

2014

BioTechnology

*An Indian Journal***FULL PAPER**

BTAIJ, 10(13), 2014 [7544-7550]

Study on the application of computing cloud technology in network security management system

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ABSTRACT

Because the network security management system has the disadvantages of data incompleteness, data recovery difficulty and poor privacy. So, this paper applies the cloud computing method to the network security management system and puts forward a network security management system based on cloud computing. This system can integrate information resources effectively and improve the utilization rate of network resource drastically. It realizes the network security management system based on cloud computing through analyzing and researching the cloud computing and network management features. Practice has proved that the system has made great progress in the aspects of network security management, resource sharing, reducing management costs and flexibility compared with traditional management methods. We can say that the efficient computing power and great storage capacity of cloud computing has been fully reflected by the network security management system, which makes the level of our network security management to get a whole improvement.

KEYWORDS

Cloud computing technology; Security management system; Network security.



INTRODUCTION

With the rapid development and popularity of the network, great changes have taken place in the network security management. Security management has become an essential security tools in network security. More and more people are choosing network management system as learning a major network security measures. However, due to China's vast territory and large population, the distribution of computer and network resource is unbalanced. Network security management is a comprehensive technology which needs the support of the research results the information security, network management, distributed computing, artificial intelligence and other fields. The concept of cloud computing was put forward the first time in 2007. The efficient computing power and great storage capacity is the greatest advantages of cloud computing. So, since it was put forward, more and more people have researched on it. This topic studies the advantages and feasibility for the application of cloud computing to network security management system. Through the comprehensive demonstration, it puts forward the application of cloud computing to the network security management system and use the efficient computing power and great storage capacity to solve the shortage of the traditional network security management system^[1]. Through the practice, we can find that the network security management system based on cloud computing has great improvement in improving network security, sharing educational resources, reducing management cost and other aspects. It is more conducive to large-scale promotion of network security technology.

DESIGN OF NETWORK SECURITY MANAGEMENT SYSTEM BASED ON CLOUD COMPUTING

The design of network security management system based on cloud computing is mainly divided into five modules: system architecture, business process, data processing, safety and reliability of system. The modularized design concept makes the structure of the whole system platform clear and hierarchic.

System architecture

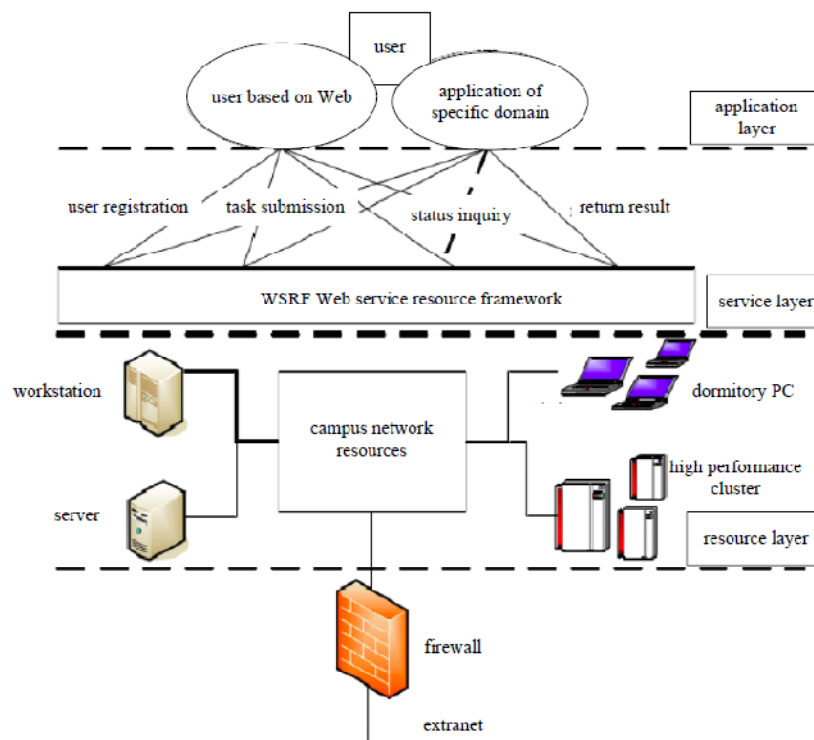


Figure 1: The overall architecture diagram of system

At present, the network speed is not ideal in our country. The network and server can't bear the centralized access. The schools that launch the network security management system usually build many learning center diversion servers, mostly adopting B / S mode. The overall structure is shown in Figure 1. It builds the central learning center server in headquarter of school and the other learning centers also build their own teaching resource servers. All the system backstage servers store the learning resource, including document resources and video resources, for the user to use freely. Currently, from the effect of system application, this operation mode has two obvious shortages^[2]: (1) In education system, there are a lot of learning resources and it has a huge volume. But, the network speed in our country is not ideal for the large amounts of resources transmission. So, due to the network transmission, some resources in the servers of platform do not synchronize

