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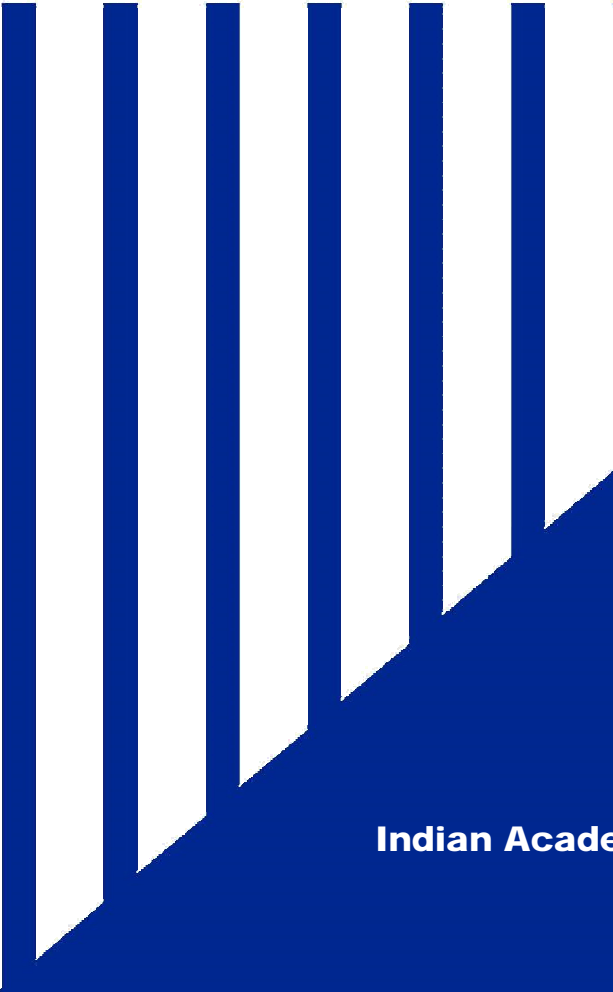
Volume 7, Issue 1 (III)
January – March 2020

ISSN 2394 - 7780

International Journal of

Advance and Innovative Research

(Conference Special)
(Part – 2)



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(ISSN: 2394-7780)

The Journal has been positively evaluated in the SJIF Journals Master List evaluation process
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APPLICATIONS OF CLOUD COMPUTING FOR LIBRARY MANAGEMENT SYSTEM

Ashraf Shah Sattar Shah Fakir¹, Dr. Rajkumar Bhakar² and Dr. Shilpa Satish Waghchoure³Librarian¹, Theem College of Engineering BoisarChief Librarian² and Head of Dept. of Library and Information Science Shri J.J.T University, RajasthanLibrarian³, Gokhale Education Society's College of Education and Research Parel, Mumbai

ABSTRACT

Cloud computing present an advantage for libraries, it is providing several opportunities to link their services to the cloud. Cloud computing is the new type of service providing on the Internet, which has entirely changed the way computers are used regardless of geographical barriers. The paper focused on cloud computing and its probable applications that can be clubbed with library services on the web based era. This study may be useful in recognizing and producing cloud based services for libraries.

Keywords: Cloud Computing, Software as a Service, Platform as a Service, Infrastructure as a Service, Models of Cloud Computing, Applications of cloud Computing.

1. INTRODUCTION

In the current scenario, web based technologies developed on virtual platforms and created huge opportunities and virtual avenues for different users to use their services. Currently, cloud computing services appear as the trendiest virtual technology for libraries to serve effectively. Cloud computing features various technologies like grid computing, utility computing, unified computing, Web 2.0, service oriented architecture and more. Cloud computing technology is giving advantages for libraries an innovative way to connect their services not only instantly, but also in new formats with the flexibility to pay, access anywhere, as you use the model.

