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CLOUD COMPUTING FOR LIBRARY RESOURCES AND SERVICES

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ABSTRACT

Cloud Computing is a new technology model for IT services which many business and organizations are adopting. It allows them to avoid locally hosting multiple servers and equipment and constantly dealing with hardware failure, software installs, upgrades and compatibility issues. Cloud computing can transform the way systems are built and services delivered, providing libraries with an opportunity to extend their impact. This article defines Cloud Computing and reveals how it is different and secure from other types of computing. The purpose of this article is to look specifically at how Cloud Computing can be employed by Libraries and what needs to be considered before moving into a Cloud Computing solution. It also discusses how Cloud Computing solutions could be beneficial to libraries in three basic areas: technology, data and community.

Keywords: *Cloud computing, Cloud-based services, Library cloud, Cloud security, Cloud technology*

Introduction

Cloud computing is a latest buzz all around with respect to web technologies and services. As web 2.0, this phrase is also being defined differently but the basic idea is almost same. In which users are getting web services on free or priced manner from service providers located at remote places. Cloud computing seems to be a new phrase but looking into the concept, we all have been using it since quite a long., e.g. email services of yahoo, google, sify or others, YouTube and, Google Docs etc. are embedded with the 'cloud computing'. These services are free and we have also been putting important information on our email IDs, youtube, flicker, and now few social networks (facebook etc.) where we have been sharing or shifting our personal information or data in different formats on the web. All these servers holding our information on the web can be metaphorically treated as clouds.

Cloud computing is the buzzword in technology circles today. It is sometimes compared with the virtualization of computing power, applications, and storage, thought of as a model to deploy pay-as-you-go web services or perceived to be similar to grid computing. Cloud computing shares characteristics with all of these technology paradigms, yet it has more to offer.

Cloud computing is more than just a passing technology trend. It's the current and future means for conducting business around the world, from financial services to retail to health care, to library systems. But what does it mean to be "in the cloud"? And how do benefits increase when services—not just software—are provided through the cloud?

This paper explains:

- How "***cloud-based services***" harness software, knowledge and work to achieve proven results for library professionals.
- How a safe, secure, and easy-to-access cloud model can help your Library and organization thrive
- How the evolution of IT, from software to cloud-based services, will ultimately improve library services.

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- How "***cloud-based services***" harness software, knowledge and work to achieve proven results for library professionals.
- How a safe, secure, and easy-to-access cloud model can help your Library and organization thrive
- How the evolution of IT, from software to cloud-based services, will ultimately improve library services.
- Why the cloud can be the most secure model available in LIS for R&D organizations because it will scale for the highest level of security protocols.

Cloud-based services go far beyond delivering software. They offer a solution that's more flexible, scalable and available. And the combination of software, knowledge and work drives improved results for all providers and all organizations & libraries on the network. Cloud-based services represent the highest level in the evolution of LIS IT. It's time to get on the cloud or be left behind.

Where did Cloud Computing come from?

The IT industry has a habit of latching onto buzzwords and applying them everywhere. "***Cloud***" is no exception. The National Institute of Standards and Technology (NIST) definition of cloud computing published October 7, 2009:

"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."

Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth". A simple example of cloud computing is Yahoo email or Gmail etc. You don't need software or a server to use them. All a consumer would need is just an internet connection and you can start sending emails. The server and email management software is all on the cloud (internet) and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits.

Historically, the concepts behind cloud computing can be attributed to **John McCarthy** who in 1961 said, "*If computers of the kind I have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility.…The computer utility could become the basis of a new and important industry*."1 In 2008, **Amy Schurr**, in an article in **Network World**,2 cited Gartner research outlining the opportunity for cloud computing "to shape the relationship among consumers of IT services, those who use IT services, and those who sell them." Ms. Schurr observed that "organizations are switching from company-owned hardware and software assets to per-use service models" and proposed that "[the] projected shift to cloud computing…will result in dramatic growth in IT products in some areas and significant reductions in other areas." As seen with other major evolutionary transformations of IT over the last four decades, new technologies can be disruptive initially, with hype moving faster than reality. But when technology is understood, the benefits begin to outweigh the negatives. Cloud concepts can mean different things to different people.

