

An Early View of Cloud Computing



Abstract

Cloud computing is a new delivery method and choice available today for Enterprise computing that in the future will be revolutionary for business. It is a massively scalable, offsite infrastructure accessible on demand across the internet on a pay-per-use basis – owned by someone else. Over the past few years business functions have increasingly demanded internet-based services. As a result of a challenging economic environment, Capgemini has seen clients reassess options of support for non-differentiating computing resource layers of the infrastructure when evaluating IT budgets. The timing is right for accelerated adoption of cloud computing.

The advantages of cloud computing are many. Both server compute and storage capacity can be accessed in near real-time, when needed, without waiting for resources to be assembled in an on-premise data center. Speed to value is high and the risks inherent in capacity planning can be mitigated. Also, the use of cloud computing is highly flexible and can quickly respond to changes in load.

Will all applications in the future be run in the cloud? Not likely. But Capgemini has helped several clients take advantage of cloud computing, most notably with Oracle Applications, Microsoft SharePoint and Application Development Testing services. This paper also presents several other well-known examples of cloud usage.

Cloud computing is real and it is here to stay. The future of cloud computing is likely to include not one standardized cloud but several cloud types, some built for specialized non-commoditized applications. In the future, some cloud types may be used in a private or semi-private manner.

Cloud computing is inherently green. Economics plays a part because as you pay for only what you need you use this resource only when needed. Being a shared service, capacity utilization is much higher than with enterprise computing and you do not have to set up and power hardware not being used.

It is easy to envision a future where businesses will combine and reuse business logic residing in far-flung locations with a new type of mashup, sometimes called a “business mashup.” Business mashups will make it easier to do business more synergistically and far more collaboratively when desired. They will also create a new marketplace. Although from a technical perspective this is an evolution, from a business perspective it will be a revolution.

Today, Capgemini recommends considering cloud computing when conducting capacity planning and further suggests calling a trusted partner who understands the use of multiple delivery models (from on-premise to hosted to remote infrastructure delivery to utility to cloud).

Capgemini has built a Cloud Computing Center of Excellence (CoE) staffed by business and technical experts to make Capgemini's cloud computing expertise and forty plus years of data center computing experience available to the Enterprise. The CoE can help Enterprise clients understand the opportunities and risks of provisioning and consuming IT services outside the firewall.

What is Cloud Computing for 2008/2009?

There is much confusion surrounding cloud computing. What exactly is it? Some believe it to be a reincarnation of grid computing; some believe it to be virtualization; while others think of it as Platform-as-a-Service, Infrastructure-as-a-Service or Software-as-a-Service; or that it is simply utility computing. There is an element of truth in all these definitions. Adding to the complexity, the definition of cloud computing may change over time. Confusion is to be expected when markets are nascent and new computing delivery methods become an option.

So what is it? The definition has several elements. Cloud computing is the use of massively scaled offsite IT resources assembled virtually, accessed over the internet, used on demand in real-time or near real-time on a pay-per-use or subscription basis, where the workloads are shared among multiple customers (principal source: "A Definition of Cloud Computing" by John Foley, *Information Week*, September 2008).

Let us work through this definition:

- Offsite: you don't own the IT resources, rather someone else has purchased them and you use them when needed;
- Assembled virtually: virtualization technology allows multiple customer applications to be run on the system or on a machine;
- On demand: the resource can be turned on or off quickly and as needed;
- Pay-per-use: use as needed, the economic model is OpEx and not CapEx, pay for what you need, not for unneeded capacity;
- Shared workloads: scale economies exist because of shared use and because client traffic may be non-correlated from a time of year or day usage perspective;
- Massive scale: access to extremely large infrastructure that would be challenging to build as a single entity.

Cloud computing is a different model. It is a set of services available on the web, provisioned and consumed outside of the firewall.

For an alternative definition, The Gartner Group defines cloud computing as, "A style of computing where massively scalable (and elastic) IT-related capabilities are provided as a service to external customer using Internet technologies."

Ultimately, this means there is now another delivery choice. Is this to say that all applications will be run from the cloud? Not likely. What it does mean is that Enter-

prises can now think of how to leverage the characteristics and advantages of cloud computing to assemble an Enterprise delivery portfolio optimized for their situation.

This paper will discuss the capabilities of the cloud, both today and into the future, to assist Enterprises in considering cloud use.

