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Data Center Based on Cloud Computing Technology

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Abstract

With the rapid development of Internet applications, the impact on the development of data centers is huge. Domestic data centers attach great importance to the acceptance of cloud computing technology and the construction of application systems. Nowadays, data centers can be effectively transformed into cloud computing development. The operating support environment has become the main consideration and focus of today's data center development. Under the concept of cloud computing, this article analyzes and builds a new data center that is more in line with the needs of resource management and information construction. Taking the development of data centers based on cloud computing technology as the research object, building data centers through cloud computing technology realizes the acquisition and organization of data and makes full use of resources. A new information resource management system with functions such as classification and query of data, overall processing and analysis of data, backup of data, information management and services has been realized. Before using the cloud computing model, the network deployed a total of 40 virtual servers, and the average CPU utilization rate was less than 40%. Since the establishment of the data center model in this article, the utilization rate of the processor has stabilized at around 95%. Therefore, the data center proposed in this paper greatly improves the utilization of data and speeds up the overall construction of the data center.

Keywords: Cloud Computing Technology, Data Center, Information Technology, Resource Management

1. Introduction

With the rapid development of cloud computing technology and the gradual promotion and deepening of its application, the informatization process of various industries in China is also gradually accelerating. Many large enterprises, universities and government departments have built a relatively complete internal network, which has basically realized the digitization of office [1]. With the increasingly wide application of cloud computing technology in various fields, some means and processes of people's daily life and work are gradually changing to higher-level requirements.

In terms of large-scale data center, Jiang H and others designed bcube to ensure the large-scale, high connectivity and small diameter of the data center network in the data center with complex internal links by building low-cost switches [2]. The data center system takes the computer, network equipment, storage processor, environmental monitoring and various security devices and software as the main information system and facilities, the information application system, network technology, storage processor, database management and other information technology and platform of the whole enterprise as the main support, and the whole enterprise staff and customers as the main services. It is the core of business, according to the unified standard requirements of the enterprise. Through the construction of IAAs layer, Hui B realizes the full utilization and dynamic expansion of infrastructure resources, supports users to build database storage environment, file storage environment and business operation environment independently, and gives users maximum flexibility in business customization [3]. Moghaddam MP uses the elastic and customized

features of IAAs layer to support data storage and business operation by dynamically allocating virtual computing resources, storage resources and network resources, and expands virtual resources on demand with the continuous operation of business [4]. The above research shows that cloud architecture combined with hybrid storage strategy and distributed database architecture can expand the original database storage capacity and the overall concurrent access ability through the increase of virtual server (integrated computing and storage) [5]. However, there are still some deficiencies in data management, such as query efficiency and convenience of analysis.

This paper takes the development of data centers based on cloud computing technology as the research object, constructs the data center through cloud computing technology, realizes the acquisition and organization of data, and makes full use of resources. A new information resource management system is realized, which has the functions of data classification and query, data comprehensive processing and analysis, data backup, information management and service. Data acquisition and organization management is an important basis for the construction of a cloud computing data center, which determines the granularity of cloud computing technology and affects the construction level and gradation of cloud computing technology. In large-scale data center mining and modeling problems, there is basic data in various fields. With the upgrading of market demand, a large number of data are mined. Terminal data requests usually require a lot of data analysis, rather than direct data. Therefore, it needs to be solved with the help of different platforms. Data centers are of great significance to the development of cloud computing technology.

2. Literature Review

Cloud computing has become increasingly popular in recent years as a means of deploying and managing data centers. The primary benefits of using cloud computing in data centers include increased scalability, flexibility, and cost-effectiveness. Cloud architecture allows for the dynamic allocation of resources, enabling data centers to easily scale up or down based on demand [6]. This can lead to significant cost savings, as organizations only pay for the resources they use. Additionally, cloud computing provides greater flexibility in terms of where and how data centers are deployed, as well as the ability to quickly deploy new services and applications. One of the key challenges of using cloud computing in data centers is security [7]. Cloud environments can be vulnerable to a wide range of cyber threats, including data breaches, denial-of-service attacks, and malicious insider activity. To address these challenges, organizations need to implement robust security measures, including firewalls, intrusion detection and prevention systems, and encryption [8]. Another challenge is the complexity of managing and maintaining cloud-based data centers, which can be difficult for organizations that lack expertise in this area. To mitigate this challenge, many organizations are turning to managed services providers, who can help with the deployment, management, and maintenance of cloud-based data centers [9].

In terms of future directions, there is a growing interest in the use of edge computing in data centers. Edge computing involves deploying data centers closer to the end-users, rather than in centralized locations. This can help to reduce latency and improve the performance of data center services, particularly for applications that require low-latency access to data. Additionally, advances in artificial intelligence and machine learning are expected to play an increasingly important role in the management and optimization of data centers in the future.

