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Library Professionals' Responsibility in the Modern Era of Cloud Technology

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Abstract: Cloud computing provides us a means by which we can access the applications as utilities, over the internet. It allows us to create, configures, and customize applications online. As a cloud librarian services like need to provide to track member information and transactions, to communicate with the member libraries contributing their resources to cloud for resource sharing, to discuss with faculty members and subject experts, librarians for preparing different packages for different faculties and classes, to update technological skills, to give technological support to member libraries, to conduct training and awareness programs for readers, to provide interlibrary loan facility, to track usage record of cloud resources, to develop digital collection, to deal with cloud resource and players and select the best bargain, to maintain own virtual profile by creating his or her blog or social network profile to interact with the user. The same platform can be used for providing reference services and educating the users on cloud resources or how to use the cloud infrastructure, to use his or her strategic planning and decision making ability at different stages of developing a cloud library.

Keywords: Cloud computing; Libraries; Cloud librarian; Web technologies; Awareness; Digital collection; Resource sharing.

Introduction

Cloud Computing is web based technology, which a new from of computing. It is a service provided on the internet or network. It is a server based service. Cloud Computing requires remote server as well as internet to maintain and organize data and applications. In cloud computing so many computers are connected with a server.

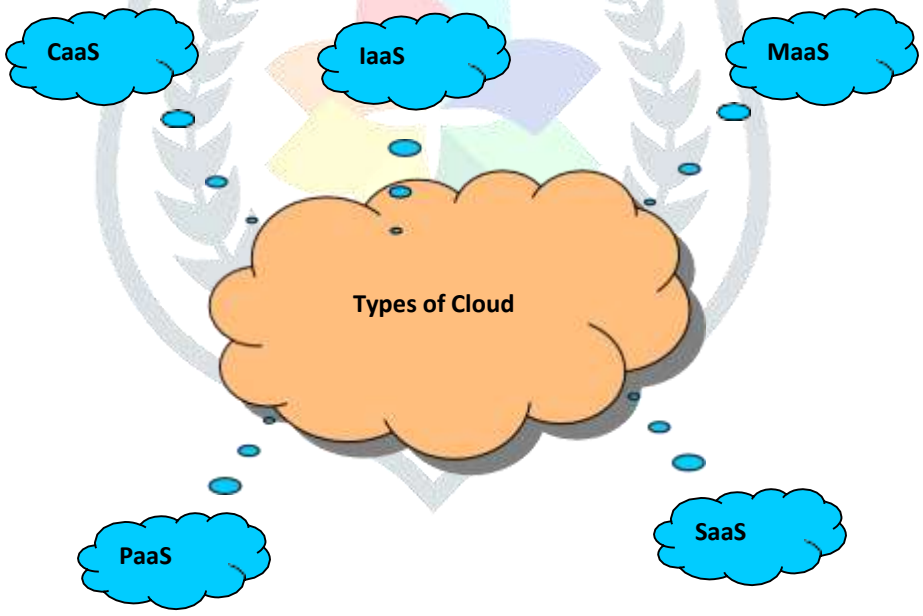
Needs of Cloud Computing

In modern libraries cloud computing is being popularized. These days there are so many libraries, which are automated. Computer technology is required for running the libraries, different software's are being used by libraries for automation. All these software's are being run by a license which libraries need to purchase from a vendor. It s very costly and no organization can purchase it separately for so many computers. To solve this problem cloud computing helps a lot.

The State of Cloud Computing in Digital Library

Cloud platforms enable organizations to use external expertise and resources to deliver complex services, remove the need for organizations to invest in server infrastructure, and lower the cost for organizations seeking elastic computing resources. Libraries have been adopting cloud-based solutions for different servicesincluding electronic journal access management, statistics tracking, digital library hosting, and even integrated library system (ILS) hosting. This has allowed libraries to make strategic choices about the allocation of resources and to offer better service than possible if relying on in-house solutions. While much ofthe focus on cloud computing in digital libraries has been on subscription service or platform (for example ILS hosting). There are cases where digital libraries need computing resources for requirements that are not provided by service or platform providers. Cloud computing can be divided into five categories: Communication-as-a-Service (CaaS), Infrastructure-as-a-Service (IaaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). Figure 2 represents depicts the types of cloudcomputing services and its related features.