How Enterprises gain Advantage

Server Compute Capacity

Perhaps the most important reason for leveraging cloud capabilities is to quickly gain access to hundreds or thousands of computers for compute capacity when needed. Building machines in the Enterprise data center can take a lot of time, not to mention procuring needed machines and software if necessary. Use of the cloud can be up to 90% faster than using servers in data centers. With cloud computing, you rent servers and you don't own them. If the business and load is seasonal, or if traffic spikes at certain times, using the cloud could be an ideal answer to building compute capacity.

The use of cloud compute capacity should definitely be considered during capacity planning. On average, Enterprise data centers work at a utilization rate of between 12 and 18 percent, but Enterprises must build to peak capacity. Often, capacity planning seems more like risk mitigation than planning – how much risk can you take? With cloud computing, you can take a hybrid approach and direct overflow traffic to the cloud.

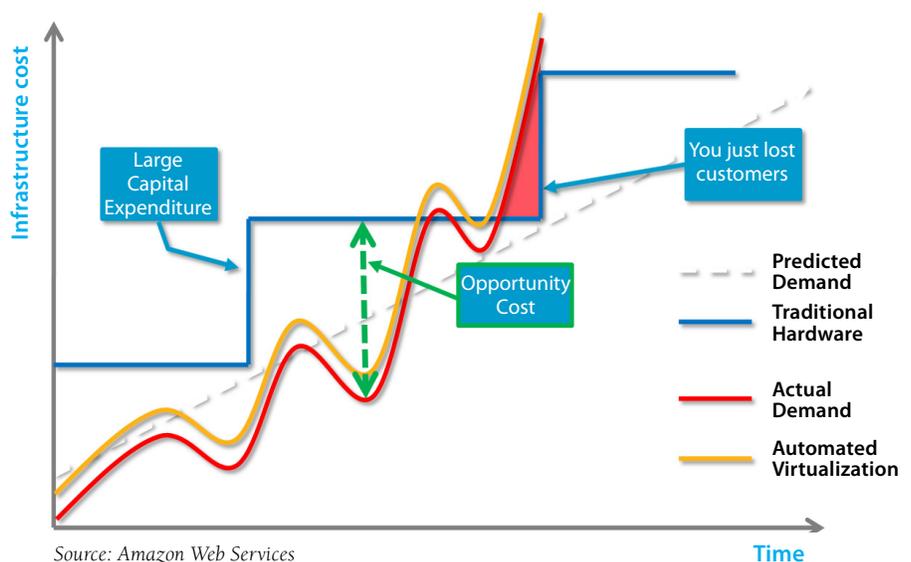


Figure 1. The Risk of Capacity Planning

Storage Capacity

Although it is true that the cost per GB of storage has declined rapidly over the past few years, the increased use of storage has more than made up for it. There is so much structured and unstructured data on Enterprise storage servers that managing it is becoming a major headache and a major cost. As building compute capacity in the Enterprise has become expensive, so has the building of storage capacity.

The use of cloud computing for storage capacity can be ideal, especially for spikes in usage. Because the use of the cloud entails low or no upfront capital cost and low ongoing operational costs, the ability to take advantage of pools of resources on demand in real-time can yield business advantage.

Green IT

The growing power usage of enterprise data centers has been well documented and is an environmental issue. Compared to more traditional forms of computing, cloud computing has much higher levels of utilization and therefore is more environmentally efficient. Enterprise computing is built for peak capacity but utilization rates are low, often below 20% on average. Running that hardware with low levels of capacity consumes resources that could otherwise not be used. Cloud computing is a shared service – you use only what you need and pay for what you use. Wasted power use and emissions are kept to a minimum.

Elasticity and Resizability

Elasticity may be best known as an economics term, but when used in computing it represents the ability to be highly flexible – nearly instantaneously – to changes in load. This may be the most compelling reason to consider cloud computing. When performing pilots on behalf of clients, Capgemini has experienced the cloud respond quickly – in real time – to changes in load, whether it is up or down. Building the kind of untapped capacity necessary for true elasticity would be difficult if not cost prohibitive for most Enterprises. With cloud computing, an infrastructure supporting an application, business, or business process can be easily resized and right-sized, depending upon conditions. Business flexibility and IT flexibility can go hand in hand.

