



Design and development of education cloud platform

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ABSTRACT

Cloud computing is a brand new network concept after grid computing, which is the development trend of the next generation of internet. Cloud computing, as a network application mode of low costs and high performance, is gradually influencing people's learning, work and life. It establishes one kind of education cloud platform based on cloud computation through analysis on characteristics and demand of education cloud platform; it carries out test for its capability. The test indicates that this platform can achieve flexible expansion according to customer demand, and better meet functions and usage requirement of teachers and students.

Keywords: Cloud Computing, Education Cloud Platform, Capability Test, Test Method, Structure of Platform

INTRODUCTION

Transfer of cloud computation technology is regarded as the education cloud in educational field, it is the basic structure of education informatization in the future, including all the hardware computation sources that required by education informatization, functions of this platform is to provide cloud service to educational field [1]. Based on the platform of education cloud of sources sharing, it can achieve integration of teaching sources and platform unification, as well as it can enhance interactive level of teaching and display ability and potential of new educational model, increase quality of educational management, enable education to be one kind of service [2].

2. Basic Structure of Education Cloud Platform

Platform of education cloud is the application and exploration in education field, it is composed of 3 fames, infrastructure level, platform service level and educational application level [3], and it is indicated in figure 1. Each level provides each kind of service to educational organization, teachers and students as well as manners of computer sources.

Infrastructure level is the bottom level of education cloud platform, it is divided into basic service and infrastructure, and it provides the computer sources, storage sources and network sources after virtualization for users to use. The infrastructure level of education cloud platform is based on visualized technology, bottom server as well as storage and network equipment by using school as unit to establish visualized source places [4]. After this physical environment is ready, the first things needs to be realized is to carry out visualized abstract representation for sources. The visualization of hardware sources adopts visualized software, transforming the physical sources into visualized platform, so that it can integrate computer sources. On this basis, visualized integrated manager can obtain each kind of information of sources by the interface of provided by visualized platform and carry out operation for visualized computer of this platform, that means visualized integrated manager is the infrastructure management module of education cloud platform and mainly manages virtual machine, it can complete functions such as data management, source control, safety management, source arrangement etc. While infrastructure level service mainly includes image management, system management, system monitoring, user management and account charging. This is corresponds to the functions provided by visualized integrated manager, it is the interface for users to obtain sources of infrastructure level.

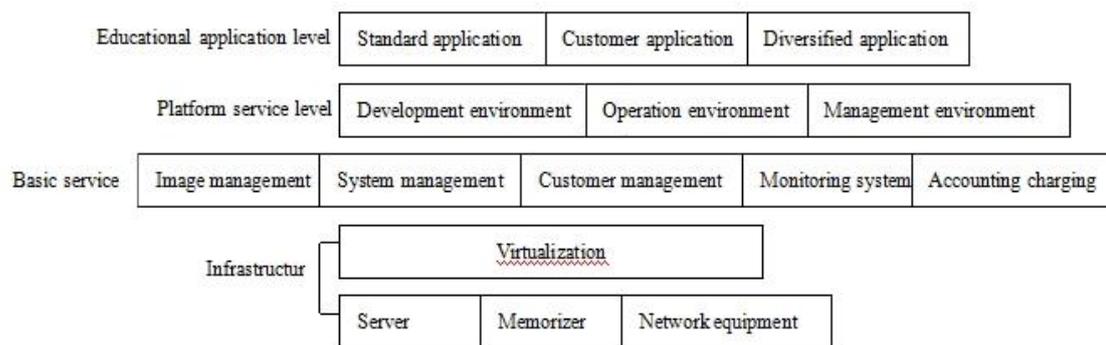


Fig.1. 3 levels of cloud education platform

Platform level is the structure above infrastructure of education cloud platform, development, operation and maintenance are the key points in the general software life cycle. While platform service level just completes these key steps and provides development, test and operation environment for educational application and development [5]. Platform service in educational cloud platform is similar to the service provided by traditional application platform, but platform service of education cloud platform is the updating for the traditional application platform in theory and practice.

Operation of platform level is above infrastructure of education cloud platform, which provides SDK and integrated development environment that support offline development, realizes automatic arrangement and expansion of application and provides operation environment needed by users. The platform adopts system structure of multiple users, including operation, management and development environment as well as the platforms provided by environment. Developers of education application can be classified into expert education application developer and individual developer. In the development environment, the developers make development and application of SDK and integrated development environment provided by platform level. After development work is completed, the developers make package of developed application according to standard of platform service level and use application upload service provided by SDK to arrange and activate on the platform level [6]. Operation environment can provide online, updating, maintenance and offline management of application to users, and the same time it also provides service such as state monitoring of application and operation as well as account charging. The operation environment provides the environment when it is operating to application; guarantee its automatic, high-efficiency and high-capability operation. The operation environment needs to continually to monitor behavior of application, guarantee its isolation and scalability, carrying out source monitoring and distribution.

