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LIS 631

Bucknall

2010 December 3

## Cloud Computing in Libraries and Library School

In the spring of 2008, I was a senior who could almost taste the summer when I would have my bachelor's degree in hand. As part of that final semester, I had to take a seminar and project class to wrap things up. Each week we set aside one class to discuss technology trends. Since our program's curriculum was so general, we discussed technology in only the broadest terms.

One day, I ran across an article on a concept that I had never heard before: cloud computing. When I brought it up in class and explained it, my teacher dismissed the idea as juvenile because of course nothing would ever replace desktop applications! Nor did she see any reason as to why people would want their data to be stored externally. I kept my head down and did not bother to challenge her beliefs. In that program of study, she was probably correct; you cannot do advance video editing via streaming since we regularly crashed the brand spanking new Macs in our projects. As of this writing, this is probably still impossible. However, major aspects of our curriculum such as graphic design and document creation can now be done entirely online without ever downloading a program (Aviary.com for example). In fact, "According to a September 2008 Pew Internet & American Life study, 69% of online Americans have already participated in cloud computing activities" (Kroski, 2009).

Now I am a semester away from graduating with a master's degree in library and information studies. In the nearly three years since that undergraduate class, cloud computing has become ubiquitous. The penetration of cloud computing has reached within the daily lives of consumers and is now swiftly moving into the realm of my new profession of librarianship. It is here there is an acceptance of this trend until the point that it is almost impossible to believe that modern library users have never interacted with what is often just referred to as "the cloud." This paper will define cloud computing in libraries, how it impacts libraries, what are the costs and finally will look at how cloud computing is being discussed for usage in a library school.

**What is Cloud Computing?**

Cloud computing can be understood as a way to use off-site computer processing power to replace content creation and servers that were traditionally hosted onsite. In layman's terms this means "using Web services for our computing needs" (Kroski, 2009). Cloud computer allows content creation to be made "when data and software applications reside on and are drawn from the network rather than locally on any one workstation" (Schnell, 2009). By utilizing online applications, users can create and save their files online, share content (often for free!), work collaboratively with others or create entire services that can all be accessed online without need of having the programs on their own computer.

These online services can reduce the need for expensive software, hardware, and even advanced technical knowledge from library staff since cloud computing services are often streamlined to be very user-friendly. As well, "the focus shifts away from which devices effectively store data and able to run applications to which devices can provide the easiest access to data and applications – which are stored at various places on the Internet" (Schnell, 2009).

**How the Trend Will Impact Libraries**

Beyond the basic components like hosted email services that have a strong consumer base, cloud computing can be utilized to address needs which are specific to libraries. This can be broken down into the three types of cloud services, replacing a library's onsite technology environment with an online version, and then situations where a library can create its own cloud infrastructure. These areas offer "benefits to information professionals: outsourced infrastructure, greater flexibility, reduced barriers to innovation, and lower startup investments" (Thomas, 2010).

The three main types of cloud services are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) (Kroski, 2009). First, cloud computing offers the ability of libraries to use online software to handle a task like video chat through either Gmail video chat or through Skype. Both of these are free services though there is "little customization or control available with these applications" (Kroski, 2009). In other words, services you offer through a SaaS' interface will look like that of your competitors which will not distinguish you from them. On the other hand, since the services and application interfaces are often familiar with users, there would be a decrease in the learning curve for library staff and users.

Second, libraries can create applications in an online environment. These environments allow a library to "build, test, and deploy Web-based applications" (Kroski, 2009). PaaS gives the library the freedom to explore development options without having to purchase and maintain the required infrastructure. This way, if a particular program turns out to not be popular or a best

fit for a library, they are not stuck with unwanted hardware and software which they could not recoup the costs from.

Third, a library no longer has to purchase their own servers to host their content. By using IaaS, a library can purchase server space and computing power. One of the major players in this arena is Amazon which offers the "Elastic Compute Cloud (EC2), which provides computing resources and Simple Storage Services (S3) for data storage" (Kroski, 2009). A library does not need to purchase a server which is underutilized but costs the same to purchase and maintain as if it were using all of its resources at all times. By using an IaaS, a library gains the benefit of only paying for the "resources you actually use" (Peters, 2010).

Cloud computing also offers the possibility for a library to replace their information technology (IT) infrastructure with an online solution. The Z. Smith Reynolds Library at Wake Forest University migrated "key IT services to cloud-based or hosted environments" (Mitchell, 2010). They used a mix of both cloud applications and open source software which they found out was not always compatible. When evaluating an online service, they evaluated the following areas: Service level agreements (legal protection), uptime reliability, cost, legal issues uploading patron data to the cloud, and what demands would be on staff to understand the new system (Mitchell, 2010). By moving sensitive patron data and services off-site, the library could face legal troubles if the server is hacked and if the server goes down, they will be unable to do nothing more than speak to customer service about the issue instead of having their in-house IT staff access and fix the problem. The Reynolds Library traded in some of its autonomy for the lower costs and flexibility of cloud computing.

