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Design and Application of Distance Education Platform Based on Cloud Computing

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ABSTRACT

Due to the data incompleteness, data recovery difficulty and poor privacy of traditional education model which is applied in distance education platform, this subject works on applying cloud computing to distance education platform and proposes a cloud-based distance education platform which can effectively integrate the teaching information resources and greatly improve the utilization rate of educational resource. Through analysis of cloud computing and flat characteristic of distance education, realizing the application of distance education based on cloud computing. Practice has proven that the platform has made great progress in teaching quality, resources sharing, education cost reduction and flexibility compared with the traditional education. It could be said that the high efficient processing ability and powerful storage capacity of cloud computing have a full representation in distance education platform and lift the overall level of distance education in our country.

KEYWORDS

Cloud computing; Distance education platform; Teaching quality; Educational resources sharing.

INTRODUCTION

With the rapid development and popularization of the network technology, the educational model has undergone enormous changes. Distance education has become an essential teaching method, more and more people are choosing distance education as a primary means of learning. However, due to the vast territory and large population of our country, the distribution of computer and network resources is uneven as well as the development and promotion of distance education is still imperfect. The practical application of distance education platform will inevitably expose some problems which need to be improved and updated. The concept of cloud computing firstly appeared in 2007, the great virtue of cloud computing are high efficient operational ability and unlimited storage capacity, so, more and more people are having a research on cloud computing. This subject is the research of advantages and feasibility of cloud computing applied on distance education platform, and though comprehensive demonstration, proposing to apply the cloud computing to distance education platform and solving the problems of traditional distance education platform by its efficient mathematical ability and unlimited storage capacity. Practice has founded that the distance education platform which integrates with cloud computing has made great progress in raising teaching quality, educational resources sharing, education cost reduction and teaching flexibility, and it is more conducive to large-scale promotion.

DESIGN OF DISTANCE EDUCATION PLATFORM BASED ON CLOUD COMPUTING

The main five modules of the distance education platform based on cloud computing are: system framework, service processing, data processing, system security and reliability. The concept of modular design makes the whole system a clear and structured platform.

System Framework

At present, the speed of our country's network is not ideal enough, the network and server is unbearable to the centralized internet access. Schools which have distance education usually build many diversion servers out of the school and mostly of servers using B / S mode, the system framework shown in Figure1. Building central learning center server in headquarter of school and building their own teaching resources servers in other learning centers, thus all system backstage servers are stored all learning resources, including documentations and videos for free using. Currently, judging from the effect of the system application, there are two obvious deficiencies of this mode: (1) The volume of the learning resources in education system is bulky and the network speed in our country is not fast enough to transmit those mass data, so resources in some servers do not synchronize with other servers due to the network transmission problem, which cause resources in some servers are incomplete or outdated, so some learners can not learn the updated knowledge timely; (2) Students need multiple registration under this combination model, and accounts among these servers can not share with each other, which means an account registered in this server can not download and learn resources in other server, and students need register again when they change to another server, which is so troublesome. The new education platform proposed in this paper takes fully advantage of cloud computing, storing resources in each central server together into "cloud", the distance education platform provides automatic searching and intelligent choice to the best transmission path, all servers can be a backup sever for each other and interchange, once one server has problem, the platform system will aromatically change to the nearest server, which users even could not feel this change. This design relieves repeated registration and onetime registration could get access of all resonances in all servers, which realizes the sharing of learning resources; Meanwhile, the reliability of platform system has been greatly improved. This system adopts the concept of modular design and the logical structure is clear. Because of the integration of cloud computing which makes the service ability improved greatly, and can freely adjust methods and interface according to the real situation of students, which is very flexible and practical.

