

# Construction and Operation of Regional Logistics Public Information Platform Based on Cloud Computing

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**Abstract:** In order to realize the social logistics resource integration and provide customized logistics services to the customers, this paper presents a regional logistics public information platform construction scheme based on analyzing the conception and characteristics of cloud computing. A system configuration model of regional logistics public information platform is advanced on the basis of analysis. Technical scheme and system configuration model can be widely used in the construction of regional logistics information system. Finally, a proposal to adopting the mode of Cooperative operation leading by the enterprise is provided combining the development situation of cloud computing and logistics information public platform in china. This paper examines recent patents that awarded from The United States Patent and Trademark Office (USPTO) and State Intellectual Property Office of the P.R.C. The main methodologies used in logistics information public platform have been reviewed in this paper. The following techniques have been covered: (i) Cloud computing system, (ii) logistics information platform, and (iii) operation mode based on Cloud Computing. The qualitative analysis of the work done by various authors has been presented based on (a) public cloud, (b) private cloud, (c) hybrid cloud.

**Keywords:** Cloud Computing, Cloud computing system, logistics information platform, operation mode.

## 1. INTRODUCTION

With the development of information technology, informationization level of logistics enterprises in China have continuously improved. But it is not an easy venture as there are considerable problems in achieving complete informationization of logistics companies. Enterprises need human as well as material resources for utilizing traditional technology for constructing logistics information platforms. At the same time, it is difficult to realize data sharing between different enterprises because decrease different software applications are being used independent of each other by these companies.

In recent years, the logistics information technology based on the Internet and on cloud computing has been proposed recently. It provided an effective way to solve the problems of logistics enterprises. How to apply the cloud computing technology to build a logistics information platform to realize intelligent logistics is one of the main project in the future development of the logistics informationization.

## 2. CLOUD COMPUTING TECHNOLOGY

### 2.1. The Definition of Cloud Computing

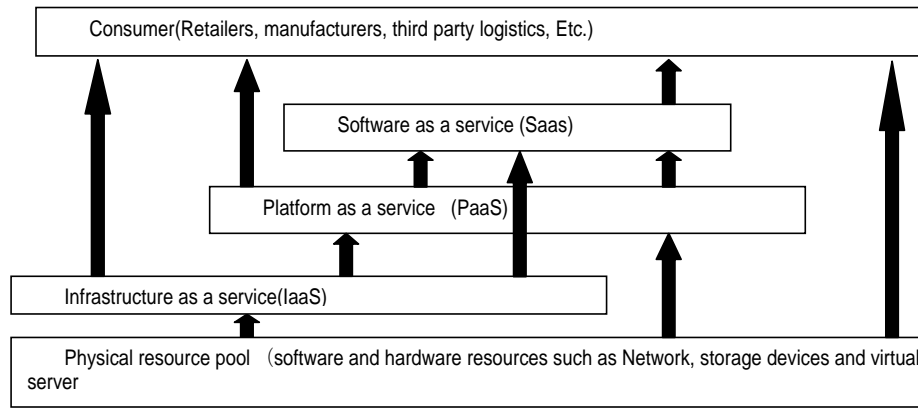
There are still different definitions of cloud computing. Its definition at Wikipedia (Wikipedia.org) has also been revised and updated.

At present, the new definition is that Cloud computing is a dynamic and scalable calculation method which provides virtualization resource through the Internet. The user does not need to know the internal details of cloud and do not need to have internal expertise about the cloud or directly control the infrastructure. It can be interpreted that the cloud can provide you with the information you need as long as there is a terminal (PC, mobile phone, notebook computer or other equipment) and you can connect to the network. When you want to enjoy the services of cloud computing, you do not need to search again and again or install the patch [1].

### 2.2. Cloud Computing System

Cloud computing can be divided into 3 levels [2]: The bottom layer is IaaS (Infrastructure as a Service). The customer can obtain services through the Internet infrastructure including computer resource, storage resource and network bandwidth. The middle layer is PaaS (Platform as a Service) as the core layer. The middle layer which contains program development environment, design of distributed memory management, system files and other management tools that can provide the development of application software, databases, application servers, hosting and application service for enterprises or individuals. The top layer is SaaS (Software as a Service). Compared to the other two layers, SaaS is the most widely application service layer which can provide various application service for customers. No need to buy software as customers can access the cloud services *via* the Internet. Customers can manage their business activities by subscribing the cloud service.

