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Application of Cloud Computing in Libraries

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Abstract:

Cloud computing is a new breed of service offered over the internet, which has completely changed the way one can use the power of computers irrespective of geographical location. It has brought in new arrives for origination and businesses to offer service using hardware or software or platform of third party sources. Thus saving on cost and maintenance. Cloud computing technology used to practice of storing, accessing and sharing data, applications and computing power in cyber space. Libraries have also started adopting this technology as cost effective tool which involves delivering hosted service over the web. This paper aims to demonstrate and elaborate various aspects of cloud computing, its uses in the field of library and information centers. This paper also tries to give clear idea that how cloud technology can help libraries to provide a better service to the user community.

Keywords: Internet, Cloud computing Laas, Paas, Saas, Models of cloud computing, Libraries.

Introduction:

Libraries play an important role in the academic world by providing access to world class resources and the services and help to stimulate research among scientists and researcher community. Until 1980, the Libraries virtually had a monopoly on the provision of information through the print resources and users were completely depended on them for resources they need to have Due to information explosion and the less budget, it is difficult manage all library activities Viz. acquisition, processing, storage, dissemination and preservation. It's provide way for people to share distribute resources thought the networks in the open environment. To meet the particular information needs of the knowledge society and to provide better services libraries are adopting many new technologies. Web enabled technologies developed on virtual platforms and generating large opportunities and virtual a path to use their services for various purposes. Now a days, cloud computing is emerged as one of the most popular virtual technology is offering great advantages for libraries to connect their services not only promptly but also in new format with the flexibility such as pay as you use model access any where any time and soon.

Now a day's libraries are using cloud computing technology for enhancing the services by adding more values, attracting the users and cost effectiveness in information technology industry cloud computing provides the user to use various applications without installation of that application in their own computer to access their personal files or official documents. Cloud computing is capable of bringing together collection of documents and

resources stored in various personal computers, personal server and other equipment in to one place and putting them on the cloud for the use of the user community cloud computing is so named because the information being accessed is found in the “clouds” and does not require a user to be in a specific place to gain access to it.

What is cloud computing?

Cloud computing is a phrase used to describe a variety of computing concepts that involve a large number of computers connected through a real time communication network such as the internet. In science, cloud computing is a synonym for distributed computing over a network, and means the ability to run a program or application on many connected computers at the same time. The phrase also more commonly refers to network based services, which appears to be provided by real server hard work, and are in fact served up by virtual hardware, simulated by software running on one or more real machines. Such virtual servers do not physically exist and can therefore be moved around and scaled up (or down) on the fly with affecting the end user-arguably, rather like a cloud. The popularity of the term can be attributed to its use in marketing to sell hosted services in the séance of application service provisioning that run client server software on a remote location.

Definition of cloud computing:

- The Christy and carina of Gartner Group define cloud computing as a style of computing in which massively scalable and elastic IT enable capabilities as delivered as a service to external customers using internet technologies. To simplify the concept, cloud computing can be defined as and 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 networks resources and applications.
- NIST provides a very good definition of cloud computing as cloud computing is a model for enabling convenient on demand network access to a shared pool of configurable computing resources (e.g. Networks , servers, storage, applications and services) that can be rapidly provisional and released with minimal management effort or service provider interaction.

Characteristics of cloud computing:

The National institute of Standards and Technology’s definition of cloud computing identifies. “Five essential characteristics”

- i. On demand self services: A consumer can unilaterally provision computing capabilities such as server time and network storage, a needed automatically without requiring human interaction with each service provider.
- ii. Broad Network Access: Capabilities are available over the network and accessed though standard mechanisms that promote use by heterogeneous thin or thick client platform (e.g. mobile phones, tablets, laptops and workstations)

- iii. **Resource Pooling:** The provider's computing resources are pooled to serve multiple consumers using a multi model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.
- iv. **Rapid Elasticity:** capabilities can be elasticity provisioned and released, in some cases automatically, to scale rapidly outwork and in word commensurate with demand. To the consumer, the capabilities available for providing often appear unlimited and can be appropriated in any quantity at any time.
- v. **Measured Service:** Cloud systems automatically control and optimize resource use by leveraging metering capability at some level of abstraction appropriate to the type of service (e.g. storage, processing, bandwidth, and active user accounts) Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer for the utilized service.

Models of cloud computing:

Cloud providers offer. Services that can be grouped in to two categories.

Service models:

Though, there are various service models originated on the web but three service models widely used for delivering the different cloud based services the described below:

- i. **Infrastructure as a service (IaaS)** The service model comprise a wide range of features, services and resources which support to build an virtual infrastructure for computing organizations can be developed entire infrastructure on demand e.g. Amazon web service, IBM, Sun and Globule Base.
- ii. **Platform as a service (PaaS)** Platform as a service model help in generating the computing platforms to run the software and other tools over the internet without managing the software and hardware at the end of user side. Amazon Elastic cloud, Emc Atoms are the examples of PaaS, model which providing platforms to users in maintaining and supporting their IT infrastructure without spending huge amount for buying hardware, software and related Technology.
- iii. **Software as a service (SaaS)** In this model, users can avail the facilities to access and use any software available with cloud vendors. However, it is not necessary for the users to buy the software, install and run, maintenance the applications on their own servers. The cloud users need not to manage the cloud infrastructure and platform on which the applications are running. This service model provides online e mail applications free services, limitless storage and remote access from any computer or device with an internet connection.

