Application of Server Virtualization Technology in Power Information Construction

Hai Yu¹,*, Jing Guo², Lei Wu², Shun Wu³, Bo Peng³
¹State Grid Liaoning electric power company, liaoning, Shenyang 110000, China
²Sichuan Star Information Technology Co., Ltd, Chengdu 610000, China
³State Grid North Hebei Electric Power Co., Ltd, Beijing 100000, China

*Corresponding author e-mail: 840183300@lndl.org

Abstract: In recent years, with the development of our country, higher requirements are put forward for the power supply. Electric power enterprises want to improve their comprehensive strength, but also in order to adapt to the development of the times, it is necessary to carry out information construction. However, the traditional physical server has many shortcomings in the enterprise information construction. Therefore, this paper puts forward the application research of server virtualization technology in power information construction. This paper compares and analyzes the resources needed by physical server and virtual server, and points out that virtual server have obvious advantages of high information security, low energy consumption, high utilization rate and low maintenance cost. In order to make the virtual server successfully applied in the information construction of electric power enterprises, this paper puts forward the operation guidance standard of server virtualization implementation process, and emphasizes that the integration of server resources should be done well in the process of information construction. In order to ensure the security of server virtualization process, this paper lists the detailed security measures of server virtualization. According to the operation of the above steps, the power enterprise can complete the information construction work better through the virtualization of the server. It is considered that the use of virtual server in enterprise information construction is a big trend, which conforms to the development of the times and improves the utilization rate of resources.

Keywords: Virtual Server, Virtualization Technology, Informatization Construction, Power Informatization

1. Introduction
The concept of virtualization technology first appeared in the 1960s. It has been widely used for automatic partition of various large machines and hardware devices. Virtualization system technology
is also widely used in small virtual computers. A small virtual machine is transformed into several small virtual computers by several virtual machines. As time goes by, micro application computers and new x86 servers have been gradually developed to provide more efficient and economical working methods [1-3]. Therefore, in the 1980s, virtual reality technology is no longer widely accepted. In the 1990s, researchers have begun to actively explore how to use intelligent virtualization technology to effectively solve some complex problems related to the rapid demand of cheap intelligent hardware market. As an emerging application technology, the application of virtualization professional technology has been widely recognized by the market [4-6].

With the continuous development of power enterprise management information in China, there are still some complex problems in the traditional power server management system infrastructure of power enterprises, such as unbalanced power resource allocation, aging equipment function, and high single point service failure rate and so on. In view of the increasing number of users of enterprise application management system in the future, if we do not purchase new system hardware operation and maintenance equipment and deploy new application management system in traditional operation and maintenance mode, it is inevitable that major problems such as high system operation and maintenance management cost and poor operation and maintenance management will appear directly [7-8]. Therefore, we can effectively integrate the existing network application management system by using the server network virtualization management technology, improve the comprehensive utilization rate of the existing server resources, and reduce the network operation and maintenance management cost, so as to fully meet the future network application development needs of China’s power enterprises [9-10].

This paper makes a detailed comparative investigation and analysis on the resources needed by physical server and virtual server. According to the survey results of this paper, the traditional physical server has the disadvantages of low security performance, low resource utilization and high maintenance cost. Aiming at these problems, this paper studies the application of server virtualization technology in power information construction. This paper focuses on the analysis of the advantages of server virtualization in the informatization construction of power enterprises. Through the relevant comparative experiments, it can be seen that the virtualization operation of the server can effectively improve the ability of resource management, information security, utilization rate and resource balance in the information construction of power enterprises. Through further research, this paper puts forward the guiding standards of server virtualization implementation process, integration of server resources, and security measures of server virtualization. Through these steps of operation, power enterprises can better complete the work of information construction.

2. Server Virtualization and Enterprise Information Construction

2.1 Principle of Server Virtualization

The concept of virtualization has been around for a long time. In short, virtualization is the process by which users use certain software programs to make them look like other applications. If this technology concept is widely applied to various computer operating systems, it can be said that different computer users can see different operating systems. A simpler form of system virtual automation is virtualization on virtual operating system. One virtual computer can run multiple virtual operating systems with the same operation type at the same time. This new form of virtualization can be used to isolate multiple virtual servers of different operating systems. The definition of virtualization underlying solution the underlying machine refers to all the machines that need to be virtualized.