with the resources in other servers, which result in a number of learning resources on the servers are incomplete or not the latest information. This makes the learners can not learn the latest knowledge timely. (2) In this combined mode, students need to register several times, because the account is not shared between servers. In other words, a account registered on a server can not use to learn and download resources on another server. The students must register again when they want to learn in another server. This is very trouble. The new education platform proposed in this paper makes full use of the advantages of cloud computing and stores the resources of each central server it the "cloud". Distance education platform provides the function of automatic search and choosing the best path to transmit data. The servers can spare for each other and switch with each other, if a server fails, the platform system can switch to another nearest server automatically and the user can not feel this process. This design makes the students no longer to make several registrations when using different servers. The users can use all the resources in the servers of a platform with one registration, which achieve the greatest sharing of learning resource. At the same time, it improves the reliability of the whole platform system. The system adopts the modularized design concept and the logical structure is clear. Due to the integration of cloud computing, the service ability of the system has significant improvement and can adjust the using method and interface according to the actual situation of the students. So, it has strong flexibility and practicality.

Design of service process module

The overall structure of distance education platform designed by the project is made up of the basic layer, service layer and application layer. It is divided into 5 modules, including the module of data processing, monitoring, treatment process, decision-making and the basic module. Among them, the resource library of the base layer platform system requests to ensure the reliability and stability of the basic resource library through the hardware, software, virtual and other technology. The base layer provides the basic support for the server and application layer, such as providing computing processing ability and storage function. We can say that the base layer is like a energy depot of platform system. Because the business processing module of the system lies in the application layer, so the core of the platform system is the application layer. The business processing module is divided into the following sub-modules: comprehensive supervision, authority distribution, business processes, system automatic sign, document processing, information collection and searching. The application layer mainly provides interactive interface for students or other programs. The service layer includes the various service functions in platform system, such as file transfer service and data query service. The next section of the paper will introduce the design of the core module of the system.

Design of the core module

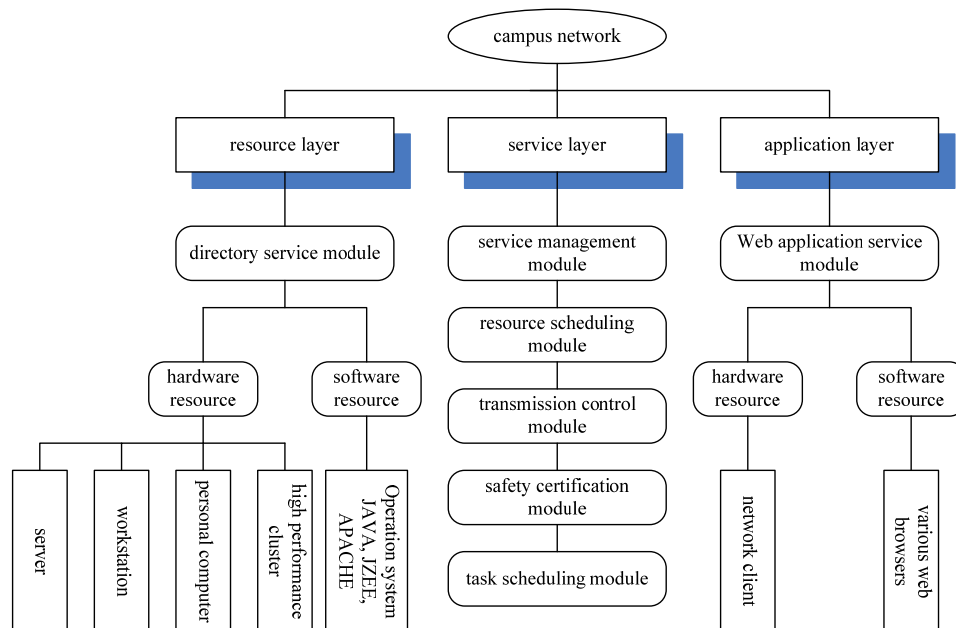


Figure 2: System module diagram

As mentioned in the previous section, the core module of distance education was divided into the following sub-modules: comprehensive supervision, authority distribution, business processes, system automatic sign, document processing, information collection and searching. System module is shown in Figure 2. Each module has the one to one relationship with the corresponding renter and each module is started by the corresponding tenant identifier. The identifier arrives each module by using meta data channel and each module accesses the needed resources combined with the meta data function area. The main function of comprehensive monitoring is the installed platform system of SaaS service. It configures the related parameters of system for users and distributes user rights. Authority control module has three kinds of methods to identify

