

LIS 631

Cloud Computing

Final Paper and Analysis

Christian Burris
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Introduction

The concept of cloud computing has been well known in the business community for many years. Companies have been able to take advantage of the option to let a third party agency from the outside manage the storage of their network resources, allowing those companies to reallocate those local resources for other purposes (Han, 2010). Libraries have begun to experience cloud computing on a wider scale more recently, and the full potential for the services currently offered have yet to be discovered. Further, libraries must decide how to adopt these services in their own workflows, hopefully expanding on their own mission and vision to serve their patrons (Scale, 2010).

Observing the advent of cloud computing into libraries has been to witness a truly emerging trend. This paper will address the trend of the relationship between cloud computing and libraries. It will examine the growth of this idea and its impact on libraries, along with the costs that are involved and what libraries are doing to address them.

Definition

Cloud computing, at its heart, cannot be defined into a narrow category. One idea has been the information technology needs of an organization offered as services by a third party agency (Buck, 2009). It can also be viewed as transferring the approach to a traditional mainframe computing model to the internet, allowing users to access data files remotely (Breeding, 2009). Additionally, cloud computing can be viewed as an individual accessing computing applications remotely through the internet rather than using software loaded on a personal computer (Hane, 2008). Synonyms for this concept include “on-demand computing”, “information utilities”, and the “internet as a platform” (Fox, 2009).

In truth, the definition is a synthesis of all of these viewpoints that represent a steady evolution of distributed computing for decades. Computing models have moved away from the days of locally managed data only to access through multiple sites, virtual access, dedicated hosting, shared hosting, and web hosting (Breeding, 2009). This has led to the model of offering software as a service, or SaaS, that takes the responsibility of purchasing, licensing, maintenance and upgrading personal software away from the user and placing it with a remote access provider (Buck, 2009). Cloud computing is an outgrowth of the SaaS concept and taking this model into a new direction: the hardware required to run software programs is itself an abstract need and was not needed for them to operate successfully (Breeding 2009). In other words, the software is hosted remotely and can run independently, regardless of the platform that is used to access it.

Cloud computing has three levels of service (Fox, 2009). Each of these embraces the concepts of remote computing:

- *Infrastructure.* Data storage and applications with remote access (Scale, 2010).
- *Platform.* Users build specialized software applications that other users can access by the internet, specifically through the Web (Scale, 2010).
- *Software.* Individuals are not required to upgrade their hardware or software because all of the services would be hosted by the Web (Scale, 2010).

For libraries, computing needs can be separated into the broad categories of user computing needs and library goals (Han, 2010). User needs translate into the software packages that run on individual computers, while library goals relate to the mission of the library to support research and instruction for its respective computing. Cloud computing can serve these

needs, for instance, as an e-mail package to facilitate the exchange of ideas to an institutional repository that would be hosted at a remote location.

Cloud computing can also represent the manifestation of certain trends in information exchange (Murray, 2010). The first would be concerns over security and the control of content (Murray, 2010). This would mean less time on the day-to-day operations to manage these tasks, and more on policy to govern these services. Next, it would be an opportunity to streamline current workflows and develop a chance to work collaboratively on new projects (Murray, 2010). Social media services can be adapted for business use, or developing SaaS for new and unique web services. Finally, it would be a method of sharing information socially with the additional goal of the exchange of knowledge (Murray, 2010). Existing services such as VuFind have flourished in this environment as a new way to encourage the discovery of library resources.

Cloud Computing and Libraries

Using the SaaS model, cloud computing was able to build on the foundation of its predecessor as software that operated independently of the platform that was designed to run it (Breeding, 2009). Inevitably, this has led to an introduction of both positive and negative consequences into libraries.

Positive consequences include:

- Reduction in introduction technology support and expenditures (Buck, 2009).
- System access regardless of device or location (Buck, 2009).
- Multitenancy, or the ability to leverage resources and costs with a group of users (Buck, 2009).

- Reliability through the redundancy of information (Buck, 2009).
- Scalability of resources (Buck, 2009).
- Support for infrastructure no longer an in-house concern (Fox, 2009).
- Need for local upgrades no longer important (Fox, 2009).
- Concerns for storage space and associated costs are pushed to outside vendors (Fox, 2009).
- Individual and/or bulk licenses for software are no longer required (Fox, 2009).
- No “per-host” license needed for operating software (Fox, 2009).
- Cost-effective measure that would allow for flexibility, safe data exchange, and a high availability of data in large quantities (Han, 2010).