Chris Peters wrote that he foresaw private clouds being developed for library systems. He described that these clouds would be hybrid that 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." The cost of developing and supporting a private cloud could be offset through the traditional consortia model which many libraries are already familiar with. On a larger scale, "a library vendor with deep IT resources [...] might build library-centric cloud services" (Peters, 2010) which would offset the responsibility of individual libraries or consortia trying to manage a cloud infrastructure.

Therefore the main benefit for moving to a cloud computing environment for a library is the ability to both try out new software without having to buy the hardware as well as being able to scale the computing power to meet the demand of users. A library's IT department can be more flexible in raising the amount of cloud computing they require by contacting their vendor instead of physically having to acquire new hardware to meet increased demands. This method will save the library money and staff resources.

**Costs of Cloud Computing**

At the 2010 Library and Information Technology Association (LITA) meeting, "One speaker mentioned dropping hosting costs from $54,000/yr to the cloud which costs $4,800/yr for both web and digital archives" (Jacobson, 2010). While this report gives an astonishing figure, libraries have not been publishing information about the cost of moving from traditional infrastructure to cloud computing. The reason surmised is that cloud computing is still a somewhat new concept that is still undergoing development and research. As well, there might be fears about releasing information about reducing costs in an economy where libraries are

already having their budgets slashed. If these cost saving measurements were known, a library may lose even more of its budget.

Despite this, libraries can and are saving money by moving to the cloud. The previous section discussed outsourcing the server infrastructure which eliminates both start-up and maintenance costs. Other less formal ways to move to cloud computing is in your software applications. The two main open source office suite applications are OpenOffice and Google applications. Both of these are free, but only the Google products are part of the cloud.

Google offers a number of replacements to traditional propriety software applications. Users can create documents, spreadsheets, forms, presentations, and even draw all online! As well, Google can host your institution's email, calendars, photos and more. Individual accounts are free. By a library increasing the presence of these cloud-based applications, they can cut costs of needing multiple licenses to have propriety software like Microsoft Office on every computer they own. Users' documents they created then belong to their own server space in the cloud instead of being a document that are forced to either type up, print, and then delete or save to a flash drive. This way, their document will always be waiting for them. By training users to use cloud based software solutions, wherever they can access the Internet, they will have their documents which will save not only them time but the library staff's as well (Stephens, 2008).

**The Cloud in the Library School**

While libraries can use cloud computing applications to create personalized portals for users (Stephens, 2008), the Department of Library and Information Studies (LIS) at the University of North Carolina at Greensboro (UNCG) could use cloud computing as their back up

methodology. This solution was proposed by me when confronted with the upcoming move of the department to another building on campus.

Before the move in late spring 2011, the LIS department will need to shed hundreds of pounds of paper. The main reason is a wish to not cart all that paper down the street, but the new building is also a LEED Silver standards building which means it "will meet the required criteria for sustainability as defined by the U.S. Green Building Council" (School of Education, 20010). With sustainability on the minds of the faculty and staff of the LIS department, they commissioned the graduate assistants to digitize the department's paperwork. I am the graduate assistant that manages the website, so my part in this project was to find ways to store and backup these papers as they are digitized.

The current proposal for back up within the LIS department is to have an external hard drive that is passed around to faculty members to back their data up on. However, this is a tedious process that also endangers the data due to the physical shuffling of the hard drive from place to place. The files that are to be backed up often exist on only the computers of faculty and staff or on flash drives. There is no centralized location of the files.

The method I am proposing is for the department is to create their own cloud server. This can be accomplished by the purchase of a Pogoplug device that connects to the network. Pogoplug is an internet enable product that will allow the LIS department to connect their own external hard drives to it and then anyone with the access permissions will be able to access the data stored on the hard drives. In summary, it is a simple cloud server. The website lists the price for Pogoplug Pro at $99 (Pogoplug, 2010). This would be a one-time fee that can further be reduced if the department buys it through a discount online vendor.

With Pogoplug, faculty and staff will be able to access the cloud hard drives through a web portal. Or they can also make their folder on Pogoplug appear as a folder on their desktop connected computer. In order to make this a backup solution, faculty should have a copy of the files also on their desktop computer. It will need to be investigated if a free synchronization application like ToySync from Microsoft would be capable of automatically keeping folders synchronized without the need to do it manually. This solution has been proposed to the chair of the LIS Tech Committee. The next likely step if the proposal goes through will be securing a Pogoplug and testing it on the network before full-scale implementation by all parties.

**Conclusion**

Cloud computing is a technology trend that will continue to gain traction. Services, products, and interactivity are often scattered but still accessible through any portal with Internet access. The flexibility of worldwide servers is only now being fully realized as more people are connecting via mobile devices like their cell phones, tablet or netbook computers. These products often have low computing power of their own and limited memory, but if they can access a browser, the user can partake in cloud computing. As well, Google is experimenting with the Chrome operating system which will further reduce the need for a traditional computer. It is targeted for people that want "most of the user experience [to take] place on the web" (Pichai, 2009). No longer is it strictly necessary to invest in expensive operating systems, software, or even very expensive hardware for the causal computer user. You can create content online and save it to the cloud. Then you can pick up where you left off the next time you log in.

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