

Cloud Computing Applications in Modern Libraries: An Overview

Dr. Shivakrishna S.D.¹; Dr. G. Kiran Kumar²

Assistant Librarian, Department of Library, College of Agriculture, Chintamani (University of Agricultural Sciences, Bangalore¹); Assistant Librarian, Department of Library, College of Agriculture, Vijayapura (University of Agricultural Sciences, Dharwad, India²)

shivakrishna2002@gmail.com, kiranmyslibphd@gmail.com

ABSTRACT

Libraries are not only early adopters of new technologies, but also early users of cutting-edge technologies they see as effective in providing information for all. Cloud Computing is a web-based technology, a new form of computing. It is a service provided on the internet or network. It is a server-based service, which is very helpful in modern times. Cloud computing requires remote servers and the internet to maintain and organize data and applications. In cloud computing, so many computers are connected to a server. The applications are installed in a remote server and all the computers connected to that server location can use all these applications. Cloud computing is a combination of technology with trends that makes infrastructures and applications more dynamic, flexible and usable. Even most of the modern Libraries are moving towards Cloud Computing technology for maintaining digital libraries, and social networking with multiple flexibilities.

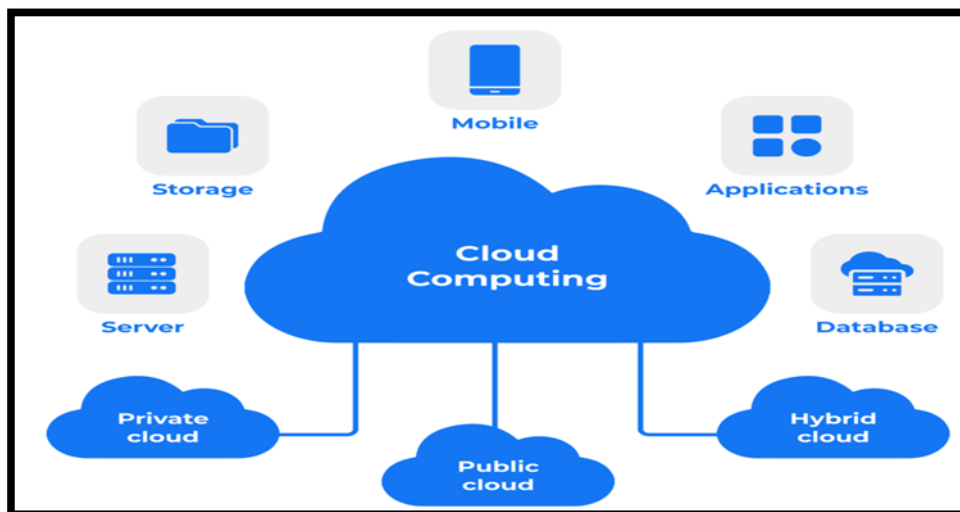
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1. INTRODUCTION

In the technological era information is explored on a large scale and the information needs of the users are also growing rapidly. To meet the specific information needs of the knowledge society and to provide better library services modern libraries are adopting many new technologies. The recent technology trend in libraries and information centers is the use of Cloud Computing as a strategic tool to provide seamless library services with quality cost-effectively or economically. In the Information technology industry cloud technology is the third revolution after Personal Computers and Internet. Cloud Computing allows the user to use various applications without installation of that application in their computer to access their files or documents. Cloud Computing is capable of bringing together a collection of documents and resources stored in various personal computers, personal servers and other equipment into one place and putting them on the cloud for the use of the user community. The latest technology trend in library science is the use of Cloud Computing for various purposes and for achieving economy in library functions. Since Cloud Computing is a new and core area professionals should be aware of it and also the application of cloud computing in Library and Information Science.

2. CONCEPT OF CLOUD COMPUTING

Cloud Computing is a type of Internet-based computing provides shared computer processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources, which can be rapidly provisioned and released with minimal management effort. Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in either privately owned or third-party data centers that may be located far from the user ranging in distance from across a city to across the world. Cloud Computing relies on the sharing of resources to achieve coherence and economy of scale, similar to a utility over an electricity network.



