

Construction on Computer Laboratory based on Cloud Computing

Jingjing Liang

Department of Information Technology, Liaoning Institute of Science and Engineering, Jinzhou,
121013, China

xiaobai820620@163.com

Keywords: cloud computing; computer laboratory; environment deployment; infrastructure; platform construction

Abstract. Cloud computing is a new service model to share resource on the network, and it is the future development trend of applying cloud computing technology in computer laboratory construction. For the problems in laboratory management, this paper analyzed advantages of cloud computing in laboratory construction and then proposed solutions of laboratory construction. Specific solutions include experiment environment deployment architecture of cloud computing, infrastructure requirements analysis of cloud computing and experiment platform construction model of cloud computing. Results of this study can provide reference for the construction of university computer laboratory, and further expand the application field of cloud computing. The actual construction can be extended based on this to meet its own characteristics and the needs of cloud computing development.

Introduction

Laboratory of colleges and universities to improve students' practical ability and innovation ability, and implements the education for all-around development the important task, is an important base of knowledge innovation and technology development. Laboratory construction is a long-term and arduous task, is an important part of the overall planning of colleges and universities. With the rapid development of information technology and higher education enrollment scale expanding, expanding the scale of computer laboratory, quantity increasing, the hardware and software facilities configuration, but it is still difficult to meet the practical needs of teaching and research, at the same time there are also some problems in terms of maintenance and management. Cloud computing is a Shared resource on the network of the new service mode, through the Internet to provide dynamic easy extension of virtualization resources [1]. Cloud computing technology was applied to computer laboratory construction, and realization of information resources integration and optimization, can improve the efficiency of resource utilization and reduce the management time and infrastructure costs. The related technology research, in the course of the construction of this paper provides a solution for the laboratory construction.

Existing problems in laboratory management

The traditional laboratory construction and management, restricts the development of laboratory and seriously affect the teaching effect. The main reason generalizations as follows [2, 3]:

(1) Computer hardware and software costs higher and difficult to maintain. Traditional way of computer deployment, each node is equipped with a computer hardware equipment and independent of the operating system and application software. For the public computer room, professional needs different hardware and software environment, the same professional updating teaching content also need to adjust the software and hardware facilities. Unable to realize sharing, many departments exists repeat purchase of the condition of hardware and software system. Increase the cost of the lab construction.

(2) Laboratory opening time is fixed, limitation of students' autonomous learning needs. The room and the influence of experiment personnel, usually during class time open laboratory, the experiment teaching of sustainability. Now many colleges and universities to turn the classroom

teaching mode reform, requirements to improve students' autonomous learning ability, through the lesson before class and other resources to complete the basic knowledge, by consolidating refining distillation after class, the laboratory opening time to meet the needs of students spare time autonomous learning, causing serious waste of resources.

(3) Overrun with computer virus, information resource safety not guaranteed. Computer viruses are the sting problem facing laboratory management personnel. Engine is difficult to eliminate the root cause of the computer virus is a student of mobile storage devices and computer hard disk data exchange, computers and all around the room in a local area network (LAN), a student of the mobile storage device in a virus can spread quickly, once the virus attacks may lead to serious consequences, not only affect the normal use, the experimental data is destroyed, may also damage to hardware or software system.

Advantages of Cloud Computing in Laboratory Construction

Cloud computing technology is an effective way to improve the laboratory construction, there is a huge advantage in the computer laboratory construction and summarized below [4-6]:

(1) Mass storage resources and experimental data. Massive amounts of data stored in the cloud space, virtual resource pool in theory can provide unlimited storage space, guaranteeing the safety and reliability of the data. Each student has a separate cloud storage space, save in the process of the experimental data and results, student or teacher can be view at any time according to need.

(2) Provide complex experimental environment. Can provide different configuration of the host or the network environment can provide a generic or extension of experimental resources, meet the needs of different size or different types of experiment. Specific measures include infrastructure supply automation, the support of heterogeneous environment as well as the platform between system migrations and so on.

