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Integrated Service Platform Architecture of Cold Chain Logistics with RFID Tracing System Based on Cloud Computing

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Abstract

With the continuous development of the social economy, more and more attention is paid to the food safety issues in daily life, and it is imperative to establish a complete integrated cold chain logistics service platform. In this paper, RFID tags with temperature sensors are used as information acquisition carriers, and a third-party cold chain logistics information platform in the context of big data is established based on cloud computing. Firstly, the positioning and key technologies of the platform are introduced. In addition, based on the overall framework of the platform proposed, the cold chain temperature monitoring, early warning system, and related hardware design, cold chain food tracking and traceability system design, and other aspects are analyzed specifically, which is of certain practical significance for the development of related enterprises and the supervision activities of the government.

Keywords: *RFID, Cold Chain Logistics, Information Platform, Tracing System;*

1. Introduction

With the continuous development of the social economy and the improvement of the people's living standards, more and more attention has been paid to food safety issues in daily life. Spoilage and deterioration occur in some perishable and fresh goods during the logistics process, which leads to subsequent safety problems, and the current situation is not optimistic [1-3]. Although the government has also enhanced its support and supervision of cold chain logistics, established and improved the cold chain logistics system in our country, the real-time monitoring of the status of goods during production, warehousing, transportation, and sales are essential means to guarantee food safety [4-6]. Cold chain logistics is a low-temperature logistics process based on refrigeration technology that applies the refrigeration technology as a means to ensure that sensitive fresh foods are always in the specified low-temperature environment in various links from production, storage, transportation, and sales to consumption, thereby achieving the purpose of ensuring food quality and reducing food shrinkage. Cold chain logistics engineering is an important driving force for optimizing the allocation of agricultural industrialization development elements and an effective way to develop modern agriculture, which is a vast system engineering project [7-10].

The cold chain logistics market in our country has enormous potential, with the entire market exceeding 150 billion yuan. In 2015, the cold chain circulation rates of fruits and vegetables, meat, and aquatic products reached 22%, 34%, and 41%, respectively. The refrigerated transportation rates were 35%, 57%, and 69%, respectively. The goals of

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the "Development plan for the cold chain logistics of agricultural products" were accomplished and slightly surpassed [11-13]. However, there is still a gap in the cold chain circulation rate and the perishable rate in our country compared with that in developed countries, and there are many problems in the development of cold chain logistics, including the following aspects: (l) The infrastructures are incomplete, such as refrigerated trucks, refrigerated self-lifting cabinets, cold storage, and cold chain distribution centers; (2) The cold chain costs remain high, which makes fresh e-commerce hardly profitable; (3) There is a lack of industry norms or standards; (4) The cold chains are prone to break in the connection link or "last mile"; (5) There are insufficient professionals and experience for cold chains logistics [14-16].

In this paper, RFID tags with temperature sensors are used as information acquisition carriers, and a third-party information platform for cold chain logistics in the context of big data is established based on cloud computing.

2. Integration of WSN Technology and RFID Technology

Wireless sensor network (WSN) is a multi-hop self-organized network that is formed by a large number of sensor nodes based on communication technology. It has the characteristics of low cost, small size, high density of sensor nodes, and frequent network topology changes. It has broad application prospects in industrial control and monitoring, agricultural production, logistics, health, environmental monitoring, and other aspects. RFID refers to radio frequency identification technology, which is a non-contact automatic identification technology that automatically identifies target objects and obtains relevant data through radio frequency signals, where human intervention is required in the identification work. It can be applied in various types of harsh environments and can identify high-speed moving objects and multiple tags with quick and easy operation. However, RFID itself also has defects, such as high cost, reliance on readers to collect data, poor anti-interference, short effective distance, and so on. If the sensor network is combined with RFID, and the effective radius of the former up to 100 m is used to form a wireless sensor network, both the target environment monitoring and target object recognition can be carried out. Hence, its application prospect is beyond measure.

At present, for the fusion technology of RFID and WSN, the fusion type of RFID and WSN can be divided into four categories: the first type is the fusion of RFID tags and sensors; the second type is the RFID reader and WSN base station; the third type is the fusion of RFID tags and WSN nodes; the fourth type is the fusion of the WSN node and the RFID reader.

