"Enhanced-Energy-aware resource allocation heuristics for efficient management of data centers for Cloud computing"

A Dissertation Proposal

Submitted

By

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REG NO:11010994

To

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In partial fulfillment of the Requirement for the

Award of the Degree of

Master of Technology in Computer Science and Engineering

Under the guidance of

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Approved Research Topic

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DISSERTATION TOPIC APPROVAL PERFORMA

Name of the student :Anupam Bhardwaj
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Qualification : M.Tech
Research Exp. :1 year

Specialization Area: Networking (pick from list of provided specialization areas by DAA)

Proposed Topics:-

1. Enhanced energy aware resource allocation for efficient management of data centers for cloud computing
2. Architecture in cloud computing.
3. Security in cloud computing.

Student has changed the topic, while registering for Backlog in last semester and lost the PAC form.

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Why so late?

Shabnam Sharma
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*Supervision should finally encircle one topic out of three proposed topics and put up for an approval before Project Approval Committee (PAC).

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DECLARATION

I hereby declare that the dissertation proposal entitled, **Enhanced-Energy-aware resource allocation heuristics for efficient management of data centers for Cloud computing**, submitted for the M.Tech Degree is entirely my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

Date: 03-05-2015

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ABSTRACT

In recent decades cloud computing has reached to a higher level, every business and services are using cloud for different purposes and for cloud resource allocation many researchers have proposed many algorithms. One of the most successful is Energy-aware resource allocation but there are several limitations of this method. So this dissertation is dedicated to improve the Energy-aware mechanism to get a better and more reliable outcome.

CERTIFICATE

This is certify that Anupam Bhardwaj has completed M_Tech dissertation proposal titled Enhanced-Energy-Aware-resource heuristics for efficient management of data centers for Cloud computing under my guidance and supervision . To the best of my knowledge, the present work is the result of his original investigation and study. No part of the dissertation proposal has ever been submitted for any degree or diploma. The dissertation proposal is fit for the submission and the partial fulfillment of the conditions for the award of M_Tech Computer Science and Engineering.

Date: 03-05-2015

Signature of Advisor

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Anupam Bhardwaj
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LIST OF ABBREVIATIONS

CPU (Central Processing Unit).

RAM (Random Access Memory)

BW (Bandwidth)

VM (Virtual Machines)

MCC (Mobile Cloud Computing)

QoS (Quality of Service)

HTTP (Hyper Text Transfer Protocol)

ZKP (Zero Knowledge Protocol)

CHAPTER 1

INTRODUCTION

This chapter explains the basics of cloud computing with its evolution. Firstly the various sectors, application and characteristics of the cloud computing also covered and then later on focuses on the recent security issues of the cloud computing which is becoming a threat to the recent scenarios in cloud computing.

1.1 Basics of Cloud Computing

Cloud refers to applications and services offered over the internet. Cloud provides greater flexibility and availability in a much cheaper way which makes cloud a good business platform. Term cloud refers to the services and applications which are provided by different data centers all over the world. This word represents the insubstantial, yet widespread nature of the internet. The most basic example of cloud is Gmail or Yahoo etc.

1.2 Evolution of Cloud Computing

By the theory of cloud computing, it can be seen that it is innovation of accessing the data in different ways. With the perspective nature of technology it is an improvement of computing, applying different concept to employ resources/hardware more proficiently. By looking cloud computing in different point of view like business, the revolutionary changes which have been taken place can be found. The concept of cloud computing takes back to the1950's when heavy and large mainframes were made. At that time, the server room was made with the help of all these mainframe's colossal hardware architecture. After that when number of persons have to access all these mainframes then it uses the different "terminals"-stations whose solitary purpose was to assist access to the mainframes. Due to cost of mainframes for buying and maintain, it wouldn't be possible to provide each mainframe to each user, so the concept of sharing is come into force which shares the data storage layer and CPU power by the multiple users at the same time. It helps a lot to the organization on its investments on sharing mainframes access, which is so called sophisticated type of technology. As, in the previous year server uses the mainframe.. By the help of virtual machines server can be access the shared data from the main frame to the new level by giving authority several separate compute environments. By this scenario server can stay in the same physical environment.

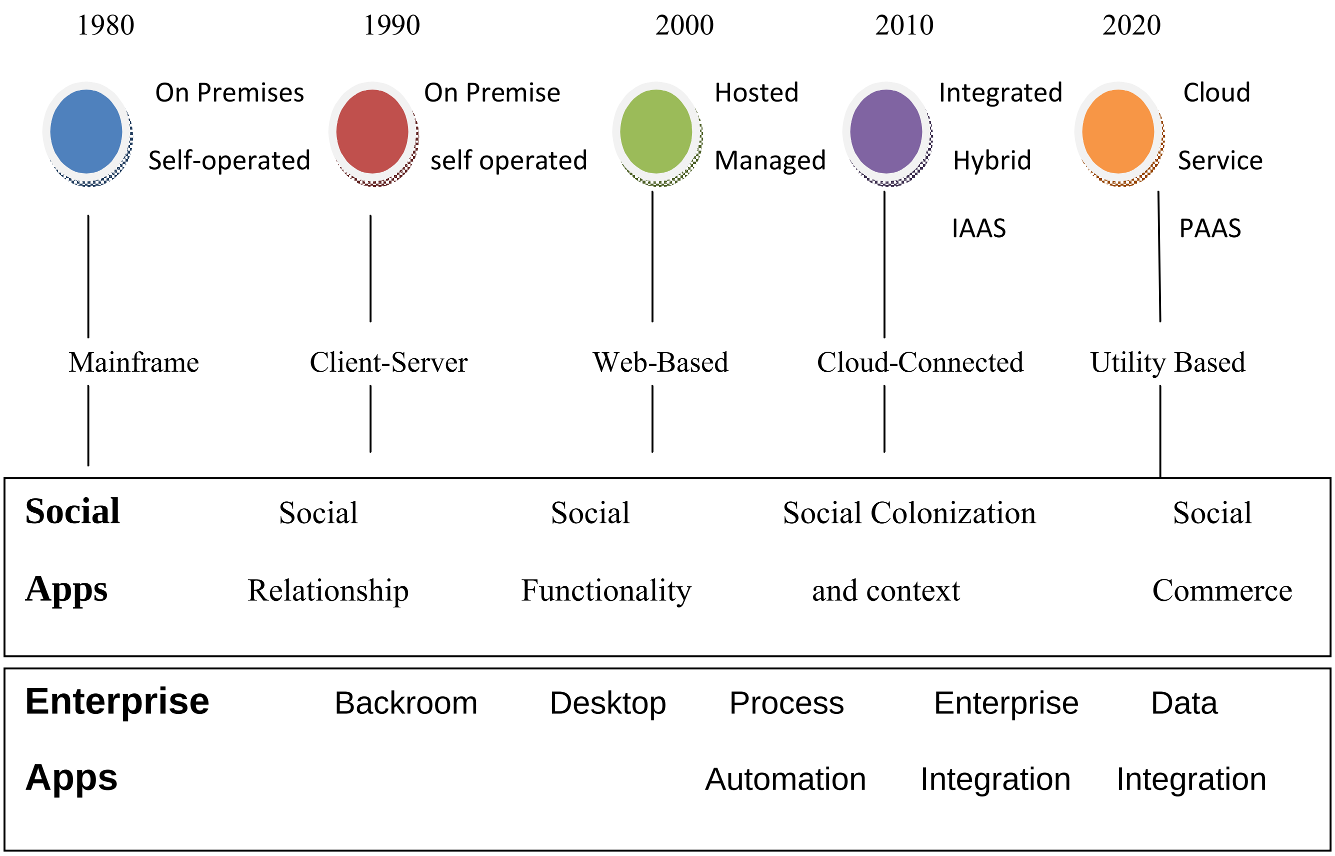


Figure 1.1 Evaluation of Cloud computing

1.3 Characteristics of Cloud Computing

There are various characteristics according to the usability of cloud. Major of them are discussed in this section as:

a) **On demand self as services**-It refers to a feature of cloud computing that allows the management of one's own service without the communication with a service provider.
b) **Ubiquitous Network Access**- It refers to access your information from anywhere and on any device by connecting to the cloud.
c) **Resource Pooling**- It refers to utilizing the same resource by number of clients at the same time without interacting with each other.
d) **Rapid Elasticity**- It refers that expanding of our cloud according the resources i.e. if there is high traffic then the increase in the memory of our cloud would be done by adding sever, or adding an extra ip address.
e) **Pay Per Use**- As the name suggest, pay only that much amount of money that how much resources are used. It calculates each minute of working with the resources.

