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CLOUD COMPUTING AND ITS APPLICATIONS IN LIBRARIES

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Abstract

Cloud computing is a paradigm shift of computing and information technology to a new phase of platform to cater the clients more sophisticated manner and also more cost effective manner from a common pool of service providers platforms. Cloud computing technology continues to grow at a rapid rate with new applications and architecture. It is used to practice of storing, accessing and sharing data, applications and computing power in cyberspace. This technological development has brought a dramatic change in every field and libraries are not exception to it. Libraries have also started adopting this technology as cost effective tool which involves delivering hosted service over the web. Budgetary provision for building collection development and procurement of computing resources and peripherals have been reducing gradually, so cloud computing is the best option for the libraries to solve the above mention problem. This paper aims to demonstrate and elaborate various aspects of cloud computing, its uses in the field of library and information centers. This paper also tries to give clear idea that how cloud technology help libraries to provide a better service to the user community.

KEYWORDS:

Internet, Cloud technology, Virtualization, Information Technology, Social networking, Personal Digital Assistants, Network.

1.INTRODUCTION

Today in this technological era, Information is exploring in large scale and information needs of the users are also growing rapidly. To meet the peculiar information needs of the knowledge society and to provide better services libraries are adopting many new technologies. The recent technology trend in library and information centres is the use of cloud computing as a strategic tool for the purpose of providing seamless library services with quality in a cost effective or economic way. In Information technology industry cloud technology is the third revolution after Personal computer (PC) and Internet. Cloud computing provides the user to use various applications without installation of that application in their own computer to access their personal files or official documents. Cloud computing is capable of bringing together collection of documents and resources stored in various personal computers, personal server and other equipment in to one place and putting them on the cloud for the use of the user community. Cloud computing is so named because the information being accessed is found in the "clouds", and does not require a user to be in a specific place to gain access to it. In this era undoubtedly

Cloud Computing is one of the hottest and value added term in the field of Computing and Libraries.

2.CLOUD COMPUTING

Cloud computing is a term describes the means of delivering any and all information technology –from computing power to computing infrastructure, applications, business processes, and personal collaboration- to an end user as a service whenever and wherever they require it. Cloud computing is an emerging style of computing where applications, data and resources are provided to the users as a service over the web. The services which are provided by the service provider may be available globally, always on, low in cost, on demand, massively scalable, pay-as-you-grow. Cloud computing is a technology that allows user to access software applications, store information, develop and test new software, create virtual services, drawn on disparate IT resources and more- all over the Internet or other network. In cloud computing users are only think about what the service does for them but don't think about how it is implemented.

Cloud computing is a model driven technology that provides configurable computing resources such as servers, networks, storage and applications as and when required with minimum effort over the internet services. According to the National Institute of Standards and Technology (NIST) definition (2009), 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 rapidly provisioned and released with minimal management effort or service provider interaction. Cloud computing is a model for delivery of resources as a service.

In other words cloud computing refers to applications and services that run on a distributed network using virtualized resources and accessed by Internet protocols and networking standards. In this technology the resources are virtual and limitless. Cloud computing takes the technology, services and applications that are similar to those on the internet and turns them into a self-service utility. The use of the word "cloud" makes reference to the two essential concepts:

Abstraction: cloud computing abstracts the details of system implementation from users and developers applications run on physical systems that aren't specified, data is stored in locations that are unknown, administration of system is outsourced to others, and access by users is ubiquitous.

Virtualization: Cloud computing virtualizes systems by pooling and sharing resources. Systems and storage can be provisioned as needed from a centralized infrastructure, costs are accessed on a metered basis, multi-tenancy is enabled and resources are scalable with agility.

Cloud computing is an abstraction based on the notion of pooling physical resources and presenting them as a virtual resource. It is a new model for provisioning resources, for staging applications, and for platform-independent user access to services. Cloud computing represents a real paradigm shift in the way in which systems are deployed. The massive scale of cloud computing systems was enabled by the popularization of the internet and due to the growth of some major large service companies.

3.ESSENTIAL CHARACTERISTICS

The NIST definition of cloud computing has assigned five essential characteristics of cloud computing system:

On-demand self-service

A client can unilaterally provision computer resources or computer capabilities, such as server time and network storage without the need for interaction with cloud service provider personnel.

Broad network access

Resources available in the cloud can be accessed over the network through standard mechanisms in a manner that provides platform-independent access to clients of all types. This includes a mixture of heterogeneous operating systems, and thick and thin platforms such as laptops, mobile phones and

personal digital assistants (PDAs).

Location independent resource pooling

A cloud service provider pooled together the computing resources in a system or server that supports multi-tenant usage. According to the demand physical and virtual systems are dynamically allocated and reallocated. There is a sense of location-independence, which is that the client generally has no control or knowledge about the location from where the services are located. Examples of resources include storage, processing, memory, network bandwidth, connectivity and virtual machines.

Rapid elasticity

Resources can be rapidly and elastically provisioned, in some case automatically, to quickly scale out and rapidly released to quickly scale in. the system can add resources either by scaling up systems or scaling out systems. From the point of view of client, cloud computing resources should look limitless and can be purchased at any time and in any quantity.

Measured service

The use of cloud computing resources are measured, audited and reported to the client based on a metered system. In this system a client can be charged on a known metrics such as amount of storage used, number of transactions, on bandwidth, amount of processing power used and so forth. On the basis of the level of service they charged from the client or the user.

4.CLOUD TYPES

Cloud computing can be distinct into following two set of models.

A.Deployment models: This refers to the location and management of the cloud's infrastructure. Deployment models are of four type's viz. public, private, hybrid and community.

