Journal of Computer Engineering and Information Technology

Review Article

A SCITECHNOL JOURNAL

An Overview of Cloud Computing Technology and its Application on Library Services

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Received: 30-April-2020, Manuscript No. JCEIT-20-3961;

Editor assigned: 05-May-2020, PreQC No. JCEIT-20-3961 (PQ);

Reviewed: 19-May-2020, QC No. JCEIT-20-3961;

Revised: 22-July-2022, QI No. JCEIT-20-3961; Manuscript No. JCEIT-20-3961 (R);

Published: 19-August-2022, DOI: 10.4172/2324-9307.1000240

Abstract

Cloud computing is completely a new model in information and communication technology and it is regarded as the third revolution following the Personal computer and the Internet. This paper provides a brief overview of cloud computing, including its definition, characteristics and models. The paper also discusses the advantages and disadvantages of cloud computing technology, as well as use of cloud computing to improve the library services.

Keywords: Cloud computing; Cloud technology; Library services; Communication technology

Introduction

Cloud computing is a relatively new phenomenon in computer system technology. It arose as a result of advancements in internet and related technologies. In cloud computing “clients" connect to the "cloud" to have access to IT resources that are priced and delivered "on-demand". The IT resources are rented and shared among numerous tenants in the same way as office space, housing and storage spaces are rented and shared among tenants. The "cloud" which is delivered over an Internet connection, takes the place of the company's data center or server [1]. Thus, cloud computing is essentially the sale and delivery of IT services through the Internet. To deliver the service, cloud computing suppliers use virtualization (one computer hosting numerous “virtual” servers), automated provisioning (software is installed automatically on servers) and internet connectivity technologies.

According to Yuvaraj the acronym of CLOUD stands for C-Computing resources, L- which stands for Location independent, O-which is accessed *via* online means, U- used as a Utility and D-on Demand availability [2].

Many libraries use cloud computing technology in day to day activities like library housekeeping activities and library automation by installing software on the cloud. OCLC's web cataloguing tools are the most prominent example, with many libraries uploading their cataloguing records to OCLC's shared resources service on the web. In academic libraries, cloud services include Google Apps, OCLC Services, Ex-Libris, OSS Labs, liblime, polaris, dropbox and dura space etc, [3].

Literature Review

ICT plays an important role in librarians' lives, but these LIS professionals frequently have limited resources, including staff and funding, making incorporating and supporting new technologies difficult. Cloud computing allows this group of LIS professionals to gain access to and use technologies that may benefit their librarianship practice, library patrons and libraries. The current study provides an overview of cloud computing technology and its application in providing library services to meet the information needs of library patterns.

What exactly is cloud computing?

“Cloud computing is a specialized form of distributed computing that introduces utilization models for remotely provisioning scalable and measured resources” [4]. It is a novel and highly adaptable approach to IT service delivery that essentially provides a single computer platform. “Cloud computing can be defined as an emerging computer paradigm in which data and services are stored in massively scalable data centers in the cloud and accessed *via* the internet by any connected device. Cloud computing is a method of providing a variety of services on virtual machines that are placed on top of a big pool of actual equipment in the cloud” [5].

According to Wikipedia, “cloud computing refers to the delivery of computing as a service rather than a product, whereby shared resources, software and information are provided to computers and other devices as a metered service over a network, typically the internet” [6].

The christy & carina of gartner 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” [7].

Cloud computing is defined by the National Institute of Standards and Technology as “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 rapidly provisioned and released with minimal management effort or service provider interaction” [8].

Characteristics of cloud computing

The main characteristics of cloud computing are as follows:

- It offers a variety of physical and virtual resources that can be customized to meet the needs of the consumer. In a distributed computer environment, it is extremely fast. As an outcome, it facilitates resource sharing among customers.
- It ensures "on-demand" resource provision and the user may monitor server uptime, capabilities and allotted network storage in real time. This function also allows the user to keep track of the computer's capabilities.