Easy to Use

Cloud computing is fairly straightforward to use as programming and technical conventions are similar enough to those of conventional computing, and leading cloud computing platforms have open APIs. However, when considering cloud computing, do not wait until the last minute when traffic suddenly spikes to see whether it is the answer for you. Plan ahead with a service provider like Capgemini to take advantage of knowledge gained with its other clients to optimize your migration to the cloud.

Multiple Locations

Be on the lookout for a cloud provider with multiple locations for delivery, fail-over and back-up. Check into technical capabilities for load that can be easily transferred from one location to another. Some providers have unique intellectual property in this area.

Network Access

With cloud computing, services are generally accessed and delivered through and over the web. Compared to a traditional model, the use of a public network rather than a private network can be a big change. Using a public network – the internet – brings with it certain advantages. The inherent routing delivery advantages of TCP-IP are well known in that, generally, messages get to their destination even when multiple paths are down. However, the use of public networks may not be suitable for all types of application traffic, so a hybrid approach may be required.

Service Provider

Lastly, reach out to system integrators and service providers with direct experience in cloud computing. Knowledgeable service providers will share with you the lessons learned with clients to define how best the cloud can help extend your own data center, whether through a full cloud solution or a hybridized approach with most traffic handled from your data center and overloads transferred to the cloud. From Capgemini's vantage point, capacity planning is the ideal place to start considering the advantages of cloud computing.

Real World Examples

Through November 2008, Capgemini has conducted pilots with multiple clients to determine how Enterprises might benefit from cloud computing. The three pilots were: Oracle Applications in the cloud, SharePoint in the cloud, and Application Development Testing in the cloud.

Oracle Applications in the Cloud

Capgemini has conducted multiple pilots deploying Oracle Applications in the cloud. In one example, we deployed Oracle's Transportation Module, their Enterprise Edition Database and Oracle Fusion onto the cloud. The results were impressive. We have experienced deployment times reduced by up to 70%, the applications themselves running as expected and similar to that of more traditional computing methods, very high flexibility in traffic – impressively scaled up and down, exceptional levels of application performance, and much lower costs than if deployed to traditional delivery systems. As a result, Capgemini is offering Oracle Applications in the cloud.

Microsoft SharePoint in the Cloud

Capgemini has been working with an automobile manufacturer to deploy several instances of Microsoft SharePoint in the cloud. The manufacturer is using SharePoint in the cloud for knowledge management, document sharing and collaboration.

The result of our work with the client has led us to conclude that as an internet facing component, Microsoft SharePoint fits in well with the cloud. The speed to value and deployment is high, and the application can be used as an application front end to an enterprise portal.

As of November 2008, Capgemini is working with multiple clients to develop a set of requirements to offer SharePoint in the cloud soon.

Application Development Testing in the Cloud

Some experts claim that Application Development Testing in the cloud is a so-called “killer app” for cloud computing. Capgemini has worked with multiple clients to use the cloud for several test types: performance testing, load testing, unit, system, regression, integration testing. Our experience has been positive and we believe the use of the cloud for these test types should be considered by

Enterprises when performing QA testing. Application development testing in the cloud allows you to more closely mirror a production environment to a staged/test system so that risk is mitigated when applications are deployed live. The use of cloud computing means far lower costs and much lower capital expenditure. Rapid setup and execution is yet another hallmark of using the cloud for application testing.

Public Cases of Cloud ROI

As cloud computing is somewhat of an early adopter market, there is scant information surrounding return on investment – perhaps the result of some organizations gaining competitive advantage and not wanting this information to get out to their competitors. There are however several examples of cloud usage hinting at ROI.

One well-known example is from the New York Times. They desired to make their historic archives and newspaper history – 11 million articles – available online. To accomplish, the task required converting these articles into PDF's (Adobe Portable Document Format). It was estimated that the conversion process would take hundreds of servers, 4 Tera Bytes of storage, and a several-month project along with a rather significant budget and IT resource consumption. The project leader conducted research and decided to try a leading cloud computing platform. The job was finished the next day at a total cost of \$240 USD.

A social media company by the name of ShareThis offers social media services to other companies by simply embedding an object/button on their site. Naturally, the load of traffic for this company can be very unpredictable and spiky. Through the use of a leading cloud computing platform, ShareThis was able to scale from 100 machines to 3,500 machines in one day when traffic increased. When traffic declined the next day it was able to right-size in the other direction. What was the cost for the one day spike? Less than \$200 USD.