3. CLOUD COMPUTING MODELS

There are three major types of cloud service models available as of now:

(i) Software as a Service:

Software as a Service (SAAS) is a cloud service providing remote access to software and its functions. The software is hosted remotely. Users are not required to purchase additional hardware. Organizations are not required to handle the installation, set-up and often daily upkeep and maintenance. SAAS is often referred to as software-on-demand and it can be termed as using it on rent rather than purchasing it. With traditional software applications, it is required to purchase the software package and install it on the computer before being able to use it. The software is used to store, back up and transfer the data. There is widespread usage of SAAS because there are usually no starting costs involved. Organizations need to pay only for the amount of storage space utilized. SAAS may also be called hosted storage. Examples of SAAS are: Google, Twitter, Facebook, Flickr etc.

(ii) Platform as a Service:

Platform as a Service (PAAS) can be defined as a computing platform in which web applications can be created quickly and easily without the need to purchase and maintain the software and infrastructure required for it. In this hardware, operating systems, storage and network capacity are hired over the Internet. In PAAS, the virtualized servers and associated services are rented by the customers to run the existing applications or to develop and test new applications. It is a software distribution model in which hosted software applications are made available to

customers over the Internet. With PAAS, it becomes feasible to change and upgrade the operating system features frequently.

(iii) Infrastructure as a Service

In Infrastructure as a Service (IAAS) Cloud Computing infrastructure servers, storage, network and operating systems are delivered as an on-demand service. In IAAS, the equipment used to support operations, includes storage, hardware, servers and networking components. are outsourced by organizations. The equipment is owned by the service provider and the responsibility for housing, running and maintaining it also lies with the service provider. The client typically pays on a per-use basis. This type of cloud computing is also sometimes referred to as HAAS or Hardware as a Service and it involves both storage services and computing power. Amazon's Web Services, one of the major players in this area, offers two main products including the Elastic Compute Cloud (EC2), which provides computing resources, and Simple Storage Service (S3) for data storage.

4. ADVANTAGES OF CLOUD COMPUTING IN LIBRARIES

There are various benefits of Cloud Computing in libraries like:

- **Cost Efficiency:** By using Cloud Computing in Libraries, lot of cost saves in the libraries. Saved cost can be used for other operations of the Library.
- **Flexibility and Innovation:** The users has great flexibility to obtain the services from which kind of clouds and it is itself a innovation. Flexibility helps to improve the library services.
- **Scalability:** 'Pay as you go' allowing a more efficient control of expenditures.
- **User Centric:** It has been observed that cloud computing is generally a user centric. As we know, Library users are always at centric position while providing library services to the users. In this context cloud computing is helpful.
- **Support included:** Enjoyment of the most advanced security procedures, availability and performance of providers with experience and knowledge in this type of service
- **Openness:** Cloud Computing is open that any library can participate. This concept of openness will further improve the library services.
- **Transparency:** There is lot of transparency for participating Libraries in Cloud computing.
- **Availability any time any where:** Generally due to cloud computing services can be reached at anywhere and also for 24x7. This is the major benefit in the context of library services.
- **Create and Collaborate:** In Cloud Computing participating libraries can create their own services and simultaneously collaborate in participating environment.
- **Portability:** Since the service is available over the Web, the service can be availed through browser from any part of the world.
- **Essay Access to Information:** Once the users register in the cloud they can access the information from anywhere, where there is an internet connection. services, especially in building digital libraries. Role of LIS professionals in this virtual era is to make cloud based services as a reliable medium to disseminate library services to their users.

- **Backup and Recovery** : Most cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.

