Cloud Computing in Digital and University Libraries

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GJCST Classification : *C.1.4, C.2.1*

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Strictly as per the compliance and regulations of:

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Abstract - Libraries may soon be building and managing their own data centers. This model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons. Provisioning and maintenance of infrastructure for Web based digital library present several challenges. In this paper we discuss problems faced with digital library and development efforts to overcome that problem. Infrastructure virtualization and cloud computing are particularly attractive choices which is challenged by both growth in the size of the indexed document collection, new features and most prominently usage. With the purpose of applying Cloud Computing to university library, the paper describes the current status of user service models in university libraries. Then it proposed to improve current user service model with Cloud Computing. This paper explores some of the security issues surrounding data location, mobility and availability.

I. Introduction

Cloud Computing is a completely new IT technology and it is known as the third revolution after PC and Internet in IT. To be more specific, Cloud Computing is the improvement of Distributed Computing, Parallel Computing, Grid Computing and Distributed Databases. And the basic principle of Cloud Computing is making tasks distributed in large numbers of distributed computers but not in local computers or remote servers. In other words, by collecting large quantities of information and resources stored in personal computers, mobile phones and other equipment, Cloud Computing is capable of integrating them and putting them on the public cloud for serving users.

Digital library is a development-oriented hardware and software integration platform, through to technical and the product integration, each kind of carrier digitization, carries on the effective deposit and the organization, provides the network the effective service. After Digital library technology popularization, provided the high grade information service but simultaneously also to expose all sorts of questions unceasingly, because the zones of different the current economic condition limit presented the development

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not balanced phenomenon, the regional resources shared with difficulty, form each one information isolated island or the resources are redundant, create the resources the waste, satisfied the aggregate demand with difficulty, the cloud computing possibly provides a good plan day by day for this kind of phenomenon.

II. Problems Of Digital Library

Digital library for our study provides a convenient, along with the increasing knowledge level, the requirement of digital library and growing. But because of uneven economic development in different regions causes the digital library's resources to be relatively short, to university digital library as an example. Various colleges and universities while are raising the respective teaching level unceasingly, have established a digital library to purchase its own database resources, but because of the teaching focus and economic conditions, library resources between university's has the differences, meanwhile looked from the whole that the Digital library has certain flaw. Data resources between various universities are relatively independent, building redundant projects possibility was high, has created the manpower, the financial resource and the resources waste, or some colleges and universities to use only part of database resources, inadequate use of resources, cannot play resources maximum utilization.

Digital library representative one kind of new infrastructure and the environment, through the cloud computing, it may use resources more effective , and can solve the defects of digital library.

a) Cloud computing realization

Based on cloud computing in the cost calculation, performance, team cooperation and the advantages of the geographic location, because simultaneously the different application procedure has used the different mutually independent platform, each application procedure completes on own server. Using cloud computing can share the server in many application procedures, realizes the resource sharing, thus also reduced server's quantity, achieves the effect of reducing the cost, therefore utilizes cloud computing in the Digital library, will give our work, the life and the study inevitably obtains a greater efficiency, see figure1.
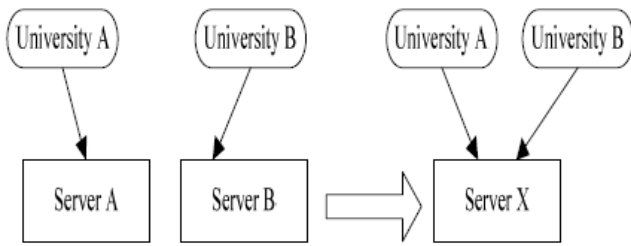
Figure 1. Server share plan

Figure 2. cloud computing implementation diagram

Every cloud computation's server may be the computation server, saves the server or the wide band resources and so on, in figure 2 every cloud represents any university Digital library database resources, every two clouds or more clouds may compose a bigger cloud, may divide the cloud or the composition cloud by the different regions either the different rank university. Saas, Software as a Service, through the browser to the form of services provided to the applications, to users and suppliers to reduce costs. Paas, Platform as a service, defined by the form of services provided to the developers application development and deployment platform, so that they can use this platform to develop, deploy and manage SaaS applications. This platform typically includes a database, middleware and development tools, all are in the form of services through the Internet. IaaS infrastructure as a service, defined by the form of services to provide servers, storage and networking hardware. SDK Software Development Kit, refers to supporting development of a certain type of software, documentation, samples, and a collection of tools. In general, SDK that the development of applications under the Windows platform.

