

## **Cloud Computing: An Overview of Using in Libraries**

by

**Dr. Kumara Swamy Rasala**

Assistant Professor in Library Science, Government Degree College, Narsampet Dist :

Warangal

E – mail [rasalaswamy@gmail.com](mailto:rasalaswamy@gmail.com)

Cell : 9441305564

### **ABSTRACT:**

Cloud computing is a new technique of computing that is extensively used in today's industry as well as society. It is also 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. Cloud computing brings the revolutionary changes in the world of Information Communication Technology. It has brought in new avenues for organization and business to offer services using hardware failure or software installs or platform of third party sources and its users to avoid locally hosting multiple servers, devices equipments, and upgrading and computability issues. For many organizations cloud computing can simplify process and save time and costs and work flows they have. This paper discusses the cloud computing definitions, historical backgrounds, characteristics service models and deployment of cloud services and overview of this technology, institutes advantages and disadvantages and the areas of an application of new generation libraries

**KEY WORDS:** Cloud Computing, Libraries Information Communication Technology, Models, SaaS, PaaS, IaaS.

### **INTRODUCTION:**

Cloud Computing technology has grown very fast in the last few years in Information Technology sectors and shown its high growth rate. It has given access to its consumers and business to use applications without installation and access their personal files at any compilation with Internet access. Cloud computing is a practical approach to

experience direct cost benefits and it has the potential to transform a data centre from a capital intensive set up a variable priced environment. There are many synonyms for cloud computing such as ‘on – demand computing’, ‘grid computing’, ‘distributed computing’, ‘software as a service’, ‘information utilities’, or ‘automatic computing’. The internet as a platform and others. Hayes, B. (2008). Cloud computing is used by almost those all who have accessed and connected to the internet on a regular basis. Whether they are using Google’s Gmail, to ward processing or photo sharing or video sharing one can use products that live in the cloud. Which are secure, backed – up and accessible from any internet connection. The best example of this is G – mail, which is increasingly used by organization and individuals to run their e – mail services. Google Applications being free for educational institutions is widely used for running different applications, especially e – mail services which was earlier run using their own computer servers. Libraries are using computers for running services such as Integrated Library Management Software (ILMS), website, or portal, digital library or institutional repository etc., These are either maintained by parent organization’s computer staff or Library staff.

#### **1) WHAT IS CLOUD COMPUTING:**

The term ‘cloud’ is analogical to ‘internet’. The term ‘cloud computing’ is based on cloud drawings used in the past to represent telephone networks and later to depict internet. With the use of cloud computing, anyone can gain access at any time through any device, via the internet, to data and files which you have uploaded, or to software applications which you have uploaded, or to software applications which you need to use for personal or professional use. Cloud computing allows them to avoid locally hosting and operating multiple servers over an organizations networks and constantly dealing with hard ware failure, software installation, upgrades, back up and compatibility issues and also enables them to save cost.

According to Wikipedia the cloud computing refers “the delivery of computing as a service rather than a product, where by shared resources, software and information are provided to computers and other devices as a metered service over a network, typically the internet. Wikipedia. (2011).

Christy, Pettey, & Forslling, Carnia. (2009). Group define cloud computing as ‘a style of computing in which massively scalable and elastic IT – enabled capabilities are delivered as a service to external customers using internet technologies’.

U.S. National Institute of Standards and Technology (NIST) defines cloud computing is a model for enabling convenient, on – demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management efforts or services provider interaction.

## **2) CLOUD ARCHITECTURE :**

Cloud computing architecture consists two components “the front end” and “the back end”. The front end comprises the client device and some applications are needed for accessing the cloud computing system. Back end refers which many encompass various computer matching data storage systems and servers. Groups of these clouds make a whole cloud computing system. A special type of software called “Middleware” is used to allow computers that are connected on the network to communicate with each other. Making copy of data is called redundancy and cloud computing service providers provide data redundancy.