2.2 Server Virtualization and Enterprise Information Construction

At present, many large-scale electric power enterprises generally choose to adopt virtualization management technology based on server when they carry out system integration and upgrading
transformation of power server. Server environment virtualization technology is a kind of virtual technology that can run multiple virtual operating systems on the same virtual host. It encapsulates the environment files of traditional multiple server applications into a removable virtual archive system file. Through the application function, it can provide multiple application services of different platform operating systems for a variety of user devices at the same time. Enhancing system data security, prolonging the life cycle of power software system, improving the resource utilization rate of system servers and reducing the total management cost of the system are very suitable for the informatization system construction and industrial development of China's power enterprises.

3. Comparative Analysis of Resources Needed by Physical Server and Virtual Server

An important feature of server virtualization is energy saving. In power enterprises, the number of original physical servers is a fixed value, which will not change under normal circumstances, but the number of virtual servers generated by network architecture is variable. This shows that the enterprise can adjust the virtual server according to its real-time situation. The more servers, the higher the power consumption. Through the virtual network architecture, the higher the energy saving rate of the server. In order to study the resource comparison between physical server and virtual server, this paper makes a further investigation.

Table 1 shows the resource comparison between the physical server and the virtual machine. From the comparison results, virtual machine has obvious advantages in improving memory utilization, CPU utilization and space saving. VCenter is a scalable and scalable platform, which can effectively maintain the business on the virtualization platform, shorten the recovery time, and can centrally control and manage the virtual machine server, so as to reduce the operation and maintenance costs.

|                      | Physical server | Virtual server |
|----------------------|-----------------|----------------|
| Space utilization    | 3U-5U           | unwanted       |
| network connections  | Exclusive use   | Network sharing|
| CPU utilization      | 8%-20%          | 30%-60%        |
| Memory utilization   | 15%-35%         | 60%-90%        |
| Fault recovery       | 1-2 days        | Less than 1 hour|
| Operation and maintenance cost | High cost | Low cost |
| Physical optical disk drive | Exclusive use | Network sharing |

4. Discussion

4.1 Application Effect Analysis of Server Virtualization in Power Enterprise Information Construction

(1) The application rate of network server is greatly improved. On the basis of fully integrating the physical application functions of existing virtual network server, the number of existing virtual server applications is reduced and automatically controlled. Before using virtual network server, the average utilization rate of network resources using physical server and its terminal CPU is only about 13%. After being applied to the virtual memory server, the average utilization rate of virtual resources of the server and its disk CPU is only about 65%.

(2) The speed of server application and loading is accelerated. Application server virtualization technology greatly reduces the loading and reconstruction time of server applications. It can quickly upgrade and maintain hardware, deploy new applications, and meet the needs of emergency drills such as information security level protection and accident recovery of electric power enterprises without several weeks of change management preparation and long-term operation process.

(3) The server can be managed uniformly. The server can be virtualized and managed according to the priority of IT resources and business, and the resources can be allocated according to the needs.
There is no need to worry about the upgrade, maintenance and compatibility of the old system.

According to the comparison results in Figure 1, compared with traditional physical servers, virtual servers have obvious advantages in performance, management tools, platform support and migration, and each index in the evaluation score is higher than 20%. Analysis shows that this is mainly due to the network architecture of virtual server, which greatly enhances the compatibility and flexibility of the system. But the traditional physical server has no advantage in this aspect and consumes more resources.

![Bar chart showing comparison between virtual and physical servers](image)

**Figure 1.** Comparative analysis of main performance between virtual server and physical server

According to the comparison results in Figure 2, compared with traditional physical servers, virtual servers also have significant advantages in resource management, information security, utilization and resource balance. In terms of single score, the score of each index has been greatly improved, especially in the aspect of information security. Analysis shows that this is mainly due to the virtual server can more scientific and reasonable use of resources, so it has a good advantage in resource management and utilization. At present, virtual server is the preferred scheme in the information construction of power enterprises. Virtualization of the server can improve the security of information, reduce energy consumption and improve utilization.
4.2 Virtualization Implementation Process

(1) Before the implementation of server virtualization, it is necessary to investigate the physical server load system of each application in detail, including operating system, CPU, memory load, network bandwidth, disk usage, etc., and carefully record and analyze the contents, so as to find out that the application system with low CPU and memory load can be virtualized under suitable conditions.

(2) Plan the project, organize and formulate the overall design plan of the project. After the evaluation of two expert groups, the project team edited and modified it for many times. The system problems and security risks that may occur in the process of enterprise server virtualization are predicted, and the security fallback solution is formulated to ensure the security and high availability of cloud business management system.