Fresh and perishable agricultural products have relatively high logistics requirements, which are mainly reflected in the following aspects:

1) There are many agricultural products involved in refrigerated and frozen transportation, and various technical indexes, such as the temperature required for hundreds of agricultural products, are different. Hence, an alarm should be issued immediately when the temperature reaches the threshold value;

2) In order to achieve the safety monitoring of agricultural products, product tracking and convenient management of agricultural products, RFID tags in which various information about the agricultural products is saved need to be attached to each product;

3) The supply chain management of fresh agricultural products requires the timeliness of logistics. Rapid delivery is required, and the goods may need to be transferred within a few hours after they arrive at the distribution center;

4) It can monitor the quality, identification, and location of agricultural products in the logistics process and perform product tracing. To this end, all data in the logistics process should be open and transparent and can be queried by the public to ensure the safety of agricultural products;

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5) There are a large number of agricultural products, and they are for the general public. Hence, they are highly sensitive to logistics costs. At present, a significant factor that the cold chain technology in our country has not been widely used in agricultural product logistics is the cost issue.

In general, the process of cold chain logistics for fresh and perishable agricultural products is as the following: pre-cooling after harvesting in the field - packaging and affixing with RFID tags in which agricultural product information is saved – refrigerated gas storage – transportation by refrigerated truck - cold storage in the wholesale station – freezer in the supermarket – refrigerator of consumers. In the entire cold chain logistics management, agricultural products are divided into two states: one state is static, that is, the agricultural products are stored in the cold storage; the other state is dynamic, that is, the agricultural products are in the process of refrigerated transportation. During transportation, environmental parameters such as temperature and odor in the refrigerated truck should be monitored in real time, and the flow direction of agricultural products should be recorded. In the cold storage management, it is necessary to pay attention to not only the real-time monitoring of environmental parameters such as temperature, humidity, and odor in the cold storage but also the automatic storage and fast management, timely and accurate delivery. In addition, attention should be paid to the identification and tracking of agricultural products in the whole logistics process.

3. Integrated Service Platform of Cold Chain Logistics with RFID Tracing System Based on Cloud Computing

As the requirements of consumers for commodity quality continues to improve, the demand for cold chain logistics is also increasing in our country. Many contradictions in the industry have gradually emerged. In general, the cold chain logistics industry in our country has the following problems to be urgently solved at present.

(1) The issue of supporting infrastructure for cold chain logistics. Cold storage and refrigerated trucks are the foundation for the development of cold chain logistics, and the quality of cold storage and refrigerated trucks is crucial to the temperature control in the cold chain logistics system. However, the cold storage in most cities of our country was built from the 1950s to the 1980s. The sanitary conditions fail to meet the standards. The refrigeration technologies used in cold storage, insulation technology, and temperature monitoring technology are relatively backward, which cannot meet the requirements of modern logistics. Refrigerated trucks are a vital tool for cold chain transportation. The transportation process is a period of high-quality problems. The per capita availability and quality of refrigerated trucks in our country are far behind those of developed countries such as the United States and Japan.

(2) The informatization level of the cold chain system needs to be further improved. In the cold chain logistics system, the background management information system responsible for processing data is a great responsibility. The underlying information collected from the front end of cold chain logistics (such as refrigerated trucks and cold storage, etc.) based on RFID technology will be transmitted to the background system through GPS or wireless sensor network (WSN) to implement close monitoring in the whole process of cold chain logistics. The territory is vast, and the regions that require cold chain logistics are relatively scattered. Hence, in information acquisition and transmission based on the cold chain system, there are situations such as information omissions, untimely transmission, etc. As a result, the optimal timing for commodity quality control is missed, which has ultimately brought substantial economic losses. According to statistics, we are subject to a shrinkage rate of up to 15% - 30% in the circulation process of fresh meat, fruits, and vegetables, agricultural products, and other agricultural products every year. The economic losses are as high as 100 billion yuan.

