



The Shift to Cloud Computing: Forget the Technology, It's About Economics

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Why Technology Is *Not* in the Driver's Seat

Cloud computing is hailed as the next big thing in IT, and a great deal of attention has focused on cloud technology. But technology is not the primary impetus to shift from traditional, data-center-based IT, and the technologies that underpin cloud computing are not new. Rather than experiencing a technological revolution, we are seeing a change *in the way we consume IT resources*. The shift is due to the economics of using the cloud versus the physical data center.

Economics have produced many market transitions throughout history.

Farming, for example, was once practiced by many independent, self-employed farmers who worked the land they owned. If they produced an excess, they sold the excess. Over time, economies of scale enabled by new technologies made the small-farm model less efficient and productive than large farms, which could produce larger quantities of food less expensively. As prices dropped, demand grew and so did large-farm productivity, reducing margins further and making small farms even less viable. Many small farms consolidated into larger farms, and small farmers went to work for agricultural corporations. Technology was the catalyst, but economics drove the transition.

The same pattern can be seen across many other scenarios: the Industrial Revolution, electricity generation, telecom, and so forth. As the service or product becomes commoditized and margins decrease, industry consolidation occurs. The value of the individual service decreases as the value of orchestrating the service increases.

This is what is taking place today in the IT arena as we begin to shift from producing all IT services consumed in our "small-farm" data centers to consuming IT services produced in the cloud by service orchestrators. Economically, cloud computing is compelling for IT service consumers and IT service providers alike.

Why Now?

If the technology behind cloud computing isn't new, why are we seeing a shift to the cloud now? Why didn't it happen before? As in the farming example, changes in technology first benefited the status quo, before a confluence of factors created an industry transition. In IT, many factors (both technological and non-technological) converged. Over the last 15 years, network speeds have increased by 18 million times, now permitting rapid transmission of data over extremely long distances. At the same time, we experienced dramatic increases in processor speed. In 1954, the average price of a

transistor was \$5.52; today, there are 1 billion transistors for every human on the planet, each costing one ten-millionth of a cent. Something that used to require a physical box with a physical location now can be done in software located anywhere.¹

Concurrently, the price of storage has plummeted. In just 50 years, the cost of one megabyte of storage has plunged from \$70,000 to about a tenth of a cent, making the cost of storage 10 million times less expensive.²

We evolved the ability to store massive amounts of data inexpensively, to decouple functions from physical hardware, and to transmit data at high speeds over long distances, putting the technology for cloud computing into place by the late 1990s. But a catalyst was still required to make cloud computing economically compelling, and that catalyst was virtualization.

Virtualization in its simplest form is the separation of software from hardware. Historically, deploying a given application required a server with dedicated storage. Today, that physical connection between software and hardware can be decoupled, or virtualized. This provides great flexibility in deciding where you want that server and storage to reside. You can set up data centers in less-expensive locales—or you can decide to divest yourself of the hardware altogether, and run the software on servers that are paid for and maintained by others. Virtualization allows you to run your applications anywhere, and change where you run them at will—disrupting the traditional delivery and consumption of IT services.

Another factor that arose to impact the shift to cloud is culture. Seventeen years ago, visionaries like Google CEO Eric Schmidt proclaimed, “When the network becomes as fast as the processor, the computer hollows out and spreads across the network.”³ Users were skeptical, however, largely because of security concerns. It was unthinkable to store sensitive data outside the corporate firewall or to delegate mission-critical processes to a vendor. Today, people are willing to seriously consider purchasing IT services from a vendor, just as they might purchase electricity—with the same assumptions of reliability, accessibility, and customer service.

