Protection and Activation of Cultural Heritage Based on Cloud Computing Platform

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Abstract. Cultural heritage is the crystallization of the wisdom of peoples of all countries. Its value is inestimable, and countries and regions around the world have reached a consensus on protecting cultural heritage. The digital museum uses virtual reality technology, three-dimensional scanning technology, computer network technology and other display technologies to present the physical museum in a three-dimensional manner in the network application in the real world. The challenges facing the construction of digital museums mainly come from two aspects: Technically, digital museums can be regarded as a combination of a large-scale distributed information resource database and a multimedia broadband network, and a unified platform resource for cultural heritage natural resource information sharing and services. In terms of management, there are a series of problems in the management of digital museums in all stages of data collection, storage, transmission, and display. Based on the above background, the research content of this article is the protection and activation of cultural heritage based on cloud computing platform. This article analyzes the technical problems facing digital museums. Based on the in-depth study of Hadoop cloud computing, a digital museum construction plan based on Hadoop and a distributed multi-QoS parallel routing algorithm based on TCP/IP are proposed. This paper mainly adopts multi-QoS distributed parallel routing algorithm to improve the data transmission efficiency, thereby improving the
query response speed of the system. This paper analyzes the theoretical foundation of Hadoop and the feasibility of building a digital museum, and builds the module implementation of the digital museum. Finally, the construction of Hadoop experimental environment is introduced. Simulation results show that compared with traditional algorithms, the improved algorithm can balance network load and improve network resource utilization. The performance analysis of the system verifies that the model proposed in this paper meets the requirements of security and integrity.

**Keywords:** Cloud Computing Platform, Cultural Heritage, Digital Museum, Hadoop Platform

1. **Introduction**

The rapid development of computer and network technology and the widespread application of information technology have brought new opportunities to the protection and display of human cultural / natural heritage. Various digital technologies are increasingly used in traditional fields related to museums. A museum is defined as a permanent non-profit organization that serves society and its development and is open to the public. It protects, researches, disseminates, and bears witness to human history for the purposes of research, education, entertainment, and collection. Intangible or tangible cultural and physical heritage, such as lifestyle heritage and digital creation, belong to the category of museums. It shows that digital technology has begun to enter production and life, and gradually applied to the modernized field of museums.

There are many definitions of digital museums, but in a more comprehensive definition of digital museums, there should be descriptions of these characteristics such as networking, virtualization, and intelligence [1-2]. Now we define digital museum as: digital museum refers to the service system built on the network for the protection and display of information resources through the processing and processing of computer digital technology in order to protect human cultural / natural heritage. The three basic characteristics that a digital museum must possess are the digitization of cultural relics data resources, the networking of information dissemination, and the publicization of browsing and display [3-5]. Therefore, it bears the heavy responsibility of protecting and using human material and intangible cultural heritage [6-8].

Wang took the metrology of boiler industry pipe system flow monitoring as an example, and realized real-time monitoring in Labview and MyDAQ environments. The fuzzy c-means clustering method is used to decompose the collected data into a feature-based subset reduction and recombination cloud network. Experiments have been performed with different tuning constant values to maintain a constant flow. The results show that fast computation time with low complexity overhead is achieved with the help of cloud distribution [9-10]. With the rapid increase of demand-side monitoring equipment and controllable facilities in the power grid, more information and communication technology (ICT) resources are needed to support the development of demand-side management (DSM). Unlike traditional power system calculations, power demand side management requires power systems to be scalable
and economical, as more and more stakeholders participate in the calculations. Cao proposed a new cost-oriented optimization model that uses cloud-based information and communication technology infrastructure to allocate cloud computing resources in a flexible and cost-effective manner [11-12].

This article applies Hadoop to the construction of a digital museum. Since the introduction of Hadoop, various Hadoop-based researches have emerged endlessly. The application direction is mainly the analysis and processing of massive data, the construction of data warehouses, and the provision of decision-making basis for enterprises. However, little is known about the current cases of application software. The innovation of this article is to use the Hadoop framework to build a digital museum platform to provide museums with a large amount of data to support faster retrieval, display, storage, management and other big data capabilities. Based on the research of the traditional digital museum, this article has improved it according to the actual situation. Due to the continuous growth of digital museum data, it will inevitably bring bottlenecks such as loading difficulties and reading delays. Therefore, this article uses the mainstream cloud computing platform and the application platform Hadoop to build a digital museum, which improves the speed of data reading and retrieval, and provides visitors with a smoother digital roaming effect. In order to achieve the protection and activation of cultural heritage based on cloud computing platform.

2. Proposed Method

2.1 Cloud Computing Platform

Cloud computing is a new computing model that delivers computing power and services to users through the Internet after pooling various resources. Users can obtain various services and resources provided by cloud computing service providers on demand, dynamically, and easily.

From a technical perspective, these three layers of services are not necessarily related in terms of technical implementation. SaaS can be implemented independently on the basis of PaaS and IaaS; similarly, PaaS can be implemented independently or on the basis of IaaS. The service hierarchy relationship of cloud computing is shown in Figure 1.
Figure 1. Cloud computing service hierarchy

As shown in Figure 1, at the IaaS level, cloud computing provides users with some of the tools needed for computing, storage, networking, and application environments through virtualization and dynamics, so that users can access the IT infrastructure on demand. At the PaaS layer, cloud computing not only provides basic computing capabilities, but also provides users with distributed software development and operating environments, test environments, deployment environments, middleware services, and database services through the network.