The Future of Enterprise Cloud Computing

Three Types of Clouds

First, while cloud computing is somewhat of an early adopter market for the Enterprise, it is clear that it is here to stay. The benefits are compelling. At first glance, it's easy to think of cloud computing as an industrialized, standardized and commoditized platform that will offer little difference from one provider to the next. Delving a bit into the subject, however, nuances begin to appear.

Think about the many different ways you can deliver applications. Take for instance on-premise delivery, hosted delivery, remote infrastructure management, utility computing, and now cloud computing. One immediately can see how an Enterprise might build advantage by using a diversified portfolio of these delivery models. Next, think about how an infrastructure must be built. For example, the infrastructure for email servers is tweaked and built and maintained differently than that for more specialized applications. Similarly, the human resource and experience needed to build and manage these two differing sets of infrastructure are different.

It now becomes easy to envision a future in which there is not one cloud, but multiple clouds. One "cloud type" might be the standardized and commoditized infrastructure for email, for example, while another cloud type might be highly specialized for a type of application that might gravitate towards becoming a bit more mission critical – call it a "type two" cloud. Many differing type two clouds are likely to exist because the application knowledge and business process knowledge are specialized. How will type two cloud providers differentiate themselves? It is likely they will surround the more specialized applications with services to migrate use to this cloud type, build highly specialized infrastructure, and build hybrid services where certain types of traffic might be sent to on premise and overflow to the cloud. Or, it could be other factors.

A "type three" cloud is a combination of type one and/or type two clouds. Type three clouds may be public, private or available only to chosen parties. To understand this cloud type, first consider a mashup. While a traditional mashup combines data from more than one source into an application (e.g. Google Maps' use of cartographic data adding location information to real estate data to create a new service), future type three clouds will perform a somewhat similar function by having the capability to combine both data and business logic residing at different places and in different clouds – sometimes called a business mashup. In the future, business

mashups in the cloud will allow for combinations of both data and logic in ways never before dreamt.

A Revolutionary Marketplace for Business

The future of cloud computing will include capabilities to upload and download business mashups in the cloud to and from publicly accessible computing environments (or private or semi-private among chosen parties). Imagine being able to easily sell, exchange or mesh together offerings and products from multiple providers together into the marketplace. Naturally, consumption will also take place in the same environment and this will drive further development of business mashups, and so on.

Encountering new technologies and changing business models brings uncertainty – it also brings tremendous flexibility and advantage. Cloud computing will become a new model for business because services made available and running in this environment are consumed and shared as Enterprises do business together more synergistically.

Recommendations

The benefits and possibilities of cloud computing are compelling and real. Capgemini has built a Cloud Center of Excellence (CoE) with a group of experts knowledgeable about both the business and technical aspects of cloud computing and how Enterprises can take advantage of the technology. With over 40 years of experience in the delivery of Enterprise data center computing and thousands of customer deployments under its belt, Capgemini can be your trusted partner in leveraging cloud computing for your organization.

Specific Recommendations

1. Capacity planning or a data center refresh are the right time to consider the merits of cloud computing.
2. Call a trusted partner who has an understanding of both Enterprise data centers and cloud computing.
3. Consider a partner offering specialized cloud services, such as cloud consulting, cloud readiness assessment services, cloud migration services, and hybrid services, to build a diversified portfolio of delivery options.
4. Consider a hybrid approach in which some of the time load is delivered from an Enterprise data center and overflow is delivered from the cloud (also consider certain types of load being delivered from the cloud).
5. Consider non-business critical applications that need to be scaled quickly as initial candidates for the cloud.
6. Consider applications accessed outside of the firewall as initial candidates for the cloud.



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Capgemini, one of the world's foremost providers of consulting, technology and outsourcing services, enables its clients to transform and perform through technologies.

Capgemini provides its clients with insights and capabilities that boost their freedom to achieve superior results through a unique way of working, the Collaborative Business Experience. The Group relies on its global delivery model called Rightshore®, which aims to get the right balance

of the best talent from multiple locations, working as one team to create and deliver the optimum solution for clients.

Present in more than 30 countries, Capgemini reported 2008 global revenues of EUR 8.7 billion and employs over 92,000 people worldwide.

More information about our services, offices and research is available at:

www.capgemini.com

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