VOL. 10, NO. 5, MARCH 2015 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences


www.arpnjournals.com

OPEN PLATFORM CLOUD INFRASTRUCTURE MODEL WITH ENHANCED VIRTUALIZATION

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ABSTRACT

Evolution of international network had led to growth in Cloud computing technology. Cost efficient personal computers with vast resource have been possible only by the evolution of Cloud Computing. The recent trend in Cloud computing technology emerges with the advancement of computing resources and hardware in single platform, provided to the user on-demand. The cloud computing has led to chief growth in the field of computer science and gave a major impact in business field with widespread adaption of virtualization and Service Oriented Architecture (SOA). In this paper, Infrastructure as a Service (IaaS) is provided on-demand to the user with enhanced virtualization technique to utilize third party resources. This may eventually lead third party user to compensate only addition charges towards their cloud vendor. Bare metal hypervisor maintains third party resource through Application Program Interface (API) during failure and data replication upon Service Level Agreement (SLA). This cloud setup would urge Business Enterprise to extend their resource across network and attract more users to cloud. Implementation of this setup provides openness to the world of Cloud Computing.

Keywords: openness, virtualization, cloud, API, business enterprise, hypervisor, IaaS, SLA.

1. INTRODUCTION

Internet has been an upsurge of various technologies that have been advanced since its commencement. Due to the unprecedented success of internet, computing resources is now more universally available. This led to growth in novel concept called Cloud Computing. Information access, software and computation and delivering storage amenities are the combination of Cloud computing. The location of stored data is not known to the user. Cloud computing accepts the theories of utility computing, virtualization techniques, autonomic and architecture of service oriented. Archetype cloud computing had led to vast change towards its implementation and it has become a development in the information technology space as it guarantees significant price decrease and novel business prospective to its users and providers [1].

The definition of Cloud computing by NIST (National Institute of Standards and Technology) [9].

"Cloud computing is a model for allowing convenient, ubiquitous, on-demand network access to a shared pool of configurable resources (networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

The benefits include:

- Decrease hardware and maintenance price
- Convenience round the globe, and
- Elasticity and extremely automatic processes.

The cloud computing main categories or patterns include 11 [7]. The three main business standards are described in this sector: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [8].

a) Software as a service (SAAS)

The cloud source provides the cloud consumer with the ability to deploy an application on a cloud infrastructure [4].

b) Platform as a service (PAAS)

Cloud source delivers capability to organize and improve applications offered by the cloud consumer on a cloud infrastructure using tools, runtimes, and services supported by the CSP [4].

c) Infrastructure as a service (IaaS)

The cloud consumer is provided with essentially a virtual machine by the cloud source. The cloud consumer has the capability to deliver processing, storage, networks, etc., and run systematic and organizes software run by virtual machine provisioned by the operating system [4].

This paper focuses on setting up hardware virtualization in Infrastructure as a Service (IaaS) model through Application Program Interface (API).

2. PROPOSED WORK

2.1 Virtualization

Type I Hypervisor directly runs on top of hardware. It acts as operating system interacting with physical hardware through Instruction Set Architecture (ISA). Instruction Set Architecture describes the memory, register, processors and interrupts management. ISA interfaces directly to physical hardware that permits the management of guest operating system. Application

Binary Interface (ABI) is used to interface Virtual Machines (VM) and Virtual Machine manager. This interface permits portability of libraries and applications across operating systems that implement the same ABI.

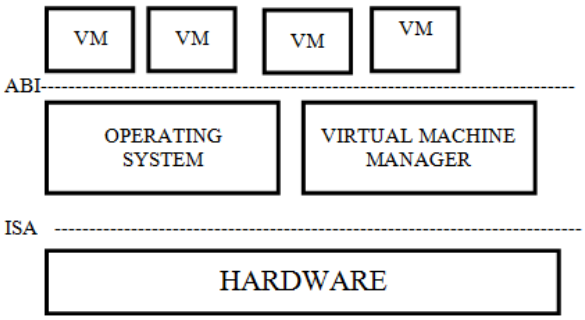

Figure-1. Architecture.

