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Research on OpenStack of open source cloud computing in colleges and universities' computer room

Lei Wang and Dandan Zhang

Department of Information Engineering, Henan Vocational College of Applied Technology, Zhengzhou Henan, P. R. China 450000

Abstract. In recent years, the cloud computing technology has a rapid development, especially open source cloud computing. Open source cloud computing has attracted a large number of user groups by the advantages of open source and low cost, have now become a large-scale promotion and application. In this paper, firstly we briefly introduced the main functions and architecture of the open source cloud computing OpenStack tools, and then discussed deeply the core problems of computer labs in colleges and universities. Combining with this research, it is not that the specific application and deployment of university computer rooms with OpenStack tool. The experimental results show that the application of OpenStack tool can efficiently and conveniently deploy cloud of university computer room, and its performance is stable and the functional value is good.

1. Introduction

With the rapid development of cloud computing technology in recent years, all kinds of open source cloud computing tools are mushrooming. At present, open source cloud computing has grown up to become the second important force in the field of computer technology. It has far-reaching impact on the structure of the cloud computing industry and business models. Open source cloud computing has attracted a large number of user groups by the advantages of open source and low cost. In the current university computer room the traditional physical compute is still widespread as the carrier of the situation, the shortcomings of this model increasingly obvious, mainly for the engine room closed, fewer managers, location distributed, hardware and software updates lag and many other problems. Therefore to explore the application of open source cloud computing technology in order to build a virtual computer room is very important, it will greatly promote the management and application efficiency of the engine room, the significance of the value is to be welcomed.

2. The Concept of Cloud Computing and Open Source Cloud Computing

2.1 Cloud Computing

Cloud computing is the use of Internet technology to achieve a high degree of sharing among common resources and access to information, this computing model is mainly to share the resources specifically which include computer facilities, storage devices, applications and other content [1]. The core of cloud computing services from top to bottom can be generally divided into three levels , each level and its meaning are as follows: ① infrastructure services layer (based on demand of expanding the basic hardware facilities services), ② platform service layer (The deployment of the corresponding application to provide services to run the corresponding thing) , ③ software service layer (provided by the provider which can be applied in the cloud computing platform, applications) .

2.2 Open Source Cloud Computing

Currently more widely used in the industry of cloud computing open-source platforms, including Enomally, Eucalyptus, OpenNebula, OpenStack and so on. [2] According to the relevant research shows that in terms of market share of the current open source cloud computing platform, OpenStack has more than 65%, becoming the most widely used in the market for an open-source cloud computing platform. At the same time in a major IT companies for the survey shows that more than 59% of respondents indicated that in the future it will be the deployment of open source cloud, so the market prospects of this technology are extremely broad. More and more large-scale IT companies have increased from OpenStack applications, such as Microsoft, IBM, Google, etc, which makes the development of OpenStack increasingly favored by the market [3]. OpenStack, on the other hand, has been in position to compete with Amazon EC2 in the public service space, and it is not inferior to traditional VMware virtual machine software in the remote cloud.

3. Openstack structure

OpenStack is d eveloped by NASA and Rackspace, it is a free software and it has an open source project licensed under the Apache license. OpenStack is designed to provide service support for virtually all types of cloud environments. The goal of this project is to offer a cloud computing management platform which is simple, convenient, and efficient to scale, plentiful and standardize. OpenStack provides basic services to users through complementary services, each of which can be integrated into an API basis [4]. Figure 1 shows the OpenStack architecture.

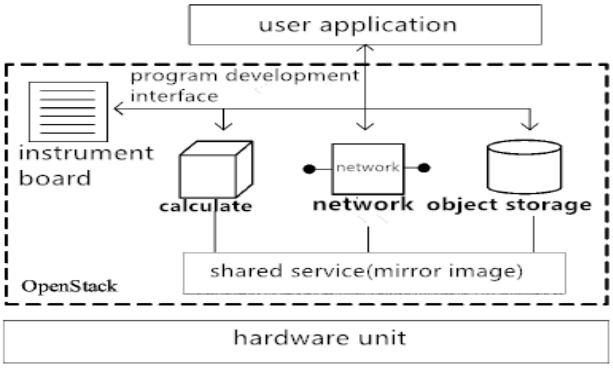

Figure 1: the OpenStack architecture

The main architecture of OpenStack includes five major component systems, the specific analysis is as following.

