Championship of Cloud Computing in Futuristic Libraries of India: An Overview

Sadik Batcha M

Associate Professor, Dept. of Library and Information Science, Annamalai University

Annamalainagar, Tamil Nadu, South India -608 002

Abstract-Cloud computing is computing technology by which user can store their data in virtual space and can be retrieved it from anywhere with the use of network. It's free and also on-demand service. It helps industries and individuals to save the money, time and space also. Using this technology one can share space and resources worldwide. The present paper discusses the overall view of cloud computing, the characteristics, Deployed models and its types. Further the focus has been given the application of cloud computing in modern libraries as it is the need of hour. The advantages of cloud computing and the areas in which cloud computing be applied with current usage are discussed with example. The present scenarios in Indian Libraries are put forth in the paper and the importances of cloud computing in Indian libraries are focused in this paper.

Keywords: Cloud Computing, Public cloud, Private cloud, Community cloud, Hybrid cloud, Saas, Paas, Iaas, e-learning, Digital Library software.

I.   INTRODUCTION

Cloud computing is an emerging technology model for information technology services which today many organizations, multinational companies and modern libraries are adopting. The idea of cloud computing was brought out by Prof. John McCarthy, who was the person behind the concept of the Artificial Intelligence, Lisp and many other things, most of which provide to be effective after 50 year. The cloud computing can improve the level of management and service of library network information and reduce the cost of management and service1 .

The Christy & Carina[1] of Gartner Group define cloud computing as 'a style of computing in which massively scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies'. To simplify the concept, cloud computing can be defined as 'simply the 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'[2.] The Impact of electronic environment influenced all sectors of social and economic life; it required imparting training to the user community of academics to retrieve right information at right time.[3]

Cloud computing is computing technology by which user can store their data in virtual space and can be retrieved it from anywhere with the use of network. It's free and also on-demand service. It helps industries and individuals to save the money, time and space also. Using this technology one can share space and resources worldwide. Only in this case, the cloud computing is acceptable by the library. If the IT resource do not have the alternative feature, or is not free from a service provider transferred to another, or the transfer cost is very high, then the dependence of the library on cloud will become very strong, which is equivalent to the cloud provider binding. So the consequences are unbearable to contemplate4.

II.   WHAT EXACTLY THE CLOUD COMPUTING

Cloud computing is a kind of computing technology which facilitates in sharing the resources and services over the internet rather than having these services and resources on local servers/ nodes or personal devices. The combination of servers, networks, connection, applications and resources is defined as 'cloud'. Cloud computing is acting as a resources pooling technology for accessing infinite computing services and resources as per demand of users and can be compare with models of pay as you use or utility model same as used for mobile services usages and electricity consumption.

III.   CHARACTERISTICS OF CLOUD COMPUTING

- Self Healing

Any application or any service running in a cloud computing environment has the property of self healing. In case of failure of the application, there is always a hot backup of the application ready to take over without disruption. There are multiple copies of the same application - each copy updating itself regularly so that at times of failure there is at least one copy of the application which can take over without even the slightest change in its running state.

- Multi-Tenancy

With cloud computing, any application supports multi-tenancy - that is multiple tenants at the same instant of time. The system allows several customers to share the infrastructure allotted to them without any of them being aware of the sharing. This is done by virtualizing the

servers on the available machine pool and then allotting the servers to multiple users. This is done in such a way that the privacy of the users or the security of their data is not compromised.

- **Linearly Scalable**

Cloud computing services are linearly scalable. The system is able to break down the workloads into pieces and service it across the infrastructure. An exact idea of linear scalability can be obtained from the fact that if one server is able to process say 1000 transactions per second, then two servers can process 2000 transactions per second.

- **Service-Oriented**

Cloud computing systems are all service oriented - i.e. the systems are such that they are created out of other discrete services. Many such discrete services which are independent of each other are combined together to form this service. This allows re-use of the different services that are available and that are being created. Using the services that were just created, other such services can be created.

- **SLA Driven**

Usually businesses have agreements on the amount of services. Scalability and availability issues cause clients to break these agreements. But cloud computing services are SLA driven such that when the system experiences peaks of load, it will automatically adjust itself so as to comply with the service-level agreements. The services will create additional instances of the applications on more servers so that the load can be easily managed.

