## Overview of Cloud Computing Technology with Special Reference to Libraries

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Abstract

Cloud computing and web collaboration are shaping 21st century libraries. These two developments seem to be behind the newest developments in library services and are driving library automation. This paper discusses some of the basics of cloud computing with the aim of introducing aspects such as: challenges and risks of the model, types in the model, advantages and disadvantages of the model. Cloud computing is not an exception in changing the world. Cloud computing provides us virtually unlimited and on-demand computing resources. The study aims to provide a means of understanding the model and exploring options available for complementing the technology and infrastructure needs.

Keywords

Cloud Computing, Cloud Models, Cloud Types.

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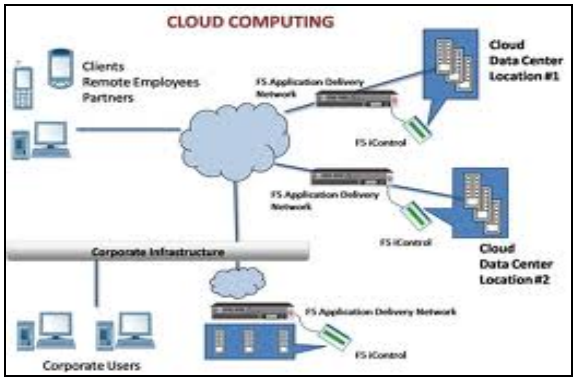
### Introduction

Cloud computing is a computing paradigm, where a large pool of system are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. In this, information is permanently stored on the internet servers and it can be cached by the users temporarily. The cloud application is created using resources from more than one service and from more than one location.



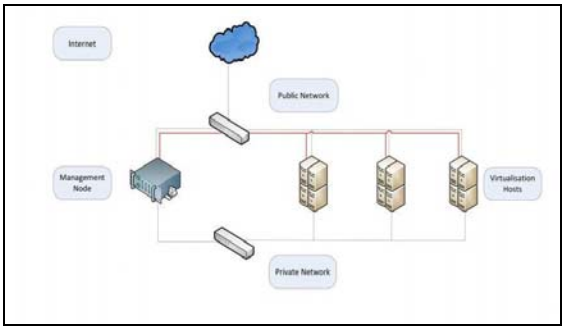

Cloud computing is a subscription-based service where a person can obtain networked storage space and computer resources. Cloud computing is better known with the example of a person experience with email. If his email client is rediffmail, yahoomail, Gmail etc, takes care of housing all of the hardware and software necessary to support his personal email account. When he want to access his email firstly, he open the web browser then go to the email client, and log in. The most important part of the equation is having internet access. His email is not housed on his physical computer; he can access it through an internet connection, and access it anywhere. If he is on a trip, at work, or down the street getting coffee, he can check his email as long as he has access to the internet. His email is different than software installed on his computer, such as a word processing program. When he creates a document using word processing software, that document stays on the device he used to make it unless he physically moves it. An email client is similar to how cloud computing works. Except instead of accessing just your email, you can choose what information you have access to within the cloud.

### Review of Literature

Chandra and Mahapatra (2012) describes in his study that the basic principle of cloud computing entails the

reduction of in-house data centres and the delegation of a portion or all of the information technology infrastructure capability to a third party. Universities and Colleges are the core of innovation through their advanced research and development. Subsequently, Higher Institutions may benefit greatly by harnessing the power of cloud computing, including cost cutting as well as all the above types of cloud services. He discusses problems faced with digital library and development efforts to overcome that problem. Then it proposed to improve current user service model with Cloud Computing. Sanchati and Kulkarni (2011) found in his study that Cloud Computing is still in the initial stage now, impacts brought by Cloud Computing are obvious. With the introduction of Cloud Computing to university library, services of libraries will have a new leap in the near future. Services provided by libraries will become more user-centric, more professional and more effective, etc. Xiaona (2010) described Cloud Computing and analyzed the current status of user service models in university libraries. Then he proposed to improve current user service model with Cloud Computing. And at last he put forward the bright prospect of user service models based on Cloud Computing.

**Software and Hardware Requirements**




**Management Node**

- Quad Core Processor
- 5GB RAM
- 600GB SATA Hard Disk
- IPMI Remote Management

**Virtualization Hosts**

- Quad or Hex Core Processors at least 32GB RAM
- 2TB Enterprise SATA Hard Disk
- IPMI Remote Management

**Network Legend**

- Black= Gigabit Ethernet
- Red Doted= IPMI

**Types of Cloud Computing**

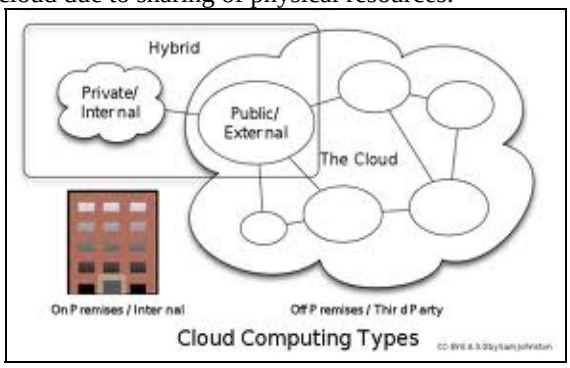
As a home user or small business owner, you will most likely use public cloud services. There are different types of clouds that you can subscribe to depending on your needs.

