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Information common and emerging cloud library technologies

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Information common refers to the shared knowledge-base and the processes that facilitate its use. It also refers to a physical space, usually in an academic library, where any and all can participate in the processes of information research, gathering and production. In order to minimize the cost and avoid duplication of resources, infrastructure, software, hardware, manpower use of emerging technologies like server virtualization and cloud computing in libraries are increasing. This paper discusses in brief application of these technologies in libraries along with role of cloud librarian and university cloud library.

Key words: Cloud computing, information common, university cloud library model, Role of cloud librarian, cloud based library services, cloud platforms.

INTRODUCTION

The field of higher education has become one of the strongest adopters of virtualization as it allows the management of all resources like laboratories and libraries centrally and gives remote access to students through mobiles too. Today's Libraries and IT experts are facing new challenges in managing electronic content achieves. The adoption of technology that enables an organization to understand the meaning of every piece of information to ensure quick and appropriate access when needed is required. What seemed a dream a few years back is coming into true nowadays? "Now many university libraries are virtualizing servers and desktops, collaborating with other campus organizations and saving money and staff time" (Kelley, 2012). They are planning to build and their own data centers for information sharing. Cloud based services provide a means for libraries to free resources on information technologies and focus on libraries' core competencies- manage, organize and disseminate information. "Cloud based services are also bringing cutting-edge services to libraries that have less information technology expertise," according to Zhu (2012). A very recent example is that in February 2012 the Library of Congress OCLC announced a new beta cloud based service for Small Libraries (WSSL), with which libraries with fewer than 20,000 items in their collections may construct a low cost, simple, but dynamic website. Features include basic patron and inventory management, with checkouts, returns, holds, and renewals, among other functions. Many libraries now adapting 3M cloud libraries applications. Let us discuss more in detail on application of cloud computing in libraries.

Server virtualization

It is a method of running multiple independent virtual operating systems or softwares or applications on a

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single physical computer. It is a way of maximizing physical resources to maximize the investment in hardware. “This technology is a way of achieving higher server density and now is pretty much a no-brainer for everybody” (Kelley, 2012). Via net computing devices now many desktops are running simultaneously on one machine without CPUs in LAN. This technology is a huge boon from a consolidation perspective and the cost savings. Essentially instead of having one application per server you can now have multiple apps on one machine, which saves a huge amount on hardware resources. With this the use of library resources has increased and also use of library software by library staff is increasing in developing countries.

The desktop virtualization model allows the use of virtual machines to let multiple network subscribers maintain individualized desktops on a single, centrally located computer or server. The central machine may be at a residence, business, or data center. Users may be geographically scattered, but all may be connected to the central machine by a local area network, wide area network, or via the public Internet. All publishers, suppliers, consortia are using this technology for giving access to their digital resources like ebooks, ejournals, articles, scholarly materials.

Virtualization is the perfect solution for applications that are meant for small- to medium-scale usage.

Cloud computing

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. “The idea of cloud computing has emerged for outsourcing of computing infrastructure, storage of client data and applications that are accessed via a remote server” (Hosch, 2009; Knorr and Gruman, 2008). Traditionally companies sold product CDs and one had to buy a license to use them. Now may companies like Tally, Frank Borland products provide subscription services on the internet, without the need for the customer to set up anything and pay on monthly or yearly basis or just for the usage. Cloud computing also provides a common computing platform where users can build their own applications for use by others through the Web.

Information Common

Information common and resources common usage and sharing is possible because of this emerging server virtualization and cloud technology. According to Wikipedia “An Information Common is an information system, such as a physical library or online community, that exists to produce, conserve, and preserve information for current and future generations. Wikipedia could be considered to be an information common to the extent that it produces and preserves information through current versions of articles and histories”. This concept refers to the shared knowledge-base and the processes that facilitate or hinder its use. It also refers to a physical space, usually in an academic library, where any and all can participate in the processes of information research, gathering and production.

