Application of Data Center Based on Cloud Computing in the Construction of Smart Campus in Colleges and Universities

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Abstract: With the continuous deepening of information construction in colleges and universities, the data center, as the brain of the smart campus, is facing great challenges in terms of scalability, efficiency, operation and maintenance, energy consumption and security. How to control and manage the data center “fast, simple, and stable”, making the data center's infrastructure, operation and maintenance, and use become simple and simple, and become the first consideration for the construction of smart campuses in colleges and universities. The cloud-based data center, with the support of virtualization technology, realizes the on-demand combination and configuration of resources, and achieves the continuous expansion of the system, so that the data center runs and manages like a computer.

1. Introduction

The rapid development of information technology and virtualization technology has brought wings to the construction of smart campuses. Universities and colleges have begun to build smart campuses that integrate cloud computing and big data platforms.[1] Different functional departments have successively launched paperless office platforms and various application systems. online.[2] Decentralized application systems and servers pose significant challenges to the maintenance and management of university data centers.[3]

Faced with the current process of digital construction in colleges and universities, traditional data centers are increasingly expensive, costly, and cumbersome to maintain, and cloud-based data centers are welcomed for their flexible deployment, efficient management, security, and reliability.[4] Therefore, it is of great significance to study the application of cloud-based data centers in the construction of colleges and universities.[5]

2. Cloud computing technology

Cloud computing is the product of the combination of traditional computers and network technologies. It usually refers to the provision of dynamically scalable and virtualized resources through the Internet. Among them, virtualization technology is the core of cloud computing.

Simply put, users of cloud computing technology can get computing resources from a large number of distributed computers as needed, rather than local computers or remote servers.[6] It is like switching from the household coal heating mode to the heating company's central heating mode. It means that computing power can also be circulated as a commodity, just like gas and water, and at a low cost. The biggest difference is that it is transmitted over the Internet.

3. Traditional data center

As the scale of university data centers continues to expand , various application systems and platforms, such as office systems OA, educational management systems, student management systems, financial management systems, and orientation systems, almost infiltrate all aspects of

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daily work in colleges and universities. [7] In the traditional data center mode, each application system is relatively independent, and effective integration between hardware resources and data resources cannot be achieved, resulting in low system utilization, poor overall performance of the data center, and inability to effectively correlate data.

4. Cloud-based data center

In the process of information construction, colleges and universities urgently need to overcome the above shortcomings and establish a new data center for computer resources, storage resources and various network resources for effective integration and dynamic allocation.

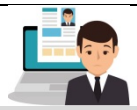
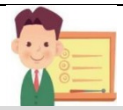
Cloud data centers do not need to purchase new server devices. By using virtualization technology, the original server can be rebuilt into a hardware platform, making it a flexible resource pool for configuration and expansion. Each system application can deploy virtual machines according to different needs of services, achieving logical independence between applications, while maintaining physical hardware aggregation, thereby saving costs, improving management efficiency and resource utilization.

At the same time, cloud-based data centers can integrate various system platforms and optimize management to achieve data sharing and interoperability between systems. Distributed resource scheduling, integrated disaster recovery backup and security control provide a more stable and secure guarantee for the data center.

4.1 Cloud data center system

The cloud computing data center system consists of users, application systems and cloud management platforms, as shown in Table 1.

Table1 Data Center System Based on Cloud Computing

<table>
<tr><td rowspan="2">users</td><td>  </td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>teachers</td><td>students</td><td>Off-campus users</td><td>administrator</td><td>Third party</td></tr>
<tr><td rowspan="3">operating system</td><td>Website group</td><td>Book management</td><td>Card</td><td>Online course selection</td><td>Online office</td><td>email</td></tr>
<tr><td colspan="3">Educational application system</td><td colspan="3">Teaching application system</td></tr>
<tr><td>Educational management</td><td>Student management</td><td>Employment management</td><td>Resource library</td><td>Scientific research management</td><td>Network teaching platform</td></tr>
<tr><td rowspan="3">Cloud management platform</td><td colspan="2">Computing resource pool</td><td colspan="2">Network resource pool</td><td colspan="2">Storage resource pool</td></tr>
<tr><td colspan="6">Virtualization kernel and platform management</td></tr>
<tr><td colspan="2">Computing resource pool</td><td colspan="2">Network resource pool</td><td colspan="2">Storage resource pool</td></tr>
</table>

Application systems are various business applications, such as educational management systems, student management systems, fixed asset management systems, and teaching resource libraries.

The cloud management platform is responsible for the entire data center resource management, realizes centralized control and management of all hosts in the data center, adopts a distributed resource scheduling scheme, and processes the concurrent access requests of a large number of users at the fastest speed. It is the management center of the business operation of colleges and universities.

4.2 Key technology

Virtualization is the core technology for implementing cloud computing. By building the distributed hardware in the network into a virtual computing environment, the computing is no longer subject to the physical limitations of the device, and centralized use of computing resources is realized.

By means of virtualization, computing resources can run more than before and improve resource utilization. Virtualization allows loosely coupled deployments between applications and physical devices, [8] and changes in physical resource state do not affect virtualized logical computing resources. It can be dynamically adjusted according to changes in basic resources to improve overall flexibility.

4.2.1 Server virtualization

The cloud computing management platform can virtualize distributed servers together to build a large host pool. Establish several clusters in the host pool and configure the cluster's high availability and dynamic resource scheduling functions for optimal system performance and higher availability.

4.2.2 Network virtualization

The network using virtualization technology is encapsulated in a software container, and the underlying hardware or network topology has no direct impact on its mobility pairing. The data exchange between the virtual machine and the virtual machine, between the virtual machine and the external network is mainly performed on the switch inside the virtual machine.

4.2.3 Storage virtualization

The mapping between physical storage and user-oriented logical storage is mainly done through the middle layer. Through centralized control and management, the storage pool can easily load the storage resources of various hardware systems for dynamic expansion.

4.3 General characteristics

Cloud-based data centers can automatically sense business needs and provide resource supply. The entire data center is like a computer. At the hardware level, it enables complete pooling of computing, I/O, and storage; At the software level, it can realize the comprehensive management and deployment of resources, enabling users to drive applications and perform unified resource scheduling.

5. Function

It can solve data heterogeneity, islanding and other issues, realize the integration and virtualization of campus hardware and software equipment and information resources, and form a cloud data center with data integration and interaction;

It can solve the problem of uneven resource allocation and low utilization efficiency. Users can understand the real-time status of the resources of the cloud data center through a unified cloud platform, so as to conduct unified and efficient management, and can flexibly control and deploy;

It enables on-demand distribution and on-demand use. The cloud platform can dynamically allocate and migrate resources of the resource pool, and can automatically provide the required services to the terminal according to the requirements of the cloud service terminal user.

6. Summary

The cloud-based data center can meet the requirements of college digital campus construction. After applying cloud computing virtualization technology, the performance of the data center system will be greatly improved. At the same time, it provides a stable foundation and platform for the construction of smart campuses in colleges and universities, promotes the integration of digital resources in colleges and universities, and improves management efficiency.

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