AN OVERVIEW OF CLOUD COMPUTING

Dr. V. UMESH

Assistant Professor, Information Technology Department.

KSOU, Mysore, India.

ABSTRACT

Cloud Computing paradigm is most popular because of its flexibility for provisioningresources quickly and efficiently. In cloud computing the resource requests are served by creating virtual machines of the requested specification on the underlying physical infrastructure. If the placement of virtual machines to the underlying physical machines will take long time or if all the accepted virtual machine requests can'tbe served then some flexibility will be lost. Cloud computing is the utility computing that provides virtualized resources, applications, and services using distributed network and Internet. Cloud computing service offers the ability to scale up and scale down your computing requirements and most importantly to reduce the cost of deployment. Many organizations are migrating to cloud computing services to lower the risk and for better business continuity. In case of on-demand access user requests infrastructure services for immediate access and for a very short interval of time, they have to pay certain charge depending upon that duration. In cloud computing, infrastructure requests are served by the allocation of virtual machines to those requests; these virtual machines should be placed on the underlying hardware infrastructure called datacentre.

Keywords: *Cloud Computing, Virtualization, Private cloud, Public cloud, Hybrid cloud, Community cloud, Hypervisor, Xen Cloud Platform (XPC), Nimbus, Open Nebula, Eucalyptus*.

INTRODUCTION.

There is plenty of dialogue of what cloud computing is. The US National Instituteof Standards and Technologies (NIST) has place a shot in process cloud computing. According to NIST [5] *Cloud computing is a model for convenient, on-demandnetwork access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.*

The above definition is often explained briefly as, network access in on-demand basic and in a very convenient manner along with less effort from management and less service provider's interaction explains quick and straight forward access for potential resources. With resources in a shared pool, illustrates the supplyof computing resources from a cloud service provider are combined in a one massive assortment, for serving all users. The frequent provisioning of resources is employed for quickly matching the active resources, once a necessity comes for those resources. This frequent and quick provisioning prevents a scarcity of computing power once the requirement will increase.

Cloud computing takes the technology, services, and applications that are almost like

those on the Internet and turns them into a self-service utility. The use of theword cloud makes relevancy to two essential ideas:

1. **Abstraction:** Cloud computing abstracts the complexity of system implementation from developers and users. Applications run on physical systems that aren't nominative, data is hold on in locations that are unknown, administration of system is outsourced to others, and access by users is present.

2. **Virtualization:** Cloud computing virtualizes system by pooling and sharing resources. Systems and storage may be provisioned as required from acentralized infrastructure, multi-tenancy is enabled, prices are assessed on a metered basis, and resources are ascendible with lissomness.

What does cloud agility mean? Its tied to the fast provisioning of computing resources. Cloud environments usually give new compute instances or storage in minute [6]. As one may imagine, the dramatic shortening of the provisioning time-frame permits work to begin way more quickly. What does multi-tenancy mean? It refers to principal of software designwhere one instance of the software runs on a server, serving multiple shopper organizations (tenants). During a multi-tenancy setting, multiple customers share a similar application, running similar software, on a similar hardware, with a similar data-storage mechanism [7]. To discuss cloud computing in detail, we would like to outline the lexicon of cloudcomputing; The majority separate cloud computing into 2 distinct sets of models:

Deployment models: This refers to the placement and management of the cloud infrastructure.

Service models: This consists of the varieties of services that you can accesson a cloud computing platform.

