Survey on Cloud Computing Services, Platforms and Architecture

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ABSTRACT

Cloud computing is virtual computing power and storage delivered using internet. This provides on demand IT resources, share them and dispose them efficiently. Cloud computing is a generic term that involve services over internet. The name cloud computing was inspired from the cloud symbol usually used in flowcharts to indicate internet. Clouds are divided in to different types according the purpose the serve. These types include Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud. Furthermore, we discuss when we are connected to the service how the Client, Application, platform, infrastructure and server will play their part. Last but not the least we discuss the advantages and disadvantages of cloud computing.

Keywords: *IaaS, SaaS, PaaS, VPN*

1. INTRODUCTION

The term "cloud computing" was made popular when Amazon released Elastic Compute Cloud in 2006. The cloud symbol was used to represent a network of computer connected to ARPANET and CSNET. The term cloud is used as a metaphor for internet. The term cloud was later used for distributed computing in early 1993. During the 1960s, the concept of time sharing emerged which was mostly used by large corporations like IBM and DEC. later in 1960 telecommunication companies stated offering services like Virtual Private Network (VPN). This concept allowed the network bandwidth to be used efficiently. They used cloud symbol to denote the demarcation point to indicate what provider is responsible for and what user is responsible for. With the drastic evolution in the field of technology it was the year 2000 when cloud computing came into existence. In Aug 2006 Amazon released Amazon web services and introduced Elastic Compute Cloud. In April 2008 Google released Google App engine and much more. [1]

1.1: What is Cloud Computing?

Generally speaking, cloud computing can be thought of as the mean for delivering hosted services over the Internet. Cloud computing can be thought as on demand delivery of computing or processing power, storage, applications and other information technology resources using cloud platform. Cloud computing emphasize on sharing resources to improve efficiency and overall performance. This allows the organizations to use third party services and keep them focused on their core business activities instead of compelling them to expand their it structure and maintenance. The observation clearly indicates that cloud computing has made companies realize that there is no such dare need to maximize their IT structure. Proponents also claim that cloud computing allows enterprise to run their application fast with improved performance and manageability. As per NIST Cloud computing is a model for empowering ubiquitous (found Everywhere), helpful, on-demand access to the computer resources (e.g., systems, servers, stockpiling, applications, and administrations) that can be quickly provisioned and discharged with negligible administration exertion or specialist co-op communication. [15] (Unique Publication 800-145).
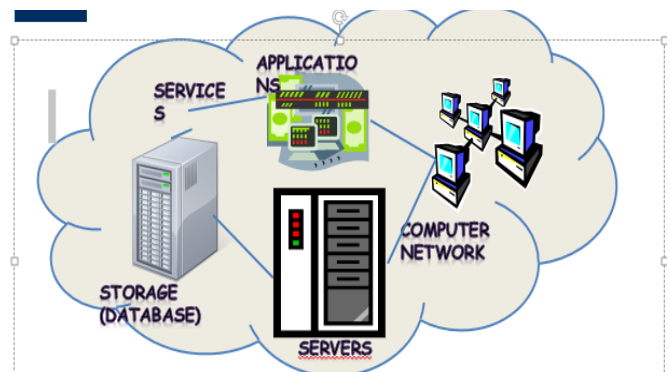

Figure 1 Cloud services

1.2: Cloud Services:

Cloud computing gives shared administrations in spite of nearby server or capacity. It gives access to data from all web empowered equipment. It additionally gives practical and less equipment and programming speculation.

1.3: Characteristics of Cloud Data, Application Services and Infrastructure.

- **Remotely hosted:** services and data is hosted remotely.
- **Ubiquitous:** services are available from anywhere 24/7.
- **Commodified:** you pay for what you would want!

Common Characteristics:

Massive Scale	Resilient Computing
Homogeneity	Geographic Distribution
Virtualization	Service Orientation
Low Cost Software	Advanced Security

Essential Characteristics:

On Demand Self-Service	
Broad Network Access	Rapid Elasticity
Resource Pooling	Measured Service

Figure 2*: Characteristics of Cloud Computing*

1.3.1: Advantages of Cloud Computing
- ✓ Lower PC costs and enhanced execution
- ✓ Reduced programming costs
- ✓ Instant programming refreshes
- ✓ Improved archive organize similarity
- ✓ Unlimited stockpiling limit and Increased information unwavering quality
- ✓ Universal archive gets to
- ✓ Latest rendition accessibility
- ✓ Easier aggregate joint effort
- ✓ Device autonomy

1.3.2: Disadvantages of Cloud Computing
- ✓ Requires a consistent Internet association
- ✓ Does not function admirably with low-speed associations
- ✓ Features may be restricted
- ✓ Can be moderate
- ✓ Stored information can be lost
- ✓ Stored information probably won't be secure