**1. Public Cloud–** In Private Cloud a core infrastructure made available to and shared by many. It can be accessed by any subscriber with an internet connection and access to the cloud space. Public cloud applications, storage, and other resources are made available to the general public by a service provider. Examples include the Internet and Public Switched Telephone Network (PSTN) etc.

**2. Private Cloud-** A private cloud is established for a specific group or organization and limits access to just that group. Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally. Infrastructure can be on- or off- premise. Private clouds are built exclusively for a single enterprise. There are two variations to a private cloud:

On-premise Private Cloud: On-premise private clouds which are also known as internal clouds are hosted within one's own data center. This is best suited for applications which require complete control and configurability of the infrastructure and security.

Externally hosted Private Cloud: This type of private cloud is hosted externally with a cloud provider, where the provider facilitates an exclusive cloud environment with full guarantee of privacy. This is best suited for enterprises that don't prefer a public cloud due to sharing of physical resources.




**3. Hybrid Cloud-** Hybrid cloud is a composition of two or more clouds that remains unique entities but are bound together, offering the benefits of multiple deployment models. Hybrid Clouds combine both public and private cloud models. With a Hybrid

Cloud, service providers can utilize third party Cloud Providers in a full or partial manner thus increasing the flexibility of computing. The Hybrid cloud environment is capable of providing on-demand, externally provisioned scale.

**4. Community Cloud-** It shares infrastructure between several organizations from a specific community with common concerns i.e. security, compliance, jurisdiction etc., whether managed internally or by a third-party and hosted internally or externally.

**Cloud Computing Models/ Services**

There are three types of cloud providers that you can subscribe to: Software as a Service Platform as a Service and Infrastructure as a Service. These three types differ in the amount of control that you have over your information, and conversely, how much you can expect your provider to do for you. Briefly, here is what you can expect from each type.

**1. Software as a Service-** It gives subscribers access to both resources and applications. It delivers an application as a service and eliminates the need to install and run an application on the client's own computers. In this, you have the least control over the cloud. In this model, a complete application 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. Today this service is offered by companies such as Google, Salesforce, Microsoft, Zoho, etc.

**2. Platform as a Service–**It gives subscribers access to the components that they require to develop and operate applications over the internet. It delivers a computing platform or solution stack as a service, most often providing a complete development platform for organisations requiring a development instance of an application. The customer has the freedom to build his own applications, which run on the provider's infrastructure. Google's App Engine, Force.com, etc are some of the popular Platform as a Service example.

**3. Infrastructure as a Service–** It delivers infrastructure as a service with good examples including server CPU cycles, data centre space, storage resources, and database capacity. Usage is billed on a per use basis; capacity can be increased in small increments. It provides basic storage and computing capabilities as standardized services over the network. Servers, storage systems, networking equipment, data centre space etc. are pooled and made available to handle workloads

**4. Communication as a Service–** It delivers granular communications applications as a service including voice, conferencing, and video services.

**Advantages of Cloud Computing**

Some of the typical benefits of cloud computing is listed below:

1. **Cost Factor:** Cloud computing is probably the most cost efficient method to use, maintain and upgrade. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payment, pay-as-you-go and other scalable options available, which makes it very reasonable for the company in question. Initial expense and recurring expenses are much lower than traditional computing.

2. **Storage Capacity:** Storing information in the cloud gives the unlimited storage capacity. Hence, no more need to worry about running out of storage space or increasing current storage space availability. Cloud storage provides users with immediate access to a broad range of resources and applications hosted in the infrastructure of another organization via a web service interface.

3. **Quick Deployment:** Cloud computing gives the advantage of quick deployment. Once a person can opted for this method of functioning, his entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that he need for his business.

4. **Information Access:** if anyone registers him in the cloud then he can access the information from anywhere, there is an internet connection. This convenient feature lets him move beyond time zone and geographic location issues. Location and device independence can be achieved that enables the users to access systems from any device and any location.

5. **Data Backup and Recovery** Since all the data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, most cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.

6. **Automatic Software Integration** In the cloud, software integration is usually something that occurs automatically. This means that we do not need to take additional efforts to customize and integrate our applications as per our preferences. This aspect usually takes care of itself. Not only that, cloud computing allows us to customize our options with great ease. Hence, we can handpick just those services and software applications that we think will best suit our particular enterprise.

7. It is reliable and scalable

8. Improved resource utilization provides green and clean technology.

9. Cloud computing poses privacy concerns because the service provider may access the data that is on the cloud at any point in time.

