

Cloud Computing & its Application in Libraries

Amrita Kumari

Assistant professor CSE,

Department - CSE – AIML

I e CMR CET, KANDLAKOYA MEDCHAL ROAD HYDERABAD

amrita.kumari1308@gmail.com.

Abstract:- Cloud computing is a new technique in the history of services which are offered in the internet. It has completely changed the way of use of the power of computers irrespective of any geographic location. The biggest profit for organizations and businesses is that it offers services using hardware, software and platform of third party sources. It is very economical as it saves cost and maintenance. Cloud computing comes in several different forms. To minimize the cost and avoid duplication of resources, infrastructure like software, hardware and manpower are used. Emerging technologies like server virtualization and cloud computing in libraries are increased. In this paper, a schedule has been made to give an overview of how service, platform and infrastructure forms of cloud computing has been used to serve the library needs. This paper discusses about the characteristics, types, advantages and disadvantages, role of cloud librarian, use of technology and initiatives of cloud computing. This attempt has also been made to overview the areas in libraries where this technology can be deployed to provide better library services and the productivity of library staff can be augmented or not.

I. INTRODUCTION

Till recently, and now too many organizations and individuals use computers to work alone, inside a business or home by investing on hardware, software and maintenance. It is the day to adopt the latest technology in an organization. With the help of technology, it can ensure quick and appropriate access of every information when need. There are so many forms of using this technology. For example the use of software applications, storing data Etc. Accessing computing power or platform to build applications is also the example of such services. From e-mail, to word processing or photo sharing or video sharing there are so many services one can choose from. These services can be accessed from any type of internet connection and are secure. These services are also backed up. The best live example of this is Gmail, which is increasingly used by organizations and individuals to run their e-mail services. Google Apps are being free for educational institutions and is widely used for running different applications, especially the email services, which was earlier run using their own computer servers. This has saved cost for the organizations as they pay per use for applications and services and time for the computer staff, which they can invest on running other services. Google takes care of the upgrading, backup and maintenance of servers. Libraries used computers for running services such as Integrated Library Management Software (ILMS), website or portal, digital library or institutional repository,

etc. These will be either maintained by parent organization's computer staff or library staff. this investment on hardware, software, and staff are doing to maintain these services and undertake backup and upgrade as and when new version of the software gets released. "Now many university libraries maintained servers and desktops, collaborating with other campus organizations and saving money and staff time" (Kelley, 2012). Cloud based services provide a means of libraries to free the resources on information technologies and focus on libraries' core competencies- manage, organize and disseminate information. "Cloud based services brings cutting-edge services to libraries that have less information technology expertise," according to Zhu (2012). Library professionals in most cases not being trained in maintaining the servers to find it difficult to undertake some of these activities without the support of IT staff from within or outside the organization. Now cloud computing become a new buzzword in the field of libraries, which is blessing to run different ICT services without much of a problem as third-party services will manage the servers and undertake upgrades and take backup of data. there are some technique in using cloud services such as privacy, security, etc.. some of the libraries have already embraced this new technology to run some of their services. Most of the libraries are now adapting 3M cloud libraries applications.

II. WHAT IS CLOUD COMPUTING ?

Cloud computing is a new phenomena. Many individuals and organizations are adopting this technology model for IT services. The benefit is that they are saved from hosting and operating multiple servers over their own network. It saves them from the burden and risk of constantly hardware failure. They need worry to install software, upgrading or backup issues. "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 Grumman, 2008). In cloud computing model, organizations need to buy or pay for only those services which are to be needed by the. In this pick and choose model, organisations are just to request the service providers to add or remove the services as per the need. To define the concept, cloud computing can be defined as simply sharing and use of applications and resources of a network environment to get work done without concern about ownership and management of the network's resources and applications" (M.-S. E Scale, 2009) Cloud computing is a very flexible model. In it, users can also build or prepare their own application which can also be used by others through internet. Actually it provides a common computing platform.

III. CLOUD COMPUTING CHARACTERISTIC

Mentioned below are the main characteristics of clouds computing:

- Resources are shared among users. It works very fast in the distributed computing environment.
- It ensures "on-demand" provision of resources, without having engineers for peak loads.
- By sharing common infrastructure, it ensures to work efficiently with multiple users and multiple applications. It reduces the cost of services.
- It is the characteristic of Cloud computing that users can access it from any corner of the world simply through the internet connection because the infrastructure is provided by a third-party.
- These applications are easy to maintain as compared to individual applications, since they are installed on a common platform and can be accessed from different places.

IV. TYPES OF CLOUD COMPUTING

There are three different types of services viz. SaaS, PaaS and IaaS.