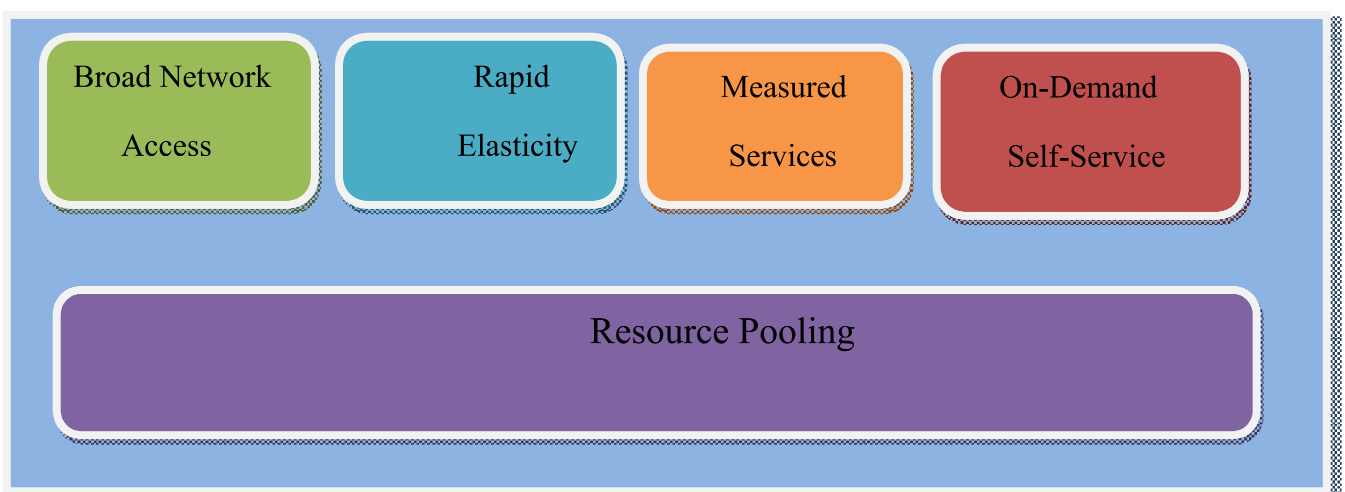


Figure 1.2 Characteristics of the cloud computing

1.4 Delivery Models of Cloud Computing

Cloud is basically divided into three segments which constitutes its delivery models as:

a) Cloud Software As a Services.
b) Cloud Platform As A Services.
c) Cloud Infrastructure As a Services.

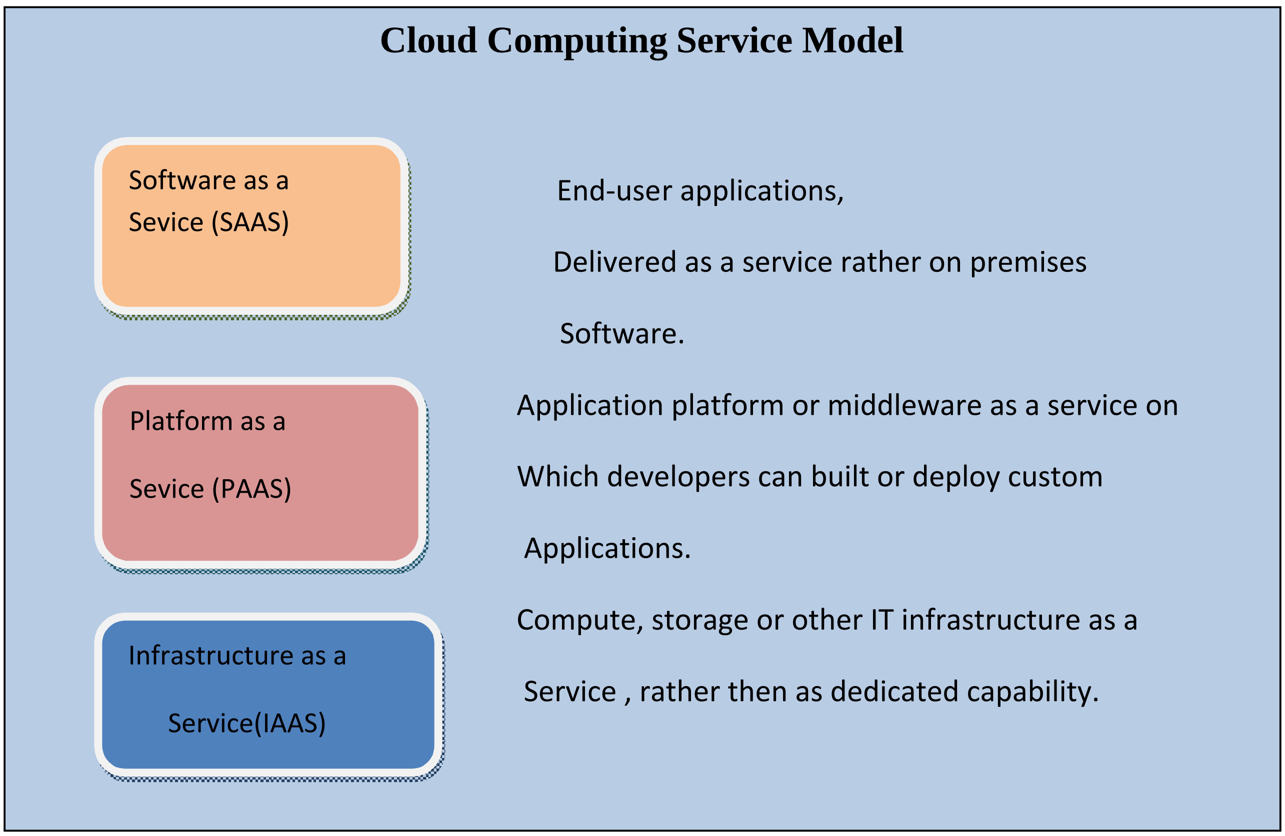


Figure 1.3 Cloud Computing Service model

Software-as-a-Service (SaaS) makes many consumer applications and their computing resources to execute and provided for utilization. It can cut the overall charges of hardware/software in terms of development, maintenance, and operations.

- **Platform-as-a-Service (PaaS)** makes computing platform to be provided to consumers. It is like a web space which can be purchased over internet where we can deploy and install over own platforms. It decreases the complexity as well as cost of housing, buying, and organization hardware/software mechanism of the platform.

- **Infrastructure-as-a-Service (IaaS)** makes the computing infrastructure of software, services, and network equipment. It allow user to build their application and deploy it on internet for further use. It can be used to stay away from housing, buying, and managing the basic hardware/software infrastructure mechanism.

1.5 Deployment Models of Cloud Computing

According to usability and security of user data cloud is divided into three deployment models as:

a) Private Cloud
b) Public Cloud.
c) Hybrid Cloud.

