TRANSMISSION OF LIBRARY TO LEARNING RESOURCE CENTRE THROUGH CLOUD COMPUTING

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Abstract : Technological development has changed the face of library, its services and its collection. Library resources are moving to digital collection. Now it is possible for the users to access the resources from outside the physical library. Cloud computing is a new technology model for IT services. The paper presents an overview of cloud computing and its possible applications that can be clubbed with library services on the web based environment. It discusses how cloud computing solution could be beneficial to libraries in technology, data and community.

IndexTerms - **Cloud computing, Cloud computing models, SaaS, PaaS, IaaS, Library and Cloud Computing**

I . INTRODUCTION

In present scenario, **c**loud computing becomes the essential part of our daily life. Anyone connected to the internet is probably using some type of cloud computing on a regular basis. Whether they are using Google's Gmail, organizing photos on Flickr or searching the web with any web browser are engaged in cloud computing. The emergence of open access, web technology and e-publishing has slowly transformed modern libraries into digital libraries. With this variety of technologies utilized, cloud computing has become an advantage of libraries to provide a single efficient system that saves money and time. Cloud computing is emerged as one of the most popular virtual technology for libraries to deliver services in an efficient manner.

II. Cloud Computing

Cloud computing is not a new technology that suddenly appeared on the web, but it is a new form of computing. Cloud computing is a kind of computing technology which facilitates in sharing the resources and services over the internet. The combination of servers, network connection, application and resources are defined as cloud.

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.: -network, services, storage, application and service) that can be rapidly provisioned and released with minimal management effort or service provider interaction".

III. Components of Cloud

In a simple topological sense, a cloud computing solution is made up of several elements. The three main components are client, the data Centre and distributed servers. Each component has a purpose and plays specific role in delivering a functional cloud-based application. Let's take close look.
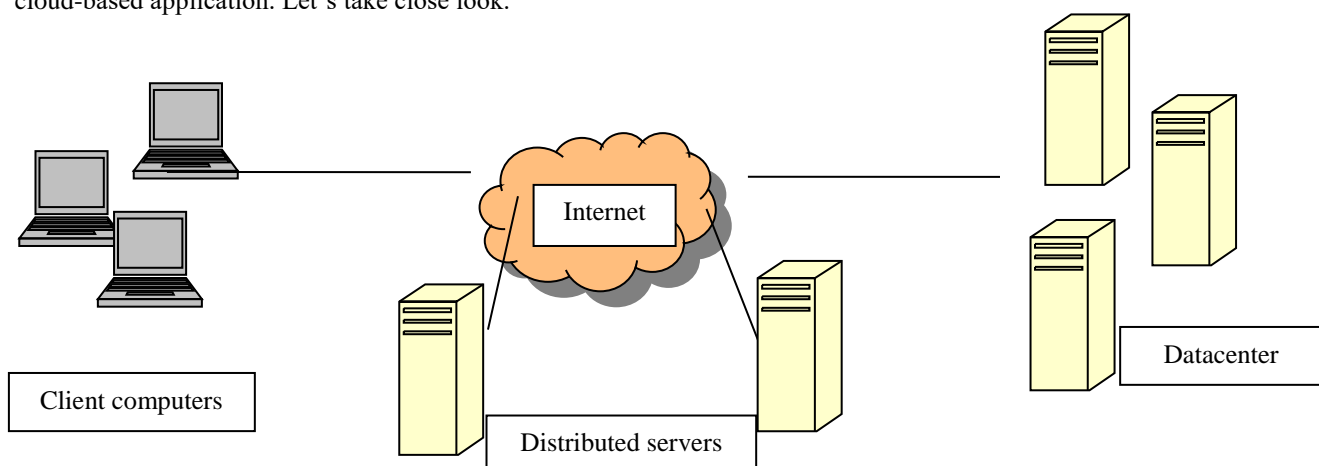
3.1 Client

Clients are the devices that the end user interact with to manage their information on the cloud. Clients generally fall into three categories.

3.1.1 Mobile:

Mobile devices include PDA or smart phones like android, blackberry or an i-phone

3.1.2 Thin:

Thin clients are computers that do not have internal hard drives, but rather let the server do all the work and deploy the information.

3.1.3 Thick:

This type of client is a regular computer using a web browser like Chrome, Firefox or Internet explorer to connect to the world.

3.2 Data Centre

The data center is the collection of servers where the application to which you subscribe is housed. It could be a large room in the basement of your building or a room full of servers on the other side of the world that you access via internet.

3.3 Distributed Servers

All servers don't have to be housed in the same location and normally they are in geographically disparate location. But for cloud the subscriber, these servers act as if they are humming away right next to each other. This gives the service provider more flexibility in option and security. For example, Amazon has their cloud solution in service all over the world. If something where to happen at one site, causing a failure, the service would still be accessed through another site. Also, if the cloud needs more hardware, they can add them at another site and simply make it part of the cloud.