As **Charles Leadbeater** points out, another helpful analogy is embedded in the phrase "cloud computing" itself. Real clouds are made from the same fundamental component (i.e. water droplets), and these atmospheric clouds morph continuously from one type (e.g. cirrus) to another (e.g. stratus or cumulus). Similarly, shared online computing resources are the fundamental common component most modern networked applications and communities run on the same basic mix of IT infrastructure. The flexibility and scalability of cloud computing means that virtual clouds can form and dissipate as often as real clouds, depending on the interests and demands of end users.

Areas of Cloud Computing:

Cloud computing is again still searching for an established definition but as of now it means using web services of others to satisfy users' computing needs, like – software applications, data storage and using different platforms to build needed applications. On basis of this cloud computing can broadly be divided in following three segments:

- **Software as a Service (SaaS):**

In this application or software is given as service to users, who can access the required programme online. For example email and few other services offered by Google, Hotmail, Yahoo, Sify, Skype etc. For libraries, Library Automation software can be used without purchasing it and there will be no worries for AMC and daily backup.

- **Platform as a Service (PaaS):**

To run required service a special platform or application infrastructure is also being provided to the clients where clients can build their web based applications. A librarian does not require to know programming language, database management systems, etc. to run applications. Windows Azure, Google App Engine and Force.com can be few of good examples of PaaS.

- **Infrastructure as a Service (IaaS):**

In IaaS, clients are being offered with storage, networking and processing of data. Amazon's Elastic Compute Cloud (EC2) or Simple Storage Service (S3), VMWare vCloud are some of its examples.

Inspite of using cutting edge technologies in 'cloud computing', still we are in debate of its use in our official systems. Therefore, following pros and cons have been observed which may broadly be focused upon.

Strength

- All time accessibility of data.
- Technical problems related to storage and accessibility can be taken care by the providers.
- No need of procuring high capacity storage server.
- User does not have to download and install any update on his/her desktop.
- User does not have to be master of the applications used in 'cloud computing'

Weakness

- Security of data is the major concerned.
- Need high capacity bandwidth while accessing subscribed services.
- You can lose control on your information or data.
- What happen when stored data get lost?

Use of cloud computing is depend on person to person and organization to organization. Storing personal data or information on other's servers may not going to affect anyone else except you but where shifting or storing organizational data on other servers may affect everyone associated with that organization. Library is a service oriented system, which need high speed IN and OUT processing of data.

Cloud-based Services: The future of Library Services

In recent years and with growing speed, “the cloud” has stormed the technology world. Its use and inherent values have affected a wide array of industries, as well as the average customer using the Internet at home. People with Apple or Amazon accounts are already participating in cloud computing at a rapidly growing rate.

And yet awareness and understanding of the cloud still varies widely within library system.

A patron’s exposure may be limited to research touting the benefits of archiving books and other content online. A Librarian, by contrast, is more likely to have direct familiarity with cloud computing, as it has been promoted as a cost-effective technology to replace aging legacy systems. As a recent article in the Harvard Business Review reported, “Over time the economics of building and running a technology infrastructure will favor the cloud over on-premise computing.”

Why is the world moving rapidly to cloud computing? And what exactly does “cloud computing” mean?

In short, cloud computing refers to working with content that’s available at a shared online location, rather than a personal disk drive or server. All software and information is stored

exclusively on an online network (and referred to as “in the cloud”) with the Internet as the point of access for all users.

As an example, here’s how the cloud stores books: First, a user uploads digital book to a secure website instead of a local hard drive. Then, that person’s circle of friends or co-workers can view those books by connecting to that website. Sharing can take place among many people simultaneously, all accessing the same destination or URL in the cloud.