- It provides efficient collaboration with various users and apps by sharing common infrastructure. It lowers the price of services.
- In cloud computing technology the services are available anytime and can be accessed anywhere. So the users can access it from any corner of the world simply through the internet connection.
- Because they are installed on a common platform and can be accessed from several locations, these apps are easier to manage than individual programs.
- Data is stored on storage devices that cannot be hacked or used by others. Servers are more dependable and highly available because there are fewer chances of infrastructure failure.
- The user only pays for the service or space that they have used and no additional fees or hidden charges. As a result, the pay-per-use approach lowers the cost of resource utilization.
- Another feature of cloud computing services is their adaptability. This service can be utilized for everything from tiny consumer applications to large commercial loads.

Categories of cloud computing

The below image shows the categories of cloud computing (Figure 1).

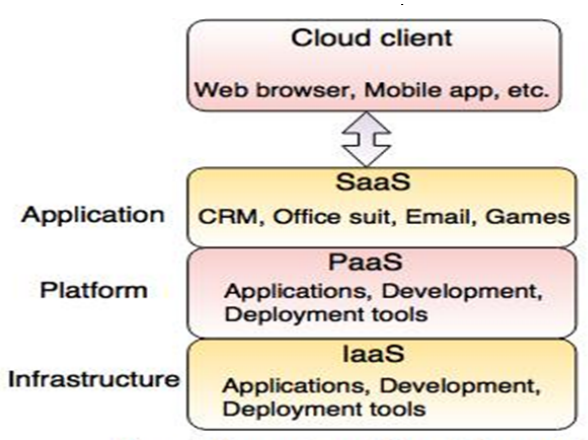

Figure 1: Categories of cloud computing.

Software as a service (SaaS): It is known as 'On-Demand Software'. In this approach, the software or apps are hosted by a cloud service provider and made available to consumers *via* the internet. And the registering client receives the application or software as a service. Some web 2.0 apps, such as Hotmail, Google Apps, Skype, office suit, games etc., are available for free on the cloud, although some business-oriented SaaS are available on a subscription or leased basis. Subscribers who took advantage of the low initial fees, on the other hand, have access to (typically 24/7) support services and don't have to worry about hosting, installing, upgrading or maintaining the programme [8].

Platform as a Service (PaaS): It is a programming platform that allows developers to build, test, execute and manage applications. A developer can quickly design an application and deploy it straight into the PaaS layer, allowing him to focus on development and innovation rather than infrastructure. PaaS providers include Microsoft, Amazon, Google Apps Engine (GAE), SalesForce.com and others. Because one developer can write apps for a PaaS vendor's platform, migrating the application to another PaaS vendor is a challenge [9].

Infrastructure as a Service (IaaS: The IaaS was previously known as Hardware as a Service (HaaS) and it combines storage and computational power. Cloud vendors provide infrastructure such as servers, storage, networks and operating systems. Instead of purchasing a server, software, datacenter space or network equipment, the client can purchase comprehensive resources in IaaS. One of the primary companies in this space is Amazon Web Services, which offers two primary products: The Elastic Compute Cloud (EC2), which provides computational resources and the Simple Storage Service (S3) which provides data storage. Amazon's Web Services is used by businesses to host or backup their websites, deliver information, execute high-performance computing simulations, hold media collections and much more. Unlike SaaS subscription models, most of these cloud services are accessible on a pay-per-use basis, allowing clients to scale up or down based on their needs at any given time and only pay for what they've used [10]. The IaaS cloud computing platform paradigm is reliant on internet and virtualization services being available [11].

Advantages of cloud computing: The following are some of the advantages of cloud computing technology:

- Remote access is one of the most significant benefits of cloud computing. We simply utilize our "cloud PC" from any PC and your existing apps and data are carried over to the cloud. As a result, we can access our documents at any time and from any location.
- The fundamental benefit of cloud computing is that it is less expensive. Because all processing is done on the cloud rather than on your local computer, there is no need to buy expensive and powerful equipment or any IT infrastructure.
- Because no programs or data are loaded on the local PC, users will not encounter delays when turning on or off their computers and the internal network will be significantly faster because there will be no internal traffic.
- Because the cloud service provider maintains both hardware and software, the department's maintenance expenditures are reduced as well.
- By utilizing cloud computing technology, we no longer need to acquire software packages for each computer in the firm; instead, only those employees who are actively using an application require cloud access.
- With cloud computing technology, we don't have to worry about updating software because the service provider will do it for us.
- When using cloud computing, we are no longer confined to the capabilities of a single desktop computer.
- The cloud provides almost unlimited storage space, but we can increase your storage capacity at any moment for a minimal fee.
- Our data is secured on the cloud server; we don't have to worry about disc failures or office disasters.
- In the cloud computing model, participants can share their resources. They can save money by sharing their resources and more libraries or organizations can access a larger number of resources in one spot.

Disadvantages of cloud computing: The cloud computing model has some limitation or disadvantages like any other technology, they are as follows;

- An internet connection is required for cloud technology; if the connection fails, the user will be unable to access the service because it is delivered the internet. It also requires additional bandwidth, as it may not work on slow Internet connections.

- Organizations have very little control over how the services are maintained or customized. Organizations are completely reliant on the service provider for backup, upgrades, restore and catastrophe recovery because it is provided by a third party.
- Because cloud computing is provided by a third party, the user has limited flexibility. As a result, there is little room for customization based on specific needs.
- Even with fast connections, you may occasionally experience delays because web-based applications can be slower than accessing a similar software programmer on your desktop PC. The reasons for this are the high upload and download bandwidth requirements of web applications.
- Data is stored "in the cloud." However, accessing the physical location of servers is extremely difficult and organizations have no idea where the cloud is and whether it is truly secure.
- It is critical that organizations have their own IT staff who are familiar with cloud computing. Because it necessitates the integration of various equipment such as a printer, USB drives, a network connection and so on. As a result, it is difficult to integrate and integration is also a problem.

Use of cloud computing to improve library services: With the cloud computing platform, the libraries can perform the below activities and enhance the library services to reach the readers in an effective way.

- Now a days e-learning is gaining more importance. The cloud computing is beneficial in the E-Learning environment. Study materials can be stored in the cloud for future reference and online exams can be administered. Discussions and revisions can take place from multiple locations at the same time.
- The library automation software is installed in the cloud service provider using cloud technology. The software provider handles software updates and maintenance in the cloud, so librarians don't have to worry about automaton software, updates or backup [12].
- Cloud platforms are increasingly being used to lend E-Books.
- Network libraries can use the same platform and provide access to their collections from a single location. The creation of a union catalogue has become much easier with cloud computing [13].
- With cloud computing, it is now possible and very easy to provide current awareness service to all patrons.
- For collection development, cloud computing is used. Duplications are easily avoided and alternate resources can be identified and made available to patrons.
- Using this technology, we can offer library bulletin board services [14].
- Libraries can use cloud computing to provide article delivery service to their patrons, with cloud computing document sharing has become simple.
- In cloud technology the library users can download the documents and library collections very easily.
- Digitization and scanning work can be centralized, avoiding duplication of such time-consuming work. Libraries can preserve their collections in digital form by creating archives [15].
- The social interaction is possible in cloud technology, libraries can use the cloud to deliver information literacy and orientation courses. They can keep tutorials, videos, presentations and files on the cloud to help users get started.
- We can share information such as bibliographical data, content pages, cover pages, question papers, syllabuses and other reading material on a single platform. It aids in the improvement of the library's economy and save the time.
- The cloud provides a platform for storing all information, which can be accessed at any time and from any location, making information discovery and searching simple and useful for researchers.

Conclusion

Nowadays, many of the accomplishments of libraries have been transformed by ICT. The technology aided library professionals by converting content into digital form and making it accessible *via* a networked environment. The cloud computing model is new phenomenon in the internet era, it is very useful for organizations like libraries in automating and managing the services with less IT infrastructure. The libraries can use this technology for easy storage of resources and provide global access in a networked environment with less cost. The users can access information from variety of devices and locations, so it saves the users valuable time also. It is our primary responsibility to be proactive in acquiring new technology and skills to improve library service. We must ensure that our library users and library personnel are trained to use a wide range of cloud services, from personal to professional.

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