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(3) The relevant industry standards and laws and regulations of cold chain logistics are not perfect. As cold chain logistics is a special component in the modern logistics system, the relevant laws and regulations and industry standards should be planned and formulated based on the overall situation of cold chain logistics. However, the cold chain logistics in our country started late. Hence, there is still much room for improvement in this aspect.

(4) Other issues. As a systematic project, cold chain logistics cannot form the scale by relying on one or several enterprises, which cannot ensure the quality of logistics and bring more leading enterprises in cold chain logistics together to establish a strong industry alliance. Ensuring the high quality and high efficiency of cold chain logistics is the primary development direction in the future. At the same time, the pace of training professional logistics talents should also be accelerated so that "hardware and software" can be highly matched.

3.1. Design of the Third-party Cold Chain Logistics Information Platform

Many logistics companies have not realized the importance of informatization to their own development. The lack of a unified information exchange platform among supply chain companies is a stumbling block that hinders modern logistics companies from moving forward toward informatization. On the other hand, many agricultural product logistics companies are subject to high logistics costs and backward application of information technology, which are mainly reflected in the following aspects: inadequate transportation mode connection, low level of loading and unloading automation, a serious shortage of intelligent transportation equipment and special tools, few applications of information technology as well as high and new technologies, a severe shortage of warehouses, cold storages and three-dimensional warehouses, which has become the primary bottleneck in the development of informatization for agricultural logistics. Some studies have concluded that there are three main distribution modes for agricultural product companies: self-operated distribution mode, common distribution mode, and third-party distribution mode. Agricultural product management enterprises with great strength and large investment scale and high logistics operation level often consider self-built agricultural product processing and distribution centers and cold chain transportation departments to form a self-operated logistics distribution network. Co-distribution is a logistics distribution activity jointly organized and implemented by enterprises so as to improve the efficiency of logistics distribution and realize the rationalization of logistics distribution. Third-party distribution is a distribution operation mode that agricultural product companies entrust the third-party professional logistics distribution companies to complete the distribution.

Compared with traditional agricultural product logistics, the e-commerce center has been added to the information model of agricultural product logistics distribution: self-operated distribution mode, common distribution mode, and third-party distribution mode. The e-commerce center integrates logistics and information flow to reduce circulation costs, speed up circulation efficiency, increase the added value of agricultural products, and create an environment that is conducive to the development of agricultural products logistics. Hence, the implementation of agricultural product logistics informatization is the key to improving the construction of agricultural product logistics infrastructure. The construction of agricultural product logistics infrastructure includes the construction of agricultural product wholesale markets, agricultural product storage, transportation conditions, tools, and other facilities. To improve agricultural infrastructure, we can start with the construction of agricultural products delivery vehicles, agricultural warehouses, processing and distribution centers, and the construction of agricultural products wholesale markets, to stimulate

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the enthusiasm of enterprises to develop agricultural product logistics, and promote the development of agricultural product logistics information.

3.1.1. Positioning of the Third-party Cold Chain Logistics Information Platform

The third-party cold chain logistics information platform collects, transmits, stores, processes, manages, and publishes information in the whole process of planting, processing, production, transportation, warehousing, distribution, and retailing in the cold chain. In this way, the sharing of information on farmers, manufacturers, distributors, retailers, etc. on the supply chain can be implemented. It includes five aspects, including information service, resource integration, online transaction, logistics information management, and decision-making assistance.

Different from the public welfare information platform for government-led investment, the third-party cold chain logistics information platform is a profitable information platform based on market-oriented competition.

(1) Improve logistics equipment

Logistics equipment refers to the complete set of buildings and utensils required to carry out various logistics activities and to organize various types of mechanical equipment, transportation vehicles, storage facilities, yards, computers, communication equipment, etc. involved in logistics. In the aspect of storage, excellent logistics equipment can ensure the safe storage of agricultural products and timely feedback if there are any problems. In the aspect of transportation, advanced transportation equipment can shorten the transit time of goods, increase the speed of transportation, accelerate the circulation of goods, fully exert the efficiency of transportation equipment, and achieve the purpose of integrating people, vehicles, and goods. Hence, it is necessary to increase professional investment and development of logistics equipment technology, facilitate the improvement and improvement of logistics equipment, and improve the backward situation of logistics equipment in the country as soon as possible.

