The Research and Application of Network Teaching Platform Based on Cloud Computing

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Abstract—**People pay attention to Network teaching platform which is an important modern education method. With the popularity of network teaching, network teaching platform can not meet the existing high-performance, low cost, scalability and other needs. The emergence of Cloud Computing provides a new network teaching solutions. Based on researched to Cloud Computing, we construct a set of building network teaching with Cloud Computing. In actual operation, the system has achieved good results, which for the future construction of the network teaching platform provides a new solution.**

Index Terms—**Network teaching; Virtualization; Cloud Computing**

I. INTRODUCTION

For a long time, education, which is the driving for the social development and progress, takes people's attention? Each country's government has invested considerable human, material and financial resources, in order to promote the further development of education. At the same time, with the development of the computer, network and multimedia technologies, network teaching has been paid more and more attention and recognition. Network teaching develops from the computer aided teaching and distance learning. It is a new teaching mode relying on computer network to realize. Students can watch instructional video; download learning materials or online communication with teachers and other operations, which break through the traditional teaching mode of the limits of time and space. In the network teaching process, students can learn anytime, anywhere to break through the traditional teaching of the simple way to acquire knowledge, to better train students in the initiative, highlighting the individual student learning.

After years of development, the scale of distance education has gradually expanded, and the education object has slowly turned to social staff. The idea of national on-the-job professional and technical personnel "continuing education, lifelong learning" has become an important direction for the country's future education development. With the increasing number in receiving education, a series of new problems have emerged. For example: As teaching methods change, the existing teaching-learning methods can not meet demand; and with the constant expansion of education, the existing teaching facilities also need to constantly update. When Cloud Computing appears, it provides a new solution to

establish a unified, open and flexible network teaching platform and reduce the hardware input. In US, the Google[1], IBM[2], Amazon[3] and Microsoft[4] and other large IT companies have built their own Cloud Computing platform; in China, such as Lenovo, Baidu, and other companies have also launched a "Cloud Services", "Cloud Storage "and other new business. In this way users do not need to buy a server, only need to purchase related "services" can create an efficient network teaching platform.

The rest of this paper is organized as follows. In Section II, we give a brief introduction of the concept of Cloud Computing, the current application and the characteristics of Cloud Computing. We introduced in the network teaching platform frame structure design based on Cloud Computing in section III. In section IV, introduced the division of network teaching platform functionality and the actual operation of the platform environment. We present conclusions in Section V.

II. CLOUD COMPUTING

Although Cloud Computing is already well-known, there isn't a unified definition agreed internationally. According to McKinsey's research, there are at least 22 definitions of Cloud Computing [5]. But we can roughly divide them into two categories: narrow Cloud Computing and generalized Cloud Computing. Narrow Cloud Computing refers to the delivery of IT infrastructure and use patterns; generalized Cloud Computing refers to the delivery of service and use patterns. This service can be IT and software, Internet-related, or any other services. That is to say, Cloud Computing offers the users the IT-related ability in a way of services. Without the knowledge of specific technology of the services, relevant knowledge and equipment operation, the users are available to get the services they need through the Internet [6].

The present application shows that, Cloud Computing offers three levels of services [7]: 1. Infrastructure as a Service, IAAS, it integrates the infrastructure (e.g. IT systems, databases, etc) and separates them into different rooms as a hotel for the corporate to hire; 2. Platform as a Service, PAAS, establish program development platform and operating system platform which allow the developers to write programs and services, the average consumers to run the program. 3. Software as a Service, SAAS, it consists of various application services based on the Cloud Computing platform.

The features of Cloud Computing accelerate its rapid development on the internet.

1) 1. Large-scale. The cloud has quite a large-scale, e.g. The Cloud Computing of Google has more than 1 million servers, and Amazon, IBM, Microsoft, and

Yahoo's "Cloud" has hundreds of thousands of servers. Therefore, "Cloud" offers the users unprecedented computing power.

2) 2. Virtualization. Cloud Computing allows users to access to application services anywhere or using any kind of terminal. The requested resources come from the "Cloud" rather than a fixed physical entity. Application operates somewhere in the "Cloud", however, the users do not need to know or worry about the specific location of operation. The only thing they need is a laptop or a cell phone to realize everything they need through the network services even including supercomputing.

3) 3. Extremely cheap. The automatic centralized management of Cloud relieves the burdens of increasingly expensive data center management costs for most enterprises. In comparison to the traditional system, the generality of the Cloud has significantly improved the utilization of the resources.
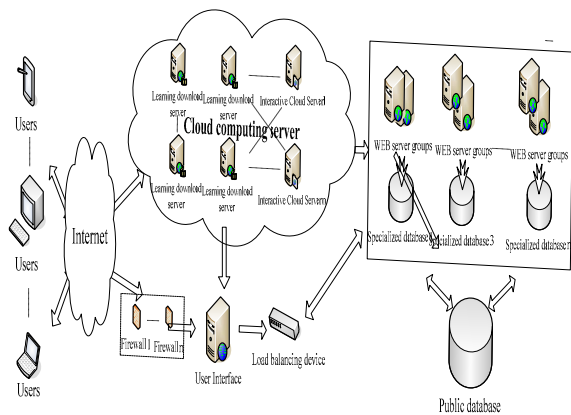

Fig 1. Network teaching platform framework structure

Therefore, users can fully enjoy the advantages of low-cost. It often takes a few hundred dollars and a few days to complete the tasks which need tens of thousands of dollars and months to complete in the past [8-9].