In conclusion, Cloud computing technology has become a popular method of deploying and managing data centers, offering increased scalability, flexibility, and cost-effectiveness. However, security and complexity of management are challenges that need to be addressed. Edge computing and AI/ML are expected to play an increasingly important role in the future of data center technology.

2.1. Cloud Computing Technology Evaluation Model and Data Center Design

Through the way of data fragmentation, the data content is divided into different storage devices to reduce the load of a single device and reduce the data access bottleneck. Data objects of different businesses are stored separately to improve data security and overall access performance. Each data object needs to develop an appropriate storage strategy from the business scenario. For large data objects, it needs to develop an additional data fragmentation strategy. For high concurrent access objects, it needs to develop an additional redundant storage strategy to ensure the normal application of data [10]. Distributed database has the characteristics of high transparency, multiple copies and easy expansion. The underlying nodes are transparent to users and easy to manage; data replication is realized through replica set, which has a certain fault tolerance rate and improves system reliability; distributed storage

technology such as data fragmentation is used to cope with high concurrent data access, and data can be dynamically distributed on new nodes to realize system expansion [11,12]. Geographic spatiotemporal big data generally has the characteristics of centralized writing and continuous reading. In this paper, the replica set technology of one master and one slave or one master and multiple slaves is adopted to ensure that the same data is consistent in different replicas. When the data in the master database fails, the slave database can read synchronously, ensuring the safety and availability of the system [7,13]. The number of slave libraries is determined by the amount of concurrent access. On the basis of cloud architecture, combined with the actual business operation, the number of slave libraries is dynamically adjusted [14]. The efficiency of big data center databases in data overlay analysis has been significantly improved [15]. Through the above experiments, the effectiveness of the storage method based on distributed storage technology under cloud architecture is verified [16]. The experimental results show that the technology can better solve the storage management and data application of massive, large-scale spatiotemporal big data. In these data center networks, there are mainly two ways to design the topology by using interconnection networks: one is to deploy a switch on each vertex and two servers on each edge [17]. Because each switch corresponding to the original vertex in the interconnection network is connected to a server equivalent to the vertex degree, this kind of data center network can be regarded as a vertex fission data center network. For example, the interconnection networks used in hsdc and aqdn are hypercube and augmented cube respectively [18]. The other is to deploy a switch on each vertex and only one server on each edge. For example, swcube and bcdc adopt generalized hypercube and crossed cube as the infrastructure respectively [19]. For the same interconnection network, the former has two advantages compared with the two kinds of data center network construction methods. First, it can deploy twice as many servers. Secondly, because the switch can be seen as a transparent device, a group of servers connected to the same switch can be seen as a complete figure [20].

2.2. Data Characteristics of Cloud Computing Technology

Data feature analysis is statistical analysis of data according to the characteristics of various fields of data [14]. It can be seen from the literature that there are many methods, such as distribution analysis, data comparative analysis, data statistical analysis, journal analysis, correlation analysis, etc. The analysis of data characteristics shows that the data characteristics are obvious, and cloud computing indirectly determines the construction quality of the data center, the judgment formula is as follows:

$$N = k + \frac{N_o - k}{1+(\frac{x}{T})^{P}} \tag{1}$$

The scalability and scalability of virtualization applications integrate the virtualization resources of cloud based hardware platform applications, and logically partition the hardware storage resources through virtualization technology, so that the virtual storage machine can be safely divided into resource blocks that users can store independently according to user needs, and the cloud storage server can allocate cloud storage space according to user needs [15]. For cloud supercomputing resources, CPU virtualization technology is adopted to make CPU simulate multi CPU parallel operation, allowing cloud computing technology to allocate computing resources independently according to service and application mode requirements. Applications run multiple operating systems independently in independent space, which significantly improves the efficiency of cloud computing. In addition, cloud computing technology can rely on the integration of hardware resources according to the performance and service requirements, which not only saves the construction and maintenance costs of the data center, but also greatly reduces the energy consumption and cooling costs. The Internet can centralize the management and unified allocation of cloud computing resources and cloud storage space distributed in different regions of the world, the calculation formula of resource integration is as follows:

$$In\,(\frac{k-n}{N}) = a - rt \tag{2}$$

$$\frac{dN}{dt} = rn\,(\frac{k-n}{N}) \tag{3}$$

To create a mining model, one is to have various mathematical methods of data mining, and the other is to select the appropriate drilling tools to integrate the drilling results into a cloud computing data center. There are two important problems in the construction of a cloud computing data center. First, the discovery of mining targets, the foundation

of the model and the direction of the model are the first. The method of mining objectives is customer demand survey, and demand analysis can be carried out from top to bottom. The second is the construction of collection policy, which is the key to obtaining big data, and also the basis of establishing model authority. The construction of cloud computing data centers has become difficult because of no support plan.

