Building intelligent logistics system based on internet of things RFID in platform of cloud computing

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ABSTRACT

RFID technology in logistics system is widely used as the core in Internet of things and plays an important role in the field of logistics management. The EPC code is stored in the RFID tag, can realize the identification of the real target. Cloud computing is a distributed processing, parallel processing and grid computing development, distributed in a large number of distributed computers through the calculation, rather than the local computer or a remote server, enterprise data center operation will be more similar as internet. The paper presents build intelligent logistics system based on Internet of things RFID in the platform of cloud computing. Simulation results validate the effectiveness of the proposed model.

Keywords: RFID, Cloud computing, Internet of things, Intelligent logistics system.
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INTRODUCTION

In IOT application services through sharing the same huge cloud computing resource pool to obtain large system throughput capacity to meet user needs in some cases of ultra high computation or storage resource request, and the cost is the total amount of use of resources costs [1]. Dynamic expansion and contraction process of the above system does not require user intervention, the system will automatically, developers on its platform but according to the standard and follow the procedure is easy to be extended principle, with not much difference between the development of local application, the system developers and users have brought a lot of benefits, and the operator can also be middleware services the core link control firmly.

The work principle of RFID is: label into the field, if the received reader special RF signals, can with the induced current obtained by the energy sending out the product information stored in the chips (i.e. Passive Tag, passive tags or passive tags), or take the initiative to send signals to send a frequency (i.e. Active Tag, active tags or active tags), the reader reads information and decoded, sent to the central information system on the data processing.

Intelligent logistics system is mainly to achieve the following two objectives: To carry on the business process reengineering of logistics enterprise itself (Business Process Re-Engineering, BPR), the traditional logistics enterprise management and business process has been changed fundamentally, so that it can survive in the information society. In the EC operating environment, providing value-added logistics services have not provide for the customer, the value-added logistics services will enhance the convenience of logistics services, to accelerate the reaction speed and reduce the service cost, extended enterprises downstream in the supply chain of the business.

Using the technology of RFID network in the world all items together, can be "communication between each other and articles". RFID tags are stored in the items of information, the reader information obtained through wireless data communication network automatic acquisition to the central information system, to realize the goods identification;

through the computer network to realize the sharing and exchange of information. That is to say the world through RFID and other information sensing did not have connected to the Internet, and eventually realize intelligent identification and management. The Internet of things will become the sensor network based on RFID technology, the RFID technology of Internet of things based on system is composed of the physical world and the logic space composed of 2 levels.

Transportation costs under the influence of economic globalization, the increasingly fierce competition. How to configure and use of resources and it is reduce manufacturing cost and enterprises to focus on the problem. To implement this strategy, not a highly advanced, reliable and efficient logistics system is unable to realize. With the development of economic globalization and the rise of network economy, the logistics function is no longer simple in order to reduce the cost, but rather becomes improve customer service quality to enhance the comprehensive competitiveness of enterprises. At present, the logistics industry is gradually formed seven development trends, they are respectively and the third party logistics cooperative information, intelligence, environmental protection, enterprise globalization and internationalization, service quality, industry. The paper presents build intelligent logistics system based on Internet of things RFID in the platform of cloud computing.

2. Design of Intelligent Logistics System based on Platform of Cloud Computing

SDK provides application development tools in the cloud platform, similar to the traditional API development, but here the SDK is a customized, provide the interface of application service cloud computing platform architecture. The main purpose of SDK is to provide enterprises to meet the personalized needs of IT. In the current enterprise management software model, when enterprises need some personalized software, technical department will take this application to the server. If there is a cloud computing platform to provide services, enterprises can develop personalized application by using SDK.

Logistics in the field of cloud computing, can let the logistics enterprises according to the actual size and its requirements; dynamically select the corresponding visual resources and services on the Internet cloud, so as to meet the need of the enterprise in the daily operations in the process of the IT service. IBM wisdom "logistics cloud" put forward a similar concept [2]. It provides a cloud based intelligent logistics plan, can put the things used in logistics, intelligence will progress cargo handling, transport, storage, maintenance and customs clearance, logistics industry, fast efficient, intensive, transparent, save the management cost, improve the management level.

