International Journal of Research in Library Science (IJRLS)
ISSN: 2455-104X
DOI: 10.26761/IJRLS.9.1.2023.1622
Volume 9, Issue 1 (January-March) 2023, Page: 89-97, Paper ID: IJRLS-1622
Received: 4 Dec. 2022 ; Accepted: 9 Feb. 2023 ; Published: 14 February. 2023

Cloud Computing: An Innovative Tool for Library Services

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ABSTRACT

Cloud computing, a cutting-edge approach to ICT, offers potential benefits like cheaper prices, accessibility from anywhere at any time, and elasticity and adaptability. In this essay, cloud computing is defined along with its definition, essential traits, paradigm, components, advantages, and disadvantages also covered is cloud computing in libraries.

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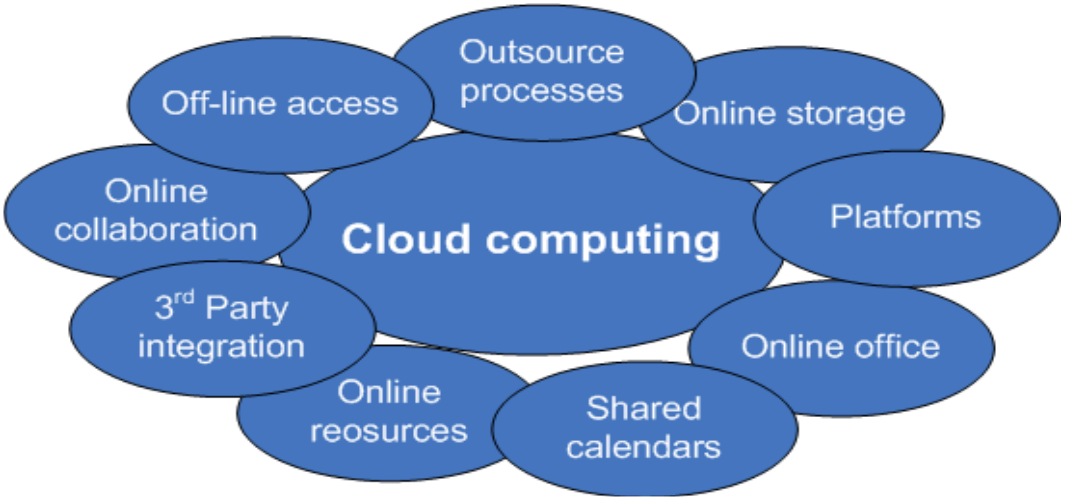
KEYWORDS: Cloud Computing, SaaS, PaaS, IaaS, Components of Cloud, Models of Cloud Computing, Libraries and Cloud.

INTRODUCTION

The process of creating an infrastructure for service provisioning can be separated from the library of offering end-user services thanks to cloud computing. Cloud computing allows people to share scattered resources and services from several businesses or websites. Cloud computing shares scattered resources through the network in an open setting (Gosavi, 2012). The internet is a virtual pool of computing resources. Many businesses, like Amazon, Google, Microsoft, and others, are speeding up the development of their cloud computing systems and improving their services to cater to more people. The three categories of cloud computing are "application," "storage," and "connectivity." Each section has a distinct function and provides a range of goods to people and businesses worldwide (Kaushik & Kumar, 2013).

For the operation of services like Integrated Library Management Software (ILMS), websites or portals, digital libraries, institutional repositories, etc., libraries need computers. These are either kept up to date by the library or computer staff of the parent company. Maintaining these services and carrying out backups and updates whenever a new version of the software is published requires investment in infrastructure, software, and employees (Naik & Dahibhate, 2012).



It can be challenging for library professionals to carry out some of these tasks without the assistance of IT workers from within or outside the company because they are typically untrained in server maintenance. The term "cloud computing" has recently gained popularity in the field of libraries, which is a blessing in disguise because it makes it easier to run various ICT services since third-party services will manage servers, carry out upgrades, and take data backups (Liu & Liu, 2013).

What is Cloud Computing?

Many businesses and people are implementing the new technological model for IT services known as cloud computing. The delivery of systems and services can be changed by cloud computing, which will enable libraries to have a greater influence (Akintomide, 2013).

The term "cloud computing" refers to internet-based computing in which virtual shared servers offer clients pay-per-use access to software, infrastructure, platform devices, and other resources. In the cloud computing approach, all the data a digital system has to give is made available as a service. Users don't need any prior experience managing the resources necessary to access these services offered on the "Internet Cloud." (Goldner, 2010)

Definition of Cloud Computing

According to the National Institute of Standards and Technology, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be quickly provisioned and released with little management effort or service provider interaction" (NIST)(Paul, 2012).