b) Permissions realization

In Figure 2 cloud superintendent should is composed by university representative, government representative and service provider representative , its responsibility should be the management daily operation, provides the high grade service and the high security, the formulation agreement, the coordinated all quarters' benefit and carries on sanction on the illegal user and the contrary operation.
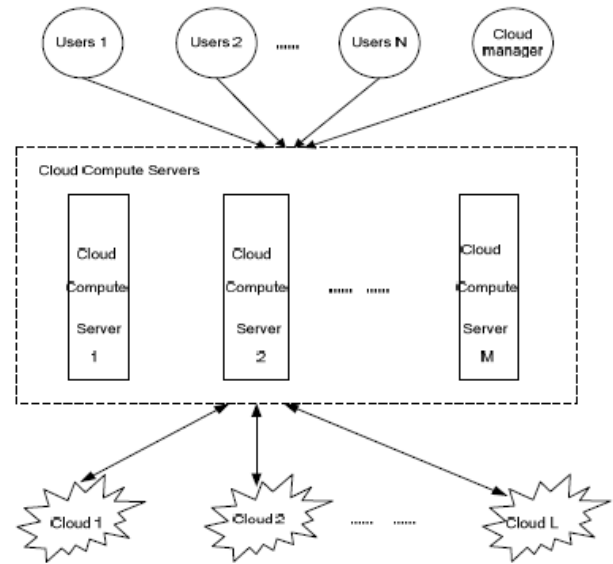
First, user requested to the Internet transmission, and between cloud platform and Internet continuous revision key, in order to protect the platform. Simultaneously the cloud platform defines an access rule to its user, the user transmits own status to the platform, the platform basis rule production user permissions statement.

III. Analysis Of Current User Service Model In University Library

University library, as a most important academic and scientific research base, charges for providing information services for its users. In the past, most libraries insisted that their service is based on their own library resources. So librarians scarcely considered users' demands. But today, modern libraries have changed this viewpoint. And librarians usually need to collect as more information as they can according to users' requirements. Then they will analyze the information and sort out them. Finally, they will provide them for users in some certain technical methods. However, services in modern libraries will increasingly focus on users' demanding in future. And the ultimate goal of modern library is to offer appropriate, comprehensive and multi-level services for its users. At current user service models are mainly WWW service model, FTP service model, BBS and E-mail service model, etc [5].

a) WWW Service Model

WWW (World Wide Web) is based on client-server model. It presents all kinds of information browsing systems with the bases of HTML language and HTTP protocol. The specific division is: WWW Servers are in charge of linking web pages by hypertext links and WWW clients are responsible for displaying information and sending requests to servers. And the

most significant feature of WWW service is its high degree of integration. In other words, it can connect all kinds of information and services seamlessly and provide users with vivid graphical user interface finally. In general, WWW provides new means of searching and sharing information for people around the world.

Meanwhile, it gradually becomes the best means of dynamic multimedia interactive for people.

b) FTP Service Model

FTP (File Transfer Protocol) is a widely used communication protocol. And it is comprised of various rules that support file transfer on the Internet. As such rules can permit online users copy files from one host to another, it brings great convenience and benefits to users. Just as other Internet services, FTP is also based on client-sever model. Meanwhile, it's easy to learn to use FTP service. First, you only need to start the FTP client program to connect with remote host, then you should issue file transfer command to remote host and after remote host received the command, it will give respond and implement the correct operation. Launching FTP service in university library network system is a good type which brings great convenience for users and library as well. By using FTP service in university library, users can make their own password, such as using their Email address, and this can let librarians obtain users visiting records easily. Furthermore, according to users' visiting records, librarians can offer corresponding services for them and improved users' satisfaction

c) BBS and E-mail Service Model

BBS (Bulletin Board Service) is a kind of electronic information service system on the Internet. It is just like a public blank board on the Internet, all users can write their thoughts or release information on this board. And E-mail is just another kind of information service on the Internet. In a word, E-mail provides a very quick, simple and economical way of communication for the Internet users in the whole world.

Through BBS system, library users can ask and consult librarians at any time. Usually they can get their response in a very short period of time. Meanwhile, librarians can communicate with more users at a time through BBS. What's more, university libraries can open lectures, release announcements and provide online help for users by BBS system. And through E-mail system, users can obtain their needed information and knowledge resources more quickly and economically as they don't need to visit libraries personally. In the new information environment, various IT technologies updated timely. So current user service models are already out of date at some extent. Although they brought convenient services for users and saved their time indeed, they cannot keep up with the development

of libraries. Facing the problems of shortage of funds, manpower and other material resources, current user service models cannot deal well with them effectively. What's worse, they may cause waste of resources and affect the quality of library services. BBSes were generally text-based, rather than GUI-based, and early BBSes conversed using the simple ASCII character set. However, some home computer manufacturers extended the ASCII character set to take advantage of the advanced color and graphics capabilities of their systems.

