More About Cloud Computing

585 Information Technologies

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Executive Summary

Cloud computing refers to utilizing web services which include numerous types of operating systems, applications, databases, database searching and retrieval, data storage, and communication that take place somewhere other than on your computer. Most of us are familiar with Yahoo or Google mail, Facebook, downloading movies or music, and sharing information in a wiki. These are also cloud computing applications.

Web services are available to private enterprise, government, schools, libraries, or individuals on an as needed or subscription basis, depending on the level and type of service requested. Costs must be carefully weighed, and in many cases do indeed provide an efficient and economical computing methodology.

Cloud computing is and promises to become even bigger business for many service providers. Amazon is rated as the top cloud computing service provider. IBM offers its technical services to future and existing clients in terms of providing educational material about cloud computing and providing cloud computing services as an upgrade path.

Cloud computing may not be economical for large data centers that are fully staffed with highly qualified individuals and fully functioning computer equipment. Concerns about security and privacy of information and the legal ownership of information have become prevalent in discussions about cloud computing.

The future for cloud computing service providers looks promising.
Introduction

Although this paper may seem general in nature, my purpose in writing it is to gain additional knowledge about cloud computing and describe what is involved in it in my own words, as if required to explain it to someone else, perhaps to a non-technical individual.

The process involved in writing this paper included studying areas in which I felt limited in my knowledge of cloud computing and where I wanted to know more. An outline was created as a guide for the PowerPoint slide presentation and conducting research for composing this paper. Scholarly journals and professional information technology articles, trade journals, and popular websites were scanned for information, including a white paper offered by IBM. To add a little pizzazz my presentation, images of clouds were included in the graphics. Searching for these images and selected just the right one was a lot of fun, adding enjoyment to a somewhat dry, yet informative topic! Citations and a bibliography were collected as I went along in the process and read articles. Costs of Could Computing seemed particularly interesting to me, so it was decided to share screen shots of some of Amazons costs and results of a study found comparing costs.

Definition of Cloud Computing

The Internet is often referred to as a cloud when depicted in communication diagrams, because it is nearly impossible to draw how a packet of information travels throughout the intricate web of wires, switches, circuits, microwave signals, servers, and transmission centers that comprise the Internet. Cloud computing may be defined in simple terms as web services that take place across the Internet, somewhere else, other than on my computer, yet I may access these services from my computer or computing device. These may be hardware or software services.

Applications

Different types of cloud computing applications or web services fall within five categories. These are: mobile, social, video, storage, and computing. There are many cloud computing applications that many of us are already familiar with using in our daily lives. These include visiting friends on Facebook, texting, looking at a mutually shared Google
calendar, sharing a wiki, having a service backup folders from a personal computer, downloading a movie, signing up for a daily inspirational e-mail, updating anti-virus program, or using Google apps.

Small businesses may use Google Sites to create and store a webpage, run a survey on SurveyMonkey, store and utilize databases, have services compute business trends, product selling services, payments and billing—it’s endless!

The number one of twelve top cloud computing service providers is Amazon.com (Techno-Pulse 2009). Amazon provides “compute, content delivery, database, E-Commerce, monitoring, networking, payments & billing, storage, support, web traffic and workforce” web services (Amazon web services 2010).

Terminology

Some of the fun terminology associated with cloud computing is vaporous or elastic. Amazon, as noted above, uses the terms cloud front, cloud watch, and private and public clouds. Key terms are:

- **IaaS** – Infrastructure-as-a-Service: This includes data storage, networking and bandwidth services, such as Amazon’s Elastic Compute Cloud with
  - DaaS – Data-as-a-Service (not desktop as a service).
- **PaaS** – Platform-as-a-Service: This includes an operating system and server stack such as Google Apps, Microsoft’s Azure, or Salesforce.com’s Force.com.
- **SaaS** – Software-as-a-Service: This includes running an application software package on a server located elsewhere, such as Google mail, NetSuite, or SPScommerce, or Salesforce.com.

Considerations

Advantages: A primary reason for small business, schools, or public libraries to find cloud computing attractive, is that it provides the ability to utilize someone else’s server and to stop the process of having to purchase and apply software and hardware updates, worrying about creating and running backup routines, and over- or underutilizing IT support. Alleviation of these concerns may allow staff to concentrate on other projects.
needing attention within the organization.

When there are a number of personal computers installed in a facility, it becomes difficult to continually apply updates, especially when the computers are in continual use, such as public access computers in public libraries. It may be more efficient to required the patrons to access Internet applications such as Google Docs/Apps or its competitors.

Cloud computing allows a business greater agility, doing more with fewer resources while improving business performance. For those businesses needing continual uptime and needing resources available 24/7, a highly efficient web service can provide on demand services with rapid delivery.

