Cloud Computing: The Evolution of Software-as-a-Service

June 04, 2008

When you plug in a toaster, you're probably not thinking about who generated the electrons that power it. It's also unlikely that you'll wonder how far those electrons traveled to reach you and what source -- coal, nuclear energy, hydro, solar or other -- gave up BTUs to send that energy down a wire into your kitchen.

You don't really need to know the details behind provision of electricity services. After all, electric power has been around for more than 100 years, traveling over grids that have changed little over that time. With the exception of rare outages, you can pretty much trust that whatever electricity you need will be there when you need it.

Today, high tech players are hoping you'll develop a similar relationship with computing capacity.

Like electricity, the next big upgrade to your corporate systems department may be something you will use but never see. It could be "cloud computing," the next step in the evolution of software-as-a-service (SaaS) technology.

Through SaaS, companies can access applications and large amounts of virtual computing power without buying it. Rather, the application is hosted offsite by some other company, which cuts maintenance headaches and most of the setup costs for users. Some SaaS applications may operate via a connection between only two or three computers. Cloud computing represents a "much larger-scale implementation," says **Haluk Demirkan**, professor of information systems at the W. P. Carey School of Business. "Now we're talking about thousands of computers" linked together via the Internet or some other network, he explains.

As an example, he offers up email. If you get a gmail account on Google, you're accessing the application via the SaaS model. But, when Arizona State University contracted with Google to run more than 50,000 student email accounts last year, the game changed from SaaS to cloud computing. Why? "Google is managing the infrastructure and software applications, the whole service," Demirkan notes. "You're getting all the functionality but none of the headaches of running the IT infrastructure in-house. No upgrades, no contract renewals, no security issues: The provider manages your service. You pay based on how much computing you use."

Why is this model called "cloud computing?" Some say it's because the computer functionality happens out there "in the clouds." Wikipedia's experts maintain "the term derives from the fact that most technology diagrams depict the Internet or IP availability by using a drawing of a cloud."

Regardless of its origin, experts are saying this isn't some pie-in-the-sky buzzword.

According to analysts at Gartner, a leading IT research and advisory company, "By 2011, early technology adopters will forgo capital expenditures and instead purchase 40 percent of their IT infrastructure as a service. Increased high-speed bandwidth makes it practical to locate infrastructure at other sites and still receive the same response times. Enterprises believe that as service-oriented architecture (SOA) becomes common, 'cloud computing' will take off, thus untying applications from specific infrastructure."

Silver lining?

Cloud computing has not one, but several silver linings.

There's the application-development speed cloud computing delivers. "For a business person, when you want to deploy a new solution, most of your time and energy is spent on defining the right infrastructure, hardware and software, to put together to create that solution," says Jamshid Vayghan, Ph.D., a chief enterprise data architect and manager for IBM's Executive Business Institute. "Cloud computing allows people to share resources to solve new problems," he adds.

He should know. IBM faces the same challenges any business faces, Vayghan says. In fact, with some 370,000 employees in 170 countries, he says his company often is more complex than the business customers it serves.

So, Big Blue launched its own "Blue Cloud" initiative. Part of that includes an internal cloud-computing environment, which Vayghan used on multiple projects last year. "I would say it improved our productivity -- the time it takes to develop and deliver a solution -- by a little more than 50 percent."

He explains: "Because we're using the shared environment, the time I'd spend on any project to acquire hardware and software, configure it, and administer the system -- I don't need to do that now. It has accelerated innovation."

Another silver lining: Not only is cloud computing a speedier way of getting IT together, it's more cost-efficient, too.

As the W. P. Carey School's Demirkan says, similar to electricity, computing power is also "perishable and intangible." According to him, "If you buy a server and it's been running all day but you didn't use it, you can't store a computer system's capacity and use it later." It's a waste, but that is what happens when companies purchase their own IT infrastructure and don't operate it 24/7 with 100 percent utilization. "With cloud computing, companies don't have those set-up costs, and they don't have idle hours" wasting their IT resources.

In addition to infrastructure resources (i.e. hardware, software, power, space), those resources include the people who manage the systems, as well as the IT security. "With cloud computing, a company's IT operation costs will go down significantly," Demirkan notes.

Then, there is the sheer capacity of this model -- a third silver lining. *Businessweek* recently reported that today's supercomputers handle "tens of trillions of computations per second," and "cloud computing aims to apply that kind of power" to business problems. High-end "desktop PCs process only about 3 billion computations a second," according to the story. Through cloud computing, your computer capacity rises dramatically, and you'll still be able to tap into it from your PC using an Internet connection.

Taking shape

Not surprisingly, IT cognoscenti are eyeing the possibilities in the clouds. Google's CEO Eric Schmidt has called such computing "transformative. It is the new model of computer architectures."

IBM's Vayghan adds: "This is not something coming 20 years from now. There already are many products."

Some will come from Vayghan's own company. Over the past year, IBM has provided cloud-computing services to clients such as China Telecom, Wuxi Municipal Government of China, the Ministry of Science and Technology of Vietnam and others.

IBM also launched "Blue Cloud," a series of cloud computing offerings, and it has entered into alliances for cloud computing programs with a number of worldwide partners, such as Google. The two companies teamed up to provide hardware, software and services that will augment university curricula at a handful of U.S. universities. They hope their investment will help the academic community explore this emerging model of computing and train the next generation of application developers to work with it.

Google also has joined with Salesforce.com to deliver a combined product that features the productivity tools of Google Apps and customer-relationship management capabilities that Salesforce delivers.

Amazon is getting into the cloud business, too. It now has a web services division that, according to the company web site, provides "access to Amazon's robust infrastructure easily and inexpensively."

The site also notes that Amazon has spent more than $2 billion building that infrastructure. How many companies could do the same?

Small wonder that Demirkan says cloud computing will "help a lot of small- to medium- size companies." Instead of spending millions and months building their own infrastructures, cloud computing lets smaller companies tap the infrastructure of corporate giants. "It gives smaller companies the same computing power as the big boys" and plenty of down-to-earth benefits.

The benefits include the cost advantage of the commoditization of hardware (such as on-demand, utility computing, cloud computing, software-oriented infrastructure), software (the software-as-service model, software-oriented architecture), and even business processes.

"But when, what and how should organizations move their IT infrastructure to the cloud computing world? What are the best management practices and metrics? How they can evaluate the success? This is my research agenda," Demirkan says.

Bottom Line:

- Software-as-a-service (SaaS) computing is evolving. Cloud computing is on the rise.
- **As with SaaS, cloud-computing customers tap into computing resources off-site and hosted by another company. The difference is scale.** Cloud computing platforms may combine thousands of computers and storage networks for backup, among other things.
- Benefits of cloud computing include lower operational costs, quicker development times and access to increased computing power.
- Big players in clouds include IBM, Google and Amazon Web Services.

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