

Cloud 'As -a- Service'

Anu Gupta

Department of Computer Sc. and System studies, Mewar University,
Vasundhara, Uttar Pradesh.
anugupta@gmail.com

Abstract: Cloud computing is one of the latest computer and business industry buzz words. These days everyone wants to get rid of on desk burden. For example the Burden of on desk hardware (memory, hard disk, CPU), application software, system software, business continuity techniques, database ext. Cloud computing is one solution which provide all the above 'As a service'. Cloud computing is a package of services. Data is no more Desktop bounded, you can access it from anywhere throughout world. Technological advancements – particularly the introduction of 'cloud computing' – have now made this a reality. This paper presents cloud as a service provider. Platform as a Service (PaaS) has become a bigger player in cloud computing, although it will continue to remain a smaller domain than Infrastructure as a Service (IaaS) and Software as a Service (SaaS). As the concept spread and offerings expanded, the industry has now embraced two flavors of cloud storage: public and private. Cloud computing is the way of doing business where the customer buys on demand, and the supplier charges for what the customer uses.. Due to Environmental benefits of cloud, it is on boom these days.

Keywords: Cloud, Growing digital universe, public and private cloud, cloud computing, cloud services.

1. Introduction

This document represents cloud as centralized service provider, which give solution for every aspect of IT either hardware or Software. Following are some of the strong reasons for stepping towards cloud computing.

1.1 Growing Digital Universe

There's a growing gap between the amount of digital data being created and the amount of available storage. The IDC study estimates that in 2009, if every byte of digital data created were to be stored, there would be a 35% shortfall in available storage; 35 ZB of data expected by 2020 and the gap will grow to more than 60% [8]. Cloud computing will become an integral part of the Digital Universe in coming years, More than 34% of total Worldwide digital data will be stored or secured by cloud Services transported using a cloud services email system or shared community.

1.2 Lower IT budget

The use of cloud services lower the portion of the IT budget devoted to system maintenance. By saving this money organizations will drive innovation and business revenue will increase more than \$1 trillion by 2020.

1.3 Mobile access to data

Individual user-generated data makes up more than 70% of the Digital Universe. Cloud services will become more important to individual users as mobile device becomes more prevalent, and as users seek more environment friendly ways of storing data.

1.4 Growing Requirement of Staff

Explosive growth of digital data won't be matched by an aggressive growth in IT staffing. The study estimates that the

Digital Universe will grow by a factor of 44 between 2009 and 2020, the number of storage containers will grow by a factor of 67, and the amount of storage capacity will grow by a factor of 30. Yet the staffing and IT investment required to manage the Digital Universe will grow by a factor of only 1.4. Enterprises and organizations will be forced to search for creative ways to manage their data, and the cloud is an obvious opportunity [8].

2. Producer Consumer Architecture

Cloud Computing can be broadly defined as “several different methods to deliver information or services to customers who pay for what they use”. Cloud computing utilizes a combination of the Internet ('Cloud') and computer technology ('Computing'). It is the real-time delivery of services and solutions to consumers via the Internet, where we have:

Producer - To deliver products to a consumer.

Consumer - Who wants or needs to utilize information.

Customer- Customer can be of two types:

Internal customer - Who is using services that another department within the same Company is offering, and is being charged for consumption.

External Customer – A person or company who is paying for a service or information to some outside service provider.

Depending upon **customer point of view** there are two types of cloud.

Internal or Private Cloud

Where the customer gets Information and Services internally from its own organization. So, the company spends capital to either provide services and data internally, or spends capital to provide the servers, storage, networking, and applications (capital spending) for an external customer

External or Public cloud

Where customer gets information and services externally, the customer owns no storage or server and has no capital expenditures; they simply want to buy what they need on demand.

Same two types of cloud can be defined from the **producer Point-of-view**.

Internal or Private Cloud

Where producer is from an internal department offering Services.

External or Public cloud

Where producer is an external company that is supplying Server, storage, rack space, electricity, and essentially supplies the capital for the information or service [11].

2.1. Public Cloud or External Cloud

A public cloud is where resources, such as storage and applications, are made available over the internet by a third-party provider. The service is typically low-cost or pays-on-demand for what you utilize. The resources are located at an Off-site location that is controlled by the third-party, and accessed by the customer via a web application or web service over the Internet. The term outsourcing is commonly used for this type of cloud computing.

Suppose I have an application that I want to put into production. What do I need to put together to roll out this product? Server, storage for the data, rack space for the server, electricity and many more hardware items. Basically, a capital investment is made to put my application into production in my company's data center. With an external (public) cloud, I do not do any of these things; someone else builds the space and provides the capital investment.

For Example Yahoo email. I can get my email from anywhere in the world at a very low cost. I rely upon Yahoo to provide and store my email, which is an application that is used in the public cloud. This is a classic example of a public cloud, because I using another company to provide the capital expense to maintain my data [11]. Several of the major players and the public cloud product include Amazon Elastic Compute Cloud (EC2), IBM Blue Cloud, Sun Cloud, and Google App Engine, Amazon Web Services, and Force.com. The main benefits of using a public cloud service are [9]:

- (a) Easy and inexpensive set-up because hardware, application and bandwidth costs are covered by the provider.
- (b) Scalability to meet needs.
- (c) No wasted resources because you pay for what you use.

