Cloud Computing and its Role in Enhancement of Library Services

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Abstract

The library field is passing in re-innovation age, some latest technological developments have been found to be very effective in providing library services in innovative way and made library automation services more effective and cost saving also. Latest technologies like QR code technology, RFID technology, Cloud computing technology, Robotics etc are some of them. The present paper focuses on cloud computing and its role in enhancement of library services. It describes how cloud computing may be useful in providing library services and making it cost effective as well.

Keywords : Cloud Computing, Types of cloud computing, Cloud based library services.

Introduction

Due to advent of latest technologies and user-friendliness of its applications, these are becoming very popular among academic societies. Library users' expectations towards libraries are also increasing. On the other hand for acquiring and implanting these technologies require infrastructure, platform, software and many more. Besides it its maintenance is also required. In such situation a technology is becoming popular which provides such required facilities like infrastructure, platform, and software service facilities on rent basis. It means that any organization can utilize latest technological services without investing full cost of it but on rent basis as per their requirement. This technology is known as cloud computing. Libraries are using computers for housekeeping services such as Integrated Library Management Software, website or portal digital library or institutional repository etc. These are either maintained by parent organization's computer staff or library staff. It requires investment on hardware, software, infrastructure and staff to maintain these services and undertake backup and upgrade as and when new version of the software gets released. But now-a-days by adopting cloud computing services these investments may be saved.

In cloud computing many servers are used on which special software are installed. Servers are may be more than one. Many software are installed in these servers. Basically cloud computing technology works on Dual layer technology. There are two layers, one layer is for managing servers called back end and other layer which is used by client called front end. Thus by combining back end and front end a server setup is developed for cloud computing. According to Wikipedia, cloud computing refers to

" The delivery of computing as a service rather than a product, whereby shared resources,
software and information are provided to computers and other devices as a metered service over a network, typically the internet."

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" 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)

"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". (M. S. E. Scale, 2009)

Cloud computing is that technology in which different services are provided with the help of internet. These services may be in the form of software, storage space on server, infrastructure service or any other service. Thus cloud computing means to provide any type of computing services through internet on user's demand. In this technology users are provided data storage facility on internet's server which is called cloud. By purchasing space on cloud users can save
any amount of data and can access that data from anywhere in the world. Libraries are using cloud computing as a means to make available free e-resources to its users, manage, organize and disseminate information.

"Cloud based services are also bringing cutting-edge services to libraries that have less information technology expertise." Zhu (2012)

Generally library professionals are not trained in maintaining servers. They require special IT staff for it. Now cloud computing has become a blessing in the field of libraries as by implementing cloud computing services in libraries, it has become easy to run different ICT services because third-party services manages servers and undertake upgrade and takes backup of data.

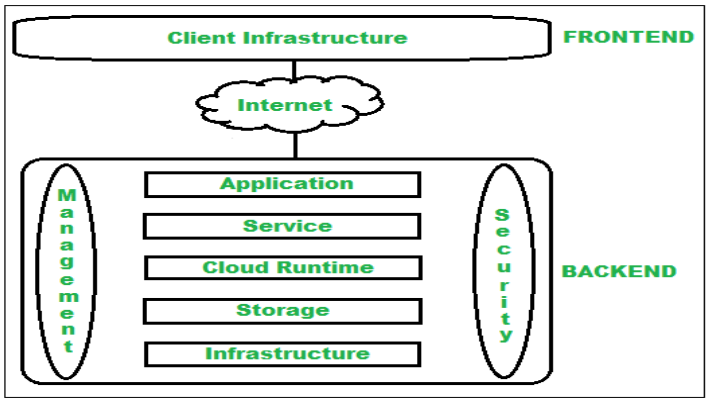

Fig 1 : - Cloud Computing Technology

Examples of Cloud Computing

There are many examples of cloud computing technology. Here some famous examples are being given : -

- **Amazon Web Service** : Amazon is a major cloud service provider. It provides facility of application hosting, web hosting, backup and storage, enterprise IT, content delivery and databases.
- **Google apps** : Google apps consists of Gmail, Google drive, Google Docs, Google Sites and many other services. All these services are cloud based services.
- **Microsoft Windows Azure** : Microsoft has its own cloud platform named Microsoft Azure. Microsoft provides cloud service through its data centers. Users do not require to pay all the services but only for those services which they choose.
- **Facebook** : It is a famous social media platform on which profiles of billions of people and many other data are stored. Facebook also uses cloud computing technology for storing its data.
- **Emails** : All companies providing e-mail service such as Gmail, Rediff, Yahoo etc. are using cloud computing technology.
- **E-learning software** : There are many e-learning software for example Byju's which provide online access to teaching resources. All these use cloud computing technology.
- **Cloud based IT services** : By using cloud based IT services The Government provides e-Governance service to its citizens.
- **Messenger applications** : In messenger applications messages sent by us are stored in cloud space by service provider. It is also a example of cloud computing.
- **Business related software** : Salesforce, Hubspot, Adobe marketing cloud are used in business field through which business resources are managed and secured. All these uses cloud computing technology.
- **Digital Ocean** : This service provider provides hosting facility of website or applications on cloud server. It is a good example of cloud computing.

