Cloud Computing For Library: A New Vision

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Abstract: Cloud computing is the essence of future computing needs that has emerged to be a savior for library professionals. It is an emerging technology characterized by an element of novelty where the research community has recently embarked. There has been drastic shift in the trinity of libraries: books which have become electronic, user which prefers web resources than print and the staff which has become cybrarian. In this changed library landscape there is need to shift our competencies for the challenges offered by IT. Availability of independent computing components on demand like cloud as CPU, Storage in cloud has removed the web of IT and librarians can focus on their mission and services

Keywords: Cloud computing, Literature review, Libraries, Cloud computing in libraries

I. INTRODUCTION

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 business or organization which relies on technology. Anyone connected to the Internet is probably using some type of cloud computing on a regular basis. Whether they are using Google's Gmail, organizing photos on Flicker or searching the Web with Bing they are engaged in cloud computing. As Geoffrey Moore points out, the interesting thing about cloud computing is it did not start as a technology for the business enterprise, but was driven by the public with services like Face book and Flickr.i Over the last few years businesses have started to see the value of cloud computing causing it to become a major technology solution for businesses and organizations around the world. Looking across the information and broader technology landscape, it is not difficult to find success stories of switching to cloud computing, disaster stories, and a great deal of debate about what cloud computing is, or isn't. 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.

II. WHAT IS CLOUD COMPUTING?

First there must be a definition of cloud computing for this discussion. The Gartner group defines cloud computing as "a style of computing in which massively scalable and elastic IT enabled capabilities are delivered as a service to external customers using Internet technologies. This into essentially four different types of cloud computing: infrastructure, platform, applications and services. To put this in more concrete terms, examples of each can be:

Type What it is Examples

a. Infrastructure Buying space / time on external servers Amazon A3 Bungee Platform
b. An existing software platform to build your Face book
c. Applications Software applications accessed with a Web Browser Google Docs Salesforce.com Services
d. Ready to use services accessed with a Web Browser ADP Mint. Com

Different people gave different definitions on cloud computing. Many cloud services actually incorporate two or more of these types. For example, Google Docs provides infrastructure as well as applications. But what does this new style of computing mean for libraries?

III. HOW IS CLOUD COMPUTING DIFFERENT?

For much of the past 25 years, software development and system engineering has centered primarily on the personal computer. The PC era was characterized by monolithic, proprietary operating systems and programs that had long development times and release cycles. In that environment, the design of software was isolated and all attention focused on a single application. With cloud computing, hardware and functionality traditionally installed and run in a local environment is now performed on the network, in the Internet cloud. In essence, the Internet cloud becomes the development platform and the operating system to which programmers write reusable, constantly updated software components that are delivered over the network and that can be embedded or loosely coupled with other Web applications. Libraries have been using some cloud computing services for over a decade. Online databases are accessed as cloud applications. Large union catalogs can also be defined as cloud applications. However, a look outside libraries is warranted to better understand the value proposition of cloud computing.

IV. WHAT CAN CLOUD COMPUTING SOLUTIONS DO FOR LIBRARIES?

So turning to cloud computing and libraries, are their real problems that can be solved? The answer is yes. The library community can apply the concept of cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help libraries save time and money while simplifying workflows.

A brief list of potential areas of improvement could include:

a. Most library computer systems are built on pre-Web technology

b. Systems distributed across the Net using pre-Web technology are harder and more costly to integrate

c. Libraries store and maintain much of the same data hundreds and thousands of times

d. With library data scatter across distributed systems the library's Web presence is weakened

e. With libraries running independent systems collaboration between libraries is made difficult and expensive

f. Information seekers work in common Web environments and distributed systems make it difficult to get the library into their workflow

g. Many systems are only used to 10% of their capacity. Combining systems into a cloud environment reduces the carbon footprints, making libraries greener These improvements can be grouped into three basic areas: technology, data and community. Each offers some general and some unique opportunities for libraries. Looking first at the technology that most current library systems employ several benefits of cloud computing solutions surface.