A. *Software as a Service (SaaS):*

Software as a Service or SaaS is a service in which software's or applications are provided to the users as a service. So we know it popularly as software on demand. The program can be accessed online via any suitable client such as a web browser. In this model, users is provide the access of the applications through licenses or subscriptions. The software's are provided in a „pay as- you-go“ model, where the user has to pay only for the software's or applications which she/he is going to use or at no charge. Example of such services is Google Apps, Sales force, etc. It is hosted centrally hosted and scope for customization or control of applications or software's is little. However, there are benefits like the user has no worry about hosting, installing, upgrading, or maintaining the software or applications. In addition, the user has low initial costs, and access to (usually 24/7) support services.

B. *Platform as a Service (PaaS):*

Platform as a Service is a category of service which provides platform or environment to allow the developers to build the required applications or software's and the users have the access simply via a web browser over the internet. Software's are deployed and configuration settings are done by users. All types of enterprises, irrespective of its size, are adopting this service as it is very hassle free, no worry about the maintenance of hardware of software infrastructure. In this model, the enterprises is helped in building, testing and deploying web based applications. The organizations need not to invest for the infrastructure they require for building web and mobile applications. They have to use of platforms of vendors such as Windows Azure, Google AppEngine, and Force.com. However, there is a disadvantage that the applications or software's which are built using these vendor's services, are usually locked into that one platform⁶. This service is like water and electricity facility, where the users have to simply „tap in“ and take

what they need without worrying about the complexity. It is based on subscription model. Users only pay for what they use. The Users can focus on an innovation instead of complex infrastructure⁷.

C. *Infrastructure as a Service (IaaS) :*

Infrastructure as a Service i.e. IaaS is also called as Hardware as a Service or Haas. In this pay as you go service model, the user is offered both storage and computing power services. This includes virtual service space or a platform. It also includes storage, network connections, IP addresses and bandwidth. In this model, user doesn't buy separately software, servers, network equipment or data-centre space; rather he buys all these as a fully outsourced service. The price of the services is on computing basis, the user pay for bundle of services chosen. The example can be taken from Amazon's web services. AWS provides Simple Storage Services (S3) for data storage and elastic compute cloud (EC2) for computing resources. An Amazon's web services is being used by organizations for many purposes viz. to run high performance computing simulations, for content delivery etc. It is also being used to host or backup the organization's websites, to host their media collections and many other services.

V. INITIATIVES OF CLOUD COMPUTING

There are good number of cloud computing initiatives undertaken by Amazon, Google, Microsoft and others offering various types of cloud computing services for the organizations, businesses, and individuals. Some services offered by these initiatives are:

A. *Amazon Web Services (AWS):*

Amazon is a major player of cloud computing. It offers a wide range of prominent services, for example, simple storage service (S3), elastic compute cloud (EC2), simple DB and simple queuing service (SQS). AWS provides a scalable and reliable low-cost platform of infrastructure in the cloud that powers hundreds of thousands of businesses in countries around the world⁸. Some o solutions offered by Amazon through cloud computing include application hosting, web hosting, backup and storage, enterprise IT, content delivery, and databases. To help new users, Amazon also offers a free service for a period of one year on all its cloud computing services to launch new applications, test existing applications in the cloud, or simply gain a hands-on an experience with AWS.

B. *Google Apps:*

Google Apps cloud services, a multi-tenant, internet scale infrastructure, offers faster access to innovation, superior reliability, and security, and maximum economies of scale as compared to on-premises, hosted and software plus services technologies⁹. Google Apps is available free for individuals and organizations (limited up to 10 user accounts), educational institutions and US non-profitable organizations and for a price to businesses and organizations. now a days Google apps offer Gmail which is most preferred email service. It also provides Google Docs, Google Sites, Google video and other services. Google Apps helps organizations to move their e-mail services, web services and office applications. Google also has „Google

App Engine" service. With this service, organizations can build and host web apps on the same systems that power Google applications. It offers fast development and deployment; simple administration, with no need to worry about hardware, patches or backups; and effortless scalability⁹.

C. Microsoft Windows Azure :

Microsoft Corporation has created its own cloud platform on 1st February 2010 which was named as Windows Azure before 25 March 2014. After this it is renamed as Microsoft Azure. Microsoft provides this service through its datacenters. In this platform, organizations can develop and run applications itself with unbounded scalability. User has to pay only for the services he chooses. Windows Azure allows developers to develop and run applications quickly, while leveraging current skills to develop applications with .NET, PHP, or Java¹⁰. Some of the scenarios offered by Windows Azure for businesses and organizations include SaaS, storage, computing, database management etc.

