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Cloud Services: Application and its Use in Information Science

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Abstract

Purpose: The purpose of the paper is to present the different views of how cloud computing is being adopted as a service in the field of Information Science, and the varied services being provided by the Cloud.

Methodology: An online survey was carried out to look for cloud services and its level of penetration in the field of information science as a services provider. Also previous work on the same topic by various researchers was also taken into account as they provided the required impetus for the research process.

Findings: The study assesses the cloud computing and the use of its services in the field of Information Science, along with few relevant examples of large scale cloud computing services.

Research Implications: The finding can be used by the professionals to get basic understanding of the cloud computing and its services for information storage and dissemination.

Keywords: Cloud Computing, Information Science, Digital Library, Web Service, Client Server

Introduction

It all started with the birth of personal computers and World Wide Web during 70's and early 80's. These inventions provide users access to World Wide Web content while sitting in their homes. During this period, organisations had developed data centres to cater their need of storage and processing (Bawa, 2013). But that didn't prove cost effective as much of their processing power remained unused, on average 5 % of their processing power was used. Later with wide availability of DSL, broadband, and fast transmission speed, organisations thought of providing their data centre on lease (Hassan & Ammad, 1999; Bawa, 2013). This led to the advent of Cloud Computing. The term is believed to have originated with George Favaloro, a Compaq business executive who described the future of Internet business with the term cloud computing. Favaloro having clear knowledge of future not only visioned the business software, but also perceived the concept of "cloud computing based applications" with Internet being large scale carrier of information and services (Kahn & Cerf, 1999; Borko, 1968).

Information technology has changed every aspect of human life. It penetrated every field and information science is not an exception. Information science has changed the way how information is stored, processed and disseminated to its end users. Information science is more vital to development of modern society as it determines what type of, when and how information is being delivered to the people. In the world of people, organisation and technology, information science sits at the centre. This implies change in technology bring proportional change in information science delivery as any other (http://www.winky.net). The technology is changing with each passing day and is getting better and cheaper, which brings a proliferated change in the information science each day. With recently cloud computing getting into science the information science delivery to people has shown and considerable amount of change. The cloud technology at large helped to the organisations working at small or large scale, because cloud has freed the information

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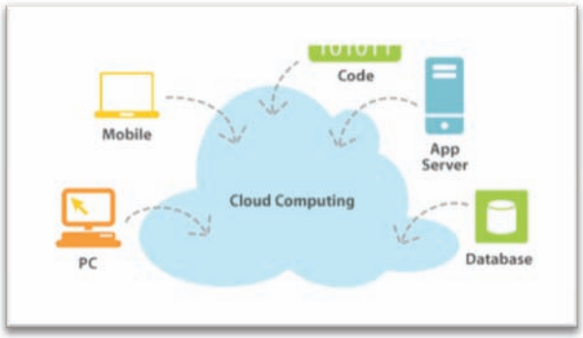
scientists from various overheads in using ICT tools for collection, processing, storage and retrieval, presentation, and communication of information.

This paper presents a picture of how cloud services has affected the information scientists and presents various cloud services used by information scientist in creating, managing and presenting information to satisfy varied user requirements.

Cloud Computing

As per definition of National Institute of Standards, Cloud computing is a model for enabling 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.

Figure 1: Cloud Computing (Nuernberg, Leggett & McFarland, 2012)



The cloud computing model as per The National Institute of Standards and Technology (NIST) comprises of five essential characteristics, three different types of service models, and four deployment models for distributing of cloud computing services.

Characteristics of Cloud Computing

Cloud computing is appealing various organisations around the globe, which makes it important to discuss its essential characteristics as a software offering. The cloud computing is composed of five different characteristics, first among these being on-demand self-service. Here computing capabilities are allocated to consumer on need basis, that is, when computing requirements of the consumer arises the services are provisioned without requiring the consumer interaction with cloud service provider.

Broad network access is one more characteristic that adds to the features of cloud computing. In case of broad network access services are provided through internet work and used through devised standard mechanism.

The third important feature of cloud computing is resource pooling. This feature allows the cloud service providers computing resources pooled to serve multiple consumers, with resources being assigned dynamically as per user demands.

Rapid elasticity characteristic is where cloud computing provides dynamic allocation of resources based on demand. The resources allocated are dynamically scaled that is provisioned and released automatically with demand.

Lastly the cloud provides measured service. The services provided and used can be monitored, controlled and reported, which help in auditing of utilised services.

Cloud Service Models

The service delivery in cloud computing is based on three different service models or layers namely Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

Software as a Service (SaaS) is the top most layer of cloud computing service model. Here applications are provided as service to the end user. Greater compatibility and better collaboration as users will be using same version of application. Example of SaaS includes Gmail, Hotmail etc.

The middle or second layer of cloud computing is what Platform as a Service (PaaS) constitutes. This layer is considered as middle or second layer of cloud computing. Here in this type of service model the platform for running application is provided by the vendor itself while the choice of date and applications rests with the user to decide.

