Cloud Computing

A High Level Perspective

www.nihilent.com

A New Era is Here

Cloud computing is Internet ("cloud-") based development and the use of computer technology. In concept, details are abstracted from the users who no longer need knowledge of, expertise in, or control over the technology infrastructure "in the cloud" that supports them. It typically involves the provision of dynamically scalable and often virtualized resources as a service over the Internet.

Typical cloud computing providers deliver common business applications online which are accessed from a browser, while the software and data are stored on the servers.

These applications are broadly divided into the following categories:

- Software as a Service (SaaS)
- Utility Computing,
- Web Services,
- Platform as a Service (PaaS),
- Managed Service Providers (MSP),
- Service Commerce, and
- Internet Integration.

An emerging compute model—cloud computing—addresses the explosive growth of internet-connected devices, and complements the increasing presence of technology in today's world. Cloud computing is massively scalable, provides a superior user experience, and is characterized by new, internet-driven economics.

It is a new consumption and delivery model inspired by consumer Internet services.

How Cloud Computing Helps Your IT Environment

The characteristics of cloud computing are a natural fit for enhancing your IT environment. You have the choice of a public or private IT environment. A *public cloud* is owned and managed by a service provider, and access it by subscription. It offers a set of standardized business process, application, and infrastructure services on a flexible price-per-use basis.

Advantages of a public cloud include standardization, capital preservation, flexibility, and a shorter time to deploy applications. A *privately owned and managed cloud* is accessible only by your company and your partner network. A private test cloud provides more ability to customize, drives efficiency, and retains the ability to standardize and implement best practices. Other advantages include availability, resiliency, security, and privacy.

Currently, before a new application is tested and/or deployed, developers often spend days, weeks, or even months to procure and configure appropriate hardware, networking, software, and storage. A cloud can automate this process, thus speeding it up dramatically.

A well-implemented cloud can significantly reduce operational and capital costs and improve quality throughout the life cycle. By contrast, when done manually, these steps can take a significant amount of time.

Major savings include efficient use of hardware resources, software license savings, provisioning cost savings, and productivity improvement. Additional savings may be gained from reducing the cost of managing inactive OS instances. Table below shows the benefits resulting from cloud computing attributes and characteristics.

Attributes and benefits of cloud computing

Common Attributes	Characteristics	Benefits
Advanced virtualization	Resources are pooled and virtualized.	Providing efficient implementation independent infrastructure.
Rapid provisioning	Resources are provisioned on demand.	Reducing setup and execution time and eliminating errors
Elastic scaling	Environments scale down and up by large factors as the needs change	Optimizing resource utilization
Flexible pricing	Resources are priced on supported topology and project phases.	Offering pricing options tailored to user resource needs.
Metering and billing	Resources used and reserved are charged back to LOBs	Prioritizing innovative projects.

Areas of savings

The major areas where implementing a cloud solution can result in savings are as follows:

- **Hardware**: Virtualization by boosting hardware utilization through stacking multiple virtual servers in a physical server.
- **Software**: Clients are charged for operating systems and other software by the number of physical servers instead of the number of instances. Hence fewer physical servers require fewer licenses.
- **System administration**: Reduced system administration and operation costs in cloud infrastructure with fewer physical servers.
- **Provisioning process:** Labor savings in service request management and fulfillment from automation and standardization.
- **Improvements in tester productivity**: Reduce idle and waiting time; increase flexibility in testing plan.