Cloud computing and server virtualization technology enables Internet to facilitate a decentralized production and distribution of information. It enables open source softwares and other commercial softwares to share software and hard ware platform common to all users. Licensing in common concept is also coming up. Creators have begun to use the licensing model to grant permissions for many uses in advance. The GNU General Public License (GPL), developed by Richard Stallman at MIT in the 1980s is an example of such license. “The GNU Free Documentation License is a form of copy left intended for use on a manual, textbook or other document to assure everyone the effective freedom to copy and redistribute it, with or without modifications, either commercially or non-commercially.” The GPL allow works in the common to be secured in the common. Prices of scholarly journals dropped dramatically and publishing corporations restricted access to these journals through expensive licenses. Research libraries had no other choice but to cut many of their journal subscriptions. European and American academic communities began to find alternate ways to distribute and manage scholarly information.

The Scholarly Publishing and Academic Resource Coalition (SPARC) work to stimulate the emergence of new scholarly communication models that expand the dissemination of scholarly research and reduce financial pressures on libraries."

Cloud libraries

Libraries can apply the concept of cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web to save money and time and to avoid duplication of work. Cloud computing can help libraries for resource, infrastructure, platform and software sharing. Different libraries under one educational trust can share and work on one platform so that consistency, uniformity, standards can be maintained. All libraries are already using the technology by the service providers like Google services, Facebook, Flickr, Slide Share, Social Book marking, File sharing, E-Portfolio, Amazon, other web tools and applications by paying a minimum amount. Because of digitization libraries have huge repositories of digital files both

subscribed, institutional and purchased and the cloud is boon for storage and maintenance of such data. In developing countries some libraries have less technological infrastructure or platform. With net computing solutions and cloud solutions they also can provide all the best services to their readers with minimum investment. A few years ago each library had hardly one computer but now that scene has changed and you can see couple of computers in every section. In digital libraries for net computing one can even arrange 50 workstations for readers' reference. Cloud libraries can be accessed and managed from anywhere so there are no restrictions of place and device. One can access the libraries from one's mobile phone too from home, can send their queries to the librarian anytime and ask librarian's help. Librarians also can help readers from any place.

Because of Z39.50 libraries can import and export catalogue entries and can maintain standard catalogues according to Library of Congress or National Library of that nation. It saves the time of member libraries. When data are maintained in the cloud, maintenance and backup of this data is done once and if a change is needed, once one library performs the change all share it. Developing and developed countries like India are spending on expensive technologies to assist their patrons in locating information owned by libraries or available online. There are very few softwares which are designed in standard formats and enable catalogue import/export facility and digital library solution which are very costly.

Many libraries cannot afford such softwares and go in for low cost local softwares which are designed just to keep records without following any library standards and so we see variations in catalogue entries. Already in many developed countries database vendors or integrated library system providers provide external servers to host library software and data. If Universities provide such standard softwares or uniform platform to all affiliated colleges through cloud it will be good for resource sharing, co-operative collection building, digitization, preservation, standardization of material and union catalogue.

M™ cloud library

This application is an innovative way to browse, borrow and read popular fiction and non-ebooks from local public library. Patrons can now enjoy e-book collection with wireless browsing and borrowing, and Internet-free reading. Our easy-to-use apps are available for most devices. They need valid library card to use this application. Patrons can use their personal accounts too to access e-books on their mobile devices like eReaders, PCs, Tablets, Kindle,Nook, iPad,iPhone, iPod Touch, Android-based tablets, Kindlefire, smartphones. More than 3000 publishers have signed with this application and provide access to more than 2 lac titles through this common platform.

Recent example of user of this application is Kitchigami Regional Library System who launched the 3M Cloud Library eBooks service to all Kitchigami cardholders, providing downloadable eBooks for all ages. Other few initiatives are OCLC's Webscale, Ex-Libris Cloud, OSS Labs, Duraspace`s- DuraCloud, Shared Academic Knowledge Base plus or KB+ (Figure 1).

