Cloud Computing as a Service

Vishal Parmar
Address: B-10, Legend Classic Apt,
Sutar-malwadi Road, Near Sutar Hospital,
Kothrud, Pune -411029

Bhushan Ashitkar
Address: A-16, Kamadhenuriddhi, Lane 4,
Mahatma Society, Kothrud,
Pune - 411038

Honorable Host: Neville Wadia Institute Of Management Studies & Research– Pune

Quotes

"Computers in the future may weigh no more than 1.5 tons"

– 1949, Popular Mechanics.

"There is no reason anyone would want a computer in their home"

– 1977 Ken Olson, president, chairman and founder of Digital Equipment Corp. (DEC),

"The computer was born to solve problems that did not exist before"

– Bill Gates.

"First to mind when asked what 'the cloud' is, a majority respond it's either an actual cloud, the sky, or something related to weather."

– Citrix Cloud Survey Guide (August 2012)

"The cloud services companies of all sizes...The cloud is for everyone. The cloud is a democracy"

– Marc Benioff 2010 CEO - Salesforce.com

Definition

Cloud Computing Services: Cloud computing is an phrase more commonly refers to network-based services, which appear to be provided by real server hardware, and are in fact served up by virtual hardware, simulated by software running on one or more real machines. Such virtual servers do not physically exist and can therefore be moved around and scaled up (or down) on the fly without affecting the end user.

Cloud Computing as "a Service"…"a commodity"

When plugging an electric appliance into an outlet, we care neither how electric power is generated nor how it gets to that outlet. This is possible because electricity is virtualized; that is, it is readily available from a wall socket that hides power generation stations and a huge distribution grid. When extended to information technologies, this concept means delivering useful functions while hiding how their internals work. Computing itself, to be considered fully virtualized, must allow computers to be built from distributed components such as processing, storage, data, and software resources. Same can be visualized as Water in the Tap, Mobile phone billing by seconds, etc…

Technologies such as cluster, grid, and now, cloud computing, have all aimed at allowing access to large amounts of computing power in a fully virtualized manner, by aggregating resources and offering a single system view. In addition, an important aim of these technologies has been delivering computing as a utility. Utility computing describes a business model for on-demand delivery of computing power; consumers pay providers based on usage ("pay-as-you-go"), similar to the way in which we currently obtain services from traditional public utility services such as water, electricity, gas, and telephony.

Cloud computing has been coined as an umbrella term to describe a category of sophisticated on-demand computing services initially offered by commercial providers, such as Amazon, Google, and Microsoft. It denotes a model on which a computing infrastructure is viewed as a "cloud," from which businesses and individuals access applications from anywhere in the world on demand. The main principle behind this model is offering computing, storage, and software "as a service."
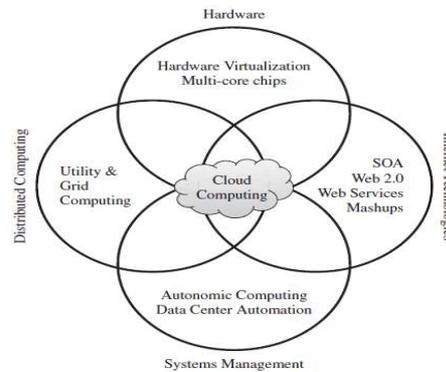
How Cloud Computing Works:

Cloud Computing is distributed 3 primary layers:

**a)** IaaS: Infrastructure as a Service **b)** PaaS: Platform as a Service **c)** SaaS: Software as a Service

IaaS: In the PaaS models, cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some PaaS offers like Windows Azure, the underlying computer and storage resources scale automatically to match application demand so that the cloud user does not have to allocate resources manually. The latter has also been proposed by an architecture aiming to facilitate real-time in cloud environments.

PaaS: offerings may also include facilities for application design, application development, testing, and deployment as well as services such as team collaboration, web service integration, and marshalling, database integration, security, scalability, storage, persistence, state management, application versioning, application instrumentation, and developer community facilitation.

Besides the service engineering aspects, PaaS offerings include mechanisms for service management, such as monitoring, workflow management, discovery, reservation, etc.