(3) According to the overall implementation planning objectives of the project, the overall placement space of the related hardware supporting equipment is planned in full consideration of the energy saving and heat dissipation of the relevant equipment and the sustainable expansion of the future equipment.

4.3 Consolidate Server Resources

The server resources stored in enterprise application data center are mainly application server and storage management server of enterprise data center. Application server resource virtualization technology integrates the virtual physical server resources of the whole data center by installing a group of virtual service management software, and then merges many abstract and separated service resources into one or more logical virtual service resources. In this kind of resource integrated management of virtual server, the virtual real machine and physical service equipment can be isolated from each other in the data center system, so as to avoid the mutual interference of physical
equipment.

4.4 Server Virtualization Security Measures

The security of virtualization is a complex problem. In terms of security deployment, we should not only consider the security of virtual machine itself, but also consider the security of virtual machine host and network environment. It can be considered from the following aspects:

1. Establish network partition, optimize network separation settings, and isolate wireless network. According to the network virtual machine and server data of different network service types, different network VLANs are identified as different service-oriented VLANs, so as to minimize the network data security vulnerability when the network is transferred from different partitions to another virtual machine service partition through different virtual server partitions.

2. Ensure that the software system configuration is reasonable, seriously organize and learn to correctly use the file sharing service management system functions. Unless explicitly required by the software business, disable file sharing should be temporarily stopped.

3. Install anti-virus software on each virtual machine and scan virus automatically every day.

4. Automatic development of appropriate hardware virtual machine data backup solutions, through the virtual backup solution software automatically real-time backup of important hardware data every day.

5. Conclusions

In the application research of server virtualization technology in power information construction, this paper compares and analyzes the resource advantages between physical server and virtual server. And through the comparative analysis of the results, this paper believes that in the process of power enterprise information construction, the use of server virtualization strategy can improve the security of enterprise information, and the utilization of the server has also been significantly improved. Because the virtual server adopts the network architecture, the number of virtual servers can be increased or decreased according to the real-time demand of power enterprises, so as to maximize the utilization of resources, especially in the server CPU and memory utilization. In the related comparative study, the traditional physical server has obvious technical shortcomings compared with the virtual server. This paper believes that the virtualization transformation of the server in the power enterprise information construction is a correct and preferred scheme. Power supply is the basis of the development of enterprises and even the country, and the information construction of power enterprises is a new requirement for power enterprises in the new era. Only when the server virtualization is applied well in the information construction, can the enterprise improve the information construction better and faster.

References

[1] Winarno, I., & Ishida, Y. (2015). Simulating resilient server using xen virtualization. Procedia Computer ence, 60(1), 1745-1752.

[2] Nagesh, O. S., Kumar, T., & Venkateswararao, V. (2017). A survey on security aspects of server virtualization in cloud computing. International Journal of Electrical & Computer Engineering, 7(3), 1326-1336.

[3] Wu Dongchen. (2019). Construction and application of campus server virtualization platform. Computer Knowledge and Technology, 015 (018), 315-316.

[4] Ogunyemi, A., & Johnston, K. (2017). Is server virtualization implementation in business and public organizations a worthwhile investment? International Journal of Information Technology & Decision Making, 16(03), 711-736.

[5] Winarno, I., Okamoto, T., Hata, Y., & Ishida, Y. (2016). A resilient server based on virtualization with a self-repair network model. International Journal of Innovative Computing Information and Control, 12(4), 1059-1071.
[6] Chuang, CF, & Chen, SS. (2017). To implement server virtualization and consolidation using 2p-cloud architecture. Tamkang Institute of Technology, 20 (1), 121-130.

[7] Wen Zhongqiu, & Wang Xiaoli. (2019). Information construction scheme and application of hospital drug logistics management based on quality traceability. China Digital Medicine, 014 (007), 94-96.

[8] Gong, F., & Tao, L. (2017). Analysis of application defect of fuzzy evaluation algorithm in the construction of enterprise information management platform. Boletin Tecnico/Technical Bulletin, 55(19), 419-424.

[9] Zhou Xueyan. (2019). Application of erp in enterprise management information construction erp in enterprise management information construction. Heilongjiang Science, 010 (001), 128-129.

[10] Amery, W. K. (2015). Coming full circle in pharmacovigilance: communicating safety information to patients through patient package inserts. Pharmacoepidemiology & Drug Safety, 8(2), 121-129.