tenants. The people related to SaaS service and application, based on their identity identifier, use the corresponding rights assigned by the system to access the specified files. In order to prove a good, efficient and convenient service for different users, SaaS should satisfy a variety of workflow requirements. The configuration tool of workflow module only supports the workflow in the department or the inside of platform system and it does not support the others. The system automatic sign module is realized by the means of signature technology and watermark identification. The main function of file processing module is to add, reduce or transfer the documents in servers. These documents are stored in a form in the database and they are independent of each other between different tenants. Also, they can manage some specific electronic files automatically, such as cleaning up the expiration or temporary files and activating the relevant documents. The main function of the searching module is to extract the relevant information in the files by collecting, allowing users to enjoy better query service. Using this function, students can search for the relevant information they need freely in the database of network security management system.

Design of scheduling mechanism

As already mentioned, according to the service characteristics offered by cloud computing, it can be divided into three layers. The lowest layer offers the most basic hardware support, such as central processing unit (CPU), memory and hard disk. They are collectively called "the hardware infrastructure services."

The system designed in this study is based on B / S model. SaaS is provided by a Web browser. SaaS platform be composed of four layers, namely: external interaction layer, comprehensive processing layer, business layer and information storage layer. Renters register system using the external interaction layer through the browser. The comprehensive processing layer can handle a variety of user's requests, making the system more flexibility. The main functions of the business layer are business security service, friendly interface, configuration information service. Usually, the information storage layer is designed by the form of shared database and data separation to improve the security of the database. In order to make the interface and function of the system can be configured, and the education resources can be the allocated efficiently and flexibly, the platform designs scheduling mechanism for the requests. The renter's requests can be roughly divided into 3 categories: One category is the interface appearance request. There are corresponding appearance modules to answer this request and such request needs SaaS to show the specified information without changing the service state. The other type is the system configuration request. This request requires SaaS to modify the corresponding configuration. Because the design the configuration module is extracted from the business module, so the processing request of configuration module is similar to the service module and it does not change the status of the service. The last is the request of education resources and this kind of request needs to change the service state. For example, if a user submits a request to study the video, this operation will start a workflow management module and the platform will allocate system resources to maintain the lifecycle of the video. Taking advantage of workflow engine and rules engine, SaaS can deal with a variety of requests smoothly, and can better arrange application services to support them to dispatch the resources.

Through researching the main business processes of education platform, using the modularized design systematically, the paper divides the network management system based on cloud computing into several logical modules, as shown in Figure 3.

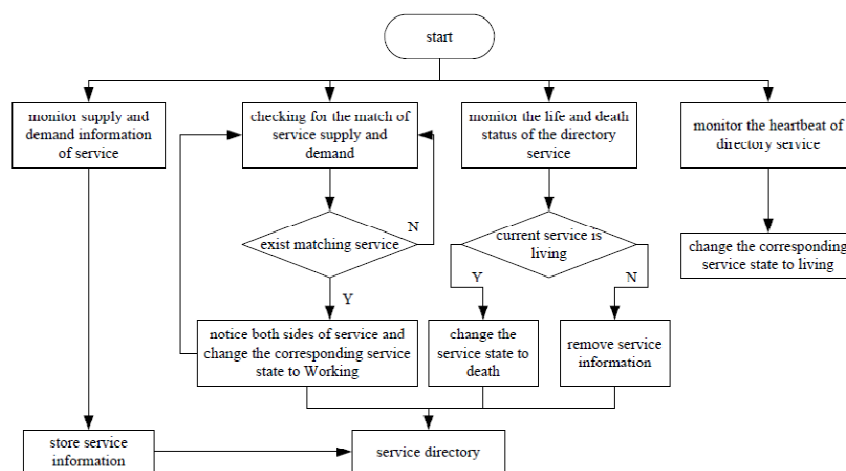


Figure 3: Business process diagram

Design of data security

(a)The demand of data security

The distance education platform based on cloud computing makes the data automatic management by using the backstage server and database management system. The school no longer carries on artificial management. The maintenance and upgrading of the whole system is completed by professional service provider, also the school no longer carries on

maintenance and management. The use of cloud computing cannot do without the Internet. All the requests sent by students and data transmission are realized by using the Internet, so it is very difficult to guarantee the safety of the data in the transmission process. Compared with the commercial system, especially the financial system, the security requirements of distance education platform are not very high, but the data which needs to be kept secret, such as the teachers and students' personal information, questions, especially the sensitive answers to questions, teaching document is not allowed to open to the public freely. So, when designing the new distance education platform, it is necessary to guarantee the safety and reliability of the sensitive data ^[3].