Disadvantages: A major disadvantage of cloud computing is that it may not be cost effective for a large data center. Most large, fully staffed data centers already provide secure web services to its branch locations and subsidiaries. These data centers may wish to consider extending their services to businesses outside their immediate arena and perhaps become cloud computing service providers.

There are other concerns to consider when contemplating a move to cloud computing:

- **Bandwidth** – How much bandwidth is enough, or is there ever enough bandwidth to satisfy our accessibility and response time needs? Is the bandwidth needed available in my area? How much bandwidth will my customers need? Is the cost of the bandwidth required effective or will it hurt the bottom line? How much data with be transferred in and out of the application or database?

- **Budgets and Contracts** - Organizations responsible for budgeting costs on an annual basis may find it difficult to begin cloud computing when future data usage needs and associated expenditures are unknown. One answer to this issue may be to participate in an application beta testing program. Our small public library is planning to participate in a program with the State Library of North Carolina to implement a shared OPAC utilizing Evergreen and WorldCat. In return to being *willing* to participate early in the program, we will be receiving additional, free support from the State Library’s IT department. This program, entitled NC Card will allow for the across the board check-out and return of materials to directly to/from any participating library in the state.

- **Security, data integrity, privacy, and trade secrets** – it is not advisable to place ultra secure data in a web service unless stringent measures are taken to protect this information.
Legal issues – Cloud users may question if legal ownership of their data changes when placed outside their immediate computing environment? They may also question, if data should be lost, who is liable? Other issues related to web services include copyrighting, ownership of trade formulas, legal copying of music, video, or images. Recently reported on news programs are issues relating to disclosing too much personal information, either by oneself or someone else, on social networking sites and then being impacted by potential employers picking up the information, affecting employability and even electability for political candidates!

**Costs**

Two categories of costs associated with cloud computing must be considered: (1) in-house and (2) web service usage and service charges. It is important to remember that businesses and their clients need a way to connect to the Internet and still retain the need of their in-house infrastructure (personal computers, wiring, LAN, electricity, data closet, floor space, and in many cases support personnel).

Screen shot to follow on next page.
Since Amazon, as mentioned earlier, is the top web services provider at the writing of this paper, *selected* screen shots of Amazon’s services and costs follow:
Basic Elastic Compute Cloud (EC2)

Amazon provides a full description of each service and associated costs, plus instances where free services are offered.
## Premium Support

**AWS Premium Support Pricing**

All AWS Premium Support plans include an unlimited number of support cases, with no annual contracts. Also, with the Gold plan, as your AWS charges grow, you earn volume discounts on your AWS Premium Support costs.

<table>
<thead>
<tr>
<th></th>
<th>Silver</th>
<th>Gold</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Greater of:</td>
<td>Greater of:</td>
</tr>
<tr>
<td></td>
<td>• $100 per month</td>
<td>• $400 per month</td>
</tr>
<tr>
<td>OR</td>
<td>• $0.10 per dollar of total monthly charges in relation to supported AWS services</td>
<td>• $0.20 per dollar of total monthly charges in relation to supported AWS services (first $10,000 of monthly charges)</td>
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<tr>
<td></td>
<td></td>
<td>• $0.15 per dollar of total monthly charges in relation to supported AWS services (next $70,000 of monthly charges)</td>
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<td></td>
<td></td>
<td>• $0.10 per dollar of total monthly charges in relation to supported AWS services (monthly charges over $80,000)</td>
</tr>
</tbody>
</table>

*(AWS Premium Support is sold by Amazon Web Services LLC.)*

The non-refundable one-time fee for Amazon EC2 and RDS Reserved Instances will be included in the Premium Support.
Cloud Front on Demand Pricing

