Analysis of Computer Software Experiment Cloud System Design Based on OpenStack

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Abstract. Computer is widely used in school teaching. The scale of computer room seriously limits the consistency of students' use of computer, so that the learning content and experimental content cannot be effectively preserved. In view of this situation, many teaching and teaching units are building computer software experimental cloud system based on OpenStack, in order to provide students with independent operation, safe and reliable learning space without increasing the human and financial burden of the computer room. In this paper, the design of computer software experimental cloud system based on OpenStack platform is analyzed, which can be used as a reference for developers.

Keywords: OpenStack, computer software, cloud computing, experimental cloud system design

1. Introduction

At present, many schools and computer room laboratories of distance education system undertake a lot of daily experimental teaching tasks. The same computer may be cross-used by different classes and different personnel. The uneven operation level of the operators can easily cause computer hardware damage, and the public network state is vulnerable to external attacks, resulting in computer poisoning or other problems of the system. It brings great inconvenience to normal teaching and maintenance of computer room. There are many machines in the computer room[1]. If there are many problems such as the above, a large number of staff will be required to maintain the computer specially, and the maintenance time of the computer will take a long time, which undoubtedly increases the unnecessary teaching cost. In addition, through the computer experiment room teaching, it is necessary to arrange different classes and students in different time periods, there are strict requirements for time and place, which brings great restrictions to everyone. Finally, when there are no teaching tasks or few teaching tasks, the computer room and maintenance personnel are idle, resulting in a great waste. These problems are difficult to be solved in the traditional teaching thinking[2]. The construction of OpenStack cloud platform opens up another unknown way for the design and application of computer...
software experimental cloud system.

2. Introduction to OpenStack.
So far, OpenStack is open and inclusive, supports various types of software cloud, is popular with global users, many users participate in supporting construction, version update fast, more and more humanized, more and more inclusive, is to build public cloud, private cloud must be an indispensable platform. The core components of OpenStack mainly include: computing module, object storage component, database service component, identity service, measuring organization, network and address management, UI interface, block storage, mirror service, deployment arrangement and so on. Each component has its own unique functions[3]. As shown in figure 1. Mirror service is mainly used to provide upload, download and file update management for virtual computers created by cloud platform. Identity service detects and authenticates user identity and permissions when users log in to virtual machines and cloud data access. OpenStack is completely open to all users, with very high flexibility and good scalability, especially suitable for the construction of school teaching computer software experimental cloud system.

![OpenStack architecture](image)

**Figure 1.** OpenStack architecture

3. Cloud Computing Technology
There are many kinds of services in the cloud. According to the difference of the nature of the service, we divide cloud computing into public cloud, private cloud and mixed cloud[4]. In the teaching institutions based on education, most of the courseware and teaching research results used in teaching will choose private cloud in order to provide services for the college and ensure the safety and control of the system.

3.1 Virtualization Technology
Virtualization technology is the key technology of computer software experiment cloud system construction. It dominates the generation of virtual machines and merges the resources of the whole physical category, so that the resources in system can be divided into independent sub-resources alone or synthesized as a whole for utilization, and the mutual call of resources between different computers can be realized[5]. To put it simply, all the resources stored and controlled will be formed into a huge pool of resources, and all the virtual and actual computers will be used, and the resources can be shared conveniently as much as they need. The application of virtual technology in computer network can provide high quality and fast service for the outside. When virtual technology is applied to physical storage system, many independent virtual machines can be created through one computer,
and the resources stored by the computer itself can be shared with the virtual machines.

3.2 Resource Management Technology
There is a more extensive resource base in cloud computing, which includes the facilities resources of many servers. It is impossible for people to manage these resources in an orderly manner. The resource management technology finds the hardware problem location through the power monitoring and detection of the hardware, so that it can be dealt with in time, and the software is to set up the device similar to the isolator to automatically disconnect the fault point or add the new access point, so that the huge resource sharing system can run methodically and provide efficient services for users.

3.3 Distributed Storage Technology
Distributed storage technology combines the storage space of each node in the network system to form a huge resource storage to meet the needs of large-scale data processing and storage. Its development will require higher and higher network transmission speed and data processing speed.

4. Functional Design According to Requirements

4.1 User Management
The main purpose of this module is to manage users with different permissions. The users of the computer software experiment cloud system have different operation and view authority, in the teaching work is the school, the teacher and the student, they are in the different level, each has the different management, the operation, the view authority, in order to complete the corresponding management task, the teaching task or the study task.

4.2 Course Service
This module is mainly used for teachers to manage all kinds of information of the experimental course, and the students view the course information and select the course through the course service module. In the process of course selection, a certain relationship is established in the cloud system of computer software experiment based on OpenStack, and the relationship between teachers and students is also established with the directory of the corresponding course at the same time.

4.3 Virtual computer Allocation
The administrator creates a virtual machine in common with the instructor. The resource that the instructor needs to transmit to the student is shared to the virtual machine in a way that creates a virtual machine. The administrator distributes management to the virtual machine, and distributes the corresponding account number and landing password to the students. The student can log in and view the corresponding information by using the corresponding account and password, and can only view the authorized virtual machine resources according to the requirements.
Figure 2. OpenStack for assigning IP, passwords

4.4 Communication and Communication
Through messages, e-mail and other functions to achieve communication, facilitate students to ask administrators or teachers questions, submit homework, testing, teachers can also use this function to remind students.

5. Conclusions
It can be seen from the above that the design of computer software experiment cloud based on OpenStack can help schools, teachers and students arrange teaching and learning time reasonably, solve several thorny problems in computer teaching, help to encourage social personnel to participate in continuing education, improve the level of social education, and provide a solid foundation for the development of high quality and high efficiency of national society and economy.

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