The Virtual Machines (VM) are provided as per the capacity of hosts underlying physical hardware. Let us consider template of VMs as shown in Figure-2.

IaaS provider

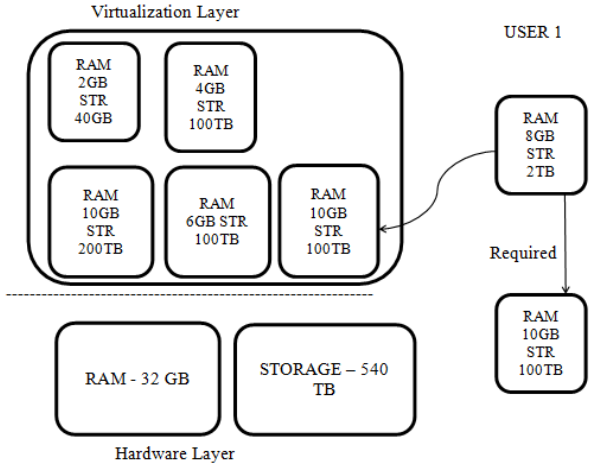

Figure-2. Virtualization.

The USER-1 requires additional computing environment to work, hence the solution is to look for a trusted IaaS provider. Here the USER-1 resource is under-utilized and some technique is necessary to effectively utilize his resource.

The proposed scheme is to exploit the USER-1 resource by virtualizing existing hardware infrastructure as shown in the Figure-3. Here two VMs with specified template have been generated. One VM for USER-1 for using basic functionalities via internet and additional VM called User Generated Virtual Machine (UGVM) to deploy it on cloud infrastructure to effectively utilize entire user resource.

IaaS provider

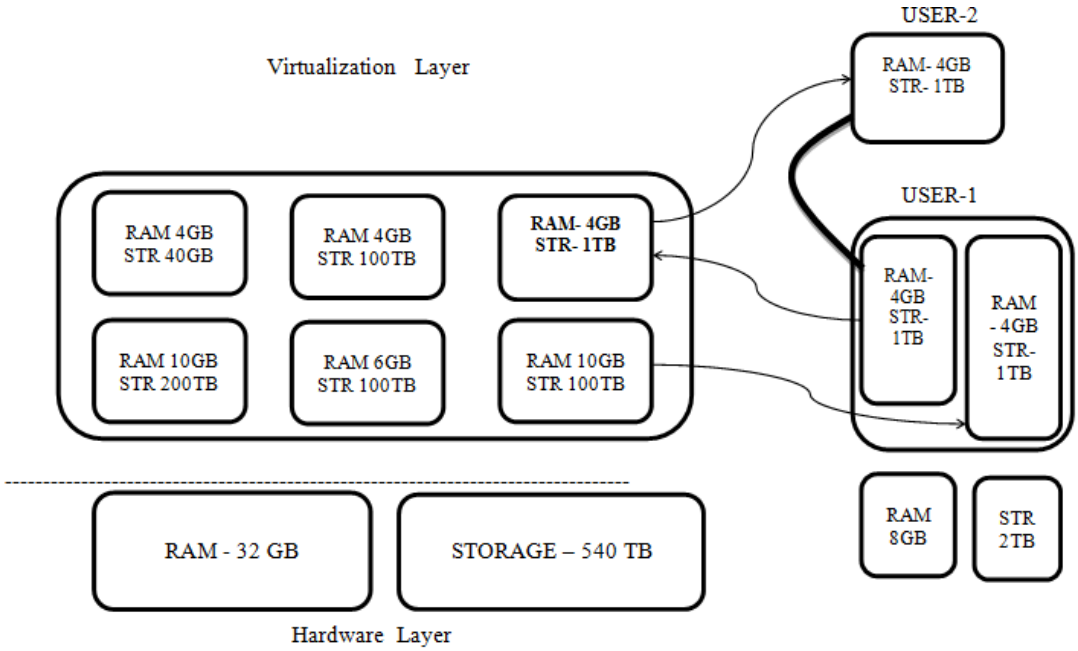

Figure-3. Virtualization.

a) User Generated Virtual Machine (UGVM)
b) Tunneling through Virtual Private Network (VPN)

The system calls generated by User Generated Virtual Machine (UGVM) is achieved through Application Program Interface (API).