What makes cloud computing different from software and other IT approaches? And why is it important to get on the cloud now?

Unlike conventional solutions, such as installed software, cloud computing is uniquely defined by these characteristics –

Characteristics’ and Advantages of Cloud Computing

- **On-demand self-service:** Any resources, from vital library functions to basic email, are available to all users at practically any time.
- **Agility:** Upgrades can be made and applied across the network on one instance of software.
- **Broad network access:** Availability ensured, as access is location independent—users can access services from any standardized device, like a PC or tablet, no matter their locations.
- **Resource pooling:** Many can use the network at one time, accessing the same tools and functions simultaneously.
- **Rapid elasticity:** Compared to a traditional computing infrastructure, a cloud-based network can easily accommodate, and respond to, a rapid increase in the number of users as well as spikes in demand.
- **Measured Service:** A provider of cloud services measures service in the same way an energy utility measures the amount of power it provides and makes the necessary adjustments.
- **Cost savings**

  In an era of shrinking budgets, it gets harder with each passing year to justify the purchase and maintenance of servers that aren’t in use almost all the time. Cloud computing offers price savings due to economies of scale and the fact that you’re only paying for the resources you actually use.

- **Flexibility and innovation**

Organizations of all sizes can take more risks when it comes to creative, innovative technology ideas when the new application will run on someone else’s infrastructure. Libraries don’t 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’re both hosted in

the cloud, the resources devoted to each will shrink and expand as traffic rises and drops. Furthermore, creating and configuring new virtual server instances is fast and easy in the cloud.

- **Broad, general IT skills vs. deep, specialized skills**

Cloud computing increases the pressure on IT professionals to become well-rounded employees with highly-developed managerial skills. Knowing how to configure and network a server isn't enough. 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 your 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. Furthermore, techies will likely be part of the teams that periodically audit cloud vendors and ensure they're performing up to the contracted standards.

Private Clouds, Hybrid Clouds and Community Clouds

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. In particular, the major cloud computing vendors haven't yet fully addressed concerns about security, privacy and reliability. These concerns are leading some libraries to build their own private or hybrid clouds. 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. In this both public and private cloud computing environments are present. This hybrid model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons. Moreover, libraries can continually adjust and fine-tune the balance between the tight control of a private IT infrastructure, and the flexibility and savings of cloud-hosted infrastructure. If reliability or security of one vendor becomes a concern, libraries are not committed to one company or one model of computing services. Moreover, if the thought of "building and managing its own data center" library's might consider a **community cloud**.

Google plans to launch a **government-only cloud** this year to address government concerns about security and privacy. Just as companies presently cooperate with one another to buy IT equipment, bandwidth and the services of IT professionals, libraries may soon cooperate in the building and management of data centers. Alternately, if enough libraries express interest, a company such as Google, Amazon, Microsoft or another cloud vendor might create a **Library Cloud** similar to **Google's Government Cloud**. Or, a library vendor with deep IT resources (e.g. OCLC or SirsiDynix) might build library-centric cloud services on top of cloud infrastructure leased from one of the more established players.

Cloud OPAC and Cloud ILS

Over the past year, more and more ILS vendors have started offering cloud-hosted versions of their products. OCLC joined several vendors last year when they began offering a cloud-based ILS tools that complement their existing cataloging tools (e.g. WorldCat and FirstSearch) and

some cloud applications are e-mail, RSS, file storage, word processing and other simple applications.

How Secure is the Cloud?

Of late, cloud computing has taken the IT world by a storm. More and more Libraries are migrating to the cloud instead of local storage. Not only is cloud storage cheaper and requires lesser maintenance, it also fosters greater collaboration and resource sharing capabilities. It is good when data from these web based clouds is accessible to users but what will happen when we see any cloud burst?

While cloud-based services offer you increased visibility and flexibility, security is still the most important aspect of any Library Information System. Some library professionals may be reluctant to have information "out there" on the cloud; it is safe to say that cloud-based services offer distinct advantages in providing security.

