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Improving Efficiency of Billing System in Cloud Computing Using Migration of Virtual Machine

Gurjot Kaur Sandhu[1], Navdeep Singh Sethi[2]

[1]M.Tech Student, CSE Department AIET Faridkot
[2]Assistant Professor, CSE Department, AIET, Faridkot

Abstract: ***Cloud computing is the model for convenient on-demand network access, with minimum management efforts for easy and fast network access to resources that are ready to use. Billing in IAAS is the important and a complex task in all organizations. It is often compromised due to lack of various interactions (consumer, provider, budget, manager, agent and online payment) simultaneously along with necessary features like discount, tax, plan etc. Billing is considered as an essential part of IaaS. In this paper we are increasing the success rate of requests sent by the users to cloud in the billing system. We improve the online billing system by using the phenomenon of migration of virtual machines. Multiple virtual machines are used at the cloud side, in case of failure of one machine the data will migrate to the other machine. When data will migrate from one virtual machine to other due to any failure at first machine, chances of failure of requests sent will reduced.***

Keywords: Cloud computing, Billing system, 1AAS, Virtual machine

1. Introduction

In cloud computing, the word cloud is used as a metaphor for "the Internet, " so the phrase cloud computing means "a type of Internet-based computing, " where different services — such as servers, storage and applications — are delivered to an organization's computers and devices through the Internet. Cloud computing is an internet based computing, whereby shared resources, software and information are provided to computers and outer devices on demand. It is gaining popularity due to cost effectiveness and ease of availability setup. There are many IAAS (Infrastructure as a Service) companies that are constantly looking for cost effective implementations of cloud systems. It is the model for convenient on-demand network access, with minimum management efforts for easy and fats network access to resources that are ready to use. It is an upcoming paradigm that offers tremendous advantages in economic aspects, such as reduced time to market, flexible computing capabilities, and limitless computing power... However, data owners are very skeptical to place their data outside their own control sphere. Their main concerns are the confidentiality, integrity, security and methods of mining the data from the cloud.[1]

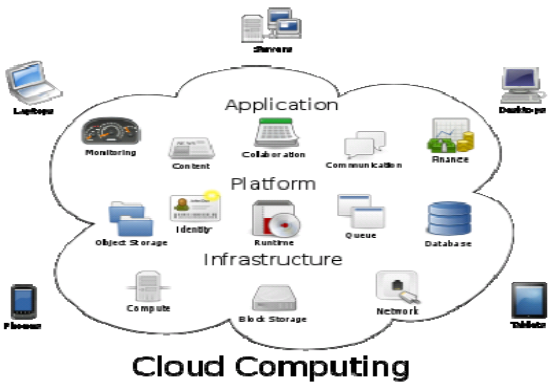

Figure 1: Cloud computing structural design

Cloud Computing Services Models

The following service models have different strengths and are suitable for different customers and business objectives. In general, interoperability and portability of customer workloads are more achievable in the Infrastructure as a Service (IaaS) service model because the building blocks of this service are relatively well-defined.

Cloud Software as a Service (SaaS). The subscriber uses the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a Web browser. The consumer does not manage or control the underlying cloud infrastructure, including network, servers, operating systems, storage, or individual application capabilities. It might be possible for the subscriber to specify application configuration settings.

Cloud Platform as a Service (PaaS). This service allows the subscriber to deploy onto the cloud infrastructure applications that the subscriber created or acquired using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.

Cloud Infrastructure as a Service (IaaS). This service enables the subscriber to use processing, storage, networks, and other fundamental computing resources, and to deploy and run other software, including operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components, such as host firewalls.[2]