Types of Cloud Computing

Cloud computing has been divided on the basis of two different basis.

A. On the basis of deployment

1. **Public Cloud Computing**

   It is available for everyone and managed by service provider. It is either free or having very few charges. Amazon web service and Microsoft azure are examples of public cloud computing.

2. **Private Cloud Computing**

   In such type of cloud computing services and networks are stored on a private cloud. User do not has to share his stored data to other people in it. For example Google Drive is an example of private cloud computing. In it data are protected by ID and password and no other people can use your drive.

3. **Community Cloud Computing**

   It is available only for single group of people. No other people outside the group can access the data. For example data available on a university website can be used by only university staff or student.

4. **Hybrid Cloud Computing**

   This cloud computing is mixing of private cloud computing and public cloud computing. If some data are available only for registered people and some for common people on a website then such cloud are called hybrid cloud.

B. On the basis of service provided by cloud

1. Infrastructure as a service (Iaas)

In this cloud computing service the service provider company provides infrastructure service to its user. In this service computing power, storage, software, network power and rest all other control are provided to user. This service is basically used for business. Virtual Private Server (VPS) is its biggest example in which software, network as well as computing power is provided to users.

2. Platform as a service (Paas)

In this cloud computing service only platform is provided to users which may consist of either storage or computing power. Users cannot control it but controlled by cloud provider. All e-mail services are example of it.

3. Software as a service (Saas)

In this cloud computing service only software is provided hosted on remote server which can be used for a particular work. Software may be of any type such as Google docs online.

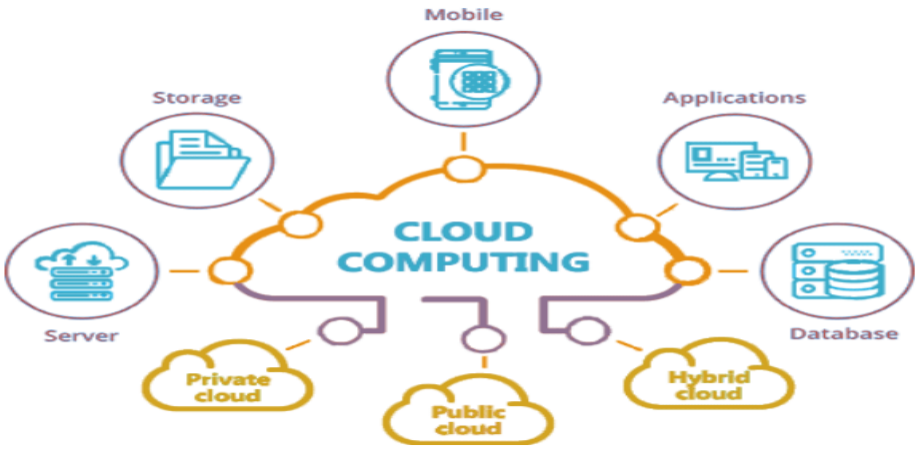

Fig 2 : Cloud Computing Architecture

Uses of Cloud Computing

We use cloud computing in our daily life. It is used from small start-ups to global corporations, from government agencies to non-profit organizations. Uses of cloud computing have been explained below :

1. **File Storage** : Common user use cloud computing to store, manage or share his file on remotely hosted system. For example Google drive, Dropbox etc.

2. **Website Hosting** : Cloud based web hosting is the best option for those website owner who do not want to host website and to do its maintenance. Cloud hosting provider also provides computing resources besides hosting website. These provide security to website and its maintenance also.

3. **Test and Development** : Through cloud computing services testing and development of any software and network can be done. Cloud services help in testing whether software is running properly or not.
4. **Backup and Recovery** : Cloud computing services also provide backup and recovery services. Many business and other organizations are using this facility.
5. **Cloud Database** : Every organization require a database, but it is very costly to develop, maintain and running a database. Cloud database is a better option for it. Cloud service provider not only provides support but also provides maintenance of databases.
6. **Big data analytics** : Big data are large and complex data. Any traditional data management tool cannot store and process it in proper manner. Cloud computing helps to store and analysis of these data.

