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Design and Application on Digital Library based on Cloud Computing

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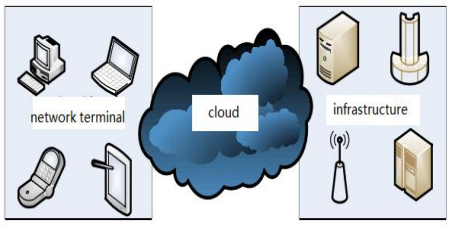
Abstract: **The purpose of this paper is to construct a complete set of digital library cloud service system based on cloud computing. Specific content includes: analyzing the present situation of the domestic and foreign digital library and cloud computing applications development in system, introducing the related theories and concepts about the research; analyzing and researching the contents and characteristics of the demand of digital library users, discussing the service system structure and operation of the cloud model of digital library, designing function module of the digital library cloud service mode; Finally, this paper giving a empirical research about the system designed to verify its feasibility.**



Keywords: Digital library; Cloud computing; Cloud service; Virtualization technologies

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1. Introduction

September 2009 organized by the Academic Committee of China Society for Library Science "Cloud Computing and Libraries "workshop held in Shanghai, marking the official involved in the library community of cloud computing. With the development of libraries, more and more scholars begin to pay attention to the concept of cloud computing business of implantable digital library. 20th century, 90 years, network technology breakthrough, the formation of digital information environment, globalization, digital library construction boom, highlighting the awareness of library services, gave birth to a new digital library services, cloud forms. The emergence of cloud computing will allow continuation of a century of library service that takes the form jump. Cloud computing technology not only greatly enriched the theory of library science, and the extension of new and extended areas of library practice.

Cloud computing books in the country by the intelligence community great concern, cloud computing has become a grid computing model cannot be ignored and business computing environment. At present, China Academic Library and Information System (China Academic Library Information System, CALIS) technology center to support the development of CALIS Distributed Digital Library of cloud services cloud services platform has been initially completed, the new generation of digital library system development and implementation of the lay A new technology base. Cloud computing will become a new bright spot in digital library services.

However, an overview of domestic and international digital library of cloud development, domestic and foreign in every respect there is a big gap, which for historical reasons, there are practical reasons. In recent years, digital libraries in China has made remarkable progress in industry, but because of the lag network infrastructure and the quality of personnel constraints, etc., many of our low level of digital library services, has most of the cloud-based library the project has not yet been started. For the purposes of Jilin Province, there is no cloud of a formal service. Analysis of the reasons to think the solution in an apt to cloud service development of digital libraries and digital libraries play a role in facilitating this is the object of this study and efforts.

Figure 1. The development of cloud computing.

Currently most of the scholars on the Digital Library of the cloud base remains at the theoretical level and the feasibility study level, the lack of the digital library system from the perspective of the evolution of the specific implementation of cloud computing research. This is not only a comprehensive analysis of the current development of digital libraries in China the main problems, but also through the cloud in the Digital Library summarized the value of the functional advantages of cloud computing. On this basis, is designed based on cloud computing architecture of digital libraries and digital library is proposed to the

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cloud evolution strategy.

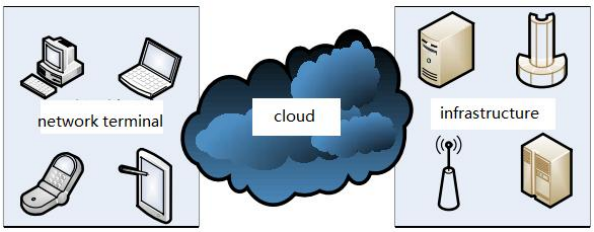

Figure 2. Cloud computing network architecture.

From the perspective of empirical research, the design of the Digital Library of the virtual cloud computing resource pool configuration, database server architecture, database access mechanism, the application server architecture, and network platform architecture and so on. Further verify the implementation of the Digital Library of cloud computing feasibility and operability. In this paper, a system designed to focus on solving the outstanding problems in current digital libraries, in raising the degree of virtualization, the integration of information resources and the resources have unique advantages, these are also papers innovation lies.