(3) Convenient laboratory management and maintenance. Unified management for laboratory hardware and software resources updated the operating system or application software when you just need to on the service operation, reducing the costs of installation and maintenance. The experimental data and application software is stored in the cloud, the cloud automatically backup, avoid paralysis of the impact of the system, even can avoid the damage caused by natural disasters and influence.

(4) Construction and maintenance cost is low. Cloud service provider's infrastructure, upgrading can reduce the hardware cost. Can also through a personal computer or PDA cheap equipment such as cloud is constructed to obtain the corresponding computing power. Cloud service provider of application software is save the purchase and maintenance cost, also can ensure the latest version of the software.

(5) Integrated cloud information management system. It includes data management, resource management, load balancing management and security management. Data management is mainly to distribution, vast amounts of data management; Resource management is mainly based on virtualization technology of physical computing resources to integrate or division; Load balancing management mainly manage massive computing tasks, and resource allocation; Safety management is through the cloud security management center to provide professional security products and security services.

Experimental Environment Deployment on Cloud Computing

Cloud computing experiment environment using cloud model centralized deployment, equipped with many layers of experimental resources. Centralized management platform to platform and experimental resources, teaching and experimental environment for unified management, combined with a variety of network information security, ensure the reliability and security of the platform management. Cloud computing experiment environment of each constitute part of the brief description is as follows:

(1) Cloud computing experiment platform [7]. Is the core of the cloud computing experiment

environment, cloud management console, the cloud computing platform and to store the backup platform into an organic whole, provide virtualized resources pool, information resource integration system, the hardware virtualization of resources, so as to improve the utilization rate of the server.

(2) Network facilities. It includes switches, routers and firewall. Among them, the switch will send each packet independently from the source port to the port of destination; Routers connect multiple networks or segment of the equipment; Firewall protection between the network and the network information security access control.

(3) Management information system. Including the system management and teaching management. Among them, the system management for system administrator to manage the platform system, including equipment management and resource management, etc.; Teaching management geared to the needs of experiment teachers, including experimental process and experimental results management, etc.

(4) Computer experimental environment. The experimental environment is provided for the computer room, according to the specification for design of the electronic computer room construction and the characteristics of cloud computing. Room terminal through twisted-pair and equipment room within the hub, the hub by optical fiber or twisted-pair cable connected to the switch.

(5) Open experiment environment. Is room outside places provide experimental environment, the campus or outside campus through the campus network, wan, or mobile media and terminal connections, experimental terminal can be individuals desktops, laptops, tablet, or smartphone.

Requirement Analysis on Cloud Computing Infrastructure

Cloud computing laboratory infrastructure includes server cluster, mass storage device and high-speed network bandwidth, needs to analyze briefly as follows:

(1) Server cluster. Large-scale server linear scaling and concurrent traffic clustering can promote cloud computing and overall performance. Specific way of cluster can be flat type load cluster, multi-layer load cluster or multilayer distributed database. High stability and safety of large server cost is higher, laboratory in colleges and universities are more appropriate USES low-cost server.

(2) Mass storage device. Traditional way of DAS, NAS and SAN storage is poor scalability and low transmission efficiency and architecture closed, etc. Numerous laboratory equipment use of personnel, process and experimental results to produce large amounts of data, so need enough storage space, as the growing demand of information storage is suitable for cloud computing, appropriate chooses mass storage device.

(3) High-speed network bandwidth. Cloud computing dramatically increased the network traffic, which could lead to outages, the network delay problems will seriously restrict development of cloud computing. In the process of experimental data analysis requires a lot of data exchange, the data distribution on different cloud computing service equipment, so the network bandwidth is the guarantee of experiments go smoothly.