"A form of computing in which extraordinarily scalable and elastic IT-enabled capabilities are supplied as a service to external consumers via Internet technologies," according to the Gartner Group.

"A pool of abstracted, highly scalable, and managed computational infrastructure capable of hosting end-customer applications and charged by usage" is how Forrester describes cloud computing.

Instead of using local servers or personal devices to manage apps, cloud computing focuses on sharing computer resources.

Essential Characteristics of Cloud Computing

Five essential elements of cloud computing has been highlighted by NIST: on-demand service, wide network access, resource pooling, quick flexibility, and quantifiable service. The five qualities listed below demonstrate how cloud computing varies from and connects to conventional computing techniques:

I. On-demand Self-service

Without speaking to a service provider directly, a customer can automatically provision computer resources such as server time and network storage as needed.

II. Broad Network Access

To encourage use by a range of thin or thick client platforms (such as smartphones, laptops, and PDAs) and other traditional or cloud-based software applications, capabilities are made available over the network and accessed using ordinary protocols.

III. Resource pooling

The supplier pools its computing resources under a multitenant model to service several clients, with various physical and virtual resources being dynamically assigned and reassigned in response to consumer demand. Even though the customer frequently lacks control over or knowledge of the precise location of the resources delivered, the client may be able to designate location at a higher level of abstraction (e.g., country, state, or data center). Memory, computing power, storage space, network bandwidth, and virtual machines are examples of resources. Even private clouds frequently trade resources among several business units. (Reeca, 2012).

IV. Rapid Elasticity

Some situations allow for the automatic and quick provisioning of capabilities for scaling out and the automatic and quick release of capabilities for scaling in. The customer is frequently given the impression that the offers' capabilities are unlimited and can be purchased anytime in any quantity.

V. Measured Service

Cloud solutions automatically control and optimize resource utilization by having a metering capability at a given degree of abstraction relevant to the type of service (e.g., storage, processing, bandwidth, or active user accounts). Resource utilization can be tracked, managed, and reported, ensuring openness for both the client and the service provider.

VI. Multi Tenacity

It is the sixth attribute of cloud computing that the Cloud Security Alliance promotes. It speaks to the necessity of chargeback/billing mechanisms, governance, service levels, segmentation, and isolation for various consumer constituencies.

It is crucial to understand that virtualization technology frequently but does not always support and enable the use of cloud services. However, there is no need to connect resource abstraction to virtualization technologies, and in many offers, virtualization by the operating system container or hypervisor is not used (Bala, 2012).

Cloud Computing Models

Cloud Providers offer services that can be grouped into three categories.

Software as a Service (SaaS)

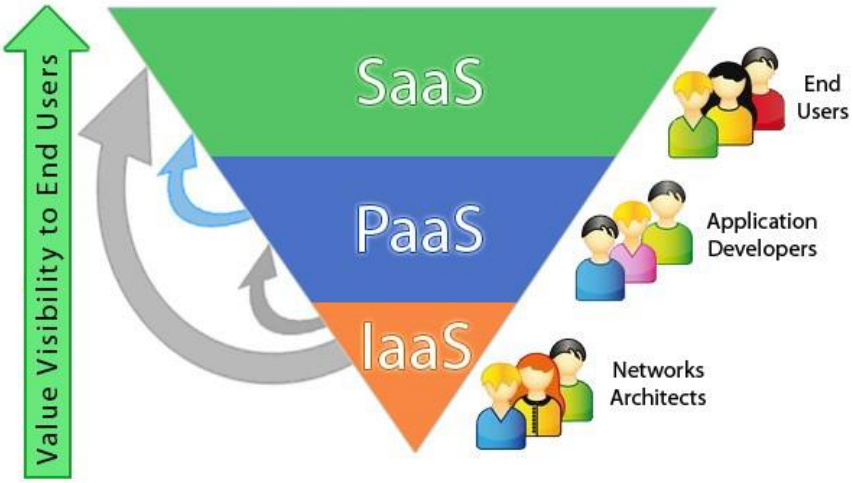
The consumer can ask for a whole application as a service using this paradigm. A single service instance running in the cloud serves many end users. Customers do not need to make an upfront investment in servers or software licensing, and the provider spends less money hosting and maintaining just one application. SaaS is now offered by businesses like Google, Salesforce, Microsoft, Zoho, and others.