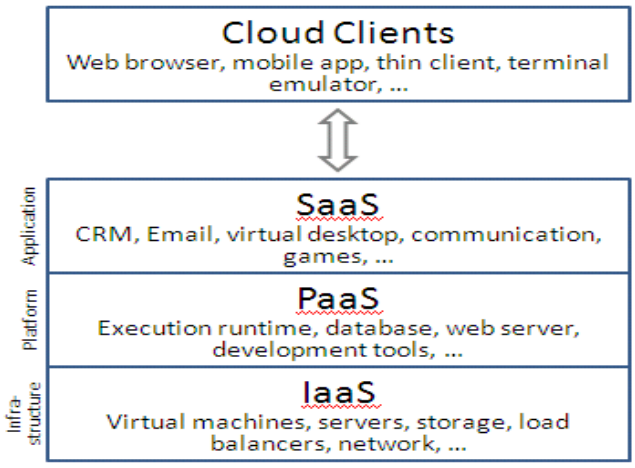

Figure 1.2: Service Models of Cloud Computing

Billing System

- Billing in IAAS is the important and a complex task in all organizations.
- It is often compromised due to lack of various interactions (consumer, provider, budget, manager, agent and online payment) simultaneously along with necessary features like discount, tax, plan etc.
- Billing is considered as an essential part of IaaS.

IAAS refers to computing infrastructure comprising of networking, hardware, virtualization operating systems and software servers offered as a service.

There are two major challenges with regard to accounting and billing in federated Cloud infrastructures. Accounting and billing must be carried out in a fair and standardized way.

Both: (a) between the user1 and the infrastructure owner; and (b) between the sites making up the federation. IaaS is one of the key components of cloud computing where billing is a challenging task. As Cloud services and infrastructure scales up, billing management complexity increases and efficient billing management technique are required. To increase the efficiency of IaaS cloud, we concentrate on billing. IaaS Online Billing System (IOBS) allows the different collaborations (Consumer, Infrastructure and Service Provider, Budget Manager, Online Payment) to access the specified services available through this. The IaaS Online Billing System is particularly useful for cost estimating and comparing because there is large variability in the cost of various infrastructures provided by different IaaS providers. For example, if there are four different users accessing the billing system simultaneously, it is not possible in traditional billing models. Thus, concurrency is introduced in this system and time is also reduced. The current system of Electricity billing is error level and also time consuming. Errors introduced at every stage are fond of errors with electro-mechanical meters, human errors while noting down the meter reading, and errors while processing the paid bills and the due bills. The major disadvantage of a post paid system is that there is no control of usage from the consumer's side. There is a lot of wastage of power due to the consumers be short of of training of electrical consumption in an well-organized way. Since the supply of power is limited, as a responsible citizen, there is a need to use electricity in a improved and efficient way. There are clear domino effect from many countries everywhere a prepaid system has reduced the usage (wastage) by a great quantity. Additional advantage of the prepaid system is that the human errors made reading meters and processing bills can be reduced to a great amount. Wireless meter can be used in residential apartments and especially in industrial consumers where bulk energy is consumed.

A billing transaction with integrity and nonrepudiation capabilities: For transparent billing of the cloud services, each billing transaction should be protected against forgery and false modifications.

2. Review of Related Work

Cloud computing is a new research area. As a result there is large-scale interest in cloud computing now a days.

Inkwon Hwang and Massoud Pedram in 2012, "Hierarchical Virtual Machine Consolidation in a Cloud Computing System" is says that these days it is important to save energy due to electric bill issues. The focus of the paper is to deploy the VMs to PMs. various demands are treated as random variables which can be correlated whit each other. Result show that the proposed method is better in spite of simplicity and scalability. Improving the energy efficiency of cloud computing systems has become an important issue because the electric energy bill for 24/7 operation of these systems can be quite large.[3]

Sukhpal Singh and Inderveer Chana in 2013**,** " Advance Billing and Metering Architecture for Infrastructure as a Service", proposed IaaS online billing system (IOBS) that describes transparency of consumption, billing and frequency of usage of services for a cloud based pay per use system. This system describes various interactions of network and user interface. The billing rules have been stored in a database. The model has been verified through UML that demonstrates that IOBS is effective in improving user interaction by reducing time and increasing customer satisfaction. [4]

Erik Elmroth, Fermin Galan Marquez, Daniel Henriksson, and David Perales Ferrera in 2012 "Accounting and Billing for Federated Cloud Infrastructures" They outline usage scenarios and a set of requirements for such infrastructures, and propose an accounting and billing architecture to be used within RESERVOIR. Even though the primary focus for this architecture is accounting and billing between resource consumers and infrastructure provides, future support for inter-site billing is also taken into account.[5]