D. RackspaceCloud :

This cloud platform offers three types of services for organizations and businesses viz. cloud servers, cloud files and load balancers. It offers free architecture assistance to its users with every account. Cloud servers are available to organizations in different sizes . It uses Akamai's content delivery network (CDN) to globally deliver the stored media and files. Its third service Cloud balancer helps organizations to enhance their server capacities and to balance the load factor and this service is extended only on-demand¹¹.

VI. CLOUD COMPUTING: APPLICATION IN LIBRARIES

There are some organizations and business houses who functions as cloud computing vendors for library software's, search engines and digital libraries etc. and offer the use of cloud computing platform for these purposes. Some of these are:

A. OCLC's Web scale :

OCLC is perfectly using cloud computing for libraries and set an example for others. Years together OCLC has been functioning as a cloud computing vendor because they provide cataloguing tools over the internet and allow member institutions to draw on their centralized data store¹³. OCLC has implemented the plan of library management systems i.e. world share management services (WMS). This service has services for many areas like acquisitions, analytics, resource sharing, cataloguing and license management components. It offers the entire library collection management in a cloud-based application. The main purposes of web scale are that libraries can share their resources, data, and innovation with ease. To serve these purposes, it has some certain features that work together to provide its users better library services. In other words, this will generate cost benefits for libraries and efficiencies not possible when utilizing disparate, specialized systems¹³. The service promises to include privacy, security, scalability and technical support.

B. Ex-Libris Cloud:

It is a leading library software vendor from USA. It provides cloud based solutions to automate the library operations. It developed most products for locally implemented solutions and adapted them to a hosted environment later. Its website claims that over 5300 in more than 80 countries are deploying Ex-Libris solutions for automation of their library resources. It allows libraries to enhance their efficiency and lower the cost of operations and extend their value through launching new services. It has changed the way to provide traditional management of library resources through its library based system, Alma. It besides ensuring considerable savings in total cost, involved in the implementation of software and the use of a centralized cloud service enables libraries to easily influence the collaborative efforts of the library community to provide effective services for their users¹⁴. To provide worldwide cloud-based services; it has opened data centres at various locations. The company promises to adhere to data security, updates, and standards in implementing cloud services to safeguard the interests of customers.

C. Dura space's Dura Cloud :

Dura space provides open source repository solutions by undertaking turnkey projects for organizations and libraries to enable them to share scholarly literature using DSpace and Fedora Commons. It is particularly devoted to improve and sustain Fedora and DSpace. These open source repository solutions are very famous for IR solutions. Its new service Dura Cloud provides digital preservation support services in the cloud, which is cost effective and simple for libraries. Dura Cloud helps libraries to move content to the cloud and store it with different service providers to eliminate the risk of data loss. The cloud solutions offered include online backup, preservation and archives, media access, online sharing, and cloud broker

D. OSS Labs:

OSS labs from India is using Amazon's elastic cloud computing platform owing to the various capabilities of Amazon such as high durability of data, ISO standards based strong information security and flexibility. It is expected that the OSS labs will be able to provide robust open based solutions to demanding customers. OSS Labs offer hosting and maintenance services for Koha ILS and DSpace IR. OSS Labs use Amazon's cloud services. Library operations have become very cost effective and the library staff need not to worry about maintenance of software.

VII. ENHANCEMENT OF LIBRARY SYSTEM BY USING THE CLOUD COMPUTING

- **Information Common:** Information are 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 the economy of library and avoids duplication of library purchase.
- **Collection Development:** Cloud computing is used for collection of development. A Duplications can be easily avoided and an alternate resources can be located and made accessible to patrons.

- **File sharing:** To share various files in electronic form become very easy with the cloud computing.
- **Information Discovery:** Cloud provides a platform to store all the information that one can access anytime from anywhere. so information discovery and searching become too easy and it is very useful for researchers.
- **E-Learning:** In the E-Learning environment , cloud computing is boon. A Study material which can be kept on the cloud for reference purpose and online examinations also can be conducted. Discussions, revisions is to be done at a time from different places.
- **Information Literacy/Orientation:** Libraries can conduct an information on literacy and orientation courses on the cloud. They keep the tutorials, videos, presentations and files on the cloud for user's orientation.
- **Social Interactions with the users:** It Can be possible because of cloud computing.
- **E-books Lending Service:** A Cloud platform is now becoming popular to lend the E-Books.
- **Union /Shared Catalogue/OPAC:** Network libraries can use same platform and give an access to their

collection on one platform. From this cloud computing creation of union catalogue becomes very easy.