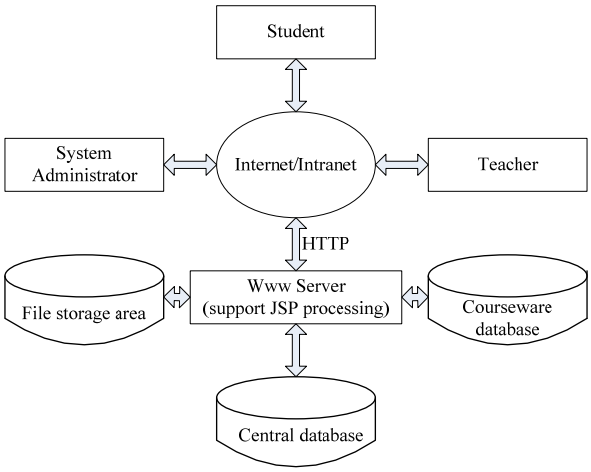

Figure 1 : The Overall System Framework

Design of Service Processing Module

The overall structure of the distance education platform which designed in this subject consists of foundation layer, service layer and application layer, which can be divided into 5 modules, including data processing, monitoring, treatment process, decision-making, basic module,etc. The resource pool of foundation layer system need hardware, software, virtual and other techniques to ensure the reliability and stability of the foundation resource pool. The foundation layer provides basic support for server and application layer, such as the processing capability and storage function. It could be said that the foundation layer is just like the energy pool of platform system.

Since the service processing module of the system lies in application layer, which should be treated as the core of platform system, and the service processing module continues to refine into: comprehensive supervision, permission assignation, service processing, automatic sign of the system, document processing, information collection, searching and other sub-modules. The application layer mainly provides interactive interface for students and other programs. The service layer includes many different kinds of services of platform system, such file transferring service, data inquiry service, etc, and next section will focus on introducing the design of core module.

Design of Core Module

As mentioned in the previous section, the core module of distance education can be divided into: comprehensive supervision, access control, service processing, automatic sign of the system, document processing, information collection, searching and other sub-modules. Figure 2 shows the system module, each module has a one-to-one match with the subscriber, and each module is started by corresponding subscriber identifier, which uses meta data channel to reach every module, and each module combines meta data function area to have access to the needed resources. The main function of comprehensive supervision is SaaS service installation platform system, and allocating relevant parameters of system for users as well as assigning user's access. The access control module has three ways to identify subscribers: SaaS service and relevant personnel of application, according to their identifier to have access to the specified file through corresponding rights which assigned the system. In order to provide better, more efficient and convenient service for different users, Saas usage should meet various needs of working process. The allocation tools of service processing module only support the working process in department or internal platform system and can not support other working process. The module of automatic sign of the system is realized by signature technology and watermark identification technique. The main function of document processing module is increasing, decreasing or transferring files in servers, all these files are stored in a list in database, and different subscriber is mutually independent. This module also can manage some specified electronic documents automatically, such as cleaning expired or temporary file, activating relevant file, etc. The main function of searching module is providing better searching service for users through extracting relevant information in documents. Using this function, students can search needed documents freely in the database of education platform.

Design of Scheduling Mechanism

As mentioned in former article, according to the characteristics of services 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 chip, and hard drive, which is called by a joint name "the fundamental hardware infrastructure services".

The system which is researched and designed this time bases on B/S mode, SaaS is provided by Web browser. The construction of Saas platform is composed of 4 layers, namely, external interaction layer, comprehensive processing layer, service layer and information storage layer. The subscriber have system registration through browser by using external interaction layer, and comprehensive processing layer can handle various requests from users flexibly, which makes the system more flexible. The main functions of service layer are business security service, user-friendly interface, information configuration service, etc. The information storage layer usually adopts shared database and separated data design for improving the security of the database. In order to make interface and function of the system configurable, and the educational resources can be allocated efficiently and flexibly, The design of this platform has a scheduling mechanism for user's requests. The requests from subscribers can be divided into three categories: the first category is appearance requests of the interface, and the corresponding interface module will respond to this request which needs Saas to display the specified information without changing the condition of service; the second one is system configuration request which asks for Saas to modify the corresponding configuration because the design of configuration module is extracted from the service module, so the service condition has no change, which is similar to the service module; the last category is the educational resources request which needs to change the condition of service. For example, a user submits the request for studying a video and this will initiate the work-flow management module, and the platform will allocate resource to maintain the lifespan of this video learning. By using the work-flow engine and regulation engine, the SaaS can smoothly solve various requests and has a better arrangement of application service to support the resource allocation.