A. Migration:

There are some points which need to be taken care before migrating libraries over the clouds.
Few of them are as follows:

a. **Know your cloud provider:** In the deluge of recent-comers to the cloud market, it is important to check the credentials of your chosen provider to know what you are getting and not getting. For instance, does the provider have a long history of solid security, if provider has commitment to security and history of executing security on their more traditional servers, it stands to reason that they will merge that commitment with their Cloud based offerings as well. It takes work to get security right, and work translates into experts and quality hardware, neither of which is free.

b. **Define the library needs:** Make sure the library can clearly articulate a good library fit for the cloud setup. While storing files might work well for the cloud, database queries from the library staff to the cloud can seem like adding light years to your response times. It might be worth a second opinion to see whether the Cloud is right for the library. At least be prepared to bring some optimization expertise to the table when shifting processing to the cloud and consider whether or not you would be better served by a local server dishing up virtual machines.

c. **Encrypt your bits and bytes:** Bothe at rest as well as in transit, encrypt as much of your cloud data and traffic as the library can get away with. It adds a layer of complexity and a little processing overhead, but not much and the peace of mind will be worth at the end. There is need to talk to the experts in the cloud for the development and also taking help of the users of the library.

d. **Manage your Cloud access:** Because putting your data or processing in the Cloud means it is step removed from your physical control and because cloud content can often add up lot of valuable intellectual property and sensitive information, the library need to make sure to control who can access it. The Cloud provider may promise to look after the data, but that does not relieve the responsibility for policing the access the library authorize. It's a good idea to limit access to specific individuals that need access, not just leave the connection open for everyone to use. It should consider two factor authentication instead of merely relying on passwords.

e. **Backup your Cloud data: -** Depending on the use case, the library may be backing up data to the cloud or using it for any number of other processes. If library take a few minutes and see that the data is duplicated, whether data access daily that is stored in the cloud, or cloud based backups, and one can retrieve it library will be miles ahead in confidence knowing that if something bad really did happen, the library will be protected.

f. **Check the fine print for cloud:** The library should get right to access, retain, use and disclose the library cloud account information and files. The cloud provider should also give technical support and address technical issues. The agreement should protect the service and its users (library) from fraud or security threats with applicable law. They should antivirus protection but along with this even the library needs strong end point security on those devices that are permitted to access library cloud.

V. MODELS OF CLOUD COMPUTING

Models are mental or pictorial representation of an event or phenomenon. Generally models are employed to study such phenomenon which cannot be seen or felt. Scholars have also used models to study cloud computing. The Cloud Computing model constitutes three service delivery and three deployment models.
The service delivery models are:

a. **Private cloud**: a cloud platform is dedicated for specific organization,

b. **Community cloud :** In community cloud model, the cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns.

c. **Public cloud** available to public users to register and use the available infrastructure, and

d. **Hybrid cloud**: a private cloud that can extend to use resources in public clouds.

VI. SOFTWARE AS A SERVICE (SAAS).

In SaaS, customers are renting complete applications instead of purchasing and installing the applications or software on their computers. SaaS provider hosts the applications and makes the applications available over the network. SaaS applications are multi-tenant applications which means that the applications are shared to multiple customers. However the applications are logically unique for each customer. It is the responsibilities of the provider to secure customers information in SaaS . Several examples of SaaS applications are online word processing tools and web content delivery services. Companies that offer SaaS services include Google and Salesforce.com.

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VII. PLATFORM AS A SERVICE (PAAS)

Consumers purchase access to the platforms, enabling them to deploy their own software and applications in the cloud. The operating systems and network access are not managed by the consumer, and there might be constraints as to which applications can be deployed. 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. Client 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

VIII. INFRASTRUCTURE AS A SERVICE (IAAS)

IaaS service offers virtual machines as well as other abstracted hardware and operating system over the network. By renting IaaS service, the customers can use the latest infrastructure technology and they do not have to concern with updating the technology. Contrast to SaaS and PaaS, customers of IaaS are mainly responsible for securing the leased infrastructure. Companies that offer this service include Go Grid, Flexi scale, and Amazon.

