Research on Cloud Computing Data Center Structure and Scheduling Mechanism Based on Internet of Things

Li Liping

Department of Science and Humanities, Shandong College of Economics and Business, Weifang, Shandong, 261101, China

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Abstract: In the era of the rapid development of the internet of things, the rapid development of cloud computing has promoted the rapid development of large-scale data centers, but also brought huge energy consumption costs. In-depth study of energy conservation in green cloud computing data centers has certain practical significance. In the cloud computing environment, the internet transfers information and data to direct transfer services. Since the emergence of cloud computing, through the continuous development of science and technology. With the continuous advancement of academia and industry, the application of cloud computing is constantly developing and deepening, and cloud computing is also moving from theory to practice. In recent years, the computer industry has developed rapidly. As a new type of network technology, cloud computing has achieved unprecedented development. Cloud computing technology has brought unprecedented changes to the entire computer industry. This article designed the cloud computing architecture of the iot data center, hoping to propose a new scheduling mechanism for the intelligent management of the data center.

1. Introduction

With the development of computer technology and the wide application of network, the construction of data center has become an important index to measure colleges and universities. Cloud computing, as a service providing model, can rely on the network to access various resources of the data center anytime, anywhere and on demand. Include computing resources, network resources, storage resources, etc. In recent years, cloud computing technology has developed vigorously, which has also promoted the climax of data center construction. As a new network application, cloud computing application puts forward many new requirements for traditional networks [2]. First, we briefly introduce the basic concept of cloud computing, and make it clear that the interconnection between data centers and within data centers is the main demand of cloud computing for the network. Then we introduce the network demand for cloud computing from different angles [3]. In order to improve the centralized processing capability of massive data, the scale of data center network is increasingly large. The data center has gradually evolved from a simple single server hosting and maintenance place to a high-performance computer centralized place integrating massive data operations and storage [4]. In order to realize the successful establishment of the green composite energy network, maximize the energy utilization rate of the system and maximize the energy efficiency, the cloud computing data center must be based on the principles of safety, economy, green and high efficiency to reliably provide services for the entire smart park [5].

For enterprises, hardware and software such as computers are not what they really need, they are just tools to complete work and improve efficiency [6]. As the underlying support platform for cloud computing, the actual performance of the data center network determines the real quality of services and applications provided by cloud computing. More and more information such as the results of high-energy physics experiments, enterprise management data, personal photos and videos are stored in the cloud data center [7]. At present, the demand for cloud computing is on the rise. For individuals, the normal use of computers requires the installation of a lot of software, and many of these software are for a fee. For infrequent users, it is often unnecessary to purchase these

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software [8]. Network services are more diverse and complicated, and requirements for performance, reliability, and manageability are becoming more and more detailed. This requires the support of new design concepts and operating mechanisms, especially as a basic part of information transmission [9]. In order to better host cloud computing-related application services and respond more favorably to tenant resource access requests, it is undergoing unprecedented changes. This article designed the cloud computing architecture of the iot data center, hoping to propose a new scheduling mechanism for the intelligent management of the data center.

2. Design Principles of Data Center Network Architecture for Cloud Computing

The design of data center network architecture is an important link in the process of cloud computing data center construction. The process must be strictly in accordance with the relevant provisions, and the designed architecture must conform to the corresponding technical and performance indicators. Network traffic shows an exponential growth trend, which brings higher requirements for communication bandwidth and average network delay to the data center network as the underlying support platform. Long-term practice shows that the network failure rate will increase rapidly with the increase of the number of system nodes. Modular design can not only simplify the data center environment and enhance cost control, but also significantly improve the work efficiency of the data center and reduce operational risks [10]. However, in actual multi-domain networks, the global optimal solution cannot be found due to the opaque information in the domain. Therefore, we need to design the algorithm in two steps according to the inter-domain network information and the topology information of each domain manager. Traditional electrical interconnection data centers have gradually been unable to meet the demand, while optical interconnection technology has incomparable advantages over electrical interconnection in many aspects. Network configuration failures account for the largest proportion, followed by failures of unknown causes. With the expansion of the network scale, the interconnection between nodes becomes more and more complex, which makes the network configuration more difficult. Virtualization technology mainly refers to the formation of a virtual pool of shared resources by pooling physical resources. The system needs a process of promotion, application and upgrade. Different voices will appear in this process, which requires the construction department to obtain the support of decision makers. Figure 1 is an equalizer architecture model.

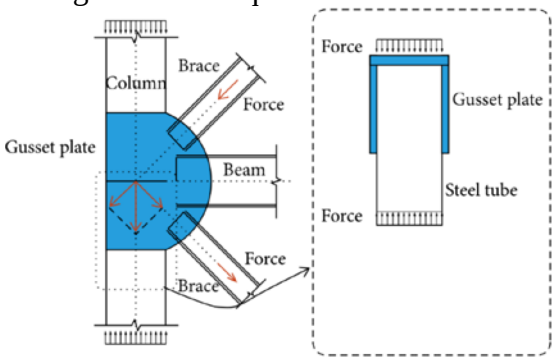

Fig.1 Equalizer Architecture Model

The data center is an important infrastructure supporting cloud business. With the rapid development of cloud computing, there is an increasing demand for cross-platform services, high network bandwidth, virtual machine migration, user privacy, and security. Traditional network topologies face issues such as high cost, limited scalability, and complex management strategies. The whole network consists of programmable switches of the same model, and the middle server divides the network into two special variants of symmetrical structures. The number of servers the network can accommodate depends on the number of ports of the switches used to build the network, and the servers in the network are divided into groups. In a single domain policy, all topology information is known. Therefore, it is easy to obtain a bandwidth reservation scheme that meets the request.