III. FRAMEWORK DESIGN

The paper has fully considered the characteristics of Cloud Computing, and designed a framework of the modern distance education platform according to the actual needs to ensure good scalability. Figure 1 shows the overall chart of cloud-based modern distance education platform, which mainly consists of four parts: Cloud Computing servers, load balancing equipment, WEB server and database storage server.

A. Cloud Server

Cloud sever is the key part of the computing platform to ensure its scalability. The resources such as online videos, audios, pictures, and course wares etc. can be stored on Cloud Computing server. The characteristics of high-performance, high reliability and scalability etc. guarantee an efficient and stable operation. At present, many companies offer cloud services, we can use data interface technology to realize remote data consistency.

B. Load Balance Device

The load balancing device is able to complete the scheduling and allocation of network bandwidth and hardware resources dynamically based on the need of learner.

C. WEB Server

WEB server is the user's access to the entrance of learning. It divides into primary and professional WEB server. The former provides functions such as information inquiry, log on, authentication etc; the latter provides functions such as online study and test, etc, load balancing devices are mainly in charge of shunt, students are distributed evenly to study on different professional sever according to the network traffic.

D. Database

Database is divided into public servers and professional servers. The former is used to record the user's information, visit records and other public information; the latter is used to record information of various majors, learning records, homework and test information, etc.
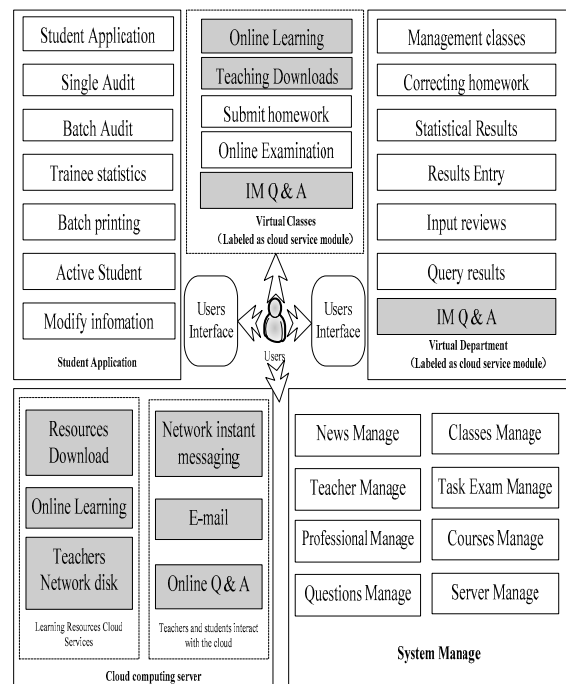

Fig 2. Cloud computing platform for network teaching modules

Cloud Computing services not only provide computing service, but also provide storage service. Nowadays, the private institutions (enterprises) have the monopoly of Cloud Computing services, but they are only able to provide commercial credit, for some special users who selected cloud services should be well alerted. Once the users use the private services on a large scale, no matter how strong its technical superiority, it is inevitable for the companies to threaten the users for the importance of "data (information)". In an information society, the "information" is particularly important. The Cloud Computing data are confidential to other users except the data owner, but for the Cloud Computing enterprises, there is no secret at all[10]. For the above reasons, in the process of framework design, the paper adopts the local database server to store private data, such as: student information, course information, major information and other important data, and to store the extended functions such as online learning, downloads, instant message, student interaction etc. on cloud server. As these are service data, there is no security problem. Function Modules

Since the Cloud Computing platform provides

high-performance computing resources, massive storage space and high quality technical services, etc. The platform designed for modern distance education mainly consists of six functional modules: Student Registration, Virtual Classes, Virtual Department, Learning Resources -- Cloud Services, Interaction between Students and Teachers -- Cloud Services, as well as System Management, the functional structure is shown in Fig 2.

E. Student Registration

Training students are required to fill out registration information, and then the system will verify the information individually. Since there are a great number of students registered in our province, the student roll should be imported into EXCEL in bulk so as to improve the efficiency of verification. The students who have been verified can access to the web learning platform as well as browsing and printing their registration information by inputting their student ID and password.

F. Virtual Classes

The establishment of virtual classes is mainly to solve problems existing in web study management [11]. Its main idea is to divide the students into smaller classes according to the region or other rules and allocate instructors to manage the class. Students need to complete learning tasks according to the learning process which the instructor issued. Meanwhile, the system will record the whole process of students' learning, and take it as a basis to give scores. Since it needs a great deal of storage space and computing resources, the system utilizes cloud service to realize online learning, data downloading, instant messaging and other functions, it effectively improve the quality of distance learning. The introduction of the concept of virtual classes has effectively solved the problems in the management of students, and it proposes a new management model of teaching for distance learning in the future.