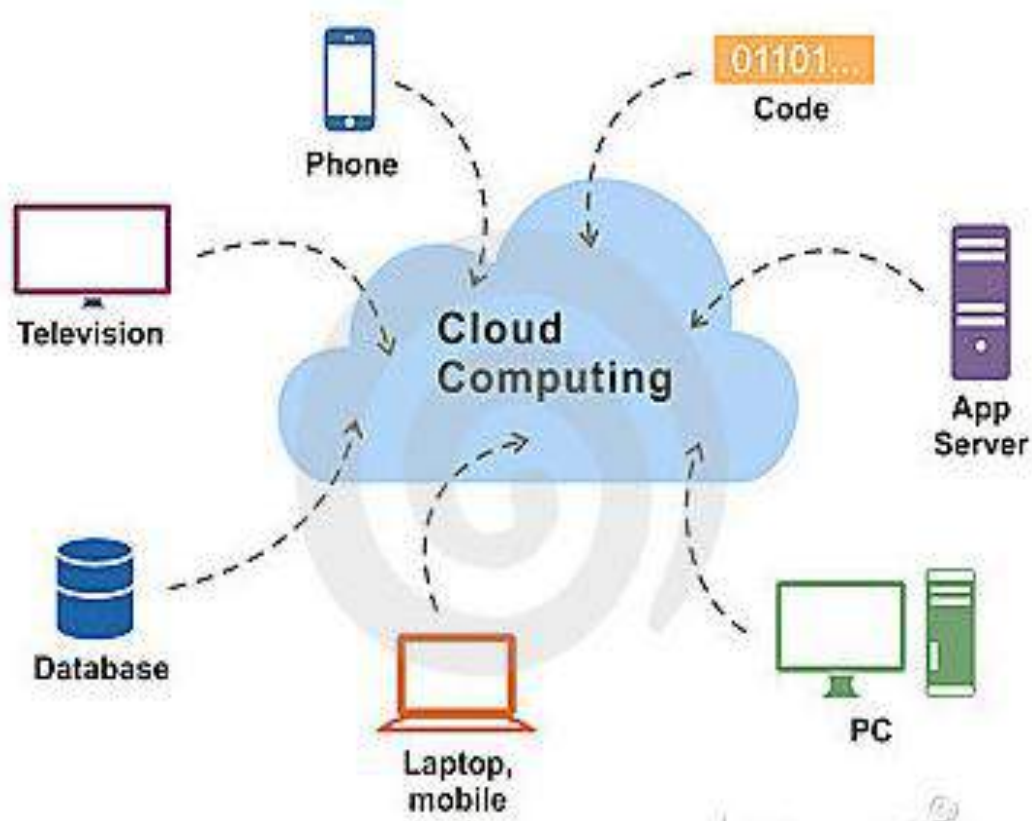
## **3) HISTORICAL BACKGROUND OF CLOUD COMPUTING:**

The origin of the term ‘cloud computing’ is obscure, it appears to derive from the practice of using drawings of stylized clouds to denote networks in diagrams of computing and communication systems. Cloud computing consists the key characters.

1. Agility improves with users ability to re provisions of resources.
2. Application Programming Interface (API) accessible to software with cloud software in the same way interaction between humans and compute.
3. Cost is claimed to be reduced in a public cloud delivery model, capital expenditure is converted to operational expenditure.
4. Virtualization technology allows servers and storage devices to be shared and utilization be increased. Applications can be easily migrated from one server to another server.

5. Centralization of infrastructure in locating with lower casts. (real estate, electricity etc.,)
6. Scalability and elasticity via dynamic (“on – demand”) provisioning of resources on a fine grained.
7. Security cloud improve due to centralization of data, increased security – focused resources etc, but concerns about loss of control over certain sensitive data, and the lack of security for stored kernels.
8. Maintenance of cloud computing applications is easier, because they do not need to be installed on each user’s computer and can be accessed from different places.

