

Survey Paper of Cloud Computing

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Abstract—The objective of this paper is to provide a comprehensive study of Cloud Computing. The paper aims to shed light on the research activities of cloud computing. In this paper, we will define cloud computing, the architecture of cloud computing, its characteristics, and the deployment model of cloud computing.

Keywords—Cloud Computing, Architecture, SaaS, PaaS, IaaS

I. INTRODUCTION

Cloud Computing is described as a category of on-demand computing services offered by commercial providers, such as Microsoft and Amazon. The purpose behind this term is to offer computing, storage, and software “as a service”. The goal of cloud computing is to come up with a scalable access to computing resources and IT services. Moreover, cloud computing can be used to store large amounts of data across various topics such as Music, E-books, Podcasts, Applications, Videos, and Files.

Buyya et al. [1] (Buyya, Shin Yeo, Venugopal, Broberg, & Brandic, June 2009) has defined the Cloud Computing as “Cloud is a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers.”

The National Institute of Standards and Technology [2] (Mell & Grance, 2011) has described cloud computing as “a model for enabling convenient, on-demand network access to a shared pool of configurable and reliable computing resources (eg:networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal consumer management effort or server provider interaction.”

Basically, a cloud can be used to move large amounts of data from a local system with limited space to an unlimited data storage space. Thus, the three main purposes behind cloud computing is to store data on remote servers, process data from servers, and access data via the Internet.

The main characteristics of cloud computing as given by the definitions include:

- On-demand self-service
- Broad network access
- Rapid Elastic Capacity
- Self-service Interface

- Resources that are virtualized.
- Measured Service

Cloud Computing is the delivery services such as networking, software, analytics, servers, storage, and intelligence. The service utilizes the Internet in order to provide fast innovation, and flexible resources. The consumer pays for the cloud services, which helps to lower the operating costs and run the infrastructure more efficiently.

The data and applications of an organization exist on the web server. If the computers of a company are connected to the cloud computing server, then the company is not required to install a suite for every computer. The client can log into a web-based server which hosts all the software for the needs of the client.

The disadvantages of cloud computing are:-

- The setup cost is expensive
- Troubleshooting problems can be tedious and can lead to conflict with the business goals.
- Since the traffic is varying, the servers can be idle most of the time.

II. CLOUD ARCHITECTURE

The cloud computing system can be classified into two sections: the front-end and the back-end. The consumer or the client sees the front-end, whereas the back-end shows the management and the security of the cloud platform, which the user cannot see.

A. Front End

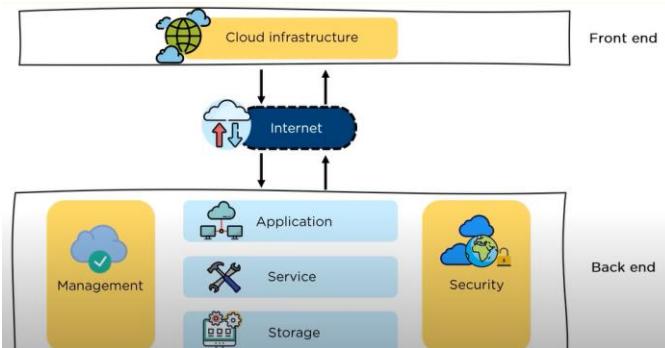
It provides applications and interfaces, required for the cloud-based service. These applications include web browsers such as google chrome and internet explorer. It includes clients and mobile devices.

The front-end consists of the cloud infrastructure. It comprises hardware and software components such as data storage, server, virtualization software, etc.

The Cloud Infrastructure provides Graphical User Interface (GUI) to end users in order to perform the respective tasks.

B. Back End

The Back end manages all the programs that run the applications on the front-end. It has a large number of data storage systems and servers.



III. SERVICE MODELS

Cloud Computing is offered in three different models. The models are built in order to satisfy the requirements of the client. The models are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

1. Software as a Service (SaaS)

In this model, the cloud provider leases the software or applications which are owned by them to the client. For example: Customer Relation Manager (CRM) is provided by salesforce.com on a cloud infrastructure to its client. The company charges the client for its services, but the software is owned by the salesforce company (software provider). This helps the organizations since they do not have to maintain the software or secure the network, and other operational issues which keep the applications running.