Deployment models:

This refers to location and management of the clouds infrastructure. Deployment models are of your types viz, public, private, hybrid and community.

Public cloud: 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 curing model. Some popular public cloud services include Amazon Ec2, S3, Google app Engine.

Private cloud: This kind of deployment model solely developed and managed by a single organization or a third party regardless whether it is located in premises or off premises. There are several reasons behind the development of private cloud for an organization some key reasons include optimize utilization of existing in house resources, security concerns including data privacy and trust also make private cloud an option for many firms, data transfer cost from local It infrastructure to a public cloud is still rather considerable, organizations always require full control over mission, critical activities the reside behind their firewalls and for research and teaching purpose .

Hybrid cloud: This type of cloud mode from more than one cloud deployment models that may be public, private, community and other models also, bound together with by standardized or proprietary technology that enables data and application portability. The hybrid cloud model is widely used by institutions and organizations because this model provides more facilities and flexibilities in making optimum use of their resources and accomplishing the tasks.

Community cloud: It is joint venture of several organization come together to build a cloud infrastructure as well as policies through which cloud service will be rendered. 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.

Application of cloud computing in libraries:

Libraries are shifting their services with the attachment of cloud and networking with the facilities to access these services anywhere and anytime . In the libraries the following possible areas were identified where cloud computing services and applications may be applied.

Building digital library /repositories:

In the present situation, every library needs a digital library to make their resources, information and services at an efficient level to ensure access via the network. Therefore every library is having a digital library that developed by a using any digital library software. D-space is widely used for building digital libraries/repositories reflective to Fedora commons. Dura cloud provides complete solutions for developing digital libraries/repositories with standard interfaces and open source codes for the both soft work Fedora Commons. Dura cloud provides complete solutions for developing digital libraries/repositories with standard interfaces and open source codes for the both software

Search library data:

OCLC is one of the best example for making use of cloud computing for sharing libraries data for years together – For instance, OCLC world cat service is one of the popular

service for searching library data now is available on the cloud. OCLC is offering various services pertain to related services on cloud platform through the web share management system. Web share management system facilitates to develop an opened and collaborative platform in which each library can share their resources, services, ideas and problems with the library community on the clouds. On the other hand, the main aim of web scale services is to provide cloud bases platform, resources and services with cost benefit and effectiveness to share the data and building the broaden collaboration in the community.

Searching scholarly content:

Knimbus is could base research platform facilitates to discover and share the scholarly consent. Knimbus stands for knowledge cloud which is dedicated to knowledge discovery and collaborative space for researchers and scholars. Knimbus is a collaborative platform for researchers to discover and share knowledge with peers and facilitates to find and access millions of journal articles, patents and eBooks, for the users tagging, sharing and discussing of these contents with their peers. Currently, information and Library Network (INELIBNET) centre (<http://www.infibnet.ac.in>) has been incorporated knimbus cloud service into its UGCINFONET digital library consortium in order to search and retrieve scholarly contents attached therein.

File storage:

To access any files on the internet, cloud computing present number of services such as Dropbox, DOC, Sky drive and soon. These services virtually save the files on the web and provide access to anywhere and anytime without any special software and hardware.

Build community power:

Cloud computing technology offers great opportunities for libraries to build networks among the library and information science professionals as well as other interested people including information seekers by using social networking tools. Twitter and face book 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 conversations, ideas and knowledge.

Library automation:

For library automation purpose, poleis provides variant cloud based services such as acquisitions, cataloging, process system, digital contents and provision for inclusion of cutting edge technologies used in libraries and also supports various standard such as MARC21, Xml, Unicode and soon which directly related to library and information Science area.

Examples of clouds:

OCLC:

Online Computer Library Centre is a nonprofit, membership, computer library service and research organization dedicated to the public purposes of furthering access to the world's information and reducing the rate of rise of library costs – In a sense OCLC has been functioning as a cloud computing vendor. They provide cataloguing tools over the internet and allow member institution to draw on their centralized data store. The centralized database allow member for the sharing of catalog records between libraries and greatly reduces the time spent in cataloging incoming material.

Library things:

It is one of the site that combine aspects of social networking and cloud computing is library thing originator of which is Tim Spalding. Library Thing offers services which are just like social networking site, authorized people to contribute information and suggestion about books and allows them to interconnect globally to share interests.

