USE OF CLOUD COMPUTING IN LIBRARY AND INFORMATION SCIENCE FIELD

PROF. NANDKISHOR GOSAVI
Librarian, Dr. D. Y. Patil, Technical Campus, Pune

&

PROF. SEETAL S. SHINDE
Lecturers, SHJB Polytechnic, Chandwad Nashik .

&

PROF. BHAGYASHREE DHAKULKAR
Lecturers, Dr. D. Y. Patil, Technical Campus, Pune.

ABSTRACT

Latest technological development has brought a dramatic change in every field, and library science is not exception to it. Information technology impacted positively on library and information system and services they provide for users. The libraries have been automated, networked and now moving towards paper less or virtual libraries. To gather challenges in the profession librarians are also applying different platforms in Library science filed for attaining economy in information handling. This paper overviews the basic concept of newly develop area known as cloud computing. The use of cloud computing in libraries and how cloud computing actually works is illustrated in this communication.

INTRODUCTION

Today we are living in the age of information. Information technology plays very vital role in library science i.e. for collection, Storage, organization, processing, and analysis of information. Library filed facing many challenges in the profession due to applications of information technology. New concepts are being added to ease the practices in the libraries is also accepting many new technologies in the profession as they suit the present information handling and they satisfy needs of the knowledge society. With the advent of Information technology, libraries have become automated which is the basic need towards advancement followed by networks and more effort are towards virtual

libraries. The emergence of e-publications, digital libraries, internet usage, web tools applications for libraries, consortium practices leads to the further developments in library profession. The latest technology trend in library science is use of cloud computing for various purposes and for achieving economy in library functions. Since cloud computing is a new and core area the professionals should be aware of it and also the application of cloud computing in library science.

What is Cloud Computing?

A definition for cloud computing can be given as an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet. Cloud computing is a way of providing various services on virtual machines allocated on top of a large physical machine pool which resides in the cloud. Cloud computing comes into focus only when we think about what IT has always wanted – a way to increase capacity or add different capabilities to the current setting on the fly without investing in new infrastructure, training new personnel or licensing new software. Here 'on the fly' and 'without investing or training' becomes the keywords in the current situation. But cloud computing offers a better solution

We have lots of compute power and storage capabilities residing in the distributed environment of the cloud. What cloud computing does is to harness the capabilities of these resources and make available these resources as a single entity which can be changed to meet the current needs of the user. The basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give it to the clients. Any web enabled device can be used to access the resources through the virtual servers. Based on the computing needs of the client, the infrastructure allotted to the client can be scaled up or down. From a business point of view, cloud computing is a method to address the Scalability and availability concerns for large scale applications which involves lesser Overhead. Since the resource allocated to the client can be varied based on the needs of the client and can be done without any fuss, the overhead is very low.

One of the key concepts of cloud computing is that processing of 1000 times The data need not be 1000 times harder. As and when the amount of data increases, the Cloud computing services can be used to manage the load effectively and make the Processing tasks easier. In the era of enterprise servers and personal computers, Hardware was the commodity as the main criteria for the processing capabilities depended on the hardware configuration of the server. But with the advent of cloud Computing, the commodity has changed to cycles and bytes - i.e. in cloud computing Services, the users are charged based on the number of cycles of execution performed Or the number of bytes transferred. The hardware or the machines on which the Applications run are hidden from the user. The amount of hardware needed for Computing is taken care of by the management and the client is charged based on how the application uses these resources.

History of Cloud Computing: The Greek myths tell of creatures plucked from the surface of the Earth enshrined as constellations in the night sky. Something similar is happening today in the world of computing. Data and programs are being swept up from desktop PCs and corporate server rooms and installed in "the compute cloud". In general, there is a shift in the geography of computation. What is cloud computing exactly? As a beginning here is a definition

"An emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet"

Like other definitions of topics like these, an understanding of the term cloud computing requires an understanding of various other terms which are closely related to this. While there is a lack of precise scientific definitions for many of these terms, general definitions can be given.

Cloud computing is an emerging paradigm in the computer industry where the Computing is moved to a cloud of computers. It has become one of the buzz words of the industry. The core concept of cloud computing is, quite simply, that the vast Computing resources that we need will reside somewhere out there in the cloud of Computers and we'll connect to them and use them as and when needed. Computing can be described as any activity of using and/or

developing computer hardware and software. It includes everything that sits in the bottom layer, i.e. everything from raw compute power to storage capabilities. Cloud computing ties together all these entities and delivers them as a single integrated entity under its own sophisticated management.