The lower or bottom layer of cloud service model is Infrastructure as a Service (IaaS): This is the lower or the bottom layer of cloud service model. In IaaS the

service provider takes care of the service in the form of server, network, storage and virtualisation while the user takes care of data, application, operating system and middleware.

Cloud Deployment Model

A cloud deployment model signifies a particular type of cloud computing atmosphere which can be differentiated by possession, size, and right to use. There are commonly four types of deployment models namely Private Cloud, Community Cloud, Public Cloud, and Hybrid Cloud. Following is the brief description of four of the deployment models.

Private Cloud

This type of cloud deployment model deals with one organisation only, that is, services are provided exclusively to a single organisation. It may be owned, managed and operated by the same organisation or by some third party unit or in some case the combination of two.

Community Cloud

This type of deployment model is used by a group of organisation belonging to a single community. By single community we mean organisations sharing same purpose, mission, requirements or policy. This type of model is common in research based organisation groups (Hassan & Ammad, 1999).

Public Cloud

This type of cloud deployment model is open to general public usage. It is generally owned or regulated by business, academic or government organisations, or a combination of them.

Hybrid Cloud

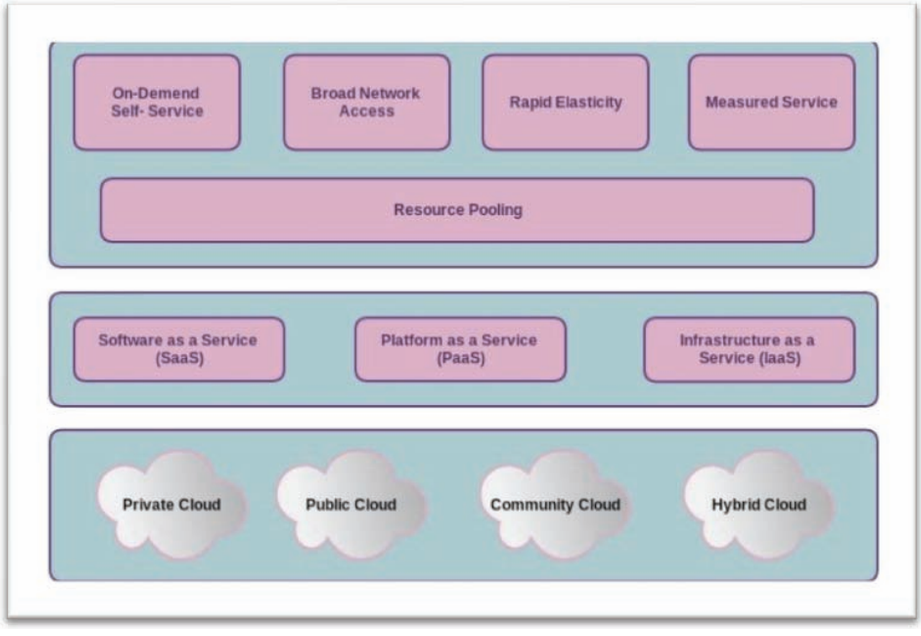
This type of model is a combination of latter three models i.e., private, community or public deployment model. The data and application portability issues are addressed by using standardised or proprietary technology.

Impact of Cloud on Information Science

Cloud computing is a newly emerged field of information technology. It grants "on-demand network access to a shared pool of configurable computing resources", for information professionals it will be adequate to define cloud computing as a service accessible over web for information management.

Information professionals have incorporated this field of cloud computing in the field of information science

Figure 2: Cloud Computing Architecture



for information handling (i.e. storage, organisation, processing, and analysis of information) and providing better services to suit needs of the knowledge society. With information science being the field concerned with problems of effective utilisation of record, integration of cloud computing can open new dimensions. The features can be listed below:

i. Efficiency is what Cloud is mostly know for, because servers used for information storage and application hosting are typically shared in the cloud environment, they are able to process multiple instances of programmes concurrently. This accounts for the better handling of resources. In a traditional environment only five percent of available server computing capability was utilised.

ii. Flexibility and scalability are two important features for which cloud is publicised. While most information management institutes do not have the same high peaks in usage and thus can take advantage of the same. That is server load will be balanced as per the demand and scaled accordingly to cater the need.

iii. Information professionals can use Cloud services for hosting repositories, journals or institutional bibliographic databases etc. which can be used to launch digital library, e-journal or other useful. Example of one such library using cloud computing to provision their digital library services is Texas Digital Library. They use Amazon's EC2 to duplicate their entire service suite as part of their Data Recovery Plan (Nuernberg, Leggett & McFarland, 2012).

iv. Cloud Library offers a simplified way to offer eBooks to your community. Let your borrowers explore and borrow eBooks on the go, at home or in the library, with just a few simple clicks!

v. Mobility is what can be an important factor for efficiency these days. As information management professionals are not concerned about setup and maintenance of applications for information management which is taken care of by the cloud service providers, they are only concerned about gathering of information, processing and then uploading to cloud for distribution, and doing all this from anywhere using any web enables devices.

vi. The problem of deficiency in technical expertise or small systems staff for some organisations can be a critical one. The Cloud solutions are the one that can bridge this gap very effectively. In case of Cloud adoption the overhead of installing new hardware, upgrading operating system and software are being taken care of by the cloud vendor himself. As a result, in many cases Cloud emerges a less expensive solution to the problem than other traditional computing methods.

vii. Data loss caused due to fire, flood, local power blackouts, or other natural or computer-related disasters prove disastrous to any organisation as information is a critical element of any organisation. Information lost is directly proportional to loss of knowledge. Amazon Web Services (AWS) provide one such Cloud solution of data back and is known globally for its block storage, file storage, backup, archive, and disaster recovery.

