

Analysis and Study of Network Resource Management Technology of Modern Data Center

Wenyang Zhang, Bilong Xiao^{a,*}

Ningbo Duacarrier Electronics Technology Co.,Ltd., Zhejiang 315191, China

^ajszc@shipgroup.com

Abstract: The development of computer technology drives the revolution of data center network in reverse. Network resource management, as a critical part of modern data center, has become a research focused point of the industry and academic circle. Data center network resource management technology, containing cloud computing management technology and network management technology must actively response to the revolution. The paper mainly analyzed the modern data center network resource management technology from the aspect of cloud computing technology.

Keywords: Data center Network resource management Cloud computing

1. INTRODUCTION

With the development of the times, people have paid more and more attentions on the application of data in the life. For example, the emergence of cloud computing and cloud data reflects the rapid network development on the one hand, and indicates the significant impact of data on people's life. As known to all, data is the basic element of Internet. And data is the basic platform for cloud computing as well. Data computing and data processing capacity are important marks for the information technology development level of an era. Data Center, as its name implies, is definitely the center of data processing and data storage. Its importance has been widely recognized by all sectors of the society. In the industry, both Google and Microsoft have started to get involved in and launch their own data centers. And even domestic major e-commerce and telecommunications sector also started to build their own independent data centers. And the academic circle has started to discuss data center fiercely and extensively in recent years. Consequently, it is urgent and necessary to study the network resource management technologies of data center under such a background.

2. NETWORK RESOURCE MANAGEMENT TECHNOLOGY OF DATA CENTER

To get a clean definition of network resource management technology of data center, first of all, we should learn what cloud computing and network resource management based on cloud is computing.

The concept “cloud” was developed in recent years. Cloud computing is also a project developed and extensively launched in recent years. What is cloud computing? Generally, it should be understood from the following three aspects. Firstly, computing of huge amounts of information. Cloud computing was proposed mainly with the purpose to serve for computing of huge amounts of information. And the development of mainframe computer is mainly for computing of huge amounts of information as well. Secondly, distributed computing. It is an essential application of cloud computing to summarize and classify the huge amounts of information thus to study certain rules among them. Thirdly, perform parallel data calculation which is an important feature of cloud computing. Cloud computing capacity can be significantly enhanced through parallel data computing. And the time required for computing has been greatly reduced. In the Internet age, with the increasing maturity of mobile 4G technology, cloud computing will be more and more extensively applied in production and daily life. But it is important to note that cloud computing is not free, and it needs to charge a certain fee.

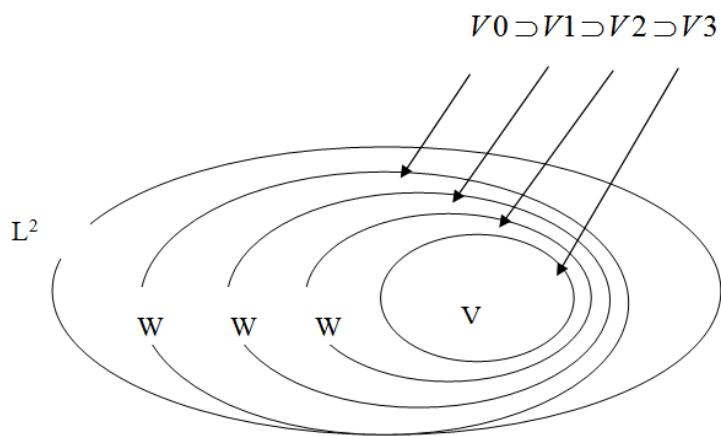


Fig. 1 Nested wavelet multiresolution sub-space

So how to use cloud computing in network resource management? Some other issues will be involved. First of all, we need to know relevant management modes of cloud computing. Generally, there are two types available: The first type is active component which means that all resources of the system can be used repeatedly and all the data can be used with rebate. The second type is passive component. Comparing with the two, the prior one is a traditional computing method and the later one is a non-traditional computing method. We can see from the classification that in Cloud computing, resource scheduling system should be the most critical part, and it plays a crucial and decisive role at network resource management.