G. Virtual Department

Virtual department is similar to virtual classes. The function is to record the process of teaching. The instructor in virtual department is mainly in charge of the tasks as follows: answer the questions, correcting students' homework, give comments and scores, etc. The instructors are able to discuss the controversial issues through instant messaging Q & A module provided by cloud services, and finally give the feedback to the students. Virtual department offers an opportunity for the teachers and the students to exchange the ideas. It gives impetus to the standardization and rigorousness of distance learning.

H. Learning Resources -- Cloud Services

Cloud Computing provides a new hardware model for modern distance education[12]. According to the features, we put all the online video learning, online learning resources downloading on cloud server. The function of this part has the features of massive and frequent visits. It requires high performance servers, high-speed network bandwidth, firewalls, and load balancing devices, few departments can meet the need of such a high-performance equipments. However, cloud services are able to save the cost greatly as well as solve the problems of hardware, network bandwidth,

security, storage, complex computing etc. At present, Century Internet, Leading Spirit and Lenovo provide this service.

I. Interaction between Teachers and Students – Cloud Service

Cloud Computing is able to provide new software resources development model. We can take advantage of this feature to implement the communication between students and teachers through Cloud service. XML can be used to exchange data in data layer and achieve the following features: IM Q&A service, E-mail service, Online Q & A Service. SAAS model of Cloud Computing can save the cost to purchase or develop a series of functional modules. At present, Google, Baihui, IBM, Lenovo are able to provide this service.

J. System Management

System management is the control center of distance learning platform. It can monitor system operation of each module function as well as setting the student information, test information, course information, major information and the server address. System management is able to allocate most of the resources dynamically in the system, while the load balancer can achieve efficient allocation of resources.

The development and maintenance of network teaching platform under the Cloud Computing environment is a process of constant updating and improvement. The users are able to give the feedback to the administrator timely about the problems and new requirements in the course of usage through e-mail, instant messaging modules, etc. so that the administrator could organize the developers to update the application program and build a high performance, flexible, open network teaching platform, and provide convenient, high-quality services for the teachers and students.

IV. APPLICATION

To verify the rationality of modern distance education based on Cloud Computing platform, developers applied .NET, XML technologies and SQL Server2008 database to develop continuing education and training platform in our province. The students are able to complete all the steps of distance learning only through the WEB browser. The function modules as well as the realization methods will be introduced briefly in the following part.

From a technical level, Cloud Computing is not a new technology. It has developed through distributed processing, parallel processing and grid computing [13]. In a sense, it can be considered as a new technology program. At present, the application of Cloud Computing platform of modern distance education is at the primary stage; my university pioneered the concept of the cloud and put it into practice. We use less investment of resources to solve the key issues. We mainly use ASP.NET, JQuery and other technologies to design the platform, XML data exchange is used in cloud server, use SQL Server 2008 in Database, and Microsoft windows 2008 R2 in operating system.

At design stage, we use VM software, in the existing environment, a total of 8 million students download videos or watch videos online, according to 10% of the online

proportion of the system, 8000 people should be met being online. Suppose the video compression ratio is 128K/S, the network bandwidth should be 1000M for 8000 people online, and the 1000M bandwidth must be dedicated. It will cost much if the university provides high-performance servers and storage devices. Thus, we can draw a conclusion that the existing resources and the universities fail to meet the requirements of large-scale online learning or information downloading. Therefore, we introduce the "cloud" concept, and put download and learning resources on the cloud server, there are also other functions such as SAAS technology with instant messaging, e-mail, online Q & A. 500M-bandwidth can meet 4,000 people online, the rest 4,000 people use cloud storage to complete the given task. There are many companies provide cloud services. The prices for rent are far below the establishment of their own, besides, the safety assurance of the data will be the most favorable. The application program of "Cloud" is able to save hardware resources, software and services to provide effective protection of the overall security of teaching platform. "Cloud Computing" provides a new concept for the development of modern distance education. The application of this concept will extend distance learning platform as well as admit more students into learning. By utilizing the above technology we succeeded in achieving the continuing education training tasks of our university in Heilongjiang Province in 2010. The practice has proved that the system had a high stability and scalability.

V. CONCLUSION

With the popularity of the network, more and more people choose to learn through the network, which has also been promoting the development of network teaching. Network teaching platform can provide students with an equal, free and open environment to encourage students to independent learning. In network teaching, students not only organize their study time on demand, and through video, audio, images and text and other methods to learning. Teachers to track student progress through to understand the student's learning, and learning problems for timely communication with students. As the number of visitors increases on the existing network education system, the device needs to constantly update. In full consideration of "Cloud Computing" characteristic, we proposed network teaching platform combine of "Cloud Computing". In Heilongjiang Province, continuing education and training of the actual application process to verify the system has high stability and scalability. In the future, as cloud computing continuous improvement of performance and this will bring new opportunities for development education.

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