Since transmission rate between USER-1 and USER-2 is low, tunnelling is done with the identification of Virtual Private Network (VPN) to effectively communicate with UGVM.

Hence through this open platform cloud infrastructure any user can deploy VMs by applying partial virtualization on their underlying hardware.

2.2 Backup

Any user using cloud would absolutely rely on cloud service provider when data goes missing; hence there is a need to keep a backup of critical data.

UGVM may fail at any time due to following reasons:

- Inconsistent internet connection
- Hardware failure
- Power failure

It is responsibility of vendor to safeguard client's data and current activity. Cloud service provider should provide an alternative solution to the failure. Therefore data stored in UGVM and copy of the image is replicated across the Cloud server at particular interval of time. In case of UGVM node failure, existing VM from cloud service provider would run the same task that had failed using replicated data and the image to give user a reliable connection and decent platform to work.

2.3 Security

External customers store some sensitive data for their business through their cloud provider's site. These data has to be preserved against malicious practice. In this proposed model as user data is transferred to different nodes across the network between UGVM and cloud service provider, UGVM has to convince cloud service provider thru Service Level Agreement (SLA) on security issues. The legal agreement between UGVM and the cloud service provider is SLA henceforth it has to be standard.

2.4 Cost

The below Figure-4 give complete graph representation of total hours resource utilized and billing strategy. UU (UGVM utilization) represents resource consumed by external customer on UGVM. CSU (Cloud service utilization) depicts resource consumption on the cloud service provider by USER-1. In comparison with UU (UGVM utilization) and CSU (Cloud Service utilization), the AU (Actual utilization) of USER-1 is derived.

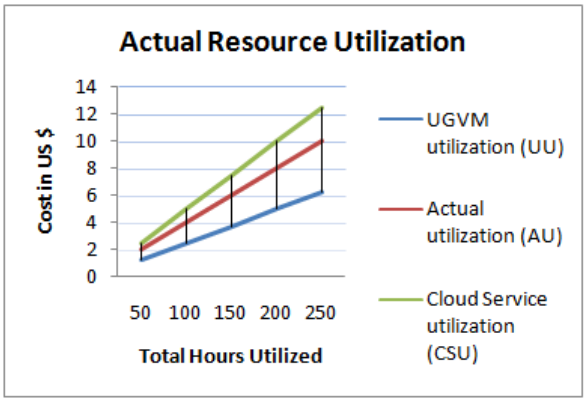

Figure-4. Actual Resource utilization.

From the above graph USER-1 has to pay only Actual Utilization cost to the cloud service provider. Here actual utilization cost is reduced by 37.5% and USER-1 has to pay only 63.5% to the cloud service provider. Remaining amount is charged by USER-2. Hence resource is completely utilized and cost is also reduced to a considerable amount.

3. CONCLUSIONS

Cloud computing introduced business environment where users can use vast resource through low cost virtual machines irrespective of their hardware specification. Moving to cloud keeps our own resource under-utilized. In this paper, cost efficient Infrastructure service is achieved through maximum user resource utilization. It has eventually led to advancement of billing system in cloud. Incorporating Open Platform Infrastructure Model in IaaS openness is achieved via hypervisor I and this may lead to different approaches in virtualization techniques. The cost of the user is also considerably reduced in Open Platform Infrastructure Model. This ultimately leads to future research in the area of Cloud Computing.

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