SaaS: SaaS has become a common delivery model for many business applications, including Office & Messaging software, DBMS software, Management software, CAD software, Development software, Virtualization, accounting, collaboration, customer relationship management (CRM), management information systems (MIS), enterprise resource planning (ERP), invoicing, human resource management (HRM), content management (CM) and service desk management.
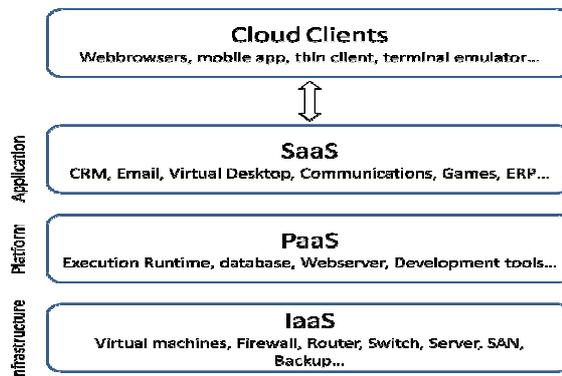
Service Providers of Cloud Computing:

There are several Service providers in the market today, however is it still said that its just about the beginning…Few of them as below:

Company	Highlighters
Amazon Web Services	leading
Google App Engine	non-windows
CloudBees	Java, JRails and Grails, Jenkins
Rackspace	Service Registry
Engine Yard	Infrastructure Abstraction layer
dotCloud	"guerilla" efforts -- where developers at Fortune 1000 organizations lobby internally to use dotCloud for a specific project
Savvis	a history in uptime and reliability
SoftLayer	the "bare metal cloud," in which SoftLayer removes the hypervisor from the mix and offers customers a choice in customizing its hardware infrastructure, including one to 64 processors and access to solid-state drive (SSD) storage and a high-speed global network that can be provisioned in real time
ProfitBricks	InfiniBand protocol
Navisite	Time Warner Cable company NaviSite; colocation services
CloudSigma	solution is really somewhere between managed services and pure cloud computing
Heroku	it allows developers to build and deploy apps using not only Ruby, but also Node.js, Java, Python and Scala.
vCloudExpress	Terremark is on the frontlines of infrastructure cloud providers transforming themselves into competitors AWS
Sungard	Specialized for DR solutions
Windows Azure	Apart from everything else SaaS – windows based

Features of Cloud Computing:

Features	Description
Blobs	Binary Large Object
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
REST	Representational State Transfer
AMQP	Advanced Message Queuing Protocol
SSD	Solid State Drives
JSON	JavaScript Object Notation
CIDR	Classless Inter-Domain Routing
Federated Users	A federated identity in information technology is the means of linking a person's electronic identity and attributes, stored across multiple distinct identity management systems
STS	Security Token Service
CTA	Cloud Tier Application
Columnar	A column-oriented database serializes all of the values of a column together, then the values of the next column, and so on
MPP	Massive Parallel Processing
RAID	redundant array of independent disks; Data is distributed across the drives in one of several ways
Scale Up	Scale up the hardware configuration for a given Virtual machine
Scale Out	Create a replica of a predefined Virtual machine
Elasticity	to adapt to workload changes by provisioning and de-provisioning resources in an autonomic manner
ACID	Atomicity, Consistency, Isolation, Durability for DB
memcached	reduce the number of times an external data source must be read
CNAME	Canonical Name record in DNS
MFA	Multi Factor Authentication
Sticky sessions	Sticky session refers to the feature of many commercial load balancing solutions for web-farms to route the requests for a particular session to the same physical machine that serviced the first request for that session. Since requests for a user are always routed to the same machine that first served the request for that session, sticky sessions can cause uneven load distribution across servers.
Edge Cache	pushing computing away from centralized nodes to the logical extremes of a network
Cluster	Group of servers
Webmethods Glue	provide web services/SOAP capabilities to existing Java and C/C++ applications
Bootstrap	System following a standard protocol once booted
Rip and Replace	Remove bad instances and reinstate
empheral storage	transitory, existing only briefly storage