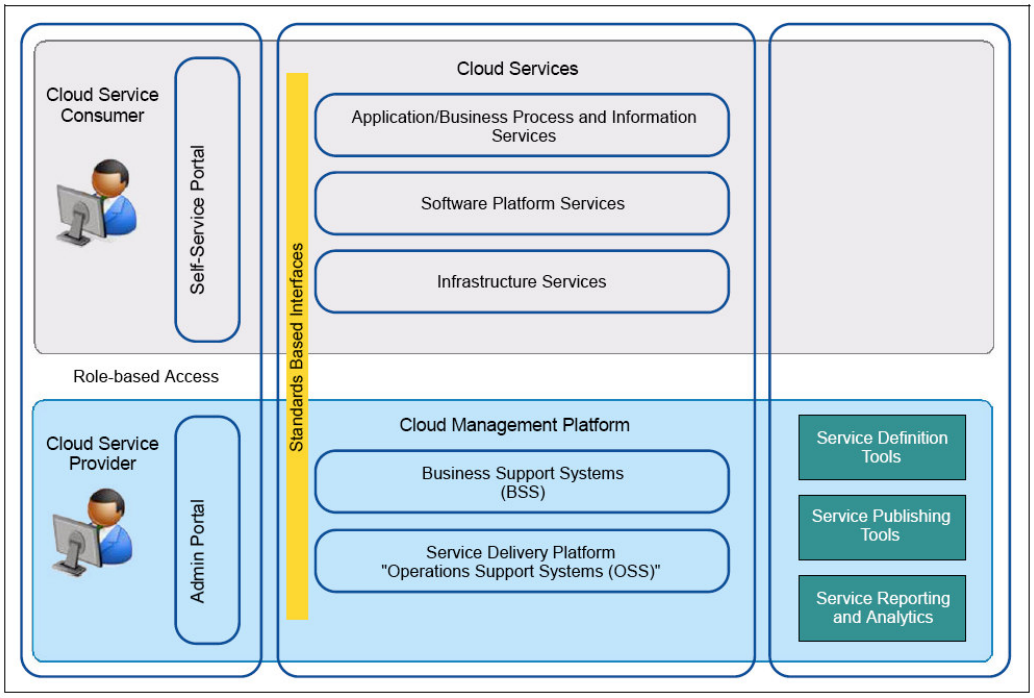
Clients who have used a test cloud have achieved significant improvements in their test environment. The table below identifies some of these improvements, as reported by actual clients.

Capability	**From**	**To**
Server/Storage utilization	10-20%	70-90%
Self service	None	Unlimited
Provisioning	Weeks	Minutes
Change management	Months	Days/Hours
Release management	Weeks	Minutes
Metering/Billing	Fixed cost model	Granular
Payback period for new services	Years	Months

Cloud functional services view

The functions and services offered by cloud computing start with the needs of the consumer, who makes a request for services and resources through a Self-Service portal. Cloud applications then search for resources to match the request using a portfolio of cloud services. Access is provided back to the consumer through the portal.

Services are made available to the consumer by the administrator. The administrator uses the Admin Portal to publish the services that are offered as part of the cloud, as well as to prepare resources for use within the cloud.



Service and request operations

There typically is a self-service portal to provide the consumer with a modern and easy to use interface to request resources from the cloud. It provides access to service offerings that allow the consumer to manage cloud resources.

This portal provides a set of standard requests to the cloud consumer. By enforcing standardization, the cloud can help improve the consistency of communication with the IT department and improve business perception of IT's ability to respond to their needs. The cloud provides a layer of abstraction between the underlying process and the consumer. This allows the data center as a whole to be viewed as a pool of resources.

Making these self-service offerings available to the users removes the burden on IT of locating and scheduling an admin to fulfill the requests. User satisfaction climbs and administration costs fall. The IT organization also gains the benefits of standardization, because standardized service offerings reduce the cost of support.

Cloud services

Business process services and information services

Business process services are focused on providing existing business processes through a cloud. If there is an existing process with steps that are known, it can be provided as a service. This allows the service provider to automate any steps within the process while leaving the changes transparent to the customer.

A private cloud's information services deliver information as a service. This allows organizations to improve the relevance and cost effectiveness of their information. It becomes available to people, processes, and applications across the business, thus improving its operational impact in driving innovation.

