Construction and Application of Joint Laboratory based on "Cloud Computing"

Xingzhou YAO, Qian SHAN

Institute of Technology, Beijing Open University, Beijing, 100081, China

ABSTRACT: Cloud computing is a new model of network application and the development trend of the next generation Internet. Cloud computing integrates computing and storage into the network, so that local applications and client are as simple as a browser with only one support script, to minimize the PC's performance and maximize its function. The way of allocating resources is needed by the integration of teaching resources of universities. Of course, cloud computing also provides strong technical support for modern distance education. As a article about the application of cloud computing into distance education network learning environment, this paper introduces the concept of cloud computing into the integration of teaching resources and explains the laboratory framework built with cloud terminal.

KEYWORD: cloud computing; cloud terminal; teaching resources; laboratory

1 THE CONCEPT AND DEVELOPMENT TREND OF CLOUD COMPUTING

1.1 *What is cloud computing*

"Cloud" of cloud computing is the server cluster resources on the Internet, which includes hardware resources (servers, memory, CPU, etc.) and software resources (such as application software, and integrated development environment, etc.). As long as the local computer sends a demand information through the Internet, the remote will have tens of thousands of computers to provide you with the resources needed and return the results to the local computer[1]. Thus, the local computer almost does not need to do anything, and all processing will be completed by computer group provided by the cloud computing providers[2].

1.2 *The development trend of cloud computing*

In recent years, the rapid development of the cloud computing industry comes from the national industrial revitalization projects, the increasingly emerging customer demand and the growing popularity of cloud computing applications. Today, cloud computing has been accepted by most companies. Cloud computing applications have begun to widely spread. Businesses can see the shadow of cloud computing. Cloud computing is the most anticipated technological revolution worldwide in the next 3-5 years. Similarly, cloud computing can provide development opportunities for any person who wants to connect users worldwide[3]. By understanding the direction of individual effort, cloud computing provides information and applications in line with their wishes, to help them learn, make decision and take action. By establishing a connection with the most convenient and productive way, cloud computing will enhance social interaction and professional exchange. Cloud computing will give rise to more intelligent devices, to promote intelligent urban construction[4]. Cloud computing will promote the progress of the server technology, which in turn will promote the improvement and innovation in cloud computing[5].

2 APPLICATION OF CLOUD COMPUTING IN EDUCATION

2.1 *Cloud computing assisted instructions*

"Cloud computing assisted instructions" (CCAI) refers to that schools and teachers use "cloud computing" to offer services, build personalized learning environment, and support teachers' teaching and students' learning to improve teaching quality. CCAI is to study the application law of services provided by cloud computing in education and teaching. Its core is the information-based instructional design supported by cloud computing services[6]. It can achieve the following three points in terms of support services:

(1)Support services for teachers: in the cloud service environment, teachers can create a teaching environment, design teaching resources, organize and coordinate teaching activities, implement teaching evaluation and manage teaching process.

(2) Support services for students: take advantage of cloud services to support student learning and innovation. Promote students' thinking ability and intellectual development, active collaborative learning. Construct student's personal learning management environment.

(3) Support services for managers: use cloud services to build the school's teaching management system, making school education information management easier and more secure.

2.2 *The important significance of cloud computing for education*

Cloud computing can provide users with more efficient and effective information storage and network services[7], mainly shown in the following four areas:

(1) Lower investment, maintenance and operating costs

The application of cloud computing can save costs for the school. Cloud computing has very low requirements for the client's device. It can bring memory, storage and computing power distributed on a large number of distributed computer together into a virtual pool of resources, and can provide utility computing services for users by network.

(2) The application of cloud computing enables the sharing of educational resources.

The development of education in China is still different. The problem of education fairness is always present. The cloud computing platform built a huge virtual resource pool, where the teachers of various schools at various places can upload or download teaching resources to solve the problem that many schools' resource update is slow and utilization rate is low.

(3) High-quality technical support as well as independent and diverse virtual learning environment

In the cloud computing model, all resources and applications will be integrated in the "cloud" side. Each student can take advantage of these resources and applications to independently create a virtual learning environment, not limited by space environment, and collaborate with other learners with a common learning goal in learning.

(4) Mobile learning

Mobile learning is a learning way indispensable for distance education. In the cloud context, a large number of educational resources will be stored in the cloud server. Learners do not have to worry about data loss or damage. They just need to have a terminal that can install a simple operating system and browser and connect Internet, enter the corresponding application by accessing the network and obtain their applications and data from the "cloud" for mobile learning[8].