Amazon and Google:

These are among the labeling enterprises also providing solutions for libraries by having partnership between library automation vendors. Amazon has been developing for years large web services architecture and they now offer hosting services for data which are priced at gigabytes-month and CPU hour rates. Google for years is working for the dissemination of information also taking interest in library solutions, going to implement “App Engine” which provides a hosted service for application within their server forms and on massive and highly redundant storage system.

Kindle:

In the electronic book arena Amazon is providing some reading services with kindle. If one have wireless connections, can purchase and read a rapid growing list of books and periodicals from the kindle no matter for the location with this service largest text can be downloaded in seconds.

Dura space:

A hasted service and open technology to help organization and end users effectively utilize public cloud services. This built upon cloud services.

Chronopolis project:

Chronopolis project designed primarily as a preservation system.

OALSTER:

OALSTER is a Service Started by the University of Michigan and now managed by OCLC which seeks to harvest all the major digital repositories around the world.

European:

European is gathering the digitized collection from Europe's galleries, libraries, archives and museums.

Advantages and Disadvantages:

Some of the advantages of cloud computing are:

Reduce storage space:

You are no longer restricted by your computers' limited storage space. You can simply save your data in the cloud and log into view and edit it as needed.

Cost effective:

Cloud computing technology is paid incrementally thus saving cost for organizations. It offers price savings due to economics of scale and the fact that organizations such as libraries are only paying for the resources they actually use.

Highly automated:

The IT or library staff need not have to worry about keeping the software up to date. The cloud service provider takes care of updating software as and when new version is released. When server is updated everyone using the service also get access to the new version without updating anything on their end.

Easy to installation and maintenance:

No longer having to worry about constant updates and other computing issues, organizations will be free to concentrate on innovation and the IT staff may concentrate on other tasks. 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 is possible to extend as per the need.

Flexibility:

Cloud computing offers much more flexibility than other local network computing systems and save time plus cost for organizations. It is possible for organizations like libraries to expand the services anytime, by requesting for an additional space on the servers.

Shared resources:

One of the important components of cloud computing is that one can share the resources. It allows people within and outside the organization to have access to the resources. A group of libraries can come together and can put their resources at one place.

which in turn will enable them to provide access to more number of resources to their end users.

Any time accessibility:

Major benefit of cloud application is around the clock availability; all you need is an internet connection with right authentication details and you can access whenever without any geographical location i.e. remotely from home, or on the move

Better mobility:

The staff and the users of the library can connect to the library server from any place or from wherever they are, rather than having to remain present at their desks by having a PC and internet access.

Disadvantages:

Following are some of the main disadvantages of cloud computing.

Data security:

The Biggest concerns about cloud computing are security, especially if the organizations are dealing with sensitive data such as credit card information of customers. If the proper security model is not yet in place, then the data stored on the cloud is vulnerable to attacks from viruses, theft etc. In addition to that, since the services are offered over the internet it is very difficult to access the physical location of servers and software and security audit is hard to undertake. Also there is a risk of data loss owing to improper backup and systems failure.

Limited flexibility:

Flexibility may be limited in terms of special customization as services on the cloud will be common for the entire user.

Cost:

Initially the cost should be higher but may end up paying higher charges in the future.

Network connectivity and bandwidth:

Since the cloud computing is offered over the internet, if the connection goes down due to any reason than the organization suffer from loss of data connectivity till the time it is set. Also the service requires more bandwidth, as it may not work on low speed internet connection.

Dependence on outside agencies:

The cloud services being offered by third party services over the internet. It is virtually difficult to have any control on the maintenance levels and the frequency. Also it is

tough to access the contingency procedures of the service provider in regard to backup, updates, restore and disaster recovery. Migration to other service provider is also an issue if the uniform standards are not followed by host.

Privacy:

Privacy loss is a big concern when we talk about cloud-based services. Data stored or shared on the cloud by large social networking sites are usually protected and can be accessed by only authorized people, but there is always a chance of accidental data leakage, mismatch and other failures.

Present situation of indian libraries:

In India, cloud computing in libraries is in development phase. 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 web 2.0 technologies are running on successful modes. Some good examples of successful cloud computing libraries include Dura cloud, OCLC, services and Google based cloud services. Now a day's many commercial as well as open sources vendors (i.e. OSS) are clubbing the cloud computing technology in to 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.

Conclusion:

We know that library is not only a knowledge ocean; its ultimate aim is to provide satisfactory services for all the people. so in the new era, library should improve itself constantly by adopting many new IT Technologies. This study provides cloud computing concepts and implications of cloud based applications in libraries in order to enhance their services in a more efficient manner. The paper attempted how cloud computing helps in freeing libraries from managing technology so that they can focus on collection building, improved services and innovation. Cloud computing encourages libraries and their users to participate in a network and community of libraries by enabling them to reuse information and socialize around information. The cloud computing techniques and methods applied to libraries not only can improve the quality of services and utilization of resources, but also can make more extensive use of cloud computing to out work life. No doubt, libraries are moving towards cloud computing technology in present time and taking advantages of cloud based services. 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 service to their target users with ease of use and trust worthiness.

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