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**Fig. (1).** The basic Framework of logistics information platform based on Cloud Computing.

The US Patent 8,638,674 entitled “System and method for cloud computing” [3] provides a system for creating, deploying, selecting and associating cloud computing services from many cloud vendors to effectuate a large-scale information technology data processing center implemented in a software. Configurations can be created that allow for service provider selection based on user-selectable parameters such as cost, availability, performance and service level agreement terms. The system employs measurement, aggregation, reporting and decision support of system usage and costing, performance, Service level, feature set, to automate the construction, operation and ongoing management of software based cloud.

### 3. DESIGN OF REGIONAL LOGISTICS INFORMATION PLATFORM ARCHITECTURE BASED ON CLOUD COMPUTING

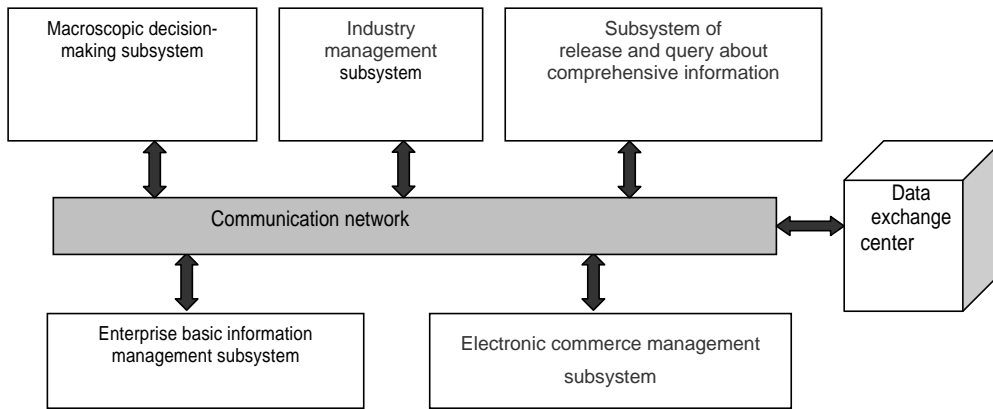
#### 3.1. Characteristics of the Regional Logistics Public Information Platform Base on Cloud Computing

- 1) Demand of resource is large: A lot of information systems of enterprises and governments in the region will be effectively integrated in order to achieve real-time tracking status information of commodity logistics. The information can be classified and statistically analysed. The system carries on the data backup periodically according to the need. So much workload put forward higher requirement for computation power parallel calculation availability and storage resources.
- 2) The changes of information resource load are large. Due to business needs and other reasons such as financial settlement, online declaration etc. The application of regional logistics public information platforms will show a short time explosive growth while the usual state tends towards stability.
- 3) The platform provides calculation capacity on the basis of the service. From the perspective of the industry, the various different information requirements of the enterprises can be packaged into different services [4]. Different services are provided to the public through the public information platforms while the customers can choose the corresponding service content according to their demand.

#### 3.2. Constructing Regional Logistics Public Information Platform using the Hierarchical Design

The main function of constructing regional logistics public information platform based on cloud computing is to integrate independent resources and information distributed in different functional departments of the government and enterprises, and to provide a set of standardized information and business services to customers [5]. Because logistics industry is operated by adopting non-standard mode in China, the existing logistics enterprises which have their own information systems can not switch to cloud computing operation model at once. The process of constructing regional logistics public information platform is sequential. According to the current situation combined with cloud computing technology, SaaS and SOA, the construction of regional logistics public information platforms can adopt the basic framework as shown in (Fig. 1).

- 1) Physical resource pool: The physical resource pool includes hardware resources such as network, storage equipment and virtual server. These distributed resources are connected together through network virtualization in order to compose logistics information platform based on cloud computing.
- 2) Infrastructure as a service (IaaS): The service mode is to provide virtual memory on the network. Customers pay rent according to the actual storage capacity. The storage ability and computer memory which form a virtual pool of resources is provided to customers as a paid service [6]. Application of virtualization technology in physical resources based on cloud computing can achieve full sharing of hardware resources by customers. Virtualization technology can allocate resources dynamically according to the actual needs not using a fixed storage space so that it can maximize the user needs with the least resources. In order to improve security and reliability of the whole information platform, the servers within regions are connected into a huge virtual server through introduction of load balance technology and server cluster technology.
- 3) Platform as a service (PaaS): As the core part of the regional logistics public information platform, the whole