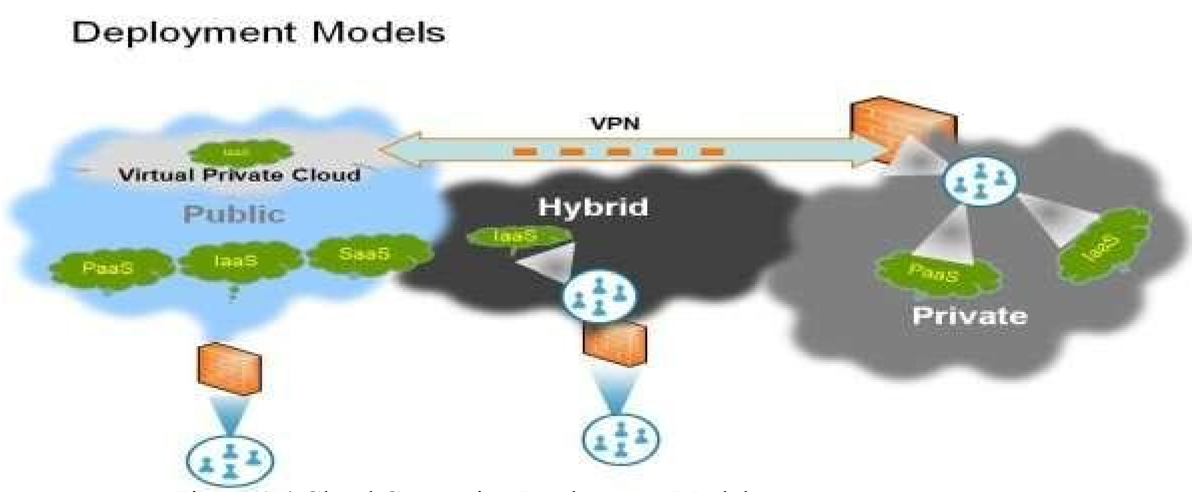


Figure 1.4 Cloud Computing Deployment Models

• **Private Cloud-** This cloud basically called as consumer cloud, because under this some features of public will be introduced. The features are ultimate scalability, cost effective, utility style costing, reliability, flexibility, location independence.

• **Public Cloud-** This cloud is a secure and distinct environment is made only for the specific client that it should operate by that client only. It possessed some features which help in differentiating from other models of cloud which are as higher security and privacy, more control, cloud bursting, improved reliability.

• **Hybrid Cloud-** This cloud is the mixture of both these two clouds that is public and private cloud, but there is lots of difference. Due to lack of knowledge they couldn't explain this at high level. They just want to explain it. They integrated the cloud services utilizing both clouds to perform different function within the same organization. This cloud model can be implemented in a number of ways. It also has a salient feature which defines the hybrid cloud these are as scalability, cost effectiveness, security, and flexibility.

1.6 Attacks on Cloud Computing

As companies emerging towards cloud computing, cloud attracts more hackers to follow. Some of the attacks are:

a) **Denial of Service (DoS) attacks-**This is a kind of attack in which a hacker overload a network server or web server with continuous requests to destroy the network, this could not take the services at good level but it destroy the while network so that the server may not able to justify client's regular request. Like in cloud computing, hacker sends enormous amount of requests to the server and that server is not capable to reply to the regular clients as server will not work properly. Solution for this attack is to decrease the privileges of the user that are connected to a server.

b) SQL Injection Attack-SQL injection is where attackers use the particular type of sequences to return the data, like in SQL scripting; queries ends with the clause that would be changed by accumulating more data in it.

c) Side Channel Attacks- Newest form of side channel attack is Method of Formal Coding Side Channel Attack (MFCSCA) which resolves the XOR function of cryptographic algorithms. So it is important threat to the present Cloud environment.

d) Man-In-The-Middle Cryptographic Attacks-This is also an important threat to network security which will occur if secure socket layer (SSL) is not accurately configured. Like if the two parties which are connected and their SSL are not working properly then all the data could be hacked by any middleware. This attack can be resolved when SSL should be correctly installed and it should confirm earlier than communication in all parties.

1.7 Security issues in Cloud Computing

Major security concerns of cloud are:

a) XML Signature Element Wrapping*:* It is a kind of wrapping of element which is renowned attack for the services. It can help us in defending a component name, attributes and value from the party which is illegal but it cannot protect the data which is inside it that is the position in the documents. They use the operation of SOAP messages to target the component. Use of digital signature can counter measure this attack.

b) Browser security*:* This issue is talking about the browser security, when a client starts requesting to server by this way (browser). Then it should use the SSL to encrypt the certificates to verify the user. It supports point–to-point communication i.e. if there is a third party; mediator host would able to decrypt the information. So, by using the different packages intermediary host, they can decrypt the information. Now the attackers get the certificates of the user and use these certificates in cloud as an authorized user.

c) **Data protection***:* As the data it is very important factor because at any place the most important thing is data. Wherever the compromise is done between security and data then all are in trouble. As cloud is too complicated for the customer of cloud and for continuously looking the behavior of the cloud supplier. When he is confident about his view regarding the data is handled in a legal way.

CHAPTER 2
LITERARURE SURVEY

Beloglazov A. (2012) “Energy-aware resource allocation heuristics for efficient management of data centers for Cloud computing” [8] this paper presented new algorithms for the VM selection in cloud by taking consideration of energy. They proposed new algorithms for VM migration VM selection and VM placement. Power consideration is the only approach of their work which makes work less effective though algorithms are very good and power conservation is achieved though there are other parameters in the concern of VM selection and placement which are not taken which degrade the performance of the algorithms. Algorithms taking the maximum power for selecting the VMs which is logical but there is no special mechanism at the time of same power or other conditions where their algorithms fails to select the VM. That’s why there is a lot of improvement required in this methodology.

Trong H. (2012) “A Traffic Power aware Algorithm for Virtual Machine Placement in Cloud Data Center” in this he presents the work on the traffic power aware of virtual machine. To migrate the virtual machine the traffic aware algorithm is proposed for reducing the cost an less consumption of energy. In the Vm placement its based on two approach power based approach and QOS based approach for that he used black box and gray box approach. In this paper he proposed to reduced over all traffic cost of the virtual machine and more the CPU utilization.

Katti C. (2012) “An Energy Efficient Resource Utilization Approach for Cloud Computing” in this paper the MADLVF have been proposed from the earlier algorithm MADRS. The MADLVF denotes median of the absolute deviation least vm in CPU utilization first and the MADRS belongs to median of the absolute deviation random selection. In the random selection the selection of VM on the random basis and in LVF the selection of virtual machine on the basis of CPU utilization.

Waleed A. (2009) "Improving the Security of CardSpace"[5]this paper propose a new approach for improving Windows Card Space technique for identity management. In this paper major limitations of the card space are pointed out and the proposal is made which solves some of its problems but there are major cases which are needed to be considered. They use classical zero knowledge protocol (ZKP) which helps to solves some of the problems but they does not resolve third party evolvement and they don't consider storage problem and many more which are to be resolved.

Ramgovind S (2010) "The Management of Security in Cloud Computing" [10] this paper explains about the different sections of cloud computing and explains that how cloud is evolving IT. This paper explains all the parameters that are evolved in cloud and different security aspects of all these parameters. Author explains how cloud works and how it is vulnerable to different attacks and how these parameters are needed to be secured. This paper is devoted for the explanation of the security terms and vulnerabilities in cloud. This paper also explains how to manage these attacks and security related issues in the cloud.

Wendell P. (2010) "DONAR: Decentralized Server Selection for Cloud Services" [7] this paper proposed a new distributed network which is helpful in selection procedure of the replicas. This approach loads off the burden of selection of replicas. It runs an algorithm which decides the replica according to situation which is more suitable and cost effective. The prototype of the algorithm is designed and tested in many environments and tests many protocols like the HTTPs etc. the DONAR is compatible with many platforms and giving much better result than previous methods. DONAR is capable to handle many customer services with maintaining the standards of quality in real time environment.

Mills K. (2011) "Comparing VM-Placement Algorithms for On-Demand Clouds" [12] this paper is also a survey paper which provides a good comparison between different VM placement algorithms. This paper points out various problems while using an algorithm for the VM placement. This paper exploits various possibilities while using a VM placement algorithm. Author test various algorithms at similar condition and provide a very good comparison chart which shows strength and weaknesses of different algorithms.

