Architecture of Cloud Computing and The Concept of Virtualization

Supreet Kaur, Amanpreet Singh, Rajeev Kumar

Abstract: ***Cloud computing is a recent technology paradigm that enables organizations or individuals to share various services in a seamless and cost-effective manner. Cloud computing makes it easy to have high performance computing. Cloud computing is a service which is easily available on market when you want it you can start the service and when you don't want you stop the service and you pay it for what you use, you need a computer or a laptop to access the Cloud Services. Cloud services are becoming popular in terms of distributed technology because they Allow cloud users to rent well-specified resources of computing, network, and storage infrastructure. Cloud computing is the development of parallel computing, distributed computing, grid computing and virtualization technologies which define the shape of a new era. However, most existing Cloud Computing platforms have not formally adopted the service-oriented architecture (SOA) that would make them more flexible, extensible, and reusable. By spanning the power of SOA and virtualization in the context of Cloud Computing ecosystem, this paper presents seven architectural principles.***

Keywords: Cloud computing, virtualization, Cloud Architecture.

I. INTRODUCTION

Cloud computing is a term used to describe both a platform and type of application. A cloud computing platform dynamically provisions, configures, reconfigures, and de-provisions servers as needed. Servers in the cloud can be physical machines or virtual machines. Advanced clouds typically include other computing resources such as storage area networks (SANs), network equipment, firewall and other security devices. Cloud computing also describes applications that are extended to be accessible through the Internet. These cloud applications use large data centers and powerful servers that host Web applications and Web services. Anyone with a suitable Internet connection and a standard browser can access a cloud application.

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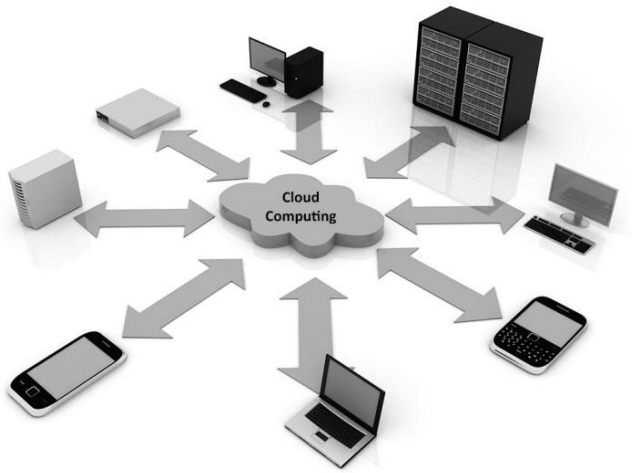

Figure 1: Cloud computing

A. Type of Cloud

The Cloud Computing model has four main deployment models which are:

Private Cloud: Private cloud means using a cloud infrastructure (network) solely by one customer/organization. It is not shared with others, yet it is remotely located. In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. A Private Cloud is implemented using a dedicated data center infrastructure of hardware and software that is used privately by an organization. The data center can be on-premises or off-premises. It is not shared with another organization.

Public Cloud: A Public Cloud is implemented using a shared data center infrastructure of hardware and software that is shared by multiple organizations. The data center is off-premises. Public clouds are less secure than the other cloud models because it places an additional burden of ensuring all applications and data accessed on the public cloud are not subjected to malicious attacks.

Hybrid Cloud: Hybrid cloud is a private cloud linked to one or more external cloud services, centrally managed, provisioned as a single unit, and circumscribed by a secure network [1]. It provides virtual IT solutions through a mix of both public and private clouds. Hybrid Cloud provides more secure control of the data and applications and allows various parties to access information over the Internet. It also has an open architecture that allows interfaces with other management systems. Hybrid cloud can describe configuration combining a local device, such as a Plug computer with cloud services. It can also describe configurations combining virtual and physical,

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Collocated assets -for example, a mostly virtualized environment that requires physical servers, routers, or other hardware such as a network appliance acting as a firewall or spam filter.

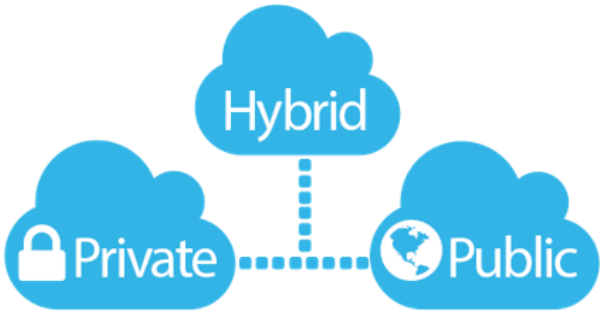

Figure 2: Type of Cloud computing

II. CLOUD COMPUTING ARCHITECTURE: OVERVIEW

Cloud computing can be divided into two sections, the user and the cloud. In most scenarios, the user is connected to the cloud via the internet. It is also possible for an organization to have a private cloud in which a user is connected via an intranet. However, both scenarios are identical other than the use of a private and public network or cloud [3]. The user sends requests to the cloud and the cloud provides the service.