3.1 Large-Scale Network Storage

3.1.1 Calculation: A set of control devices, mainly used in a single user or group management using a virtual machine instance of the entire life cycle process, issued by the user's own needs and then provide them with virtual services Project [5]. Mainly for the virtual machine to create, switch, suspend, hand-up, adjust, migrate, restart and other specific operations, while the CPU, memory and other information to configure the specifications. Integrate into the project by the Austin version.

3.1.2 Object Storage: A complete set of applications for the scalable and scalable system, the use of built-in redundancy and high fault tolerance mechanism to attain the object storage system that hosts the implementation of storage or file search. It can give Glance mirror store. Give Cinder volume backup serviced [6]. By the Austin version together in the project.

3.1.3 Network and Address Management: to provide cloud computing technology based on the network virtualization technology means to bestow OpenStack the rest of the service content to provide network connectivity services. It can be configured as subnet, network, and router for DNS,

DHCP, L3 services and load balancing. The network architecture can support VLAN and GRE at the same time. Its plug-in architecture can support most of the mainstream networking vendors with technologies such as OpenvSwitch. Integrate into the project by the Folsom version [7].

3.1.4 Shared Services: This serviced mainly to include two aspects of content and identity services and mirroring services, the former are a kind of identity services to users and access equipment mapping between the certification. The latter mirroring service is to give the virtual machine image registration, storage, transmission and search and other related services.

3.1.5 Database services: to give users services which is based on OpenStack environment can be expanded to provide and stable relations and non-relational database engine services. Integrate by the ale-house version of the project.

3.2 Deploy

In the OpenStack tool to deploy it mainly includes cloud computing and cloud storage two parts, which OpenStack cloud computing is based on user needs to provide a reasonable allocation of computing resources to give the virtual server to create and manage the service content; and OpenStack cloud storage is mainly to provide large-scale, scalable storage content, which can be achieved for the storage of TB level data information. OpenStack cloud computing and cloud storage two projects can be independently deployed separately, it can also be combined for deployment. No matter with the private cloud, public cloud or hybrid cloud it all can be relatively simple to construct.

OpenStack has better openness, so its components are more flexible, and good inclusion also makes it more extensive. With the computing, object storage, network and address management, shared services, database services and other service groups, some of which can be installed according to their individual needs, network architecture has a very good flexibility and diversity. It can support multiple types of mainstream virtual machine software devices such as VMware, QEMU, KVM, XenServer, LXC and so on, it also be able to use in the development of independent plug-ins and other virtualization software.

OpenStack is a set of control devices which are used to start instances of a virtual machine for a single user or group of applications. It can also apply to specific project network settings that have multiple instances at the same time. OpenStack can even be comparable to Amazon EC2 in public cloud processing; it is also superior in private cloud performance, not behind VMware. In the public transport, this set of management mechanisms has a pre-made mirror or give the user to create the mirror to provide storage, which users can also be launched through the virtual machine. OpenStack Object Storage is a class of systems that use built-in redundancy and fault-tolerant mechanisms for object storage within a larger scale and expandable system.

4. OpenStack is used in university computer room

4.1 Large-Scale Network Storage

In the computer room, when university teachers carry out experimental teaching, the process of distributing course materials to students and filing the students work are usually more cumbersome. The more common approach taken by schools is the computer room management staff to give one or two rooms set up a separate storage server, each of the different courses to be divided into a separate space, and then provided for teachers and students in the application. On film and television production courses, for example, a class of dozens of students occupied by the storage spaced will reach as many as hundreds of G [8]. The enormous workload of these single-server servers can be exceeded by the large volume of student work that is being copied and transmitted. The storage room for the implementation of centralized management of the server is even more difficult.

