A Study of Cloud Computing Based on Virtualization and Security Threats

Amanpreet Kaur[1]*, Dr.Sawtantar Singh Khurmi[2]

[1]*Dept. of CSE, DBU, Mandi Gobindgarh, India
[2]Dept. of CSE, DBU, Mandi Gobindgarh, India

*Corresponding Author: sawtantar@gmail.com

Abstract- Cloud computing is an emerging technology based on the network that provides access to the data from server. It Cloud computing is an emerging technology based on the network that provides access to the data from server. It illustrates an extremely scalable computing asset offered as an external service Paid by Internet method. In cloud computing, mainly we have focused on virtualization, energy efficiency and security. In this paper, we conducted a survey of cloud computing which is a framework that uses different services, IaaS, PaaS, SaaS and HaaS. A comparison for the same is also explained. The concept of virtualization is also discussed following Bare metal hypervisor, Hosted hypervisor and VMM (Virtual machine migration). Different security threats have been mentioned being considered for cloud services. For the calculation of energy consumption, cloud computing uses energy efficiency concept. Work done by various authors in cloud computing has been discussed with the research gap as well.

Keywords- Cloud computing, Virtualization, service model, Virtual machine migration, security threats and energy efficiency

I. CONTEXT

In the early days, mainframe computers were used having large sizewith limited resources like power, CPU and memory. Because of less availability of the resources, the users are also limited. The concept of cloud computing was used by mainframe computers initially at 1920s, where all the users usually accessed data stored on the server at any time anywhere. No hard drives or special system is required, only account of the user is basically required [1].

The paper is divided into seven sections. With the continuation of the context, the concept of cloud computing has been explained. Virtualization is explained with its types, namely, bare metal hypervisor, hosted hypervisor and VMM. The threats in cloud computing are drawn in tabular form in section 4. The concept of energy efficiency in cloud computing is explained in section 5. Various authors has done their work in this field, so a glance of existing technique is explained in section 6. According, the crux of the paper is defined in section 7 as conclusion.

II. CLOUD COMPUTING

Cloud computing is a distributed computing paradigm, in which the computing resources like virtualized physical machine that host applications, shared storage devices, backup server etc through internet. Cloud computing typically results in an increasing number of data centres, including power costs, cooling, and carbon peak power consumption.
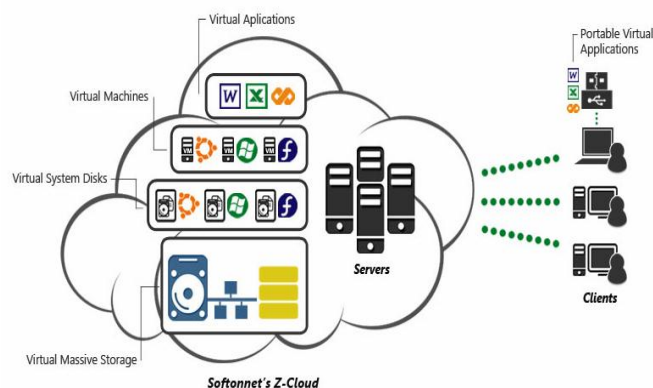

Fig. 1.Cloud Computing Environment

The basic technology of cloud computing environment is virtualization. To establish a variety of strategies, such as virtual machine migration, virtual machine and server consolidation, energy-efficient computing is required [2].

Examples of cloud computing are, yahoo, Google, Amazon etc. A user only requires internet connection and an android phone to send the emails. All the emails managed by the cloud service providers usually stores in cloud. The cloud service models are listed below [3-6]:
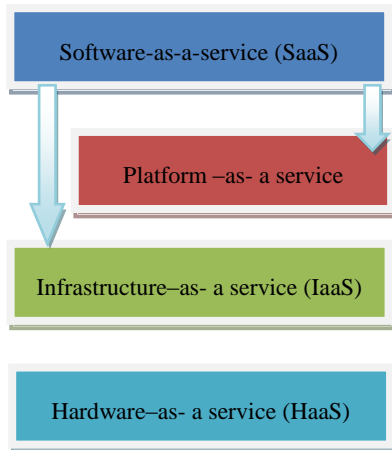
Fig..2. Cloud computing service

Table 1 is defining the services offered by cloud computing, namely, SaaS, IaaS and PaaS. The description is based on the basis of users, availability of users, reason of use, service provider.

Table 1.Service model of cloud computing

Service	SAAS	PAAS	IAAS
Definition	It is known as Software as a service in which third party provider makes the applications to be available to the users over internet.	It is known as a Platform as a service. This service provides a platform to allow developers to build applications and services over the internet.	It is known as infrastructure as a service. This is used to deliver hardware component like storage and server to users.
Users	Business user	Developer	System manager
Availability of services	Email, office automation, website testing, virtual desktop	Services and application test.	Virtual machines, operating system, network, storage, backup services.
Reason of use	For completing business task	Create an application for users	G Provide platform for service and application test and deployment integration.
Service provider	Google apps, saleforce.com	Amazon, Microsoft	Rackspace, Amazon.

III.   VIRTUALIZATION

Virtualization means to partition the computer resources into many different executable machines with the help of hardware and software. It allows a number of virtual machines to execute on a single machine. It allows the servers that used more power to create more servers with less powers and thus reducing the overall cost of the space. A virtual machine manager is used to monitor a program that enables multiple OS (operating system) that has been shared on a single host. Virtual machine or Hypervisor is of two types named as Bare Metal hypervisor and Hosted Hypervisor that are explained below [7].