3 THE USE OF CLOUD TERMINAL TO BUILD NETWORK CLASSROOMS

The traditional network classroom is expensive to build, difficult to maintain and difficult to manage, which is a common problem of the network classroom. The use of cloud terminal to build network classrooms can solve these difficulties. It saves costs and is easy to maintain, with teacher's computer-side \ server under the centralized control and unified management. We can say this is the best choice to build the network classroom[9]. Computer network classroom topology with cloud terminal mode is shown in Figure 1.
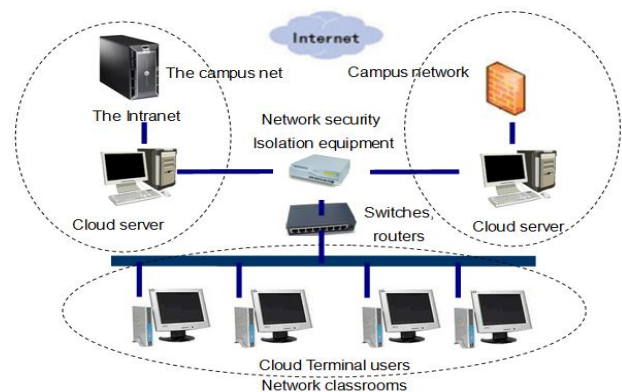

Figure 1 network classroom built with the cloud terminal mode

The hardware system mainly includes cloud terminal servers, cloud service software and other network-connected devices (switches, routers, firewalls, etc.); software system mainly consists of multimedia teaching software (teacher's computer and student's computer programs) and other commonly used software. Cloud terminal is the client terminal product based on the network environment. It communicates with multi-user server via VDP (Virtual Desktop Protocol). Cloud terminal and the server are linked via TCP / IP protocols and standard LAN infrastructure. The main functions including configuration, storage, operation, and management of cloud terminal as a client terminal are done by the cloud server, thus maximizing the use of "massive processing" capability of server resources, so that each computer is likely to have a server-level computing power, and many clients can use separate accounts to log on the cloud server to work.

4 COMPOSITION OF CLOUD COMPUTING JOINT LABORATORY

4.1 *Analysis of laboratory construction demand*

Beijing Open University is a new type of university supported by modern information technology that provides open distance education for adults. As a school bearing the national education system reform pilot project, Beijing Open University assumes the heavy task of exploring the establishment of talent training model of open distance education, and has gradually formed the creative talent training mode with clear objective, distinctive feature, good school-running quality and coordinated scale and benefit.

The cloud computing experiment laboratory based on cloud terminal server can ensure the experimental needs of software engineering specialty and e-commerce courses. Through remote login to the lab, students can master the cloud client and server-side technology, and be familiar with the experimental skills including Andriod-based and iOS-based mobile cloud computing development, cloud testing, and network marketing, etc.

The laboratory set up the only Phoenix Nest sandbox system authorized by Baidu to simulate Baidu's cloud services. Baidu provides hundreds of millions of actual data and some dynamic simulation cases. Through practical exercise, students after graduation can reach the level of engaging in mobile application development or cloud computing service project implementation, in the process of application design and development, can follow standard software engineering ideas, quickly grasp and use the latest development technologies, design and implement the reliable mobile cloud computing service products, have a good professional quality, and become the enterprises' application-oriented talents.

4.2 *Laboratory Construction Mode*

Cloud experiment platform of Beijing Open University is a high performance computing solution based on IBM cloud computing platform. It not only faces schools, but also provides high performance computing resources and services for business, government and the open source community to achieve the targets of serving teaching and research, conducting scientific research, supporting services industry. All kinds of educational software and hardware resources are placed in the cloud to compose education cloud. When users log in the cloud computing system through the terminal account and visit the resources in cloud, cloud computing resource management system will automatically assign the computers that meet the computing performance requirements to cloud users,

automatically search the resources in education cloud and choose the best path to send data[10].

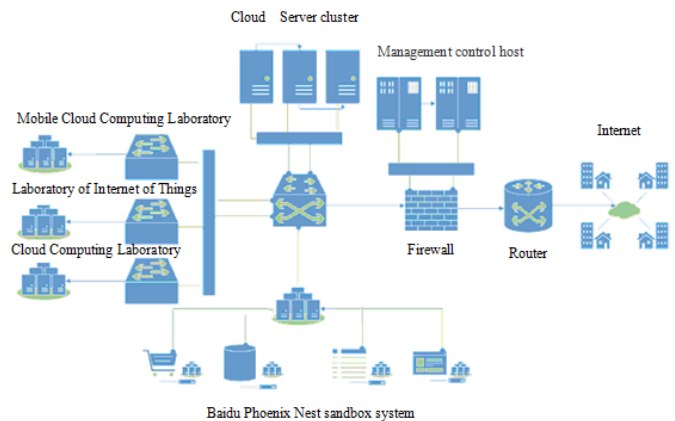The composition of cloud computing integrated laboratory system is shown in Figure 2.