- The ability to back up data at a secure location that's geographically separate from the primary location.
- The ability to apply a uniform, high level of security, privacy controls, and resources that can continually improve over time. By scaling security and control over an entire network, small library systems benefit from a level of investment that they would be unable to leverage on their own.
- A single, integrated database platform that makes information available without the risks inherent in mending together multiple information platforms.

Perhaps most important, a cloud-based network can offer a level of constant monitoring that's simply impossible with paper-based and client-server software models. Physical files can get lost or misplaced and there is little ability to determine exactly who has touched (or even altered) a document.

Both Google and Amazon are now offering attractive cloud services for library and business organizations. The service is extremely reliable—our resource is stored across multiple servers and can be seamlessly shared among all our patrons and staffs.

At this junction, with cloud computing on the rise, questions are being raised about security issues. For a start, any document stored on an internet/intranet, no matter how big or small, can be subject to malicious hackers. However, generally speaking cloud based storage has often been under the attack of tech critics claiming it to be an insecure medium for storage of data.

Google and certain other cloud service providers have had their cloud of outages – however, this does not essentially make them less secure. **Cloud outages** are in no way more serious than traditional outages – the documents remain secure, only the server goes offline temporarily.

On the contrary, owing to such risks and security issues, most cloud based service providers take security as an important factor. Apart from **data redundancy**, providers such as Amazon also offer **data encryption** for enhanced security.

However, this is where as the end user, our decision comes into play. Of course, if libraries are opting for the cloud, chances are that they are doing it to minimize the cost of local storage – in other words, it does not make sense to use local storage for backups of our cloud resources. In such a scenario, before we opt for a cloud-based storage provider, look for the backup offerings – chances are, they will surely provide nightly backups, in which our documents and transactions are backed up every day. But a wiser choice will be to opt for **incremental backup**, wherein our data is backed up after each transaction. Obviously, ***incremental backup provides to-the minute backup and is more reliable***.

In this case, usage of cloud computing cannot be discharged on account of security myths. Trusting on a cloud based service provider to secure our resources is much the same way as trusting a postal or courier company with our letters – we often place our important letters and parcels in their hands, don't we? A mere isolated event or mishap with the courier service provider cannot essentially be generalized as the overall measure of service offered by that provider.

It goes without saying that the future of data and resource storage is cloud storage. Most providers offer a secure product with encryption, redundancy and backups. This persistent dedication to optimal security and the attention paid to it over the cloud ensures peace of mind for library professionals and users.

Conclusion

We know that library is not only a knowledge ocean; its ultimate aim is to provide satisfactory services for all the people. Libraries have the opportunity to improve their services and relevance in today's information society. So in the new era, library should improve itself constantly by adding many new IT technologies. Cloud Computing is one avenue for this move into the future. It can bring several benefits for libraries and give them a different future.

In this paper we attempted to improve library services by using Cloud Computing. Although study of Cloud Computing is still in the initial stage now, impacts brought by Cloud Computing are obvious. With the introduction of Cloud Computing in the 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. Cloud environment is a highly developed network environment; it appears to the users of high-quality service and high security. The Cloud Computing techniques and methods applied to Digital Libraries, not only can improve the utilization rate of resources to address the imbalance in development between regions, but also can make more extensive use of Cloud Computing to our work life.

The cooperative effect of libraries using the same, shared hardware, services and data- rather than hosting hardware and software on behalf of individual libraries- can result in lowering the total costs of managing library collections and enhancing the both library user's experience and library staff workflows.

The vision is to use Cloud Computing to deliver library resources, services and expertise at the point of need, within user workflows and in manner that users want and understand. It should be free libraries from managing technology so they can focus on collection building, improved services and innovation. The Cloud Computing model will encourage libraries and their users to participate in a network and community of libraries by enabling them to reuse information and socialize around information. It can also create a powerful, unified presence for libraries on the web and give users a local, group and global reach.

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