Private clouds, hybrid clouds and community clouds

Private cloud is also called internal cloud or corporate cloud that provides hosted services to a limited number of people behind a firewall. This kind of cloud used in college libraries. A hybrid cloud is a composition of at least one private cloud and at least one public cloud. A hybrid cloud is primarily based in a privately-owned and operated data center, but it can shift some of its traffic and data processing requests to public cloud vendors such as Amazon or Rackspace on an as needed basis. This hybrid model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons. Moreover, libraries can continually adjust and fine-tune the balance between the tight control of a private IT infrastructure, and the flexibility and savings of cloud-hosted infrastructure. If reliability or security of one vendor becomes a concern, you're not committed to one company or one model of computing services.

Libraries presently cooperate with one another to buy IT equipment, bandwidth and the services of IT professionals, libraries may soon cooperate in the building and management of data centers. Alternately, if enough libraries express interest, a company such as Google, Amazon, Microsoft or another cloud vendor might create a Library Cloud similar to Google's Government Cloud. Or, a library vendor with deep IT resources (e.g. OCLC or SirsiDynix) might build library-centric cloud services on top of cloud infrastructure leased from one of the more established players.

Open source cloud computing platforms

Eucalyptus, OpenStack, Nimbus, Open Nebula, Open QRM, Zennos, Xen, EyeOS, Appscale, Google Drive, J-Cloud an open source multi cloud library.

Paid cloud computing platform and servers

Amazon EC2, Appistry, AT &T, Enomaly, GCloud3, Zizmox, Google, Microsoft, RackSpace, Fanggle, DuraCloud, 3M Cloud Library Applications.

With the rapid development and extensive use of ICT

Figure 1. M™ cloud library design.

and Web technologies in libraries, users' information requirements are increasingly personalized. And now more and more libraries advocate User-centered services. And only in this way, can they master the basic demands of their users. Furthermore, the library can develop itself according to such information and improve users' satisfaction. Farkas (2007) said web collaboration allows for libraries to be able to go to places where the patrons are and deliver relevant services where and when users need them.

Pasadena, Glendale and a few other libraries in California tested a cloud library platform developed by 3M to lend out ebooks recently in June 2012. They are using self check out machines too made by 3M. This cloud platform keeps everything in a synchronized way. Readers can download books within half a minute on iphones, ipads, Nooks, Androids or PC and Mac Computers. They can continue reading from one to another device.

As this technology has already entered in libraries the future libraries are virtual libraries and cloud libraries. Slowly developing countries will also get solutions at reasonable costs.

University Cloud Library model

Libraries are at the heart of any educational system. So university libraries are the heart of the university and fully depend on library resources. Traditional education is changing into distance education and e-learning. Universities increasingly use digital media (computers and the Internet) to accomplish their tasks. Because of open access system and use of digital media in research, preservation and dissemination of knowledge and delivery of education in universities readers are now accessing information from digital libraries and internet. The role of libraries in managing e-resources and giving maximum information has increased. It has been observed that in developing countries affiliated colleges maintain their separate library and resources. As now many books and journals are available in electronic form libraries are purchasing/ subscribing to those resources or taking memberships of consortia. Universities are also investing a lot of funds for purchase and subscription of difference resources. If universities will give access to all these resources on their cloud for all affiliated colleges it will save time, money and manpower. Universities and other funding agencies provide different grants for colleges for purchase of reading material. With the cloud technology member libraries will purchase new material to share rather than duplicate material. It will help to increase new resources for reference. Member libraries can give their resources on ILL.

Figure 2 shows the model for Cloud University Library. Material for different courses can be stored on the cloud e.g. Ebooks, Journals, Databases, Question Papers, Question banks, theses dissertations, project reports, chapters from the books, conference proceedings, newspaper articles, manuscripts, presentations (ppts), guest lectures, images, working papers, websites, edublogs, educational videos, CDs, DVDs, notices, circulars, newsletters, annual reports etc. Also university can keep best library management solution on the cloud to access and use by member libraries/affiliated college libraries on cloud for uniformity, union catalogue and resource sharing purpose. Library of Congress already initiated this cloud based activity for small libraries.