Platform as a Service (PaaS)

In this case, a layer of software or a development environment is packaged and made available as a service, allowing for the construction of additional service tiers. Applications created by the client can run on the infrastructure of the provider. PaaS companies offer a predetermined set of OS and application servers, such as the LAMP platform (Linux, Apache, MySql, and PHP), constrained J2EE, Ruby, etc., to fulfill the manageability and scalability requirements of the applications. Examples of well-known PaaS include Google App Engine, Force.com, etc.

Infrastructure as a Service (IaaS)

IaaS offers fundamental computing and storage capabilities as standardized network services. A pooled system of servers, storage devices, networks hardware, and data center space, etc., handles workloads. Usually, the client would install his own software on the system. Amazon, GoGrid, 3 Tera, and other well-known instances come to mind (David, 2011).



There are various cloud computing deployment options, and each offers different trade-offs for organizations moving their applications to the cloud. The following is how NIST describes the cloud deployment models:

Private Cloud: The only entity using the cloud infrastructure is the organization. It might exist on or off premises and be controlled by the company or a third party.

Community Cloud: The cloud infrastructure is shared by numerous businesses, which aids a particular community in overcoming obstacles (e.g., mission, security requirements, policy, and compliance considerations). It may exist on or off-site and be managed by the organizations or a third party.

Public Cloud: A company offering cloud services owns the cloud infrastructure, which is made available to the general public or a sizable industry group.

Hybrid Cloud: The cloud infrastructure comprises two or more clouds (private, community, or public), each of which is distinct but connected by standardized or proprietary technologies to allow for the portability of data and applications (e.g., cloud bursting for load-balancing between clouds)(Arora, Singh, & Tyagi, 2012).

Components of Cloud

Three main parts make up a cloud system: clients, data centers, and distributed servers. Each component serves a clear purpose and performs a certain function.

Clients: Clients operate similarly to LAN clients daily in a cloud computing architecture. These are the computers located on the end customers' desks. The front-end programs are installed in this location. They may come from laptops, tablets, smartphones, or PDAs. Clients, in a nutshell, are the devices that users utilize to manage client information. The client falls into one of the following three categories based on physical characteristics.

- Mobile- Mobile devices include smartphones, Tablets, or PDAs.
- Thin: These dump terminals have no hard drive space and rely entirely on the servers to handle all processing.
- Thick: To connect to the cloud, this type of client uses a standard PC and a web browser like Firefox or Internet Explorer.

Data Centre: The group of servers in the data center is where the subscribed-to applications are hosted. A data center server may be virtualized, meaning that although the software is placed on the primary physical server to the user, it has a different server identity. This allows for the operation of six virtual servers on a single physical server.

Distributed Servers: In our case, it's not required for the data center to always house just one server. Sometimes, servers are positioned in distant parts of the world. However, it appears as though the data is flowing from a central server to the end user. In this method, the other services kick in to take care of the customers if one server goes down or becomes instantly unresponsive to a client request, possibly because of congestion, etc. The data in these servers are frequently synchronized to give the client flawless service (Santhisri & Lakshmi, 2015).

Important Role of Cloud Computing in Library

The front and back end are the two ways cloud computing systems can be separated. They communicate with one another across a network, most frequently the Internet. The front end is the side that the computer user or client sees. The "cloud" portion of the system serves as the back end. The "cloud" of computing services is built at the back end using a variety of computers, servers, and data storage devices. The system is managed by a central server, which

keeps track of client requests and traffic to ensure everything operates well. It abides by a set of guidelines known as protocols. Servers and other remote computers do most of the work and data storage (Sharma & Tripathi, 2016).

Many intriguing library options are provided by cloud computing, which lowers technological costs and improves capacity, dependability, and performance for some automation operations. For libraries, cloud computing has many possibilities. Libraries might upload ever more material to the cloud. Users can browse a physical shelf of books, CDs, or DVDs using cloud computing, choose to take something out or scan a bar code with their mobile device. Any researcher would have access to a comprehensive, quickly searchable database that contained scans of all historical and uncommon documents. Many libraries currently share bibliographic information with OCLC and have online catalogues. Online directories that are updated more frequently are connected to resource-sharing alliances (Swapna & Biradar, 2017).

Libraries and Clouds

We are now a part of the information era. Information technology is essential for managing library resources, including information gathering, organization, processing, and analysis. The use of information technology in the library industry has created various difficulties. New ideas and technologies are being incorporated to simplify library procedures and meet the needs of a knowledge-based society. Libraries have become automated with the development of information technology, which is the fundamental requirement for advancement, followed by networks and an increased focus on virtual libraries.