- **Virtualized**

The applications in cloud computing are fully decoupled from the underlying hardware. The cloud computing environment is a fully virtualized environment.

- **Flexible**

Another feature of the cloud computing services is that they are flexible. They can be used to serve a large variety of workload types - varying from small loads of a small consumer application to very heavy loads of a commercial application.

IV. DEPLOYMENT MODELS OF CLOUD COMPUTING

There are various categories of cloud computing. The subscription of cloud is fully depended on the requirement of subscriber.

- **Private Cloud**

It's based on specific requirement. This type of cloud is made for a particular group or institution, organization and limits access to just group or individuals**.** This kind of deployment model solely developed and managed by a single organization or a third party regardless whether it is located in premise or off premise.

- **Public Cloud**

It is identified, where several institutions, organizations have same needs an hare infrastructure. This is a cloud computing category in which service providers create their computing resources, accessible on web for public. Public cloud is meant for general public use and open to all. This kind of deployment model of cloud computing is developed by any cloud computing agency and having own policy, value, and profit, costing, and charging model. Some
popular public cloud services include Amazon EC2, S3, Google App Engine and Force.com.

- **Community Cloud**

As name suggests, a community cloud is distributed among two or more organizations that have similar cloud requirements. This type of cloud deploy model helpful in developing of economic scalability and democratic equilibrium. In the community cloud model cloud infrastructure may be hosted by a third party vendor or within one of the organizations in the community.

- **Hybrid Cloud**

Hybrid cloud is a combination of two or three deployment models (Private, Public and Community Cloud). The Hybrid cloud model is widely used by institutions and organizations. It is because this model provides more facilities and flexibilities in making optimum use of their resources and accomplishing the tasks.

V. SERVICE MODELS OF CLOUD COMPUTING

There are currently three service models of cloud computing

- **Software as a Service (SaaS)**

In this service user use an application, but does not control the operating system, hardware or network infrastructure. Software package such as CRM or CAD/CAM can be accessed under cloud computing scheme. Here a customer upon registration is allowed to use software accessible through net and use it for his or his business process. The related data and work may be stored on local machines or with the service providers. SaaS services may be available on rental basis or on peruse basis. There is usually little customisation or control available with these applications. However, subscribers benefit from low initial costs, have access to (usually 24/7) support services, and needn't worry about hosting, installing, upgrading, or maintaining the software5

- Platform as a Service (PaaS)

In this service user host an environment for their application. The user controls the application but doesn't control system or network infrastructure which they are using. Cloud vendors are companies that offer cloud computing services and products. One of the services that they provide is called PaaS. Under this a computing platform such as operating system is provided to a customer or end user on a monthly rental basis. Some of the major cloud computing vendor is Amazon, Microsoft, and Google etc. It helps 'organisations not to make investment in the infrastructure required for building web and mobile applications, but can rent the use of platforms such as Windows Azure, Google AppEngine, and Force.com Applications which are built using these provider's services. However, are usually locked into that one platform[6]. This service is delivered the way utilities like water and electricity are supplied, users have to simply 'tap in' and take what they need without worrying about the complexity. And like a utility, PaaS is based on a metering or subscription model so users only pay for what they use. With PaaS, one can focus on innovation instead of complex infrastructure7

- Infrastructure As a Service (IaaS)

It is also known as Hardware as a Service which provides infrastructure like CPU, memory and the other storage over the network. One may avail hardware services such as processors, memory, networks etc on agreed basis for specific duration and price. Suppliers typically bill such services on a utility computing basis; the amount of resources consumed (and therefore the cost) will typically reflect the level of activity[2]. IaaS is priced on a pay-as-you-go model enabling clients to scale up or down the operations depending on their needs at any given time and pay only for what they use[5].

