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Cloud Computing in Libraries

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Abstract

Cloud computing technology came up as a boon for libraries and is offering various opportunities for libraries to connect their services with clouds. The paper presents an overview of cloud computing and its possible applications that can be clubbed with library services on the web-based environment.

Keywords

Cloud Computing, IaaS, PaaS, SaaS Models of Cloud Computing

Research Paper

Introduction

When you store your photos online instead of on your home computer or use webmail or a social networking site you are using a cloud computing service. If you are an organization and you want to use for example an online invoicing service is a cloud computing service. Cloud computing refers to the delivery of computing resources over the internet instead of keeping data on your own hard drive or updating applications for your needs. You use a service over the internet at another location to store your information or use its applications. Doing so may give rise to certain privacy implications.

What is Cloud Computing?

At its simplest cloud computing is the dynamic delivery of information technology resources and capabilities as a service over the Internet. Cloud Computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. It generally incorporates Infrastructure as a Service (IaaS) Platform as a Service (PaaS) and Software as a Service (SaaS).

History of Cloud Computing

The Greek myth tells a tale of creatures plucked from the surface of the Earth enshrined as constellations in the night sky. Something similar is happening today in the world of computing. Data and programs are being swept up from desktop PCs and corporate server rooms and installed in the Compute Cloud in general there is shift in the geography of computation. What is cloud computing exactly? As a beginning here is a definition.

Definitions of Cloud Computing

According to Hoy, 2012, most cloud computing applications and infrastructure are built with the assumption that users will access them from the internet on multiple platforms and from the internet on multiple platforms and from anywhere in the world.

According to the IEEE Computer society cloud computing is

> "A paradigm in which information is permanently stored in servers on the internet and temporarily on clients that include desktops entertainment centers table clients that include desktops entertainment centers table computers notebooks wall computers handles etc".

According to Andrew, 2012, The "Cloud" element of cloud computing can be seen as an acronym that stands for

C- Computing Resources

L - Location Independent

O – Can be accessed via online means

U – Used as a Utility

D – Available on Demand

Gartner IT Glossary defines cloud computing as a style of computing in which scalable and elastic IT-enabled capacities are delivered as a service using internet technologies.

According to NIST, "Cloud computing is a model for enabling ubiquitous convenient on demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction".

Cloud Computing is the delivery of computing as a service rather than a product where by shared resources software and information are provided to computers and other devices as utility over a network. Wikipedia.

> "An emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet".

Characteristics of Cloud computing

The following are characteristics of cloud computing :

- **Self Healing :** Any application or any service running in a cloud computing environment has the property of self healing.
- **Multi Tenancy:** With cloud computing any application supports multi tenancy that is multiple tenants at the some instant of time.
- **Linearly Scalable:** Cloud computing services are linearly scalable. The system is able to break down the workloads into pieces and service it across the infrastructure.
- **Service-Oriented:** Cloud computing systems are all service oriented i.e. the systems are such that they are created out of other discrete services. Many such discrete services. Which are independent of each other are combined together to form this service.
- **SLA Driven:** Usually businesses have agreements on the amount of services. Scalability and availability issues cause clients to break these agreements. But cloud computing services are SLA driven such that when the system experiences peaks of load, it will automatically adjust itself so as to comply with the service level agreements.
- **Virtualized:** The applications in cloud computing are fully decoupled from the underlying hardware. The cloud computing environment is a fully virtualized environment.

- **Flexible:** Another feature of the cloud computing services is that they are flexible. They 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.
- **Cloud Computing Models:** Though, there are various service models originated on the web but three service models widely used for delivering the different cloud based services that described below:
- **Infrastructure as a service (IaaS):** The cloud computing vendors offer infrastructure as a service. One may avail hardware services such as Processors, Memory, Networks etc on agreed basis for specific duration and price.
- **Platform as a service (PaaS):** Cloud vendors are companies that offer cloud computing services and products. One of the services that they provide is called PaaS. Under this, a computing platform such as operating system is provided to a customer or end user on a monthly rental basis. Some of the major cloud computing vendor is Amazon, Microsoft and Google etc
- **Softerware as a Service (SaaS):** Software package such as CRM or CAD/CAM can be accessed under cloud computing scheme. Here a customer upon registration is allowed to use software accessible on rental basis or on per use basis.