Education application level is the application congregation on platform service level, each application is corresponds to detailed requirement in education and teaching, realizes one group of certain business logistic, which is different from infrastructure level and platform service level, basic function of education application level servers for management, sharing, development and application of education and teaching in the process of education informatization, it also serves for personnel and student engaging in education.

3. Education Cloud Platform Based on Cloud-computation

Education cloud platform applies cloud computing technology to carry out unified management and deployment of the resources on cloud computing platform through a unified cloud computing service platform and provides users with various kinds of cloud learning service in the manner of service. In order to realize this kind of Education cloud platform and realize network learning in the real sense, cloud learning system must be constructed. The education cloud platform could realize elastic expansion according to the requirements of users. Learning object of users is fragmented knowledge of product parts and the requirements of all users are regarded as a kind of cloud computing service request. The user's terminal can be IE browser, mobile phone, E-commerce, palmtop computer or other electronic telecommunications products. Education cloud platform is a cloud computing application system established on the cloud computing platform. Developers could adopt NET, PHP and other tools to develop Education cloud platform. Education cloud platform constructs a cloud computing service platform [7]. Through various kinds of cloud computing Windows operating systems, it could provide all kinds of cloud learning application services to users, as shown in figure 2.



Fig 2. System Model of Education Cloud

Education cloud platform model includes three modules, i.e. interactive control module, user evaluation module and teacher instruction module, as well as three databases of accumulate resources, evaluation and teacher instruction. The interactive control module, user evaluation module and teacher instruction module construct network courseware system (cloud learning foreground system); resource library, user evaluation library and teacher instruction library construct the backstage database system of the cloud learning system. Network courseware system is a cloud learning application system established on cloud computing platform. Administrators maintain and manage network courseware system and database system through cloud computing platform. Users and teachers have information exchange and communication between network courseware system and database system through interactive control module and other modules. These information or resources improve or update information of three databases through three modules. In this system, all common users, administrators or instructors could login through unified man-machine interface. The system analyzes and records their behaviors and registers through the billing system [8]. User evaluation module is applied by users for evaluation of system function, in order to improve the system; interactive control module is used for interactive control operation by users, and the general interactive control operations could all be realized through this module; teacher instruction module is used by teachers for instruction and article management, etc.

4. Analysis and Test Method of Education Cloud Platform

4.1 Peak value of concurrent users

Measurement method: $\hat{C} = C + 3\sqrt{C}$ Of which, C is the number of average concurrent users

Element name of measurement: extendibility estimation of system

Measurement method: $C' = C \times (1+m)^t$

C' is the number of expected concurrent users, C is the number of average concurrent users, m is the growth of business in unit time, t is the number of calculating expected time unit.

4.2 Command efficiency

Measurement method: $E = n/t$

n indicates the command number implemented in time of t , t means the time of implementing n pieces of command, the million times of implementing command in second, test index is directly generated by test procedure [9].

4.3 Concurrent users

It is mentioned that test demand can support remote concurrent access and control of nearly thousand wireless sensors. According to index formula of concurrent user peak of calculation ability in the efficiency index, the average calculated average concurrent users are about 814. Because the maximum concurrent use peak involved in requirement is nearly 1000, while it adopts 1000 to carry out calculation, so the actual estimated average concurrent users are about 800.

4.4 Command efficiency

Result of testing command efficiency by tools is indicated in table 4.

Table 5.4 Command efficiency evaluation results

Concurrent users	Command efficiency
100	1.2 /second
200	1.2 /second
300	1.3 /second
400	1.4 /second
500	1.4 /second
800	2.5 /second

By arranging platform environment of corresponding cloud education and demonstration of capability test, this education cloud platform can cover 3 and more than 3 sensor network as well as it can control support platform. In addition, it can support concurrent control ability of 3G portable equipment; each 3G portable equipment can concurrently control at least 3 wireless sensors at the same time.

Through concurrent pressure test, the result indicates that this education cloud platform can support remote concurrent access and control of nearly thousand wireless sensors, it can also better meet function and usage requirement of teachers and students.

CONCLUSION

Establishment of education cloud platform will expand one new study space in educational field, under the model of network study under cloud computation, people can carry out information acquisition and disposal at any time, in any place and by any manner, which can lower the cost and difficult of learning source and service by Web to create flexible and quick study manner, colorful study environment, so that it is helpful to enhance ability in study and production, and it can increase study effect in the end. Through capability test of education cloud platform, this platform can support remote concurrent access and control of nearly 1000 wireless sensors, which can better meet function and usage requirement of teachers and students.

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