IV. Cloud service models

The term service in cloud computing is the concept of being able to use reusable, fine-grained components across a service provider's network. This is widely known as "as a service". There are three major types of service models available.

4.1 Software as a Service (SaaS)

In this type of cloud computing, the applications are accessible from various client devices through a thin client interface such as a web browser. When the software is hosted off-site, the customer doesn't have to maintain it or support it. The service provider does all the patching and upgrades as well as keeping the infrastructure running. Cost for accessing the software can be an ongoing thing. Rather than pay it once and be done with it, the more you use it the more you will be billed.

4.2 Platform as a Service (PaaS)

PaaS provides an application platform, or middleware, as a service on which developers can build application and run them on the infrastructure that the cloud vendor owns and maintains. This supplies all the resources required to build application and services completely from internet, without having to download or install software. PaaS services include application design, development, testing, deployment and hosting. Other service includes team collaboration, database integration, security, scalability, storage and versioning. A downfall to PaaS is a lack of interoperability and portability among providers.

4.3 Infrastructure as a Service (IaaS)

IaaS is the next form of service available in cloud computing. SaaS and PaaS are providing applications to customers, where IaaS simply offers the hardware so that the customers can put whatever they want on it. The use does not manage or control the underlying cloud infrastructure, but has control over operating system, storage, deployed software and possibly limited control of selecting network components.

V. Cloud Deployment models

Cloud computing can be classified into four types of deployment model on the basis of location where the cloud is hosted. These are public, private, hybrid and community cloud.

5.1 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 charging model.

5.2 Private cloud

In this model cloud services are limited to specific organization and are managed by the organization itself or a third party.

5.3 Community Cloud

In community cloud environments a group of related customers have access to computing services. Although the actual computing services may be run in-house or by the cloud provider, community cloud tends to feature shared access to some or all resources in the cloud environment.

5.4 Hybrid Cloud

This type of cloud made from more than one cloud deployment models. This merges different cloud models such as public, private or community. 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 task.

VI. Cloud computing in Libraries

Libraries are in a unique position to experiment with cloud computing. Cloud computing can manage many common challenges of library such as scarce resources, increased user demand, ever more complex collection, system and work flows to a great extent. Cloud-based library management services are offering workflows that save time and discovery solutions that meet users' expectations because of the integration in the cloud between libraries, applications, partners and data. Library can utilize cloud services such as SaaS, PaaS and IaaS in a number of areas such as library automation, website hosting, digital library services, search services, storage, integrated library system etc. some of these are:

6.1 Automation

Library automation in most of the library is being undertaken on locally hosted servers using different types of commercial and open source integrated library management software and managed either by internal IT or library staff. Now many software venders (e.g. Ex-Libris) offer this on the cloud (SaaS model) which enable the library free from investing on hardware and undertaking maintenance, software updating and backup.

6.2 Digital Library services

An efficient way to manage resources, information and library related services is to maintain a digital library. Digital library services are presently being offered by libraries mostly using locally hosted open source software such as Dspace, Enprints, and Fedora Commons etc. Apart from adding resources, this involves libraries to maintain the service, take up backups, and regular updating of software as and when new version is released. To relieve the libraries in undertaking this kind of work, vendors are now offering digital library services on the cloud using SaaS model. For example, vendors such as Duraspace, OSS Labs etc. are offering this service.

6.3 Website hosting

Website hosting is one of the earliest adoptions of cloud computing as many organizations including libraries preferred to host their websites on third party service providers rather than hosting and maintaining their own servers. Google sites serves as an example of a service for hosting websites outside of the library's services and allowing for multiple editors to access the site from varied locations.

6.4 Storage

Libraries require space to store the electronic files and documents. The documents could be official correspondence, full text documents, bibliographic records etc. At present, these are stored and accessed using personal desktops or from servers which are locally hosted. Cloud computing makes it possible for uploading and downloading of information from anywhere any time by offering no maintenance, no cost storage space. For example, Windows Sky Drive offers 25GB to store file and share documents online. Similarly, Amazon, Dropbox and many more initiatives offers storage space on the cloud to enable organization and individuals to store and share their documents. Libraries may take advantage of this and store some of their documents in order to undertake collaborative activities with other libraries.

6.5 Search services

Libraries have already migrated to key services such as Open URL providers, and federated search engines on the cloud either by using commercial or open source solutions. For example, hosted Ex-Libris, SFX Open –URL link resolver service offers libraries to linkup to the subscribed journal full text article.

6.6 Office applications

Libraries, at present, use various office applications such as word processing, spread sheets, power point presentations, etc. using Microsoft Office on local hosted computers. However, now owing to cloud computing there are many applications which are made available on the internet. Google docs, a free office application suit available on the internet may be used in the libraries to undertake office operations.

