Cloud Computing: A New Way of Information Management in Academic Libraries

Dr. Sanjay B.Munavalli
Librarian
Pillai College of Arts,Commerce & Science (Autonomous)

Abstract:- The globalisation of information and knowledge resources has been influenced by the growing use and applications of information and communication technology (ICT). Instead of using local servers or personal devices to handle applications, cloud computing relies on the sharing of computing resources. Libraries are passing through a stage when their budgets are shrinking considerably and users demands are multiplying manifolds. Cloud deployment will go up significantly in the next few years. Libraries would integrate cloud based services in their agenda.

Keywords:- Cloud Computing, Models, Applications, Types, Problems.

I.   INTRODUCTION

Information and communication technology plays a crucial part in the growth of libraries and information hubs. In the world of information and communication technology, cloud computing is a cutting-edge technology. It's a more advanced version of Distributed Computing, Parallel Computing, Grid Computing, and Distributed Databases. Cloud computing technology manages data, software, and applications via the web (Internet) and central remote servers. It allows users to access their personal and official files on any computer with internet access without installing applications on their local machine. Libraries have become automated with the advent of information technology, which is the basic need for advancement, followed by networks, and more effort is being directed toward virtual libraries. Cloud computing is used in libraries to build a digital library and for managing daily functions using hardware and software.

The widespread use and application of information and communication technology (ICT) has resulted in the globalisation of information and knowledge resources. Users can access at their convenient Bibliographic databases,full-text documents,and digital library collections. Cloud computing is a type of technology that manages data and applications by utilising the internet and central remote servers. By centralising data storage, processing, and bandwidth, this technology provides much more efficient computing. Instead of having local servers or personal devices to handle applications, cloud computing relies on sharing computing resources. Cloud computing allows consumers and businesses to use applications without installing them and access their personal files from any computer via the internet. Cloud computing is similar to grid computing, a type of computing in which the unused processing cycles of all computers in a network are used to solve problems that are too complex for any single machine.

➢ *Meaning:*
A method of using a computer in which users are given temporary access to services stored online.

➢ *Definition:*
A method of handling applications that relies on sharing computer resources rather than using local servers or personal devices.

The basic definition of cloud computing is "having online access to files, data, programmes, and third-party services hosted by a third-party provider"[Hodson08] and "paying only for the computing resources and services consumed."

'A form of computing that uses the Internet makes it possible to offer massively elastic and IT-focused capabilities as a service to outside clients. (Christy & Carina)'.

II.   PROPERTIES OF CLOUD COMPUTING

➢ *From Google's Point of View Cloud Computing has Six Fundamental Properties:*
- Cloud Computing is User-Centric- The users can have an access to stored documents, messages, images, applications having connected to the cloud. In addition to access users can share it with others. In effect, any device that accesses user data in the cloud also accessible to other users.
- Cloud Computing is Task-Oriented – The main focus of cloud computing is to solve the assigned task in a expected way. Conventional applications-word processing,Spreadsheets,email, are becoming less important than the documents they create.
- Cloud Computing is Powerful- It helps to connect thousands of computers together in a cloud to create a wealth of computing power .
- Cloud Computing is Accessible- Users can access more information from different sources of information stored in the cloud. Users not limited to access a single source of data,like a desktop PC.

- Cloud Computing is Intelligent-With all the various data stored on the computers in a cloud,data mining and analysis are necessary to access that information in an intelligent manner.
- Cloud Computing is Programmable-Many of the jobs necessary with cloud computing must be automated.For example,to protect the integrity of the data,information stored on a single computer in the cloud must be replicated on other computers in the cloud.If that one computer goes offline,the loud's programming automatically redistributes that computer's data to new computer in the cloud.