- **Document Download Service:** One can download the documents easily if permit access in the network.
- **Digital preservation/Scanning Service:** Digitization and scanning work is to be done centralized and so one can avoid duplication of such time consuming work. Libraries can preserve the collection is in the digital form in the form of archives.
- **Article Delivery Service:** Cloud computing is to be used for article delivery service to the patrons by the libraries. The Publishers are already using this technology for providing access to libraries.
- **Current Awareness Service:** To provide current awareness service to all patrons it has become very easy with cloud computing.
- **Document Sharing:** Document sharing has become very easy with cloud computing.
- **Bulletin board service:** We can provide a new services on the bulletin board with this technology.

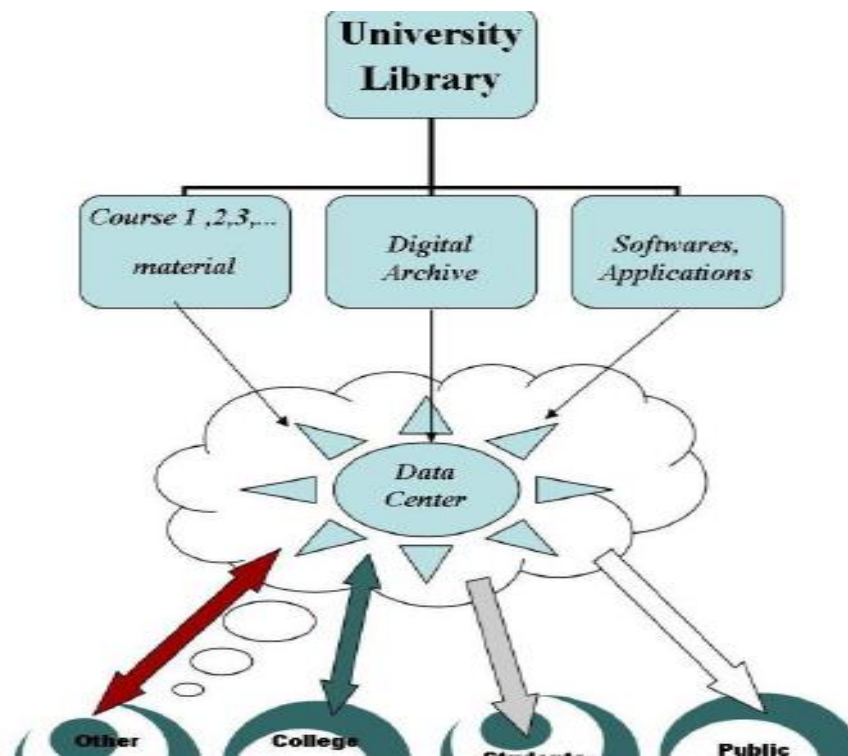


Fig. 1: The model for Cloud University Library.

VIII. ROLE OF CLOUD LIBRARIAN

- To track member information and transactions .
- To provide an Access Pin to students and define validity(Pin can be auto generated Validity can be set in the software).
- To communicate with the member libraries and contributing their resources to cloud for resource sharing .
- To communicate with the EBooks, Journals publishers&the distributors, consortia, database providers

- To discuss with the faculty members and the subject experts, librarians for preparing different packages for different faculties and classes.
- To update technological skills.
- To give a technological support to member libraries.
- To conduct a training and awareness programs for readers.
- To provide interlibrary loan facility To track usage record of cloud resources.
- To develop digital collection To keep record of physical resources too for providing referral service.
- To deal with the Cloud resource and players and select the best bargain.

- To maintain their own virtual profile by creating his or her blog or social network profile to interact with the user and the same platform can be used for providing.

A. *Advantages :*

- **Cost saving** – In cloud computing, the user has to pay only for those services which he chooses and thus technology enables the libraries or organizations to save on costs.
- **Easy on installation and maintenance** – By using this technology, the organization has no worry about server updates and other computing issues. IT staff of the organizations may concentrate on their other tasks and there is no need to procure any hardware to run the servers.
- **Increased storage** - Cloud can hold more storage than a personal computer or the servers available in the libraries or organizations and it is possible to extend as per the need.
- **Automation** – With the help of cloud computing technology, every software update or maintenance is done automatically by the service provider and the IT or library staff need not to worry about all these things.
- **Flexible** – This technology is very flexible and the user is free to add or remove any of its facilities thus saving cost and time of the users. It facilitates the libraries to expand its services anytime.
- **Better mobility** - The users rather than having to remain present at their desks with a PC and Internet connection can access the library servers from wherever they are,.
- **Shared resources** – This is the main and important feature of cloud computing that participating organizations can share their resources. By sharing their resources, they can save on costs and more libraries can access more number of resources at one place.

