Monday, March 9, 2009

Cloud Computing: The Economic Imperative

Wed, Mar 04, 2009

Cloud Computing: The Economic Imperative
Why this paradigm shift in IT isn't just lofty thinking
By Cara Erenben

Primary Topic Channel: Tech Leadership

What is cloud computing? There is an amusing video on YouTube.com that tries to answer that very question.

The video's author, an employee of a cloud-computing company called Joyent Inc., asked that question to several top tech editors and CEOs at the Web 2.0 Expo last May and pieced together their responses in a short, comical video.

One interviewee quipped that cloud computing is when you're using your laptop in an airplane at 40,000 feet. The amusing, and rather telling, aspect of the video is that all the interview subjects said something different.

It seems cloud computing is still an abstraction. But the term itself isn't new. Anyone who has ever seen a network diagram has probably seen a cloud with arrows pointing to and from it. The cloud represents the network--either a local intranet, or the internet at large--and all the resources available on it. Instead of having software that is stored and run on an individual PC, the user taps into this "cloud" for his or her computing needs.

These days, cloud computing relates to the way IT professionals design, build, deploy, and run applications that operate in a virtualized environment.

"IT as a service...is what cloud computing is all about," said Hagen Wenzek, a senior strategist at IBM.

In the same way a utility company delivers electricity, natural gas, or water--you sign up, then don't have to think about it any more--cloud computing delivers IT services to the end user. Advocates of this service model say it's simpler, faster, and cheaper for organizations--and the experience for the end user is also superior.

Concepts such as on-demand resources, utility computing, virtualization, Software as a Service (SaaS), and Desktop as a Service are integral parts of cloud computing.

"All of these bits and pieces are now finding their way into a more comprehensive story that explains how IT is being delivered and consumed as a service," Wenzek said.

Characteristically, cloud computing is efficient, automated, and delivers standardized resources--all of which can result in significant cost savings. Several U.S. colleges, universities, and K-12 school districts are already reaping the benefits of switching to a cloud-computing model.

The current economic crisis in the United States and worldwide is pushing businesses and institutions to adopt this new way of running technology. In the private sector, spending on IT cloud services will grow almost threefold, reaching $42 billion by 2012, according to research firm IDC.

"The cloud model offers a much cheaper way for businesses to acquire and use IT," said Frank Gens, senior vice president and chief analyst at IDC, in a statement. "In an economic downturn, the appeal of that cost advantage will be greatly magnified."

The investment in technology infrastructure since the turn of the century is also driving the trend toward cloud computing: As school and business networks have become faster and more robust, the capacity to deliver software and IT services through these networks to users on demand has increased.

Moore's Law has borne out for so long that we've moved into an age of digital abundance, where the cost of technology devices for end users is fairly low, said Michael King, IBM's vice president of global education industry.

That fact has shifted IT managers' focus from the initial cost of purchasing technology to the total cost of ownership (TCO) for operating and maintaining the technology, King said. What's important now to schools is, how much electricity will it consume? How many maintenance technicians will be needed?

"It's not the technology itself any longer, it's the stuff that goes around the technology [that is most important]--and I think that's an economic driver toward cloud computing," King said. "Cloud computing is ultimately going to enable a significant transformation of education to increase quality, increase access to educational resources, and at the same time lower costs. It's a very fundamental shift, on the order of the shift toward the PC computing model a couple of decades ago."

How it works

Cloud computing takes the complexity off the desktop--the software, operating system, and processing power--and moves it into the cloud, which is a central location.

The experience is transparent to the end user, who is not aware that the computing power is not coming from his or her desktop computer. The servers at the cloud center dole out whatever the user requests, whether it's the internet, software applications, his or her personal files, or even supercomputing capabilities.

There are multiple ways to implement cloud computing.

A school or institution can build and run its own data center to power the cloud on campus. Or, if the school can't afford a mainframe computer or large server farm, it can outsource that function to a hosting company and sign up for services delivered over the internet--eliminating the need to invest in robust hardware or install software.