R.B Hiware, P.Bhaskar, Uttam Bombale, Nilesh Kumar in 2013, "Advance Low Cost Electricity Billing System Using GSM" author proposed the technique for Prepaid and postpaid scheme using SMS. GSM network is used for sending and receiving SMS. There are many problems in distribution and metering. By using GSM system this problem have been reduced.[6]

Gurudatt Kulkarni1, Ramesh Sutar 2 Jayant Gambhir in 2012**,** "Cloud Computing-Infrastructure as Service-Amazon EC2" author proposed that Cloud computing is an increasingly popular paradigm for accessing computing resources. This paper also outlines the responsibilities of IaaS provider and the facilities to IaaS consumer. Amazon Elastic Cloud is one of the flexible clouds discussed in paper.[7]

Dr. A.M.Khan and kazi hazim ali in 2013, "Cloud Computing: Security Concerns, Risk Issues & Legal Aspects" The paper deal with cloud computing and security concerns, Assessing Risk Tolerance in Cloud Computing and Legal and Regulatory Issues also discussed, we covered many of the qualities and promises of cloud computing. In addition, we examined the three models for cloud services (SPI) and the four models for cloud deployment (public, private, community and hybrid).While developing a background in cloud computing, we also discussed many security aspects of clouds.[8]

Eng. Anwar J. Alzaid and Eng. Jassim M. Albazzaz "Cloud Computing: An overview" in September 2013, has proposed the concept of cloud computing in detail. This paper is a brief survey based on readings on cloud computing, it will provide an overview of the basic concepts, definitions, and outlines of the general architecture of this technology [9].

3. Proposed Methodology

1. User will send his/her requests to the cloud for requesting database, resources etc.

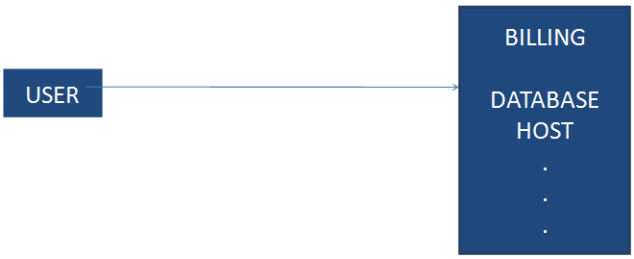

Figure 3.1: user sending request to cloud

2. The appropriate action will be taken at the cloud depending upon the user's request and will create different log files for keeping the records of each task.
3. Different log files of the user's task, database server, virtual machine will be created.
4. Finally, we will track the files available to check how many requests have been failed and how many requests have been completed successfully.
5. This report of analysis will calculate the total efficiency of the system whether the billing on cloud is better or billing should be performed at client side.

ID	DATE	TIME	STATUS
1.	16-03-14	11:11 a.m.	Accepted
2.	16-03-14	11:12 a.m.	Accepted
3.	16-03-14	11:15 a.m.	Error
4.	16-03-14	11:16 a.m.	Accepted

Figure 3.2: log files of sent requests

a. Some of the causes of failure or errors are:

i. Database may be misplaced.
ii. Hardware/virtual machines may not work properly.
iii. There may be any problem in the bandwidth of network.
iv. Host may be so busy.

6. We will create a virtual cloud environment in Java using Cloud simulator in Net beans and will create 2 Virtual machines of different configurations inside the simulator (let's say VM 1 and VM2).
7. User will store his/her data inside the Virtual Machine.
8. Now the Virtual Machine will process the request of the user.
9. If the Virtual Machine fails at any point of time, then the data of the VM1 is migrated to the VM2
10. Hence providing the non-stop services to the user
11. Hence providing the non-stop services to the user

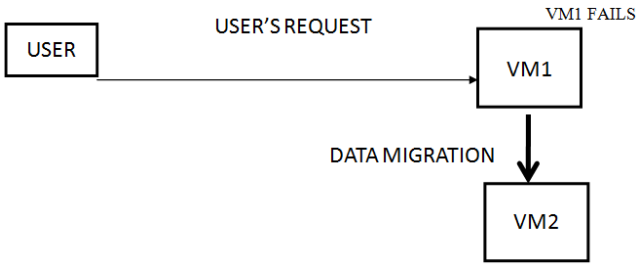

Figure 3.3: Migration of virtual machine (vm1) to virtual machine (vm 2)

3.1 Tools Used

Language (Back End)

Java is a general-purpose computer programming language that is concurrent, class based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation.