By studying main service process of the education platform, the system which uses modular design will divide the distance education platform which based on cloud computing into several logical function modules, as shown in Figure 3.

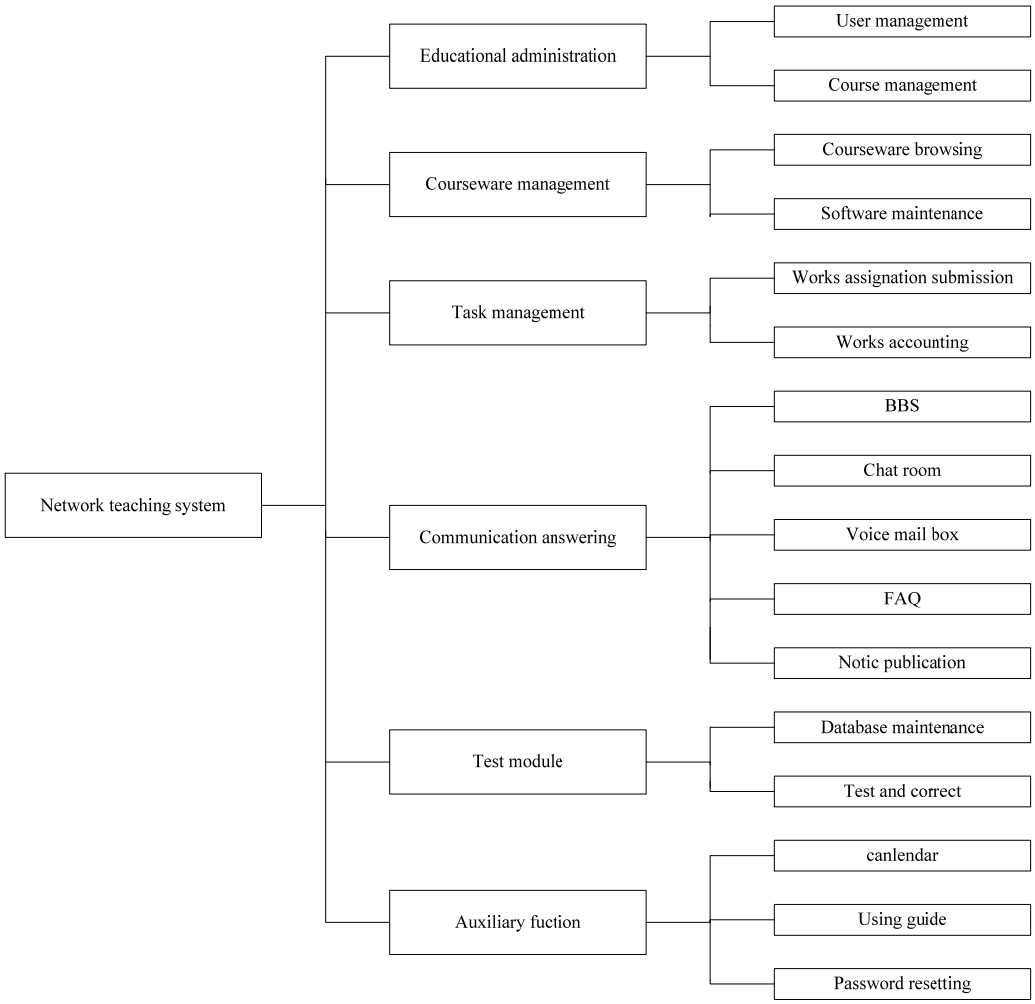

Figure 2 : The System Module

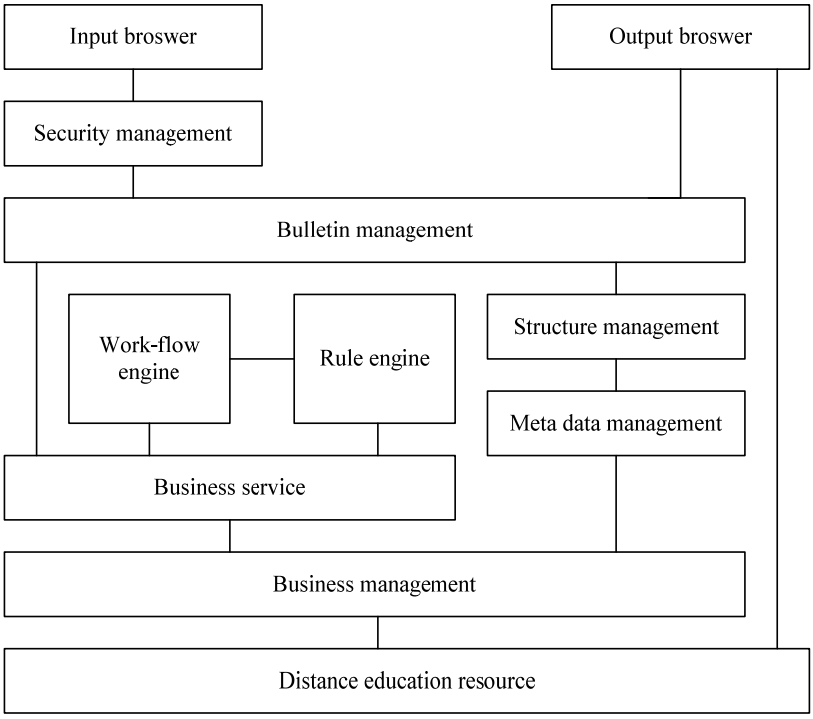

Figure 3 : Scheduling Mechanism for Distance Education

Design of Data Security

The Security Requirement of data

The distance education platform based on cloud computing which uses backstage server and database management system to have automatic management instead of manpower management; the maintenance and upgrading of the entire system are all completed by professional service provider, which relieves school from the maintenance management; the usage of cloud computing is inseparable from the Internet, all requests sending and data transferring from students are completed through the Internet, so the security of data transmission is hard to guarantee. Although the security requirement of distance education is lower than that of business system,especially the financial system, but the personal information of teacher or student, examination paper, particular the answers to some sensitive questions, and other confidential data like teaching documents cannot freely make public. All this need to ensure the security and reliability of sensitive data when design the new distance education platform.

Isolation Methods of Data in Education Platform

There usually are three ways of isolation. The first one is database isolation which keeps the independence of database from user to user, and one account corresponds to one database, this is the most thorough method and the data has the highest security, the only defect is the investment is too much. The second way is isolating data mode but sharing the database, and using only one database in entire education platform, every account has a isolated mode which provides every user a logical data isolation but not a real physical isolation; and one database can support many users, which reduce the cost of system effectively, but due to the abstract isolation which has relatively