Research on Application and Development of Cloud Computing Technology

Lei ZENG

School of Information Science and Enginering, Chongqing Jiaotong University, Chongqing, 400074,CHINA

Abstract: The cloud computing technology as a super computing pattern is more and more concerned by scholars and companies, is known as the third big technology revolution in the field of computer. The concept and key technology of cloud computing was studied. The cloud computing technology was applied to the smart grid, banking, hospital information system, library and military information system. A deep analysis of the application and development was made. Finally, research results showed that the cloud computing technology had the wide development prospect.

Keywords: The cloud computing technology; Super computing pattern; Key technology

1. Introduction

Cloud computing technology is booming in recent years. It is a further development and commercial realization of distributed computing, parallel computing and grid computing. It can use the cloud computing to share computing power and storage capacity with the Internet, can also prevent the waste of resources and achieve the maximization of benefit according to the demand distribution and utilization at the same time. Cloud computing technology has attracted attention for its unique advantages, and it will be applied to all kinds of industry and become an inevitable trend, a lot of gratifying results will be emerged in the future.

2. The Concept and Theory of Cloud Computing Technology

At present, the cloud computing technology has not yet formed a unified concept, but all kinds of concepts were defined according to the core feature of cloud computing. The core feature of cloud computing is to manage and control a large amount of computing resources with the network connection and constitute a computing resource pool to provide users with on-demand services.

Cloud computing is derivative of distributed processing, parallel processing and grid computing, and it splits a huge computational processing program into numerous smaller subroutines automatically by the network. Then it returns the results to the user after computing and analysis by a vast system which composed of multiple servers. In a word, the basic theory[1] of cloud computing is that the computing is distributed on a large number of distributed computers, not local computers or remote servers, and the operation of data centers is similar to the Internet. Essentially, the cloud computing is that every user enjoys the services such as storage, computing, database and interaction through remote connection.

3. The Key Technology of Cloud Computing

3.1. Cluster system

To prop up the operation of the cloud computing system is cluster system, which is composed of a number of homogeneous or heterogeneous computers. In this environment, the distribution of the computation is constituted, and the modules which are solved are interrelated. The accuracy of data calculation depends on the cluster system.

3.2. Virtualization technology

Virtualization technology is one of the most important technologies for providing the basic layer support for cloud computing services. If there is no virtualization technology, cloud computing services just be an empty talk. Virtualization technology[2] is a calculation form to provide users for services with virtual resources, it is useful to allocate the computer resources and improve the efficient of service, it can manage and use the physical resources effectively, which achieve a dynamic framework. The advantage of virtualization is that could strengthen the flexibility of the system, so the service cost is reduced to the lowest, and the utilization of resources is effectively improved.

3.3. Parallel computing

Parallel computing means the process of solving the problem with multiple computing resources, which is an effective method to improve the computing speed and the processing power of computer system. Its basic theory is to use multiple processors to solve the same questions. In other words, the problem is resolved into some parts, and each part carry on parallel computing by an independent

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processor. The parallel computing system can be a super computer which is specially designed and composed of multiple processors, or a cluster of several independent computers interconnected in a way. With completing the data processing by the parallel computing cluster, and then return the results of the processing to the users.

4. The Application of Cloud Computing Technology

4.1. Smart grid based on cloud computing technology

With the development of smart grid technology and national interconnected power grid, the data and information of the future power system will become more complex and show a geometric progression growth, the association between all kinds of information will be more closed. At the same time, the on-line dynamic analysis and control which required computing power of power system will also greatly improve, the computing power of the current power system has been difficult to adapt the new application of the demand. Based on the above idea, cloud computing can be lead into the power system, and then construct the smart grid based on cloud computing system, smart cloud emerged which is private cloud of power system. Intelligent Cloud can achieve integration of existing computing power and storage resources with the full use of physical network of power system, so it is valued to improve data processing capacity and real-time control and advanced analysis application computing needs. Smart cloud provides a variety of services to the user and power system applications in a transparent way.