(b) Data isolation method in the system of network security management

Usually there are three isolation methods. The first is a database isolation that is to keep the independence of the database between users. An account corresponds to a database. This isolation method is the most thorough isolation with the highest data security; however, the only drawback of this method is that it needs to invest too much money. The second is the data pattern isolation and database sharing. The entire education platform just uses one database and each account has a separate mode, which provides abstract logical data isolation for each user, not the actual physical isolation. Also, a database can support several users, which effectively reduces the cost of system. Because the logical relationship of abstract isolation is complex relatively, so it is difficult to manage. The third is the data model and database shared. The entire education platform only has one database and a data mode. It plus the identifier (user ID) on the business table which has isolated demand to achieve the purpose of isolating the data. This makes the sharing degree of database achieve the highest and the cost of system achieves the lowest, but the isolation is not thorough enough. The drawbacks of this method are that it would increase the burden of the system' developer and the amount of code in the aspect of developer' safety and reliability would increase a lot. The data on the platform is also easy to lose. Considering the cost and safety of system, this paper adopts the second isolation method when carrying on data isolation. Its relatively low cost and safety meets our requirements to the distance education ^[4].

(c) Strengthen of protection measures to sensitive data

Taking into account the database management system has its own set of data security access mechanism, most of the traditional systems only encrypt the identification of the system users and do not encrypt the data information of system internals. Because of the database management rights of distance education system are in the hands of the operator, so it is necessary to encrypt some private data to prevent illegal disclosure and steal. This project researches a new cloud storage and SaaS applications to protect the security of the data ^[5]. In the process of system development, user data is isolated from the system. After running in the system platform, if the user's data and data storage location can keep update synchronization, which means a new data is stored in the new position, it can protect the private data. While creating and running a database, generally the system will encrypt the database according to the conventional encryption method. Sometimes, it will make a few changes to the function of original system to update the storage location of data in system running time. As shown in Figure 4, the data on the old server of system operator can be transmitted to the new server through the network, which is equivalent to download the resources of original server to their mobile hard disk. The users have right to transfer all the files in the database to any database they want. After the transmitting of the data, the original database server will lost the access right to private data ^[6].

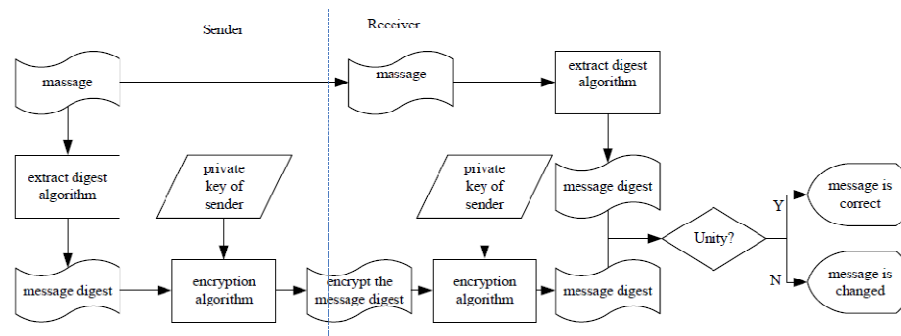


Figure 4: Identity authentication

IMPLEMENTATION AND TEST OF NETWORK SECURITY MANAGEMENT SYSTEM BASED ON CLOUD COMPUTING

In order to prove the rationality of the system designed in this research, the system development platform uses VC + +6.0 and database development uses SQL2008. The followings are the design and realization situation of each function module in platform system. The interface of application client is composed of 5 parts: login interface, "community" management, cloud storage, cloud computing, management and control platform ^[7]. Users of the system upload their own