➤ *Characteristics of Cloud Computing:*
- Cost: Cost-effective, and capital expenditure is transformed into operating expenditure under a public cloud delivery model.
- Reliability: When several redundant locations are deployed, reliability is increased and well-designed cloud computing that is suitable for business continuity and disaster recovery is provided.
- Performance: Web services are used as the system interface, and performance is monitored while consistent and loosely connected architectures are built.
- Security: Although data centralization, more resources devoted to security, and other factors may lead to an enhancement in security, concerns about the loss of control over certain sensitive data and the lack of protection for stored kernels may still exist.
- Self Healing: Any programme or service operating in a cloud computing environment has the ability to repair itself. There is always a hot backup of the programme available and prepared to take over without any interruption in the event of an application failure.
- Multi-Tenancy: Any application that uses cloud computing can enable multi-tenancy, or having numerous tenants active at once. Without any of the customers being aware of it, the system enables multiple users to share the infrastructure that has been assigned to them.
- Linear Scalable: Services offered by cloud computing are linearly scalable. The workloads can be divided up by the system, which then distributes them throughout the infrastructure. If one server can handle, let's say, 1000 transactions per second, then two servers can process 2000 transactions per second. This is a precise example of linear scalability.

- Service-Oriented: Systems for cloud computing are service-oriented, meaning they are byproducts of other distinct services. To provide this service, numerous discrete services that are independent of one another are integrated.
- Virtualization: In cloud computing, the underlying hardware is completely isolated from the applications. The environment for cloud computing is entirely virtualized. This technology enables the sharing of servers and storage devices, increasing utilisation. Applications can be moved more easily from one physical server to another.
- Flexible:The flexibility of cloud computing can be used to serve a large variety of workload types varying from small loads of a small consumer application to very heavy loads of a commercial application.

III. TYPES OF CLOUD COMPUTING

➤ *There are Four Types of Cloud Computing as Per there Service*
- Applications as a Service (AaaS): These were the first types of cloud computing services to emerge. A service is made available to an end-user under this. The end user is asked to register with the service provider before using the application. One of the first well-known applications was Hotmail's web-based email service, which debuted in 1996. Hundreds of such services are now available on the internet.
- Software as a Service (SaaS): SaaS is primarily based on on-demand applications and software. Customers who receive applications as a service can access the programme online from any device.
- Infrastructure as a Service (IaaS): Resource clouds are used to describe infrastructure. Third parties provide resources (infrastructure) to users as a service to allow them to use them as they see fit.
- Platform as a Service (Paas): The companies that offer cloud computing services and products are called vendors and the services provided by them is called PaaS.PaaS is computing platform to offer operating system and variety of services to customers on a monthly rental basis.

Table 1 Difference Between Traditional Computing and Cloud Computing

Traditional Computing	Cloud Computing
High infrastructure which results more cost	Centralized infrastructure in location with lower cost
Security cost is high	Due to centralization on network cost is low
Computer maintenance is difficult and expensive.	Easy maintenance because less number of computers can be accessed from network
Need of More Highly Qualified Human Resource	Less Human Resource with higher qualification
Reliability is less	Reliability is improved because of centralized networking
Personal computers have been the focus of software development and system engineering.	Hardware and software Traditionally installed computers can be used for software development via internet cloud networks.
For developments of softwares it takes long time	Because programmers can obtain developed software from the internet, the time available for developing new software is limited.
Design of software is focused on single application	As a result, programmers can use continuously updated software components that can be integrated with other web applications.
We spend a lot of money on this for a limited application.	We spend a limited amount of money for a large application.

IV. APPLICATIONS OF CLOUD COMPUTING IN ACADEMIC LIBRARY

A. Currently there are Some Service Models which are in use

➤ *WWW Service Model:*

The client-server approach is how the World Wide Web runs. Users of WWW benefit from a vibrant graphical user interface that makes it simple to access all different kinds of information and services. People all across the world may share and search for information more easily thanks to the World Wide Web. It has a number of information-browsing tools that employ HTTP and HTML understanding. The specific division is that www clients are in charge of displaying information and communicating with servers, whilst www servers are in charge of hypertext linking web pages.

The high level of integration that the www service offers contributes to its significance. As a result, it will eventually overtake other information services tools to become the best dynamic multimedia interactive tool for everyone on the planet.