Menzel M. (2012) “Cloud Genius: Decision Support for Web Server Cloud Migration”[4] this paper proposed a new decision making mechanism for cloud computing which resolves the major problem of mapping and resolving the selection of best and suitable resource at the time of need. They also test this mechanism which they termed as “Cloud Genius” through different experiments and they used Analytic hierarchy process selection and maintenance of QoS in cloud environment. The automation process helps the migration process at the time of execution in the cloud. In experiments a prototypic model of the system is validated through different tests which checks time and space complexity of the model to check the durability of the system which is helpful in maintaining the QoS in the model.

Garg S. (2012) “An environment for modeling and simulation of message-passing parallel applications for cloud computing” [9] this paper presents several problems in the present cloud simulators and address them not suitable as a tester for the mechanisms and models proposed for cloud. Paper presented that the present simulators are not using relevant approaches to present real time simulations therefore they are not able to test the approaches correctly for the cloud. Author proposed a now simulator by using relevant techniques which are used by cloud so that methodologies can be tested for the cloud correctly. Author created simulator using proper algorithms which simulate the scalable network and proper message passing environment so that proper calculations can be done.

Makkes M. (2013) “Defining Intercloud Federation Framework for Multi-provider Cloud Services Integration” [6] This paper studies the InterCloud Federation framework and divides it into two parts: Consumer side and Provider Side. It proposed a new identity management scenario for the inter-cloud for basic operations and also proposed a brokering mechanism to increase the usability of framework. Proposed framework work on the middleware approach and also provide the solution to enhance it. Proposed model develop a new scenario and management which is helpful in increasing the interpretability and integration of the framework. Its identity management differs between consumer and provider which help in maintaining the middleware.

Hoang T. (2013) "A Survey of Mobile Cloud Computing: Architecture, Applications, and Approaches" [11] this paper is a detailed survey of the Mobile Cloud Computing. This paper explains about the MCC, how MCC works, what are the general requirements, what are the threats, how to manage the environment, what are the security requirements etc. this papers explains the detailed study of the MCC. Author shows how to manage the environment, performance and security in MCC. This paper also explains the possible growth and possible limitations according to the present scenario.

Tchana Alain Broto Laurent, Hagimont Daniel [13], has demonstrated about the cloud computing platforms and applications. The paper contains various approaches to fault tolerance. As all know that cloud computing works on virtualization technology it consist of hosts , virtual machines and data centers. It is divided into three layers in which the first layer consist of three main things i.e. hosts , virtual machines and applications. Layer 2 is based on provider who is responsible in managing the data centers and the client who has a need of running an application in cloud. Paper consists of fault techniques which are either fulfilled by the provider of the services or by the customers which is not satisfactory. So the emphasis must be on integrated solutions for fault tolerance. In this paper, analysis has been made on automatic repair for fault tolerance over the complex infrastructure of cloud. It has also been discussed about the two visions for FT management in cloud computing whether exclusive (it can be a customer or provider) or collaborative(integrating two cloud customers or provider).

Kim Won, Kim Soo Dong, Lee Eunseok, Lee Sung Young(2009) [10], have discussed about the adoption issues for cloud computing. Cloud computing provides services such as software and hardware with the help of internet. User need to pay for the services it uses. It has lead to low cost and distribution of services on a massive scale all over the world. There are various adoption issue of cloud computing such as out age , security, performance, compliances, private cloud, Integration , cost and environment. Outage can be permanent or temporary. Outage means when the user is not able to receive services from the cloud there is totally a black out for the services. This can lead to loss of critical applications and data. So, it is not recommendable for high mission critical applications and date. Outage may occur few hours, several days or several times a year. Security is provided by the cloud but it cannot be100%. There can be loss of data during electronic transfer or by entrance of sophiscated hackers to reveal the important and critical data of organization. Even humans cannot be trusted over doing things with bad intentions. The major reason for performance degradation is communication period between the clients and web servers of cloud. This problem starts when amount of data being transferred increases as the number of user increases. This could even make a difference over the physical distance between the user and the provider. Another reason is that when the demand increases more than the expectations of the provider. Cloud computing should be eco – friendly and energy efficient. It should not lead to the environment degradation. Like this, other issues are discussed over the paper and expecting them to overcome these issues.

Constructing Private Cloud Storage Using Network Attached Storage is based on providing more security and flexibility in private cloud. Availability, data recoverability, flexibility and quick response are also important features provided by a private cloud. An economical and robust private and public cloud system using NAS proposed in this paper. Cell recovery is also explained, which is data recovery. The cell recovery time directly proportional to the number of file. The reason that the size is partial meta data is to accord with number of files stored. Improvements in this system can be made by increasing the amount of data or files and can also be implemented in different cloud environments.

Ramgovind S, Eloff MM, Smith E from School of Computing, University of South Africa, explain **The Management of Security in Cloud Computing**. Gartner�s list about cloud security issues, as well the findings from the International Data Corporation enterprise panel survey based on cloud threats are discussed in the paper. It also discusses cloud transparency other security issues in public, private and hybrid clouds.

CHAPTER 3

SCOPE OF STUDY

Scope Of the Study:

The proposed algorithms are the modified versions of energy aware resource allocations which are very effective in terms of power conservation. This dissertation proposes a new VM resource allocation strategy which enhances the energy aware scheme to very extent. This algorithm conserve power to the same level as previous algorithm with the enhancement to other parameters so other factors also be satisfied other than power. This algorithm is very effective and solves the problem in energy aware resource allocation heuristics.

CHAPTER 4

PROBLEM STATEMENT AND OBJECTIVE OF STUDY

4.1 Problem Definition:

Energy aware resource allocation heuristics is very effective and cost saving techniques for managing data centers but they are using greedy approach for conserving the energy due to which it fails in many scenarios. In order to achieve more efficiency more parameters must be included instead of only energy.

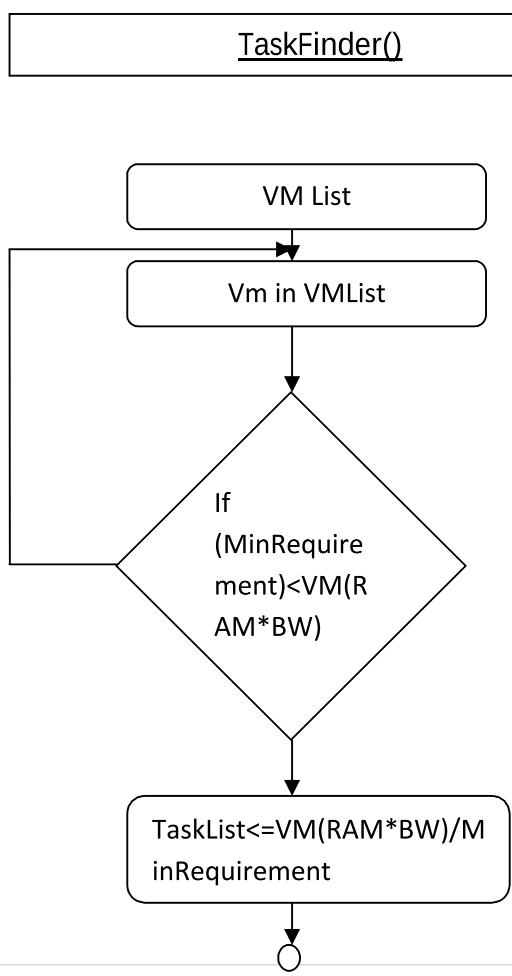
4.2 Objectives:

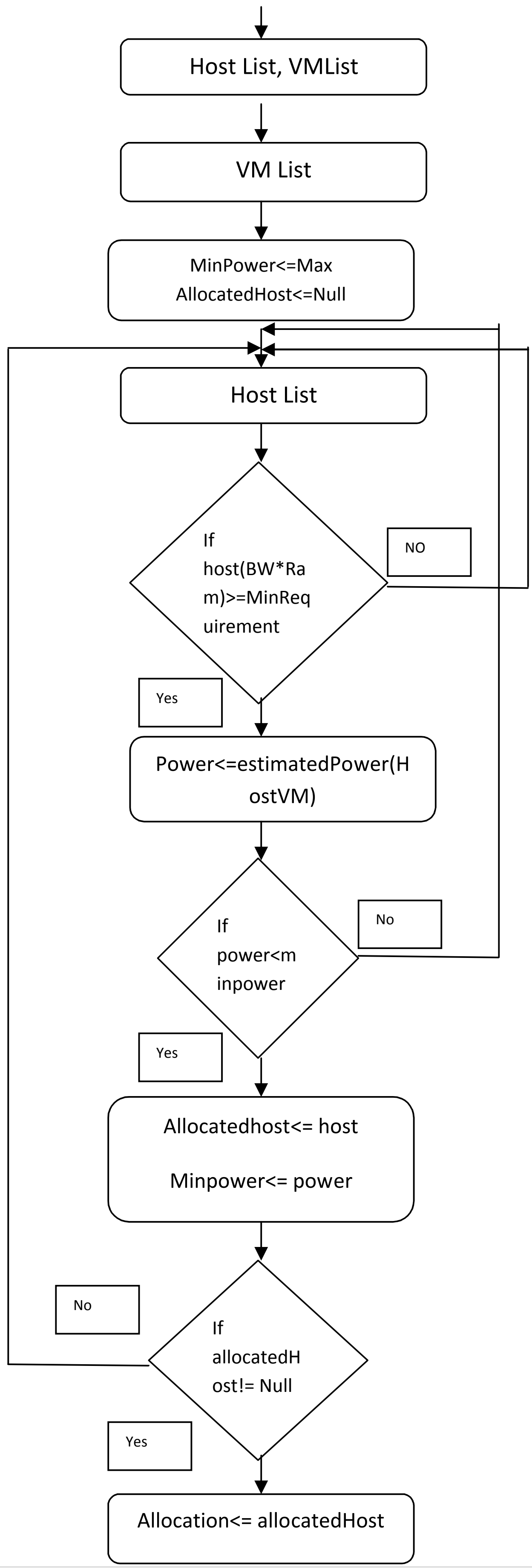
- Determine parameters participate in resource allocation in data centers.
- Modify current energy aware algorithms considering other parameters.
- Design new algorithms for VM placement and VM selection.
- Simulate and compare all the algorithms.

CHAPTER 5
RESEARCH METHODOLOGY

FLOWCHART:

Here is the flowchart of our algorithm which explains the working outlines. Task finder and vm placement flowchart is important one because whole working is depend upon it. VM selection is used for minimization of migration in the whole process. For the explanation of this algorithm we are going to describe you here what exactly is going there. In last algorithm, it checks the host list of vm according to it, it start working and find out the vm whose values are nearby to threshold values, if the values of vm is cross at the time of workload then the migration is taken place that is in overload position vm cannot handle it and it transfer the cloudlet to next vm. In this way working of last algorithm works.




Host List, VMList
VM List
MinPower<=Max
AllocatedHost<=Null
Host List
If
host(BW*Ra
m)>=MinReq
uirement
NO
Yes
Power<=estimatedPower(H
ostVM)
If
power<m
inpower
No
Yes
Allocatedhost<= host
Minpower<= power
No
If
allocatedH
ost!= Null
Yes
Allocation<= allocatedHost

Methodology:

Energy aware resource allocation is much enhanced and acceptable heuristics for data centers management but there are some parameters which are also to be considered other than power and majorly task allocation is to be considered. This dissertation modifies previous algorithms and developed a new algorithm to calculate tasks for each VM.

```
Algorithm 1:TaskFinder()

Inputs: VMList                    Outputs: TaskList, MinReqirement

MinRequirement<=MAX

Foreach Vm in VMList do

        If MinRequirement<Vm(RAM*BW)

                MinRequirement<=Vm(RAM*BW)

        End

End

Foreach Vm in VMList do

        Tasklist<=Vm(RAM*BW)/ MinRequirement

End

Return Tasklist, MinRequirement

**BW=bandwidth
```

VM Placement:

For VM placement the basic structure and parameters are taken from parent algorithm with the changes of our parameters. So the new algorithm will be:

```
Algorithm 2:Modified Best Fit Decreasing()

Inputs: Hostlist,Vmlist    Outputs: Allocation

Tasklist, MinRequrement<=TakFinder(Vmlist)

Foreach Vm in Vmlist do

    Minpower<=MAX

    allocatedHost<=NULL

        foreach host in Hostlist do

                if host(BW*RAM)>=MinRequirement

                        power<=estimatedPower(host,Vm)

                        if power<Minpower

                                allocatedHost<=host

                                Minpower<=power

                        End

                        If allocatedHost != NULL

                                Allocation<= allocatedHost

                        End

                End

        End

End

Return Allocation
```

VM Selection:

VM selection is divided into two steps first allocation of host(Algorithm 2) and second is VM Migration (Algorithm 3) so the parameters considered for these algorithm are calculated by TaskFinder() algorithm. So the VM Migration policy is using power model used by the

```
Algorithm 3: Minimization of Migrations (MM)
Input: hostList     Output: migrationList
foreach h in hostList do
        vmList<=h.getVmList()
        vmList.sortDecreasingUtilization()
        hUtil<=h.getUtil()
        bestFitUtil<=MAX
        TaskList, MinRequirement<=TaskFinder(vmList)
        while hUtil >THRESH_UP do
                foreach vm in vmList do
                        if vm.getUtil() >hUtil − THRESH_UP
                                t<=vm.getUtil() − hUtil + THRESH_UP
                                if t <bestFitUtil
                                        bestFitUtil<=t
                                        bestFitVm<=vm
                                                end
                        else
                                if bestFitUtil = MAX
                                         MaxTask<=MIN
                                         SelectVm<=NULL
                                        foreach VM in vmList do
                                                task<=allcatedTask(vm)
                                                task<=TaskList(VM)-task
                                                if task>MaxTask
                                                        MaxTask<=task
                                                        SelectVm=VM
                                                end
                                        end
                                        bestFitVm<=VM
                                                end
                                                break
                        end
                end
                hUtil<=hUtil − bestFitVm.getUtil()
                migrationList.add(bestFitVm)
                vmList.remove(bestFitVm)
        end

        if hUtil <THRESH_LOW
                 migrationList.add(h.getVmList())
                 vmList.remove(h.getVmList())
        end
end
return migrationList
```

Energy aware model:

$P(u) = k \cdot P_{max} + (1 - k) \cdot P_{max} \cdot u, (1)$

The Minimization of Migrations (MM) policy selects the minimum number of VMs needed to migrate from a host to lower the CPU utilization below the upper utilization threshold if the upper threshold is violated. The algorithm states all the possible methods to get best VM to migrate the priority is energy which is achieved by using power model by in case of ambiguity task are the secondary solution which is proposed. The new algorithm is described in Algorithm 3.

CHAPTER 6
RESULTS AND DISCUSSION

This dissertation is focused on creating an efficient energy aware resource allocation technique by using different parameters which affect the energy and performance while allocating the resources. The expected outcome will be an improved energy efficient resource allocation technique which has better result than the present technique.

The results showing the final calculated values, after the simulation of workload in cloudsim simulator. The changes are done according to new algorithm and the selection, removal and migration of virtual machines are done taking consideration of MIPS and RAM with power, instead of only power. So after the simulation the mean time before vm shutdown is increase which shows that each virtual machine is doing work more before there shutdown and the standard deviation time is decrease which shows the stability in the execution time than the existing one.

The power consumption is same in both the algorithm which shows that even we have modified the algorithm there is no change in power consumptions of data centers but the execution time and standard deviation is changed which shows possible enhancement in overall performance.

Tools Used:

Eclipse is an integrated development environment (IDE). It is based on Java programming which is open source platform that allows developers to launch their applications according to the environment of development. The main goal of eclipse is to develop a robust, better applications, full featured, commercial quality platform. The eclipse team has been focused on three major sites:

- It is responsible for generating workbench of eclipse IDE with the help of Java Development Tools and Plug-In Tools.
- It focused on next most important thing which is tools because by the help of tools only projects can be created with best results. Right now the subproject includes tools like COBOL IDE, C/C++ IDE and EMF modelling tool.
- The last one on which it mainly focus, technology research, incubation and different skills using Eclipse platform.