SDK provides support for enterprise application basic API, including storage service, queue service, authentication service etc.. In addition also provides the ability to invoke the Web Service and packaged into Web Service for external calls. Problems and countermeasures have been, security problems are restricting the development of cloud computing, cloud computing is the biggest obstacle in the implementation of enterprises. This paper summarizes the security platform facing and puts forward the corresponding countermeasures, as is shown by equation1.

$$v_X^2(\tau_j) \approx 2\int_{1/2^{j+1}}^{1/2^j} S_X(f)df$$

(1)

Where, $v_X^2(\tau_j)$ is the first layer of the maximal overlap discrete $\{\widetilde{W}_{j,k}\}$ wavelet transform (MODWT) variance coefficient sequence, which $S_X(f)$ is the spectral density function $\{X(k)\}$ sequence? As the cloud software service and application development platform -- PaaS (Plat-formasaserice), on the one hand, provide a platform, to build and run the software services at the same time, on the other hand, it is responsible for the management of all hardware and software resources, through the Internet to provide on-demand, based on Web software solutions. PaaS provides all the required for the operation of the Internet application infrastructure. Users only need to "open water" to obtain the service, they don't have to worry about behind the scenes complexity. PaaS is based on a subscription model, so the user only needs to pay for his use of function. Using PaaS, independent software developers and enterprise IT departments is to focus more on innovation, rather than the complex infrastructure. Logistics enterprises can budget more into can provide real value to the business place, rather than basic equipment purchase and maintenance.

The Internet of things worth is not a network capable of sensing, but must all sectors involved application, different industries, will have different application, will have different requirements, these must be based on the characteristics of the industry, for the development of in-depth study and valuable. This application development can not rely on the operator; can not just rely on the so-called Internet enterprise, because operators and technology companies are unable to understand the requirements of the industry and the industry specific.

In cloud computing platform of general data through the Internet transmission, data by the cloud service management need to keep the security of the data, including the calculation and data backup of the data on the server [3]. Generally speaking, the enterprise data security requirements, such as customer information, contract bidding rules. But the enterprise the data submitted to the cloud computing platform, enterprises will lose control of the data, unable to ensure the security of the data, increase the likelihood that data is leaked.

The logistics department according to the requirements of the shipper sales invoice generation Chukuchan: according to the outbound priority (such as the date of production priority from the front) query outbound goods storage bin and inventory status to the warehouse, such as customer specified number specified batch query, and outbound goods delivery into position and the corresponding tray of goods. Picking a person carrying out of order to the warehouse manager, and it is warehouse keeper check information for executing the corresponding product warehouse forklift driver.

At present, the Amazon, Google, IBM, Microsoft, Sun companies such as cloud computing infrastructure or cloud computing platform, open source organizations and academic circles have put forward many cloud computing system or platform. The Google cloud computing infrastructure Google cloud computing infrastructure in the initial search services for application based on gradually extended, consists of distributed file system GoogleFileSystem (GFS) system is composed of it, several large-scale distributed database BigTable, MapReduce programming mode, distributed Chubby locking mechanism, independent and closely. "Blue cloud computing platform 3.2IBM" IBM "Lan Yun (BlueCloud)" computing platform is composed of a data center monitoring software, IBMTivoli (Tivolimonitoring), IBMDB2 database, IBMTivoli deployment management software (Tivoliprovi-sioningmanager), IBMWebSphere application server and open source virtualization software and open source software consists of information processing, as is shown by equation2.

$$z_3(kT_3) = \begin{bmatrix} 2 & 1 \end{bmatrix} x(kT_3) + v_3(kT_3)$$

(2)

Where x is white noise, $v_3(k)$ is a zero mean, variance, $R_3(k) = 1.5$. Between the above three measurement noise and state noise $T_3 = 3$ is uncorrelated. In the face of cloud computing services, business users will usually on system reliability, availability, skeptical, worried about the timely resolution of problems can not be services, comprehensive application and so on have affected the enterprise cloud computing. To solve this problem, it can introduce SLA service level agreement to provide reliable service to the user. At the same time, SLA can further constraints on the cloud service provider, improve service quality; I can increase the enterprise users of cloud services of confidence.

Sun's cloud infrastructure architecture, including service application, middleware, operating system, virtual server, physical server and so on 6 levels, the proposed "cloud computing can be described from hardware to any traditional hierarchical application services" point of view. The Azure cloud platform of Microsoft includes 4 levels. The bottom layer is Microsoft Global Foundation Services System (globalfoundationservice, GFS), from all over the world the fourth generation data center; cloud infrastructure service layer (cloudinfrastructureservice) on the WindowsAzure operating system as the core, mainly engaged in virtualized computing resource management and intelligent task allocation; WindowsAzure is an application service platform, it plays a member (BuildingBlock) function, provides a range of services for users.