However, these negative consequences must be considered:

- Pricing models must also be considered (Buck, 2009).
- Concerns regarding privacy and security on a remote system (Buck, 2009).
- Moving services and stored data between providers (Buck, 2009).
- Stability and the quality of service (Buck, 2009).
- Plans for outages in service (Buck, 2009).
- Reading the fine print to understand limits of service (Buck, 2009).
- Hosting of services by an outside company and its employees (Fox, 2009).
- Risks of confidentiality and sabotage (Fox, 2009).
- Possibility of data loss (Fox, 2009).
- No local customization or development (Fox, 2009).
- Data interface is only as good as what is provided by the vendor (Fox, 2009).

The risks involved with an outside company managing library data could also be compounded the perceptions of librarians themselves. The first risk would be the issue of trust, as libraries give up the local management of data and give it to an outside agency (Mitchell, 2010). This can also reflect a fundamental change in libraries themselves, since more libraries are moving beyond the realm of information storehouses toward information access providers. Related to this concept would be the changing skill sets required to manage data in a cloud setting (Mitchell, 2010). Ideally, this would support training for locally hosted systems, but at the same time it may involve a new set of procedures that may not have been previously considered. Finally, there would be the matter of legal jurisdiction which is a gray area in this exchange (Han, 2010). The uncertainties of data ownership once it has moved to the cloud as well possible recourse for library seeking to move that data either to another provider or back to the library itself is an area that left open, at worst, for a court to decide.

Currently, libraries may use services from several providers that are cloud-based but without the perception of cloud computing. OCLC has operated WorldCat from the cloud for several years, using library-generated records as its foundation to show local holdings and information (Breeding, 2009). DuraCloud, an online digital repository, permits users to store information remotely and later, using the speed from a local internet connection, allow users to access that data and interact with it accordingly (Breeding, 2009). Some open source integrated library systems, such as Koha and Evergreen, use cloud computing for all traditional library operations without the need for libraries to host that information on a local server (Collins, 2010). Services such as Google Scholar often operate in tandem with the suite of online products accessible to a library, supplementing online services and giving a greater breadth and depth to particular resources (Scale, 2010).

Cloud computing has also spread through libraries as users comment on their successes and how effectively they are being used in the course of library operations. Libraries have been able to embrace some of the selling points of several programs, such as collaboration and resource sharing, which would have been cost-prohibitive to provide to library personnel (Mitchell, 2010). Additionally, the interaction between libraries and patrons who may have difficulty accessing particular programs could be removed with programs that would operate regardless of the operating system used to access that, whether it was a laptop running Linux or a smartphone (Pretlow, 2010). Publishers have also entered the cloud as well, making specific data sets available to libraries in the same manner as a database subscription (Fox, 2009).

To date, libraries have adapted several cloud-based services into their workflows. As these services become more commonplace, their ease of use has advanced their incorporation into library procedures (Mitchell, 2010). For example:

- Google Docs to work collaboratively on specific projects (Buck, 2009). This can also be used for brainstorming exercises and similar group activities (Pretlow, 2010).
- Google Calendar and Gmail for scheduling and e-mail amongst staff, students or volunteers. A shared calendar can also benefit the coordination of a timeslots at the convenience of users (Pretlow, 2010).
- Dropbox has been utilized to provide additional data storage, and its interface can be customized to restrict data and folders from users according to access needs (Mitchell, 2010).

- As a more inventive approach, GoToMyPC has been used by individuals to access their computers at work from outside locations, such as meetings or conferences (Buck, 2009).

Costs

The costs for a library to move to the cloud may be more significant than dollars and cents. As mentioned previously, libraries must “surrender” local control of their data and its upkeep to an outside agency, possibly one that does not work with libraries on a regular basis (Mitchell, 2010). The library should not approach this without a full review of this decision and how it would impact local services: it may be possible to drop the need to upgrade programs and other software, but the hand-off in service may not be easy to determine (Scale, 2010). If the library is convinced that the benefits can easily outweigh the drawbacks of such a move, then the problems could be significantly reduced (Pace, 2009).

The perspective of library users and providers should also be considered in this process. If a library chooses to go in this direction, a user would not have to feel the concerns of maintenance of management if a service is inaccessible; the user should be able to gather the data and research as required without any obstacles (Scale, 2010). For a provider, the cloud should be a method for users to access information as easily as a locally hosted catalog (Scale, 2010). In either case, this access should be invisible and preferable seamless to all parties from either aspect of the service.

The goals for a library should be the center of any discussion about cost. Libraries have often been called upon to do more with less, and capital is no exception to this rule. Services such as a library website, and integrated library system, and a central repository can be important

for a library to fulfill its mission and remain effective to its users (Han, 2010). If the costs for any of these services can be offset- either partially or in full- by an external provider, then libraries may choose these as options for its staffing and resources. In turn, libraries could benefit from these services that had been placed on hold due to lack of development time and see a greater return on the investment of staff time to address these new services (Fox, 2009).

