Research on the Sharing Mode of Higher Vocational Teaching Resources Based on Private Cloud

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Abstract: Cloud computing technology enables higher vocational teaching resources to be shared and a new model is formed. By analyzing the application status of higher vocational teaching resources construction and the advantages of private cloud, this paper proposes the idea of constructing a teaching resource sharing model based on private cloud, so that teaching resources can be better utilized.

1. Introduction

(1) Teaching resources are scattered and information islands are formed. At present, all higher vocational colleges are busy building their own teaching resources system and uploading some teaching materials. However, the systems cannot communicate with each other, forming a barrier and resources cannot be shared. It is possible to promote the development of higher vocational colleges by being able to communicate with each other and communicate[1].

(2) Teaching resources are scarce, and software and hardware construction is insufficient. Although vocational colleges focus on employment and practical operations, teaching resources are particularly important, and some video materials can give students better guidance. However, at present, the teaching resources of higher vocational colleges have not received enough attention, the amount of information is small, and the investment in software and hardware is insufficient, not only cannot be shared, but also their own resources are scarce. All higher vocational colleges should jointly establish a library of teaching resources to make teaching resources richer and more valuable[2].

2. Private Cloud

2.1. Classification of cloud computing and characteristics of private clouds

Cloud computing is a new type of data processing method that provides a resource sharing pool with powerful processing capabilities, high reliability, and flexibility to facilitate data maintenance and sharing. According to the scope of deployment, cloud computing can be divided into four types: public cloud, private cloud, community cloud and hybrid cloud. The public cloud has a service provider, and the user can obtain the information through the network by paying the fee to the service provider. A private cloud is a self-built cloud computing system. A community cloud is created by multiple agencies within a single domain. A hybrid cloud is a hybrid application of two

or more cloud computing types. Because the private cloud is self-built, it has the following advantages: First, it is safe within the firewall; Second, the network is relatively stable based on the campus network; Third, because the private cloud is developed on the basis of open source code, it can make full use of it. Software and hardware resources; Fourth, the deployment method can be selected by itself.

2.2. Private cloud architecture design

This paper designs the private cloud into four levels: cloud user layer, application interface layer, infrastructure layer and management layer. 1. Cloud user layer. The cloud user layer interacts with the user. Establish a shared platform through the campus network. The service catalog covers all services, and the user operates to trigger the task. 2. Application interface layer. The application interface layer has various software and hardware interfaces and network server clusters, mainly for Internet applications. The triggering of tasks through network clusters is part of the flexibility and openness of the private cloud. 3. Infrastructure layer. The infrastructure layer is the backbone of the private cloud, including hardware virtualization and various hardware facilities. The use of distributed systems avoids network congestion caused by centralized systems and allows resources to be allocated reasonably. Apply data processing methods such as network computing. Virtualization, distributed and other technologies used by private clouds make operations more efficient and easier to use. 4. Management. The management includes deployment tools and resource monitoring, deploying the above three levels, and effectively integrating and monitoring system resources[3].

3. OpenStack Private Cloud Application Research

3.1. The core components of OpenStack and its structure analysis

OpenStack has seven core components: identity authentication, user interface, network management, block storage, computing components, image services, and object storage modules: 1. Identity Module (Keystone). Provide uniform authentication for other services, and authorize service tokens, service rules, and more. 2. User Interface Module (Horizon). Manage user interfaces, based on API access to web ports, virtual machines and their mirrors, compute components, block storage, object storage. 3. Network Management Module (Quantum). Based on network virtualization technology, it provides network services for other modules, including network connection and IP address management. 4. Block storage module (Cinder). Implement block storage of virtual machine instances and provide cloud disk services. The calculation component can take the data and store the mass processing results. 5. Calculation component module (Nova Compute). Provide virtualization drivers, manage block storage modules, mirror service modules, and network management modules, and be responsible for the entire life cycle of virtual machine instances. 6. Image Service Module (Glance). Provides mirroring services for virtual machines, including adding, deleting, editing, and mirroring functions, and is responsible for their directory management. 7. Object storage module (Swift). New static storage that can be read, written, and changed through compute component modules and provides storage for mirrored service modules. You can also back up block storage content.

