

# Cloud Computing: The Next Generation Platform for Libraries

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## Abstract:

With technological advancement, the libraries are no more the chained treasure houses of knowledge. In today's age of information explosion, like other areas, information technology is playing a vital role in the field of library science from collection to storage and processing to organising. With advancement in every paradigm changing concept like Internet, Information and Communication Technology, Cluster Computing etc. the libraries have enthusiastically awakened themselves to accept the change to suit the present information hungry society. Likewise, Cloud Computing is the new and core area for information dissemination that all the library professionals should be aware of. Cloud Computing refers to both applications delivered as a service over internet and the system software in the centres that provide services. In simple terms, cloud means a model through which the individuals can access the applications anytime and anywhere around the world on demand. This paper discusses brief information on cloud computing and its usage. This paper would highlight the areas in the libraries where cloud computing can be applied to expand their services. This paper would also focus on the ways in which the libraries can encourage their users to participate in a network where the information can be reused and socialized. At the same time, this paper would help to understand the limitations and security risks posed in utilizing these technologies.

**Keywords:** Cloud Computing, Types of Clouds, Areas for Application, Benefits, and Hurdles for Implementation.

**Introduction:** The emergence of web enabled technologies developed on virtual platforms has significantly contributed in generating large opportunities and virtual paths to use their services meeting our multiple needs. Like, when plugging an electric appliance into an outlet, we neither care how electric power is generated nor how it gets to the outlet. This is possible because electricity is virtualized. When extending this concept to information technologies, means delivering useful functions while hiding how their internal works. Here, computing itself is be considered as virtualized that allows the computers to be built from different components such as processing, storage, data, and software resources<sup>[1]</sup>.

Technology can be complex, expensive and difficult to manage. Cloud Computing is not a technology that suddenly appeared on the web, but can be viewed as a computing technology that facilitates sharing of resources and services over the internet rather than accessing from local servers or nodes or personal devices. Today, many libraries find themselves constrained due to the inadequate specialized professionals and funding to use any technology to its full potential. Cloud Computing design can help the libraries to grow themselves by lowering this thresholds of expertise and expense. There's no more unringing the bell of Cloud Computing. This model of computing has become well established in the main stream of Information Technology, and we can anticipate that it would become increasingly dominant over time<sup>[2]</sup>.

## What is Cloud Computing?

Cloud Computing has been coined as an umbrella term to describe a category of sophisticated on-demand computing services initially offered by the commercial providers such as Amazon, Google, Microsoft etc. It denoted a model on which the computing infrastructure is viewed as a cloud from where businesses and individuals can access applications from anywhere around the world on demand<sup>[3]</sup>. The main principle behind this model is offering computing, storage and software as a service.

The National Institute of Standards and Technology (NIST)<sup>[4]</sup> characterizes Cloud Computing as "A pay-per-use model for enabling available convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction".

The Cloud Computing takes its name from the way that it's fuzzy, distant, diffuse and immense. One can't see or touch the cloud – its actual pieces and parts are scattered in data centres, whose exact physical locations we may or may not know. The term Cloud Computing is used quite freely, tagged to almost any type of virtualized computing environment or any arrangement where library relies on a remote hosting environment for a major automation component. Introducing Cloud Computing into an organization such as library requires a bit more thought and planning.

“The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer”<sup>[5]</sup>.

Cloud Computing is a paradigm, that allows on-demand network access to shared computing resources. It is a model for managing, storing and processing data online via the Internet.

### What does it really mean?

- Your photos, files, and music are saved on a computer somewhere other than your computer
- You can access your images, files, and music from any computer, anywhere in the world.
- You can share your files easily by providing links/URLS
- You can access same information from any kind of device: computer, tablet, or Smartphone.
- You can use any kind of software, whether it is for word processing, creating slideshows, or photo editing, without having to download or install it on your computer.
- The software is updated automatically
- You can increase or decrease services depending on your need.