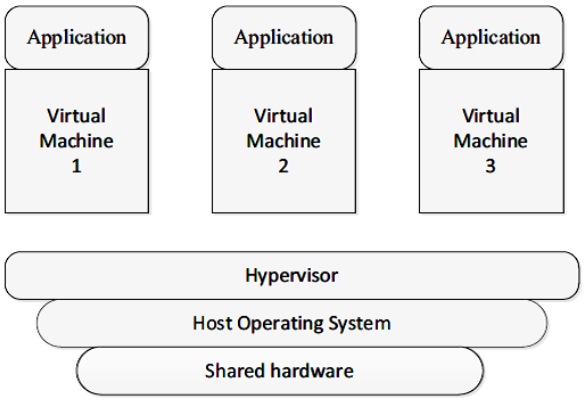

Figure 3: Cloud Architecture

Within the cloud, a central server is responsible for administering the system and in many ways functions as the operating system of the specific cloud network. Another name for this is called ―middleware‖ which is the central server for a particular cloud. Examples include Google App Engine and Amazon EC2 [3].

Cloud service models are commonly divided into SaaS, PaaS, and IaaS that exhibited by a given cloud infrastructure. It's helpful to add more structure to the service model stacks: Fig. 4 shows a cloud reference architecture [8] that makes the most important security-relevant cloud components explicit and provides an abstract overview of cloud computing for security issue analysis.

➔ Software as a Service (SaaS)

Software as a service (or SaaS) is a way of delivering applications over the Internet—as a service. Instead of installing and maintaining software, you simply access it via the Internet, freeing yourself from complex software and hardware management.

SaaS applications are sometimes called Web-based software, on-demand software, or hosted software. Whatever the name, SaaS applications run on a SaaS provider's servers. The provider manages access to the application, including security, availability, and performance.

➔ Platform as a service (PaaS)

It is a complete development and deployment environment in the cloud, with resources that enable you to deliver everything from simple cloud-based apps to sophisticated, cloud-enabled enterprise applications. You purchase the resources you need from a cloud service provider on a pay-as-you-go basis and access them over a secure Internet connection. Similar to the way in which you might create macros in Excel, PaaS allows you to create applications using software components that are built into the PaaS (middleware). Applications using PaaS inherit cloud characteristic such as scalability, high-availability, multi-tenancy, SaaS enablement, and more.

➔ Infrastructure as a Service (IaaS)

Cloud infrastructure services, known as Infrastructure as a Service (IaaS), are self-service models for accessing, monitoring, and managing remote datacenter infrastructures, such as compute (virtualized or bare metal), storage, networking, and networking services (e.g. firewalls). Instead of having to purchase hardware outright, users can purchase IaaS based on consumption, similar to electricity or other utility billing. Many IaaS providers now offer databases, messaging queues, and other services above the virtualization layer as well.

III. CHARACTERISTICS OF VIRTUALIZATION IN CLOUD COMPUTING

Cloud computing typically begins with virtualization [2]. Virtualization is using computer resources to imitate other computer resources or whole computers. It separates resources and services from the underlying physical delivery environment. Virtualization has three characteristics that make it ideal for cloud computing:

1) **Partitioning:** In virtualization, many applications and operating systems (OSes) are supported in a single physical system by partitioning (separating) the available resources.

2) **Isolation:** Each virtual machine is isolated from its host physical system and other virtualized machines. Because of this isolation, if one virtual-instance crashes, it doesn't affect the other virtual machines. In addition, data isn't shared between one virtual container and another.

3) **Encapsulation:** A virtual machine can be represented (and even stored) as a single file, so you can identify it easily based on the service it provides. In essence, the encapsulated process could be a business service. This encapsulated virtual machine can be presented to an application as a complete entity. Therefore, encapsulation can protect each application so that it doesn't interfere with another application.

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IV. BENEFITS OF CLOUD COMPUTING

The following are some of the benefits for those who offer cloud computing-based services and applications [4].

i. Cost Savings

The cloud promises to cut the cost of acquiring, delivering, and maintain computing power, a benefit of particular importance in times of economic uncertainty. By enabling SME to purchase only the computing services needed, instead of investing in complex and expensive IT infrastructures, SME can cut down the costs of developing, testing, and maintaining new and existing systems.

ii). Mobile Access:

The cloud computing enables to access high-powered computing and storage resources for anyone with a network access device. Capabilities of cloud computing helps to facilitate Tele-network initiatives, as well as bolster an agency's continuity of operations (COOP) demands.

iii) Scalability and Capacity

Cloud Computing main benefit is scalability and capacity. By using of public cloud we can scale up and won as per our requirement and the capacity also. But in private it's not possible. Traditional computing also doesn't support scalability.

iv) Resource Maximization

Cloud computing has reduce burden of IT resources to many companies and agencies by maximizing the resources from cloud computing pool.

v). Collaboration

Collaboration is a term where a group of people can work together through online. By using cloud computing environment online, collaboration is easier than before a good example is Google docs.

vi) Customization:

Cloud computing is a platform where we can modify to our needs with being re-development. It offers a platform for creating and amending applications to address a diversity of tasks and challenges.

V. CONCLUSION

Cloud computing is a new term that is introduced in business environment where users can interact directly with the virtualized resources and safe the cost for the consumers. Cloud computing provides scalable and efficient means to manage IT resources in organizations. It has several models to protect its data for the business users. An organization Used private clouds within its organization to prevent from loss of data. Cloud computing have several deployment models that help in retrieving the information. SAAS, PAAS, IAAS are the three models for cloud computing. Security in cloud computing consist of security abilities of web browsers and web service structure the flexibility the cloud brings in has some disadvantages over privacy and security[6][7]. As and when the issues around security and privacy are elucidated cloud computing will be accepted widely.

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