State Machine-based Early Warning and Monitoring Script Algorithms for Cloud Computing Servers

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Abstract: Cloud computing distributes all kinds of heterogeneous and dynamic resources in the cloud computing platform, forming a huge virtual resource pool. Cloud users can access services according to the principle of on-demand use. The server system under cloud computing is mainly composed of a series of server clusters based on distributed architecture, under which the number of servers may be as many as tens of thousands. To manage such a large number of cloud computing cluster server systems and ensure their high-performance operation, it is necessary to have an effective cloud computing cluster monitoring system to monitor and control them. Based on the state machine, the author studies the algorithm of the cloud computing server early warning monitoring script. The analysis and evaluation results show that the real-time monitoring and early warning of cloud computing environment resource information has the characteristics of low system overhead and friendly user interface, which can accurately reflect the load information of the system and virtual machine, and contribute to the reliability of cloud computing system service Upgrade.

1. Introduction

In the long running process of cloud computing, SaaS software will change due to many complex factors of many system platform service layers and tenant application layers in a wide range of applications [1]. The performance of the SaaS software is degraded, and the service quality of the SaaS software is seriously degraded and the availability is lost [2]. In the cloud computing mode, cloud users can not only use various terminals, access dynamic resource pools through the Internet, acquire required resources on demand, but also experience functional services such as mass storage and big data processing [3]. The cloud computing platform is mainly composed of a series of cluster servers based on distributed architecture, and the number of servers under it may be as many as tens of thousands. The main functions of the resource monitoring system are divided into two categories: monitoring and control monitoring refers to obtaining the operating status of the monitored resources, and controlling refers to changing the operating status of the monitored resources [4]. The main functions of resource monitoring system are divided into two categories: monitoring and control monitoring refers to obtaining the operation status of monitored resources, control refers to changing the operation status of monitored resources, monitoring and resource supply to adjust and optimize to solve [5]. To manage such a large number of cloud computing cluster systems, we need to find performance bottlenecks in time to ensure the high availability of the whole system and ensure its high-performance operation. Organizations that use multiple cloud monitoring technologies can prevent and solve performance problems in a timely manner, support changes in business needs, optimize scheduling decisions, etc [6].

Cloud computing is a new computing model. It distributes computing tasks on resource pools composed of a large number of computers so that various application systems can acquire computing power, storage space and various software services according to their needs. Cloud computing has been widely used because of its flexibility and on-demand use [7]. China is a country with many geological hazards. Landslides, collapses, debris flows, ground collapses and ground fissures caused by geological hazards have caused great hidden dangers to people's lives [8]. Using the network, the hydrological and soil geological data generated by displacement sensors, rainfall gauges and video monitoring information are distributed to cloud computing platform, and

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centralized calculation and processing are carried out by virtual machine to generate relevant early warning information [9]. And generate Web Service, published to the user's computer and mobile phone, can effectively carry out geological disaster warning in an instant, guide post-disaster reconstruction, and alleviate the loss of life and property of the people [10]. Therefore, there must be a reasonable cloud computing cluster server monitoring and management solution. Quality of service has different definitions in different industries. Visibility, response time and throughput, reliability, security, accessibility, and integrity are the IT industry quality of service metrics defined by IBM researchers. As a large-scale high-performance distributed system, cloud computing requires a large amount of monitoring data to perform various tasks such as fault detection, performance analysis, performance adjustment, performance prediction, and scheduling.

2. Definition and Characteristics of Cloud Computing

With the advancement of the information industry, cloud computing, a strategic emerging industry, has been mentioned at an unprecedented height. Cloud computing is a product of parallel computing, grid computing, and distributed computing. The cloud computing platform contains various resources such as storage and computing, and these resources can be dynamically allocated. The ideal cloud computing is to provide the required transparent services to users called "ends" by a computer network called "cloud." Cloud computing mainly includes the following three levels of services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Resource monitoring has been widely used in software optimization, configuration, performance evaluation, etc. It is the premise of many important operations such as cloud computing system fault detection, network analysis, task scheduling and load balancing. Some scholars have conducted a detailed investigation on cloud computing monitoring, analyzed the needs of cloud computing monitoring, evaluated the existing cloud monitoring tools, and pointed out the future research direction and outstanding issues in the field of cloud monitoring. Through the Internet, cloud platform can dynamically allocate resources in resource pool to users according to their needs. Through the establishment of provincial-level cloud computing platform for geological information, centralized management of servers and virtualization of servers, the author establishes a private cloud for geological hazard warning, which provides an application for SaaS model.

Cloud computing integrates the advantages of mobile computing, mobile network and cloud computing, that is, all intelligent terminal devices can be accessed from the wireless network environment regardless of what services they need. Some scholars have deeply analyzed the tools and methods of distributed system management, studied how they can be reused in cloud computing environment, and proposed a private cloud monitoring system (PCMONS) based on Eucalyptus platform, but the system did not monitor the virtual machine information. With the help of cloud computing technology, we have made a good intensive application of hardware and software resources. The functions that could be realized on traditional PC terminals can now be obtained only on mobile devices. SaaS is a model for providing software through the Internet. The relevant departments of geological disaster warning in various cities do not need to install software, and directly use the Web-based software services provided by the Early Warning Center to immediately carry out geological hazard warning processing. At present, the definition of cloud computing is divided into two categories: “narrow sense” and “generalized”. The "narrow" concept of cloud computing is focused on infrastructure and represents the delivery model of infrastructure. With limited storage capacity on mobile terminals and easy loss of information, server-side cloud computing solves these problems for mobile terminals because of its large storage and superior computing power. Clustering algorithms simplify the need for monitoring to help administrators take action to manage resources in cloud computing data center points