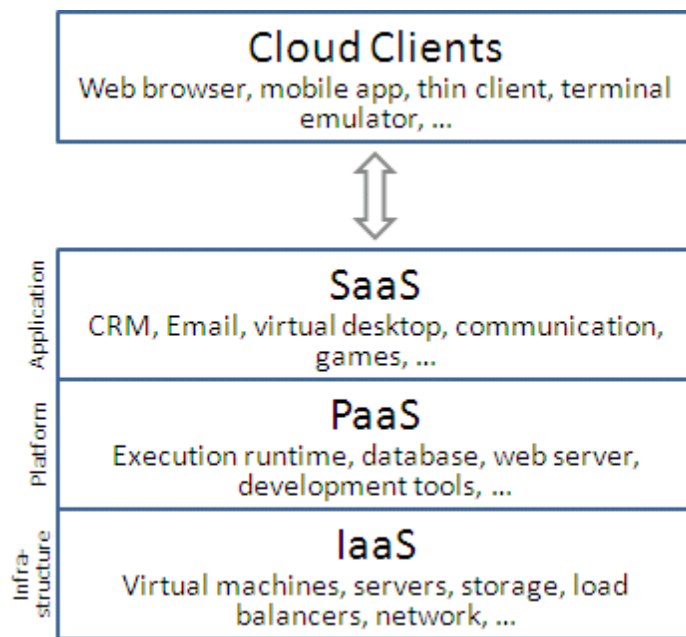
This cloud model promotes availability and is composed of five essential characteristics; there service models, and four deployment models.



#### 4) TYPES OF CLOUD COMPUTING:

Cloud computing Information Technology model has wider meaning as it essential has three different types of services models. The following figure shows the three types of cloud services as three distinct models. They are

1. SaaS – Software as a Service
2. PaaS – Platform as a Service
3. IaaS – Infrastructure as a Service



**5.1.SaaS – Software as a Service:** In this model, a complete applications is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are serviced. The delivery of business applications designed for a specific purpose. Software as a service comes in two distinct modes.

**5.1.1 Simple multi – tenancy :** Each customer has its own resources that are segregated from those of other customers. It amounts to a relatively inefficient form of multi – tenancy.

**5.1.2 Fine – grain multi – tenancy :** This offers same level of segregation, but more efficient. All resources are shared but customer data and access capabilities are segregated with the applications.

Ex: Google Applications, Microsoft Office 365, Onlive, Marketo, Casengo sales force, Zoho and Trade card etc.,

**5.2.PaaS – Platform as a Service (PaaS)** includes the delivery of more than just infrastructure. It delivers what you might call a solution stack and integrated set of software that provides every thing a developer needs to build an application – for both software development and runtime. PaaS providers offers a predefined combination of os and application servers such as LAMP Platform (Linux, Apache, Mysq and PHP), restricted J2EE, Ruby etc.,

Ex: Heroku, Force.com Engine yard, Mendix, openshift, Google Application Engine.

**5.3.IaaS – Infrastructure as a Service – (IaaS)** provides basic storage and computing capabilities of computer hardware (servers, networking technology, storage and data centers space) as a service. It also include the delivery of operating system and virtualization technologies to merge the resources.

Ex: Amazon, Ec2, Go Grid, 3Tera, Azure services platform, Dyn, DNS, etc.

## **6) DEPLOYMENT MODELS:**

There are four different models of cloud computing.

**6.1PUBLIC CLOUD** – Public or external cloud is traditional cloud computing. It applications, storage, and other resources are made available to the general public a service provider. These services are free or offered on a pay – per – use model. The service providers like Amazon, AWS, Microsoft and Google own and operate infrastructure and access only via internet. (Direct connectivity not offered)

**6.2 COMMUNITY CLOUD** – If several organizations have similar requirements and seek to share infrastructure to realize the benefits of cloud computing, then community cloud can be established. This is more expensive as compared to public cloud. This option offer high levels of privacy security and policy compliance.