VI.   CLOUD BASED SERVICES IN LIBRARIES

There are various library services in which we can implement cloud computing in our routine works i.e.

a) Online E-resources-

Now a days there are various famous publishers which are providing
the valuable online E-resources like e-Books e-journals', Online databases etc. libraries are subscribing these E-resources and making accessible for users via network. This access is generally based on cloud. There are many main library consortia which use cloud computing for their databases like UGC-Infonet, AICTEINDEST, FORSA etc., running under the MHRD project for education through ICT. They are also providing e-Resources to the academic institutions which can be access through network. Using e-Resources there is no need to store the data in servers of library. Libraries can access the resources from publisher's server directly where the e-Resources are store.

b) OPAC-

Online Public Access Catalogue is an online catalogue of a library which can be accessed through the network browser. It is one of the best examples for making use of cloud computing for sharing data among libraries. The Services of OCLC, World Cat, Library of Congress, British library Catalogue etc. are one of the popular services for searching library collection which is available on the cloud. These are the valuable services which are creating cooperation among libraries and uniformity of data also. OPAC helps libraries to make easy Inter Library Loan and Document Delivery Services. Online Public Access Catalogue (OPAC) is a major development in the early eighties, which have been designed to be the principle means of catalogue access to the library collections, both in the reading rooms and externally over telecom networks8.

c) Institutional Repositories-

The style of study is changing. Each and every user is engaged with digital instruments like iPhones, Smart phones, tablets and laptop, because most of the information is generating now in digital format. So there is a greatest need to archive data in digital format. There are many cloud based digital library software like D-Space, Greenstone, Fedora, E-prints etc. by which libraries can make a digital repository and archive their data on cloud. The stored data in repositories can be accessed easily worldwide through the internet   24 X 7.

d) Integrated Library Management Software-

ILMS helps libraries to automate their house keeping work like acquisition, cataloguing, technical processing, circulation, serials etc. There are many softwares like KOHA, NewGenlib, ABCD, PHPMyLibrary are available in the market which are providing these services on the cloud and also supports various standards such as MARC21, XML, Z39.50 etc. Many software vender such as SirsiDynix, Ex Libris are providing the cloud service which helps libraries to save invest in infrastructure.

e) Storage and Cost Benefit-

In the Indian scenario many libraries which are unable to purchase the costly infrastructure like hardware, software, servers. By using the cloud computing there is no need to purchase infrastructure. There are many open access cloud services available free of cost such as Google drive, Googledocs, SkyDrive, Google Dropbox, iCloud etc.,where libraries can store their data. At present various cloud service providers like CloudSigma, Soutron global, Amazon A3, DuraCloud, Informatics etc., which are providing the cloud space to libraries to store their data at minimum cost.

f) Web Hosting-

Website hosting is also based on cloud computing. This service generally provides and maintain by the third party service providers such as Rack space, BigRock, Net4. It's basically a renting of server space and bandwidth so that libraries can maintain files for their websites through a website hosting service provider.

g) Social Networking Tools-

Cloud computing technology offers great opportunities for libraries, library professionals and also information seekers to build their network by using social networking sites, like Twitter, Facebook, LinkedIn, Instagram, flickr, Google plus, Ibibo, Blogs, Wikis etc. these sites helps libraries to build community power and provide the platform to share the information and knowledge among the users.

h) Discovery Tools-

There are some Cloud based aggregated subject gateways that support systematic unified web-scale resource discovery such as SUMMON (a Pro-Quest business), EBSCO Discovery Service, Primo Central (Ex Libris) and Scout etc. Knimbus is also cloud based research platform which provides the facility to discover and share the scholarly content. Knimbus stands for Knowledge Cloud which is dedicated to knowledge discovery and collaborative space for researchers and scholars.

Table 1 Cloud Based Services in Libraries

Field/Area	Cloud based Services	Institutions
OPAC	Worldcat	OCLC
	Library of Congress Catalogue	Library of Congress
	Trove	National Library of Australia
	British Library Public Catalogue	British Library
	IndCat	INFLIBNET
eLearning	NPTEL Video	IITs and IISc Bangalore
	MIT Open Courseware	MIT
	MOOCs (Free Online Courses)	Massive Open Online Courses
	e-PG Pathshala	INFLIBNET
Consortia	UGC-Infonet	Inflibnet
	INDEST-AICTE Consortium	MHRD Project
	NKRC	NISCAIR (CSIR)
Digital Library Software	DSpace, FEDORA	DuraSpace
	Greenstone	UNESCO and the New Zealand Digital Library Project, University of Waikato
	EPrints	University of Southampton School of Electronics and Computer Science
	Digital Library extension Service(DLXS)	University of Michigan
Open Source ILM	KOHA	KatipoCommunications, Horowhenua Library Trust, New Zealand
	Evergreen	Georgia Public Library Service