B. *DISADVANTAGE:*

- **Privacy and security of Data** - It is very big concern that there is a risk about the privacy and security of data. It can be accessed by others in cloud and it is more risky when the data is sensitive such as credit card information of customers. If the proper security model is not yet in the place, then the data stored on the cloud is vulnerable to attacks from viruses, theft, etc. In addition, there is also the risk of data loss if there is system failure or improper backup. The physical location of servers is difficult to find as these services are provided through internet. It is difficult to undertake the audit of software and security.
- **Network connectivity and bandwidth** – It is also a big concern that this service is directly connected to internet connectivity. If there is connection failure, then the user cannot access because this service is provided through internet. Also more bandwidth is required, as it may not work on low-speed Internet connections¹⁹.
- **Providers are supreme power** – As these services are provided by third party, the organizations have very little power to maintain or customize the services. It is

very difficult to access the physical location of servers and the organizations have to depend on the service providers. Also the organizations are totally dependent on provider for backup, updates, restore and disaster recovery.

- **Flexibility is limited** – It has limited flexibility for the user as cloud computing is provided by third party. So there is little scope for customization as per specific requirements.
- **Cost** - Initially the cost of this service be higher as there are some common services for all. The organizations can reduce by more usage of these services. However, cloud computing providers may increase the cost of their services in the future and organizations may end up paying higher charges.
- **Knowledge and integration** – This one is very important requirement that the organizations have their own IT staff who have knowledge of cloud computing. Otherwise it is dependent on the service provider. Likewise, it is difficult to integrate equipment used in data centres are different from that of peripheral equipment's in the organization such as printers, USB drives, etc. So it is difficult to integrate and the integration is also an issue.

IX. CONCLUSION

Cloud computing is a new way in the computer systems technology. It is emerged due to the developments in internet and associated technologies. This phenomenon is in developing stage and will be very helpful for the organizations, if the services are being used with care. However, this technique is very helpful for organizations like libraries in automating and managing their services. This technology has certain advantages. With the help of this technology, library staff will be free from managing the servers.

REFERENCES

- [1.] Wikipedia. Cloud computing. http://en.wikipedia.org/wiki/Cloud_computing (accessed on 20 August, 2014).
- [2.] D. A. Kumar, and S. mandal, "Development of cloud computing in integrated library management and retrieval system." *International Journal of Library and Information Science*. 2013. 5(10). 394-400
- [3.] Christy, Pettey& Forsling, Carina. Gartner highlights five attributes of cloud computing, 2009. <http://www.gartner.com/newsroom/id/1035013> (accessed on 19/08/2014).
- [4.] S.Y.Bansode, and S.M. Pujar, "Cloud Computing and Libraries." *DESIDOC Journal of Library & Information Technology*, Vol. 32, No. 6, November 2012, pp. 506-512
- [5.] Mark Shane E. Scale, "Cloud computing and collaboration", *Library Hi Tech News*, Vol. 26 Iss: 9, pp.10 – 13 <http://www.libraryjournal.com/article/CA6695772.html> (accessed on 22/08/2014)
- [6.] S. Dhamdhere, and R. Lihikar, "Information common and emerging cloud library technologies."

- International Journal of Library and Information Science. 2013. 5(10). 410-416
- [8.] About AWS. 2014. <http://aws.amazon.com/what-isaws/> (accessed on 4 July 2014).
- [9.] Google.com. Google App Engine. 2014. <https://developers.google.com/appengine/?csw=1> (accessed on 02 August 2014).
- [10.] Microsoft.com. Cloud Platform. 2014. <http://www.microsoft.com/enterprise/it-trends/cloud-computing/default.aspx#fbid=gB0X9apRw93> (accessed on 05 Aug 2014).
- [11.] Rackspace.com. The Rackspace Cloud. 2012. <http://www.rackspace.com/cloud/> (accessed on 01 Aug 2014).
- [12.] Robert Fox, "Library in the Clouds," OCLC Systems & Services, v. 25, 3 (2009): 156-61.
- [13.] OCLC. OCLC World share management services.2012. <http://www.oclc.org/worldshare-management-services.en.html> (accessed on 26 July 2014).
- [14.] Kozokin, Sarit. Ex-Libris cloud: Open for business. 2011.
- [15.] <http://www.exlibrisgroup.com/?catid={BC76D337-FEFA-4603-B827-28AB9F818BDB}> (accessed on 28 June 2014).
- [16.] Duracloud.org. Duracloud. 2012. <http://www.duracloud.org> (accessed on 18 July 2014).