Figure 2 Cloud Computing Joint Laboratory

Baidu Phoenix Nest sandbox system laboratory is China's first Internet marketing cloud practice platform invested and established by Beijing Open University. The practice platform has 54 high-performance IBM servers and 200M bandwidth, providing hundreds of millions of actual data and a number of dynamic simulation cases (virtual Baidu operational data) for my school e-business majors to conduct simulation exercise and analysis, to provide students with a search engine marketing practice environment. Practice platform will access by way of remote network.

Outstanding characteristic of Baidu Phoenix Nest laboratory:

- China's first leading Internet marketing laboratory, Internet marketing simulation training system based on search engine technology and technology application;
- created by Baidu core technology team that masters the world's most advanced search engine technology and cloud technology, with Baidu's real marketing data as experimental material;
- Baidu Phoenix Nest sandbox system uses a number of patented technologies and hundreds of sets of data models to constitute the cloud core system;
- "Internet marketing laboratory system" can let students quickly master Internet marketing skills, and accelerate the accumulation of Internet marketing experience, like using the "Flight Simulator" to train pilots;
- can help companies capture more business opportunities, win more customers, and effectively enhance the promotion effect.

5 APPLICATION EXAMPLES AND EVALUATION

5.1 *Application examples*

Take laboratory application of Baidu Phoenix Nest sandbox system as example to illustrate the role of the laboratory. The laboratory has played a role in my school's e-commerce remote experiments, and completed "search engine marketing" and "Internet marketing instance optimization" through experimental platform; take students' remote login Baidu Phoenix Nest sandbox system platform to conduct "the basic search promotion operation" experiment of "search engine marketing" course as an example to illustrate the system application. Table 1 is the system administrator's log files. Table 2 is the student login log files.

Table 1 Administrator operation management log
Administrator

Student account	Operation Type	Operation time 2014/1/11
zhangsan	Login system	13:43
lisi	Login system	13:05
wangwu	Login system	10:04
maliu	Login system	16:22

Table 2 Student use log

Operation record Passport name	Operation time 2014/1/7	Administrator
shiglin,id=12	10:03	bhsoftware
Mona,id=10	09:36	bhsoftware
mayu,id=21	09:56	bhsoftware

After using their own account login, students can conduct learning training of "search engine marketing" and "Baidu Phoenix Nest sandbox system practice" courses.

Baidu Phoenix Nest sandbox system can achieve Baidu data statistics, marketing analysis, search engine optimization (SEO) and other experiments.

5.2 *Evaluation*

(1) Student gain and experience

By logging in laboratory, students complete the course experiment, and get some gain and experience:

1) Through training, in order to quickly acquire skills! Through practice, in order to accelerate the accumulation of experience;

2) Build a large number of practical cases, stimulate students' inquiry learning motivation, and quickly grasp the skills related to the Internet marketing.

3) "it is better to practice rather than to hear for many times". Listening to a lot of theoretical courses on Internet marketing is not better than practicing once.

(2) The student evaluation data

Students log in experimental platform to complete the experiment, which involves laboratory access speed, platform operation, curriculum evaluation, the overall evaluation, with conclusions as follows:

Table 3 student evaluation data

evaluative dimension	satisfy	general
laboratory access speed	58%	42%
platform interface	69%	31%
curriculum evaluation	73%	27%
overall evaluation	63%	37%

You can see that the vast majority of students is satisfied or basically satisfied with the laboratory access speed, platform operation, curriculum evaluation, the overall evaluation. Laboratory construction is in line with expectations, and can complete the task of teaching.

6 CONCLUSION

Emergence of cloud computing technology provides new opportunities for the development of education. The impact of cloud computing on education is more obvious. It also provides a good opportunity for open distance education. The application of cloud computing techniques and methods to the construction of distance education system not only can integrate the teaching information resources, improve resource utilization and teaching standards, and can bring new applications to the cloud computing, making cloud computing change our learning and life in many aspects.

The consecution of cloud computing joint laboratory fulfills our strategic development goals, and can play an important role in distance learning. The experimental results can meet the overall goal of instructional design, and play an important role in teaching practice of my school.

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