Figure2 Types of Cloud Computing Services



• **Communication as a Service (CaaS):** Allow for certain messaging (Rittinghouse and.Ransome 2010)tools, like, voice over IP (VOIP), Instant Messages (IM) and Video Conferencing.

• **Information as a Service (IaaS):** Allows customer to maintain owner and management of their application while off-loading infrastructure management (Rittinghouse and.Ransome 2010) to the Iaasprovider.

• **Monitoring as a Service (MaaS):** Outsourcing of security service ((Rittinghouse and.Ransome 2010)to a third party security team.

• **Platform as a Service (PaaS):** Meant for web-based ((Rittinghouse and.Ransome 2010) development infrastructure.

• **Software as a Service (SaaS):**When a software vendor supplies software (Rittinghouse and.Ransome2010) over a network as opposed to the typical distribution of installation of individual computers

Digital libraries have quietly been on the forefront of cloud computing technology for a number of years. The use of SaaS in digital libraries reaches back to early 2000 with the establishment of companies like Serials Solutions (http://serialssolutions.com). Much of the work is migrating to electronic journals and it has focused on a SaaS platform, and recent companies (http://www.libguides.com) such as Lib Guides have shown that libraries are willing to invest in SaaS solutions. In the IaaS arena, Amazon Elastic Computing Cloud (EC2) offers IT infrastructure for organizations to launch different sized servers using a variety of operating systems, including several flavours of Linux and Windows. EC2 provides organizations with essentially unlimited storage using their S3 service, the ability to take snapshots of both data and servers, and the ability to include EC2 servers in an organization's private (http://aws.amazon.com/ec2/) network.

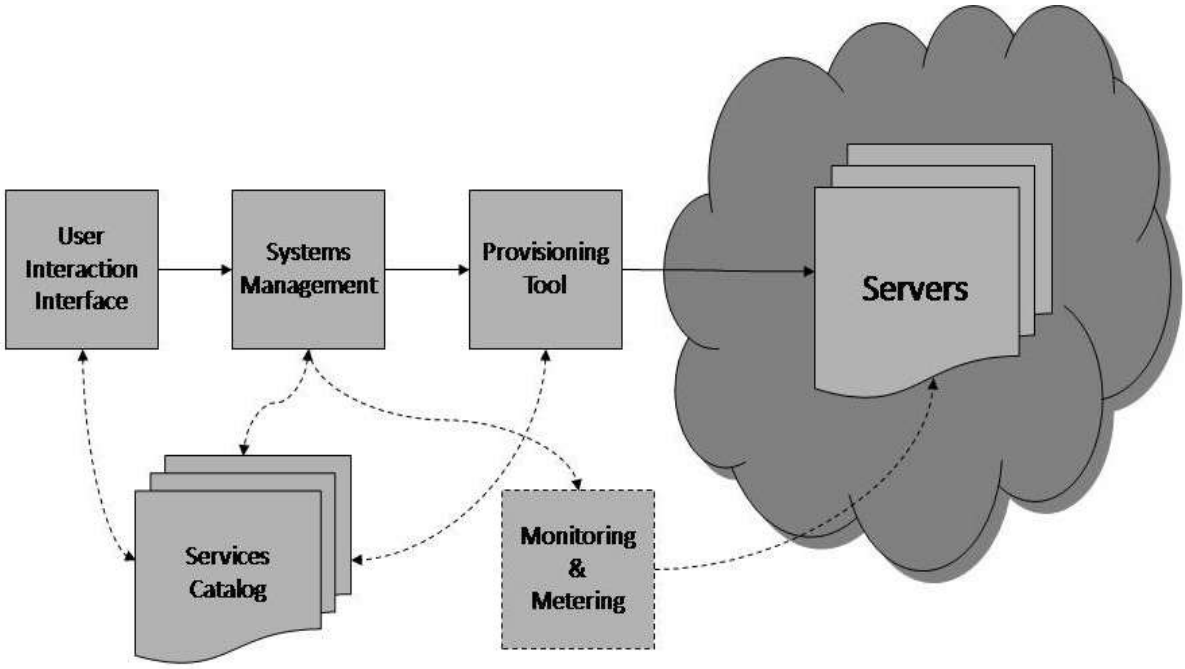
Wheeler and Waggener (2009) use this classification (Wheeler and Waggener 2009) (SaaS, PaaS, and IaaS) as a launching pad to discuss ways in which they can be used to enable collaboration or 'sourcing' between institutions and consortia. Marshall Breeding (2009) places these three types of services (Breeding 2009) within the context of other infrastructure and hosting options such as co-location (the duplication of specific IT resources in multiple places), shared and dedicated hosting (licensing a shared or distinct portion of a server for use), and cloud computing (abstracting the hardware, software, and service layers to provide an extensible computing environment). Embedded within these classifications are needs and use arguments, organizational goals, and institutional priorities. Digital libraries are in a unique position to experiment with cloud computing given their service-oriented mission and need to find appropriate solutions using limited resources. Fox (2009) observes that the goals of the organization (Fox 2009) have an impact on their use of cloud solutions. Digital libraries are often supported by external or organization level IT services and do not have internal expertise on advanced IT management. Many libraries have been active in investigating innovative uses of cloud computing (Kroski, 2009), including new ways of using infrastructure (Leong. 2009)services. Kroski's article mentions the use of Amazon EC2 services by both the DC Public Library system and Ohio Link to provide library IT services using IaaS techniques.