3. Research Method

3.1. Objects

This paper takes the data center based on cloud platform technology as the research object, taking the school as an example, mainly to collect the business scope of school functional departments, through data verification and analysis, combined with cloud computing technology, to study the construction of a data center.

3.2. Data Center Based on Cloud Computing

In this paper, the cloud computing data center is designed for cloud computing, and the design of the whole information system adopts the pont design method. The storage structure based on the NAS network can connect with the main server through the network. The establishment of a relatively unified storage system can reduce the capacity of files or information, and can also organize and plan the storage categories. When users use unified storage, they can freely allocate the stored resources. Due to the change of external environment, if users can't control the files according to the demand, they will be unable to complete the business. In practice, when users use their servers, they have to put forward corresponding requirements for the RDM of the data module because of performance problems. If the unified storage is adopted, the user does not need to make a lot of trouble to select the required data, because the unified storage will be selected by the user.

4. Results and Discussion

Changes of data center under cloud computing technology

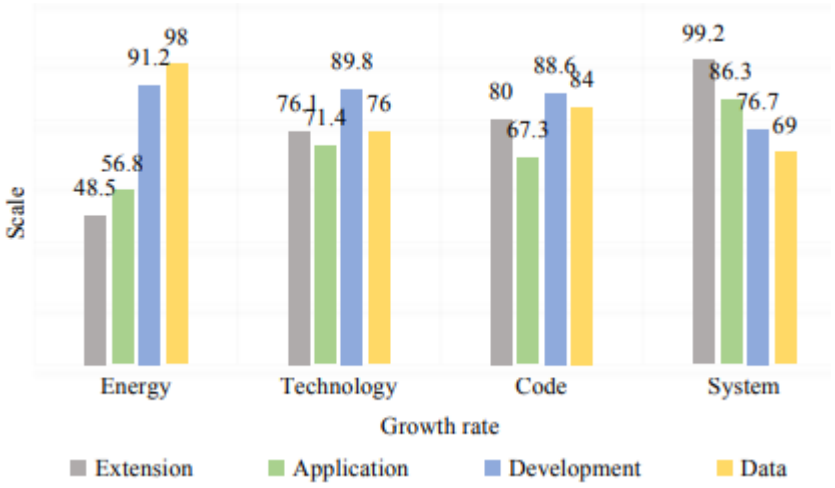

Fig. 1. Changes of data center under cloud computing technology

As shown in Figure 1, from 2010 to 2019, the total space and capacity of the global data center have doubled. It is estimated that from 2020 to 2030, the data center space will grow at an annual rate of 13.8%; On the other hand, behind the cloud computing technology to promote the vigorous development of the data center industry is its huge energy consumption.

Table 1. Difference of information level of data center

	It resources	Cost	Data	CPU	Efficiency
CPU	48.5	76.1	88	99.2	75

Reliable	56.8	71.4	64	86.3	66
Elastic	91.2	60	70	58	89
Dynamic allocation	77	79	90	78	70
Application	86	68	86	69	56
Utilization rate	69	90	76	87	98

As shown in Table 1, the cloud computing system has achieved a total of 60000 person times of application visits, including 21000 person times of mobile access, which has achieved good application results. It has built three business kanban of leader decision analysis, sales index analysis, and economic operation analysis, meeting the needs of Provincial Bureau (company) leaders and managers of planning, sales, monopoly, internal management and other major business departments to check at any time look at the needs of macro data of cigarette business in the whole province and industry. At the same time, according to the further requirements of refined management of prefecture level municipal bureau (company), we developed the prefecture level marketing analysis kanban, which not only realized the horizontal sales comparison of the whole province, but also increased the sales analysis from the vertical to the level of marketing department and customer manager, meeting the more comprehensive decision-making management needs of prefecture level management personnel for the data center. With the application and large-scale promotion of 5g, cloud computing and other emerging technologies, human society is accelerating into the digital era. The vision of a smart city and the improvement of social living standards have put forward higher requirements for network and computing. Cloud computing technology will help the Internet and new infrastructure to enter a new stage. There is no doubt that the data center industry will benefit from cloud computing technology. It will become more prosperous with the development of science and technology.