Cloud is a term used as a metaphor for the wide area networks (like internet) or any such large networked environment. It came partly from the cloud-like symbol used to represent the complexities of the networks in the schematic diagrams. It represents all the complexities of the network which may include everything from cables, routers, servers, data centers and all such other devices.

Computing started off with the mainframe era. There were big mainframes and everyone connected to them via "dumb" terminals. This old model of business computing was frustrating for the people sitting at the dumb terminals because they could do only what they were "authorized" to do. They were dependent on the computer administrators to give them permission or to fix their problems. They had no way of staying up to the latest innovations. The personal computer was a rebellion against the tyranny of centralized computing operations. There was a kind of freedom in the use of personal computers. But this was later replaced by server architectures with enterprise servers and others showing up in the industry. This made sure that the computing was done and it did not eat up any of the resources that one had with him. All the computing was performed at servers. Internet grew in the lap of these servers. With cloud computing we have come a full circle. We come back to the centralized computing infrastructure. But this time it is something which can easily be accessed via the internet and something over which we have all the control.

Characteristics of Cloud computing:

1.   **Self Healing:**

Any application or any service running in a cloud computing environment has the property of self healing. In case of failure of the application, there is always a hot backup of the application ready to take over without disruption. There are multiple copies of the same application - each copy updating itself regularly so that at times of failure there is at least one copy of the application which can take over without even the slightest change in its running state.

2.   Multi-tenancy:

With cloud computing, any application supports multi-tenancy - that is multiple tenants at the same instant of time. The system allows several customers to share the infrastructure allotted to them without any of them being aware of the sharing. This is done by virtualizing the servers on the available machine pool and then allotting the servers to multiple users. This is done in such a way that the privacy of the users or the security of their data is not compromised.

3.   Linearly Scalable:

Cloud computing services are linearly scalable. The system is able to break down the workloads into pieces and service it across the infrastructure. An exact idea of linear scalability can be obtained from the fact that if one server is able to process say 1000 transactions per second, then two servers can process 2000 transactions per second.

4.   Service-oriented:

Cloud computing systems are all service oriented - i.e. the systems are such that they are created out of other discrete services. Many such discrete services which are independent of each other are combined together to form this service. This allows re-use of the different services that are available and that are being created. Using the services that were just created, other such services can be created.

5.   SLA Driven:

Usually businesses have agreements on the amount of services. Scalability and availability issues cause clients to break these agreements. But cloud computing services are SLA driven such that when the system experiences peaks of load, it will automatically adjust itself so as to comply with the service-level agreements. The services will create additional instances of the applications on more servers so that the load can be easily managed.

6.   Virtualized:

The applications in cloud computing are fully decoupled from the underlying hardware. The cloud computing environment is a fully virtualized environment.

7.   Flexible:

Another feature of the cloud computing services is that they are flexible. They can be used to serve a large variety of workload types - varying from small loads of a small consumer application to very heavy loads of a commercial application

Types of Cloud computing:

1. Software as s service (SaaS):

Software package such as CRM or CAD/CAM can be accessed under cloud computing scheme. Here a customer upon registration is allowed to use software accessible through net and use it for his or his business process. The related data and work may be stored on local machines or with the service providers. SaaS services may be available on rental basis or on per use basis.

2. Platform as a Service (PaaS):

Cloud vendors are companies that offer cloud computing services and products. One of the services that they provide is called PaaS. Under this a computing platform such as operating system is provided to a customer or end user on a monthly rental basis. Some of the major cloud computing vendor is Amazon, Microsoft, and Google etc

3. Infrastructure as a service (IaaS):

The cloud computing vendors offer infrastructure as a service. One may avail hardware services such as processors, memory, networks etc on agreed basis for specific duration and price.

Working Of Cloud Computing:

Cloud computing system can be divided it into two sections: the front end and the back end. They connect to each other through a network, usually the Internet. The front end is the side the computer user, or client, sees. The back end is the "cloud" section of the system. On the back end there are various computers, servers and data storage systems that create the "cloud" of computing services. A central server administers the system, monitoring traffic and client demands to ensure everything runs smoothly. It follows a set of rules called protocols Servers and remote computers do most of the work and store the data.

Use Cloud computing in library and information science:

Cloud computing offers many interesting possibilities for libraries that may help to reduce technology cost and increase capacity reliability, and performance for some type of automation activities. Cloud computing has made strong inroads into other commercial sectors and is now beginning to find more application in library science. The cloud computing pushes hardware to more abstract levels. Most of us are acquainted with fast computing power being delivered from systems that we can see and touch.