➤ *BBS and E-Mail Service Model:*

An electronic information service system based on the internet is called BBS (Bulletin Board Service). It resembles a public, empty internet board where anyone can post ideas or information. Email is merely one more sort of online information service. In a word, email offers internet users worldwide an extremely quick, easy, and affordable method of communication. University libraries can provide lectures, publish notices, and offer online assistance to users using the BBS system and the email system. Because users don't need to physically visit libraries, they can access the information and knowledge resources they need more rapidly and affordably.

➤ *File Transfer Protocol Service Model (Ftp):*

The widely used communication protocol FTP consists of a number of principles that allow for the transfer of files across the internet. These regulations allow online users to copy files from one server to another, which is quite convenient and advantageous for users. Like other internet services, FTP is built using a client-server architecture. In an academic library, users can create their own passwords by using their email address, which enables librarians to get early access to user visits and records. Additionally, librarians can offer users the appropriate services depending on their visits, boosting user happiness.

➤ *Unified Search Service Model:*

Because of the Digital Library's usage of cloud computing, distributed uniform access interfaces are now supported by the integrated library resources. The consistent access platform may advertise library materials, direct users, and respond to their queries by employing high-quality navigation. Users will be better equipped to use library resources and acquire higher information retrieval skills as a result.

➤ *Integrated Consulting Services Model*:

Sharing of digital library resources, technology, professionals, and services is made possible by the integrated digital reference service. The use of the library will significantly benefit from this.

➤ *Real-Time Access Services Model:*

Cloud computing can help digital libraries build a shared public cloud. A shared cloud may theoretically have infinite computation and storage capacity. It has clear benefits for libraries.

➤ *Knowledge Service Model:*

Knowledge is stored, processed, and shared through digital libraries. In university libraries, the creation of a shared public cloud can drastically cut down on staff and material resources.

> *All-Oriented Service Model:*

Everyone who can access the library's resources, including professors, teachers, and students, can receive services from digital libraries. By overseeing the certificate for the library, they enable users to access a variety of library resources.

V. PROBLEMS AND CHALLENGES IN CLOUD COMPUTING

A. The Following are Major Problems and Challenges in Cloud Computing

> *Security and Privacy :*

Cloud computing presents significant challenges in terms of security and privacy. Organizations that handle personally identifiable information about their customers or users may be affected. Cloud data is vulnerable to viruses, hacking, theft, and other threats. As a result, there is always the risk of data loss when storing data in the cloud.

> *Network Connectivity and Bandwidth:*

Because cloud computing relies on the internet, the organisation will lose data connectivity if the connection becomes sluggish for any reason until the connection is back up and running. Additionally, because the service might not function on slow internet connections, it needs extra capacity (Miller,2009).

> *Dependence on Outside Agencies:*

It is almost difficult to exert any control over the frequency and amount of maintenance for cloud services delivered via the internet by other parties. It is very challenging to assess the service provider's backup, update, restore, and disaster recovery contingency plans. If the host disregards the universal requirements, switching to another service provider becomes a problem. (Bansode and Pujar,2012).

> *D.Integration Of Knowledge :*

It is also difficult to integrate cloud-stored knowledge and data.

> *E.Cost:*

The cost may be high or low according to the number of users. If there are more users and less data, the cost may be lower; however, if there are fewer users and a large amount of data, the cost may be higher.

VI. CONCLUSION

Libraries are passing through a stage when their budgets are shrinking considerably and users demands are multiplying manifolds .Under such situation,cloud computing and web collaboration are emerging as two major concepts,supporting innovative developments in libraries as they help them to offer much improved services by strengthening the power of collaboration and computing.

Cloud deployment will go up significantly in the next few years.Libraries would more integrate mobile value added services deeply into their service agenda to deliver advanced services to their users.In near future it is expected that majority of the academic libraries will take advantage of cloud computing and cater variety of information services to their readers to explore their knowledge resources in a meaningful way..

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