Both the Gartner Hype report (Hype Cycle for Cloud Computing 2009) on cloud computing (2009) and the Educause Horizon report (*2009 Horizon Report* 2009) point to the expansion of cloud services in the comingyears. Digital libraries and especially academic organizations have largely followed suit, having already migrated key services such as Open URL providers, and federated and pre-indexed search engines.

Architecture of Cloud Computing in Digital Library

The architecture (http://en.wikipedia.org/wiki/ cloud computing) behind cloud computing is a massive network of 'cloud servers' interconnected as if in a grid running in parallel, sometimes using the technique of virtualization to maximize computing power per server. Figure 3 represents the architecture of cloud computing in digital library.

Figure3 Cloud Computing Architecture for Digital Library



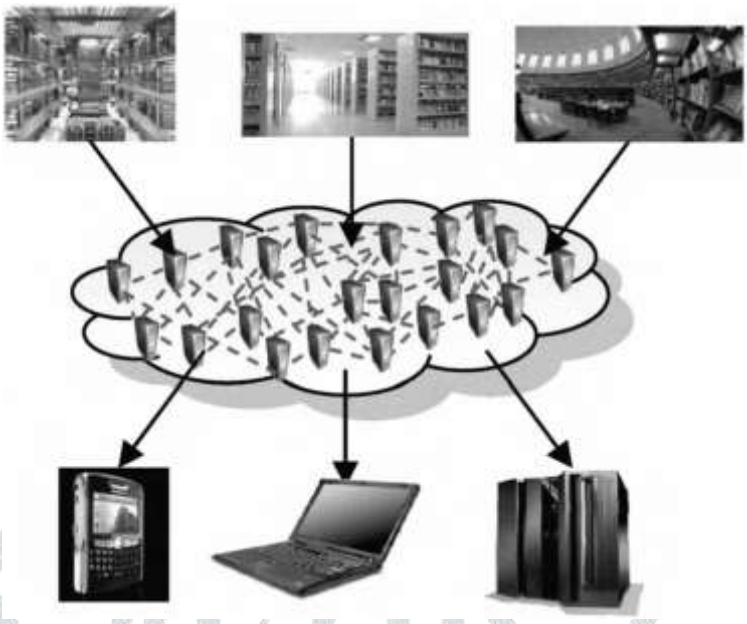
A front-end interface allows a user to select a service from a catalogue. This request gets passed to the system management which finds the correct resources, and then calls the provisioning services which carves out resources in the cloud. The provisioning service may deploy the requested stack or web application as well.

- **User interaction interface**: This is how users of the cloud interface with the cloud to request services.
- **Services catalogue**: This is the list of services that a user can request.
- **System management**: This is the piece which manages the computer resources available.
- **Provisioning tool**: This tool carves out the systems from the cloud to deliver on the requested service. It may also deploy the required images.
- **Monitoring and metering**: This optional piece tracks the usage of the cloud so the resources used canbe attributed to a certain user.
- **Servers**: The servers are managed by the system management tool. They can be either virtual or real.

