An Application of Virtualization Technology in Setting Up the Virtual Teaching and Research Platform

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Abstract: To adapt to the construction and management of virtual teaching and research platform, we use the Convert Physical Server migrating from Windows to Linux system to create a new virtual machine. Applying virtualization technology and taking the advantages of the use of code with 64-bit virtual memory addresses, a physical-to-virtual machine conversion can be quickly and smoothly performed, which makes the virtual teaching and research platform run safely and efficiently, and also provide reliable information to serve diversified teaching and research support.

Introduction

Virtual teaching and research platform means to develop and use online education resources, to establish an open and interactive teaching and research network based on modern information technology, in order to realizes the resource exchange and sharing of a group of network teaching and research, to promote education modernization with the aid of education informatization. The virtual teaching and research platform stemmed from the concept of virtual community, virtual community concept originated in the United States, some people who have common interest use modem (modulator-demodulator) to form network to convenient them talk to each other, discuss and communication. Nowadays, virtual community is mainly used for entertainment, life, and emotional communication, etc.

The virtual teaching and research platform is used for teachers to carry out their teaching and research activity on virtual community space, is also an important environment for school teacher’s training and activities. Virtual teaching and research platform linking teachers with the computer network can break the limitation of time and space. All the content related to daily teaching and research activity can be put in digital form on the Internet. Virtual teaching and research platform makes full use of multimedia technology, Internet, database technology and artificial intelligence technology, etc. It can take the advantages of the integration of information technology, to collect wisdoms of the staff involved to promote multidisciplinary development and a variety of technology integration. So use the Convert Physical Server migrating from Windows to Linux system to create a new virtual machine from a physical computer has greatly meaningful to better match to the increasingly education informatization.

The remainder of this paper is structured as follows. Section II gives a detailed explanation of the designation of virtual teaching and research platform and devises a migration scheme to adapt to the virtual teaching and research platform operation and release. Section III discusses the virtualization implementation procedure. Section IV presents application value of the virtual teaching and research platform. The last section concludes and suggests further recommendations.

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Virtual Teaching and Research Platform Website Designation

The website server is an important part of establishing the virtual research environment. The virtualization technology can be used to fully release the hardware performance, extend and organize storage, ensure network security and data security in a mixed environment on website. Based on the analysis of technical feasibility and hardware resources, a migration scheme can be devised to adapt to the virtual teaching and research platform operation and release.

Vitalizing Server

Server virtualization is to abstract the server's physical resources into logical resource, use one server as several even hundreds isolated virtual server, make CPU, memory, disk, I/O hardware to be dynamically managed as the resource pool, which will improve the utilization of resources, simplify the system management, realize the server consolidation. By deploying Virtual Iron Extended Enterprise Edition 4.4 virtualization platform on the target server, which have dynamic migration device-LiveMigrate, and configuring high availability fault tolerance - LiveRecovery.

Constructing Network Storage Service

Storage virtualization technology create a more efficient and flexible storage pool, not only simplifies the virtual machine storage process, also can be directly used to storage infrastructure functions, for the use and management of the storage system in a virtual environment provides the most effective way. Here we choose VMware as the storage resource management server. VMware storage virtualization technology integrates the storage resources, implements tiered storage for data center. It can deploy the application of more than one hundred servers into that of more than 40 servers, and connect SAN storage backend. The back-end connection to storage and integration of multiple servers constituting a manner of “Server Farm”, significantly improve the availability and reliability of the Server.

Setting up Operating System

We extend a single system to two virtual servers. The first virtual server only carrying the ASP installs Windows. ASP.NET has to run on Windows, according to the minimize service principle of installing least components and services environment. The second virtual server bearing the PHP and MySQL installs Linux, due to their site environment not must be Windows components. Both systems deploy 64-bit version and 64-bit application to enhance the performance of the virtual machine itself and give full play to the physical hardware computing power. Each teaching and research website works as a virtual directory configuration, simplify the access path.

Optimizing Access and Safety Measures

Virtual network undertake communication between the host and virtual machine, and between the virtual machines. Communication is divided into two parts, between internal local area network (LAN) and between wan and LAN. Configuring the network adapter can reduce network traffic congestion and that provides a redundancy link. vSwitch logical ports are in the same logic network segment. When two or more virtual machines connect to the same vSwitch, the network information between them will be exchanged in local. Virtual machines between different vLANs communicate with each other, need an external layer 3 switches or routing forwarding to live virtual physical network into a vSwitch, each virtual machine can access the network adapter connected to the wan.

Virtualization Implementation Procedure

To meet the needs of the web services extension, safety, and dynamic change in practice, we need to combine with existing infrastructure step by step:
(i) modify the disk array. Divide logical disk into a double disk, use the first disk (logical disk 1- Raid1) as vSphere platform system space, the rest of the disk (logical disk 2) used as Raid5 + hotspare, use FreeNAS to manage this part of the space used as a storage resource pool.