IP Spooling	creation of IP packets with a forged source IP address, with the purpose of concealing the identity of the sender or impersonating another computing system
Packet Sniffing	intercept and log traffic passing over a digital network or part of a network
degaussing	process of decreasing or eliminating a remnant magnetic field
Multitenancy	sharing of resources and costs across a large pool of users
Virtualization	allows sharing of servers and storage devices and increased utilization
Reliability	improves with the use of multiple redundant sites, which makes well-designed cloud computing suitable for business continuity and disaster recovery
Cascading	used to create and execute complex data processing workflows on a Hadoop cluster
BigCouch	allows users to create clusters of CouchDBs that are distributed over an arbitrary number of servers, While it appears to the end-user as one CouchDB instance
Synchronous	Synchronous transmission uses no start and stop bits, but instead synchronizes transmission speeds at both the receiving and sending end of the transmission using clock signal(s) built into each component
Shardding	Horizontal partitioning is a database design principle whereby rows of a database table are held separately, rather than being split into columns
Desktop Virtualization	using citrix
BASE	Basically Available, Soft state, Eventual consistency
Eventual consistency	distributed computing that informally guarantees that, if no new updates are made to a given data item, eventually all accesses to that item will return the last updated value
Multipart Upload	File uploaded in parts in parallel
Service Registry	an API-driven cloud service built to keep track of your services and store configuration values, which allows you to react to changes faster and make your application or service more highly-available. Service Registry built on top of Apache Cassandra and Apache ZooKeeper
DevOps	Development for Operations; The goal of DevOps is to describe application needs in a way that provisioning tools can read so that deployment becomes automatic
RDMA	remote direct memory access
Infiniband	InfiniBand is a switched fabric computer network communications link used in high-performance computing and enterprise data centers
Vendor Lock-in	Restrictions to the Cloud user to move to another vendor

Comparison of Features:
(Key features)

Features	Amazon Web Services	Windows Azure	Google App Engine
Asynchronous	✓	✓	✓
BASE db Model	✓	✓	✓
Columnar	✓	✓	✓

Degaussing	✓	✓	?
Edge Cache	✓	✓	?
Empheral Storage	✓	✓	?
Federated Users	✓	✓	?
Infiniband	✗	✓	?
IP Spoofing Protection	✓	✓	?
MFA	✓	✓	?
MPP	✓	✓	?
Multipart Upload	✓	✗	?
REST	✓	✓	?
SSD	✓	✗	?

Costing Models in Cloud Computing:

With cloud computing, organizations do not have to worry about over-purchasing expensive hardware, adding in-house staff, or beefing up data centers. Perhaps the most important edge offered by cloud computing is its flexible cost model that allows companies to cut costs while being more scalable to grow or contract as an organization evolves.

In the Cloud, the physical infrastructure is not owned by the company using it. Instead, companies follow a pay-as-you-go plan for accessing resources and applications from a cloud service provider that offers a generally lower total cost because their costs are spread across a large number of users at several different companies.

Performing a return on investment (ROI) analysis is valuable when considering a move to the Cloud. In doing so, examine servers, software licenses, IT departments, support and anything else necessary to host and manage a platform.

Example Costing:

Sample Calculation for 4 Server		On-Premises	Cloud
Rack	8 Server Capacity	$3,000	$500
Switches	24 port L2	$2,000	$0
Load Balancer	8port LB	$20,000	$0
Servers	6 mid range server	$24,000	$1,206
Firewalls	4 public port	$3,000	$0
24/7 Support		$0	$400
Mgt. Software	Support teams	$0	$730
Expected labour		$1,200	$600
	Totals	**$53,200**	**$3,436**

Key Advantages and Disadvantages of Cloud Computing:
Advantages:
Cost Efficient

Cloud computing is probably the most cost efficient method to use, maintain and upgrade. Traditional desktop software costs companies a lot in terms of finance. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payment, pay-as-you-go and other scalable options available, which makes it very reasonable for the company in question.

Almost Unlimited Storage

Storing information in the cloud gives you almost unlimited storage capacity. Hence, you no more need to worry about running out of storage space or increasing your current storage space availability.

Backup and Recovery

Since all your data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, most cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.

Automatic Software Integration

In the cloud, software integration is usually something that occurs automatically. This means that you do not need to take additional efforts to customize and integrate your applications as per your preferences. This aspect usually takes care of itself. Not only that, cloud computing allows you to customize your options with great ease. Hence, you can handpick just those services and software applications that you think will best suit your particular enterprise.