**Fig. (2).** System configuration model of regional logistics public information platform.

process from collecting to arranging information can be completed in this layer. In order to ensure the real-time processing, the platform usually adopts distributed calculation and storage in the processing of dealing with massive data information. The problem of cloud platform interface standard should be paid attention during the deployment of public information platform. Packaging the stripped calculation function into standard services combined with the specific computational model is convenient to call on by the upper cloud. Services of development environment and the server platform are provided to logistics enterprises at this level. Logistics enterprises can develop their own application program based on the platform and can transmit it to other users through the internet.

- 4) Software as a service (SaaS), Application software is deployed by the service provider on the server. The user orders application software service through the network. The service provider collects fees according to time, quantity and other factors of the customized software. On this level, services such as cargo tracking, inventory management, logistics monitoring and intelligent distribution can be provided [7]. A variety of application business process is achieved in the cloud application layer and the third party logistics enterprise application services can also be integrated into this layer. The platform can share computing ability and storage space for a number of customers paid through the application of the virtual technology, When integrated services of parties in the industry. Thereby, the efficiency of utilizing resources is greatly improved and the enterprise operating costs are reduced.

A separate patent on the concept of SaaS, CN103501350A, entitled “a method and the device of disposing in the cloud computing platform SaaS” [8] discloses in the cloud computing platform SaaS (SaaS) use the method and device of disposing, which dispose the package by uploading on the Multi-Server, carry the package which is disposed to the Multi-Server and use required server role type. According to the Multi-Server deployment mapping relation, the Multi-Server is arranged and the package is set up in advance, arrange the current server that corresponds of using.

#### 4. SYSTEM CONFIGURATION MODEL OF REGIONAL LOGISTICS PUBLIC INFORMATION PLATFORM

On the basis of above analysis, the author puts forward a system configuration model of regional logistics public information platform. The platform consists of a network (Communication network), a center (Data exchange center) and 5 subsystems. The 5 sub-systems are macroscopic decision-making subsystem, Industry management subsystem, Subsystem of release and query about comprehensive information, Enterprise basic information management subsystem and Electronic commerce management subsystem. The system configuration model of regional logistics public information platform is shown in (Fig. 2).

- 1) Communication network: Communication network is a bridge and a link connected to the components of the public logistics information system which realize information sharing and real-time communication. Network (logistics park network, urban logistics information network and wireless communication network *e.g.*) can be chosen in the light of different situations.
- 2) Data exchange center: Data exchange center is composed by the data integration module and the information query module etc. The function is to realize data acquisition, organization and processing of information sharing.
- 3) Macroscopic decision-making subsystem: The system is used for collecting, classification, query and interpretation of the relevant policies and regulations issued by the user and the department of logistics. Users can clearly understand the relevant regulations and policies of the logistics industry.
- 4) Subsystem of release and query about comprehensive information: The system is a logistics information release and query system of the public logistics information platform. Relevant information entered into the system is classified statistical and analytical according to the involved area and infrastructure. The system mainly used release and query information sharing for real time in logistics activities such as

logistics service information, commodity information, railway station information, aviation port information, road facilities information, goods and vehicles scheduling tracking and so on. The system provides a powerful logistics database query for enterprises and government.

- 5) Industry management subsystem: It is the general name for e-government system of the relevant government departments. For example, tax authorities, customs, inspection and quarantine, bank and industrial and commercial departments. Government are improving the efficiency by implementation of these services and introduction of the insurance business in the system.
- 6) Enterprise basic information management subsystem: It is a generic term for logistics enterprise system. It is one of the main information platforms related to the enterprise basic information and credit file that are available to all registered members of the user query and call.
- 7) E-commerce system management subsystem: E-commerce system management subsystem includes contract management system, order management, payment management system, customer management system and safety management system. The system provides a virtual trading platform for the transaction subject. All aspect of the transaction such as management and application of the order, information and payment can realize in the electronic commerce. Enterprises can acquire the needs of customers accurately and timely through the order management system. At the same time customers can also select and combine the logistics and payment according to their own needs in order to meet the personalized demands.