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, professional, effective, etc. And we all believe that libraries will create more knowledge benefits for 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 extensive use of cloud computing to our work life.

ENHANCEMENT OF LIBRARY SERVICES BY THE USE OF CLOUD COMPUTING

E-books Lending Service: Cloud platform is now becoming popular to lend the E-Books.
Union /Shared Catalogue/OPAC: Network libraries can use same platform and give access to their collection on

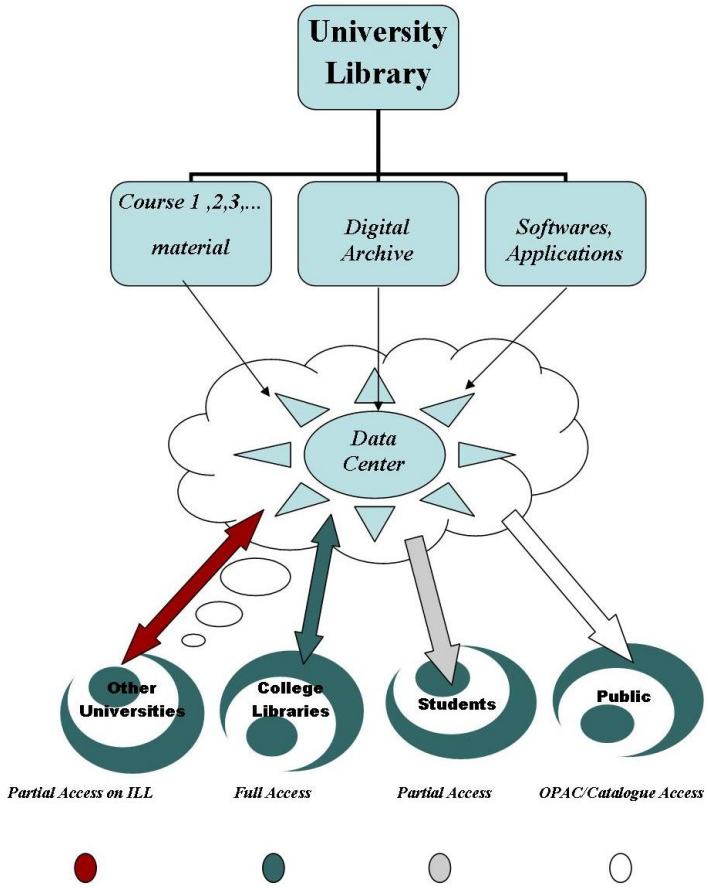

Figure 2. The model for Cloud University Library.

one platform. Through cloud computing creation of union catalogue becomes very easy.

Document Download Service: One can download documents easily if permit access in the network.

Digital preservation/Scanning Service: Digitization and scanning work can be done centralized and so one can avoid duplication of such time consuming work. Libraries can preserve the collection is digital form in the form of archives.

Article Delivery Service: Cloud computing can be used for article delivery service to the patrons by the libraries. Publishers are already using this technology for providing access to libraries.

Current Awareness Service: To provide current awareness service to all patrons has become easy with cloud computing.

Document Sharing: Document sharing has become easy with cloud computing.

Bulletin board service: We can provide new services on bulletin board with this technology.

Information Common: Information common like bibliographical data, content pages, cover pages, question papers, syllabus, and other reading material we can share on one platform. It helps in improving economy of library and avoids duplication of library purchase.

Collection Development: Cloud computing is used for collection development. Duplications can be easily avoided and alternate resources can be located and made accessible to patrons.

File sharing: To share various files in electronic form become easy with the cloud computing.

Information Discovery: Cloud provides a platform to store all information that one can access anytime from anywhere; so information discovery and searching become easy and it is very useful for researchers.