The third party logistics enterprise, the span of regional storage location is great, and therefore need to network distributed storage management and inventory control technology to reduce management costs, improve efficiency. Network distributed storage management and inventory control technology is an integral part of the ILS [4]. Distributed storage management and inventory control module is a part, ERP software at present, relatively large ERP system, such as SAP R/3 including the module. In order to ensure consistency, that is established in the local area of all, as is equation3. Where the main features of the covariance *P* matrix of the noise correction value represents the change in pixel intensity, this change is caused by *S* the change of the actual $\lambda \propto \sigma^2_{s,s_0}$ pixel in the scene. Therefore there should be $\sigma^2_{s,s_0} = \lambda$.

$$\|\beta\|_2^2 = \frac{\lambda}{\sigma^2_{s,s_0}} u^T u = 1$$

(3)

Cloud computing can calculate the mass information storage and low cost and high performance to solve the

problem of infinite growth, allows the IT infrastructure to realize resource and service, so that users can customize according to need, thus changing the traditional IT infrastructure delivery and payment.

Many cloud computing deployment depends on the computer cluster (but with grid composition, architecture, working mode, to be quite different), also absorbed the characteristics of autonomic computing and utility computing. In a large number of distributed computers through the calculation, rather than the local computer or a remote server, enterprise data center operation will be more similar with the internet. This makes the enterprise can be resource switch on the application of need, demand according to visit the computer and storage system. Like from a single generator model ancient to power plant centralized power supply mode. It means that computing power can also be used as a kind of commodity circulation, like gas, hydropower, and convenient use, low cost. Biggest difference lies in that; it is to be transmitted through the internet.

The cloud computing platforms have their own different characteristics. Especially in the platform use, transparent computing platform for the user and provides a client node user actual contact and remote virtual storage server cannot be contacted. 1.5 Open. Google platforms for cloud computing environment is a private environment, in addition to the application program interface open limited, such as GWT (GoogleWebtoolkit), except for GoogleAppEngine and GoogleMapAPI, Google and no cloud computing internal infrastructure sharing to external users to use it. IBM's "blue cloud computing platform is soft," the set of hardware available for sale, the soft, hardware products to build their own cloud computing applications based on Amazon elastic cloud computing is managed cloud computing platform, users can remote operating direct manipulation user interface, not to see the actual physical node [5]. From the perspective of the other differences is between the cloud computing systems. It can be seen that, although cloud computing systems are common in many ways, but in fact each system still has very big different, it also calculates the user or developer to cloud brought different experience.

Intelligent logistics is to deepen the application based on the Internet, the Internet of things technology, analysis technology by using the advanced information collection, information processing, information flow, information management, intelligent, completed intelligent transportation, warehousing, distribution, packaging, handling a number of links, and the real-time feedback flow, enhanced flow monitoring, enables fast efficient delivery to the demand from the suppliers, so as to provide maximum profits for the supplier, to provide the most efficient service for the demand side, greatly reduce the consumption of natural resources and social resources, maximize the protection of the natural ecological environment.

3. Application of Internet of Things RFID in Intelligent Logistics System

Internet of things through the sensor, RFID technology, mobile phone, GPS and other equipment, all objects in the world are connected to the information network, fully embodies the integration of physical space and information space, but also provides to the matter, to complex, interconnected relationship between person and person, thus reducing the. Information systems and physical distance in the world, to construct coverage of all things in the world of "Internet of Things", one of its core technologies is the RFID technology.

RFID reader is a wireless transmitting and receiving equipment, mainly including the RF module and digital signal processing unit 2 part of read and write operations, label, reader demodulate and decode the received radio frequency signal, and then sent to the application system through network. So it has a strong ability of storage and computation.

Although RFID is fast in every field, but with respect to our country economy of scale, the scope of its application is still far from achieving wide degree, even in the transport and logistics industry RFID application more and more, and also at the point distribution state, and can not reach the surface state. Often is the industry leading enterprises to maintain its competitive position and take the lead in trying to use this kind of new technology, more and more enterprises have a wait-and-see attitude and hesitation. Or to the logistics industry as an example, the application of RFID technology can greatly improve the operation efficiency of logistics, such as speeding up the goods out of storage time, reduce the field operation personnel, realize accurate inventory fast and accurate positioning, cargo tracking [6].

$$W_m^{-1}[0,n]\sum_{k=0}^{n-1}[\overline{A}^k(m)]^T C^T Cy(m,k)$$

$$=W_m^{-1}[0,n]\left\{\sum_{k=0}^{n-1}[\overline{A}^k(m)]^T C^T Cy(m,k)\overline{A}^k(m)\right\}x(m,0)$$

$$=W_m^{-1}[0,n]W_m[0,n]x(m,0)=x(m,0)$$

(4)

Where the $W_m[0,n]$ is non singular, and the construction $W_m[0,n]$ is method. The non singular knowable, $W_m^{-1}[0,n]$ inverse exists. Then, the interval of any one is not $[0,n-1]$ identically zero output, $y(m,k)$ can be obtained by the formula (4). Intelligent sensing, automatic transmission by means of the Internet of things, make the enterprise can realize the real-time monitoring of the whole process in supply chain logistics, grasp the logistics activity, and real-time response, the state automatic decision, intelligent response. Each node in the manufacturing enterprise logistics process must rely on other nodes logistics status of real-time strain.