An Invention has been the resource method and system for the management cloud computing system (CN103560915A) [9]. The invention provides resource method and system for the management of cloud computing system. The method includes: acquire the business that the cloud computing system provided; the behavior of the computational resource, memory resource, capacity of memory and the transmission resource that use the business detects, obtain all professional testing results. According to the professional testing result, for corresponding computational resource, memory resource, capacity of memory and the transmission resource of every professional distribution; Distribute computational resource, memory resource, capacity of memory and transmission resource according to every business, establish the said professional resource pool that corresponds; Detect every professional real-time computational resource, memory resource, capacity of memory and transmission resource that uses, obtain the in service behavior of resource in every professional resource pool; According to the in service behavior of resource in the resource pool of business, output resource management information.

Another invention was a cloud computing method, cloud management platform and customer end (CN103544064A) [10]. The method includes: the cloud resource request that

the user equipment sent is received to the cloud management platform, contains the calculation task in the cloud resource request and accomplishes the required computational resource information of said calculation task; The computational resource for the distribution of said user equipment is determined to the the computational resource information that said cloud management platform contains in according to the cloud resource request from idle computational resource, the computational resource is provided by at least one customer end, and it has at least one virtual machine to move in every customer end.

The invention (CN103136646A) entitled “the control device of a logistics information platform” [11] relates to the control device of a logistics information platform, including the user management module which is used for addition and deletion of new users. The authority management module is used for controlling the rights of using of user to every module of system; The XML files management module, the condition of uploading that is used for inquiring the XML files and the system journal enquiry module is used for the inquiry system daily record. This invention has the convenience and advantages of individualized setting for all users and systems.

## 5. COMPARATIVE ANALYSIS AND SELECTION OF REGIONAL LOGISTICS INFORMATION PLATFORM OPERATION MODE BASED ON CLOUD COMPUTING

### 5.1. Comprehensive Comparison and Analysis of the Operation Mode

The logistics public information platform based on cloud computing is a new and modern logistics operation mode. The aim is to integrate social logistics resources and innovate logistics operation mode supported by the advanced information technology of cloud computing, internet of things and advanced management concept of supply chain management.

In the cloud computing environment, according to the different mode of construction and service, regional logistics information platform can be realized by following the 3 modes [12, 13], *i.e.* logistics operation mode based on public cloud, logistics operation mode based on the private cloud and logistics operation mode based on hybrid cloud. Application scope and the period of these three modes are different. Comprehensive comparison and analysis of the various modes are shown in (Table 1). Operation mode should be selected according to the policy environment, industry characteristics and application requirements.

The logistics operation mode based on public cloud is a mode based on the public logistics services and logistics information platform. Enterprises register and publish logistics service in the public cloud platform while customers release logistics service demand in the cloud logistics platform. The logistics operation mode can provide function of matching between supply and demand, transaction management, design and optimization of Logistics solution, business collaboration, process monitoring, credit management and others. Due to

**Table 1. Comparative analysis of various operation mode.**

No	Operation Mode	Advantage	Weaknesses	Scope of Application
1	Logistics operation mode based on public cloud.	Integrating Social logistics resources, providing a variety of logistics services for customers.	Operation of the business mode is more complex. Related to business reputation and information security.	The area having good policy and credit environment.
2	Logistics operation mode based on private cloud.	Mode of operation is simple, driven by the order of Customer logistics service, providing their own professional logistics services as the core.	The service offered is relatively single. enterprises need to heavily invest in the project.	Applies to the large and comprehensive logistics enterprises or the professional third party logistics providers which have certain scale.
3	Logistics operation mode based on hybrid cloud.	Have the advantage both Logistics operation mode based on public cloud and Logistics operation mode based on private cloud.	To realize seamless integration between the logistics platform of private cloud owned by the core logistics enterprise and the logistics platform of public cloud.	The area with a good policy environment and more mature market.

integrating social logistics resources better, the operation mode can provide a variety of high quality logistics services for customers including professional third party logistics and the fourth party logistics service [14]. Because of many service providers and customers involved, operation business mode is more complex. This mode need the government as the subject of investment and operation also relates to business reputation, information security problems. Its mode of operation is still constantly exploring.