With the help of extensive plug-ins user is able to develop application in various other languages like C , C++ , ABAP , Haskell , Fortran, Python, ruby on rails framework , COBOL, JavaScript , Perl , PHP etc. Eclipse environment provides the user with three different features as eclipse java development tools, Eclipse C/C++ development tools and Eclipse PHP development tools. The eclipse java development tool (JDT) is used for java and scala, Eclipse java C/C++ development tool (CDT) for C/C++ and Eclipse PDT for php and other programming languages. It can work on any of the operation systems like Windows, Linux, MAC, Solaris etc. The plug-ins is main functionality of the runtime system. It allows the eclipse platforms to increase the features to C/C++ and python as well as to work with typesetting language i.e. Latex with the help of the plug-in. As an eclipse JDT, it provides advanced refactoring techniques and code analysis. It provides platform for network applications, dbms and modeling-based language such as UML etc[6].

CloudSimulator:

Cloud simulator is an extensible toolkit to provide the simulation and modeling of the cloud computing environment. It is an open source web application which provides simulation and modeling in cloud computing. Providers can also analyze the resources and the need of resources or particular need to check the resources for a particular scenario. It can provide us with somewhat nearby results to the results which would have been got in actual scenario. It enables the researchers and industry-based developers to simulate and model their design issues they want to work upon. It creates an environment for software development where one can perform simulation and produce test[6].

6.1 Cloud Simulator Functions

It provides support in simulation and modelling are:-

- Large scale data centers for cloud computing.
- Virtualization for server hosts, for providing host resources to virtual machines based on the customizable policies.
- Computational resources with energy awareness.
- Network topologies for data centers and inter-process communication.

These are the some unique features of Cloudsim which helps in developing, new algorithm, methods, protocols in cloud computing.

The world leading technology is cloud computing which helps in delivering reliability, fault tolerant, scalable computational services. Some service software are there on which Cloud Computing simulate the results are (SaaS, IaaS, PaaS).

The best thing of this simulator is to evaluating the hypothesis which is given before the software development. In this testing is done of algorithm, so that changes can be taken place, if it is not working according to our hypothesis.

Lastly, the main objective of this simulator is to provide generalised and effective work which we have done. By using cloudsim, researchers and developers can focus on specific issues of the hypothesis that they want to investigate.

6.2 RESULTS:

Here, are the list of figures which describes the comparison of time, standard deviation and energy with the base paper results.

Experiment name: planetlab_npa
Number of hosts: 800
Number of VMs: 1052
Total simulation time: 86400.00 sec
Energy consumption: 2410.80 kWh
Number of VM migrations: 0
SLA: 0.00000%
SLA perf degradation due to migration: 0.00%
SLA time per active host: 0.00%
Overall SLA violation: 0.00%
Average SLA violation: 0.00%
Number of host shutdowns: 569
Mean time before a host shutdown: 4088.83 sec
StDev time before a host shutdown: 10234.28 sec
Mean time before a VM migration: NaN sec
StDev time before a VM migration: NaN sec

Figure 6.2.1 Result Example of single Simulation

The figure shows the different values of time, standard deviation and power according these values; we deploy a bar chart which shows the comparison between different values.

Number of hosts	Number of vms	Total Simulation Time	Energy Consumption	Number of host shutdowns	Mean time before a host shutdown	StDev time before a host s	
800	1052	86400.00 sec	2410.80 Kwh	457	4386.71 sec	10234.28 s	12355.39 sec
800	1052	86400.00 sec	2410.80 Kwh	569	4088.83 sec		
800	898	86400.00 sec	2410.80 Kwh	545	5152.00 sec	12011.80 s	13386.60 sec
800	898	86400.00 sec	2410.80 Kwh	605	4527.85 sec		
800	1061	86400.00 sec	2410.80 Kwh	582	16056.64 sec	19417.07 s	28307.37 sec
800	1061	86400.00 sec	2410.80 Kwh	734	8845.98 sec		
800	1516	86400.00 sec	2410.80 Kwh	385	10692.84 sec	16663.88 s	19032.27 sec
800	1516	86400.00 sec	2410.80 Kwh	616	10017.42 sec		
800	1078	86400.00 sec	2410.80 Kwh	467	3854.51 sec	12922.62 s	11709.43 sec
800	1078	86400.00 sec	2410.80 Kwh	594	5144.52 sec		
800	1463	86400.00 sec	2410.80 Kwh	358	8999.30 sec	15896.31 s	18853.51 sec
800	1463	86400.00 sec	2410.80 Kwh	461	8060.37 sec		
800	1358	86400.00 sec	2410.80 Kwh	412	6311.74 sec	13602.42 s	14402.18 sec
800	1358	86400.00 sec	2410.80 Kwh	697	7666.62 sec		
800	1233	86400.00 sec	2410.80 Kwh	419	5267.47 sec	13345.72 s	14024.40 sec
800	1233	86400.00 sec	2410.80 Kwh	583	6587.71 sec		
800	1054	86400.00 sec	2410.80 Kwh	476	3817.55 sec	13060.81 s	12112.53 sec
800	1054	86400.00 sec	2410.80 Kwh	612	5723.60 sec		
800	1033	86400.00 sec	2410.80 Kwh	519	5119.61 sec	13975.37 s	14456.56 sec
800	1033	86400.00 sec	2410.80 Kwh	706	6327.26 sec		

Figure 6.2.2 Excel Chart showing results of different workloads:

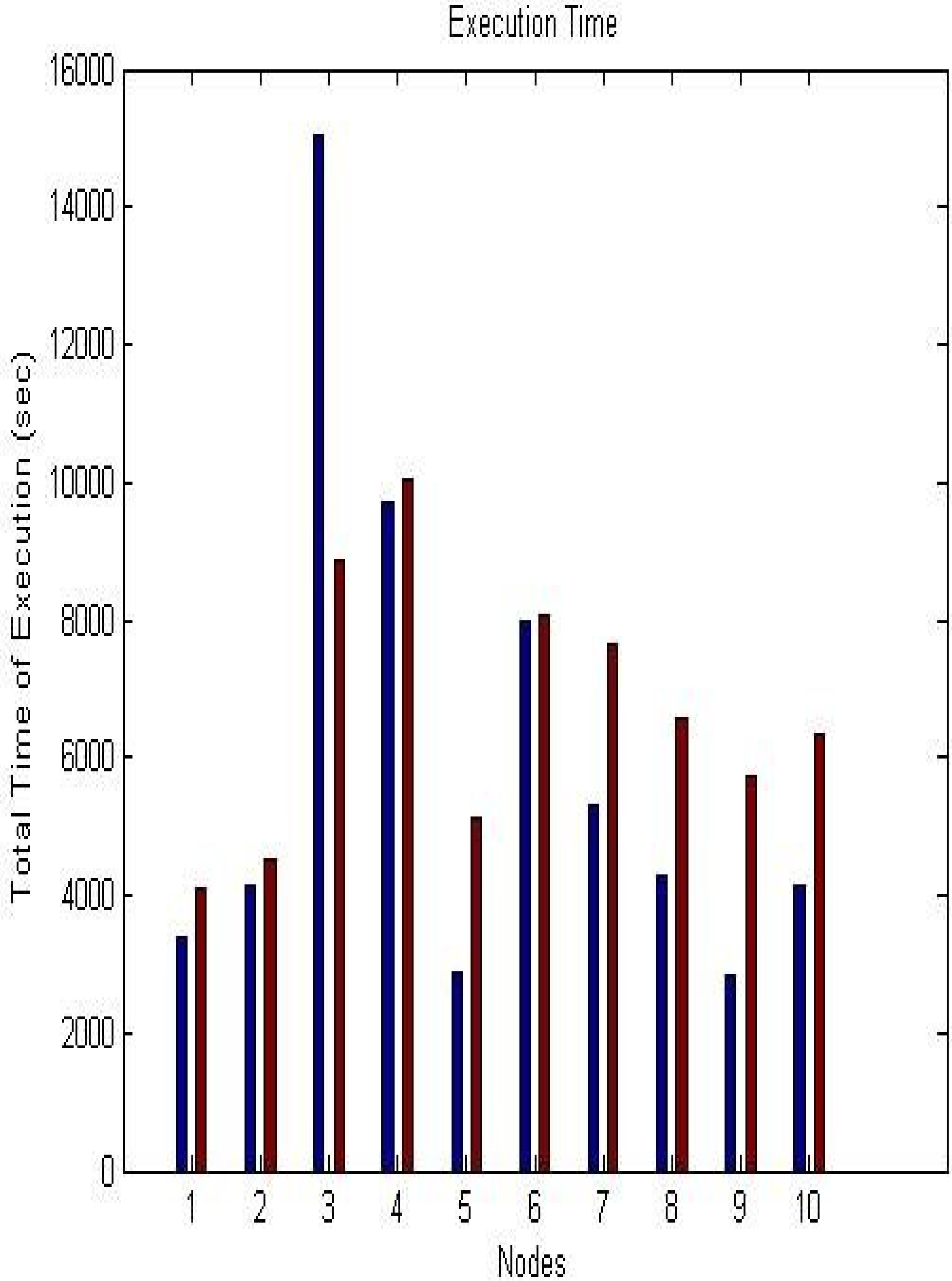


Figure 6.2.3 Execution Time comparisons of different workloads

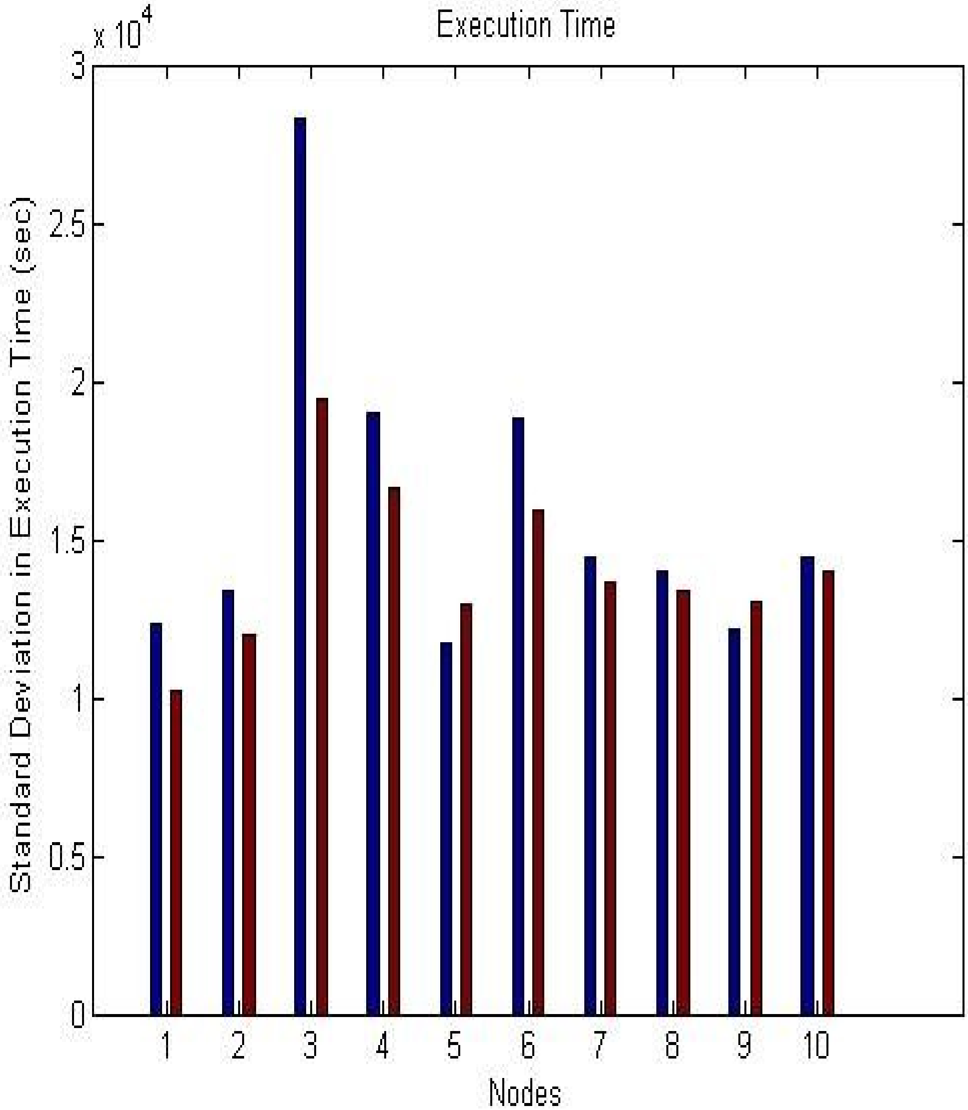


Figure 6.2.4 Standard Deviation comparisons of different workloads.

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All these results are counted on the basis of different simulation results of our dissertation work. Simulation results for different values have been generated down below.

This shows how the vm placement is done in different state of working in cloud computing whether it is in position of migration or failure. It completes it works according to module where they need any nodes to discard, it should be done because of that node efficiency may be decreased.

Here are the simulation results of cloud simulation which we got the different values for vm placement due to which time and standard deviation have been calculated which has shown below figures.