5. DISADVANTAGES OF CLOUD COMPUTING IN LIBRARIES

There are various disadvantages of Cloud Computing like:

- **Dependency on Internet:** In the Cloud Computing environment, there is dependency on Internet. If the internet services are running smoothly then cloud computing services are running smoothly. If there is any problem in internet, Cloud Computing services stands to be closed.
- **Vulnerability to Attack:** In the Cloud Computing environment, every component is potentially accessible from the Internet. There are various chances of vulnerability of attack at anywhere in the internet environment.
- **Cloud Computing Platform Dependencies:** Implicit dependency which is also known as vendor lock-in is another disadvantages of Cloud Computing.
- **Security Risks:** Data security and privacy are concerns, and Cloud Computing can be vulnerable to data breaches, theft, and other attacks.
- **Limited Control and Flexibility:** Users have less control and flexibility over the underlying cloud infrastructure.
- **Cloud Computing Costs:** Cloud Computing- especially on a small scale and for short term projects can be a costly. The overall the price tags may be higher as expected.
- **Integration Complexity:** Integrating Cloud Computing with existing systems can be complex.
- **Downtime:** This may be one of the worst disadvantages of Cloud Computing. No Cloud provider, even the very best, would claim immunity to service outages.

6. APPLICATIONS OF CLOUD TECHNOLOGIES IN LIBRARIES

There are various areas of libraries where Cloud Computing Services can be applied are:

- ❖ **Building Institutional Repositories/ Digital Libraries:** It has been observed that the participating libraries in Cloud Computing can easily build Digital Libraries/ Institutional Repositories by using software like DSpace, E-Prints etc.
- ❖ **Searching Library Data:** Searching Library Data is very important service by which participating libraries can search the data from anywhere and at any time. For instance OCLC World Cat service for searching data which is available on clouds.
- ❖ **Hosting Websites:** In the present scenario, Libraries preferred to hosting their own websites on third party service providers rather than maintaining their own servers.
- ❖ **Library Automation:** Cloud based computing is very helpful for Library Automation. Generally Application software required for Library automation are costlier and moreover servers required for library automation are also costlier. In cloud based computing there is no need to purchase application software, servers, etc.
- ❖ **Searching Scholarly Contents:** The user in libraries usually searches their scholarly contents in cloud based services. For example UGC Digital Library consortium of INFLIBNET.

- ❖ **File Storage:** By using cloud computing libraries can store number of useful files and these files can be shared at anytime and anywhere.
- ❖ **Building Community Power:** Cloud computing technology offers great opportunities for libraries to build networks among the library and information science professionals and interested information seekers by using social networking tools. Twitter and Facebook are most famous social networking services which play a key role in building community power. This cooperative effort of libraries will create time-saving, efficiencies and wider recognition, cooperative intelligence for better decision-making and provides the platform for innovation and sharing the intellectual conversation ideas and knowledge.
- ❖ **Delivery Customized Services:** It is only due to cloud computing which focused on delivery customized services.
- ❖ **Open Infrastructure:** In cloud computing environment, open infrastructure is the major advantage for libraries for example Amazon, EC2 etc.
- ❖ **Publishing:** Publishing becomes easy due to cloud computing environment for example Wordpress.com, twitter, You tube etc.
- ❖ **Web-Based Library Management Systems:** Web-based Library management systems can be formulated due to cloud computing.
- ❖ **OCLC based ILS services:** OCLC based ILS services can be provided in the cloud computing environment.
- ❖ **Cloud OPAC-** Most of the libraries in the world have a catalogue on the web. These catalogues are available with their library's local servers made available over the web. If the catalogue of the libraries made available through the cloud, it would be more beneficial to the users to find out the availability of materials.

CONCLUSION

Cloud computing helps in the integration of libraries easily. Cloud Computing offers user-centered multilevel services. Nowadays most libraries are moving towards Cloud Computing Technology for maintaining digital libraries, and social networking with multiple flexibilities. It is the right time for libraries to implement library services with Cloud Based Technologies and provide reliable and rapid services to their users. Another role of Library professionals in this modern era is to make Cloud Based Services a reliable medium to disseminate library services to their users with ease of use and save time of users. Cloud Computing is an emerging computing paradigm that promises to provide opportunities for delivering a variety of computing services in a way that has not been experienced before Cloud Computing which is applied in Digital Libraries. All library resources and services distributed on the Internet can be integrated as a whole, which forms a new type of adaptive control service system supporting interlibrary collaboration and service access, as well as sharing resources from different libraries.

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Cloud Computing Applications in Modern Libraries: An Overview

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