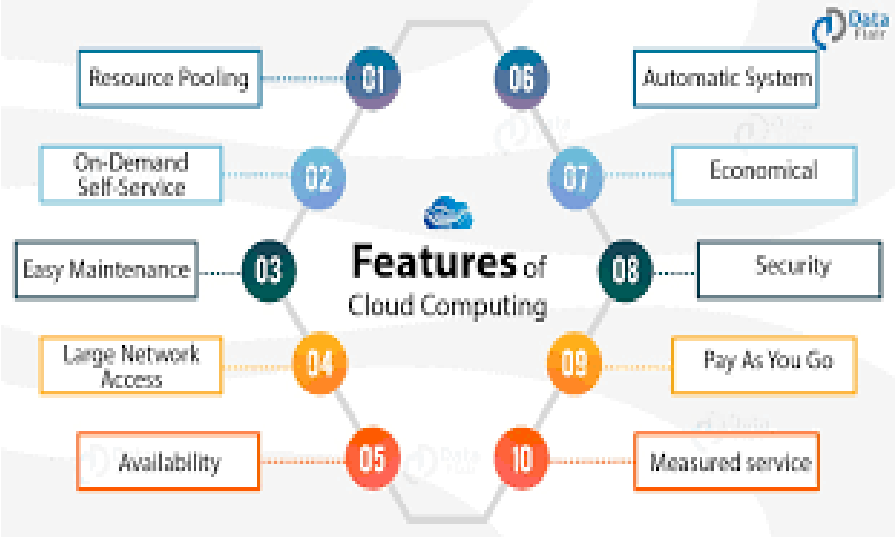

Fig 3 : Features of Cloud Computing

Cloud Computing Vendors for Libraries

Some organizations functions as cloud computing vendors for library software, digital libraries etc. and offer the use of cloud computing platform for these purposes. Following are some of them :

1. **OCLC's Webscale**

OCLC has been functioning as a cloud computing vendor. It provides cataloguing tools over the internet and allow member institutions to draw on their centralized data store. A plan of library management system called Worldshare Management Services has been initiated by OCLC. The service comprises acquisitions, analytics, resource sharing, cataloguing and license management components. It provides whole library collection management in a cloud based application. The chief purpose of webscale is that libraries can share their resources and data with ease. This leads to cost benefit for libraries and more efficiencies. The service include privacy, security and technical support.

2. **Ex-Libris Cloud**

It is a leading library software vendor from USA. It offers cloud based solutions to automate the library operations. It allows libraries to enhance their efficiency and lower the cost of operations and initiate new services. To provide worldwide cloud based services, it has established data centers at many locations.

3. **Duraspace's Dura Cloud**

Duraspace provides open source repository solutions for libraries making them enable to share scholarly literature using DSpace and Fedora Commons. Its new service Dura Cloud provides digital preservation support service in the cloud which is cost effective and simple for libraries. It helps libraries to move content to the cloud and store it with different service providers to get rid of the risk of data loss. The cloud solutions provides online backup, preservation and archives, media access and online sharing.

4. **OSS Labs**

It is from India using Amazon's cloud computing platform. It offers hosting and maintenance service for Koha ILS and DSpace IR. By using its service library services have become very cost effective and it provides maintenance of software also.

Role of Cloud Computing in Enhancement of Library Services

Recent technological advances in information and communication technology have a great impact on libraries. Now libraries are switching from traditional libraries to digital libraries. Separate e-library sections are being added to existing libraries. Services of libraries are switching from manual to automatic. All these require infrastructure, platform, software, hardware, network and many more. For this, huge amount of financial assistance is required. In such situation cloud computing has emerged as a great opportunity for libraries that may help to reduce cost and increase performance for some type of automation activities. Cloud computing has large potential for libraries. Libraries may keep more and more data on cloud and provide its users access to these data from anywhere. Libraries are taking advantages of cloud computing technology. Following are examples of cloud based services in libraries :

1. **Union Catalogue(OPAC)** : In this cataloguing process cataloguing data of networked libraries stored on a single platform. Network libraries can use the same platform and give access to their collection on one platform. By using cloud computing, creation of union catalogue becomes very easy.
2. **E-Books Lending Service** : Cloud platform is now being used for lending of e-books at huge level.
3. **Digital Preservation Service** : Digitization and scanning work can be done centralized and also one can avoid duplication of work. Libraries can preserve the collection in digital form in archives.
4. **Current Awareness Service** : By the use of cloud computing it has become very easy to provide current awareness service to all users.
5. **Document Sharing** : By the use of cloud computing document sharing has become very easy.

6. **Bulletin Board Service** : By using cloud computing technology we can provide new services on bulletin board.
7. **Information Common** : Those information which are common in library like bibliographical data, content pages, cover pages, question papers, syllabus, and other reading material, libraries can share on one platform. It helps in improving economy of library and avoids duplication of library cost and labour.
8. **Collection Development** : Cloud computing may be used for collection development. Duplication of the same collection may be avoided easily. Huge amount of resources can be stored and made accessible to users.
9. **Literature Search** : Cloud provides a platform to store all information that one can access anytime from anywhere, so searching of information becomes very useful for researchers.
10. **Information Literacy and Orientation programs** : Libraries can conduct information literacy and orientation program on the cloud. Tutorials, videos, presentations and files can be kept on the cloud for user's orientation.

Conclusion

Cloud computing has emerged as a new technology in information and communication technology. Using cloud is beneficial to many organizations and its various offerings can be exploited as per the requirement. Similarly this technology is also helpful for libraries in automating and managing their services. With the help of this technology, library staff will be free from managing the services. Commonly it is difficult for library professionals to manage the technologies. In such situation, library staffs feel difficulty in undertaking automation of library activities or developing digital library services. Here cloud computing technology can be helpful to undertake modern ICT activities. The library professionals need not to worry about infrastructure, platform, software, hardware, network and many other technical aspects and its maintenance. They only have to add content of resources. With the use of ICT and internet library professionals are sharing their library resources with others on the platform. Thus cloud computing technology has an important role in enhancing library services, if handled with utmost care and awareness.

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