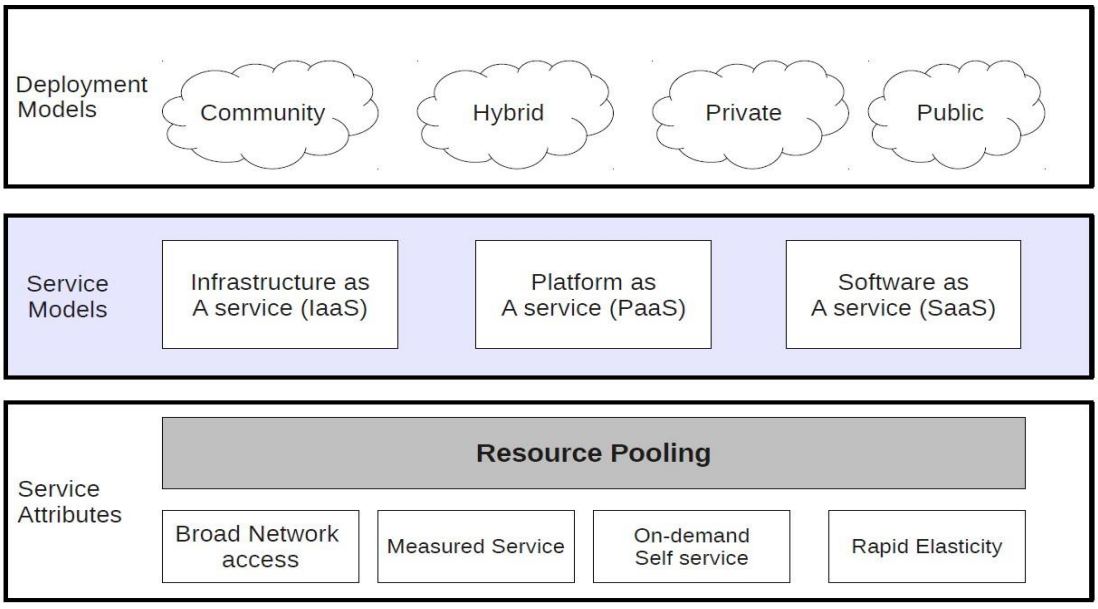

Figure 1.1: The NIST model of cloud computing

DEPLOYMENT MODELS.

Deployment model defines the aim and location of the cloud. Based on the ownership the cloud is classified into four deployment model [5] private cloud, public cloud,community cloud and hybrid cloud.

Private Cloud.

Private cloud (also referred to as internal cloud or company cloud) is a term for a proprietary computing design that gives hosted services to a restricted variety of individuals behind a firewall. The cloud could be managed by that organizationor a third party. Private cloud could also be either on or off premises. This offers organization the price advantages of virtualization.

Public Cloud.

A public cloud is one that supports the quality cloud computing model, during which aservice provider makes resources, like applications and storage, out there to the public over the web. Public cloud services are free or offered on a pay-per-usage model. It's an extension of private cloud with further value profit owing to service provider. The most edges of employing a public cloud service are; simple and cheap set-up, quantifiable to fulfill wants, no wasted resources as a result of to acquirewhat you utilize.

Hybrid Cloud.

A hybrid cloud is a composition of a minimum of one private cloud and a minimumof one public cloud. A hybrid cloud is usually offered in one amongst two ways:a seller incorporates a private cloud and forms a partnership with a public cloudsupplier, or a public cloud supplier forms a partnership with a seller that gives private cloud platforms. A hybrid cloud is a cloud computing model within which a corporation provides and manages some resources in-house and has others provided outwardly. Ideally, the hybrid approach permits a business to require advantage ofthe measurability and cost-effectiveness that a public cloud computing setting offers while not exposing mission important applications and data to third-party.

Community Cloud.

A community cloud is a multi-tenant infrastructure that's shred among many organizations from a selected cluster with common computing issues. Such issues may be well associated with regulative compliance like audit necessities, or is relateto performance necessities, like hosting applications that need a fast-latent period. The community cloud is often either on-premises or off-premises, and may be ruled by the taking part organization or by third party managed service provider.

SERVICE MODELS.

After deployment of the cloud, completely different vendors provide clouds that have different services related to them. The portfolio of service offered adds another set of definitions referred to the service model. There are various services models delineated within the literature, all of that take the shape *XaaS* or *<Something >asa Service* [2].
Three service types [5] have been universally accepted:

Software as a Service (SaaS).