1.3.3: Challenges and Opportunities
- ✓ The use of the cloud computing provides a number of opportunities:
- ✓ It power's up services to be utilized with no understanding of their framework.
- ✓ Cloud computing works using cost-cutting of scale:
- ✓ It possibly brings down the cost for new businesses, as they would not need to purchase their very own product or servers.
- ✓ Cost would be by on-demand pricing.
- ✓ Traders and Service suppliers guarantee costs by building up a continuing income stream.
- ✓ Data and services are stored on a different location and is accessible remotely but available from "anyplace" [3].
- ✓ As always there are pros and cons of everything:
- ✓ Use of cloud computing means depending on others and that could possibly limit elasticity and innovation:

- ✓ The others are likely turned into the greater Internet organizations like Google and IBM, who may corner the market.
- ✓ Some argue with a conflict that this use of supercomputers is a return to the time of mainframe computing (although mainframes where very slow than the new generation of our PC's).
- ✓ Security could prove to be a big issue:
- ✓ It is as yet misty how safe out-sourced information is and when utilizing these administrations responsibility for isn't in every case clear.
- ✓ There are also issues related to policies and access:
- ✓ If your data is stored on different location like you are sitting in Pakistan and all your data is stored on servers which are installed in America, whose policy do you follow and accept to?
- ✓ What happens if that remote server goes down like a disaster happens there or some technical issues come up?
- ✓ How will you then access your data which will be very important at the time when server is down?
- ✓ There have been cases of users or subscribers being locked or blocked out of their accounts and losing access to data.
- ✓

2: MODELS OF CLOUD COMPUTING
1. Infrastructure as Service (IaaS)
2. Platform as Service (PaaS)
3. Software as Service (SaaS)

2.1 Infrastructure as service (IaaS)

This model indicates the hardware is managed and provided by an external provider. It offers access to all the cloud service, also provides accessibility to computing resources like server, storage and networks using internet. It provides a platform for the user to create their IT infrastructure. The concept is to provide virtual hardware using Virtual machines (VM) using keep the virtual environment separated from the underlying hardware and other VM. The user can deploy its own system on the virtual infrastructure. Some common examples include Amazon'EC2, Go Grid, 3 Tera, etc.

Key Features
1. Instead of buying hardware for our enterprise we can simply pay for IaaS for on-demand need to reduce our buying expense of hardware.
2. It is expandable depending on processing and storage needs.
3. Saves multinational companies and firms the costs of purchasing and maintaining their hardware.
4. Location independence data can be accessed from anywhere in the world using internet.
5. Storing data in cloud has led to "No Single Point Failure". [1]

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2.2 Platform as service (PaaS)

Is a cloud computing model which provides development and software tools? It provides user with an environment to develop, manage, customize, test and deliver software and applications. PaaS provides key services to host and develop applications. This model enable user to create their own applications, which make use of the third party hardware. It enables the user to create or run the app instead of dealing with the underlying infrastructure and services. It includes predefined platforms like LAMP platform (Linux, Apache, MySQL and PHP), classified J2EE, Ruby. Google's App Engine, Force.com, etc. [5]

Key Features

1. It is simple and convenient for user.
2. Provides a platform with a bunch of tools to test, develop and host applications in the same environment or platform.
3. The service providers manage security, OS, server OS and software's, and backups if in case something happens.
4. Also have feature of collaborative work even if teams work remotely I-e they are working on different locations but can communicate with each other remotely the best example is Circle.
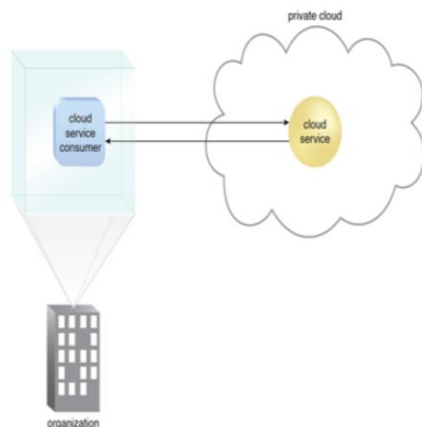
Many of the PaaS providers offer same services but by imposing different limitations. It should be kept in mind before using any third party service provider that they satisfy the business needs of the enterprise. In this case it can be the language and service availability.