Generally speaking, there are mainly three types of resource scheduling modes for cloud computing. The most common one is concentrated scheduling which completes data exchange via the center dispatching center. The remaining two resource scheduling methods are hierarchical and distributed scheduling modes.

3. NETWORK RESOURCE MANAGEMENT TECHNOLOGY OF DATA CENTER

For Internet data center, the network resource management technology adopted is mainly as virtualization technology. And virtualization technology is the main orientation for the network resource management in the future. Therefore, it can be seen that the network resource management technology of internet data center is relatively advance. And for China at current stage, data center will definitely develop to virtualization inevitably. And the utilization of network resource management technology is virtualized as well. Virtualization is mainly realized through virtual machine, namely treating the virtual machine as the basic unit for realizing resource allocation and resources scheduling. Performance isolation and resource scheduling can be realized through treating the data center as a flattened network by data center network.

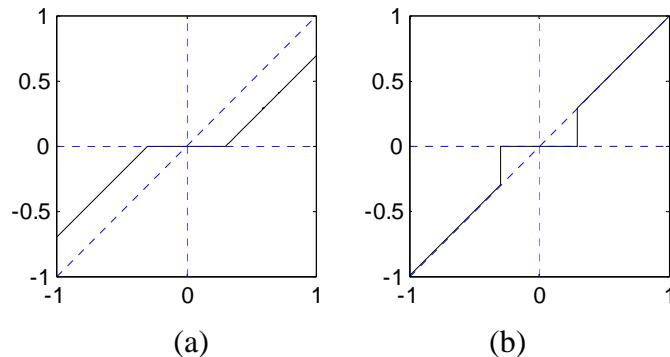


Fig. 2 Two traditional threshold functions (Fig. a shows the soft threshold function; Fig. b shows the hard threshold function)

Then how to achieve virtualization? It is mainly achieved through a logical manner at present, and realize automatic network resource allocation in a logical manner which have further solved a problem, namely the automation network resources management is realized logically. At present, a majority of enterprises in China market have realized virtualization management. However, the data center of each company have not been fully virtualized with certain space for technology promotion and development.

We will discuss how to achieve network resource management below. First of all, a data center should be built by utilizing related virtual technology. The data center shall ensure complete virtualization, full virtualization of the storage process and virtualization management for network equipment. According to incomplete statistics of the relevant

organizations, about 70% of management costs can be saved by adopting virtualization technology. In addition, virtualization technology not only has the advantage of energy saving, but also the characteristics of load resistant. According to the above paragraphs we can know that cloud computing can perform parallel data calculation. It can realize multiple operations without mutually contradicting with a single system. So how to realize the virtualization management of network resource, or in another words, how to realize network virtualization technology?

First of all, we should realize network virtualization within the host, namely introduce the virtualization technology to the host and establish distressed channels among multiple virtual machines thus to realize complete communication thus to build the basic frame for resource management. And there are mainly three methods to realize the network virtualization: direct virtual exchanging technology, data exchange via external exchangers and data transfer completed by adopting a network card.

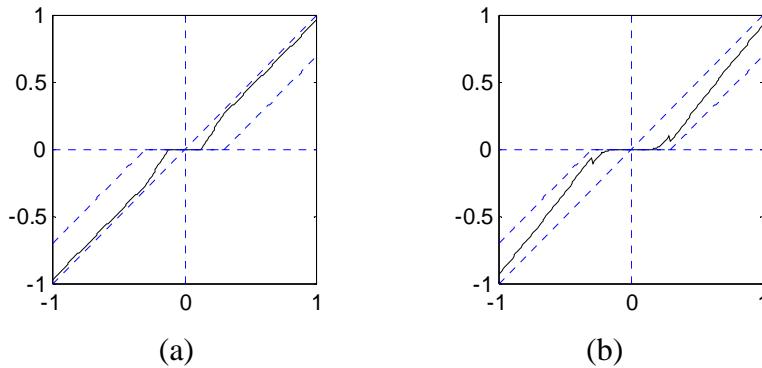


Fig. 3 Two integrated threshold functions (Fig. a shows the optimized threshold function 1; Fig. b stands for the optimized threshold function 2)