The US Patent 8,447,731 entitled “Method and system for information management” [15] has provided a method for collecting and managing trial information comprising the steps of receiving electronically stored information related to a trial; storing the information in a virtual storage location; parsing the electronically stored information by analyzing and extracting various metadata. The method including the steps of receiving trial information and populating a database with the trial information. The method next includes the step of designating portions of the trial information for later use, followed by receiving confirmation of acceptance of the designated portions.

Logistics operation mode based on private cloud is dependent on the informationization of logistics enterprises. Logistics enterprises apply and deploy technology architecture for the enterprise information system in accordance with the cloud computing. The logistics enterprise provides logistics resources to carry out the operation and management of information. Therefore logistics service mode is different according to the professional logistics enterprises and private cloud [16]. Logistics information platform based on the mode of private cloud is simple. Generally speaking, enterprises with professional logistics platforms provide good quality strongly controlled services to their customers. Due to the lack of effective social integration of logistics resources, the offered services are relatively weak as compared with the logistics operation mode based on public cloud. Because every enterprise need a lot of investment, this mode is applicable to large integrated logistics enterprises or third party professional logistics service providers.

The US Patent 8,495,611 entitled “Systems and methods for private cloud computing” [17], has discussed a system and method for private cloud computing and the development and deployment of cloud applications in the private sector. The private cloud computing system discussed in this patent include as components at least a cloud controller, a cloud stack, Service Registry, and a cloud application builder.

Logistics operation mode based on hybrid cloud is a composite mode of operation composed of the public cloud integrating social logistics resources and the private cloud logistics platform. The logistics enterprises as the leadership provide logistics service solution through the integrated operation mode of supply chain for customers. This hybrid cloud logistics operation mode has the advantages of the logistics operation mode based on public cloud and logistics operation mode based on private cloud. But this mode has higher requirements as well as it a seamless integration between the public and private cloud platforms.

## 5.2. Selection of the Platform Operation Mode

Construction of the logistics public information platform based on cloud computing and logistics services based on SaaS is the focus of this current research. Research in this field in China and abroad is still in the exploratory stage. According to current situation of cloud computing and Internet of things in China, it is not realistic to rely on the government for investment and construction of regional logistics information platform based on cloud computing. However it is also difficult to simply depend on investment and financing by private sector enterprises. As this is a new technology, there is a lack of mature expertise by private enterprises, therefore the operation mode also lack the application value.

The paper suggests that logistics information platform based on cloud computing should adopt “cooperative operation mode led by the enterprise”. It is the operation mode which demand enterprise driven operation and government guided joint planning. This is the dominant which has attracted massive investment from public as well