Software as a Service provides a whole environment with pre-installed applicationsalongside infrastructure. Consumer will access these applications by using any device capable of operate an Internet browser. This can be supported the thought of dealings software from a service supplier than shopping for itself. The software is hosted on centralized network servers to create practicality offered over the Internetor any other network. Additionally, called Software on demand it's presently most popular style of cloud computing, attributable to its high flexibility, nice services, increased measurability and fewer maintenance e.g., Yahoo mail, Google docs, CRMclient knowledge. SaaS is extremely effective in lowering the prices of business because it provides access to applications at a price ordinarily way cheaper than a commissioned application fee, that is feasible because of its monthly fees-based revenue model. With SaaS user needn't worry concerning installation or upgrades.

Platform as a Service (PaaS).

Platform as a Service provides a framework for the developers to create and deploytheir own application on a hosted infrastructure. The client doesn't have to be trouble concerning the underlying hardware; they solely have to be compelled to manage the in-operation environment with the interface provided to them. They can use any artificial language supported by the cloud service provider to create their application in that environment e.g., SalesForce.coms Force.com [8].

Infrastructure as a Service (IaaS).

In Infrastructure as a Service computing model consumer will borrow the basic hardware resources for building their own framework. They'll customize their entireframework with the assistance of virtual machines, memory, virtual network etc. The consumer doesn't have to manage the physical resources, as they're supplied with virtual resources which can be managed programmatically. It delivers the computing infrastructure as a totally outsourced service. A number of the businesses that giveinfrastructure as a service are Google, IBM, Amazon.com etc. Virtualization allows IaaS suppliers to supply virtually unlimited instances of servers to customers and build efficient use of the hosting hardware.

VIRTUALIZATION VS. CLOUD COMPUTING.

Virtualization and cloud computing were each developed to maximize the employment of computing resources whereas streamlining processes and increasing efficiencies to cut back the full value of possession.

Virtualization could be accustomed to offer cloud computing, cloud computing is sort of completely different from virtualization. Cloud computing to most people might appear as if virtualization and is incredibly similar in fashion, however itis often higher represented as a service where virtualization is a component of a physical infrastructure [9]. Cloud computing was born from the construct of utility computing. Utility computing was the idea that computing resources and hardware would become atrade goods to the corporations and/or federal agencies would purchase computing resources from a central pool and pay just for resource they used. These resources would be metered, such as you get power for your home from an electric company.

The real distinction between virtualization and cloud computing is truly notthat troublesome to grasp. For example, a self-service model isn't a vital elementin virtualization, however is in cloud computing. You'll actually argue some virtualization solutions might embrace a self-service component; but, it's not obligatory. In cloud computing, self-service could be a crucial construct to deliver accessibility to any user at any time, that is what a service is all regarding. Moreover, self-service is an efficient mechanism to cut back the number of coaching and support required in the slightest degree levels among a company. Both technologies will prevent cost. If you select to use virtualization, you may incur a good deal of direct value however will save additional on operational expenditures within the long-standing time. Cloud computing works simply in an opposite fashion, you would not like several resources at the start, therefore cloud computing can seemingly value little within the starting. However, as your applications become additional fashionable to your users, the demand on resources will increase.

VIRTUAL MACHINE AND CLOUD COMPUTING.

Virtual machines include virtual hardware and a real software package. The virtual machines give an entire setting for application to run similar to they might on their own individual server, together with each the hardware and software package [10]. Enterprise needs are driving the evolution and adoption of the cloud and this cancreate the utilization of virtual machines even additional vital than it's been up to now.

In Infrastructure as a Service model the infrastructure requests are served by allocating virtual machines to those requests [2] [11]. Therefore, on service supplier's aspect one in every of the first concern is the allocation of virtual machine onthe particular physical resource i.e. the underlying hardware infrastructure. This allocation ought to be economical in order that resource utilization is optimized and to serve in lesser time.