VII. Cloud computing initiative for libraries

Initiatives relevant to the libraries are also undertaken by organizations and business house in integrated library software, digital library, search engine etc. Few major ones are:

7.1 OCLC's Web scale

OCLC has set up an example for making use of cloud computing for libraries. Now OCLC has geared to implement the plan of library management system on the cloud, in which OCLC has Web-scale delivery and circulation, print and electronic acquisition, cataloguing and license management components. Its World share management Service (WMS) allows libraries to to manage entire collection management life cycle in cloud-based application. The service promises to include privacy, security and technical support.

7.2 Ex-Libris Cloud

Ex-Libris, a leading software vendor from USA, who initially developed most of the current products as locally implemented solutions and at a later stage, adapted them to a hosted environment. The company's next generation library system, Alma, was conceived as a cloud-based service to transform the traditional management of library resources. To provide worldwide cloud –based services, it has opened data centers at various locations.

7.3 Duraspace's Dura Cloud

Duraspace provides open source repository solutions by undertaking turnkey projects for organizations and libraries to enable them to share scholarly literature using Dspace and Fedora Commons. Its new service Duracloud provides digital preservation support services in the cloud. Duracloud helps libraries to move content to the cloud and store it with different service providers to eliminate the risk of data loss. The cloud solution includes online backup, preservation and archives.

7.4 OSS Labs

OSS Labs from India using Amazon's elastic cloud computing platform owing to the various capabilities of Amazon such as high durability of data, strong information security based on ISO standards, scalability and flexibility. It is expected that the OSS labs will be able to provide open based solutions to demanding customers. It offers Koha ILS and Dspace institutional repository hosting and software maintenance subscription services for libraries.

VIII. Advantages and disadvantages of cloud computing

Like any other technology, cloud computing too has its advantages and disadvantages as compared to locally hosted services.

7.1 Advantages

Some of the advantages of cloud computing are:

7.1.1 Cost saving: Cloud computing technology is paid incrementally thus saving costs for organizations. It offers price saving such as libraries are only paying for the resources they actually use.

7.1.2 Easy on installation and maintenance: The service provider in the cloud will install and update the application and resources and no need for technical staff to maintain.

7.1.3 Increased storage: cloud can hold more storage than a personal computer or the servers available on the libraries and it is possible to extend as per need.

7.1.4 Flexibility: Cloud computing offer much more flexibility than other local network computing systems and save time and cost for organizations. It is possible for the library to expand the services anytime.

7.1.5 Better mobility: the staff and the users of the library can connect to the library servers from wherever they are.
7.1.6 Shred resources: One of the important components of cloud computing is that one can share the resources. This allows people within and outside the library to access the resources. A group of libraries can come together and can put their resources at one place and can start the resource sharing initiative.

7.2 Disadvantages

Following are some of the disadvantages of cloud computing
7.2.1 Data security and privacy: The biggest concerns about cloud computing are security and privacy; especially the organization is dealing with sensitive data. If the proper security model is not yet in place, then the data stored on cloud is vulnerable to attack from viruses, theft etc.

7.2.2 Network connectivity and bandwidth: Since the cloud computing is offered over the internet, if the connection goes down due to any reason then 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 connections.

7.2.3 Dependence on outside agencies: The cloud services being offered by third party service provider over internet, it is virtually difficult to have any control on the maintenance level and the frequency.

VII. Conclusion

Libraries have the opportunity to improve their services and relevance in today's information society. Cloud computing is one avenue for this move into the future. It can bring several benefits for libraries and give them a better opportunity. Each library builds and maintains a database, buys equipment and installs and updates the software. The cooperation effect of libraries using the same, shared hardware, services and data can result in lowering the total costs of managing library collections. Another role of LIS professional in this virtual era is to make cloud-based services as a reliable medium to disseminate library services on their target users with ease of use and trustworthiness.

REFERENCES

[1] Anthony, T. V. (2010). *Cloud computing:a practical approach.* New Delhi: Tata Mc Graw Hill.

[2] Bansode, S. (2012). Cloud computing and libraries. *DESIDOC Journal of Library and Information Technology* , 506-512.

[3] Goldner, M. (2010). Winds of change:libraries and cloud computing. *OCLC online Computer Literacy Center* , 1-13.

[4] Gosavi, N. [. (2012). Use of cloud computing in libary and information science field. *International journal of Digital Library Services* , 51-60.

[5] Kaushik, A. a. (2013). Application of cloud computing in libraries. *International journal of Information Technology* , 270-273.

[6] Lawal, R. (2013). Cloud compuing and its applicationin e-library services:Nigeria in focus. *International Journal of Innovation and Management Technology* , 476-479.

[7] Mitchel, E. (2013). *Cloud based services for your library.* New Delhi: Ess Ess Publication.

[8] NIST. (2011, September). *https://nvlpubs.nist.gov/nistpubs/legacy/sp/nistspecialpublication800-145.pdf.* Retrieved November 15, 2018, from https://nvlpubs.nist.gov/nistpubs/legacy/sp/nistspecialpublication800-145.pdf: https://nvlpubs.nist.gov/nistpubs/legacy/sp/nistspecialpublication800-145.pdf