The reason why modern logistics can develop smoothly depends on information technology, which is the guarantee for the regular operation of the modern logistics system. Informatization can drive the high-speed operation of the entire logistics and significantly reduce costs.

(2) RFID technology

In agricultural product logistics, the most basic principle is to guarantee the quality of agricultural products and improve the efficiency of circulation, as any time delay may lead to the deterioration of agricultural products. RFID technology, that is, Radio Frequency Identification (Radio Frequency Identification), is a non-contact automatic identification technology. Its basic principle is to apply radio frequency signals and spatial coupling (inductive or electromagnetic coupling) transmission characteristics to implement the automatic identification of the identified objects. In this paper, RFID technology is applied to the cold chain logistics of drugs to monitor the temperature in real time and transmit data at any time.

The traditional method of measuring temperature is to measure when the goods enter and leave the warehouse manually. The lack of continuity of information, the resulting data are not reliable and authentic enough. As there are too many uncertainties in the transportation of agricultural products, it is necessary to have real-time information feedback on fresh agricultural product temperature. Through RFID technology, the temperature information of fresh agricultural products can be collected in real time without performing manual unpacking and inspection, which reduces the probability of abnormal temperature of the goods caused by manual unpacking inspection and can also transmit temperature information at any time during the transportation of goods. If there is any abnormality, it can be dealt with in time, which is convenient to define the responsibility.

(1) The RFID temperature recorder is placed

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inside the refrigerated medicine packaging box, which can reflect the temperature information given by the external refrigerated truck in real time. (2) The system time interval for the sensor is set, and the temperature data recorded and measured are periodically sent to the RFID tag regularly. (3) The reader installed in the refrigerated truck emits radio frequency signals outwards to form an electromagnetic field. (4) The RFID tag of the thermometer is triggered by the electromagnetic field, and the temperature information is transmitted through the antenna. The reader is used for receiving signals, and temperature data are obtained after demodulation and decoding. (5) The reader transmits temperature information to the computer network system in real time. If the temperature is abnormal, the alarm system will issue an alarm to the driver.

1) GPS system

The Global Positioning System (GPS) is a system that makes use of multiple satellites distributed at an altitude of about 20,000 km to determine the status of ground targets for positioning and navigation accurately. At present, it is used in logistics vehicles to solve the problems of reasonable vehicle scheduling, real-time monitoring of the transit status of vehicles, as well as cargo anti-theft. The GPS system can grasp the most dynamic information transmitted through the medium and transfer the information to the information platform. The logistics personnel can perform data information analysis and address the problem, which has improved work efficiency. If the refrigerated truck is equipped with the GPS system based on the original temperature control system, on the one hand, it meets the temperature environment requirements for goods transported on the way; on the other hand, the temperature can be adjusted in a timely manner to meet the high standards and requirements of the storage and transportation environment for refrigerated drugs and ensures the transportation quality. The GPS system has fundamentally changed the traditional backward logistics distribution mode, which has accomplished the task of tracking the entire journey of the driving vehicle.

2) Cold chain logistics information system

Informatization construction can implement the information sharing of the upstream and downstream nodes in the supply chain, which is conducive to improving the stability and certainty of the fresh agricultural product logistics. The implementation of information sharing of resources from all parties is inseparable from the cold chain logistics information processor. The data resource is a management system for exchanging information and sharing data. In many cases, major decisions made by an enterprise come from the transformation of such data information. Data information is the basis for decision-making, and informatization can realize its value perfectly. In the actual management information system, various enterprises have different structures for the thousand information systems. However, they can be merged into a unified basic structure.