Bare metal hypervisor

This hypervisor is installed on the hardware itself and controls the available resources. Hyper V and VMware are the example of bare metal hypervisor.
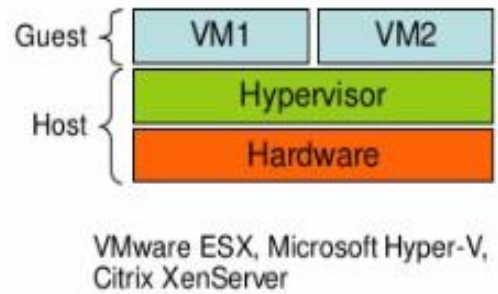

Fig.. 3 Bare Metal Hypervisor

Hosted Hypervisor

This is installed on the operating system and OS has a control over it. VMware player, Virtual box and Xen are the example of Hosted hypervisor.
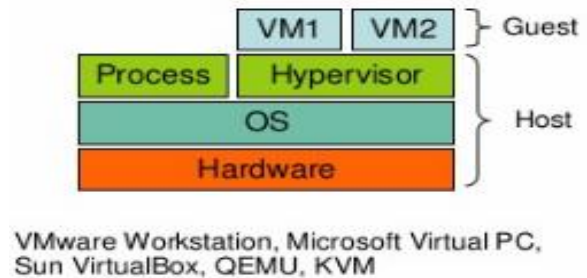

Fig.4. Hosted hypervisor

Virtual machine Migration

Virtual machine migration is the process to transferring the different VMs with their jobs or tasks from one physical machine to another physical machine within same or

different server. Thus, after migration, the execution of jobs by different VMs does not get affected [8].

IV.   SECURITY THREATS AND ATTACKS

There are some threats that considered for cloud service users are listed in table below:

Table 2. Security Threats and Attacks for cloud service users [9-11]

Threats	Description
Responsibility Ambiguity	As the services to the users are provided through internet thus conceptual conflict may occur due to lack of responsibility among the cloud service users.
Lack of Governance	As we know that all the service models will perform different responsibilities thus the governance will mainly affected by the cloud service model.
Loss of trust	Due to the black box feature of the cloud service, it becomes difficult for a cloud service user to maintain his service provider trust level. This is due to the fact that the provider's security level is not in formalized manner.
Service provider lock in	This happed due to the lack of tool that has to convert the virtual machine to a standard format
Unsecure cloud service user access	attack on cloud like phishing, fraud are available. To amplify the impact of these attacks password are used usually.
Data loss and leakage	Encryption key loss will cause a serious problem to the users.

V.   ENERGY EFFICIENCY IN CLOUD COMPUTING

To determine the amount of energy consumed by the data centres, mainly two parameters are used that are accepted internationally. These metrics are named as Power usages effectiveness and Data centre infrastructure efficiency. Both are defined below [12, 13]:

$$P_e = \frac{\text{Total available power}}{\text{Ports eqiped power}} \quad (1)$$

$$D_c = \frac{\text{Ports equipment power}}{\text{Total available power}} \times 100 \quad (2)$$

VI.   RELATED WORK

This section explains the existing work in the field of cloud computing in the tabular form. The explanation is given for the work being proposed by the authors with the research gap.

Table 2. Comparison of existing work

Author	Proposed work	Research Gap
Abdul Razaque [15]	Task Scheduling based on the carbon footprint in Cloud Computing	High execution time due to less flexibility and reliability.
Teena Mathew [16]	Analysis of various Task Scheduling Algorithms in Cloud Computing environment	Computation complexity increases because every server was treated individually.
Hamid Arabnejad [17]	Low-time complexity budget–deadline constrained workflow scheduling for heterogeneous resources	There is no any concept of the dynamic concurrent DAG scheduling problem is proposed so that the complexity is not acceptable.
Jia Yu and Rajkumar Buyya [18]	A Budget Constrained Scheduling of Workflow Applications on effectiveness Grids by Genetic Algorithms	To solve the QoS constraints such as reliability and security no optimization has been used.
Qie He [20]	Hybridization of particle swarm optimization with a feasibility-based rule for constrained optimization	For solving a constrained optimization problems HPSO is not appreciable so that the weakness of penalty function needs more enhancements.
Jasraj Meena [21]	Cost Effective GA for Workflow Scheduling in Cloud in Deadline Constraint	There is a big issue of shutdown time of VMs and due to the general execution workflow cost is affected. Due to the absence of optimal schedule plan for a real cloud environment,

		the computational cost is more and there is a chance of improvisation in the optimal schedule planning.
Alexander A. Visheratin [22]	Workflow scheduling algorithms for hard-deadline constrained cloud environments	For providing better solution in the starting point heuristic algorithm was absent.
Anton Beloglazov [23]	Energy-aware resource allocation heuristics for effecient management of data centers for Cloud Computing	The proposed system consumed more energy and thus can not be used on large scale environment. Difficult to run on large-scale and at large-scale energy consumption is more. There is no any concept of the generic resource manager.
Weihong Chen [24]	Efficient Task Scheduling for Budget Constrained Parallel Applications on Heterogeneous Cloud Computing Systems	The problem of proposed work is only applicable for the homogeneous cloud environment.

VII.   CONCLUSION

The main aim of cloud computing is to provide a flexible and efficient platform to the clients to share their files of data in an efficient way. Different users share the available resources in an effective way. In this paper, we have discussed the architecture and the various service provider of cloud computing. The concept of virtualization along with the challenges issues of cloud computing has been discussed in detail. Instead of the several restrictions and the need of better ways to process, cloud computing is becoming a very attractive paradigm, especially for large businesses.

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