**Cloud Computing and Libraries**

Libraries have been using some cloud computing services for over a decade. Online databases are accessed as cloud applications. Large union catalogs can also be defined as cloud applications. The library community can apply the concept of cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help libraries save time and money while simplifying workflows.
If a person used any of the popular web 2.0 services over the past few years (e.g. Gmail, Wikipedia, Flickr or Twitter), then he already have some experience with cloud computing, since most of these applications are hosted in the large online data centers/ libraries that are the hallmark of cloud computing. A brief list of potential areas of improvement could include:

1. Most library computer systems are built on pre-web technology.

2. Systems distributed across the net using pre-web technology are harder and more costly to integrate.

3. Information seekers work in common web environments and distributed systems make it difficult to get the library into their workflow.

Following effects of cloud computing will probably impact libraries and other sized organizations:

**Cost savings:** Cloud computing offers price savings due to economies of scale and the fact that we are only paying for the resources you actually use.

**Flexibility and innovation:** Libraries do not have to decide between devoting their limited server resources to the OPAC's overflow traffic and a new mobile web application that one of your colleagues wants to develop. If they are both hosted in the cloud, the resources devoted to each will shrink and expand as traffic rises and drops.

**General IT skills:** Systems librarians have to manage complex projects and evaluate competing vendors on a variety of criteria. Holding vendors accountable is especially important when they manage a significant chunk of our online data and IT infrastructure. Therefore, as long as cloud security remains a significant concern, techies may be called upon to help write binding, enforceable contracts that hold vendors to certain standards with regards to reliability and security of their services.

**Cloud OPAC:** Over the past year, more and more vendors have started offering cloud-hosted versions of their products. OCLC joined several other vendors last year when they began offering a cloud-based tool that complement their existing cataloging tools (e.g. World Cat and First Search).

**Different Types of Cloud:** Libraries may soon be building and managing their own data centers. In addition to all the hype and optimism surrounding cloud computing, there are still significant fears and doubts a hybrid cloud is primarily based in a privately-owned and operated data center, but it can shift some of its traffic and data processing requests to public cloud vendors such as Amazon or Rackspace on an as needed basis. This hybrid model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons.

**Cloud Computing Challenges/ Security**
Some common challenges are:
**1. Data Protection:** Data Security is a crucial element that warrants scrutiny. Enterprises are

reluctant to buy an assurance of business data security from vendors. They fear losing data to competition and the data confidentiality of consumers. In the cloud model, Service providers are responsible for maintaining data security and enterprises would have to rely on them. This could potentially put your company to great risk. Hence, you need to make absolutely sure that you choose the most reliable service provider, who will keep your information totally secure.

**2. Data Recovery and Availability:** All business applications have service level agreements that are stringently followed. Operational teams play a key role in management of service level agreements and maintenance of applications. In production environments, operational teams support:

- Appropriate clustering and Fail over
- Data Replication
- System monitoring
- Maintenance (Runtime Governance)
- Disaster recovery
- Capacity and performance management

**3. Management Capabilities:** There is huge potential to improve on the scalability and load balancing features provided today. The Scaling offerings and maintaining sufficient performance is a challenge, especially for software as a service provider, who must deliver over networks and environments that they do not necessarily control.

**4. Regulatory and Compliance Restrictions:** Many industries and countries disallow data or asset transparency. Also, some cloud providers have had outages with disastrous results, so trust remains an issue. In order to meet such requirements, cloud providers need to setup a data center or a storage site exclusively within the country to comply with regulations

**5. Federation and Interoperability:** IT functions typically automate a contiguous business process – and will thus require service integration among cloud providers.

**6. Vendor lock-in and Data Management:** Data ownership in the cloud is not clear cut. Nor is the process by which data is to be reclaimed from cloud provider systems.

**7. Technical Issues** Though, it is true that information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. We should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance. Besides, we will need a very good internet connection to be logged onto the server at all times.

**8. Prone to Attack** Storing information in the cloud could make your company vulnerable to external hack attacks and threats. As you are well aware, nothing on the internet is completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

**Conclusion**

The cloud provides many options for the everyday computer user as well as large and small businesses. However, with this increased ease also come drawbacks. We have less control over who has access to our information and little to no knowledge of where it is stored. We also must be aware of the security risks of having data stored on the cloud. Cloud computing is one avenue for this move into the future. It can bring several benefits for libraries and give them a different future.

**References**

- http://en.wikipedia.org/wiki/Cloud_computing
- http://www.thbs.com/pdfs/Cloud-Computing-Overview.pdf
- http://www.us-cert.gov/reading_room/USCERT-CloudComputingHuthCebula.pdf
- Padhy, Suresh Chandra and Mahapatra, R. K. (2012). Cloud Computing: Academic Libraries in Orissa. *VSRD Technical & Non-Technical Journal*. 3(3) 124-130.
- Sanchati, Rupesh and Kulkarni, Gaurav. Cloud Computing in Digital and University Libraries. *Global Journal of Computer Science and Technology*. 11(12) 37-42.
- Xiaona, Feng. Application of Cloud Computing in University library user service model. Advanced Computer Theory and Engineering (ICACTE), 2010 3rd International Conference. Vol.3. 144-147.