2. MEANING AND CONCEPT OF CLOUD COMPUTING

The word cloud refers to a network present at remote area. Cloud can provide services on public or private networks i.e. wide area network, local area network. Cloud computing refers to operating, accessing, and configuring the application online. It provides online data storage infra and function. Cloud computing denotes that rather than all the hardware and software you are utilizing sitting on your desktop or anywhere indoors your local network. It refers to the various types of services and results that can be presented in the Internet cloud and in many cases the tools used to access these services and applications do not require any special applications. With cloud computing you are able to employ the software conveying by the internet on the browser without any fitting, host applications on the Internet set up your individual database system and remote file storage and more.

The National Institute of Technology and Standards (NIST) provide the simplest definition of Cloud computing is a model for enabling, convenient, on-demand network access to a shared pool of configurable computing resources e.g. Server, Networks, services, Storage and Applications, that can be fastly maintained and associated with negligible management effort or service provider interface

According to Gartner cloud computing as: "A style of computing where massively scalable IT- related capabilities are provided 'as a service' using internet technologies to multiple external customers"

Buyya said that 'Cloud computing is a parallel and distributed computing system consisting of a collection of virtualized and interconnected computers that are energetically provisioned and presented as one or more unified computing resources based on service level agreements recognized throughout compromise between the service provider and costumers.

3. FEATURES OF CLOUD COMPUTING

Main attributes of clouds computing are given below

- ❖ Self-healing: A self diagnosis and self healing system must be created against various failures or downgrades.
 - ❖ Self-service interface: With the self-service cloud, users retrieve a web based portal, where they can demand or construct a server and launch applications.
 - ❖ Pay Per Usage: Cloud providers usually use the "pay-as-use" model, which can escort to unpredicted operating costs if administrators are not familiar with the cloud-pricing model.
 - ❖ Service-oriented: It is a way is to modularize key business services and improve service interfaces designed to ensure that the service business operates in a variety of services.
-

- ❖ It can access from around the world through an Internet connection because the infrastructure is provided by a third party.
- ❖ These applications are easier to maintain as contrasted to individual applications, as they are installed on a common platform and can be retrieved from different locations.
- ❖ The infrastructure is less likely to fail, so the servers are more reliable and highly available
- ❖ Cloud computing allows all employees to be more flexible. Employees can retrieve files using web-enabled devices such as laptops, smart phones and notebooks.

4. MODELS OF CLOUD COMPUTING

There are two models are working for the cloud computing b) Service Models.

4.1) Deployment Models: NIST defines cloud deployment model is according to where the infrastructure for the deployment resides and who has control over that infrastructure. NIST classified four types of deployment model:

a) Private Cloud: Private cloud is usually infra and services to be accessible within an organization. Such services may be managed by the organization itself to support various user groups, or third party. This cloud offers more security as it is implemented within the internal firewall

b) Community Cloud: This cloud system and service allows access by a group of organizations. The third party or member organization may be responsible for managing the cloud. It shares the infrastructure between many organizations.

c) Public Cloud: It allows systems and services to be simply reachable to common public. The whole cloud computing infra is fully controlled by the third party providers. E.g. Amazon, Google, Microsoft offers cloud services via Internet.

d) Hybrid Cloud: This cloud is a mixture of public and private model. In a hybrid cloud, an organization uses interconnected private and public cloud infrastructure. Many organizations use this model when they need to rapidly expand their IT infrastructure, such as leveraging public cloud to complement the capabilities available in a private cloud.



Figure-1: Types Deployment Models

Source: <https://chrislazari.com/what-is-cloud-computing/>

4.2) Service Models: A cloud service is any service provided to users on request via net from a cloud computing provider's servers as resisted to being supplied within own premises servers of organization. Service models are categorized in four types as per given below:



Figure 2: Types Service Models

Source: <https://www.edureka.co/blog/cloud-computing-services-types/>

a) Software as a Service (SaaS): This service model permits end users to provide software applications as a service. It submits to software deployed on a hosted service and available through the Internet. It uses the cloud computing infra to convey an application to several users, rather than the traditional model of one application per desktop. It allows managing activities from central locations within a single one to several model including architecture, pricing, partnerships and management features. **There are many SaaS applications-**

A) Billing invoicing system

B) Customer relationship management application

C) Help application

D) Human Resource Solutions. SaaS is the fastest growing market in which a recent report mentions that current double growth is forecast.