Role of Cloud computing in libraries:

Cloud computing is a completely new in technology and it is known as 3rd revolution after PC and Internet. Cloud computing is an enhancement of distributed computing, parallel computing, grid computing and distributed databases. Among these, grid and utility computing are known as predecessors of cloud computing.

Cloud computing has large potential for libraries. Libraries may put more and more content into the loud. Using cloud computing user would be able to browse a physical shelf of books, CDs or DVDs or choose to take out an item or scan a bar code into his mobile device. All historical and rare documents would be scanned into a comprehensive, easily searchable database and would be accessible to any researcher. Many libraries already have online catalogues and share bibliographic data with OCLC. More frequent online catalogues are linked to consortium that share resources.

Data storage cloud be a main function of libraries, particularly those with digital collections storing large digital files can stress local server infrastructures. The files need to be backed up, maintained, and reproduced for patrons. This can strain the data integrity as well as hog bandwidth. Moving data to the cloud may be a leap of faith for some library professionals. It's a new technology and on the surface it is believed that library would have some control over this data or collections. However, with faster retrieval times for patron's requests and local server space it could improve storage solutions for libraries. Cloud computing or IT infrastructure that exists remotely , often gives users increased capacity and less need for updates and maintenance , and has gained wider acceptance among librarians

Advantages of Cloud computing in libraries:

1. **Cost saving**
2. **Flexibility and innovation**
3. **User centric**
4. **Openness**
5. **Transparency**
6. **interoperability**
7. **Representation**
8. **Availability anytime anywhere**
9. **Connect and Converse**
10. **Create and collaborate**

Examples of Cloud libraries:

1. **OCLC**
2. **Library of Congress (LC)**
3. **Exlibris**
4. **Polaris**
5. **Scribd**
6. **Discovery Service**
7. **Google Docs / Google Scholar**
8. **Worldcat**
9. **Encore**

Conclusion:

Cloud computing builds on decades of research in virtualization, distributed computing, utility computing, more recently networking, and web software services. It implies a service oriented architecture, reduced information technology overhead forth end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. In today's global competitive market, companies must innovate and get the most from its resources to succeed. Cloud computing infrastructures are next generation platforms that can provide tremendous value to companies of any size. They can help companies achieve more efficient use of their IT hardware and software investments and provide a means to accelerate the adoption of innovations.

Cloud computing increases profitability by improving resource utilization. Costs are driven down by delivering appropriate resources only for the time those resources are needed. Cloud computing has enabled teams and organizations to streamline lengthy procurement processes.

Cloud computing enables innovation by alleviating the need of innovators to find resources to develop, test, and make their innovations available to the user community. Innovators are free to focus on the innovation rather than the logistics of finding and managing resources that enable the innovation.

References:

1. Cloud Computing – MLADEN .A.VOUK -Issues, Research an Implementations, Information Technical Interfaces, June 2008.

2. SME Survey on Cloud Computing Cloud Computing Information Assuranec Framework.

3. McKinsey & Co. Report presented at Uptime Institute Symposium pril 18, 2009. Clearing the Air on Cloud Computing. ttp://uptimeinstitute.org/content/view/353/319; http://images.cxotoday.com/cxoimages/storyimages/matter101157.pdf (accessed November 27, 2009).

4.   Clash of the Clouds. *The Economist* October 15, 2009. http://www.economist.com/displaystory.cfm?story_id=14637206 (accessed November 15, 2009).

5.   Proffitt, A. Pharma's Early Cloud Adopters. *BioIT World*, November/December 2009, pp.31-32.

6.   Microsoft Sidekick users lose data. http://www.telegraph.co.uk/technology/microsoft/6316609/Microsoft-Sidekick-users-lose-data.html (accessed November 28, 2009)

7.   Farber, R. Cloud Computing: Pie in the Sky? *ScientificComputing.com*, November/December 2009

8.   Davies, K. Amylin, Amazon, and the Cloud. *BioIT World*, November/December 2009, pp. 35, 42.

9.   Davies, K. The "C" Word. *BioIT World*, November/December 2009, pp. 24-26, 42.

10.   Davies, K. Cycle Computing's Tour de Cloud. *BioIT World*, November/December 2009, pp.28-29.

11.   Mullin, R. The New Computing Pioneers. *Chem. Eng. News* **2009**, *87*(21), 10-14.