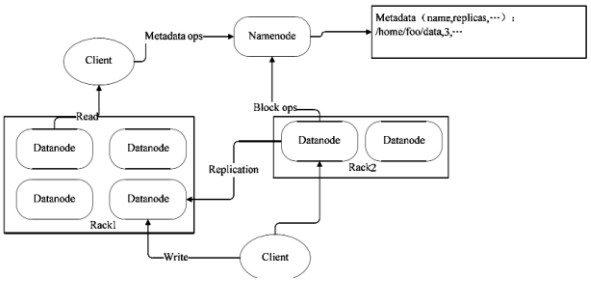

Figure 3. HDFS.

With the rapid development of network technology and computer technology, information penetrates to the social fields in rapid and an unprecedented situation, the performance of information is more and more rich, now, documentation, image, audio, video and other multimedia information become the indispensable element to construct digital library, the main research content of this subject is how to make these information security effective utilization and management, how to set up digital library which is convenient, rich in content and information sharing, the traditional service model has been ragged. In this context, new service calculation mode-cloud computing which based on distributed computing can meet the needs of the construction of digital library, so it will become the new trend of the development of digital library.

2. Methods and Key Technologies

2.1. Methods

Building a successful digital library services based on cloud computing system is a long and arduous task, not only professionals in libraries, computer aspects of personnel is also essential. Which gives a new era of digital reference service has brought new challenges, just keep on learning and exploring, be possible to adapt to the new situation on the reference development. The development of modern information technology for the digital library service model brings an opportunity to optimize the digital library service model optimized for the needs of modern information technology to support the integrated use of the concept of cloud computing services to optimize the strategy, pushes strategy, specific Strategy, the strategic integration of personal contact, supplemented by traditional digital library service, to demand a given service.

Digital Library for the realization of the core values, needs, based on the traditional service, absorbing the idea of cloud computing, with the use of information technology, information services; new thoughts formed a new service strategy. Also need to retain some of the traditional service mode, with the new service strategies, multiple methods, the formation of virtualization, fast, personalized, efficient service delivery model, high quality of library service to the user's ultimate goal.

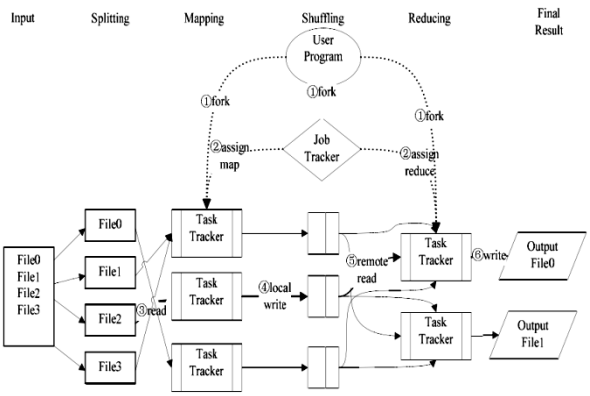

Figure 4. Map-Reduce.

This paper summarized the previous researches of DL, cloud computing and the personalized information service, then study found that some problems which information service of DL faced, and the bottleneck hindering the development of DL. Then applied the virtualization, distributed data storage, mass data processing and cloud platform and other key technology of cloud computing to build a personalized information service platform of DL, last deployed the cloud service on the platform. This paper has carried on the following work:

(1) Introduce some problems existed in the key technology of cloud computing and personalized information service model.

(2) Highlights the distributed file storage, mass data processing and information security in cloud computing.

(3) Based on the IaaS, PaaS, SaaS three layers

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structure of cloud computing, we deployed a hybrid cloud platform of personalized information service of DL. Then construct the framework of personalized information service of DL under the cloud, the model is divided into infrastructure layer, middle management layer and application services layer, which corresponded to the infrastructure as a service, platform as a structure and software as a service of cloud computing.

(4) on the basis of constructing a general framework, propose solutions and partial realization of the model, virtualization solution of infrastructure layer is designed on the basis of VMware virtualization, the middle management mainly design and implement of how to monitor the cloud platform resources and load balance control, also design the function module and recommended process of personalized information service. Finally apply Jet speed and Mash up technology to realize the portal of personalized information s éance.