Simulator

The CloudSim simulation layer provides support for modeling and simulation of virtualized Cloud-based data center environments including dedicated management interfaces for VMs, memory, storage, and bandwidth. The fundamental issues, such as provisioning of hosts to VMs, managing application execution, and monitoring dynamic system state, are handled by this layer.

NetBeans

NetBeans IDE is a free, open source, popular (with approximately 1 million downloads), integrated development environment used by many developers. Out of the box, it provides built-in support for developing in Java, C, C++, XML, and HTML.

4. Results and Discussion

Proposed system is tested more than 1000 times. Proposed system shows very good results for online requesting system. In the result the percentage of successful requests by the user increases to 80-90% because of the migration af data from one virtual machine to other, in case of any failure of request due to virtual machine failure.

4.3.1 Average Waiting Time Graph

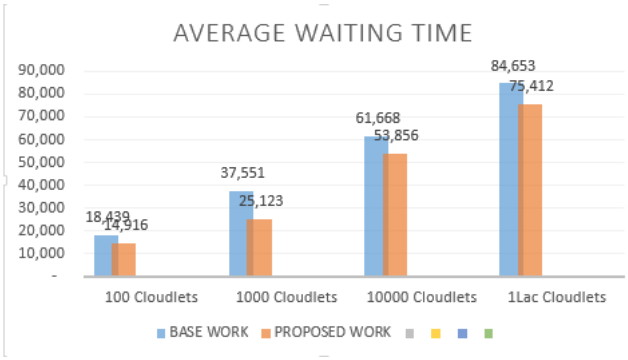

Figure 4.3.1: Average Waiting Time

4.3.2 Average Cost Graph

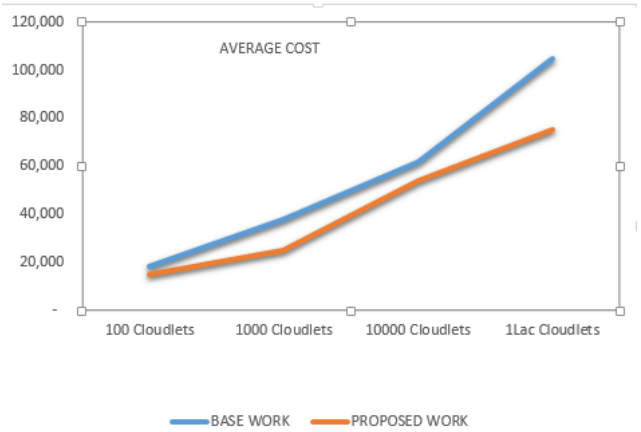

Figure 4.3.2: Average Cost

4.3.3 Total Execution Time Graph

Figure 4.3.3: Total Execution Time

5. Conclusion

The research work is increasing the chances of success of a request made by user to cloud. We enhanced the online billing system using cloud. We are increasing the success rate of requests sent by the users to cloud in the billing system. We are using the phenomenon of migration of virtual machines to improve the online billing system. Multiple virtual machines are used at the cloud side, in case of failure of one machine the data is migrating to the other machine. When data migrates from one virtual machine to other due to any failure at first machine, chances of failure of requests sent reduces. So using of phenomenon of migration of data from one vm to other is very useful to increases the success rate of the requests send to cloud.

6. Future Scope

- In the present work we are improving the efficiency of billing system by multiple virtual machines. In case of failure of one vm is migrating to the other, which increases the success rate of the requests sent to the cloud.
- Still there is some hope of improvement. In future, in case of failure of all the virtual machines present in a host, the request will be failed so to reduce this failure we can use migration of data from of one host to the other host.

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