Application of Cloud Computing in Digital Library

Digital library is a development-oriented hardware and software integration platform, through technical andthe product integration. Each kind of carrier digitization carries on the effective deposit and the organization provides the network with effective service. Figure 4 illustrates application of cloud computing in digital library.

Figure 4: Application of cloud computing in digital library



Cloud computing offers real alternatives to information technology field for improved flexibility and lower cost. Digital Libraries (Yang and Liu 2010) are developing for software applications, platforms, and infrastructure as a service to information technology departments over the 'cloud'. It also provides for better and easier management of data security, since all the data is located on a central server, so administrators cancontrol all those who have access to the files as also those who do not have access to files. The main objective of cloud computing is to use a specific software through calculation and the data stored in a desired computerdistribution which causes the enterprise to reduce cost and improve performance. Digital library represents one kind of new infrastructure and the environment; through cloud computing technology since it uses resources more effectively and can solve the constraints in digital library.

Application in Libraries

- **Building Digital Library / Repositories**

In the present situation every library needs a digital library, to make their resources, Information and services at the efficient level to ensure success via the network.

- **Searching Data**

OCLC is one of the best examples for making use of cloud for sharing libraries data for years together. For instance, OCLC, World Cat service is one of the popular Service for searching library data now is available on the cloud.

- **File Storage**

These service virtually share the files on the web and provide access to anywhere anytime without any special software and hardware.

- **Library Automation**

For library automation purpose, cloud based services such as acquistation, Cataloguing, process system, digital content etc. , used in libraries and also supports various standard such as MARC21, Z39.50 and so on which directly related to Library and Information Science area.

Enhancement of Library Services by the Use of Cloud Computing

- **E-book Lending Service**

Cloud platform is now becoming popular to lend the e-books.

- **Union/ Shared catalogue/ OPAC**

Network libraries can use same platform and give access to their collection on the
Platform. Through cloud computing creation of union catalog becomes very easy.

- **Document Download Service**

One can download documents easily if permit access in the network.

- **Digital Preservation/ Scanning**

Digitization and scanning work can be done centralized and so one can avoid duplication of such time consuming work Libraries can preserve the collection is digital from in the form of archives.

- **CAS (Current Awareness Service)**

To provide current awareness service to all patrons has become easy
With cloud computing.

- **Document Sharing**

Document Sharing has become easy with cloud computing.

- **File Sharing**

To shares various files in electronic from become easy with the cloud computing.

- **Information Discovery**

Cloud provides a platform to share all information. That one can access anytime from Anywhere. So, information discovery and searching become easy and it is very useful for researchers.

- **Information Orientation**

Libraries can conduct information literacy and orientation courses on the cloud.

Benefits of Cloud Computing

- **Cost Saving**

In cloud computing the users has to pay only for those services which he chooses and thus technology enables the libraries or organization to save on cost.

- **Easy and installation and maintenance**

By using this technology, the organisation has no worry about server updates and other computing issues.

- **Increased Storage**

Cloud computing can hold more storage than a personal computer as the servers available in the libraries or organisation and it is possible to extend as per the need.

- **Flexible**

This technology is very flexible.

- **IT Facilities**

IT facilities the libraries to expand its services anytime**.**

- **Shared Resources**

This is the main and important feature of cloud computing, that participating organisation can share their resources.

Role of the Librarian in Cloud Computing Era

- To update technological skills
- To develop digital collection
- To communicate with the E-books, Journals publishers & distributors, database providers
- To communicate with the member libraries contributing their resources to cloud for resource sharing
- To track usage record of cloud resources
- To provide interlibrary loan facility
- To provide interlibrary service facility
- To maintain own virtual profile by creating his or her blog or social network profile to interact with the user. The same platform can be used for providing reference services and educating the users on cloud resources or how to use the cloud infrastructure.
- To use his or her strategic planning and decision making ability at different stages of developing a cloud library.

Conclusion

This study provides cloud computing concepts and implications of cloud based applications in libraries in order to enhance their services in a more efficient manner. Cloud computing is very helpful in modern times; with the helps of technology library staff will be free from managing the servers. This technology can be of immense importance in helping libraries to undertake modern ICT activities. Role of LIS professionals in this virtual era is to make cloud based services as a reliable medium to disseminate library services to their target users with ease of use and trustworthiness.

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