2.2. Key Technologies

Cloud computing is an Internet application mode put forward by Google, which is the realization of some computer science concept in the Internet, such as distributed processing, parallel processing and grid computing. But along with the development of the web2.0 technology, digital library is also more used the idea and the technology of web2.0, which used to improve their own service, expanding the high-end complex network application, to the library 2.0 ahead. Therefore, adopting the cloud computing model as the underlying architecture of digital library can greatly improve the library's service in software environment, the application platform, data sharing and other aspects, which is the best solution. But, to cloud computing in the early stage, there are many immature and discuss place when they application in the library, and the particularly important is how to make sure the information resources security, so, we must think carefully about the security risk which cloud computing will bring, so that we can cope with the possible challenges easy.

Whatever in foreign countries or in domestic, cloud computing in the research on the application of digital libraries has just started, it is must use different methods in the research progress of home and abroad to start the research of the construction of the digital library based on cloud computing, which can achieve a comprehensive and in-depth research purposes. Cloud computing will make the digital library undergoing profound change in software environment, the hardware store, application platform and services methods. In the cloud computing applications process, in order to ensure the security of the digital library information resources, it is should be gradually establish and perfect the relevant industry standards, making ensure the safety of the information resources storage, realizing the information resources confidentiality and integrity, strengthen authority into user access control.

3. Results and Discussion

Domestic digital libraries still has a big gap with those abroad. The founder of cloud computing, Google, has also put forward some concepts computer which can be realized online, for instance, the mode of International applications, distributed processing, parallel processing and grid computing. Could computing is a computing model which major tasks lies in the computing pool and consumers can ask for access of information services freely.

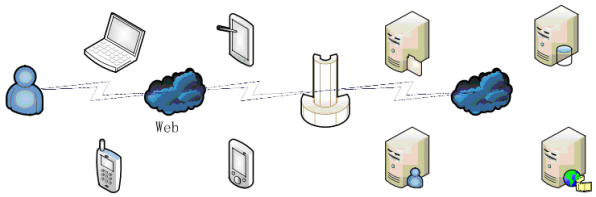

Figure 5. Digital library based on cloud computing.

"Cloud" is a mixture of evolution. The use of cloud computing mode as the foundation and application platform of digital library and for data sharing will greatly change the services of the libraries. Hence it can be seen that it is the most reliable solution with the best expansibility.

With the developing of network and information technology, the era of big data is here, information overload and the redundancy phenomenon becomes more and more serious, which makes it difficult for users to get their real needs and information resources they interested in. Information service model of traditional Digital Library (DL) has faced challenges, the environment of DL information resources gradually transformed from physical space to virtual space, the existence of information resources also transformed from emulation mode to digital mode. After the age of the Internet, Web era, grid era,Web2.0 era, the DL has begun to enter the era of cloud computing. In cloud computing environment, how to provide personalized information service is core of research on DL.

"Cloud" has brought us convenience but also security risks. Therefore, we must consider what we can do to deal with the problems which may occur. Concept, architecture and service levels are introduced through some features of digital library as well as the possibilities and necessities of cloud computing for usage. Here scientific demonstration of solutions is also involved.

4. Conclusion

Digital library whose production and development is relied on modern information technology is a kind of library modernization development form. With the development and popularization of Internet and

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computer technology, digital library moves forward rapidly. Cloud computing is a kind of production integrated with series of computer technology implications which has developed to a certain stage. It will make far-reaching to digital library and even other fields. Cloud computing is still in the stage of rapid development. So in this article the origin and concept of cloud computing will be summarized in detail, the character， basic structure of the cloud computing and its application and impact in each field will be analyzed strongly. In the cloud computing environment, the construction and service of digital library has changed greatly. The cloud storage based on digital library, the digital library infrastructure integration and construction based on cloud service, and even the library automation based on cloud computing, all of these need to research deeply in library field in the cloud computing era. Besides, the changes of digital library service model based on cloud computing are also the one of the important content. In this article three kinds of service model is proposed: personalized cloud platform service model based on the needs of the users, user side active push-service model and sharing cloud platform service model. Structure model is designed respectively, the working process and model of service model is explained, and their application scope is analyzed in this article.

Acknowledgments

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