complex logical relation makes the management difficult. The third one is sharing both data mode and database, the entire education platform has only one database and one data mode, adding identifier (user ID) into the isolation-needed service chart for isolating the specified data; This method has the highest degree of sharing and lowest system cost but the isolation is not thorough enough: The defect is that will increase the burden on system developer who will write more code on reliability and security aspects but the data in platform is easy to lose. Considering both system security and cost, the data of this paper adopts the second isolation method which has relatively low cost but qualified security need can meet the requirements of distance education in our country.

Reinforcement of Measure for Sensitive Data Protection

Most of traditional system only encodes the system user's identify but do not encode most of system data information, considering the database management system has its own set of mechanism for data security access. Since the system operator holds the database management right of distance education system, it is necessary to encode some confidential data to avoid illegal publication and stealing. This project focuses on a new method of cloud storage and SaaS application to protect the security of data. In the process of system development, user's data is separated from the system and runs in the system platform, if user's data can keep updating and synchronizing with the data storage position, namely the new data in the new position, it can have the protection function for personal data. It usually uses ordinary way to encode database when creating and running database, sometimes it will has several small change to original system in order to make system to update data storage position. As shown in Figure 4, the data in old server B of system operator can be transmitted into new sever B through the Internet, which equals to download the resource in former sever to a mobile hard disk, and user have access to transfer all documents in database to any database. The original database server will lose access to the personal data.