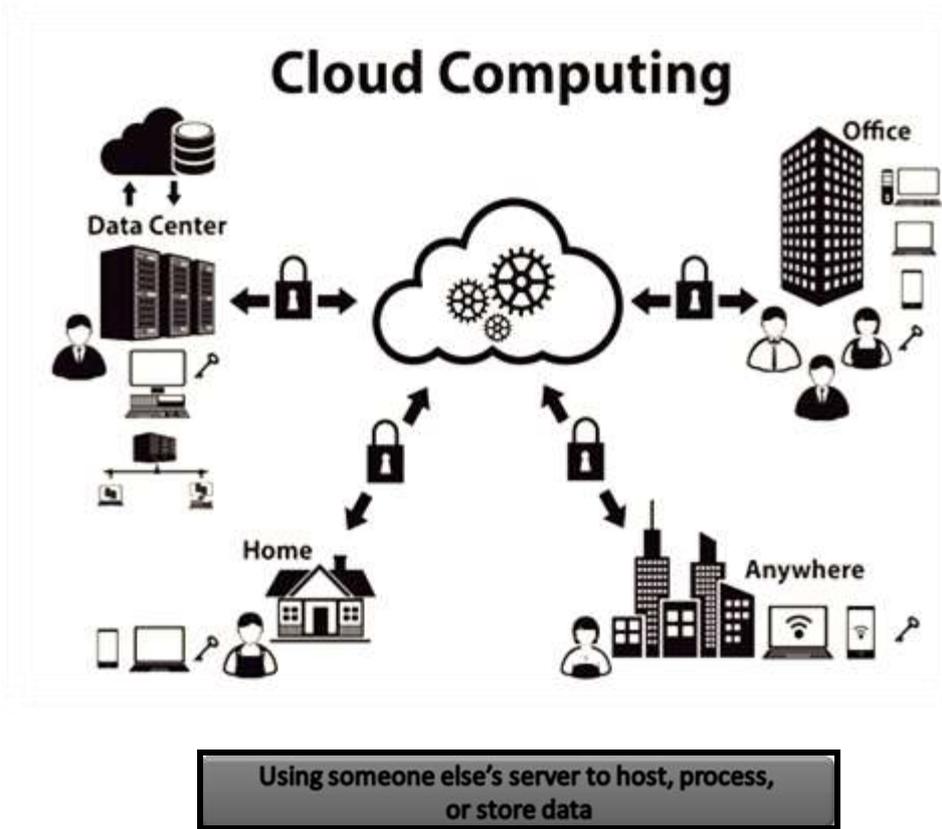
### Characteristics of Cloud Computing:

- **On Demand Service:** To use it, when we need it.
- **Network Access:** Using Internet as a medium.
- **Pricing:** Subscription or based on utility.
- **Shared Resources:** Resources are pooled together and used by multiple clients.
- **Scalability:** Allows elasticity of resources.

### Components of Cloud Computing:

There are three major components of Cloud Computing. Each of these components plays a vital role in the working of the Cloud Computing model.

- (i) Clients: Devices like PC, Laptop, Palmtop, Tablet, Mobile, PDA's etc through which the data available on the cloud is managed.
- (ii) Data Centre: These are set of servers located at a single or multiple locations in a network where all the applications are housed for the subscribers to subscribe applications as per their use.
- (iii) Distributed servers: Generally, the servers are distributed in different geographical locations to avoid the state of interruption that can be caused due to failure of a single server at one particular location. During this situation, the work of the subscriber is switched over to another server located at different sites preventing disturbance to subscriber.



Basic Structure of Cloud Computing<sup>[6]</sup>

### Types of Clouds:

Cloud Computing Services are divided into three classes, according to the abstraction level of the capability provided and the service model of providers namely:

#### 1. SaaS:

- It stands for 'Software As A Service'.
- It is an 'On-Demand Service'.
- 'Pay Per Use' of application software to users.
- It is Platform Independent and does not require to install a software on the PC.
- It runs a single instance of the software and is available for multiple end users.
- All the computing resources are managed by the vendor.
- This service is accessible via a web browser or light weight client applications.
- Examples: Google Drive and Dropbox.

### Pros:

- a. Universally accessible from any platform
- b. No need to commute, one can work from any place.
- c. Excellent for collaborative working.
- d. Vendor provides modest service tools.
- e. Allows for Multi-tendency.

### Cons:

- a. Peetability and Browser Issues.
- b. Internet performance may dictate overall performance
- c. Compliance restrictions.

**2. PaaS:**

- It stands for 'Platform As A Service'.
- This service is made up of a programming language execution environment i.e., an operating system, a web server and a database.
- All these encapsulate the environment where users can build, compile and run their programs without worrying of the underlying infrastructure.
- In this model, user is responsible for managing the data and the application resources. All the other resources are managed by the vendor.
- Examples: Google App Engine etc.

**Pros:**

- a. Cost Effective, Rapid Development (It's Scalable).
- b. Faster market for developers.
- c. Easy deployment of web applications.
- d. Private or Public deployment is possible.

**Cons:**

- a. Developers are limited to the provider's languages and tools.
- b. Migration issues such as the risk of the vendor lock-in.

**3. Iaas:**

- It stands for 'Infrastructure As A Service'.
- This service offers the computing architecture and infrastructure. i.e., it offers all computing resources but in a virtual environment so that multiple users can access them. These resources include Data storage, Virtualization, Servers and Networking.
- Most of the vendors are responsible for managing these four resources where the users would be responsible for handling the other resources like Applications, Data, Runtime and Middleware.
- Examples: Amazon Web Services, Rackspace etc.