Cloud computing represents a new form of resource delivery and is a new product of the integration of distributed computing, parallel computing, virtualization, network storage and other technologies. At the same time, in order to overcome the shortcomings of the C/S mode monitoring system, and considering the popularity of Internet technology, the Web-based monitoring interface

is easier to use, can be independent of the platform, and can realize remote monitoring through the Internet. So for the mobile Internet, the characteristics of cloud computing are fully reflected, and we will develop and store various applications in the cloud-based mode server. Therefore, it reduces the processing requirements on mobile terminals. Resources in cloud computing environment are highly virtualized and resilient. In addition to monitoring the resources of physical servers, virtual machines running on them need to be monitored. Scholars of Chinese Academy of Sciences have proposed a strategy for dynamic provision of node resources based on failure rules in cloud computing environment, which takes into account resource requirements and failure rules to ensure the reliability of node resources dynamically provided. In the broad sense of cloud definition, cloud computing is composed of services. Users can access all kinds of services provided by cloud just as they can access water resources and electricity resources. Cloud users do not need to care about the implementation process of the underlying cloud platform. They only need to pay attention to the services they use, and ultimately get the services and use them by sending service requests to the cloud platform.

3. Early Warning and Monitoring of Cloud Computing Server

In order to ensure the stability of cloud platform, real-time performance monitoring and fault management are two core parts. A fully functional monitoring system needs to integrate real-time performance monitoring and fault management. Through monitoring, we can know the running status of the system and find out the main machine that causes the fault in time. Analyse the system performance bottleneck, help users find errors in the shortest possible time and locate, restore or adjust the system. And then achieve higher performance indicators. Control the running state of the service object in the distributed system and adjust the system operation. Cloud computing server monitoring system mainly includes the following functions: First, it should be able to detect hardware failures in time, and alarm prompts, to ensure the normal operation of the system. Second, it can monitor the use of key resources of the system, discover performance bottlenecks in time, and carry out intelligent resource regulation to ensure that the system continues to operate under high performance. The controller maintains all information about the node controllers running inside the system and is responsible for controlling the lifecycle of these instances. It routes requests to open virtual instances to node controllers with available resources. In order to improve the reliability of the cloud computing platform and ensure the quality of service, a monitoring mechanism must be introduced in the cloud computing platform to understand the running status of the platform in real time, and it can play an early warning role when the platform is abnormal.

In recent years, the monitoring and optimization methods of cloud computing systems have gradually attracted attention in the field of software engineering research. At present, the famous cloud computing platforms in the industry have their own monitoring software. The computing platform resource monitoring system monitors the cloud platform application layer, and needs to monitor the virtual machine and cloud network services in the application layer and the cloud application service status, and provide real-time fault detection function for the monitored data. There are two types of cloud services, namely, cloud server services and application servers deployed in virtual machines and the quality of service they provide. Because cloud computing systems involve a large number of servers, it is necessary to support the operation of servers and applications on thousands of nodes in the entire network. The cloud computing server monitoring system first needs to have a good supervision structure to implement centralized monitoring and management methods to greatly reduce the operation and maintenance personnel's work and reduce maintenance costs. Cloud computing monitoring service RMS is implemented in the form of Web services. The cloud monitoring controller is responsible for collecting and analyzing the resource information of cloud computing system and storing the filtered information into the database. Cloud users and cloud administrators retrieve and browse the filtered cloud resource information through the cloud controller in a Web way. However, the current cloud computing monitoring mainly focuses on data analysis and resource scheduling on the monitoring platform, and there is little discussion on the design and implementation of the specific monitoring platform.

However, due to the heterogeneity of monitored objects (including hardware, software and external devices, cloud computing components), the dynamic nature of monitored objects, the complex logic between a large number of monitored objects, a large number of cloud computing objects, and the diversity of user needs. This will make monitoring more difficult. In the actual monitoring process, the key point of monitoring network services is that we need to know the status of each type of network services in real time and display them on the monitoring browser side. In monitoring the status of application servers, we need to collect the quality of service data of different servers in real time, and finally present it to the browser in the form of data graph, so that the monitors can get the current status information in the most intuitive way. There are more and more applications based on Internet cloud computing, and cloud computing is slowly moving from the Internet to the mobile Internet. This has become a trend. The resource monitoring platform in the cloud computing environment is designed to meet these needs. Its main tasks are monitoring information collection and system maintenance, management and optimization based on monitoring data analysis results. Due to the distributed characteristics and dynamic characteristics of cloud computing, the completion of these two types of monitoring on the cloud platform requires the flexibility and scalability of the monitoring system. Therefore, the monitoring system needs to have configurable features and certain scalability to support flexible monitoring.

4. Conclusion

With the development and maturity of IT technology, cloud computing has become more and more frequent in our lives. Cloud computing integrates all computing resources, storage resources, and network resources to form a huge resource pool, which can be obtained by users in an on-demand manner through virtualization. At the same time, various services are provided in the cloud, and users can access the platform and use services through various means. Aiming at the heterogeneity, dynamics and complex diversity of monitoring objects in cloud computing environment, a resource monitoring platform in cloud computing environment is proposed, and the composition, key technologies and technical implementation of the platform are introduced. In order to ensure the stable operation of virtual nodes in cloud platform and the continuous provision of cloud services, stable and efficient monitoring measures are indispensable. The establishment of this system effectively increases the advance and real-time dynamic of geological hazard early warning, and has strong practicability. In order to ensure the normal collection of monitoring information, an algorithm of dynamic replacement of virtual machine monitoring cluster head is proposed. The experimental results show that the model can not only collect the static and dynamic information of the system in real time. It can also track the running status of the nodes and obtain the information of the working nodes. When the resource needs exceed the preset threshold, it can send out alarm prompts and replace cluster heads in time, which ensures the normal operation of the monitoring system.

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