IX. THE RISKS AND BENEFITS OF CLOUD COMPUTING

a. *Risk 1: Network Dependency:*

Cloud computing is dependent on the internet. The most basic drawback of cloud computing is that you need internet connection to access the cloud and this direct tie to the internet means that this system is prone to outages and service interruptions at any time. This could occur in the middle of a task or transaction, meaning the action could be delayed or lost entirely if time sensitive.

b. *Risk 2: Difficulty in creating hybrid systems:*

This pertains especially to those organizations that hold sensitive information. Organizations like government offices and financial institutions usually have their own IT services and will not take their data offsite despite the benefits of efficiency and performance. There really are no current industry standardized forms that come apply to all systems when it comes to connecting to new cloud systems. With legacy systems, compatibility with a public cloud structure would need some IT magic and some hardware tweaks. And with a legacy system run organization it's likely they will not part with these tried and systems.

c. *Risk 3: Centralization:*

Organizations usually outsource data and application services to a centralized provider. In cloud computing, we know that network dependency is a drawback due to outages. Centralized data can certainly add another risk to cloud computing: If the provider's service goes down, all clients are affected.

d. *Risk 4: Data Integrity/Security:*

There is already a huge risk with data hosted in-house, so its no secret that data offsite sits at even higher risk. With Data offsite, more avenues for attack and the fact that it will be traveling more makes it easier to be intercepted. With

technology always improving, there are ways to make sure of better encryption. However with technology always improving, there are always people out there improving their hacking skills.

a) *Benefit 1: Flexibility:*

Network Dependency may mean dependency to the internet, but it means independence from the office. Employees are now more able to access data from servers outside the office and not hard-wired in-house servers—creating a more flexible and mobile work lifestyle for organizations. Not only does cloud computing provide flexibility for workers, it provides flexibility in implementing changes and new technologies without high risk and cost. Because organizations aren't bound to a hard-wired IT infrastructure that cost billions to create in the first place, the have room to experiment and change things with the ability to just as easily revert back to their original system if things do not work out.

b) *Benefit 2: Cost Reduction and Increased Efficiency:*

The low barrier of entry and the pay-per-use model offered by cloud computing makes it very versatile. It is scalable for large corporations and affordable for small ones. Since a massive amount of resources is not needed for everyone, they can be leased to other clients, and the cost can be divided among those clients. A cloud provider can offer an infinite amount of resources to many users. Because of reduced cost and time, organizations can focus efforts elsewhere and be more efficient.

c) *Benefit 3: Reliability:*

While internet connectivity and the provider itself being subject to outages is a scary fact of the nature of cloud computing, there is still more reliability in comparison to in-house systems because of the economies of scale. The vendor is more able to give 24/7 technical support and highly trained experienced staff to support the infrastructure at its best condition, and the benefits will reach all their clients. Compare this to each organization having a team of on-site IT people with varied skill set.

d) *Benefit 4: Security Gains:*

Yes, there are security risks with cloud computing. But as mentioned above, the traditional, in-house data storage system comes with risks as well. The gain here lies within smaller, newer companies with low-budget for implementing security systems and less know-how about security technology. The cloud provider already provides the hardware and knowledge for the most current security measures. It is evident that implementing a new data system comes with serious risks to consider, but it is also clear that the benefits of cloud computing can be factors that help business grow—especially smaller ones.

A. *Pros and Cons of Cloud Clouding:*

Cloud computing gives greater efficiency as servers are shared and can run multiple program instances simultaneously thus optimizing the resources. The main advantage of cloud is flexibility i.e. if we are adding new information resources in the cloud, they can quickly add computing resources if the services become more popular, instead of adding new servers. Virtual servers can also be

started in the clouds and operated only as long as needed. Cloud computing is not always cheaper when all factors related to it are considered such as network bandwidth, transition costs and backup storage costs. Another concern is about security and privacy. It requires proper precautions to minimize the risk

X. CLOUD COMPUTING SERVICES

Cloud computing services or cloud services are typically categorized into three types namely Software as a Service (SaaS), Platforms as a Service (PaaS) and Infrastructure as a Service (IaaS) . These three categories offer different services to cloud customers. Usually, cloud customers can demand on the type of services they require. Brief description of the three services will be presented in the subsequent sections.

XI. 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. 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 users experience and library staff workflows. While local library systems served an important purpose earlier in library automation they now represent a tremendous duplication of effort. Each library builds and maintains a database, buys equipment and installs and updates the software. In fact, some libraries can get stuck in perpetual upgrade mode, which involves lots of testing and retesting and time-consuming customization.

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