The logistics information system is a type of enterprise information system, in which computer hardware and software equipment, especially Internet and other IT technologies, are combined with various mechanized and automated logistics tool equipment, The data, information, knowledge, and other resources are used to collect, transfer, process, store, update and maintain logistics information, thereby implementing the digital intelligence, standardization and integration of comprehensive management of physical logistics, and informatization and networking of logistics business processing command. In order to improve the efficiency and effectiveness of the overall logistics activities, reduce the overall logistics costs, and make the enterprise logistics distribution achieve a highly competitive advantage, the integrated human-machine system and the fresh agricultural logistics information system are applied in this regard. On the one hand, the data submitted by the information platform are analyzed, and data

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mining is performed to prevent qualitative changes. The responsibilities are defined so that the problems can be handled, and the problems that occurred can be controlled. On the other hand, it applies scientific and technical means through the information system to improve the lagging situation of the logistics for fresh agricultural products and improve the transportation efficiency, thereby increasing the success rate of fresh agricultural products delivered to customers on time with high quality.

3.1.2. Key Technologies of the Cold Chain Logistics Information Platform

(1) Radio frequency identification technology. Radio frequency identification (RFID) has the advantages of convenient and fast read and write operations, large storage capacity, repeatable read and write, adaptability to harsh environments, identification of high-speed moving objects, and recognition of multiple tags at the same time. RFID technology can record temperature and humidity information on cold chain transportation vehicles and cold storage.

In the pre-cooling or cold storage packaging link of agricultural products that require temperature, an RFID tag with a temperature sensor is attached to each cargo box or packaging unit to record and monitor the temperature in the cold storage. At the same time, multi-point temperature sensors are installed in the refrigerated compartments or frozen containers. The temperature information and location information of the storage and transportation process is packed and stored in real time to the RFID chip, and transmitted to the cold chain monitoring center through the GPRs system. When the temperature is abnormal, or the transportation line is abnormal, it can automatically issue an alarm, and the monitoring center can urge the driver to take emergency measures.

(2) Information platform development technology. The information platform adopts the J2EE framework, combined with MVC (Model-View-Controller) design pattern and mainstream technologies such as the Struts development framework and Eclipse development platform. J2EE technology applies a container-component structure, which is divided into four layers: customer layer, Weh layer, business logic layer, and enterprise information system layer. The Oracle database system adopts a distributed relational database as the core. In order to integrate with the original Oracle OTM transportation management system, the platform maintains a unified database development environment.

(3) Cloud computing. Cloud computing is a type of distributed computing, which refers to the decomposition of massive data computing processing programs into countless small programs through the network “cloud”. Subsequently, through a system composed of multiple servers for processing and analysis, the applet obtains the result and returns it to the users. In the early stage of cloud computing, to put it simply, it is about simple distributed computing, task distribution, and merge of computing results.

3.1.3. Overall Framework of the Third-party Cold Chain Logistics Information Platform

The information platform should have the functions such as real-time monitoring of self-operated and integrated external refrigerated truck transportation or distribution, temperature and line abnormality warning, intelligent vehicle scheduling, supply chain finance, agricultural product traceability, mobile terminal APP, etc. The block diagram of the completed intelligent information platform is shown in Figure 1 as the following.