Types of Cloud Computing:

Public Clouds : The cloud infrastructure is available to the public on a commercial basis by a cloud service provider. This enables a consumer to develop and deploy a service in the cloud with very little financial outlay compared to the capital expenditure requirements normally associated with other deployment options.

Private Clouds : The cloud infrastructure has been deployed and is maintained and operated for a specific organization. The operation may be in house or with a third party on the premises.

Hybrid Cloud: The cloud infrastructure consists of a number of clouds of any type. But the clouds have the ability through their interfaces to allow data and/or applications to be moved from one cloud to another. This can be a combination of private and public clouds that support the requirement to retain some data in an organization and the need to offer services in the cloud federated cloud (Cloud Federation). A federated cloud (also called as cloud federation) is the deployment and management of multiple external and internal cloud computing services

according to the requirements of the business that perform a common action.

Community Cloud : The cloud infrastructure is shared among a number of organizations with similar interests and requirements. This may help limit the capital expenditure costs for its establishment as the costs are shared among the organizations. The operation may be in house or with a third party on the premises.

Advantages of Cloud Computing

Cast Effective : Cloud computing technology is paid incrementally thus saving cast for organizations. It offers price savings due to economies of scale and the fact that organizations such as libraries are only paying for the resources they actually use.

Accessibility : The cloud computing services can easily accessible any part of the world but internet is most essential thing. Cloud Services also allow us to synchronize data across multiple devices.

- **Easy to installation and maintenance:** Librarian can easily install cloud tools on a computer by using internet. There is no need to any special IT staff. There is need to procure any hardware to run the servers.
- **Increased Storage:** Cloud can hold more storage than a personal computer or the server available in the libraries or organizations and it is possible to extend as per the need
- **Flexibility:** Cloud computing offers much more flexibility than other local network computing systems and saves time plus cost for organizations. It is possible for organizations like libraries to expand the services any time by requesting for an additional space on the servers.
- **Better Mobility:** The staff and the users of the library can connect to the library servers from any place or from wherever they are rather than having to remain present at their desks by having a PC and Internet access. A group of libraries can come together and can put their resources at one place, which in turn will enable them to provide access to more number of resources to their end users.

Disadvantages

Data Security: The biggest concerns about cloud computing are security especially if the organizations are dealing with sensitive data such as credit card information of customers if the proper security model is not yet in place then the data stored on the cloud is vulnerable to attacks from viruses theft etc.

Network Connectivity and bandwidth: Since the cloud computing is offered over

the internet if the connection goes down due to any reason then the organizations suffer from loss of data connectivity till the time it is set. Also the service requires more bandwidth as it may not work on low speed internet connections.

Dependence on outside agencies: The cloud services are being offered by third party services over the internet. It is virtually difficult to have any control on the maintenance levels and the frequency. Also it is tough to assess the contingency procedures of the service provider in regard to backup updates restore and disaster recovery. Migration to other service provider is also an issue if the uniform standards are not followed by the host.

Limited Flexibility: Flexibility may be limited in terms of special customization as services on the cloud will be common for all the users.

Cost: Initially the cost could be higher but may reduce depending on the usage of services. However, organizations may end up paying higher charges in the future.

Knowledge and Integration: Deeper knowledge of cloud computing is essential as working of the service is totally dependent on the service provider. Similarly, integration is an issue as it will be difficult to integrated equipment used in data centers to host data with that of peripheral equipment's in the organization such as printers USB drives etc.

Privacy: Privacy loss is a big concern when we talk about cloud based services. Data stored or shared on the cloud by large social networking sites are usually protected and can be accessed by only authorized people but there is always a chance of accidental data leakage mismatch and other failure.

Conclusion

Libraries have the opportunity to improve their services and relevance in today's information society. Cloud Computing is one avenue for this move into the future. It can bring several benefits for libraries and give them a different future. It can bring several benefits future cloud computing builds on decades of research in virtualization distributed computing more recently networking and web software services. It implies a service oriented architecture, reduced information technology, overhead forth end user, great flexibility, reduced total cost of ownership on demand services and many other things.

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