



## IMPACT OF CLOUD COMPUTING TECHNOLOGY ON ACADEMIC LIBRARIES

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### ABSTRACT

Cloud computing is a transformative paradigm that enables scalable, convenient, on demand access to a shared pool of configurable computing and networking resources for efficiently delivering applications and services over the internet. It is offering various opportunities for libraries to connect their services with clouds. This paper presents an overview of cloud computing technology and its function and how this technology and its services are associated with the academic library environment.

**Keywords:** Cloud Computing, Characteristics of Cloud Computing, Types of Cloud Computing, Impact of cloud computing on Academic Libraries.

### Introduction:

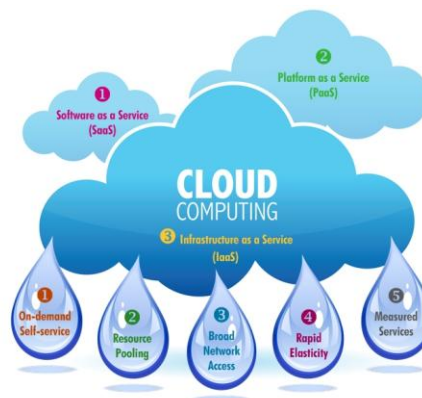
Cloud computing is more than technology. It is more than a platform. It is more than just a hosting provider. It is more than just an application hosted as a service. It is more than providing storage services on the Internet. It is a combination of all the above. Now a days Cloud computing technology is very essential needed in the Education Sector and especially for Libraries. This Cloud computing technology came up as an advantage for libraries and is providing various opportunities for libraries to connect their services with clouds. The new concept of cloud and libraries has generated a latest form called cloud libraries. Though the usages of cloud computing may vary with the libraries nature, services and information needs but most common usages of cloud computing within libraries can be development of digital libraries, corporate cataloging, acquisition, storage and sharing the resources on a virtual environment on the web. The need of cloud computing may occur due to the information explosion, problems in accessing the information, saving the time of the users and staff, resource sharing problems, problems in library resources management, complex demand of users and attraction of users towards cutting edge technologies.

### Cloud Computing:

Cloud Computing is a transformative computing paradigm that involves delivering applications and services over the internet. Many of the underlying technologies that are the foundations of cloud computing have existed for quite some time. Cloud computing involves provision of computing networking and storage resources on demand and providing these resources as metered services to the users, in a "Pay as you go" model.

Wikipedia claimed that the concept of cloud computing emerged back to the 1960s, when John McCarthy opined that computation may someday be organized as a public utility. Chellappa gave the first academic definition of the term Cloud Computing in 1997 and later on, in the year 2007 the term cloud computing came into popularity and firstly was used in this context when Kevin Kelly opined that eventually we will have the inter-cloud, the cloud of clouds.

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 provisioned and released with minimal management effort or service provider interaction.' 3Buyya defined 'Cloud computing is a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on Service Level Agreements (SLA) established through negotiation between the service provider and consumers.'



### Essential Characteristics of Cloud Computing:

#### On-Demand Self Service:

Computer service such as email, applications, network or server service can be provided without requiring human communication with each service provider. Cloud service providers providing on demand self services include Amazon web service (AWS), Microsoft, Google, IBM and sales force .com. New York Times and NASDAQ are examples of companies using (NIST).

#### Broad Network Access:

Cloud facilities are available over the network and accessed

through standard mechanism that promote use by mixed thin or thick client platforms such as mobile phones, laptops and PDA

### **Resource Pooling:**

The Provider's Computing resources are pooled together to serve multiple consumers using multiple –tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. The resources included among other storage, processing, memory, network bandwidth, virtual machines and email services. The pooling together of the resource builds economies of scale (Gartner).

### **Rapid elasticity:**

Cloud services can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.

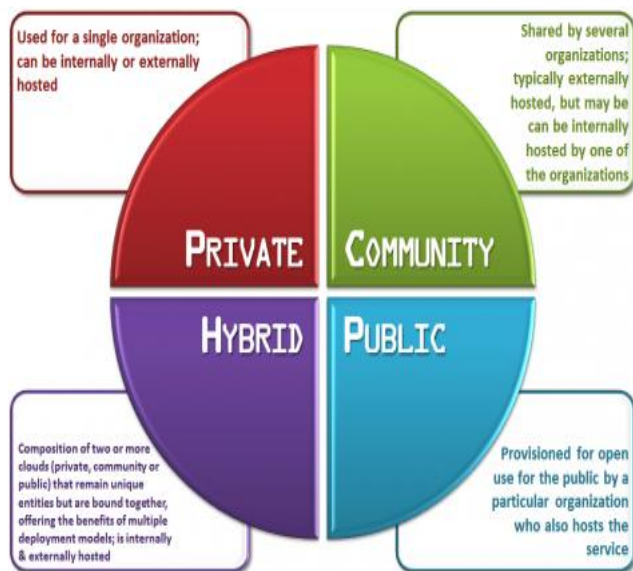
### **Measured Service:**

Cloud Computing resources are provided to users on a pay-per-use model. The usages of the cloud resources are measured and the user is charged based on some specific metric. Metrics such as amount of CPU cycles used, amount of storages space used, number of network I/O requests, etc, are used to calculate the usage charges for the cloud resources.