One of the most important recent catalysts was the global economic downturn, which forced people to reexamine their business models from stem to stern. IT underwent stringent evaluation, and cloud computing had to be considered as a possible alternative to the traditional model. Cloud enables the conversion of fixed costs (the ownership cost of servers and storage, plus employee salaries and overhead) to variable costs. There is always a certain amount of excess capability (and its attendant costs) with on-premises IT, because IT must be provisioned for peak demands. If you are using your equipment at peak capacity only during certain times (the pre-holiday shopping season, for example), the rest of the time you are paying for extra capacity that you don't use. Some experts estimate average asset utilization rates for enterprise IT equipment at 25 percent, which is unacceptably low for any other capital-intensive asset. Cloud computing is both flexible and scalable, allowing you to buy only what you need, when you need it.

1. “Technology Avalanche,” David Evans, Cisco IBSG, 2010.

2. *Ibid.*

3. “Cloud Computing Is No Pipe Dream,” Jeffrey F. Rayport, BusinessWeek Online, December 9, 2008.

Another economic benefit is the ability to reallocate resources. For example, a hospital needs IT services, but the focus of the business is healthcare, not IT. The organizational expertise and the culture are not those of IT; IT is viewed as a necessary evil. When hospital IT shifts to the cloud, not only does it transform a fixed cost to a variable cost—it unburdens the hospital of the cost of the resources and people required to support IT functions, freeing resources that the hospital can redirect to its core mission.

There are also savings in the time it takes to scale IT services. If a business with internal IT suddenly ramps up to meet a peak demand, it must buy new hardware, wait for it to be built and shipped, then wait longer for it to be installed and integrated. The business becomes permanently committed to the additional capacity it has purchased. If a business using cloud computing needs to ramp up, it can do so almost instantaneously. When peak demand has passed, the business can scale back and save money.

The technology is a given; it's there and it's ready. Instead of worrying about the technology, businesses should compare the total cost of ownership of running an internal IT shop—hardware, software, licensing fees, facilities, and IT staff—to that of moving to the cloud, with its variable cost and scalability. The economics are compelling; the cloud wins.

Cloud Readiness for the Enterprise

When is the cloud right for your business? That depends on the state of the business's current IT environment. Few enterprises will leap wholesale into cloud computing, nor should they.

Cloud computing makes immediate sense for most small and medium-sized businesses (SMBs). The economic argument between in-house IT and cloud computing has already been settled in favor of the cloud, which can provide more capabilities and access to greater IT expertise than most SMBs could ever afford in-house—at tremendous cost savings.

Larger enterprises, on the other hand, should approach cloud computing in stages. If the company owns highly underutilized assets, there is less impetus to move to the cloud as long as those assets can be utilized over time without significant additions to IT staff. Even in this case, however, cloud computing principles used in-house to virtualize IT and deliver the technology as services—creating an internal cloud—will be more cost-effective than the traditional IT model of delivering discrete silos of technology.

Deploying an internal cloud is less about changing technology than it is about transforming culture and how the IT function is managed. Many organizations still have hardware dedicated to specific business units (BUs). As each BU must be provisioned for peak usage, about 75 percent of that capability is unused much of the time. Each BU has its own hardware and software budgets. Each BU makes independent decisions about which hardware and software to purchase, how many licenses it needs, and so forth. Clearly, these resources are not optimized across the organization, and a great deal of computing capacity is tied up in dedicated equipment.

In an internal cloud, where resources are virtualized, each BU purchases the capacity it needs, when it needs it. An entire organization can be served with fewer resources at

lower cost because of the cloud's ability to scale. There is little need for excess capacity, because the BUs rarely will require peak capacity at the same time, and peaks usually can be planned for and provided on an as-needed basis.

Internal clouds will represent an interim phase in enterprise IT migration to hybrid and public cloud services. Traditional, siloed IT shops will struggle to compete with cloud-computing providers in the areas of cost, flexibility, and scalability unless they virtualize their own operations. In addition to the near-term financial benefits realized by deploying an internal cloud, the process also assures cloud readiness. The philosophy of "Don't outsource what you don't understand" should still apply—if you get your processes right before you move to the cloud, you'll be well-positioned to make the transition successfully.

Issues with trust and security remain as short-term challenges, but in reality it is no more likely that a hacker will invade a cloud than your in-house data center. Nonetheless, these concerns will persist for a while, and they are probably the reason some organizations will opt for internal clouds first.