Software platform services

Software platform services allow a consumer to select a specific software instance that they want created, without the need to be aware of where and how it will be hosted. For example, a developer can request a new database instance without having to be aware of what OS or hardware the database will run on. This allows the consumer to focus on the characteristics of the application and gives the provider the freedom to fulfill the request with any resources that will meet the need. This capability is known as “software as a service” (SaaS).

Platform service offerings include workflow facilities for design, development, testing, deployment, and hosting, as well as services that enable team collaboration, Web service integration and marshalling, database integration, security, scalability, storage, persistence, state management, application versioning, application instrumentation, and developer community facilitation. These services are provisioned as an integrated solution over the Web.

Key components of software platform services include tools and services for developers, dynamic software usage and accounting, and optimized middleware – application servers, database servers, and portal servers.

Infrastructure services

Infrastructure services allow for the provisioning of standardized compute resources. They allow a consumer to request and receive a new computer instance without needing to focus on IT concerns such as network placement and hardware availability.

Cloud management platform

The cloud management platform is the set of tools and capabilities that provide services to the consumer. Most of the previous items were about services that were consumed. Cloud management is about providing resources to the system so that services can be consumed.

Top "Cloud Computing Solution Providers to Watch in 2009"

- 10 Gen
- 3Leaf Systems
- 3Tera
- Akamai
- Amazon EC2
- Apache Hadoop
- Appirio
- Appistry
- AppNexus
- Aptana
- Arjuna
- Asankya
- AT&T
- BlueWolf
- Boomi
- Box Net
- CAN Solutions
- Cassatta
- Cisco
- Citrix
- Cloud9
- Cloudera
- CloudHan
- CloudScale
- Cloudstatus
- CloudWorks
- CohehiveFT
- Cordys
- Dataline
- Dell
- Elastra
- EMC
- ENKI
- Force.com
- GigaSpaces
- GoGrid
- Google
- gOS
- Heroku
- HP
- Hyperic
- IBM
- iCloud
- Joyent
- Microsoft Azure
- Microsoft Mesh
- Nirvanix
- uScaled
- RightScale
- Stax

"Cloud Computing Trends 2009"

1. **Google Cloud Computing**

Google has invested heavily in online storage and cloud computing. Google went from a happy consumer of open source to an active contributor to open source on a very big scale. Google already lets people port some of their personal data to the Internet and use its Web-based software.

2. **Amazon Cloud Computing**

Amazon Elastic Compute Cloud (also known as "EC2") is a commercial web service that allows customers to rent computers on which to run their own computer applications. EC2 allows scalable deployment of applications by providing a web services interface through which a customer can create virtual machines, i.e. server instances, on which the customer can load any software of their choice

3. **Microsoft Cloud Computing**

Microsoft provides products, technologies and offerings around public and private (Azure) clouds, each based on the concepts of being highly virtualized, managed in a consistent manner, dynamic and elastic scalability, and focused on the delivery of services to the user

4. **IBM Cloud Computing**

IBM's provides task-specific cloud computing. The company is set to offer business processes as cloud services, virtual desktop as a service, which would allow businesses to deliver desktops virtually. There are also plans for cloud-based services such as business analytics and data storage.

5. **Cloud Grid computing**

Grid computing has been used in environments where users make few but large allocation requests. Cloud computing really is about lots of small allocation requests.

Gartner's Take on Cloud Computing: It Will Be As Influential As E-business

Cloud computing heralds an evolution of business that is no less influential than e-business, according to Gartner Inc. Gartner maintains that the very confusion and contradiction that surrounds the term "cloud computing" signifies its potential to change the status quo in the IT market.

Gartner defines cloud computing as a style of computing where massively scalable IT-related capabilities are provided "as a service" using Internet technologies to multiple external customers.

"During the past 15 years, a continuing trend toward IT industrialization has grown in popularity as IT services delivered via hardware, software and people are becoming repeatable and usable by a wide range of customers and service providers," said Daryl Plummer, managing vice president and Gartner Fellow. "This is due, in part to the commoditization and standardization of technologies, in part to virtualization and the rise of service-oriented software architectures, and most importantly, to the dramatic growth in popularity of the Internet."