But through the application of OpenStack tools it can be based on one of the cloud computing technology, and it can be very convenient to establish large-capacity storage space. Now, computer room management staff can do centralized management on the existing room in the storage server. 5

sets of servers as a unit, the use of the general six small switch device node area, and then based on the actual needs of the situation and then expand it to a number of node area, and then matched with the implementation of user authentication node authentication access control, and Agent node to implement a balanced load, which will be able to form a relatively reasonable and complete cloud storage system, the following Figure 2 is the cloud storage deployment diagram.

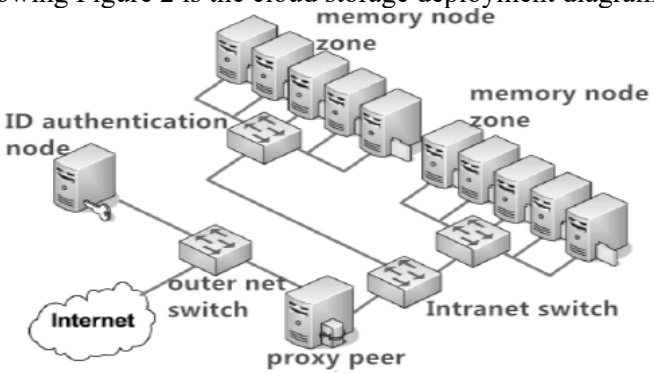

Figure 2: Cloud Storage Deployment Diagram

4.2 Virtual Cloud Computing

In the past, the most common computer room often used the physical machine as a unit architecture to implement the software configuration and management, of course, this model has obvious shortcomings and weakness: first of all, managers install all physical equipment exactly the same the operating system and teaching software which are based on the teaching plan , this model is not only inefficient , but also it will waste a lot of working time , and the labor intensity is also large . Second, some course teachers expect to able to adjust the teaching system and software according to the actual situation of the course being taught such as software. However, it is difficult to update the operating system and software content with the physical machine. So it is very inefficient to carry out a lot of repetitive work. Finally, on a single physical machine which loads too much of the curriculum software will not only affect the computer performance, and mixed a variety of teaching software together, it does not meet the requirements of the objective teaching environment.

OpenStack virtual computing technology can achieve for the construction of virtual computer cloud system relatively simple, it can achieve the above three aspects of the model effectively to solve the problem. Figure 3 shows in simple, highly viable virtual computer resource cloud deployment. Using four computing nodes as an independent unit, use a 5-small switchboard equipment to constitute a separate area. Managers can carry out more equipment for parallel access based on the actual needs of the curriculu. Each computing node is able to achieve both internal and external network at the same time connected to the external network which can give users access to the simulated computer, while the network is focused on the management of the cloud system. In order to guarantee the security of the system, a VPN node can be added to facilitate access to the external network of the intranet management end, and a monitoring node is used to achieve the security control of computing services. After adopting OpenStack computing service the simulated computer application is the same as the physical machine.

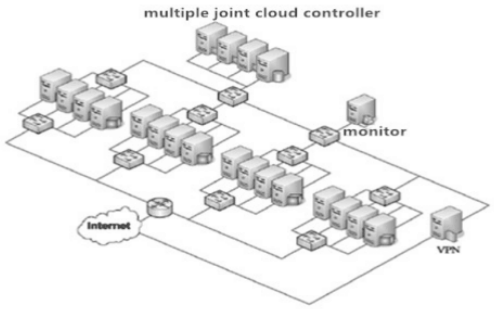

Figure 3: OpenStack Computing Cloud Deployment Diagram

5. Summary

This paper is mainly given a deep analysis and discussion on OpenStack in the computer room of the deployment and application of the focus of the study focused on the OpenStack open source cloud computing tools to build the structure and function. The experimental results show that OpenStack is more convenient and efficient for cloud deployment, and the performance is relatively stable, to satisfy the elementary needs of cloud computing services in colleges and universities. By applying OpenStack tool for university computer room, it can greatly support the integration of resources. At the same time, it will be applicable to the virtual experiment teaching, and it will have good practical value.

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