Easy Access to Information

Once you register yourself in the cloud, you can access the information from anywhere, where there is an Internet connection. This convenient feature lets you move beyond time zone and geographic location issues.

Quick Deployment

Lastly and most importantly, cloud computing gives you the advantage of quick deployment. Once you opt for this method of functioning, your entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that you need for your business.

Disadvantages:

Technical Issues

Though it is true that information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. You should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance. Besides, you will need a very good Internet connection to be logged onto the server at all times. You will invariably be stuck in case of network and connectivity problems.

Security in the Cloud

The other major issue while in the cloud is that of security issues. Before adopting this technology, you should know that you will be surrendering all your company's sensitive information to a third-party cloud service provider. This could potentially put your company to great risk. Hence, you need to make absolutely sure that you choose the most reliable service provider, who will keep your information totally secure.

Prone to Attack

Storing information in the cloud could make your company vulnerable to external hack attacks and threats. As you are well aware, nothing on the Internet is completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

Vendor Lock-in

Because cloud computing is still relatively new, standards are still being developed. Many cloud platforms and services are proprietary, meaning that they are built on the specific standards, tools and protocols developed by a particular vendor for its particular cloud offering. This can make migrating off a proprietary cloud platform prohibitively complicated and expensive.

Analysis of the report:

Given the fact that Cloud Computing is a vast topic for which online survey is the best mechanism available for any sort of research to be done. Hence this Paper is an resultant of such a research been done to compile the drops from the ocean pertaining to beneficial features of Cloud Computing. This report can be a ready reckon for all size/type of Industries and Market Segments.

The above research helps us to derive our cloud computing requirements and availability in the market. Users can determine prior to procuring cloud computing service what they focus areas would be. While the technology can prove to be a great asset to your company, it could also cause harm if not understood and used properly.

Reference:

Rajkumar Buyya, James Broberg & Andrzej Goscinski 2011: *Cloud Computing: Principles and Paradigms*: John Wiley & Sons, Inc.

Michael Hugos, Derek Hulitzky 2011: *Business in the Cloud*: John Wiley & Sons, Inc George Reese 2009: Cloud Application Architectures: O'Reilly Media, Inc.

Marla Sukesh, 21 Jan 2013 Service Oriented Architecture: Available http://www.codeproject.com/Articles/515253/Service-Oriented-Architecture-and-WCF

Wikipedia encyclopedia Available: http://en.wikipedia.org/wiki/Main_Page; Knowledge Encyclopedia Portal

Amazon Web Services Availabe: https://en.wikipedia.org/wiki/Amazon_Web_Services corporate website

Google App Engine Available: https://en.wikipedia.org/wiki/Google_App_Engine, corporate website

CloudBees Available: https://en.wikipedia.org/wiki/CloudBees , corporate website

Rackspace Available: https://en.wikipedia.org/wiki/Rackspace corporate website

Engine Yard Available: https://en.wikipedia.org/wiki/Engine_Yard corporate website

dotCloud Available: https://www.dotcloud.com/ corporate website

Savvis Available: https://en.wikipedia.org/wiki/Savvis corporate website

SoftLayer Available https://en.wikipedia.org/wiki/SoftLayer corporate website

vCloud Available https://en.wikipedia.org/wiki/VCloud corporate website

ProfitBricks Available http://www.profitbricks.com/ corporate website

Navisite Available https://en.wikipedia.org/wiki/Navisite corporate website

CloudSigma Available https://en.wikipedia.org/wiki/CloudSigma corporate website

Heroku Available https://en.wikipedia.org/wiki/Herokub corporate website

vCloudExpress Available http://vcloudexpress.terremark.com/ corporate website

Sungard Available https://en.wikipedia.org/wiki/Sungard corporate website

Windows Azure Available https://en.wikipedia.org/wiki/Windows_Azure corporate website

Hudson website Available http://us.hudson.com/it/cloud-computing-cost-savings cost comparison

Amazon website Available http://calculator.s3.amazonaws.com/calc5.html interactive cost comparison as per your requirement to find the Total Cost of Operation TCO.

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