3. On the Construction of Virtual Network and Control of Management Mechanism

3.1 Algorithm Design Problem

In the operating environment of cloud computing technology, data centers often use several virtual machines running on a server to provide different types of services required by customers. The use of virtual machine technology greatly improves the processing and response capabilities of data centers. Due to the high dynamic and burst characteristics of data center network traffic, it is difficult to effectively predict and schedule. The circuit switch manager configures switches according to communication requirements. The traditional tree network construction method has been unable to meet the requirements of the new generation of network services [11]. This kind of structure cannot provide high enough performance requirements for bandwidth, throughput and real-time communication, nor can it provide high scalability. The switch manager is arranged in the top-of-rack switch and is connected with the topology manager to decide whether packets are transmitted through the electric switching network or the optical switching network. If the receiver corresponding to an output port is less than the number of nodes that need to send data to that port, conflicts will occur.

Due to the relatively closed and centralized management of the data center network, it is drawn by different performance requirements in the actual deployment process, showing the coexistence of various network forms. In line with the premise of cointegration test. Check whether there is a long-term equilibrium relationship between relevant variables. The inspection results are shown in Table 1.

Table 1 Co-Integration Test Results

Characteristic value	Trace estimation	Critical value
0.643	951	132.25
0.716	867	147.48
0.804	1104	143.86
0.328	886	176.23

In order to find the minimum reserved bandwidth in the model, we first run linear programming in the upper abstract topology. We obtain the minimum reserved bandwidth of inter-domain links and virtual links in each domain. Map virtual links to actual paths within the domain:

$$Q_i = C_q A_i \sqrt{\frac{2\Delta P_i}{\rho}} \tag{1}$$

The cost of a virtual link can be calculated by mapping:

$$U = RI + L\frac{dI}{dt} + E \tag{2}$$

Unifies two linear programs:

$$P_S - P_A = \frac{\rho}{2C_q^2 A_1^2} Q_1^2 \tag{3}$$

The total cost of occupying resources under the multi-domain policy is:

$$F_P = \left(P_A - P_B\right) A_P \tag{4}$$

As more switching equipment is adopted and the two network cards of the server are fully utilized to construct the network, the network capacity and fault tolerance are greatly improved. Figure 2 show that variation of aggregation bottleneck throughput with respect to switch failure.

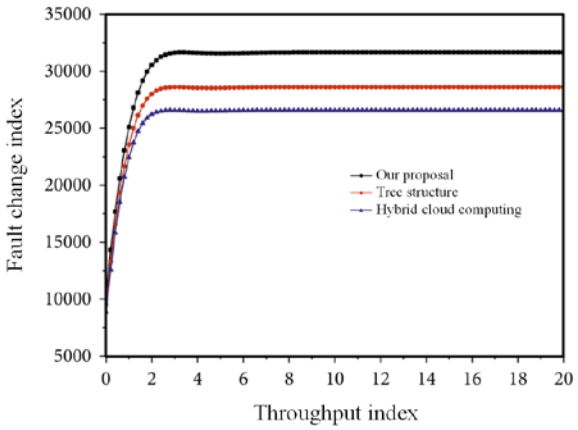

Fig.2 Change in Throughput Relative to Switch Failure

3.2 Allocation of Data Storage

The components of the virtual network will divide the traditional hardware network into virtual network systems with different service functions and run cloud computing virtual machines belonging to different applications and services in each virtual cloud computing network system. Local misconfiguration may also cause widespread failure of the network. In addition, the current cloud computing data center network tends to use commercial switches with low cost in large areas. However, the processing capacity of commercial switches is very limited. Only with the support of the decision-making level can all promotion and operation and maintenance work go smoothly, and the construction of a digital campus can gradually achieve results [12]. The traditional operational database can no longer handle the massive data accumulated by the business system. Using data warehouse technology for storage and online analytical processing technology for analysis, the minimum reserved bandwidth can be obtained based on limited inter-domain topology information [13]. The components of cloud computing virtual network structure also provide a flexible management system for multi-user data processing of cloud computing data center and effective allocation of resources under cloud computing technology, which makes the Internet of Things structure based on cloud computing technology and the existing data center combine with each other.

4. Conclusion

Since the emergence of cloud computing, through the continuous development of science and technology, through the continuous promotion of academia and industry, the application of cloud computing is continuously developing and deepening, and cloud computing is also moving from theory to practice. Intelligent Internet of Things data center based on cloud computing is the integration and application of Internet of Things technology, cloud computing, network, embedded and other related technologies in data center construction and monitoring. As the underlying support platform for cloud computing, the actual performance of the data center network determines the real quality of services and applications provided by cloud computing, which provides a strong guarantee for computing and data-intensive cloud computing applications. Cloud computing integrates physical resources such as communication, computation and storage, and provides them to users in a convenient and low-cost way, enabling users to live within their means without having corresponding underlying physical infrastructure. Cloud-oriented data centers can provide services to users on demand. Its flexible service features are an important way to solve the efficiency problem of data centers. It promotes a series of related technological innovations and a new development direction for the next generation of data centers.

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