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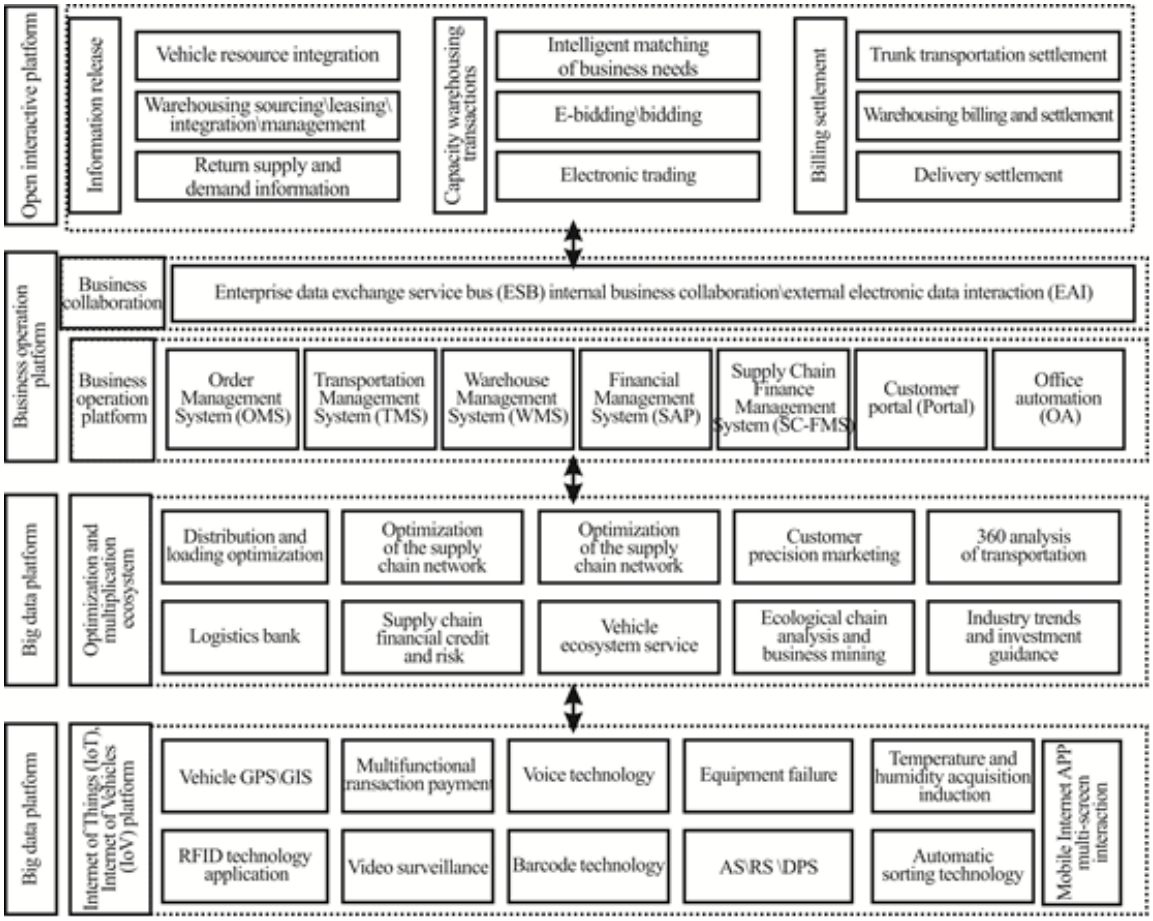

Figure 1. Block diagram of the intelligent information platform

Through big data analysis of cold chain logistics temperature and humidity, location, orders, customer consumption records, transportation vehicles, and driver records, etc., it can provide a guarantee for enterprises to monitor the quality and safety of cold chain, serve as a decision-making basis for scheduling and distribution optimization, and offer good customer experience by tracking goods, moving inquiries and signing online, etc. As a result, it can further reduce the risk of cold chain operations, evaluate supply chain financial credit, and innovate the profit model of fresh e-commerce.

3.2. Design of Cold Chain Temperature Monitoring and Early Warning System in the Context of Cloud Computing

3.2.1. Design of Cold Chain Temperature Monitoring and Early Warning Function

(1) Data acquisition function. The vehicle-mounted terminal is installed on the transportation vehicles. The vehicle-mounted terminal is composed of an ARM embedded controller, an RFID (Radio Frequency Identification) module, a GPRS wireless communication module, and other modules.

(2) Data processing and temperature alarm function. When the collected temperature exceeds the preset threshold, an alarm is issued, and the on-site personnel adjusts the temperature independently or after being instructed by the monitoring center. If the equipment fails, an emergency cold chain rescue will be initiated.

(3) Data communication and storage functions. The on-board terminal on the transport vehicle sends temperature data information to the monitoring center through wireless transmission to implement data synchronization between the remote end and the monitoring center. The monitoring center stores various types of data information third-party cold

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chain logistics food traceability carriers, that is, automatic collection equipment, in the system database, which is stored as historical data backup for future queries. It can be an RFID tag (to save cost, it can also be 1D/2D statistics and responsibility processing). The structure of the monitoring system is shown in Figure 2 as the following.