Public cloud: A public cloud is a shared cloud computing infrastructure that anyone can access. Public clouds services are available to the clients for free of cost or with cost from a third party service provider through Internet. It is also known as provider cloud. In public cloud an organization can rents the cloud system and pay for what they use on-demand. The public cloud infrastructure is available for public use alternatively for an organization or an industry group and it is owned by an organization selling cloud services. Rackspace, Amazon, Google, Microsoft Azure, IBM offerings are examples of public clouds.

Private cloud: A private cloud is a cloud computing infrastructure owned by a single party. The private cloud technology is functioned for the special use of an organization. Private clouds are available only to the members of the organization and it is may be managed by that organization or a third party. Private cloud is also known as "internal cloud". In private cloud an organization turns its IT environment into cloud and uses it to deliver services to their users. Private cloud will facilitate user to store and disseminate their data on respective cloud (e.g. institutional cloud, eBay).

Hybrid cloud: A hybrid cloud is a combination of public and private cloud. It is also known as combined cloud. In hybrid cloud, private and public clouds retain their unique identities but are bound together as a unit. A hybrid cloud may offer standardize or proprietary access to data and applications, as well as application portability. An example of hybrid clouds is Google Apps.

Community cloud: Community clouds are specifically organized clouds, to serve a common function or purpose. It may be for a particular organization or a group of organization, but they share common concerns such as their mission, policies, security, and so on. It can be managed by the organization itself

or by the third party (e.g. Institutional Gmail of Google Apps)

B.Service models: This is particularly based on type of services that any user can access on a cloud computing platform.

Software as a service (SaaS): In this service model hardware, operating system and other special purpose software are made available by the service provider to the user over the Internet. It is a complete operating environment with applications, management and the user interface. In this model all types of responsibilities are upon on the vendors, client's responsibility is begins and ends with entering and managing their data. SaaS eliminates customer worries about application servers, storage, application development and related concerns of Information technology.

When a cloud computing vendor offers software running in the cloud with the use of application on a pay-as-you-go-model, it is referred as SaaS.

Some examples of SaaS cloud service providers are:

Google Apps
Sales Force.com
SQL Azure

Platform as a Service (PaaS): In the PaaS model, cloud providers deliver a computing platform together with hardware, OS, framework, database, and web server and application developer can develop and run their software solutions on that cloud platform. There will be some restrictions on the type of software that developers can run. PaaS saves costs by reducing upfront software licensing and infrastructure costs, and by reducing ongoing operational cost for development, test and hosting environment. An example of PaaS service is that SalesForce.com opened an API called the Force API that allowed developers to create applications based on the SalesForce.com technologies.

Infrastructure as a Service (IaaS): This is the provisioning of virtual computers, virtual storage, virtual infrastructure and other hardware accessories where the organization has control over the operating system, thereby allowing the execution of arbitrary software. In this model the service provider manages the entire infrastructure and the clients are responsible for all other deployment.
Examples of IaaS service provider include

Amazon elastic computer cloud (EC2)
Eucalyptus
GoGrid
Terremark etc.

The above three service models have together known as SPI model of cloud computing. Many other service models are also there, which are;

StaaS (Storage as a service)
IdaaS (Identity as a service)
CmaaS(Compliance as a service) and so on.

5.CLOUD COMPUTING AND LIBRARIES

In this technological era, libraries are improved constantly by adopting many new IT technologies. The theories of conventional libraries have been changed now a day. Introduction of new and innovative technologies like cloud technology helps libraries to provide better services to the user community. Though libraries have been using some of cloud computing services for over a decade like online databases, large union catalogues as cloud applications, the library community can further adopt the concept of cloud computing to strengthen the power of collaboration or cooperation and to build a

major, fused existence on the worldwide network. Following are some examples of Cloud Libraries:

1. OCLC
2. Library of Congress (LC)
3. Columbia Public Library
3. Exlibris
4. Polaris
5. Scribd
6. Discovery Service
7. Google Docs / Google Scholar
8. Worldcat
9. Encore

5.1 APPLICATIONS OF CLOUD TECHNOLOGIES IN LIBRARIES

A.Libraries can host their own websites with the help of cloud technologies. The District of Columbia Public Library is using Amazon's EC2 (Elastic Computing Cloud) service to host their website and it provides libraries with rapid scalability and redundancy.

B.Libraries can build digital library, content management system, institutional repository, Inter Library Loan (IIL) system and Integrated Library System (ILS) from locally-managed to vendor-hosted environment, of their own with the help of cloud technology.

C.Libraries can use cloud technology like Google Docs to store library documents by making one Google account and provide service to the user. It collects responses in web forms, Google Calendar for instruction and meeting rooms, and Google Analytics to collect statistics about their website, catalogue and blogs.

D.Cloud technology can be applied for backing up of media collections and storing and accessing of bibliographic data. Libraries can also store and maintain much of the same data hundreds and thousands of times.

E.Libraries can build their PC system on cloud with this technology so that user can incorporate more simply the system. When the library systems are deployed as open cloud solutions then the library community itself can step up to create extensions to their core services and more importantly share them throughout the community using cloud computing.

6.CONCLUSION

Cloud computing can transform the way systems are built and services delivered, providing libraries with an opportunity to extend their impact Cloud computing has become a major topic of discussion and debate for any organization which relies on technology. Cloud computing is beneficial as it is flexible, scalable, elastic, pay per usage, economy of scale, cost effective and no maintenance fee for hardware and software etc. The paper attempted how cloud computing helps in freeing libraries from managing technology so that they can focus on collection building, improved services and innovation. Cloud computing encourages libraries and their users to participate in a network and community of libraries by enabling them to reuse information and socialize around information. The Cloud computing techniques and methods applied to libraries, not only can improve the quality of services and utilization of resources, but also can make more extensive use of cloud computing to our work life.

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