Cloud Services in the Field of Information Science

There are wide array of cloud services available to satisfy the needs of information collection, maintenance, and dissemination. The selection of the service depends on choice and type of service needed. Below are few of the cloud services currently used by people in the field of information science:

1. Ex Libris's bX merges data usage from world over researchers to create a service that provides scholarly recommendation. Soon Ex Libris will provide service known as Hot Articles, a free of cost service using bX data that shows what articles are trending in a particular subject (Wikipedia, 2014).

2. Mobile phone apps can add value to cloud-based library data. One of the best example being OCLC's WorldCat mobile site which works by directing users to the very nearest library having possession of a certain book needed by the particular user by processing the data retrieved from WorldCat databases, locations of libraries, and tracking user locations.

3. StackMap is shelf-mapping software that displays physical location of a book in a library using a pre-recorded call number range. Unlike the radio-frequency identification (RFID) chips, presenting the users a real-time search of a book via location tracking, this service in spite of being less dynamic proves to be much useful.

4. Amazon's Elastic Compute Cloud (EC2) is a service hosted by Amazon.com having quality attributes of being scalable, reliable, pay per use, and elastic. Information scientists can use it for the setup of vir-

tual servers. By this the information scientists can boot up a virtual Amazon machine and install software needed by them. The servers can be used as per demand and can be shut down as and when desired.

5. Dura Cloud is one of the service providers for digital library setup. Dura Cloud is managed by Duraspace which in turn is being managed and operated under Dspace digital library software and Fedora Commons. Fedora Commons is a framework for digital repository. It provides complete service for digital library creation which includes both software and hardware. DuraCloud services are being sold under nominal fee which provides great opportunity to the new comers in digital library creation (Pandya, 2012).
6. Polaris is a library automation system. Standard acquisition and processing system is also included with the package. Polaris ILS Client License allows the library to connect different PC and printers at no extra cost. The package uses standardised standards like MARC 21 for bibliographic data, XML, Z39.50 for information retrieval, Unicode etc. (Pandya, 2012)

Conclusion

This paper presents various cloud services used in the field of information science and the way they have affected it. With cloud services the information science has reached the targets which were once hard to achieve like how to manage the large volumes of information being generated day after day and how to disseminate that information to the world over web. The unprecedented increase in Information technology resources and enormous increase in electronic datasets, information science professionals are facing the serious problem of technical and monetary constraints which were never faced before; moreover information demands are multiplying and to tackle that is becoming tougher. With cloud services the information science professionals have means to manage, catalogue and disseminate this large dataset of information without worrying about the technical and financial aspect. The technical expertise is being provided by cloud service vendors in the form of services which the professionals of information science use as per their requirements, and the financially the cloud services are cheaper when compared to the non-cloud based means.

References

Bawa, V. (2013). *History and Use of Cloud Computing*, 1(1). Retrieved from http://vbawa.blogspot.in/2013/06/how-cloud-computingcame- into-existence.html.

Borko, H. (1968). Information science: What is it? *American Documentation*, January, 19(1), 3-5.

Corrado, E. M., & Moulaison, H. L. (2012). The library cloud pros and cons. *Library Journal*. Retrieved from http://www.thedigitalshift.com/2012/03/software/the-library-cloud-pros-and-cons/

Hassan, N., & Ammad, M. R. (1999). Cloud computing: Opportunities and challenges. *Journal of Modern Science and Technology*, 1(1). Harlow, England: Addison-Wesley.

Kahn, R. E., & Cerf, V. G. (1999). *What is the Internet (And What Makes It Work)*. Retrieved from http:/ www.cnri.reston.va.us/ what_is_internet.html.

Nuernberg P., Leggett J., & McFarland, M. (2012). Cloud as infrastructure at the Texas Digital Library. *Journal of Digital Information*, 13(1).

Pandya, M. (2012). *Cloud computing for libraries: A SWOT analysis*.

Regalado, A. (2013). *History and Use of Cloud Computing*, 1(1). Retrieved from http://vbawa.blogspot.in/2013/06/how-cloudcomputing- came-into-existence.html.

What is Cloud? (2012). Retreived from http://www.winky.net.

Wikipedia (2014). *Amazon Web Services, Wikipedia, The Free Encyclopedia*. Retreived from http://www.wikipedia.org/wiki/Amazon Web Services.