SaaS cloud service providers: Google Apps, SQL Azure, SalesForce.com, Twitter, Microsoft 365 and Oracle on Demand. Unauthorized access to data is a lack of SaaS as user's data is accumulated on the Cloud provider's server.

b) Platform as a Service (PaaS): Platform as a Service model assists to create computing platforms for running software and other tools on a computer without having to manage the software and hardware at the end of the user. PaaS offers virtual machines, applications operating systems, development frame works, services, transactions and control structures. The client can organize its applications on the cloud infra or use applications programmed using languages and tools sustained by the PaaS service provider. PaaS model is providing platforms to costumers for maintain and support their IT infrastructure without using a large amount of money to buy hardware, software and related technologies for example Amazon Elastic Cloud, EMC Atmos, Aptana and GoGrid .

c) Infrastructure as a Service (IaaS): This service model offers contact to basic resources such as virtual and physical machines, virtual storage etc. These resources are made accessible to end user via server virtualization. The customers install or develop its own operating systems, software and applications. Providing virtual resources (compute, storage and communication) on requirement is known as Infrastructure as a Service (IAAS).

IaaS service provider: There are many service providers like Amazon, elastic compute cloud (EC2), Google Base, NaviSite, GoGrid, FlexiScale, Verizon Terremark, Savvis, HP, IBM, Sun and Linode, RackSpace.

5. APPLICATIONS OF CLOUD COMPUTING IN LIBRARY MANAGEMENT SYSTEM

With the fastly development of several ICT technologies, users' information needs are gradually more modified and now increasingly libraries reward user-oriented services. Hence, librarians should regularly study of new trends in ICT to fulfill the information needs of users. And only in this way, can they dominate the basic needs of their users. The library can build up such information and improve user satisfaction. ICT technology has been the inspiration for the development of the library. What's more, librarians can use new technologies to develop libraries and optimize library facilities and services.

Libraries are changing their services with addition of cloud and networking with the services to available these services without time and locations. Cloud computing provides several services for libraries that may assist to reduce technology cost and boost capacity consistency and performance for some kind of automation activities. Cloud computing has great prospective in for libraries. Libraries may add more content into the cloud computing. Following potential fields are recognized where Cloud computing services and applications may be applied:

5.1 Library Automation System

Automation is a field; most of the libraries are keen on day-to-day operations. Previously, automation in libraries is being carried out on a locally hosted server using a variety of commercial and open source integrated library management software and directed by internal IT professionals or library staff. Although, several software vendors and third-party services are now providing to host this service on the cloud to save libraries from spending on hardware. Apart from cost-benefit, libraries will be free from maintenance of undertakings like software maintenance, backup etc. For example vendors like Ex-Libris, OSS Labs.

5.2 Searching Scholarly Materials

Presently Knimbus cloud services embedded in the Information and Library Network (INFLIBNET) center have been integrated into its UGC INFONET Digital Library Consortium to find and retrieve scholarly contents

that is attached to it. Knimbus is a cloud-based research platform that allows you to learn and contribute study scholarly material. Knimbus is a Knowledge Cloud, contributed to knowledge innovation and shared space for scholars and researchers. The journey to Knimbus began in 2010 by entrepreneurs Rahul Agarwal and Tarun Arora face the challenges of researchers to searching and accessing many information sources. Presently 100,000 academic institutions and research/development laboratories, scholars, researchers and scientists, as well as more than 50,000 researchers in worldwide are used Knimbus. It is a mutual platform for researchers to discover and share knowledge with peers and make it easy for users to find and access millions of journal articles, patents and eBooks for tagging, sharing and discussing this content with their peers.