The virtual machine placement in cloud computing are often created by considering any one of the three classes [12]; reservation, on-demand access andspot markets. In case of reservation

user must pay a particular fee for a selected amount for every instance of a virtual machine. In case of on-demand access user requests virtual machine for immediate access for a relatively short interval of time, and pay the charge relying upon that period. In case of spot markets, the users oughtto specify the price they're willing to buy the requested virtual machines, as in spot markets there's frequent fluctuation in providers value. The users are allotted with virtual machines only if the providers value is same or less than the users fee.

HYPERVISOR IN CLOUD COMPUTING

Virtualization involves a shift in thinking from physical resource to logical, improves IT resource utilization by treating your physical resources as pool of resources where virtual resources will be dynamical allotted. By implementing virtualization in your work environment, you're able to consolidate resources like processors, storage, and network into a virtual environment. System virtualization creates several virtual systems inside one physical system; virtual systems unit are not dependent on operating environment that use virtual resources. System virtualization is most typically enforced with hypervisor technology; hypervisor or virtual machine

manager are firmware or software components that are capable of virtualizing system resources, and managing them [13].
Typically, hypervisors are classified into two categories

- Type 1 Hypervisor
- Type 2 Hypervisor

Type 1 Hypervisor:

This sort of hypervisor is deployed as a bare-metal installation. This suggests that the primary thing is to install the hypervisor as the operating system on the server. The good thing about this is that the hypervisor can communicate directly with

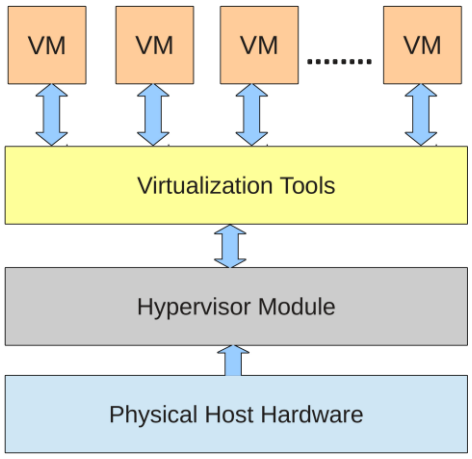

Figure 1.2: Type 1 Hypervisor

the underlying physical server hardware. Those resources are then virtualized and delivered to the running VMs. This is often the well-liked methodology for several production systems [14].

Type 2 Hypervisor:

This model is additionally referred to as a hosted hypervisor. The software isn't put in onto the bare-metal, however instead is loaded on top of already installedlive operating system. Though there's an additional hop for the resources to takeafter they experience to the VM the latency is minimal and with today's fashionable software enhancements, the hypervisor will still perform optimally [14].

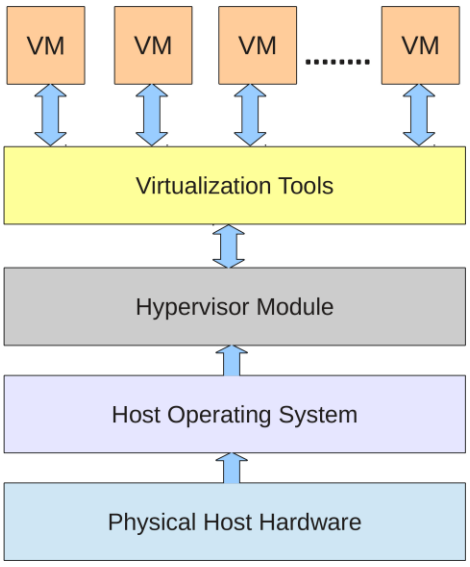

Figure 1.3: Type 2 Hypervisor

Hypervisors are based on two types [15] of virtualization:

- Full Virtualization.
- Para Virtualization.

Full Virtualization:

Most hypervisors typically use full virtualization which suggests that they utterly emulate all hardware devices to the machines. Guest operating systems don't need any modification and behave as if they each have exclusive access to the whole system.

Full virtualization typically includes performance drawbacks as a result of completeemulation typically demands a lot of process resources (and a lot of overhead) fromthe hypervisor.