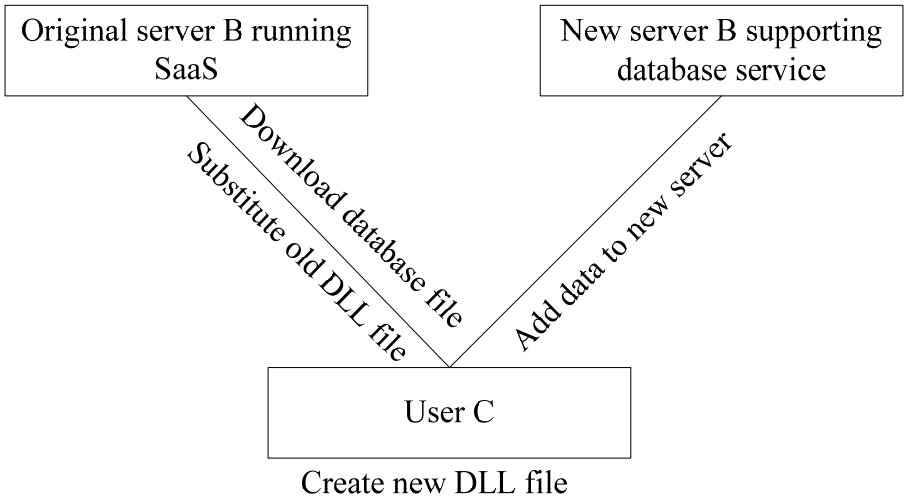

Figure 4 : Data Migration Diagram

APPLICATION AND TESTING OF DISTANCE EDUCATION PLATFORM BASED ON CLOUD COMPUTING

In order to approve the design in this subject is reasonable. The mining platform of this system adopts VC++6.0, and database mining uses SQL2008. The following is the design and application status of each function modules in platform system. The application interface is composed of 5 parts: log-in interface, "community" management, cloud storage, cloud computing, and platform control. Users upload their information through registration in log-in interface, and could use the studying resources in platform after log-in. The platform obtains resources from corresponding server providing to users according to their requests, the log-in information is shown in Figure 5. The "community" will manage the submitted information after user's filling out and submission. The "community" has all resources in platform, as shown in Figure 6, the essence of "community" is the classification of user's requests, abstracting the users with same or similar kind of requests to the resident in a"community" and assigning administrator for them. Users need to comply with the management regulation in "community", using the resources according to the certain process. The administrator knows the specified needs of users according to their behavior in "community" and introduces related resources. In cloud computing service module, all learning resources are stored in cloud server, the powerful processing ability of cloud computing can easily meet the needs of frequent visit by great number of users; cloud service mode will also reduce the cost on bandwidth, firewall, and load balance equipment and will also help users to solve many major problems, such as network security, complex computation and data completeness; cloud computing uses XML technology to have data exchange in the lowest layer, and this system has teacher-student interaction function, which means teacher an directly answer the questions from student in the education platform. The system management module can control and manage all resources in the platform, including the monitoring of system itself and also the supervision of actions from teacher or student, all actions and resources in platform are transparent to this module. As shown in Figure 7.

