automatically write, raw materials and other information necessary to manually input, most enterprises have their own management information system, this layer should be through the message mode of management information and business in Internet database system, so that information in the database of information with the RFID has a high degree of consistency.

The key points of system

Standardization of recorded content. Involved in food safety records in the content hard to unity, the key to a variety of foods have different recording sites, so in order to achieve full transparency in food safety, traceability, harmonization, but also the relevant departments to develop a detailed standard, unified RFID coding standard, and then strictly in accordance with the standards of all relevant enterprises accurately record relevant information. Only these ways can the effectiveness of RFID in the record information to maximize.

Cost. RFID compared to barcodes have waterproof, anti-magnetic, high temperature, long service life, reading from the large, confidentiality, data storage capacity and can freely change, etc., but has failed to RFID to replace bar codes with a wide range, because itself has a deadly cost. The outbreak of the use of RFID is a big trend, but must be addressed is the cost, the price of RFID approximation only when the price bar code, RFID can be a wide range of applications.

Supply chain issues. Food from production to final sales in the market with a long supply chain, supply chain and has a large business, if you can not make good use of distributed systems management, and good control of layer to add updates, then it is likely to cause the information back out of touch, still the problem of food safety risks caused.

Conclusions

This article discusses the food supply chain, design of the basic framework of traceability system, a RFID technology based on distributed food chain traceability system framework model, and which describes the framework of the hierarchical structure of the system problems related to the achievement of key briefly discussed. In future studies, further research will be more efficient, more widespread application of the system framework, and the advantages of RFID technology into a larger play.

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