**6.3 HYBRID CLOUD** – Hybrid cloud means either two separate clouds joined together. (Public, Private, internal or external) or combination of virtualized cloud server instances together with real physical hardware.

**6.3.1 Definition:** Hybrid cloud is probably the use of physical hardware and virtualized cloud server instances together to provide a single common service. Two clouds have been joined together are more correctly called a “combined cloud”. Hybrid cloud provides the flexibility of a house applications with the fault tolerance and scalability of cloud based services.

**6.4 PRIVATE CLOUD** – Private cloud describes offerings that deploy cloud computing on private networks. It consists of applications or virtual machines in a company’s own set of hosts. They provide benefits of utility co – putting shared hardware costs, the ability to recover from failure, and the ability to scale up or down depending upon demand.

## **7) CLOUD COMPUTING BENEFITS:**

Enterprises would need to align their applications. So as to exploit the architecture models that cloud computing offers. Some of the typical benefits are list below.

- Location independence, so long as there is access to the internet.
- Increased flexibility and market agility as the quick development model of cloud computing in creases the ability to re – provision rapidly as required.
- Allows the enterprise to focus on its core business.
- Increased competitive advantage.

- Increased security at a much lesser cost as compared to traditional stand alone applications due to centralization of data and increased security – focused resources.
- Reeducation in upfront capital expenditure on hardware and software development. Consumption is usually billed on a utility(like phone bills) or subscription (like magazines) model.
- Easy to maintain as they don't have to be installed on each user's computer.

## **8) CHARACTERISTICS OF CLOUD COMPUTING:**

There are some characteristics of cloud computing are mentioned as under.

**8.1 ON DEMAND SELF SERVICES :-** Computer services such as e – mail, applications, network or server service can be provided without requiring human interaction with each service provider. Cloud services providers providing on demand self services include Amazon Web Services (AWS), Microsoft, Google, IBM and sales force.com.

**8.2 BROAD NETWORK ACCESS** – Cloud capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms such as mobile phones, laptops and PDA's.

**8.3RESOURCE 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.

**8.4RAPID 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 the capabilities available for provisioning often appear to be unlimited can be purchased in any quantity at any time.

**8.5MEASURED SERVICE** – Cloud computing resources usage can be measured controlled, and reported providing transparency for both the provider and consumer of the utilized service. Cloud computing services use a metering capability which enables to control and optimize resources use. This implies that just like air time, electricity or municipality water, IT services are charged per usage metrics – pay per user.



## **9) CLOUD COMPUTING INITIATIVES FOR LIBRARIES:**

Like all purpose cloud initiatives undertaken by giants, there are sizable number of initiatives relevant to libraries initiated by organizations and business houses which are in business of integrated library software, digital libraries, search engines etc.,

**9.1 OCLS's Web scale** – OCLC (On Line 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 years together OCLC has been functioning as a cloud computing vender because they provide cataloguing tools over the internet and allow member institutions to draw on their centralized data structure (Fox, Robert. 2009).

OCLC has implement the plan of library management system on the cloud which has delivery and circulation print and electronic acquisitions, cataloguing license management components. It World share Management Services (WMS) allow libraries to manage entire collection management in a cloud based application. The purpose is sharing resources to save money, promote community development and drive better services for library users.

In other words it generate cost benefits for libraries and efficiencies not possible when utilizing discrete specialized systems (OCLC, 2012).

**9.2 EX – LIBRIS CLOUD:** - Ex – Libris is a leading library software vender form USA. The company's next generation library system, Alma, was conceived as cloud based service to transform the traditional management of library resources. It besides ensuring savings in total cost, involved in the implementation of software and the use of centralized cloud service enable libraries to provide effective services for their users (Kozokin, Sarit. 2011).

To provide world wide cloud based services it has opened data centers at various locations. The company promises to data security, updates, and standards in implementing cloud services to safeguards the interest of customers.

**9.3 DURASPACE'S DURA CLOUD:-** Dura space provides open source repository solutions by undertaking turnkey projects for organizations and libraries to enable them to share scholarly literature using D space and Fedora Commons. Its new service Dura

cloud provides digital preservation support service in the cloud which is cost effective and simple for libraries.