Figure 3: A cloud service consumers in the organizations on premises environment accesses a cloud service hosted on the same organization's private cloud via a virtual private network

2.3 Software as Service (SaaS)

SaaS usually deal with the user utilization of the application. It is cloud computing model that provides users cloud-based software. Instead of installing software on devices, applications hosted remotely are accessed using web or Application Programming Interface (API). This service has enabled user to store and analyze data. It also allows collaborated work to be done on similar and different projects. This model provides the customer with the on demand software. The core part of the services executes on the cloud and multiple users can be entertained by services provided through cloud. Today SaaS is offered by giant s like GOOGLE, Microsoft, Zoho, ET, etc. [5]

Key features

1. Services are provided to the customer based on subscription model which means user needs to subscribe to the service before utilizing it.
2. It is not required of the subscriber to install, manage or upgrade software; it is the responsibility of service provider.
3. Data is kept secured on the cloud and backed up constantly.
4. Highly scalable.
5. High availability application is accessible anytime and from anywhere using internet.

3: CLOUD DEPLOYMENT MODELS:

1. Public
2. Private
3. Hybrid

3.1 Public Cloud

Public cloud is used to provide services that are offered by third parties over the internet for end users and the providers are responsible for the maintenance of the cloud. [1] These clouds are used to save money, but they are less secure then private clouds since they are available over the internet for all users, but the security of these clouds can be improved if the management team implements proper security mechanisms. [11]
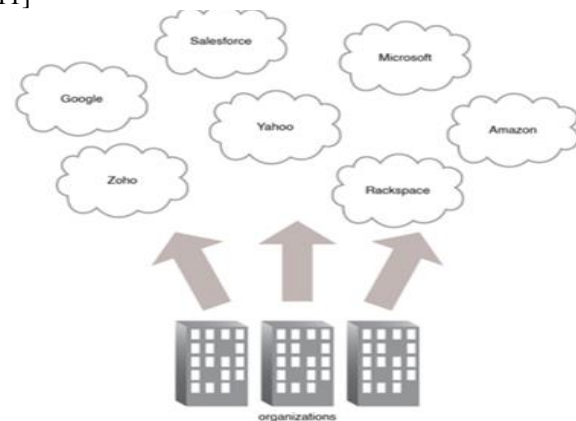
Figure 4 : Organization Act as cloud consumers when accessing cloud services and IT resources made available by different cloud providers.

3.2 Private Cloud

Private clouds are designed for the companies who don't want to share services with public users; they have their own IT professionals who deal with the maintenance of the cloud. The purpose of the private cloud is to provide privacy, security, limited access and reliability to the organization services.

3.2.1 Privacy:

Since private clouds are used to keep the data, information or services private none of the users from outside the organization can access the cloud until and unless they have the access rights.

3.2.2: Security:
Private clouds have good access controls users with appropriate identity can access the cloud due to which the cloud is more secure than a public cloud.

3.2.3: Limited Access:
Due to limited access the cloud can easily allocate resources to
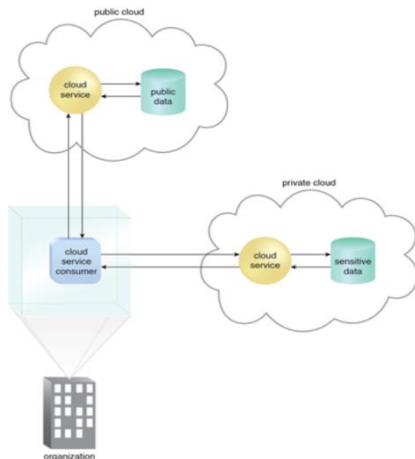
the users when they need it and organization can easily maintain and configure cloud to achieve good network connection between the cloud and consumers.

3.2.4: Reliability:
Data, information or services are more reliable because the clouds have firewalls to secure the cloud and allow the users who have rights to consume the data, information and services.

3.3 Hybrid Cloud

It combines different deployment model to create a single cloud with facilities of two or more models. This model is implemented in such environment where the companies or users want to share data within the companies and outside the companies. Moreover, it enables workload and data to move among private and public cloud in a flexible way as necessities and cost changes.

Figure 5: An Organization using Hybrid Cloud architecture that utilizes both a private and public cloud

3.4 Other Deployment Models:
3.4.1 Community Cloud
Community clouds are service models used when the information is to be share among different groups having common concern like security. It is managed by internal IT team or a third-party. In addition, it is for those organizations that have same cloud requirement and goals to be achieved. This model is cost effective for such scenarios since all the groups will contribute instead of having their own private clouds.

3.4.1 Distributed Cloud
Distributed cloud is a cloud computing platform that interlinks application and data present in different geographical locations. It is used to reduce latency and provide good performance for cloud services. This model is emerging more with the passage of time and advancement in technology since distributed systems are being generated.