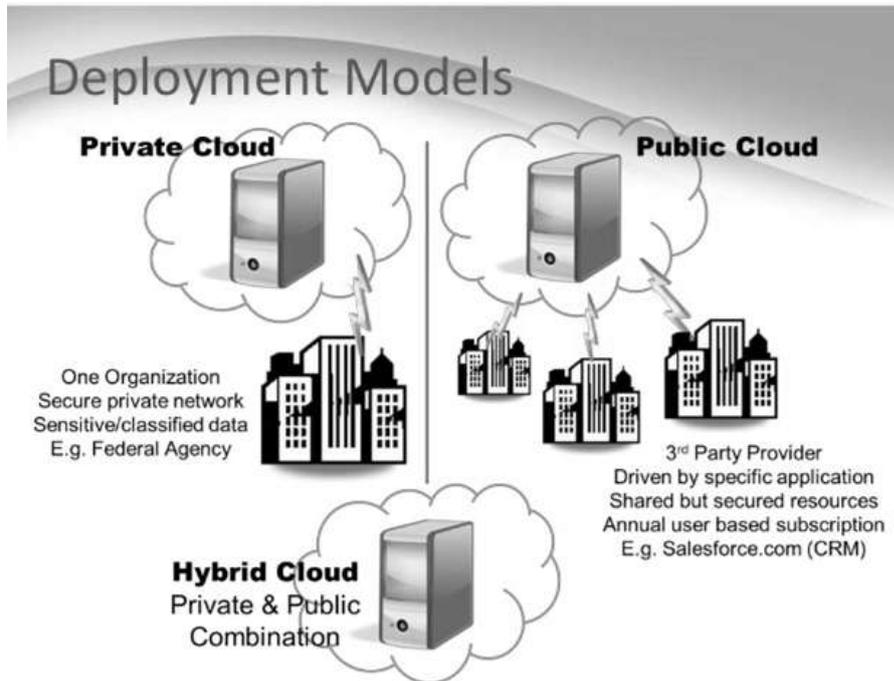
**Pros:**

- a. The cloud provides the infrastructure.
- b. Enhanced Scalability and Dynamic workloads are supported.
- c. It is Flexible.

**Cons:**

- a. Security Issues.
- b. Network & Service delays.

## Classifications based on Infrastructure or Deployment Models<sup>[7]</sup>:



## Applications of Cloud Computing in the Libraries:

- To enable cloud based access to the collections in the library using OPAC.
- For building the computer system on web technology for the users to integrate more easily with the systems.
- For developing the Inter library loan system and Integrated Library System (ILS) from locally managed vendor to web hosted environment<sup>[8]</sup>.
- For searching and backing up the library data and media collections.
- For building the digital library, content management system or institutional repositories.
- For managing the website Hosting.
- For searching, storing and accessing the bibliographic details and the scholarly content.
- For building the community power.
- For maintaining standardization and library Automation with multi-user (Client).<sup>[9]</sup>

## Benefits of Cloud Computing in Libraries:

- It helps to provide a single platform branding to the Library.
- Highly automated atmosphere of Cloud Computing helps to maintain its software's up-to-date, as maintenance is the job of service provider.
- It helps to cut down the technology costs on developing hardware and software infrastructure.
- Library services become more user-centric, quality driven, professional and effective and also draw a path for building a new leap for the future.
- It helps the libraries to create an on-demand self sufficient service eliminating the additional or fixed plan charges.
- Provides advantage to the user to rent out server space and application space on third party infrastructure based on the usage of application and space.
- It helps the libraries to host their own website and also collect statistics about their website, catalogues and blogs.
- Helps the libraries to maintain their historical and rare documents by scanning into a comprehensive, easily searchable database allowing any user to access with ease.<sup>[10]</sup>
- User's real-time participation on the web increases visibility of knowledge resources and services.

- It helps the cloud user to have federated search via, WEB OPAC, Integrated Library Management System, Web Hosting, Universal OPAC, Online resources sharing, digital library, Inter Library Loan etc.
- Cloud based Stack Map, shelf-mapping software enable users in mapping the physical location of the books available in the library.<sup>[11]</sup>
- As the services using cloud are metered, it adds up telemetry as a service.
- It enables to maintain global co-operation to carry out decision on collection development, preservation and digitization. This in turn enables to maintain bibliographic and authority records.

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

- Library of Congress (LC)
- OCLC
- Polaris Library Systems
- Scribd
- Worldcat
- Dura Cloud
- Ex Libris
- Google Docs / Google Scholar etc.

#### **Hurdles for Implementation of Cloud Computing in Libraries:**

- To use and maintain Cloud Computing service there is a need to have constant connectivity.
- Complexity involved in every innovation can act as a barrier for implementation of this technology.
- No matter where the data rests, always costs are involved for physical infrastructure and professionals.
- Like every technology based concept, Cloud Computing also has trust and security issues.
- It is difficult to understand the complete system of cloud computing as it has been totally developed and deployed by cloud service providers.<sup>[12]</sup>

#### **Conclusion:**

In terms of technology, cloud technology can be named as third revolution after Personal Computer (PC) and Internet. Like in other organizations, Cloud Computing also offers numerous benefits to the libraries. This new computing paradigm offers a huge amount of compute and storage resources to the users. The forth principle of Dr. S. R. Ranganathan ‘Save the time of the reader’ applies in the best way when we say Cloud Computing. This system not only encourages the libraries to participate in the libraries community network but also enables to reuse and socialize the information. At one end where concept of Cloud Computing sounds economical offering infinite growth opportunities, it is also exposed with security risks and cyber attacks. If these concerns in cloud computing are addressed in a right way before implementation, it could serve as a gateway to connect various libraries around us. On the whole, cloud computing can be an entry to wide range of information resources all around the world.

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