5.3 Framework of Repositories and Digital Library

In this age of digital era each library needs a digital library to efficiently access their information, services and resources to certain network access. Therefore, each library has a digital library that is build up using any cloud based digital library software. DuraSpace has two software's called Dspace and Fedora Commons, but Dspace is widely used to frame repositories and digital libraries associated with Fedora Commons. Dura Cloud supplies the entire solution for developing a repositories and digital library with standard interfaces and open source code for both software.

5.4 Website Hosting

With the help of cloud technologies many libraries can host their own websites. Website hosting is one of the initial embracing of cloud computers because several organizations, including libraries prefer to host websites with third-party service providers rather than hosting and maintaining their own servers. An example of a service is hosting websites outside the Google Site Library servers and multiple editors allow access to the site in various places. The District of Columbia Public Library is using Amazon's EC2 service to host its website and offers libraries with faster extensible and idleness.

5.5 Storage of Documents

Libraries need space to store similar electronic files and documents like official correspondence, full-text documents, bibliographic records, teachings, etc. Currently, these are stored and retrieved through a personalized desktop or locally hosted server. Cloud computing is compensating for new services, which provide free space for storing files and documents. For instance Windows Sky Drive offers 25GB for storing and sharing files as well as documents online sync across multiple devices and enable collaboration across the web, regardless of their geographic areas. Likewise Dropbox, Microsoft OneDrive²⁶, Box²⁷, Apple iCloud²⁸, Spideroak²⁹, Amazon Cloud Drive³⁰ and many projects have offered storage space on the cloud to facilitate organizations and individuals to store and share their files. CLOCKSS³¹ (Controlled Lots of Copies Keeps Stuff Safe) and PORTICO³² provides libraries a enduring "dark archive solution" of e-resources and digital collections, offering defense against the latent loss of retrieve to e-literature vital to a library's collection. In India Tata Institute of Fundamental Research Bangalore National Centre for Biological Sciences are using Portico. Offers CLOCKSS³¹ (a content protected by many copies) and a Portico 32 library

5.6 To Build up Community Strength

Cloud computing technology provides libraries with a great opportunity to build networks amid library professionals and aspiring information seekers using various social networking tools. WhatsApp, Twitter and Facebook are the most popular social networking services that play a vital role in increasing community strength. These collaborative efforts of libraries will save time, competency and wider gratitude, create collaborative intelligence for better decision-making, and provide the platform for sharing ideas and knowledge of intellectual communication and innovation

5.7 Browsing Library Data

Several libraries already have online catalogs and allocate bibliographical data with Online Computer Library Center (OCLC). It is a great example of using cloud computing to contribute library data together over the years. WorldShare Management Services (WMS) an incorporated group of cloud based library management applications of OCLC provides libraries cost savings, workflow functionality, and capability to distribute new trends to patrons by allocating data, and work around the libraries. Traditional library systems often have to spend on maintaining servers and software, and these costs are reduced by WMS. Its memberships contain Remote Database Search, Serial Management, Custom Reporting course Reserve, Open URL Fixer, all over Listing Services and Worldcat searching Services Group Views. WMS incorporates all print and e- resource management workflows containing selection, acquisition and maintenance in the same web-based WorldShare interface. WorldCat gives your library more visible on the web and superior information about your system.

6. CONCLUSION

This study provides the inferences and concepts of cloud based applications in libraries to improve their services in a more competent way. Cloud computing is an innovative trends in ICT era. Libraries are currently moving towards cloud computing and are taking benefit of cloud based services especially in creating digital libraries, social networking and information communication. The role of library professionals in this virtual age is to spread cloud-based services as a consistent medium for ease of use and dissemination of library services to their patrons.

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