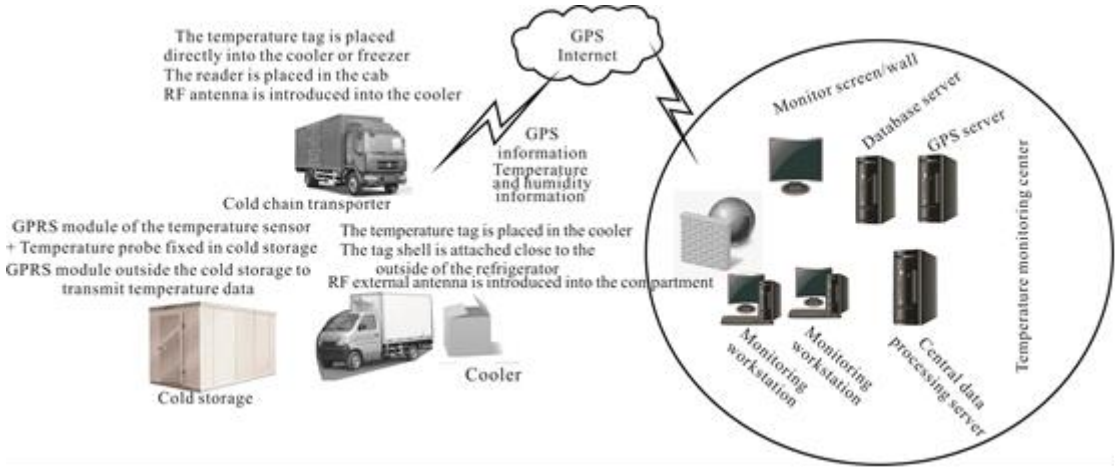

Figure 2. Structure of the monitoring and early warning system in the context of cloud computing

3.2.2. Hardware Design of the Cold Chain Temperature Monitoring and Early Warning System

The temperature monitoring and early warning system for refrigerated trucks and cold storage include an active RFID tag system with the temperature sensor, embedded master control system, GPRS wireless data transmission module, buzzer, and other hardware.

(1) Data acquisition - RFID temperature tag and reader system. The active RFID temperature sensor tags and gainable active RFID readers are selected. The temperature sensor includes a temperature-measuring element made of energy gap material. In addition, it is seamlessly connected to the 14-bit AID converter and the serial interface circuit on the same chip.

(2) Processor - embedded master control system. There are several mainstream processors, such as a single-chip microcomputer, an ARM processor, and a DSP processor. Their computing power and price increase successively. The design requires abundant external interfaces and control ports. Hence, the ARM processor with high-cost performance is selected.

(3) Data transmission - GPRS wireless data transmission module. The GPRS module is controlled by the ARM controller. The monitoring terminal and the GPRS module are connected through a wireless network, and the monitoring terminal sends AT commands to the GPRS module to select the data receiving and sending functions.

The system adopts the Java serial port package Javacomm20 to implement serial port communication. The mobile GPRS communication gateway is used, and the data received by the SIM card are sent to the data center in the form of short messages.

In order to achieve temperature monitoring and early warning data collection, debugging simulation, we apply the graphical control visual modeling simulation provided by LabVIEW in this paper.

3.2.3. Analysis of Cold Chain Food Tracking and Traceability System Requirements

The carrier of the third-party cold chain logistics food traceability is an automatic collection device, which can be an RFID tag (to save costs, it can be a 1D/2D barcode), containing various types of information required for traceability. The system functions include the following:

(1) Consumers can make inquiries about food origin, processing, inspection materials, flow, and

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other information to enhance their trust in food quality.

(2) Each operating unit of the agricultural product supply chain carries out real-time data statistics and control management on procurement, inventory, sales, finance, and so on.

(3) When there are quality problems in agricultural products, meat products, and aquatic products, the relevant batch of food can be withdrawn quickly and accurately.

(4) By linking with the government or the quality supervision department in the industry, quality supervision can be more accurate, standardized, and operable.

3.2.4. Framework of the Cold Chain Agricultural Products Traceability System

The framework for the cold chain agricultural product traceability system is shown in Figure 3 as the following.