IV. IMPROVEMENT OF USER SERVICE MODEL IN UNIVERSITY LIBRARIES

With the rapid development of various IT technologies, users' information requirements are increasingly personalized. And now more and more libraries advocated user-centered services. So librarians should mine and study users' information requirements frequently. And only in this way, they can master the basic demands of their users. And furthermore, library can develop itself according to such information and improve users' satisfaction. University library, as we all know, is famous for its academic and teaching influences. And IT technology has been the driving force of library development. What's more, librarians can keep using new technology to develop library and optimize library service. With the expansion of Cloud Computing application, this paper proposed to apply Cloud Computing in libraries. By establishing a pubic cloud among many university libraries, it not only can conserve library resources but also can improve its user satisfaction. And it can be illustrated in figure 3.

Figure 3 : Application of Cloud Computing in University Library

a) Unified Search Service Model

Although there are OP AC(Online Public Access Catalog)and ILL(Inter-library loan) services already,

library users still cannot access to the shared resources through an uniform access platform. However, with the adoption of Cloud Computing in university library, the integrated library resources support distributed uniform access interface [61]. At the same time, the uniform access platform can promote library resources, guide and answer users' questions by using high-quality navigation. As a result, users can grip more information retrieval methods and make better use of library resources.

b) Integrated Consulting Services Model

Today almost every university library can provide its users with network reference by BBS or E-mail. But with the constant improvement of users' demanding, integrated digital reference service came into being. And driven by Cloud Computing, CDRS (Cooperative digital reference service) can realize the sharing of technology, resources, experts and services of university libraries. Furthermore, it will develop QI A smart joint service system, and this will bring great conveniences for library users [71].

c) Real-time Access Services Model

In the era of digital libraries, library users paid more attention to electronic journals, electronic databases and so on. This is really a big challenge for university libraries. But by introducing Cloud Computing, university libraries can establish a shared public cloud jointly [81. As shared cloud can have infinite storage capacity and computing power theoretically. It can bring obvious benefits to libraries. On one hand, allied libraries no longer consider the hardware cost; on the other hand, it can help reduce the purchase of electronic database resources repeatedly among allied libraries. Meanwhile, users can visit the shared resources by any terminal equipment, such as PC, 30 mobile phone or PDA only if you can access to the Internet.

d) Knowledge Service Model

In the context of the knowledge economy, knowledge resource has become the main resource affecting productivity development. And university libraries are the main departments of storing, processing and spreading knowledge. So how to provide users with efficient transmission of information and knowledge services became urgent task for librarians today T91. However, the Emergence of Cloud Computing accelerated library's development. And the establishment of shared public cloud can save manpower and material resources greatly among university libraries. Therefore, with the aid of Cloud Computing, librarians won't have to maintain their own equipments or deal with consultations personally. And librarians will have more time and energy to offer users with their needed knowledge-based services but not only information.

e) All-oriented Service Model

Comparing with foreign university libraries, we can find that foreign libraries are intended to provide services for all the people. Besides the professors, teachers or students, all the people of that country can access to the library resources. In addition, they also permit users access to many libraries' resources by handling related certificate of that library. And fortunately, domestic libraries can also do this in the cloud environment. Anybody who can through the legal network identity authentication has the right to visit the joint resources of university libraries on the Internet [101]. In other words, university libraries will offer services for all the people with the help of Cloud Computing.

V. CONCLUSION

We know that library is not only a knowledge ocean, its ultimate aim is to provide satisfactory services for all the people. So in the new era, library should improve itself constantly by adopting many new IT technologies. And in this paper, we attempted to improve current user service model in university library by using Cloud Computing. Although study of Cloud Computing is still in the initial stage now, impacts brought by Cloud Computing are obvious. With the introduction of Cloud Computing to university library, services of libraries will have a new leap in the near future. Services provided by libraries will become more user-centric, more professional and more effective, etc. And we all believe that libraries will create more knowledge benefits for our country with the help of Cloud Computing. Cloud environment is a highly developed network environment; it appears to the users of high-quality service and high security. The Cloud computing techniques and methods applied to digital libraries, not only can improve the utilization rate of resources to address the imbalance in development between regions, but also can make more extensive use of cloud computing to our work life.

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