The introduction of the digital library, internet usage, online tool applications for libraries, and consortium activities facilitates the development of the library profession. The third IT revolution, following the internet and the PC, is known as cloud computing. It is a brand-new IT technology. The later technology trend in library science is the use of cloud computing for diverse reasons and achieving economy in library operations. Professionals should be aware of cloud computing because it is a recent and important field and how it is used in library science (Gandotra, Tyagi, & Tiwari, 2019).

Application of Cloud Computing in Libraries

Libraries can use cloud computing services in a variety of ways, including the following:

Building Digital Libraries/Institutional Repositories: Libraries that use cloud computing have been found to find it simple to build institutional repositories and digital libraries utilizing tools like DSpace, etc.

Searching Library Data: The very significant service of searching library data allows users from participating libraries to do so at any time and from any location. For instance, the data search service OCLC World Cat is accessible via the cloud.

Hosting Websites: Users from cooperating libraries can conduct this very important function of searching library data at any time and from any location. One such cloud-based resource is the data search service OCLC World Cat.

Searching Scholarly Contents: Currently, library customers typically use cloud-based services to search for academic information. The best example is the UGC Digital Library's collaboration withthe internet.

File Storage: Libraries can store various helpful information using cloud computing, and these materials can be shared anytime, anywhere.

Library Automation: Automating libraries is a great use for cloud computing. In general, the application software needed for library automation is more expensive, and the servers are also more expensive. It is not necessary to buy servers, application software, etc., when using cloud computing.

Building Community Power: Library professionals can create networks of people who work in various types of libraries by using social networking sites like Facebook and Twitter. Additionally, networks can create information seekers (Kumar & Mandal, 2013).

Advantages of Cloud Computing in Library Service

Cost Saving: Library costs are reduced when they use cloud computing. The money saved can be put toward other library operations.

Flexibility and Innovation: Users can choose from various cloud services, each of which is an innovation in and of itself, with significant flexibility. Flexibility aids in the enhancement of library services.

User-Centric: It has been noted that user-centricity is a common theme in cloud computing. As is well known, when offering library services to users, they are always at the center of attention. Cloud computing is advantageous in this situation.

Openness: Any library can join in this kind of cloud computing due to its openness. The idea of openness will enhance library services even more.

Transparency: For participating libraries in cloud computing, there is much transparency.

Availability Any Time, Anywhere: Cloud computing services are often accessible from anywhere, at any time. The primary advantage of library services is this.

Create and Collaborate: Participating libraries in cloud computing can develop their own services while working together in a shared environment.

Cloud OPAC: Most libraries worldwide have an online catalogue. The local servers of these libraries have made these catalogues accessible online. It will be more advantageous for users to learn about the availability of resources if the library catalogue is made available via the cloud (Bansode & Pujar, 2012).

Disadvantages of Cloud Computing in Library Service

There are various disadvantages of Cloud Computing are as under:

Dependency on the Internet: There is an internet dependency in the cloud computing environment. Cloud computing services perform successfully if internet services are functioning correctly. Any issues with internet access could result in the suspension of cloud computing services.

Network Connectivity and Bandwidth: The fact that this service is closely related to internet connectivity is another major worry. Because this service is offered through the internet, the user cannot use it if there is a connection issue. Additionally, bandwidth is necessary because it might not function on slow Internet connections.

Security and Privacy: Particularly when it comes to sensitive data, there is no security or privacy of the data.

Vulnerability to Attack: Every element in the cloud computing system can be accessed online. Anywhere in the internet ecosystem, there are a variety of attack vulnerabilities.

Limited Control and Flexibility: Service seekers have little control flexibility in the world of cloud computing. A monopoly of service providers will emerge as a result of this environment.

Cloud Computing Platform Dependencies: Another drawback of cloud computing is implicit dependency, commonly referred to as vendor lock-in.

Lock–in: Customers find it extremely challenging to change cloud computing service providers. It leads to service dependence on a specific CSP (Kumar & Mandal, Development of cloud computing in integrated library management and retrieval system, 2013).

CONCLUSION

Libraries are embracing cloud computing technology and utilizing cloud-based services, particularly for digital libraries, social networking, and information exchange. It is, therefore, time for libraries to give cloud-based technologies some serious thought to provide their patrons with dependable and quick services. Making cloud-based services a trustworthy medium to deliver library services to their customers with the simplicity of use and time savings is another duty of LIS professionals in this era of technology.

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