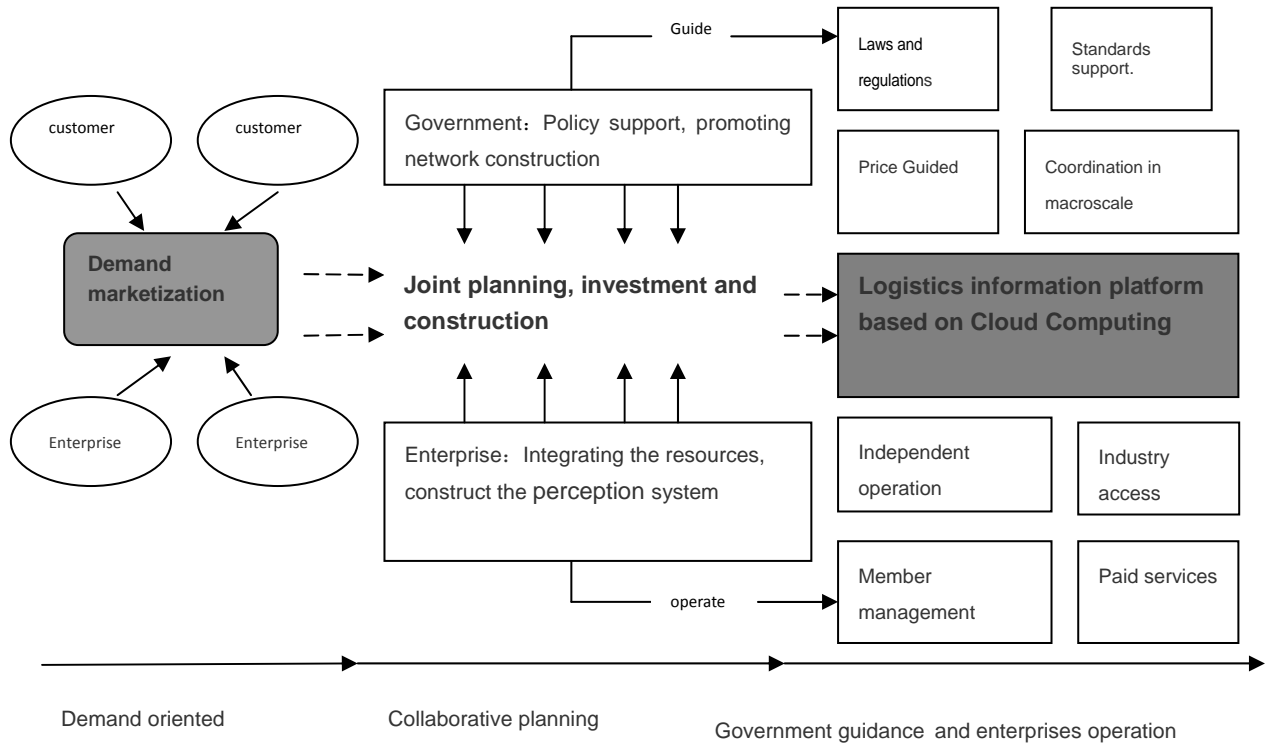


Fig. (3). Implementation Roadmap of cooperative operation mode led by enterprises.

as private sector. Guided by the government, enterprises are responsible for the actual operation in the implementation process. "Cooperative operation mode" combines the advantage of the public cloud and the advantage of private cloud in a body while avoids the disadvantages of them. Implementation roadmap of operation mode led by Enterprises is shown in (Fig. 3).

- 1) Demand oriented and joint planning: Logistics information platform in cloud computing environment will be implemented phased according to the status of funds. Cooperative mode with enterprises as the leading should be formed by the market spontaneously at first. The enterprises initiate and gradually integrate the logistics information system resources. Application of cloud logistics service virtualization technology, cloud access technology and logistics service perceptive technology related to enterprises would construct the overall perception system in logistics industry while the government is responsible for the guidance and support. At the same time, the government should undertake integration and construction of infrastructure and logistics security technology in the network layer in order to realize large-scale synchronous data transmission functions to meet the demand of different customer which has various perception of the transmission of information.
- 2) Government promoting and market operation: The government in charge of the industry sector is responsible for the soft environment which included the relevant policies and regulations, business process, technical standards in the logistics information platform based on cloud computing. At the same time,

government gives the guidance for the information service price and comprehensive coordination of the platform management. Logistics enterprises as the main part of the operation platform, should perfect the platform operation mode through introducing the industry access system and membership management in the range of government policies and industry association system allowed. Enterprises can independent operate in the platform such as charging membership dues, service fees, rental fees, advertising fees to the member enterprises who join the information platform. Enterprise oriented collaborative operation mode has a strong feature of market operation, with the nature of the profit obvious. This mode of operation is in accordance with the current development situation of logistics industry in China. The spread of this operation mode is conducive to promoting the application of cloud computing technology in logistics industry in order to maximize the overall value of cloud computing technology in society.

### 6. CURRENT & FUTURE DEVELOPMENTS

Logistics public information platform based on cloud computing is an end-to-end collaboration business platform which crosses regional and platform. The platform can realize the sharing of regional logistics resources and optimize the allocation of social logistics resources. It has not only important realistic meaning to improve modern logistics function, but also practical applications for the development of modern logistics crossing industry and cross regional.

In the cloud computing environment, cloud computing is grid computing platform which provides public computing

based on SOA. Software, computing ability and storage ability as services is provided to public at the same time charged royalties related in the platform [18]. This is great changes in the computer world but there are certain security problems which need further exploration and research.

The secure communication method and system for based on the cloud computing (CN103546545A) [19] provides the secure communication method and system and said method includes: sent to said high in the clouds server by said geographic location information, said Equipment information and the said authentication serial number that will obtain based on the terminal of cloud computing; Receive said geographic location information, said Equipment information and said authentication serial number by said terminal send based on the cloud computing by said high in the clouds server; Compare received said geographic location information, said Equipment information and said authentication serial number and the Phase information that prestores by said high in the clouds server, with the authority of the said local information treatment facility of determining said terminal place based on the cloud computing.

#### CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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