Figure 5 : Register

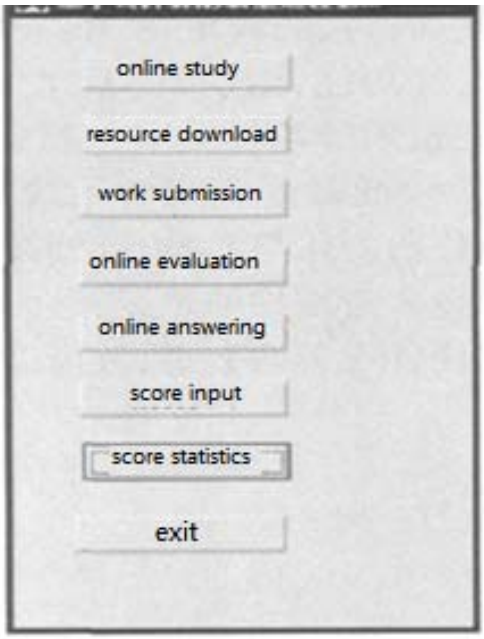

Figure 6 : Virtual Community

Through testing and verification of this platform, it has been found that the distance education platform has following advantages: First, the overall service ability is strong, especially the storage ability and computing ability of complex problem; the advantages of cloud computing technology has a full demonstration on this system,which greatly improved the abilities of resources sharing and computation. Second, this system provides the possibility to build national distance education platform, realizing the unified deployment of resources in different distance education center around the country, which can effectively reduce the education cost. Finally, according to different needs from users, the system can allocate resources flexibly, without changing code function and deploying the independent system to give the users their customized leaning system.

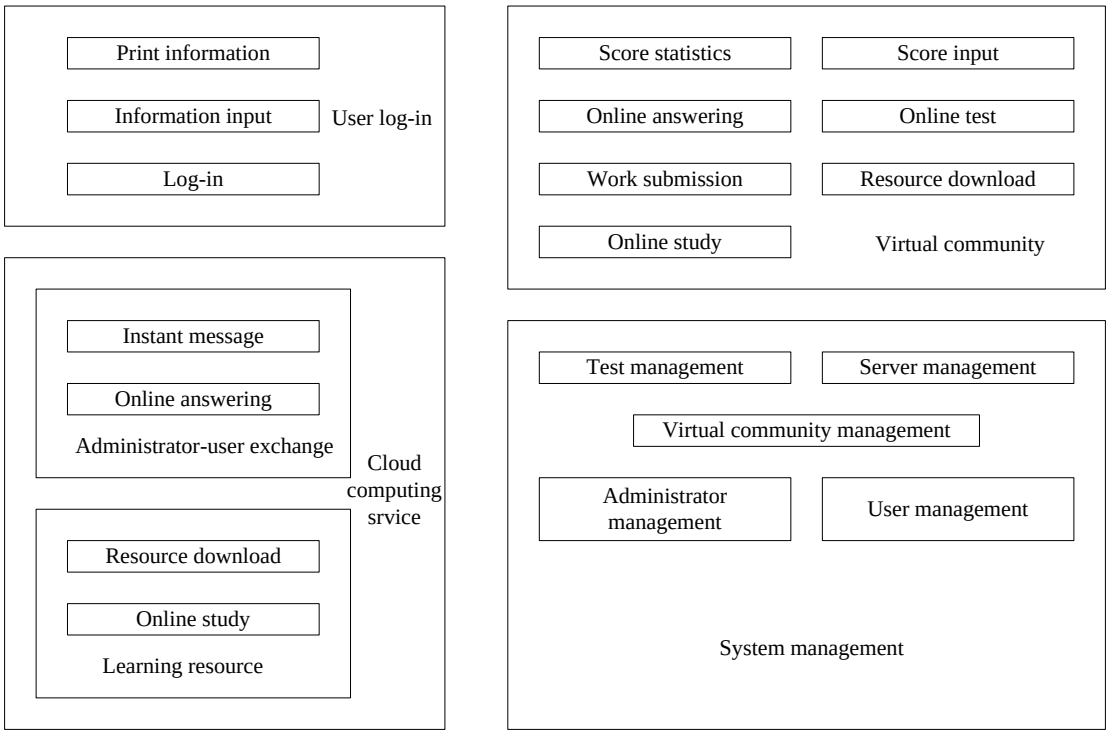

Figure 7 : System Function Module

CONCLUSION

This paper analyzes the theory basis of applying cloud computing technology to distance education platform and assesses the difficulty of system application. Through in-depth research, designing a new project to realize the idea, and this project fully inheriting the advantages of traditional system as well as adding innovation in it. It realizes a new education system which meets the newest requests of modern distance education. It has proven by testing that the new system is better than old education system for greatly improving on education service ability, learning resources sharing, and flexibility, which is very consistent with our nation's needs of modern distance education.

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