Construction Model on Cloud Computing Experimental Platform

Based on cloud computing technology and fusion virtualization technology laboratory construction, the formation of storage resources, computing resources pool, pool network resource pool as well as safety resource pool, can achieve a variety of parallel computing, virtualization and support a variety of types of storage and a variety of forms of network topology, can according to user needs for the allocation of resources, not only can save cost, also can be configured according to user's optimization. With reference to the cloud four layers architecture construction model of the three layers of services as shown in Fig. 1 [8-10].

For the construction of the model shown in Fig. 1 part briefly described as follows:

(1) SaaS software as a service, will provide to the user use software function directly, don't need to care about the specific hardware or system [11]. Laboratory of cloud client mainly use the

browser and application program interface, the software is encapsulated into a standard Web Service personalized configuration platform of the user operation is not affected by other users.

(2) PaaS platform as a service, based on the hardware support software, easy to realize the demand for the use of special development platform [12]. It includes user management, resource management, security management and data management, etc. Among them, the user management is a basic information and user interaction management; Resource management is the resource deployment, using the load balancing and other measures to achieve the purpose of performance optimization; Safety management is mainly for identity authentication, access permissions and access control management; Data management, including the database server deployment and scheduling management [13].

(3) IaaS, infrastructure as a service, provide computing functions and basic storage as a standard service on the network, made up of physical resources and virtual resources. Physical resources can be stored in any position and network resource in theory there is no limit on the total scale; Virtualization technology to achieve the conversion from physical resources to logical resources, external simple logical form, shielding the complexity of the physical resources, improve the efficiency of resource use.

