Research on the Construction and Service Mode of Digital Library Based On Cloud Computing

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Abstract. Cloud computing is a data processing process based on the transmission capacity of the Internet, and it provides a certain development opportunity for the construction of digital library at the current stage through the information transformation between the relevant servers of the personal computer and the Internet computing cluster. In this paper, starting from the concept of cloud computing technology, and then discusses the problem of cloud computing technology in the library application, so as to promote the quality of cloud computing technology in the library application.

1. Introduction
Cloud computing is the optimization of network technology, parallel processing technology and distributed processing technology. The cloud computer will be able to organize and optimize the data that is scattered across different computers, so that the data can be integrated through the sharing network, and the associated information data can be released on a large number of distributed machines, rather than on the local computer or remote servers.

2. The concept of the “cloud computing”
Cloud computing is a mode based on internet related services’ increasing, using and delivering. It usually involves resources that are dynamically extensible and often virtualized through the Internet. The cloud is a metaphor for the Internet.
Cloud computing is a pay-per-use mode that provides available, convenient, on-demand network access, by which we can get into the configurable computing resources shared pool (resources including network, servers, storage, applications, services), these resources can be quickly provided, with minimal management effort, or minimal interaction with service providers.[1]
Cloud computing is another big change from the Large calculation computer to client-server transformation in the 1980s. Cloud Computing is the product of the integration of traditional computer and Network Technologies such as Distributed Computing, Parallel Computing, Utility Computing, Network Storage Technologies, Virtualization, Load Balance, and High Available.

3. The Characteristics of the “cloud computing”
The commonly accepted features of cloud computing are as follows:

3.1. Large-scale
The cloud has a considerable scale, and many cloud centers are supported by thousands of servers. In order To reduce the cost of use, we can use clusters to acquire a powerful calculation ability, and work together through a set of loosely integrated computer hardware and software.
3.2. Virtualization
Cloud Computing supports users to obtain application services at any location and using various terminals.

3.3. High reliability
“Cloud” uses the data replication multi-copy fault tolerance, interchangeable isomorphic compute nodes and other measures to guarantee the high reliability of service. Using cloud computing is more reliable than using local computers.

3.4. Generality
The same cloud can support different application services at the same time, and resources can be replaced by each other through technologies such as virtualization, which can improve the utilization rate of resources.

3.5. High scalability
The size of the "cloud" can be dynamically retractable, meet the needs of application and user scale growth. The resources in the cloud can be added and reduced according to the requirements, which can meet the growth rate of user scale and application.

3.6. On-demand service
"Cloud" is a huge pool of resources that you need to use or buy as needed; the cloud can be charged like tap water, electricity, and gas.

3.7. Low cost
Users only need to focus on building business and resources, without upgrading and considering the reconstruction of the equipment, and do not need to build computer rooms or employ maintenance personnel, which can reduce user costs.[2]

4. The service modality of “Cloud computing”
Cloud computing can be considered to include services at the following levels: infrastructure level services (IaaS), platform level services (PaaS), and software level services (SaaS). [3]

LaaS (Infrastructure-as-a- Service): infrastructure level services
Consumers can get services from a perfect computer infrastructure through Internet.

PaaS(Platform-as-a- Service): platform level services
PaaS actually refers to a platform for software development as a service, which is submitted to users in SaaS model.

SaaS(Software-as-a-Service): software level services
It is a mode of providing software through Internet. Instead of purchasing software, users rent Web based software to manage business activities.
5. Problems faced by Digital Library
Digital library is developed by a traditional library, which will organize and manage the multimedia information, such as text, image, scientific data and pictures, which need to be stored, by collecting and encoding, and then use the computer network to provide the service.

With the coming of the big data era, the information volume of the digital library is increasing rapidly, and the storage cost of the library is even more difficult for the library which is originally strained. [4]

On the one hand, Additional human maintenance and management cost of equipment, makes the digital library unbearable; On the other hand, there's a big difference between different storage devices and systems, and it's difficult to integrate between different devices, so that it's very difficult to manage and make good use of the storage resources.

6. The application of “cloud computing” in library management
The application of cloud computing to the management of library has changed the responsibility system of the traditional library, which is managed by the curator. Applying cloud computing to library management enhances the efficiency of management.

6.1. Cloud computing technology has changed the service mode of the library
Applying cloud computing to library service, we want to provide readers with the required information, such as online reading, data download and other related services directly through the Internet. The new service mode, which provides relevant information according to readers’ needs and preferences, ensures that readers can find and read useful information quickly and conveniently, which greatly reduces the workload of library staff.[5]

6.2. Cloud computing technology saves expenses for library
Because of the application of cloud computing in the library, the library will reduce the server maintenance work content, relevant data need not be stored on the local hard disk, and there is no maximum limit for the overall server process, there is no maximum limit for the whole server process, at the same time, the library only need to provide a small fee to enjoy the high quality service of cloud computing. The related services of cloud computing are also carried out through relevant suppliers, without costs of additional maintenance and update.