Kentucky's Pike County Schools subscribes to an outside company for server capacity, software, and IT services. North Carolina State University (NCSU) runs its own computing cloud on a server farm consisting of 2,000 blade computers from IBM. Marist College in Poughkeepsie, N.Y., runs cloud computing on a mainframe.

"Marist decided to go for the very optimized, big mainframe that can slice and dice highly efficient computing resources," Wenzek said, "while N.C. State has massive amounts of simple, cheap servers."

"For a college that is not high-tech or invested in technology, SaaS...is very, very attractive," said Bill Thirsk, chief information officer at Marist College. "Instead of having to buy hardware and software licenses and pay for maintenance, [the school] can pay some company or some organization a usage fee and get the functionality of a system [without having] to own it."

For institutions that choose to construct their own data center, this requires a big investment in staffing, building space, and equipment--but the return on their investment is significant, Thirsk said.

"The interesting thing about cloud computing is it's not hard to develop a cloud. You take all your pieces and parts, you interconnect them, and you make them work together as an information system. Then you have to decide how you are going to scale that," he said. **(See Marist College's story here.)**

Cloud computing can be highly energy-efficient, Wenzek said. Because software runs in the "cloud," end users don't need powerful machines with lots of processing power or memory. And scaled-down machines use less energy than operating the equivalent number of desktop computers.

Efficiency also comes because a data center centralizes resources in just a few locations; the resources are standardized, meaning they consist of "like" components with the lowest possible number of variations, and the processes are automated.

"Every manual step leads to increased complexity, increased cost, and slower response time--all working against the notion of simpler, faster, cheaper," Wenzek said.

On top of the servers in a cloud center, you install cloud management software, which does everything from configuring and rationing resources to authenticating users and cleaning up "dumb" terminals so the computers in a lab are ready for the next user.

NCSU developed its own cloud-computing management software, called the Virtual Computing Lab. **(See NCSU's story here.)** IBM's cloud-computing solution consists of Blue Cloud software running on iDataPlex servers.

"iDataPlex is basically a super-simple, very, very dense rack with a lot of blade servers in there," Wenzek said. "That is one of the most efficient ways to build infrastructure for a cloud."

Public and private clouds

Public computing clouds are open to anyone who wants to sign up and use them. Private clouds typically sit behind the firewall of an enterprise or university, and only people within that organization have permission to access the cloud and its resources.

"There's also something in the middle," Wenzek said. IBM, for example, operates a cloud data center for its customers. Multiple customers share the same infrastructure, but each customer's cloud is secure and separated as though behind its own firewall.

"It brings you the value of more efficiency," Wenzek said, "because we are able to share the same infrastructure with many other customers, and therefore it's more efficient. If you had your own small little cloud, [it] can never be as efficient as a huge pool of IT resources."

Simpler, faster, cheaper

"The overall experience of being able to stop fussing around with IT is one of the biggest shifts that is happening out there," Wenzek said.

Most students and faculty just want to use technology tools and resources; they don't care where these resources are located or who is delivering them. Cloud computing makes it easy for them to do so. Faculty members simply go to the web to request the IT services they need for themselves or their students. From a menu, they can choose the operating system, the software applications, and the server capacity they need, and then they can schedule this request to repeat for the entire semester, or as needed.

"You look at that catalog, and you select what you want, and you press a button--and whoop, it's there. It's up and running," Wenzek said. "I have my distance learning course. I have my administration system. I can run my payroll. All of that without even fussing with the IT department--that's a fundamental shift for how you are using IT."

Often, when someone needs additional server capacity, it can take weeks or months to fulfill the request. You have to fill out procurement forms, place an order, wait for shipping, and then set up and configure the machine.

Cloud computing can fulfill that same request within minutes. It provides a highly scalable, near-instantaneous way to deliver computing power or resources on demand. You just go to the web, choose what you want from a menu of available services, and then that server is allocated as a virtual machine almost immediately.