In recent years, electronic label application in some practical, such as logistics management, process management, industrial air parcel quay container management etc.. At present, in addition to the actual carrier container source box, non vessel carrier is a part of the box and the owner owned box, the rest for the container leasing company case. The actual carrier is Ship Company, train, car, all aircraft; they control the transportation [7]. The non vessel carrier is in container transportation, management of container freight canvassing, packing, detaining, inland transportation and business to business or inland war, but not the operation of ships.

The reader and tag data information is the main threat to the RFID network system security by using the soft hardware. Application of RFID technology in the system general design, usually attack methods are: information, forgery, tampering with information, information playback interruption of information, as well as the illegal tracking tags, interferes with the normal work of the reader and the tag, as is shown by equation() the interception of tag data transfer information.

$$Z(k) = H(k,m(k))X(k) + v(k,m(k))$$

(5)

Where, $m(k)$ is an effective k model for the sampling, a system model set $M = \{m_1, m_2, \cdots, m_n\}$, model transformation process with the Markov process? A non-volatile memory for storing user data is an important content of the key, so they cannot be obtained, the information through simple optical photograph. In the authentication process, at least to access these data area one, therefore, can use the signal probe monitoring on the bus access to important data. For good design, simple repeated authentication is not enough to the key position of access memory all. For example, use a different encryption key and encryption algorithm in the same card, then every few weeks in between them to switch to a storage area of the chip, the algorithm and the key without being broadcast call cannot be activated before processor control and so on, so that the passive monitoring bus early to find these secrets. These contact smart card IC experience can be used in RFID design.

By coupling the RF signal element space between tag and reader (no contact) coupling, in the coupling channel, according to temporal relations, transfer, data to realize the energy. There are two types of coupling RF signal between reader and tag. (1) Inductively coupled. The transformer model, achieved by coupling space high frequency alternating magnetic field, is based on law of electromagnetic induction. (2) The electromagnetic backscattering coupling: the principle of radar model, electromagnetic waves transmitted, met the target reflection, and carried back to the target information, is based on the law of propagation of electromagnetic wave.

Public logistics information platform is to provide international logistics information service for international logistics, international logistics needs of enterprises and other relevant departments of the public business platform. Its essence is to support and guarantee for international logistics information means of production. The establishment of public logistics information platform can achieve rapid response to customer. The modern social economy is a service economy society. Establish customer rapid response system is the basis of international logistics enterprises to better customer service. The establishment of public logistics information platform can strengthen cooperation with partners.

$$k_i = \hat{k}_i \bigg/ \sqrt{\sum_{i=1}^{t} \hat{k}_i^2}$$

(6)

In the formula6, k_i as the normalized attribute index, $\hat{k}_i$ as a measure of a certain evaluation index in the domain of values, t as the number of the same index attribute measure value. Active electronic label is arranged in the battery, the general has a far reading distance, the deficiency is the life of the Battery Co. (3 ~ 10 years); no battery passive electronic tags, it receives the reader (readout) microwave signals, will be part of the microwave energy into DC power for their own work, general do maintenance free. Compared to the active system, passive system in the

reading distance and adaptation object speed slightly.

In logistics, goods or goods of information recorded in the tray box label. This barcode system can clear information about their location, cargo tray and even individual identity, history, goods transportation destination, validity and other useful information [8]. Bar code system can provide detailed data for the goods in the supply chain, and the establishment of physical contact between the goods and the integrity of the identity, the user can easily access the reliable information goods. And through the data acquisition of bar code efficient, it is timely logistics and warehousing information feedback to production and processing, to guide the production.

If the container transfer mode in theory, each circulation partly responsible for all abide by the original rules, then the container can be timely recovery, but the fact is not such as we desire, container, container damage caused by the recovery is not timely situation exists. For example, if the goods transfer mode is CY - CY, namely from the carrier at the port of loading container yard to the carrier at the port of discharge of the container yard. If in strict accordance with the regulations, the carrier should be at the port of container yard will container deranging, will the delivery of the goods from the container and pulled out, and then the handing over of the goods to the consignee or his agent.