Para Virtualization:

Paravirtualization is a virtualization technique that presents a software system interface

to the virtual machines that's almost like but not same as that of the underlying hardware. The intent of this changed interface is to cut back the portionof the guest operational system's execution time that's spent performing operations that are substantially tougher to run in exceedingly virtual surroundings compared to a non-virtualized environment surroundings. There are specifically defined" hooks" that enable the guest and host to request and acknowledge these tough tasks that will rather be executed within the virtual domain, where execution performance is slower.

Open-source Cloud Computing Solutions.

The event of cloud computing solutions brings many technical challenges to cloud developers. These challenges is sorted in three main areas: negotiation, decision, and operation [12]. Within the negotiation phase, there are the challenges relative to application developers' interface with the cloud additionally because the description of the cloud offerings. It includes the definition of the programmability level that the cloud solution can supply. The decision phase copes with most drawbacks that clouds face behind the scenes; however virtual resources is scheduled to fulfill user needs. Last, the operation phase is related to the social control of selections and also the communication between cloud components.

Xen Cloud Platform (XPC).

The Xen hypervisor could be a answer for infrastructure virtualization that gives an abstraction layer between servers hardware and the software [16] [17]. Xen is associate open supply type-1 or bare metal hypervisor, that makes it doable torun several instances of software's or so completely different operative systems in parallel on one machine. Xen is employed because the basis for variety of industrialand open-source applications, such as: server virtualization, Infrastructure as a Service (IaaS), desktop virtualization, security applications, embedded and hardware appliance. Xen allows user to extend server utilization, consolidate server farms, scale back quality, and reduce total value of possession. The Xen is employed by several cloud solutions like Amazon EC2, Nimbus and Eucalyptus.

Nimbus.

Nimbus [16] [18] is open-source solution to deploy clusters into Infrastructure as a Service for cloud computing focusing principally on scientific applications. It offers to users the likelihood to apportion and assemble remote resource by deploying virtualmachines, referred to as virtual space services. A virtual space service is a virtual machine manager. To deploy applications, Nimbus offers a cloud kit configuration that consists of service hosting and image repository. Combining all the tools and capabilities in numerous ways in which permits users to quickly develop custom community specific solutions. For instance, one community would possibly need to use Nimbus IaaS to assemble a private of community cloud whereas the other might want to concentrate on augmenting resources of an already exiting cloud withresources from varied community and public clouds.

Open Nebula.

Open Nebula is an open-source toolkit accustomed build personal public and hybrid clouds [19] [16] [20]. It's been designed to be integrated with networking and storage solutions and to suit into existing data-centers. The target is to develop the most-advanced, highly-scalable and adoptable solutions for building and managingvirtualized data centers and IaaS clouds. It gives cloud developers and users with alternative of cloud and system interfaces type, open cloud to de-facto standards,to supports the bound of an expensive scheme of upper level parts. They arrangefor operation network to alter the management of Open Nebula cloud instances, fault tolerance practicality to maximize time period within the cloud, increased management of images and templates, new security practicality, increased support for federation of data-centers and support for multi-tier architectures.

Eucalyptus.

Eucalyptus is an open-source cloud computing framework targeted on educational analysis. Eucalyptus users are ready to begin, control, access and terminate entire virtual machines [16] [21]. Eucalyptus project presents four characteristics that differentiate it from others cloud computing solutions: (a) Eucalyptus was designedto be simple while not requiring dedicated resources; (b) Eucalyptus was designed to encourage third-party extensions through standard software and language-agnostic communications mechanisms; (c) Eucalyptus external interface is based on the Amazon API and (d) Eucalyptus provides a virtual network overlay that isolates network traffic of various uses and permits clusters to be a part of a similar native network.

CONCLUSION.

In this paper an overview of the cloud computing is given, in which different deployment models, service models have been described. A differentiation between virtualization and cloud computing is also presented along with virtualization technologies and open source cloud computing solutions.

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