Mr. Plummer said that taken together, these three major trends constitute the basis of a discontinuity that will create a new opportunity to shape the relationship between those who use IT services and those who sell them. Essentially it will mean that users of IT-related services will be able to focus on what the service provides them rather than how the services are implemented or hosted. Gartner maintains that although names for this type of operation have come into vogue at different times — utility computing, software as a service (SaaS) and application service providers — none has garnered widespread acceptance as the central theme for how IT-related services can be delivered globally.

The types of IT services that can be provided through a cloud are wide-reaching. Compute facilities provide computational services so that users can use central processing unit (CPU) cycles without buying computers. Storage services provide a way to store data and documents without having to continually grow farms of storage networks and servers. SaaS companies offer CRM services through their multitenant shared facilities so clients can manage their customers without buying software. These represent only the beginning of options for delivering all kinds of complex capabilities to both businesses and individuals.

"The focus has moved up from the infrastructure implementations and onto the services that allow for access to the capabilities provided," said David Mitchell Smith, vice president and Gartner Fellow. "Although many companies will argue how the cloud services are implemented, the ultimate measure of success will be how the services are consumed and whether that leads to new business opportunities."

Gartner predicts that the impact of cloud computing on IT vendors will be huge. Established vendors have a great presence in traditional software markets, and as new Web 2.0 and cloud business models evolve and expand outside of consumer markets, a great deal could change. "The vendors are at very different levels of maturity," said David Cearley, vice president and Gartner Fellow. "The consumer-focused vendors are the most mature in delivering what Gartner calls a 'cloud/Web platform' from technology and community perspectives, but the business-focused vendors have rich business services and, at times, are very adept at selling business services."

Branding is a powerful and revenue-generating asset for potential vendors. Gartner analysts cited Wal-Mart as an example of a company that has two brands — one with consumers for its low prices and one in the business world for its supply chain expertise, its core competency, which it capitalizes on to support its consumer-facing brand.

"Companies invest billions of dollars in building up their core competencies, much of which goes into IT," Mr. Smith said. "If companies could lease their core competencies to other companies then they would capitalize on both brands, driving revenue both in the consumer-facing market and the business service market in the way that Amazon has done with technology."

Gartner maintains that cloud computing is very much an evolving concept that will take many years to fully mature. It also underlined the fact that the cloud-computing model is not simply the next generation of the Internet.

"When organizations cross the threshold between the Internet as a communications channel and the deliberate delivery of service over the Internet, then we truly start to head for an economy based on consumption of everything from storage to computation to video to finance deduction management," said Mr. Plummer.

Cost of cloud computing, expensive!

An experimental example was carried out to determine if the current cost of moving something like a lab environment into an outsourced environment would be cost effective. Current 'cloud' offerings are really geared to dealing with temporary spikes in compute load rather than moving an entire infrastructure out of a corporate data center, however, mirroring a lab environment is perhaps a plausible use of the cloud.

This demonstration was simply to determine the monthly cost of hosting a lab environment in Amazon's EC2 and then comparing it to the fully loaded cost of having a lab environment in house.

The service for the experiment on was Amazon's EC2 and their storage service (S3) for persistent data management. EC2 allows you to provision various types of x86 servers of differing compute capabilities and you are billed by instance hour of time. There is no restriction on how compute intensive your instance is. Their cost matrix for Linux instances and S3 storage can be viewed here and the Windows pricing is here. The Windows pricing also includes options for SQL Server (and authentication services).

The experiments were run for five systems of various configurations running the application. This included Linux running MySQL, Linux running Oracle, Windows running SQL Server and other combinations. The databases were stored on Amazon's EBS (Elastic Block Store) storage for persistence reasons. The applications were run for two weeks under simulated load for monitoring 1,000 systems to get an idea of network and storage bandwidth.