In the end, the question of monetary cost remains a deciding factor for these services. Libraries have sought to keep costs as low as possible, and the possibility of combining or replacing current services with cloud-based application can be an effective method to reduce costs and hopefully have a return on the initial investment (Breeding, 2009). Moreover, “free” services may not have that description in reality, as the costs in staff time and research time could have unforeseen results not obvious at the moment of activation (Mitchell, 2010). Subscription-based services, by that reckoning, may have similar concerns of cost, though these would be addressed either during the disposition of the contract or at the beginning of service (Mitchell, 2010). The desire to cut costs can lead to measures of efficiency for libraries, as the movement of resources toward the cloud can be an opportunity to examine workflows and evaluate processes across the board (Breeding, 2009). These costs can also be the most difficult to predict, as they could lead in directions that can only be addressed during the course of normal operations.

How Libraries Are Handling Issues

Like the introduction of other technologies into libraries, cloud computing has been viewed as an opportunity to expand library services and the goals of libraries overall (Hane, 2008). However, the advent of cloud computing is hardly a new concept for libraries. Beyond

the library services that already exist on the cloud, the roots for cloud computing reach back to the early client-server models in the 1960s, when “dumb” terminals were the only way to access remote resources (Fox, 2009). It is up to libraries to determine how these resources will provide the best service, even if there are cases where the decision may not be to move to the cloud computing at a particular time. Like the business world, finding the tipping point may be a moving target (Breeding, 2009).

One of the most valuable services from cloud computing has been the ability to create user communities. The library can view these cloud-based services as a method for organizing and accomplishing specific goals as well as a way to simply get things done (Scale, 2010). In this action, libraries can define that community in a more personal way with the factors of membership, influence, the integration and fulfillment of needs, and a shared emotional experience as a way to create cohesion and foster a sense of belonging (Murray, 2010).

Cloud computing has also mean that libraries can take a proactive approach toward major projects. The “library as a place” philosophy has permeated the operation of contemporary libraries, so cloud computing services are scarcely an exception to this rule. These services can also be viewed as Web 2.0 technology and the services that have been introduced as a result (Murray, 2010). Library patrons feel a sense of participation in the larger community through services such as Library Thing, but library staff can also enjoy the benefits of having a stake in some measure of library operations. The two-way nature user generated content, a feature of Web 2.0 software can flourish in this level of interaction. By extending this idea farther, contemporary users are eager to access information on their own terms, regardless of their location or the device they are using to reach the content (Fox, 2009). Keeping the platform as “blind” as possible can push library content toward a much wider audience.

Perhaps the most profound change in this transition has been the shift away from the libraries “owning” their data to “accessing” it instead (Scale, 2010). The correlation to libraries that have already moved to cloud-based resources to enhance their collections can be compared to the introduction of electronic resources into libraries years before. When libraries accepted the remote access model for these resources, it can be argued that it was preparation for what was to come later. The SaaS model has been able to extend into the area of software itself, turning the question of local ownership back to the providers of this software, and therefore the responsibility for its access as well (Breeding, 2009).

Libraries have also been about the users who utilize library resources and their collections. The expectations of library users has grown in the past decade as their experiences with non-library websites such as Google and Amazon have raised their expectations for what library websites can go in turn (Buck, 2009). The question has often been asked is ‘can these external providers threaten the library mission?’ in deciding how these expectations can be solved by cloud computing (Scale, 2010). Inevitably, if these services can allow a faster response to the needs of patrons by adapting and scaling library information systems to fulfill those needs, then the effort was not in vain (Mitchell, 2010).

Conclusion

Cloud computing has come a long way from its introduction in the business community to its adoption by the library community. Creating a working definition of cloud based technologies was important to its development as a frame of reference. The adaptation of cloud-based services to support (or replace) current library technologies was a turning point for many libraries as the staff and computing resources necessary to achieve these results previously were

repurposed to other areas. The cost of these changes was, at its basic level, to determine if these services could support the mission of a library; after a measure of review, the benefits were largely positive for libraries that chose to move in this direction.

Cloud computing can also be regarded as a tool that effectively leveled the field between certain levels of disparity. Smaller libraries were able to provide services like their larger counterparts. People without a certain level of computing power could bridge the “digital divide” at a greater pace. Most of all, libraries could strategize the deployment of resources both effectively for their budgets and efficiently for their staff. The full effects of this revolution may not be known for several years, but it represents a step toward libraries taking a measure of control on their collective futures.

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