All organizations should stay informed about the evolution of cloud computing, and reevaluate the potential benefits of cloud against their current IT services delivery and consumption model. For organizations ready to adopt cloud services in the near term, the [Cisco® Internet Business Solutions Group \(IBSG\)](#) offers a five-point roadmap to help enterprises embark on the most essential elements of a cloud-computing program:

1. **Optimize the current IT environment by providing an internal set of cloud services and enabling the incorporation of external services.** This will become the services roadmap. Depending on the maturity of your IT organization, start with consolidation, move into standardization, and then virtualize. Once you start virtualizing, you begin to develop service delivery models and manage your IT assets as sets of services rather than discrete technologies. Then you'll be able to take a hard look at adopting cloud services for production environments. You will experience cost benefits by optimizing your infrastructure and increasing utilization of existing assets, and there's no downside.
2. **Identify cloud services opportunities based on business needs, value proposition, and the ability to adopt/support those services.** This will become the services portfolio. Which functions or processes is the organization willing and able to assign to an external cloud service, and which must remain behind the corporate firewall? Build a portfolio of end-user services and recommendations for how you think they should be delivered. Evaluate how they will be delivered as an external service versus delivered internally. Can you reduce costs and improve service levels?
3. **Communicate with the business units about cloud services and the roadmap and process for incorporating them into the architecture, whether the services are internal or external.** This will become the communications plan. Communication is vital because independent software vendors (ISVs) are not

meeting with IT to sell their products and services—they are talking directly to the BUs. You need to let the BUs know what you are doing so that you are not working at cross purposes.

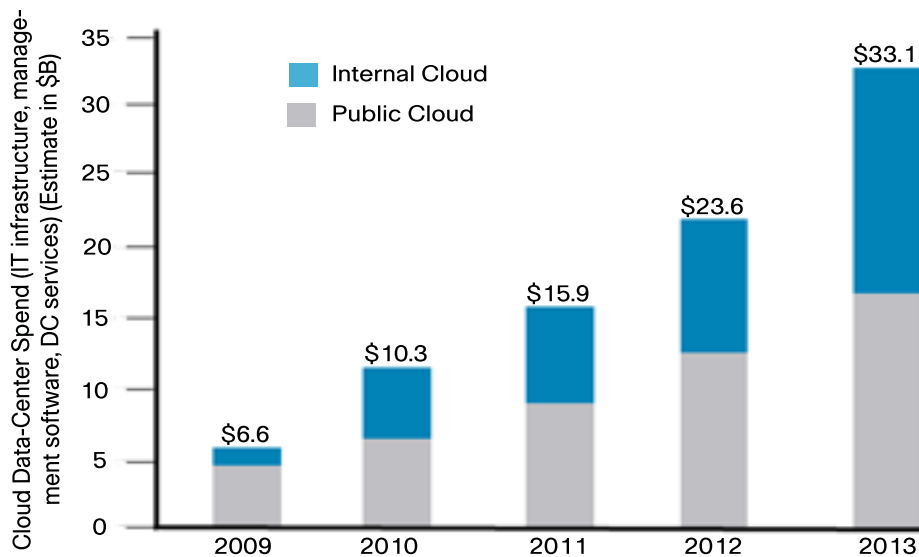
4. **Experiment with and pilot various services, internally and externally, to identify where the real issues will arise.** This will be the test bed. Take advantage of opportunities that require quick development work to test the cloud environment, and look to cloud-based providers for discrete functions such as CRM to test the concept.
5. **Designate a cross-functional team to continually monitor which new services, providers, and standards are in this space, and to determine whether they affect the roadmap.** This will be the sensing and strategy-evolution function. It's better to discover where the bumps are in a test environment than in a production environment.

And, of course, iterate and refine your operating model constantly as it relates to consuming, delivering, and supporting cloud services. This five-step process allows the organization to achieve cloud readiness for either the public or private cloud.