3.1 Network stability recognition based on the optimized wavelet threshold function

Step 2, virtual technology among backbone networks. If the first step is to build a basic framework, the second step is equivalent to achieving blood transfusion. And there are three methods to realize backbone network virtualization technology as well: virtualization after resource separation, virtualization during resource integration and fair share of virtualization technology. The three methods have their own advantages and objects. Take the first method as an example, it is to realize resource isolation. Since traditional resource isolation has many problems, the most common virtualization structure is SecondNet which is applicable to simultaneously uterine contraction of many users. The workflow is that: First of all, it will virtualize each user to a data center, and assign fixed bandwidth to them. And then it will complete resource utilization through corresponding algorithm. Comparing with the other two methods, this method belongs to paid service. Therefore, the user shall choose between resources and costs. While for data center, it can be transparent and fair to the most extent.

Virtualization is a method with the purpose to promote the equitable distribution of resources to ensure reasonable distribution and sharing of resources.

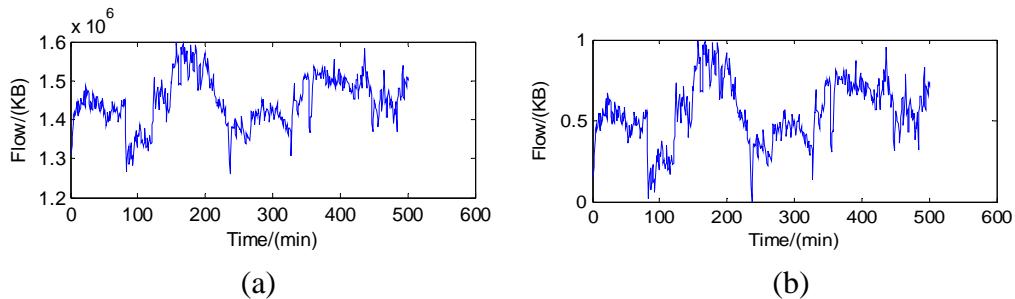


Fig. 4 Changing network flow under the stable status (Fig. a is the original signal; Fig. b is the signal after normalization)

The progress of technology will expand the modern data center. And traditional resource management technologies will certainly cannot satisfy the development requirements. Consequently, automation management is necessary for data center development while reviewing from this point of view. Corresponding technology innovation shall be carried out during the development progress thus to promote reasonable distribution of resources and generate intelligent management mode which is a basic development direction.

4. CONCLUSION

With China's growing national strength, China has been playing increasingly important role in world stage. And the technology development shall be consistently required. And data capacity, as a national force symbol, shall be promoted correspondingly. So all kinds of data centers will appear constantly, and will be constantly updated. And network information management within data center has been challenging people's wisdom. The application and development of network resource management technology not only can effectively promote resource management, but also can enhance the significance of data center. Within data center, people will pay more and more attentions on the development of cloud computing technology. The virtualization management means of cloud computing technology will certainly become the main direction of network resource management. For modern data centers, they can only get improved and progress by referring to new technologies and continuous development of virtualization management techniques, and can win the survival and development opportunities in the coming competition.

ACKNOWLEDGMENTS

This work was supported by 2016 Ningbo international science and technology cooperation project (2016D10009).

REFERENCES

- [1] Fliervoet J M, Geerling G W, Mostert E, et al. Analyzing Collaborative Governance Through Social Network Analysis: A Case Study of River Management Along the Waal River in The Netherlands [J]. Environmental Management, 2016, 57(2): 355-367.
- [2] Agryzkov T, Martí P, Tortosa L, et al. Measuring urban activities using Foursquare data and network analysis: a case study of Murcia (Spain) [J]. International Journal of Geographical Information Science, 2016, 31(1): 1-22.