After two weeks, the compute costs, I/O costs, and persistent storage costs were tallied and then scaled to mirror the monthly cost of a sample lab environment.

Amazon EC2 Costs for 300 lab instances. There are 744 hours in a typical month (24*31).

Instance Type	Num	Cost/Instance Hour	Compute Cost/Month
Windows	100	$0.125	$9,300
Windows + SQL Server	50	$1.100	$40,920
Linux	150	$0.100	$11,160
Windows (SQL/xlarge)	2	$2.400	$3,571.20
		Total Cost Per Month	$64,951.20
Storage			**Storage Cost/Month**
5.6T (usable)		$0.10 Gb/month	$573.44
I/O	30B	$0.10 per 1MM I/Os	$300.00
Network			**Network Cost/Month**
I/O	20 Gb	$0.10 Gb/month	$2.00
		Total EC2 Cost/Month	$64,826.64
		Total EC2 Cost/Year	$789,919.68

Now, if we calculate actual lab costs that mirror this environment here's what we get (we've deliberately excluded our non-x86 platforms such as POWER and SPARC). The retail costs for Microsoft SQL Server and Oracle are included even though as an ISVs wouldn't nearly pay as much. The EC2 cost for Windows systems is considerably higher than Linux, and this is because of the software licensing costs blended into the instance hour calculation.

In the cases of leasing hardware, the number is more or less a constant cost as new gear is purchased and older gear is bought out. For software costs, they've been amortized over three years.

Gear	**Number**	**Cost Per Month**
Dell 1950	28	
Dell 2950	2	
HP DL585	2	
10TB iSCSI	1	$10,000
Dell/HP/Equallogic Support		$300
HVAC/Power		$1,000
Floor Space	500 sq/ft $24 sq/ft/year	$1,000
VMware ESX	9	$1,250
Annual Support (VMware)		$1,250
Internet		$1,200
Network Infrastructure		$556
	Total Infrastructure Cost/Month	**$16,556**
Software Cost		
SQL Server 2008		$2,083
Oracle 10g/11g		$2,083
	Labour Cost/Month	**$4,166**
	Total In-House Cost/Month	**$24,888.89**
	Total In-House Annual Cost	**$298,666.67**

Cloud Computing's Hidden Costs

Cloud service providers can make compelling and simple sales pitches in terms of cost of individual services -$100 per user per year sounds pretty good. But "hidden" expenses can alter a company's outlook. Costs related to people, processes, and architecture associated with both the transition and the operations require analysis and planning before signing up for a business case based on a move to the cloud. CIOs and other IT professionals are already well acquainted with such expenses, but the challenge will lie in uncovering them in the relatively unfamiliar cloud model and determining accountability for each.

As companies consider taking the next steps into the cloud, senior leadership will need to explore four key questions to help uncover the hidden costs:

1. What are the viable paths to move (or replace) legacy applications into the cloud?

1. What architectural changes are required to integrate cloud and non-cloud applications?

2. How should we change our technology and operations processes to take advantage of different procurement, provisioning, and management models?

3. How will a private cloud -built for the sole use of one enterprise -give me more flexibility than current hosting or public cloud models? What are the cost trade-offs?

These questions foreshadow a transition from individual cloud-based applications to more complex systems. For example, when a cloud application such as Salesforce.com -which tracks targets and prospects through your business development, sales, and relationships cycles -really takes hold in your organization, the conversation quickly jumps to the "systems" conversation (a customer management system for example), which prompts other questions:

1. How do I make sure all of the customers in Salesforce.com are synchronized with those in my customer management application, my billing application, and my six product systems?

2. Should I add custom application logic into Salesforce.com to validate customer and company information against my master list? Or should I do it externally and integrate the resulting systems and processes?

3. What kinds of skills and other organizational considerations should I make for the IT staff that support my customer systems?

Salesforce.com as an example simply because of its wide adoption across industries, but it is important to keep in mind that the preceding questions should be raised for other industry and enterprise application discussions.

*****