2.2 Hadoop Platform

Hadoop is a very good technology for big data processing and cloud computing. The Hadoop technology is shown in Figure 2.

As shown in Figure 2, there are many good related technologies in the hadoop technology system that can help us quickly design and implement telecommunication business systems. We can use the Hive technology in Hadoop to design the data model of the telecommunication business system, and then the Hive technology stores the data warehouse in the data model layer, mainly storing some offline data and reports. For some operation log streams, we can use spark for storage and processing. And can store some temporary data in hbase and elasticsearch. hadoop provides more powerful technical support for telecommunication business system construction. The architecture is shown in Figure 3.

As shown in Figure 3, the telecommunications business system mainly uses spring, struts, and hibernate technologies. And integrate these three technologies, spring is responsible for...
the business logic layer of the telecommunications business system, struts is responsible for the telecommunications business system page display control layer, using hibernate technology to perform database persistence operations on the telecommunication business system, mainly using hibernate for the persistence layer design.

3. Experiments

3.1 Experimental Environment and Settings
CentOS Linux operating system, built on the Oracle VM VirtualBox virtual machine. The experimental machine is a 64-bit windows operating system, 4G memory, CPU clocked at 2.5GHZ, and hard disk 512G. The Hadoop version used is currently the relatively stable 1.1.2 version, the jdk version is 1.6, and the main server uses Tomcat6.0 as the web container.

Runs three different algorithms: distributed routing algorithm (DRA), distributed multi-QoS constraint routing algorithm (MPD), and distributed multi-QoS distributed parallel routing algorithm (MPDPRA) to test and evaluate communication overhead and The average success rate of a link. In this simulation, the number of requests for each connection is 2,000, and each experimental data is obtained by averaging 10 sets of data results.

4. Discussion

4.1 Evaluation of Multi-QoS Distributed Parallel Routing Algorithm
Hadoop cluster preparation, as shown in Table 1.

| Machine name | Machine IP           | Use                      |
|--------------|----------------------|--------------------------|
| Hadoop0      | 192.168.56.77        | namesode / secondarynamenode / jobtracker |
| Hadoop1      | 192.168.56.78        | datanode/taskTracker     |
| Hadoop2      | 192.168.56.79        | datanode/taskTracker     |

Generate connection requests according to the following principles: 1) Randomly select any pair of source nodes and destination nodes from the entire node set as experimental nodes according to the uniform probability distribution. 2) The QoS constraint value of this simulation uses the value of the uniform distribution function in a fixed interval. 3) The exponential distribution with parameter $\lambda = 0.4$ is the reference function for each node's connection request arrival. The average connection success rate is shown in Figure 4.

![Average connection success rate](image_url)

Figure 4. Average connection success rate
As shown in Figure 4, each connection request can be obtained by simulating the network resource according to the QoS constraint value. The success rate of the link connection performance on the three algorithms is approximately equal. The average connection success rate is basically the same when it just started running, but after the network runs for a period of time, more and more applications enter the network to compete for network resources. At this time, the network is under heavy load, and the connection success rate of the three algorithms begins to decline. The moment is the point where the network load is close to 76%, the point where the connection success rate drops sharply is the point where the network load exceeds 86%, and when the connection success rate is close to one-tenth, the network is overwhelmed and can hardly provide normal QoS guarantee Even a cliff-like decline occurred. When the network load is very heavy, the connection success rate of the traditional distributed routing algorithm is higher than the connection success rate of the other two algorithms, but as the network load is reduced, the disadvantages of the traditional distributed algorithm begin to show, and the connection success rate The decline is very fast and lower than the other two algorithms.

4.2 Performance Analysis
In the process of user data isolation and access, data isolation, storage, and access are all based on virtual domains. Different virtual domains correspond to different data. Isolation and storage of data can be allocated with user rights, data privacy, or data type. Different allocation methods determine where the data is stored and how it is accessed. In addition, different virtual domains operate independently without communication without permission. To merge or communicate data between virtual domains, the management VM needs to allocate the corresponding certificate or key chain. Through the above virtual domain allocation and data isolation, the privacy of data storage and access in the cloud computing platform is guaranteed.

During the user's data isolation access process, the cloud computing platform will comprehensively verify the user's trust certificate and trust level, and monitor the user's access behavior in real time. On the one hand, only the integrity of the trust certificate can ensure the user's access rights; on the other hand, during the user's access, the user's behavior will also be monitored in real time. Above the required level of trust, the legitimate access rights of users can be guaranteed. At the same time, according to the privacy and classification of data, the permissions requirements of different virtual domains on trust certificates and trust levels will be very different.

5. Conclusions
Based on the systematic research of digital museum and cloud computing technology, this paper gives a concrete design plan of digital museum based on Hadoop. Compared with the traditional data museum, the Hadoop-based digital museum in this paper can provide users with more efficient multimedia display access speed, which can meet the storage and access requirements of massive data files. Provided strong support for the arrival of big data. A distributed multi-QoS parallel routing algorithm based on TCP/IP is proposed. Multi-QoS distributed parallel routing algorithms are mainly used to improve data transmission efficiency, thereby improving system query response speed. In order to achieve the protection
and activation of cultural heritage based on cloud computing platform.

There are still many deficiencies in the research of this paper, such as: the functions of each module are not perfect, and 3D virtual roaming has not been realized. Due to the confidentiality of museum data, the system uses only test data. In future work, I will further study Hadoop and digital museum technology.

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