2.2 Private or Internal Cloud

An application where an organization has more control and is managed by the organization itself locally is termed "private cloud." A private, or internal, cloud is where the data is stored and accessed by a limited number of users in the company's own datacenter behind a firewall. The private cloud has all of

the benefits of the public clouds, but it is hosted inside the firewall of the company or department it is supporting.

One of the important features is that a private cloud can allow both internal and external costumers.

To access data in a secure local environment, which differentiates a private cloud from a public cloud? [5, 11]

2.3 Public Vs private

When a company is thinking about whether to use a public or private cloud, the company is making a decision on whether or not to outsource the capital expense.

Public cloud provider is making the capital investment, as opposed to a "private cloud" where the company internally makes the capital investment for the infrastructure [11].

3. CLOUD COMPUTING 'AS- A- SERVICE'

3.1 "Cloud Computing" versus "Cloud Services"

These days customers are not explicitly buying "cloud computing", but the "cloud services" that are enabled by cloud computing environments; cloud computing is hidden underneath the business or consumer service. And so, in our definitional framework, we distinguish between both:

Cloud Services Consumer and Business products, services and solutions that are delivered and consumed in real-time over the Internet

Cloud computing an emerging IT development, deployment And delivery model, enabling real-time delivery of products, services and solutions over the Internet (i.e., enabling cloud services) [8].

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) [7].

3.2 'SOFTWARE' as a service

Software-as-a-Service (SaaS) – This model is designed to simply rent out the soft wares to the user. The service is usually provided through some type of front end or web portal. While the end user is free to use the service from anywhere, the company pays a per use fee. Salesforce.com offers this type of service [11].

Computer applications can be stored and accessed online. This would allow better control over application usage, in addition to giving easier and increased access to users

SaaS is a very broad market. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere. The reason SaaS works at the Shared infrastructure.

So in this economic environment, it comes as no surprise that organizations, large and small, are looking to SaaS providers To offer them services where they pay for infrastructure or expertise on a monthly basis. It will radically change the ways businesses operate -- much like what Web browsers and email did in the 1990s [9]. Different SaaS services include:

3.2.1 Web Facing Applications

Web facing applications will typically use a Cloud Storage offering that provides the data directly to the user's browser using a URL. The data is typed and the browser invokes the appropriate application to view the data. For example, Media Streaming, Social Media sites.

YouTube is a very good example of media streaming and content storage and sharing. Social Media Sites include Myspace, Face book, Twitter, Blogs, etc. Cloud Storage is used as an auxiliary storage space augmenting the web facing social application

3.2.2 Database as a service

Database files are now in the form of URLs. Sharing of database means, just share the link. Similar to database here also, we can Keep track of which user making changes, get latest changes and can go back to any version. Now, we know who else are working on same document, can have web chatting, web session and make a social network [4].

3.2.3 Business application as a service

Today's businesses are using applications from cloud computing in full swing. These soft wares are centrally managed and vendor pays based on usage. E.g. CRM, project management, web conferencing, HR management, web base office [4].

3.3. 'STORAGE' as a service

Computer data no longer has to be stored on site. Instead, they can be stored and backed up at another location supervised and run by a third-party.

3.3.1 General Content Storage with Synchronization to/from the cloud

As we store the data at cloud end, so all the pupations made by client should appear at cloud storage end also. This is the ability to synchronize local client data, from multiple clients, with a Cloud Storage version. Changes are detected and then Synchronization is done asynchronously and opportunistically.

3.3.2 Backup as a service

(a) Backup Software running on, some, local machines. Cloud is providing storage space for backup. There is local backup software or backup server using Cloud Storage as the destination of backup data. There is a local, central backup server that aggregates the use of the Cloud Storage for one location. It generally takes the form of an appliance giving the user an interface to manage the appliance. Also the appliance would back up its own metadata.

Examples: CIRRUSTORE

(b) Backup from one cloud provider to the other

This is the case of using a second cloud provider as the target of backup data from the first cloud provider.

(c) Restore (i.e. Give me back all my data)

Restoring is the obvious reason of why you are doing the backups. Most solutions allow for both online restores as well as physical shipment of data from cloud end to the customer.

3.3.3 Archive/Retention to the Cloud

This is the use case of using the Cloud Storage for archiving of data. Now what is archiving?

(a) Archiving: To store the rarely used important data on some chippier disks for a long time E.g. Scanned copies of Bank checks, old e-mails ext.

(b) Retention Period: "Keep my files for X amount of time" This is the cases where you define the period of time that you guarantee files will be retained.

(c) Secure Deletion: "When it's gone, it's REALLY gone"

This is the case where the service provider provides a means of deleting data in such a way that it's truly gone, i.e. not recoverable by any means. A common Method for this is encrypting the data at rest and then shredding the encryption keys.