The cloud solutions offered include online backup, preservation and achieves, media access, online shopping, and cloud broken.

#### **10) CLOUD COMPUTING APPLICATIONS IN LIBRARIES:-**

Libraries are in unique position to experiment with cloud computing given their service oriented mission and need to find appropriate solutions using limited resources. According to Fox 11 one of the key pressures that pushes libraries to cloud solutions and proves to be impediment to migration the availability of it support services. He also observes the goals and policies of organizations in making use of cloud computing services. These factors make SaaS and PaaS approaches appealing for libraries.

**10.1 AUTOMATION** – Automation is an area, of the libraries to start in order day to day operations. Automation in libraries undertaken locally hosted servers using different types of commercial and open source integrated library management software vendors and third party services offering hosting of this service (SaaS approach) on the cloud to save libraries from investing on hardware.

**10.2 DIGITAL LIBRARY SERVICES:-** Digital libraries or institutional repositories as part of modern libraries owing to changing format of information. The digital library services offered open source software. Such as D.Space, E prints, Fedora Commons etc.

**10.3 OFFICE APPLICATIONS :-** Libraries are using various office applications such as word processing, spread sheets, power point presentation etc., using Microsoft office on the local computers. In cloud computing many applications are made freely available on the internet by companies like Google, Microsoft, etc., The information available on internet is also allows storing and sharing of resources with other colleagues who can remotely work on the documents of their geographical locations.

**10.4 STORAGE** - Libraries require space to store the electronic files and document. The documents, could be office correspondence, full text documents, bibliographic records, tutorials etc., The cloud computing has brought new services which offer space at no cost to store files and documentations. Libraries may take advantage of this

store to undertake collaborative activities with other libraries. The digital preservation libraries are making use of services of CLOCKSS (<http://www.clockss.org/clockss/home>) and Portico ([http://www.portocp.org/digital - preservation](http://www.portocp.org/digital-preservation)) to get permanent access to the subscribed content irrespective of their publishers' existence.

**10.5 SEARCH SERVICES :-** Libraries have already migrated key services such as open URL providers and federated and pre – indexed search engines on the cloud either by using commercial or open sources solutions.

E.g.: hosted Ex – libris service offers libraries to link – up to the subscribed Journal full – text article.

**10.6 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.

## **11) ADVANTAGES AND DISADVANTAGES:**

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

**11.1 ADVANTAGES:** Some of the following advantages of cloud computing hosted services.

1. Cost saving
2. Increased storage
3. Highly automated
4. Flexibility and innovation
5. Better mobility
6. Shared resources
7. Easy on installation and maintenance
8. User centric
9. Interoperability
10. Availability any time any where
11. Transparency
12. Create & Collaborate

**11.2 DISADVANTAGES:** Following are some of the main disadvantages of cloud computing.

1. Data security and privacy
2. Network connectivity and bandwidth
3. Dependence on outside agencies
4. Limited flexibility
5. Cost Knowledge and integration.

**12) CONCLUSIONS:**

Cloud computing is a new baby in the computer systems technology emerged for developments in internet with associated technologies. The Cloud computing offers numerous benefits for different organizations, individuals and in Libraries also. Library professionals may find to manage the technologies, own to their skill levels. Lack of support from Information Technology department within the organizations. This kind of situation hinders the automation of Library activities and developing digital Library Services. Here cloud computing helps Libraries to undertake modern ICT activities. Library provide Cloud service, it has to think about its personal information, and that its users can be protected. In today's information society Libraries have the opportunity to improve their services with the help of cloud computing. It is one path for move into the future which brings excellence advantages for Libraries. Libraries have taken a big leap in adopting this technology especially in the west, but surely it will slowly spread to developing countries. It is evident from the literature that some service providers have already pitched into help libraries to automate and establish digital libraries on the cloud.

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