Cloud Readiness for the Traditional Service Provider

The cloud represents a large and growing opportunity for service providers (SPs) (see Figure 1).

Figure 1. Cloud Will Account for US\$33 Billion, or Approximately 5 Percent of the Data-Center Market, by 2013



Source: Cisco IBSG, 2009

There are many nontraditional players in the cloud today, however, which means that traditional SPs are competing not only with other SPs, but also with IT equipment and service players like IBM and HP (who are building their own clouds), and Internet-based providers such as Google. Competition is coming even from smartphone providers like Apple and BlackBerry, all vying to be the provider of choice for applications and services.

Historically, application delivery has not been a strength for SPs. But SPs possess other advantages that position them to become major players in the cloud—if they invest the time and effort to pursue it:

- **SPs Know the Network.** SPs deliver all their services over the network today. The network is the foundation for delivering cloud services, so SPs are already masters in this space.
- **SPs Know How To Manage Services.** They understand how to bill; how to create, manage, and track service-level agreements (SLAs); and how to support customers. Delivering infrastructure as a service or software as a service is little different from delivering voice as a service.
- **SPs Already Have a Trusted Relationship with Customers.** Not only do SPs have ongoing relationships with enterprises, they already have relationships with SMBs, which are likely to be the earliest and most enthusiastic consumers of cloud services.
- **SPs Know How to Play the Role of a Service Exchange.** Independent software vendors and many others who are building out their own data centers with the aim of providing cloud services on their own platforms will find this simply will not scale. In addition, many of these firms have no experience with managed services or managing SLAs—but this is second nature for SPs. The period of transition to the cloud will be something of a free-for-all, accompanied by a swarm of confusing and competing claims. Customers will be more inclined to go with trusted providers than to sort through the chaos in the marketplace as armies of cloud vendors compete for customers.

Although SPs are in the best position to monetize services in the cloud, they must move quickly or be left behind. Customers will not be willing to pay for voice alone, when others are offering full suites of cloud services. SPs are already seeing declining margins for connectivity. With over-the-top players like Google building parallel networks to bypass SPs, service providers must seize this opportunity to do what they do best: become brokers or exchanges in the cloud, intermediating, aggregating, combining, and orchestrating services delivered by ISVs.

Role of the Network

There will be many different approaches to cloud computing, but the network is the glue that binds it all together. Cloud computing in the future will be less about which services are provided than it will be about making everything work together. This is where the network comes in, linking platforms and services in the “intercloud.” The network will be the means of aggregating individual, highly disparate services and creating a logical abstraction that appears to the user as one physical set of resources.

The network will also be the primary mechanism that allows providers to monitor and manage those services. By aggregating the management of diverse services, the SP becomes an exchange that adds value, provides the platform, supports the customer, and handles the billing. This allows SPs to recognize and monetize cross-selling and upselling opportunities.

The network also facilitates the creation of virtual private clouds. When an enterprise is concerned about security in the public cloud, a cloud broker could aggregate the desired services and manage them as a secured entity for the customer.

Conclusion

There is no reason to hold back from cloud computing based on untried technology issues; as previously mentioned, there's nothing new about the technologies used in cloud computing. It's all a matter of economics, following a pattern of commoditization we have seen many times throughout history. There are many things that enterprises and SPs can do today to get ready for the inevitable shift to the cloud. It is difficult to predict, but Cisco IBSG expects that within 10 years, the majority of IT services will be delivered via public or private clouds.

The network is the foundation of cloud computing. The software and hardware are important, but the services simply cannot be delivered without the network and its ability to monitor, manage, and report.

The formation of cloud brokerages or exchanges is a logical development to provide cost-effective, efficient, and well-managed delivery of services. Nobody knows how to do this better than SPs, but they must move now to take advantage of this rich opportunity. The good news is that we have found that SPs are recognizing this opportunity and forming strategies to capitalize on it. The cloud does have a silver lining for SPs, and the time to act is now.

For more information about the economics of cloud computing, please contact:

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For more information about cloud computing, please visit www.cisco.com/go/cloud

More Information

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