VII.   ADVANTAGES OF CLOUD COMPUTING

1. Cost reduction and effectiveness

2. Library Co-operation

3. Virtualization

4. Storage of data

5. Time saving

6. Save the physical space of library

7. Best manpower management

VIII.   RECENT SITUATION OF INDIAN LIBRARIES

In India, cloud computing in libraries is in development phases. Libraries are trying to provide to users cloud based services but in real sense they are not fully successful owing to the lack of good service providers and technical skills of LIS professionals in the field of library management using advanced technology. But some services such as digital libraries, web documentation and using web2.0 technologies are running on successful modes. Some good examples of successful cloud computing libraries include Dura cloud, OCLC services and Google based cloud services. Nowadays

many commercial as well as open sources venders (i.e. OSS) are clubbing the cloud computing technology into their services and products. However, cloud computing technology is not fully accepted in the Indian libraries but they are trying to develop themselves in this area.

IX.   CONCLUSION

Libraries are in a unique position to experiment with cloud computing given their service-oriented mission and need to find appropriate solutions using limited resources9..This paper provides cloud computing concepts and implications of cloud based applications in libraries in order to enhance their services in a more efficient manner. No doubt, libraries are moving towards cloud computing technology in present time and taking advantages of cloud based services especially in building digital libraries, social networking and information communication with manifold flexibilities but some issues related to security, privacy, trustworthiness and legal issues were still not fully resolved. Although cloud computing has been concerned about standards and protocols, but the library for cloud computing should also have industry standards. Library industry managers should organize the application of cloud computing standards and related agreements to study the formation of the industry's application code10. Therefore it is time for libraries think seriously before clubbing libraries services with cloud based technologies and provide reliable and rapid services to their users. Another role of LIS professionals in this virtual era is to make cloud based services as a reliable medium to disseminate library services to their target users with ease of use and trustworthiness.

REFERENCE:

[1]. Christy, Pettey & Forsling, Carina. Gartner highlights five attributes of cloud computing. 2009. http://www.gartner.com/it/page.jsp?id=1035013 (accessed on 28/12/2011).

[2]. Scale, Mark-Shane E. Cloud computing and collaboration. Library Hi Tech News, 2009, 26(9), 10-13.

[3]. Shabana Tabusum, Saleem, A. & Batcha, M.Sadik. Digital Literacy Awareness among Arts and Science College Students in TiruVallur District: A Study. International Journal of Managerial Studies and Research, 2014, 2(4), 61-67.

[4]. Jiang Liyan. Cloud-based Information Platform Library. Journal of Modern Information, 2011,8, 47-51.

[5]. Kroski, Ellyssa. Library cloud atlas: a guide to cloud computing and storage/stacking the tech. Library Journal, 2009. http://www.libraryjournal.com/article/CA6695772.html (accessed on 15 February 2011).

[6]. Colayer. What is Paas? 2009. http://ex.colayer.com/ _ cached /LINK _whatispaas /LINK_ whatispaas.html (accessed on 29 December 2011).

[7]. About AWS. 2011. http://aws.amazon.com/what-is- aws/ (accessed on 4 January 2011).

[8]. Tabusum, S. & Batcha, M.Sadik. Impact of Library Automation in the Development Era. IOSR Journal Of Humanities And Social Science, 2013, 17(5), 20-26.

[9]. Mitchell, Erik. Using cloud services for library IT infrastructure. Code4Lib Journal, 2010, 9. http://journal.code4lib.org/articles/2510 (accessed on 8 January 2012).

[10].Chen Mang, Zhou Liqing, & Zheng Cong, The Research on Construction and Performance of Library's Cheap Private Cloud Storage, Library Journal, 2015. 85-93.

AUTHOR'S PROFILE

Dr. M. Sadik Batcha is working as the Associate Professor in Department of Library and Information Science, Annamalai University. He was formerly Professor and Head of the Department of Library and Information Science, Periyar University. He has done his M.L.I.S., M.Phil and Ph.D. He started his career as College Librarian and has elevated to the position of teaching faculty in University. He has put through 22 years experience in Teaching and Research. He has produced 10 Ph.D scholars and more than 62 M.Phil students. He has brought out about 59 Research Articles in National and International Journals. He has delivered about 50 invited talks on different research areas. His area of specialization is Scientometrics. He has edited 4 books and has been a life member of ALA.