(d) Discovery: "Satisfy my subpoenas"

This is providing a service such that when certain documents are required to be produced for a court case, the appropriate documents are produced without undue time or costs. E.g. Bank cheques.

3.3.4 Cloud Storage Peering (i.e. "Intercloud" Storage)

This is the concept of having the Storage Clouds of different Cloud Storage Providers being able to interoperate between each other. Possible Characteristics are:

(a) Shared storage and replication between cloud storage offerings.

(b) Distribute the data across cloud storage providers. Examples:

1. "Federated" Cloud Storage
2. "Cloud Exchange" [6]

3.4 'INFRASTRUCTURE' as a Service (IaaS)

As the name implies, you are buying infrastructure. You own the software and are purchasing virtual power to execute as needed. This is much like running a virtual server on your own equipment, except you are now running a virtual server on a virtual disk. This model is similar to a utility company model, as you pay for what you use. For an example Amazon Web Services provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use

The provider's application program interfaces (API) to start, stop, access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. Because this pay-for-what-you-use model resembles the way electricity, fuel and water are consumed, it's sometimes referred to as utility computing or 'hardware as a service' which includes Memory, processor or servers, all the infrastructure at cloud end[9,11].

3.5 PLATEFORM' as a service (PaaS)

In this model of cloud computing, the provider provides a platform for your use. A set of software and product development tools are hosted on the provider's infrastructure. Services provided by this model include all phases of the system development life cycle (SDLC). Developers create applications on the provider's platform over the Internet. PaaS providers may use APIs, website portals or gateway software installed on the customer's computer. Force.com and GoogleApps are examples of PaaS [9, 11].

4.Characteristic and key attributes of cloud services

4.1. characteristics

A cloud service has some distinct characteristics that differentiate it from traditional hosting.

- (a) It is sold on demand, typically by the minute or the hour.
- (b) It is elastic; a user can have as much or as little of a service as they want at any given time.
- (c) Service is fully managed by the provider (the consumer needs nothing but a personal computer and

Not limited to the client's workplace, travel destination, and home. The flexibility to work from home is an enticing perk for many potential employees. Employees could even access needed applications via cellular devices.

(d) Increased productivity due to decreased latency and multi-tenancy: Latency is decreased due to increased accessibility (people can work wherever and whenever). Multi-tenancy is a core feature of cloud computing as people can work together online and collaborate regardless of location.

(e) Increased security

(f) Computer-specific malware or malfunction - if a specific computer is attacked by malware or crashes; sensitive documents are safe since they are not stored on the computer but rather off-site, work can be resumed on another computer.

(g) Heightened security - dedicated providers of the service would concentrate efforts in safeguarding their plentiful clients' sensitive data.

(h) Centralized location of confidential documents - with regards to client information, sensitive data will no longer be left on often unsupervised laptops and desktops, but would instead be stored

Offsite at a third party location, guarded through superior technology.

(i) Better infrastructure at a lower cost (hardware/software):

(j) Reduced capital expenditure - the firm does not have to invest in software and hardware services, as it will be handled by third-party providers. Similarly, the firm will not have to worry about obsolescence or upgrades either; so the firm can focus on its core business. The firm would merely pay a subscription fee and/or payments based upon usage.

(k) Scalability - during the busy/off seasons for individual departments, firm can allocate computing resources from one department to another or increase or decrease its total resource usage [12].

(l) Less power consumption than clients consume less power than thick clients.

(m) Less noise without a spinning hard drive, less heat is generated and quieter fans can be used on the thin client.

(o) Ease of repair or replacement thin clients are easy to replace in case of malfunctioning as it does not contain much Hardware [1].

5. Related security threats

There are issues related to providing the data to the users, and securing that data. Some of the concerns with cloud computing include new methodologies, how much control over the data the provider companies maintain, where the data is maintained, and how it is secured[2].

- (a) There must be clear separation of customer data.

(b) Determine whether you can get access to logging and audit trails for both compliance and security.

(c) Determine how secure are their Web applications?

(d) There is also the issue of availability. This availability could be jeopardized by a denial of service or by the service provider suffering a failure or going out of business

(e) What are your provider's access controls? How does your provider handle breaches or other insider threats? [9]

6. Conclusion and Future work

Cloud computing offers real benefits to companies seeking a competitive edge in today's economy. Many more providers are moving into this area, and the competition is driving prices even lower. Attractive pricing, the ability to free up staff for other duties, and the ability to pay for "as needed" services will continue to drive more businesses to consider cloud computing. The decision to move to cloud-based services should fit into the organization's overall corporate objectives.

Just as there are advantages to cloud computing, there are also several key security issues to keep in mind.

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Author Profile



Anu Gupta received the B.Tech and M.Tech degrees in computer Sc. and Engineering from Kurukshetra university, kurukshetra in 2003 and 2006, respectively. During 2006-2012, she stayed in Amity School of Engineering, Amity University, Noida, Uttar pradesh as Assistant professor in computer Sc. And Engg. Department. She is now perusing a full time PHD in computer Sc .and system studies with Mewar University, Vasundhra, Uttar Pradesh under guidance of Dr. R.B. Garg.