<table>
<thead>
<tr>
<th>Regional Data Transfer Out</th>
<th>United States</th>
<th>Europe</th>
<th>Hong Kong &amp; Singapore</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 10 TB / month</td>
<td>$0.150 / GB</td>
<td>$0.150 / GB</td>
<td>$0.190 / GB</td>
<td>$0.201 / GB</td>
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<td>Next 40 TB / month</td>
<td>$0.100 / GB</td>
<td>$0.100 / GB</td>
<td>$0.140 / GB</td>
<td>$0.148 / GB</td>
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<td>Next 100 TB / month</td>
<td>$0.080 / GB</td>
<td>$0.080 / GB</td>
<td>$0.120 / GB</td>
<td>$0.127 / GB</td>
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<tr>
<td>Next 100 TB / month</td>
<td>$0.070 / GB</td>
<td>$0.070 / GB</td>
<td>$0.110 / GB</td>
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<tr>
<td>Next 250 TB / month</td>
<td>$0.060 / GB</td>
<td>$0.060 / GB</td>
<td>$0.100 / GB</td>
<td>$0.106 / GB</td>
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<tr>
<td>Next 250 TB / month</td>
<td>$0.050 / GB</td>
<td>$0.050 / GB</td>
<td>$0.090 / GB</td>
<td>$0.096 / GB</td>
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<tr>
<td>Next 250 TB / month</td>
<td>$0.040 / GB</td>
<td>$0.040 / GB</td>
<td>$0.080 / GB</td>
<td>$0.085 / GB</td>
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<tr>
<td>Over 1000 GB / month</td>
<td>$0.030 / GB</td>
<td>$0.030 / GB</td>
<td>$0.070 / GB</td>
<td>$0.075 / GB</td>
</tr>
</tbody>
</table>

Requests

- Per 10,000 HTTP requests: $0.0075 / GB, $0.0090 / GB, $0.0090 / GB, $0.0095 / GB
- Per 10,000 HTTPS requests: $0.0100 / GB, $0.0120 / GB, $0.0120 / GB, $0.0130 / GB

Simple Relational Database Service

<table>
<thead>
<tr>
<th>DB Instance Class (On-Demand)</th>
<th>Price Per Hour</th>
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<tbody>
<tr>
<td>Small DB Instance</td>
<td>$0.11</td>
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<tr>
<td>Large DB Instance</td>
<td>$0.44</td>
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<tr>
<td>Extra Large DB Instance</td>
<td>$0.68</td>
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</table>

<table>
<thead>
<tr>
<th>High-Memory DB Instance Class (On-Demand)</th>
<th>Price Per Hour</th>
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</thead>
<tbody>
<tr>
<td>Extra Large DB Instance</td>
<td>$0.65</td>
</tr>
<tr>
<td>Double Extra Large DB Instance</td>
<td>$1.30</td>
</tr>
<tr>
<td>Quadruple Extra Large DB Instance</td>
<td>$2.60</td>
</tr>
</tbody>
</table>

Multi-AZ Deployment

- When you run your DB Instance as a Multi-AZ deployment for enhanced data durability and availability, Amazon RDS provisions and maintains a standby in a different Availability Zone for automatic failover in the event of a scheduled or unplanned outage. Learn more about Multi-AZ deployments.
Alex Bowley reports in his “The up.time IT Systems Management Blog” (January 28, 2009) in a posting entitled “Cost of cloud computing, expensive!” Bowley details the costs of using Amazon’s EC2 service with providing the same service in an in-house, mirrored laboratory: Amazon total annual cost $789,919.68; Lab $298,666.67. The point taken from this article is not to criticize technique or pick apart the intricacies of the data studied, but rather learn awareness to question and analyze and web service costs carefully.

Service Providers

Techno-pulse.com (2009) lists their twelve top picks for Cloud Service Providers for 2009 and identifies the “watch out for the following [upcoming] companies,” one of which is AT&T. Apparently, there are numerous businesses interested in becoming cloud computing service providers, and there “will be more to come, chasing after the big $$$.”

For Libraries

Small public libraries, such as the one in which I work, may readily utilize web services existing today. These include the use of Google Docs or Apps; creating websites in MS Live or Google Sites; utilizing online informational services such as NCLive which provides ebooks, audiobooks, computer-based training (CBT), journals and newspapers, information, and database searching. Staff and patrons may attend webinars. Libraries may consider placing their circulation, patron database, and catalog database with a web service provider.

Sean F. Fitzpatrick reports in his article entitled “Early Adopters Climb on OCLC’s Web-scale Management Cloud” which appeared in American Libraries (September 2010), that “the University of Tennessee at Chattanooga and Pepperdine University in Malibu, California, are the first in line to go live with OCLC’s much hyped Web-scale Management Services (WMS)... This change to a web-based system with a modern interface is huge.”

In our small public library system, I received permission from our director and recently created a new, well functioning website in Google Sites (on which I can easily expand, make edits, and change colors seasonally) and have provided links to NCLIVE, homework help and other digital libraries, Learning Express CBT, NC Knows live chat with a librarian, and even Amazon, where we are using a Wish List service for donations. Please visit
www.madisoncountylibrary.org. Our patrons have access to OpenOffice which has been downloaded on each public access computer.

Other libraries are utilizing *thin clients* which is a slimmed down PC provide “access only” to the Internet and web applications.

**Future**

Of course no one can predict the future of cloud computing. Exciting terms about it are: accelerating, anywhere/anytime, astounding, profound change, promising, and transformational.
Bibliography