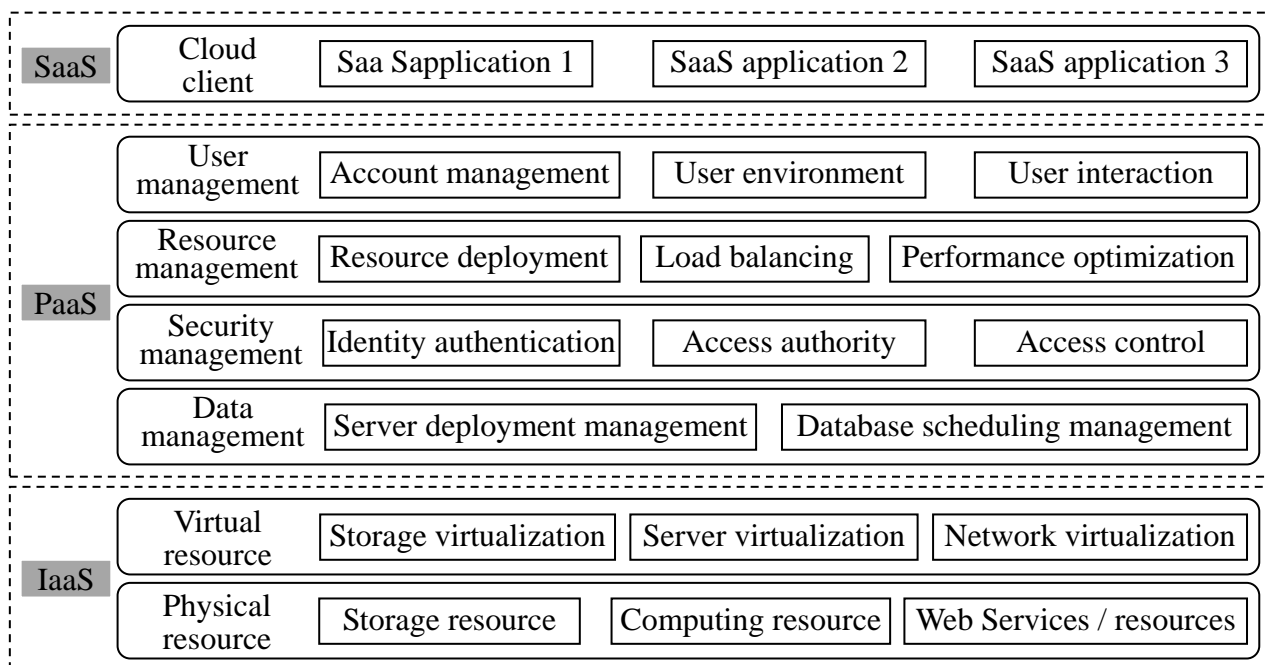


Fig. 1. Construction model of cloud computing experiment platform

Conclusion

Cloud computing technology brings new development opportunity for college computer laboratory construction, realized the data sharing between different equipment, to provide users with unlimited storage space and computing performance; Provides support multiple levels and types of cloud computing experiment, the experimental operation is not restricted by time and place; Desktop terminal more and more simple, reducing the costs of the laboratory construction [14]. The actual construction process can be based on the research content of this article deployment experiment environment architecture, infrastructure and cloud computing experiment platform construction, on this basis can be extended to adapt to the characteristics and the needs of the development of cloud computing. In this paper, the research results provide a reference for university computer laboratory construction, and further expand the application field of cloud computing.

References

[1] C. X. Zhang, "Optimization of University Computer Laboratory Construction Based on Cloud

- Computing," *Journal of Huaiyin Institute of Technology*, vol. 22, no. 5, pp. 28-30, 2013.
- [2] Humphrey M. Sabi, Faith-Michael E. Uzoka, Kehbuma Langmia, et al. Conceptualizing a model for adoption of cloud computing in education[J]. *International Journal of Information Management*, 2016, 36(2): 183-191.
- [3] Q. R. Chen, "The construction and research of virtual computer laboratory based on Cloud Computing," *Information security and technology*, vol. 6, no. 1, pp. 50-53, 2015.
- [4] H. G. Li, "The application of cloud computing in the construction of university computer laboratory," *Digital Technology and Application*, vol. 33, no. 1, pp. 246-246, 2016.
- [5] Eleni Kavvadia, Spyros Sagiadinos, Konstantinos Oikonomou, et al. Elastic virtual machine placement in cloud computing network environments[J]. *Computer Networks*, 2015, 93(3): 435-447.
- [6] Mohammad Masdari, Sima ValiKardan, Zahra Shahi, et al. Towards workflow scheduling in cloud computing: A comprehensive analysis[J]. *Journal of Network and Computer Applications*, 2016, 66(5): 64-82.
- [7] H. Y. Sun, "Research on the application of cloud computing in the construction of university computer laboratory," *Computer CD-ROM Software and Application*, vol. 17, no. 1, pp. 241-242, 2014.
- [8] Victor Chang, Yen-Hung Kuo, Muthu Ramachandran. Cloud computing adoption framework: A security framework for business clouds[J]. *Future Generation Computer Systems*, 2016, 57(4): 24-41.
- [9] Q. W. Meng, T. Liu, "Research on the model of computer laboratory construction based on cloud computing," *Intelligent computer and Application*, vol. 1, no. 4, pp. 72-76, 2011.
- [10] Y. Q. Chen, "Research on open computer laboratory construction based on cloud computing," *Journal of Anhui Vocational College of Electronics & Information Technology*, vol. 14, no. 3, pp. 12-15, 2015.
- [11] C. X. Chen, "The strategy and method of cloud computing in university laboratory informatization," *Experimental technology and management*, vol. 31, no. 1, pp. 221-224, 2014.
- [12] Fernando Koch, Marcos D. Assunção, Carlos Cardonha, et al. Optimising resource costs of cloud computing for education[J]. *Future Generation Computer Systems*, 2016, 55(2): 473-479.
- [13] Mahir Kaya, Altan Koçyiğit, P. Erhan Eren. An adaptive mobile cloud computing framework using a call graph based model[J]. *Journal of Network and Computer Applications*, 2016, 65(4): 12-35.
- [14] R. J. Xie, "The application of cloud computing in the construction and management of computer laboratory in higher vocational colleges," *Fujian Computer*, vol. 31, no. 8, pp. 153-154, 2015.