Open Resource Computing: [1] This sort of scattered cloud results from [1] a general significance of conveyed processing, since they are more much equivalent to dispersed figuring than circulated registering. Regardless, it is seen as a sub-class of disseminated figuring. Volunteer cloud distributed computing is portrayed as the convergence of open asset registering and distributed computing, where a distributed computing foundation is fabricated utilizing volunteered resources. Several difficulties appear from this kind of foundation, due to the unpredictability of the assets used to assemble it and the dynamic condition it works in. It can likewise be called distributed cloud, or specially appointed cloud. An intriguing exertion such way is Cloud Home; it intends to execute a distributed computing framework utilizing volunteered assets giving a plan of action to boost commitments through monetary compensation. [3]

4: CLOUD COMPUTING ARCHITECTURE:
Cloud computing comprises of many components, which are loosely coupled. Broadly it is divided into two parts
- Front end
- Back end

Each end is connected through a network.
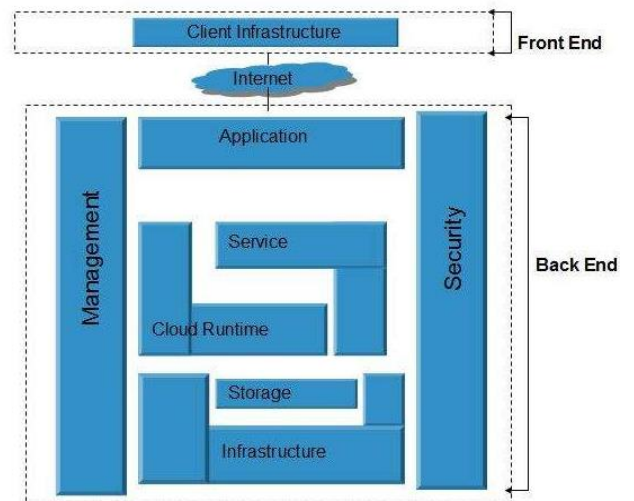
Figure 6: Clod computing Architecture

4.1 Front End:
This is the customer part of cloud computing. It comprise of interface and application required to collaborate to get to cloud computing stage. E.g. internet browser
4.2 Back end:
It suggests to the cloud itself. It contains every one of the resources to give cloud services. It contains colossal information stockpiling, virtual machines, security system, administrations, organization models, servers, and so forth.
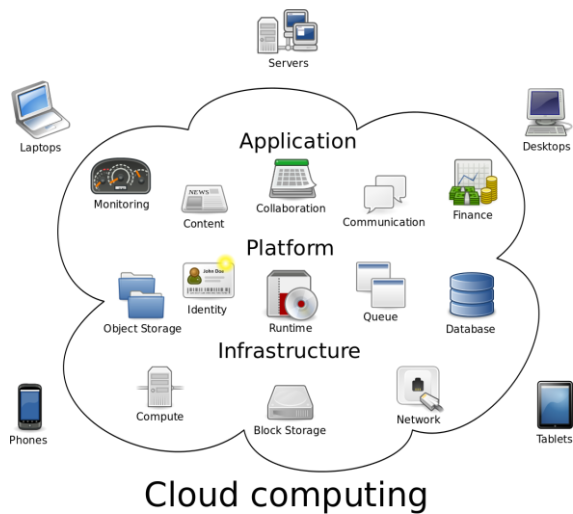
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Figure 7: Cloud Computing Working

5: SECURITY & PRIVACY:

Stolen data or altering Data is possible in cloud environment, since data from various users and organization are put together in a cloud. If someone uploads the data on cloud they have lost the control on their data and the control is transferred to the service providers that are third person. Sometimes the Cloud Service Provider (CSP) uses the data or malicious purposes or can make it corrupt. Security and privacy is major and important issue on cloud computing that is to preserving confidentiality, integrity and availability of data.[4] A simple solution is to encrypt the data before uploading it onto the cloud or encrypt it while the data is stored on cloud.[4] This encrypting methods ensures that the data are not visible to attackers/hackers but cloud administrators have the key to decrypt that data.[4]

6: EMERGING TRENDS

Cloud computing is still a subject of specialization and research [1] and there will be more evolutions. Major cloud computing companies/firms invest billions of dollars per year in cloud Research and Development to make it more efficient. [1] For example, in 2011 Microsoft committed 90 percent of its $9.6 billion R&D budget to its cloud computing research and development.[1] Research and survey by investment bank Centaur Partners in late 2015 predicted that SaaS revenue would grow from $13.5 billion in 2011 to $32.8 billion in 2016. [1]

7: CONCLUSION:

Cloud computing services, architectures and platforms as highlighted in this research study which in current era are in used among various public information technology giants and even in private organizations. Cloud computing are in use to deploy various services offered by organization over the internet for their users. There are several advantages disadvantages followed by key challenges as highlighted in this paper on which researchers need to focus and doing research currently.

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