"That's just a huge, huge difference from what we had before," Wenzek said. "It's a very different way of buying servers. You don't ship the server anymore. Someone just automatically allocates capacity to you that is equivalent to what you were ordering as a server, out of a huge data center that provides IT like a utility provides electricity."

"Any time you streamline and standardize within your organization, whether it be in computers or processes, you are going to save money," Thirsk said.

Cost savings come from centralizing and standardizing computer resources and drawing less power. The simplicity of the system also results in less maintenance, especially if cloud computing is outsourced. That means fewer IT staff members are needed.

Another advantage to cloud computing is being able to buy software licenses based on actual usage, not on the number of computers you have.

Typically, cloud computing supports all types of devices. It is operating system agnostic and supports open-source applications. In the case of Pike County Schools in Kentucky, the district used cloud computing to transform 1,400 old computers that were ready for surplus into fully functioning virtual machines. **(See Pike County's story here.)**

Instant supercomputing power, on demand

Most students and faculty are already familiar with public clouds, or consumer-based cloud services such as those offered by Amazon, Google, Adobe, Expedia, or Facebook. These clouds give users a login and access to specific software.

"Someone is giving you software, they are running all their own servers, you get an account, and those services are delivered to you. It's a very low-cost way for companies to deliver very high-valued services for you," Thirsk said.

Amazon resells its idle computing capacity, outside of the holiday rush, to computer users. Individuals can go onto Amazon's web service, called the Amazon Elastic Compute Cloud (Amazon EC2), sign up for server space, and pay by credit card. Amazon charges 10 cents per gigabyte, per month, plus transmission fees. Users can terminate the service at

any time.

"You can get it very fast, and you can get rid of it very fast," Wenzek said. A service like this would be useful for meeting temporary, high-capacity computing needs--such as executing research algorithms or testing software--but it might be too costly or generic for most educational uses, he said.

The advantage of this kind of service is that you can sign up for a thousand servers for just a few hours to run an algorithm, without having to buy them and scrap them afterward. "Here, [the servers are] automatically allocated to somebody else, and you just buy them for the time you are using them," Wenzek said.

Regulatory issues...and other concerns

Some state laws say it's necessary to keep certain data, such as health or employment records, inside a single jurisdiction. With a subscription-based cloud computing model, the user doesn't always know where the data center is located. Many data centers are being built in locations that offer the best return on investment.

"Iceland or Greenland is a fantastic location for a data center, because it's cold and you have great internet access, you have geothermal power," Wenzek said, explaining that data centers generate a lot of heat and use a great deal of energy to cool. "You need to make sure that whatever you do is actually complying with those laws."

A powerful, secure, and reliable data center and network are essential to the success of cloud computing. "There is a very important role for companies, IT departments, and the like to guarantee that experience, or else people will become disappointed," Wenzek said.

Cloud computing might not be the right solution for all schools. Some IT directors might have concerns about data security, while others might worry what will happen if they lose their network connection.

IBM's King says this latter concern is becoming less of an issue, however, as schools build redundancies into their network infrastructure.

Moving forward

King said the education community should consider leveraging public service clouds and build their own private cloud services to keep students and faculty engaged, to keep their institutions relevant, and to keep costs down.

"There are things people should do today that can be done. Things like moving the desktop into the cloud. It is something that is very green. It immediately generates cost savings, and it is something that the technology--and, for the most part, the people--can do today," he said.

"I think the next two to three years will really be about developing shared services, exploiting cloud-computing models, and really driving fundamental transformation in how we organize education and deliver value to students and the education community."

A former eSchool News editor, Cara Erenben is now a freelance writer who frequently covers education and technology.

Links:

Joyent Inc.'s "What is Cloud Computing"

Amazon Elastic Compute Cloud (Amazon EC2)

North Carolina State University

Pike County Schools

Marist College

eSchoolNews
7920 Norfolk Ave, Suite 900, Bethesda Maryland, 20814
Tel. (866) 394-0115, Fax. (301) 913-0119
Web: http://www.eschoolnews.com, Email: WebAdmin@eschoolnews.com