3.2. Teaching resources to build and share the OpenStack deployment method

OpenStack's node deployment methods include single-point deployment and multi-point deployment. Single-point deployment requires less resources and is easy to maintain, but it is not easy to expand. Multi-point deployment has good scalability, but it is easy to cause node unclear.

Combining the advantages and disadvantages of the above two single deployment methods, the university teaching resources are built and shared using the master-slave control method, using one master node and multiple computing nodes. The client interacts with the node through the network, through the central firewall, and through the core switch. The master node has two main virtual machines—the network control virtual machine and the cloud control virtual machine. The two virtual machines are managed in a unified manner by the Libvir library. The cloud control virtual machine has a server cluster, and implements a network cloud of block storage and computing components through various APIs. The network control virtual machine provides network service and service authentication, management image and object storage. Compute nodes have components such as compute components, network management agents, block storage volumes, and object storage, including basic hardware and management software. The master node allocates tasks to each computing node through the core switch, and the master node can obtain resources of each computing node.

4. Higher vocational teaching resource sharing based on OpenStack private cloud mode

4.1. Integration of existing teaching resources

Before the advent of cloud computing, some higher vocational colleges also established their own teaching resources, uploaded to the campus network server, and accessible through their own local area network. In order to better share resources, private clouds can be used to integrate the teaching resources of existing vocational colleges. It is only necessary to classify the resources on the original server into an image file and upload it to the Glance service of the OpenStack private cloud specific compute node virtual machine. Before uploading, you need to create a localized virtual disk space that can be virtualized using KVM technology. This way all the terminals participating in the private cloud can access these teaching resources.

4.2. Construction method

The OpenStack private cloud-based teaching resource sharing model uses a distributed build approach that distributes resources to the virtual machine services of each compute node, ie, configures OpenStack Computing applications on those high-performance computers. The two virtual machines of the master node are uniformly deployed and deployed. The specific construction methods mainly include the deb packaging method, the deb script installation method and the source installation method. Considering the flexibility of construction, this article uses the source installation method. The two main underlying components include databases and message queues. A database is a way to store information, operational status, and calculation results. This article uses Mysql5. 7 database, programming using sql language for database construction and management. It is applied to the identity authentication module Keystone, block storage module Cinder, computing component module Nova Compute and mirror service module Glance. Message Queuing uses the Rabbitmq communication method and HA. Applies to messaging between application components. When the client receives the command, it triggers the task, and the message queue passes the task to the relevant component application.

4.3. High availability mode

Since the teaching resources of higher vocational education will contain a large amount of video materials, when there is a large amount of traffic, there may be a situation of downtime, and the private cloud system for the sharing of teaching resources needs to be designed into a high-

availability mode. High availability of ready-to-use hardware runs each service instance and prevents system downtime and data loss through service instance failover implementation [6]. There are several forms of high availability mode: Active - Active, Active - Passive, Cluster. Active-Active is the simultaneous operation of two hosts at the same time, division of labor and cooperation, and mutual supervision of each other's operating status, one of which has a downtime, and the other takes over all of its work; Active-Passive When one of the hosts is in the working state, the other host is in the standby state. When the working host is down, the standby starts immediately and takes over all the work; each host in the cluster There is an Active-Active relationship between them, and multiple hosts share the work. Based on the previous design, this paper adopts the cluster method to control the working nodes of each computing node through the master control node and establish a supervision mechanism.

There are two service states for OpenStack components: stateless services and stateful services. Stateless services There is no dependency between requests for services. They are independent of each other and are applicable to Active-Active forms and distributed systems. The service request following the stateful service depends on the result of the previous service request and is applicable to the Active-Passive form. Based on the previous design, the Open-Stack component of this article uses stateless services.

5. Conclusions

The private cloud-based teaching resource sharing model is built. The open and flexible OpenStack cloud platform is selected for implementation. The core components and their structures are studied. The pros and cons are chosen to be master-slave. Firstly, it is necessary to integrate the existing teaching resources, and then adopt a distributed construction method. This paper focuses on the design of the sharing model.

Acknowledgements

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