Basic data management, logistics and integration, the key lies in the processing of massive data, the upstream and downstream information sharing, data sources, to ensure the reliability and security, provide the data storage and backup, access to different application system. RFID data is described by the standard format (such as XML based, RDF etc.). A middleware standard, follow the standards development, universal adapter, emphasizes the modularity, provide two times the development interface, applications of different RFID; according to the characteristics of RFID, RFID data model definitions, joined the RFID interface, access to the enterprise application system. RFID data cannot be filtered out, the historical data is very important, the middleware filters to establish a data filtering rules, can be used for the public information service.

4. Build Intelligent Logistics System based on Internet of Things RFID in Platform of Cloud Computing
RFID is an automatic identification technique of non-contact radio frequency communication to achieve. The RFID tag has the advantages of small volume, large capacity, long life and reusable characteristics, can support fast read and write, multi object recognition, non visual recognition, mobile recognition, positioning and long-term follow-up management.

The hardware platform is commonly known as the Iaas, which mainly provide user virtual computing resources, storage resources, cyber source. All hardware facilities including servers, network equipment, storage equipment, it is cloud computing data center [9]. The hardware platform must first have the scalability (Scaling), the user can be assumed that the hardware resources infinite.

According to their own needs, user dynamic use of these resources, and to pay the service fee according to usage. Need not to need to buy equipment to support the current maintenance visits. In the virtual technology to design a hardware platform is very important, it can share a large hardware facilities allow multiple operating system, the hardware platform provider can provide all kinds of cloud platform hardware requirements. Virtual technology common charges (such as: VMware), is a free open source technology (such as: Xen) the cloud platform to Paas, it provides service development tools and software (such as: database, distributed operating system, etc.) to help the developers to develop service cloud services. In addition, it is also a cloud service platform. Therefore, the cloud platform needs to have the Java runtime, Web2.0 application runtime, all kinds of middleware.

Collaborative sharing platform of the system through the Internet of things, the enterprise can be carried out between the logistics share cooperative distribution and storage: logistics enterprises based on cooperation between effectively freight information sharing, resource sharing to realize collaborative freight, delivery; between supply chain enterprises will storage resource sharing in the whole supply chain scope, an enterprise can use the supply other enterprises on the chain storage resources, improve the efficiency of transportation and distribution.

Cloud computing operating system usually contains the following modules: modules large-scale infrastructure software and hardware management, virtual management of computing, distributed file system, business / resource scheduling management, safety management control. Build intelligent logistics system based on Internet of things RFID with cloud computing is figure1. In simple terms, the cloud operating system has the following functions, one is treated as the control of a few, can manage and drive the massive server, storage hardware, the hardware resource logic of a data center is integrated into a server; two is to provide a unified, standard for cloud application software interface is calculated; three task management of massive and resource allocation.
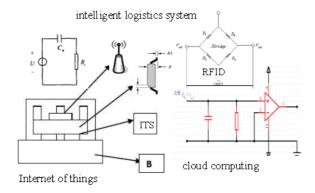
Fig. 1. Build intelligent logistics system based on Internet of things RFID with cloud computing

Now RFID technology in logistics system is widely used as the Internet of things, the core technology plays an important role in the field of logistics management. The EPC code is stored in the RFID tag, can realize the identification of the real target, some real-time dynamic information at the same time label also stores the real target and may be updated, high-level information processing software can pass the RFID reader to identify, transmission and query of the target information. Compared and the now widespread use of bar code technology, RFID has the advantages of read and write long distance, high security, large amount of stored data, the use of harsh environment, long service life etc.. RFID can be used to track and manage almost all physical objects, is one of the important means of informationization of logistics management, tracking and other fields, and has a very important role to improve the intelligent level of logistics. Through virtualization, cloud computing platform can be very flexible to meet various needs, not by hardware limitations.

Computing hardware platform in the realization of their cloud, which takes into account the storage structure, which not only need to consider the storage capacity, more important is the need to consider disk data read and write speed. The rate of a single disk is likely to limit the service program for data access, so in the actual process, data needs to be distributed to multiple disks, and through the multiple simultaneous disk read and write in order to improve the speed of it.

CONCLUSION

Cloud computing users can through the network access to resources on demand, and pay per use, like to turn on the light electricity, turn on the tap water, access is used; from the background, cloud computing can realize the compatibility of various heterogeneous hardware and software resources on the basis of dynamic circulation, to achieve resource. The paper presents build intelligent logistics system based on Internet of things RFID in the platform of cloud computing. The static, fixed hardware resource scheduling, forming a pool of resources, the realization of the two basic functions of the cloud is Cloud Computing Center operating system, but the important role of the operating system is far more than that.

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