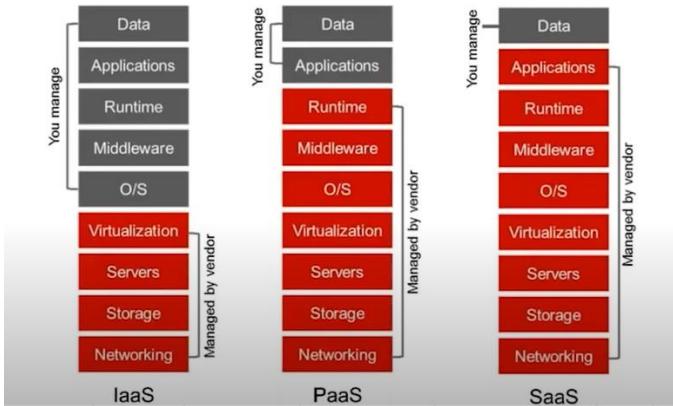
2. Platform as a Service (PaaS)

The Cloud Provider gives the ability to the client in order to deploy customer created applications using tools and programming languages. The provider does not control the underlying architecture including operating system, storage and servers, etc. The provider presents a cloud-based environment in which the user can build applications without the need of working with Integrated Development Environments (IDEs). For example: Google allows the clients to make their own applications using the Google App Engine. Other examples include Microsoft Azure and Apache Startos.

3. Infrastructure as a Service (IaaS)

The service offers a way of acquiring computing capabilities over the web. The client can utilize resources such as processing power, storage facilities, VPN, and networks. The client is charged by a “pay-as-you-go” model, where the customer is billed depending upon the use of the processing power and storage space. The IaaS services are utilized on platforms such as Google Cloud Platform and Amazon EC2.

The working of the server models are given below:



IV. DEPLOYMENT MODELS

The owner of the cloud data centers can deploy the cloud. The atmosphere will consist of either one Cloud or multiple Clouds.

A. Public Cloud

The Cloud Infrastructure is available to the users over the Internet. The infrastructure is owned by a cloud provider. Resources such as applications and storage are made available to the public via the Internet. This setup is easy and inexpensive as the costs of the hardware, application and bandwidth costs are covered by the provider. Example: AWS, Microsoft Azure, IBM's Blue Cloud

B. Private Cloud

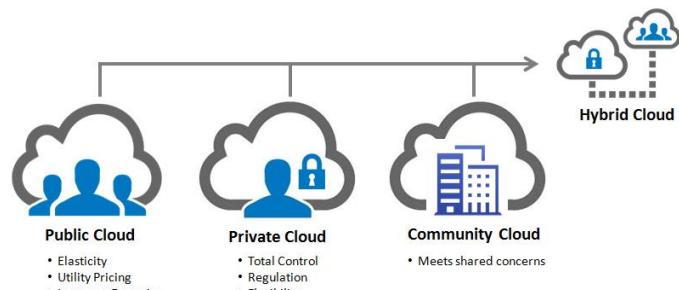
The cloud infrastructure is operated by a single entity. It gives companies direct control over their data. The model offers services to a limited number of people behind firewalls. Hence, any security risk is minimal in this model. Examples: AWS, VMWare.

C. Hybrid Cloud

This cloud computing environment uses a mix of on-premise, private cloud and third-party services, and public cloud services. Hence, it consists of functionalities of both private and public cloud. Example: Federal Agencies use private clouds when sensitive information is involved whereas they utilize public clouds to share datasets with the general public or other government departments.

D. Community Cloud

This type of model follows a collaborative effort in which the cloud infrastructure is shared among various organizations belonging to a specific community with a common concern (such as security, jurisdiction, compliance, etc.).



V. ON-PREMISE vs CLOUD COMPUTING

On-premise software is installed and run on the computers of the organization using the software, rather than using remote servers such as cloud. The best example of an on-premise software is the Microsoft Suits which runs many applications such as Word, Excel, Powerpoint Presentations.

The key differences between cloud computing and on-premise software is

ON-PREMISE	CLOUD COMPUTING
Higher Pay, Less Scalable	Pay for what you use Scale up=Pay more Scale Down=Pay less
Huge Space for servers	No server space required
Need team for hardware and software maintenance	No experts required for hardware and software maintenance.
Poor Data Security	Better Data Security
Less Chance of Data recovery	Disaster recovery
Lack of flexibility	High flexibility
No automatic updates	Automatic software updates
Data can't be accessed remotely	Data can be accessed and shared anywhere over the Internet
Takes longer implementation time	Short implementation time

VI. CONCLUSION

Cloud Computing has emerged as one of the most important fields in the 21st century. In fact, Amazon AWS employs 29 million employees with cloud skills. The various jobs in this field include Cloud Engineer, Cloud Architect, Back-end Developer, Front-end Developer, System Engineer, and Data Engineer. Employees in the field of cloud computing have developed expertise and working knowledge on several cloud platforms such as Agile, Amazon Web Services, Azure, IBM Cloud, VMWare.

It has been noticed that the internet services on-demand is going to increase in the near future. The clients only need to connect their laptops to the server in order to use more storage, processing speed, and pay service charges by simple payment methods such as pay-per-use or subscription models. Moreover, the financial burden of the client is reduced as they do not have to pay for maintenance cost nor computing infrastructure.

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