4.2. Banking system based on cloud computing technology

With the rapid development of information technology, the financial industry is facing increasingly fierce competition. The high degree of information sharing and the security and reliability of data are the priority issues of the system construction. With the intensification of competition in the domestic banking industry, banks will continue to deepen business philosophy which customers as the center and high-quality business as the core. The improvement of bank system must put forward higher requirements, and cloud computing technology is the best choice which could enhance data security and speed up the information sharing, improve service quality, reduce costs and gain competitive advantage. The advantages embody in the following four aspects: (1) Combining cloud computing with data mining technology can enhance the bank's data processing capabilities and quickly make business decisions. (2) It can enhance the reliability and storage capacity of the banking data to force majeure events such as earthquakes and fires, and it is benefit to provide strong support for the bank's growing business

data. (3) It can improve the security of banking data transmission to prevent a variety of viral threats and malicious intrusions. (4) It can reduce the overall cost of the bank.

4.3. Hospital information based on cloud computing technology

Hospital as an important unit of the health system is extremely complex in the information process and hospital as the important composition part must dissolve in the information society, serve to the society and serve to the people. Hospital information should need to change the management mode of the hospital, and regard digital management and information management as the core. At the same time, it also need establish and improve the hospital information processing system, hospital office automation system, medical consultation system and health counseling system. Due to the different hospitals use different kinds of computers, software and peripheral storage devices to store data and image. Between different health institutions and doctors' offices, data interoperability has some problems.

Based on Web, servers, storage, databases, and other cloud computing architecture, software can provide the integration platform for worldwide medical researchers and workers. Cloud computing[3] can process intensive medical research and data intensive medical applications and cloud computing technology can also provide data study and analysis integration of the medical field. Based on these characteristics of cloud computing, cloud computing technology is applied in the hospital information which can help solve the problems encountered in the implementation of the regional health information network.

4.4. Library system based on cloud computing technology

Cloud computing technology is also bound to be widely used in the library as a data center, the library will also benefit from the upcoming cloud era. Combined with the characteristics of cloud computing and the reality, cloud computing technology will give the library work the following profound changes: (1) Ensure the server running and the maximum of the error probability. In the current library, the library can't work and provide normal service to the user once the server fails. But in the cloud computing model, because there are millions of servers in the cloud, it can really continue to provide security services. (2) Get a high computing power and overcome server access restrictions bottleneck with very low cost. Application of cloud computing technology, the library can get services from cloud model with millions of servers by paying a small cost. And user's request can be got a response in the millisecond time. So the library gets higher benefits with the lower cost. (3) The sharing of informa-

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tion resources is convenient. Through the cloud computing model, the library can work together to build a library of information sharing space named cloud library, they can be real-time access to other libraries to get great satisfaction for users.

4.5. Military information system based on cloud computing technology

The military information system architecture based on cloud computing has some basic support technology. There are cloud computing resource management, virtualization, distributed data management and distributed data processing. So it is necessary to reform the existing military integrated electronic information system architecture. It can satisfy the information system of high performance, high reliability and scalability requirements, and the architecture has the following advantages[4]: (1) using the virtual technology to reduce the hardware resource construction and hardware maintenance, greatly reduce energy consumption, and reduce the system hardware maintenance costs. (2) Using distributed data processing technology can greatly improve the large scale data access and intelligence processing capacity and the real-time reliability of the system processing. (3) Using the virtual data storage can improve the real-time and reliability of the system access data, reduce the system reaction time and improve the operational effectiveness. (4) The service oriented distributed computing application framework which can be flexibly based on different operational tasks and can obtain and aggregate various combat service capability quickly. (5) Using the relevant technology like service monitoring, quality monitoring, load balancing and dynamic transfer can greatly improve the system reliability and operational effectiveness.

5. Conclusions

Cloud computing is a system which able to provide hardware services, infrastructure services, platform services, software services and storage service system to a variety of network applications. The cloud computing is a precious wealth, how to apply cloud computing technology will be research focus in a period of time and research topic in the field of computer. Precisely because of this, we must need study the security issues of cloud computing and constantly improve the safety and reliability of cloud computing environment through all kinds of effective measures and technology. It is important to promote the development of cloud computing so that can meet the needs of the majority of users.

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