6.3. Guarantee the basic operation of the server and effectively improve the service performance
Cloud computing has tens of thousands of servers, Cloud computing has tens of thousands of servers. Even if one of the servers has a system failure, other relevant servers in the cloud can copy all the information in a short time and provide relevant services through other servers. This technology has effectively realized the uninterrupted service of library.

6.4. Effectively implements the sharing of various information resources to the maximum degree
In cloud computing, distributed network libraries can be built in the digital library on the Internet through the integration of distributed computing resources in the cloud computing. All kinds of libraries can build a common information space based on the various connected infrastructures under the system.
6.5. Fully and effectively Providing information service in library

In the cloud computing environment, users can carry out various information resources query and other related information resources services through various mobile terminals, such as mobile phones, etc; At the same time, there is a powerful access function in the cloud computing mode, and all relevant users can systematically check the various information resources of the library through different types of mobile terminals. [6]

7. Information security problems in the construction of Library Digital Resources under the “cloud computing” environment

During the digital resource construction of the library, the existing technical resources need to be comprehensively informed and applied, and a certain safety strategy shall be adopted in the application of relevant cloud computing, as follows:

Applying advanced information storage technology, fully integrated data security under the background of cloud computing, in order to truly achieve the full security of library data, it is necessary to carry out the following aspects. [7]

On the one hand, the supplier of cloud computing needs to improve the management and storage of information data stored by the most advanced virtualized mass storage technology at the present stage. This technique is mainly to carry out fault-tolerant work by means of data replicas, without other related equipment. As long as multiple copies are created through different virtual disks, the availability of data and access to relevant performance can be effectively enhanced.

On the other hand, digital library can make timely, effective and comprehensive backup processing of various collection data and information resources, which can be stored in a long-term and stable way.

7.1. Effective system authority control through user authentication and other operations

In the cloud computing environment, it is required to fundamentally guarantee the whole safety of the related information service. Only by system authentication and authorization can we access the resources of digital library, which is also the basic prerequisite for the security of library service.

7.2. Full safety of the digital library is effectively guaranteed through the relevant policies and regulations

Relevant managers need to carry out research on cloud computing standards and protocols, and make certain application specifications. As data security and confidentiality issues are involved in multiple levels and fields, it is necessary to gradually improve the relevant management regulations in the joint research and development of different stakeholders so as to provide effective guarantee for their safety. [8]

8. “cloud computing” technology realize the full sharing of knowledge

The library's digital resources are stored in tens of thousands of servers, and the relevant information can be accessed globally, and users can search for resources in a global pool of resources.

8.1. Cloud computing technology overcomes the bottleneck of server access restrictions

The library costs less to obtain the services provided by millions of servers in the cloud mode, and the response time is within milliseconds, so that the library can get higher benefits at lower cost. [9]

8.2. Cloud computing improves the service efficiency of the library

Data storage

Cloud computing system is composed of a large number of servers, which uses distributed storage mode to store data, which is called the data storage system GFS. The storage system can provide fault-tolerant function and provide high performance services for a large number of users.

Data management
Cloud computing needs to analyze and deal with massive distributed data. The data read frequency is greater than the data update frequency. Cloud system data management adopts column store data management mode in database field.[10]

9. Library management strategy against cloud computing challenge.

9.1. Strengthen the formulation of cloud computing standards
Effective use of funds, technology, resources, manpower, and so on, to formulate a unified standard, efficient integration of the cloud computing and library management.

Is to establish a standard cloud computing association to form a unified and standard management model.

Is to give great efforts to support the human, material and financial resources of the library, and enhance the strength of the cloud computing.[11]

9.2. Strengthen the legal construction under the cloud computing environment
We should strengthen the inevitability of the integration of Library and cloud computing, so as to ensure and protect the library's own interests not to be infringed. The industry association of cloud computing should be set up, and the mutual supervision and cooperation between departments should be carried out to promote the improvement and formulation of the law of cloud computing.

9.3. Changes the mode of library management and service
To provide users with personalized service projects, take service as the main body of management, and provide more services and personalized projects to readers through Internet.

To change the process of traditional library management, liberate a large number of staff, enable them to provide better services for readers, to help the development of the library.

9.4. The practical case study
In the process of integration of cloud computing and library management, it is necessary to apply the methods and standards to the actual management in terms of continuous sublimation legal construction and standard development.[12]

10. Concluding
"Cloud computing" is not only a kind of technology, but also an idea. The concept of "cloud computing" may be more important than the implementation of "cloud computing" technology. Through the cloud computing platform, the construction and service mode of a digital library based on cloud computing can be built, which can integrate a large number of digital resources and provide the readers with value-added services. [13]The emergence of the concept of cloud computing will affect and change the various elements of library. The concept of cloud computing is both an opportunity and a challenge for libraries. Therefore, the co-construction and sharing of information resources under the "cloud computing" environment is a great and brand-new project. Let us join hands and integrate "cloud computing" properly into the system of library information resources co construction and sharing, and experience the fun of walking in the "cloud" together.

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