information in the login interface through the registration method. After landing the system, you can use learning resources on the platform. According to the needs of the users, the platform gets the resources from the corresponding server and offers them to the users. The registration information of login interface is shown in Figure 5. After users filling out and submitting the information, the "community" will manage this submitted information. And the "community" has all the resources on the platform. As shown in Figure 6, in essence, "community" is a kind of classification of user needs. It abstracts the same class users or the users who have similar demands into the households of a "community" and distribute a manager to them. The user needs to comply with the community management system in the "community" and use community resources (learning resources of platform) according to certain process. The manager understands the specific needs of users according to their behavior in "community", so as to recommend related resources to users. Because the powerful computing capability of cloud computing can easily meet the access needs of a large number of users, so in the services module of cloud computing, all teaching resources are stored in the cloud server. Cloud service model can reduce a lot of investment in bandwidth, firewall and load balancing equipment for users. Also, it will help the users to solve network security problems, complex computing problems, data integrity problems and other important problems. Cloud computing carries out data exchange at the bottom by using the XML technology^[8]. The system has the function of interaction between teachers and students, and teachers can directly solve problems for students in education platform. The management module of system can control all resources in the platform, including the control to every module of the system itself and the supervision to the behavior of teachers and students on the platform. All the resources and operation on platform are transparent to the module. The specific information about the module is shown in Figure 5.

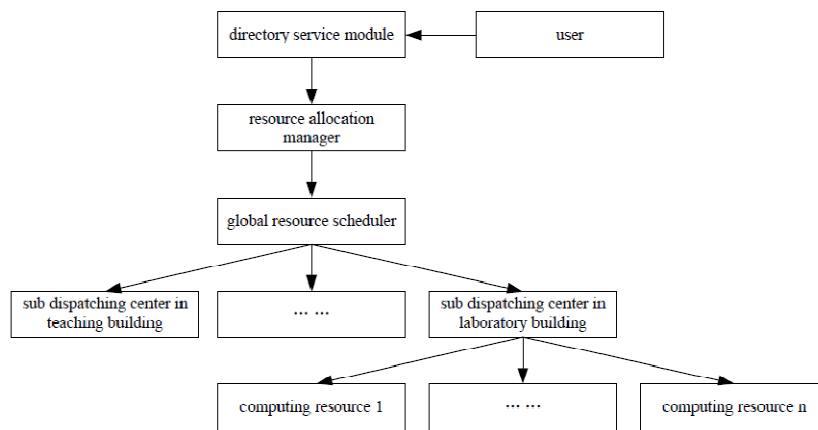


Figure 5: Resource scheduling model

By testing the platform, we found that the distance education system has the following advantages: first, the system's overall service capacity is very strong, especially the storage ability and computation ability of complicated problems. The advantages of cloud computing technology have been fully displayed in this system. The most common system structures are B/S (Browser/Server) and C/S (Client/Server) in the design of the management information system. B / S structure is the structure of browser and server, which is a useful improvement to the C / S structure. And it gets fully support by Microsoft, IBM, HP, Lenovo and other industry giants, but also the future dominant trends of system design structure. The reason for using B / S architecture is that it has good stability, high safety and easy to maintain. The advantages and disadvantages of B / S and C / S structure are contrasted in Figure 6.

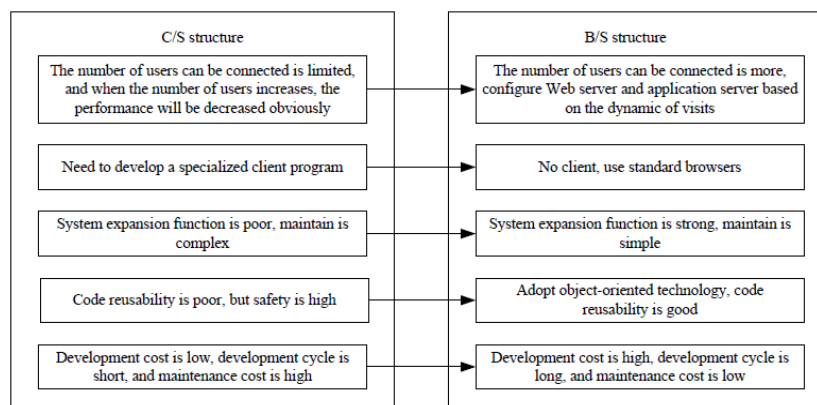


Figure 6: Structure characteristics comparison diagram of B/S and C/S

CONCLUSION

This paper analyzes the theoretical basis of the application of cloud computing technology to the network security management system in detail and evaluates the technical difficulty of the system implementation. Through in-depth research, this subject designs a new implementation scheme, which fully inherits the traditional advantages of the system and makes further innovation. It achieves a set of management system in line with the latest modern network security requirements. Compared with the traditional network management system, we find that this system has great improvement in service capability, sharing learning resources, flexibility and other aspects, consisting with the needs of modern network security management in our country.

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