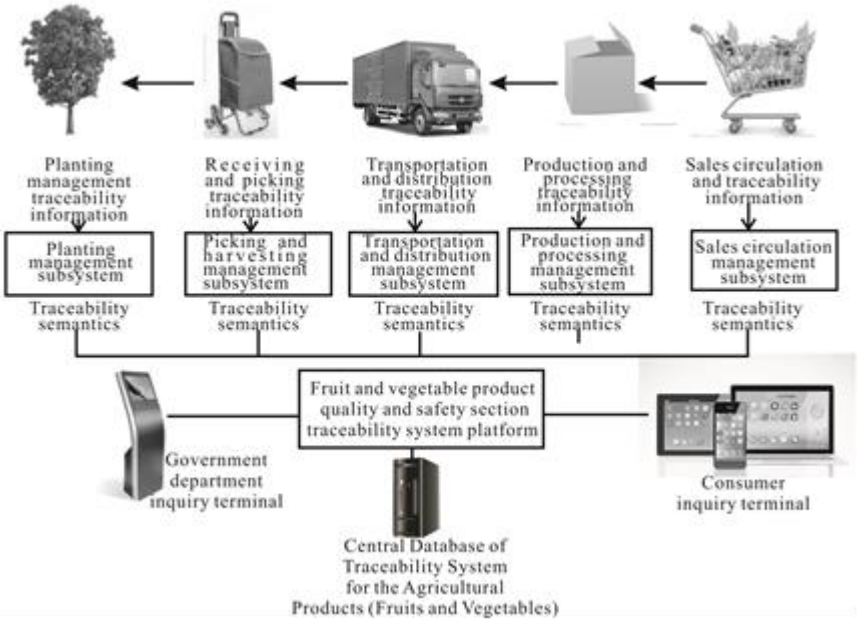

Figure 3. Framework of a traceability system for agricultural products (fruits and vegetables)

The traceability system includes the information required for tracking and traceability, including the operations/responsible person, time, node temperature and humidity, inspection operations, and other operations from the planting and picking in the production area to the transportation, production and processing, storage, distribution, and sales. The key information or retrieval code is written into the RFID, and the detailed information is enquired through the database of each management subsystem and integrated into the central database of the traceability system. At the terminal of circulation, consumers or governments can view the complete information.

3.2.5. Design of Tracking Identifier

By reference to the agricultural product coding rules "NYT1431-2007 Agricultural Product Traceability Coding Guidelines", the composition of the long code is as the following: 1 digit for category + 6 digits for administrative divisions + 2 digits for the company + 2 digits for the product + 6 digits for the date + 3 digits for batch number. In addition, the actual situation of the cold chain logistics is combined to design the code, as shown in Table 1 below.

Table 1. Traceability code for agricultural products

Code type	Digit	Role description

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Job code	2	Differentiate cultivation, collection, processing and production, transportation, storage, inspection, and so on
Batch code	6	Adopt serial number coding. The batch number is the code assigned to a batch of goods, and the batch of goods is processed, produced, or packaged under similar conditions
Node code	9	Include node administrative divisions, types, companies, and other information, and the association queries can be adopted
Personnel code	4	Record operator, responsible person, inspector, and other information
Temperature and humidity	8	4 digits for temperature, 4 digits for humidity, and humidity data are for reference
Position	18	9 digits each for latitude and longitude, including degrees, minutes and seconds
Date and time	14	The year, month, day, hour, minute, and second information need to be included in some links
Product name	13	The product commodity code EAN association expression can be used

4. Conclusions

Through the application of RFID tags with temperature sensors, the place of origin, freshness, quality, and other indexes of the products can be managed in a detailed and real-time manner. The monitoring personnel can strictly monitor, record, and analyze the temperature of the transportation and storage of food, medicines, and other items, identify problems in time, reduce the shrinkage rate, reduce the waste of the company, and improve the operational efficiency. In this paper, RFID, cloud computing technology, and J2EE development technology are used to design the framework for the third-party cold chain logistics information platform. The demand analysis and the overall design for transportation monitoring, early warning system, and agricultural product traceability system are carried out, which is of practical significance for the agricultural product logistics, fresh e-commerce logistics, commercial logistics, and also has reference value for pharmaceutical logistics.

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