### **Types of Cloud Computing:**

Cloud computing is usually described in one of two ways. Either based on the cloud location, or on the service that the cloud is offering.

#### **Based on a cloud location,**



### **Public Cloud:**

Public cloud means that the whole computing infrastructure is located on the premises of a cloud computing company that offers the cloud service. The location remains, thus, separate from the customer and he has no physical control over the infrastructure.

### **Private cloud:**

Private cloud means using a cloud infrastructure (network) solely by one customer/organization. It is not shared with others, yet it is remotely located. If the cloud is externally hosted. The companies have an option of choosing an on-premise private cloud as well, which is more expensive, but they do have a physical control over the infrastructure. The security and control level is highest while using a private network. Yet, the cost reduction can be minimal, if the company needs to invest in an on-premise cloud infrastructure.

### **Hybrid cloud:**

Hybrid cloud means, using both private and public clouds, depending on their purpose.

### **Community cloud:**

Community cloud implies an infrastructure that is shared between organizations, usually with the shared data and data management concerns. For example, a community cloud can belong to a government of a single country. Community clouds can be located both on and off the premises.

### **Based on Cloud Service:**

#### **Software as a Service (SaaS):**

**SaaS** is far and away the most common model of cloud service: Companies buy access to an application but have no responsibility for (and no control over) its implementation. More than 60% of companies that Nemertes works with already use at least one (and often several ) applications that they get via SaaS, ranging from horizontally useful tools such as customer relationship management (as with Salesforce.com) to more vertically specific tools for such tasks as insurance claims adjustment, classroom scheduling and medical billing management.

#### **Platform as a Service (PaaS):**

**PaaS** involves providing a platform on which a customer can run its own applications. For example, a small company might have a Java application to which it has trouble providing enough resources during holiday peak loads. The company might go to a platform provider, such as Akamai, to run the system on its Java application server framework. Microsoft, Force.com and Google also provide platforms on which customers can run applications.

#### **Infrastructure as a Service (IaaS):**

**IaaS** allows an organization to run entire data center application stacks, from the operating system up to the application, on a service provider's infrastructure. Amazon's Elastic Compute Cloud is perhaps the most famous public cloud infrastructure available.

### **Impact of cloud computing in Academic Libraries:**

Today we are living in the age of information. Information technology plays a very vital role in handing library resources ranges from collection, storage, organization, processing, and analysis of information dissemination. The Academic Library field facing many challenges in the profession due to applications of information technology. New concepts and technologies are being added to ease the practices in the libraries and satisfy the 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.

Cloud computing offers many possibilities that will help to reduce technology cost of installing and maintaining library and improve collaboration among users a good and the 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 circulation, cataloguing, acquisition and other library related services on cloud platform through the web share management system. Web share management system facilitates to develop an open 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 based the broaden collaboration in the community. platforms, resources and services with cost benefit and effectiveness to share the data and building

#### **Advantages of Cloud Computing:**

**Cost Reduction:** Cloud computing lessens paperwork, enterprise deal charge and minimizes the financial endeavor in hardware. Moving your library to the cloud in addition reduce the manpower.

**Easier Collaboration:** Cloud computing services allow to access any time from any computers, so the library users can access library services even in remote location.

**Inexpensive:** with cloud computing, it is possible to reduce operational cost and investment on hardware. Generally only system capable of running a web browser is required at the user end.

**Scalable and flexible:** Cloud computing can consent to maximize supplies for better competence and lessen unused capacity. Access to resources from any geographical point and the ability to test and evaluate resources at no cost.

#### **Limitation of Cloud Computing in Libraries:**

**Network connection:** The concept thinks that the client has reliable network connection. If there are problems of network connectivity, accessing the cloud also becomes a problem. Performance of the cloud applications also depend on the performance of network at clients' side. Upload and download speeds are slower as compared to that of a local server.

**Control of data security:** In a public cloud, the client does not have the control over security of his/ her own data. The clients' data can be susceptible to hacking or phishing attacks. Since the servers on cloud are interconnected it is easy for malware to spread.

**Additional costs:** Although cloud computing offers cost benefits, it has some hidden or additional costs as well. Clients are charged extra for data transfer or other services. Initial offerings are priced higher, till economies of scale work out for the service provider.

**Peripherals:** Peripheral devices like printers or scanners might not work with cloud. Many of them require software to be installed locally. Networked peripherals have lesser problems.

**Integration:** Integrating internal applications with those on cloud can be complex and in some cases not viable.

**Conclusion:** The character of the information constructs the questions of regularity and interoperability commendable of continuous discussion, and essentials to come up with sensible key in accessing, shielding information and knowledge assets. While Academic librarians are mostly clients of cloud computing services, an accepting of their procedure is important for effective and efficient use. This includes the advantages and disadvantages or challenges involved. Even in technologically backward or incompetent atmosphere, Academic librarians need to be familiar regarding these issues so that they can exploit what inadequate services and resources they have and, at the similar time, be arranged to handle irregular change caused by information technology developments. Potentially, the cloud Computing technology endow with access to the enormous mainstream and despite of wherever they are purely located, but the challenge in some rising world areas is with insufficient Information Technology infrastructure, information centers, and applications.

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