(ii) install VMware virtualization platform, and deploy FreeNAS, Windows and Linux system on it.

(iii) configure FreeNAS, divide the storage space for Windows and Linux respectively. Automatically mount a windows share at boot time with Windows and Linux, then began to move site files into the new division of space.

(iv) configure teaching and research web server in Windows and Linux to make accessible on web by a virtual directory, database connection, directory to read and write attribute, and configure reverse proxy on Apache for all course websites on Windows.

(v) configure Squid to realize the acceleration of the entire site agent, and configure FreeNAS for automatically backup Windows.

(vi) improve the migration work, e.g. configuring FTP (File Transfer Protocol) Service for Remote Access to the Router or Switch, configure firewalls and the Intrusion Detection System.

Application Value

Virtual teaching and research platform is an important basis to popularize and apply diversified teaching and research support network. The basic requirement of providing effective teaching and research support service is the reliability and scalability of the network services. Using virtualization technology to schematize and optimize the virtual teaching and research platform in order to ensure its flexible and reliable service has great practical significance for education informatization. Applying virtualization technology and taking the advantages of the use of code with 64-bit virtual memory addresses, a physical-to-virtual machine conversion can be quickly and smoothly performed, which make the virtual teaching and research platform run safely and efficiently, and also provide reliable information to serve diversified teaching and research support.

(i) The implementation of virtualization technology realize a migration from one physical server to multiple virtual servers, one operating system environment to multiple system environment, lower to higher security levels of isolation protection, to reach a complex site environment stably and reliably. Firstly, virtualization technology reduces the number of physical servers required for management, by providing virtual redundant path to reduce single point failure rates, correspondingly, management maintenance workload decrease, managers can focus on making the server optimized configuration scheme to ensure to provide high availability services. Secondly, using virtualization technology, data center can divide virtual resources on a physical server dynamically according to different demand of resources, and provides extended resource pool, greatly improve the utilization rate of each server, and then reduces the server acquisition cost. Thirdly, by means of virtualization technology, all the applications are running in a virtual environment, which leads to the separation of the hardware and software. Migration technique can minimize the impact of unpredictable fault to service.

(ii) The introduction of network storage service can be thought of the most distinctive design. It resolves the storage space division and data offline backup. Firstly, virtualization provides shared storage, and separates the virtual machine's migration and storage system migration. When virtual machine migrates, virtual machine configuration and image file are intact, which reduces the required amount of data transferred. Second, storage virtualization could realize hierarchical storage data. According to specific application need of performance, such as storage, speaking, reading and writing, the higher requirements on performance of data migrate to the performance standard of disk array, while the old disk array as a secondary storage will be used to store backup data. Third, storage and server system directly articulated undoubtedly make writing and reading more efficiency. But it also inevitably faced with more spare space in sometime which is a waste, less
spare space in another time which is not enough for use. Using FreeNAS to change local device to a network storage device, can improve the storage space utilization rate and data security ability greatly.

(iii) Virtualization simplifies the deployment of the server, makes the management and maintenance work the server more flexible. Multiple virtual servers of different operating system run and are monitored in the unified platform independently, standardized hardware reduces the failure of compatibility. Firstly, multi-set of virtual servers based on one physical network adapters communicating with external network, sharing underutilized network bandwidth will improve the utilization of hardware resources. Secondly, the use of internal label switching shortens the address search time in the process of each jump. Thirdly, end-to-end security isolation is provided for online business by the access control, isolation, node virtualization technology, all communication between the virtual networks is transparent, not audio monitoring. The firewalls and other network security equipment would make virtualization network security protection more completely. Fourthly, the characteristics of network virtualization and the centralized management reduce the cost of investment in the maintenance and construction of data center network, avoid possibly redundant construction due to the growth of the business data, and realize the purpose of cost savings.

Conclusions
To adapt to the construction and management of virtual teaching and research platform, we use the Convert Physical Server migrating from Windows to Linux system to create a new virtual machine. Applying virtualization technology and taking the advantages of the use of code with 64-bit virtual memory addresses, a physical-to-virtual machine conversion can be quickly and smoothly performed, which make the virtual teaching and research platform run safely and efficiently, and also provide reliable information to serve diversified teaching and research support.

Of course, the application of Virtualization network technology must be based on the conditions of hardware facilities. Their usability and availability after migration should be fully considered to ensure the coordination between each system. The migration costs and implementation feasibility also need to be considered. Even though the new technology has many benefits, it will also incur risks due to current conditions’ change significantly. Establishing suitable risk control measures may necessarily be good for the platform. In addition, the construction of network virtual teaching and research platform is a long-term work, virtualization technology should not only meet the needs of the various types of site construction, also needs to take into account the technical principles and manageability requirements. Practically, more attentions should be paid to deal with the collaboration of management and technology, to find ways to solve problems that complex application services function will face with, and to balance the resource in the multiple distribution centers, in order to provide effective support for the development of education informatization.

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References