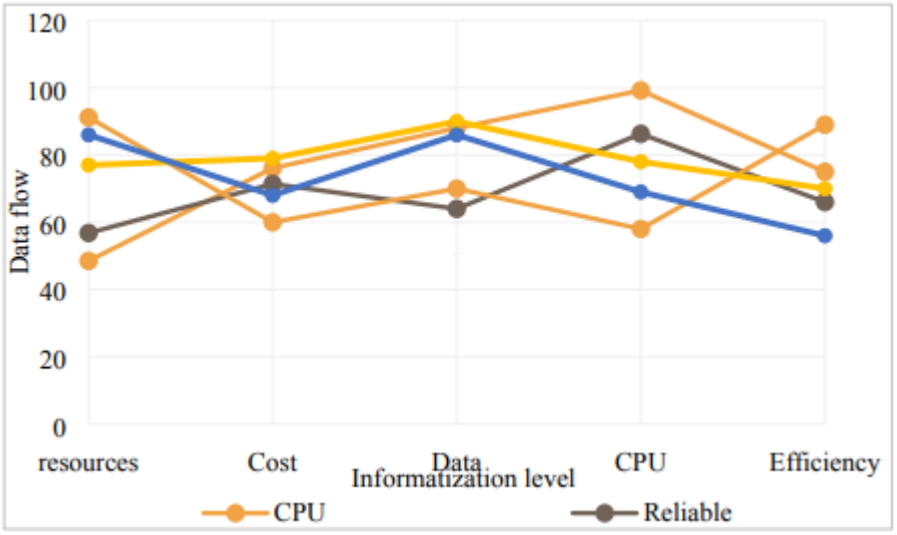

Fig. 2. Difference of information level of data center

As shown in Figure 2, with the support of cloud computing, the server is reconfigured to improve the utilization of server resources in all aspects. Before the cloud computing mode was used, 40 virtual servers were deployed in the network, and the average CPU utilization was less than 40%. Since the establishment of the data center model, the utilization rate of processors has been stable at about 95%. Therefore, the data center proposed in this paper improves the utilization rate of data to a great extent and speeds up the overall construction of the data center. At present, the data center technology based on the concept of cloud computing is still in the process of continuous improvement and development, and the data center under the traditional technology and architecture will be gradually replaced. Therefore, by analyzing the cloud computing technology of the data center, we can build a new data center that is

more in line with the needs of resource management and information construction, which can meet the actual needs, stable, reliable and reliable low cost and good value.

5. Conclusion

In order to make full use of infrastructure, implement more effective management of resources, and provide better on-demand services for users, more and more enterprises use cloud computing technology to build private cloud computing platforms within the enterprise. In this paper, through the existing resources and new resources in the development of cloud computing technology, we build a "large-scale, scalable, high-performance, cost controllable, easy operation and maintenance, easy access, easy design and high reliability basic resource system", that is, the development of data center based on cloud computing technology. Through the research of data center infrastructure based on cloud computing technology, we can effectively improve the comprehensive service management ability of its basic resources in the application system. At present, the data center technology based on the concept of cloud computing is still in the process of continuous improvement and development, and the data center under the traditional technology and architecture will be gradually replaced. Therefore, by analyzing the cloud computing technology of the data center, building a new data center that is more in line with the needs of resource management and information construction can meet the actual needs, stable, reliable and cost-effective low, with good value.

In conclusion, cloud computing technology has become a popular method of deploying and managing data centers, offering increased scalability, flexibility, and cost-effectiveness. Cloud architecture allows for the dynamic allocation of resources, enabling data centers to easily scale up or down based on demand, leading to significant cost savings. Additionally, cloud computing provides greater flexibility in terms of where and how data centers are deployed, as well as the ability to quickly deploy new services and applications. However, security and complexity of management are challenges that need to be addressed by implementing robust security measures and using managed services providers. Advancements in edge computing and AI/ML are expected to play an increasingly important role in the future of data center technology.

The integration of cloud computing technology in data centers has revolutionized the way organizations approach IT infrastructure and operations. By leveraging the benefits of cloud computing, such as scalability, flexibility, and cost-effectiveness, data centers are now able to adapt to changing business needs and stay ahead of the technology curve. This has led to increased efficiency and cost savings, as well as improved performance and availability of services. However, as with any new technology, there are also challenges to be addressed. Security remains a major concern, as cloud environments can be vulnerable to a wide range of cyber threats. Organizations must implement robust security measures and stay vigilant to protect their data and systems. Additionally, managing and maintaining cloud-based data centers can be complex, requiring specialized skills and expertise. To address these challenges, many organizations are turning to managed services providers, who can help with the deployment, management, and maintenance of cloud-based data centers. This allows organizations to focus on their core business while leveraging the expertise of specialized providers.

Looking to the future, advancements in edge computing and AI/ML are expected to play an increasingly important role in the management and optimization of data centers. Edge computing will enable data centers to be deployed closer to the end-users, reducing latency and improving performance. AI and ML will enable data centers to operate more efficiently and effectively, optimizing resource utilization and predicting and preventing issues before they occur. Overall, the integration of cloud computing technology in data centers has brought significant benefits, but also requires organizations to address the challenges and stay on top of the latest developments and trends.

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