E-Learning: In the E-Learning environment too, cloud computing is boon. Study material can be kept on the cloud for reference purpose and online examinations also can be conducted. Discussions, revisions can be done at a time from different places.

Information Literacy/Orientation: Libraries can conduct information literacy and orientation courses on the cloud. They can keep the tutorials, videos, presentations and files on the cloud for user's orientation.

Social Interactions with the users: Can be possible because of cloud computing.

Online Demos: For giving online demo, cloud computing can be used at various levels.

There are a variety of cloud-based services in the library world. The most obvious is cloud-based access to a library's book and AV collections through the Online Public Access Catalog (OPAC) that is part of the library's Integrated Library System (ILS). OPACs can be overlaid with cloud-based front ends or recommender systems to make them more user-friendly. Bibliocommon is an example of a cloud-based front end for public libraries that works in tandem with a variety of ILSs. Biblio-commons and competing offerings from other vendors not only replace the search and discovery functionality of the OPAC but can also replace some patron account-related tasks, such as placing holds, paying fines, and updating user profiles. Some also provide a discovery experience based on community-contributed content, such as user-generated tags and reviews. Discovery layers like Serials Solutions' Summon, EBSCO's Electronic Data System (EDS), Ex Libris's Primo Central, and others are meant to access all of a library's data silos, not just resources catalogued in the ILS. Such discovery layers can provide access to special collections in the institutional repository and to products hosted outside of the library. For example, scans of public domain books in the HathiTrust digital repository can be found via the discovery layer of its academic library partners.

If a library wants more than the discovery layer in the cloud, library technology vendors including Innovative Interfaces and Online Computer Library Centre (OCNC) have either implemented or are in the process of laun-ching completely new ILSs in the cloud, and open source providers, such as ByWater Solutions, can deliver cloud-based hosting services for the Koha ILS.

Electronic resources can also be made available through extramural repositories. Google Scholar incorpo-rates metadata from journal indexes, article repositories, and other sources to offer web-scale access to scholarship that can be accessed at a patron's library of choice. OverDrive, the most popular library e-book vendor, works with public and academic libraries and is making strides to integrate seamlessly with online library systems. 3M's new e-book service, unveiled last year, permits users to sync their reading on multiple devices but still requires an initial download of the entire e-book file.

Citation management software in the cloud can double as a platform for sharing content, forming communities around research topics, and recommending resources [2]. Mendeley, for example, offers citation management through a web browser, though, to be fully functional, users need to download a client to their local computer.

New services may offer innovative approaches to managing scholarly communication electronically. Third Iron will let academic researchers browse and save new journal content through a service called BrowZine, available for the iPad.

Role of Cloud Librarian

1. To track member information and transactions
2. To provide Access Pin to students and define validity. (Pin can be auto generated; Validity can be set in the software)
3. To communicate with the member libraries contributing their resources to cloud for resource sharing
4. To communicate with the Ebooks, Journals publishers& distributors, consortia, database providers
5. To discuss with faculty members and subject experts, librarians for preparing different packages for different faculties and classes.
6. To update technological skills
7. To give technological support to member libraries
8. To conduct training and awareness programs for readers
9. To provide interlibrary loan facility
10. To track usage record of cloud resources
11. To develop digital collection
12. To keep record of physical resources too for providing referral service
13. To deal with Cloud resource and players and select the best bargain.
14. To maintain own virtual profile by creating his or her blog or social network profile to interact with the user. The same platform can be used for providing reference services and educating the users on cloud resources or how to use the Cloud infrastructure.
15. To use his or her strategic planning and decision making ability at different stages of developing a Cloud library.

Conclusion

With the proliferation of scholarly resources, and the need to provide relevant information to users in a convenient manner librarians have a great challenge before them. Technology is advancing at a phenomenal rate, but it needs to be harnessed in the most efficient way. Cloud computing, resulting in cloud libraries will certainly provide a great leap forward in providing access to large quantities of information to users.

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