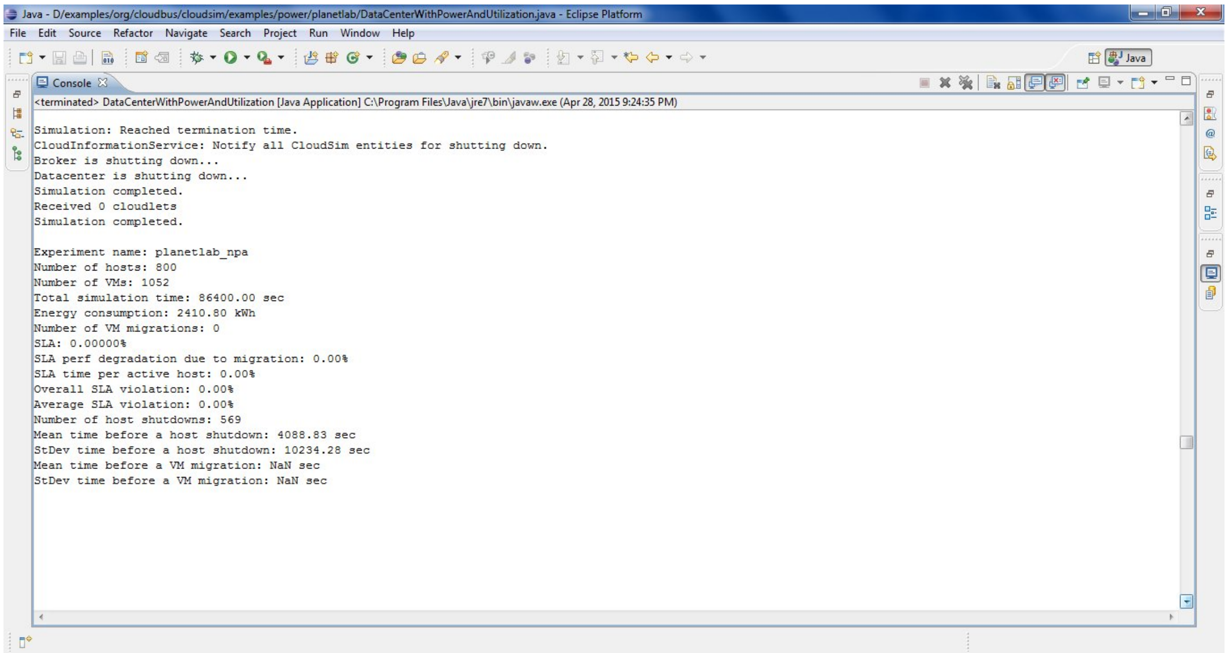

Figure 6.2.6 Times before Shut down 4088 sec

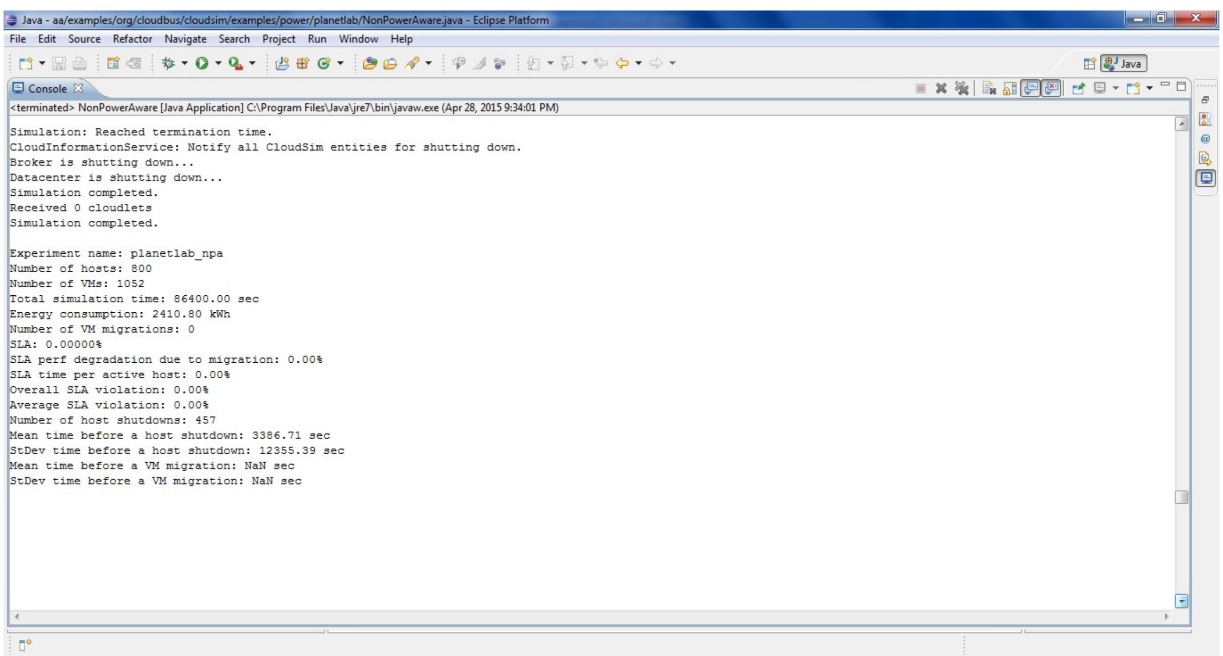

Figure 6.2.7 Times before Shut down 3306 sec

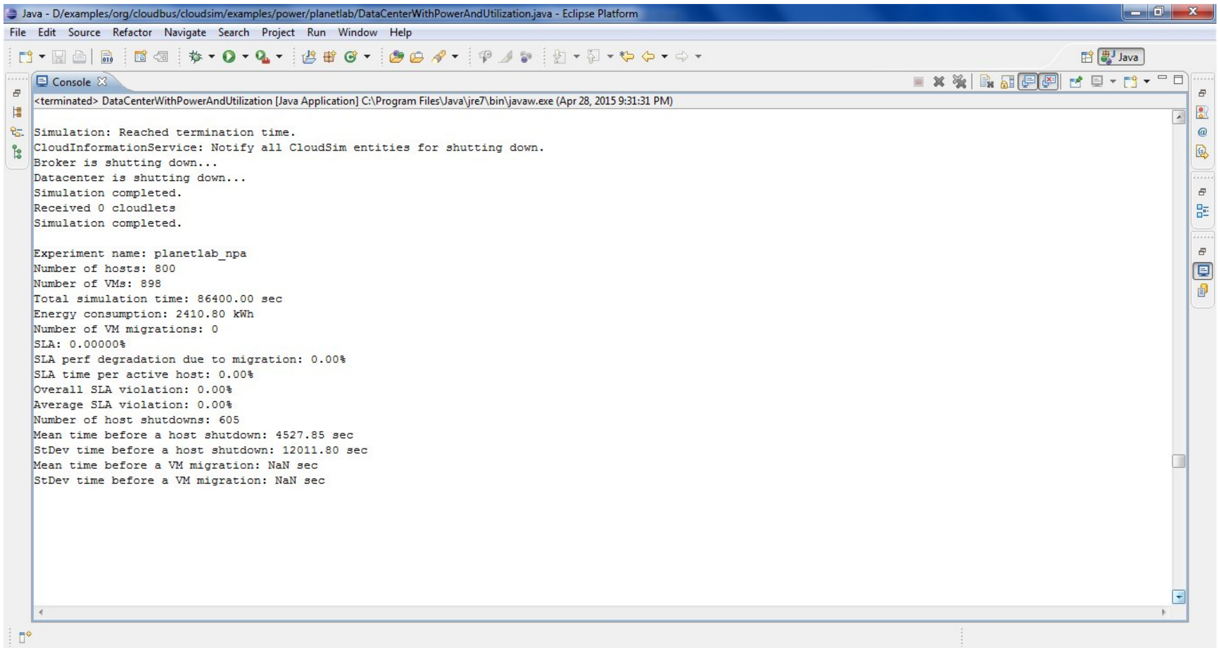

Figure 6.2.8 Times before Shut down 4527 sec

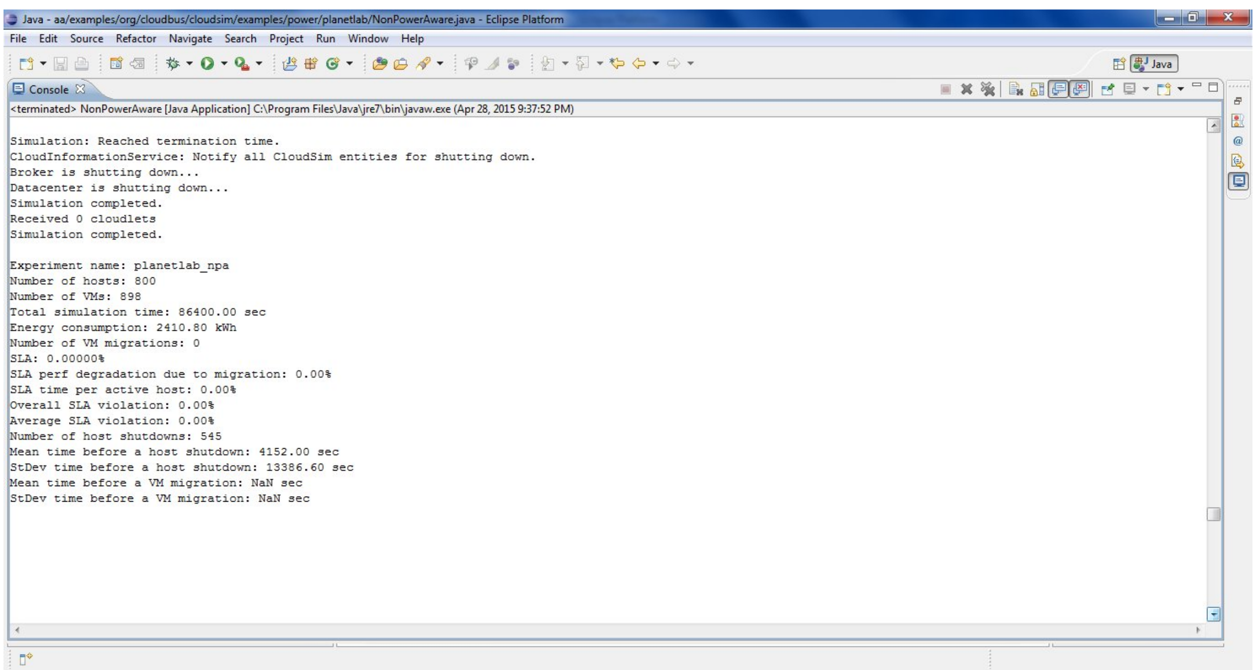

Figure 6.2.9 Times before Shut down 4152 sec

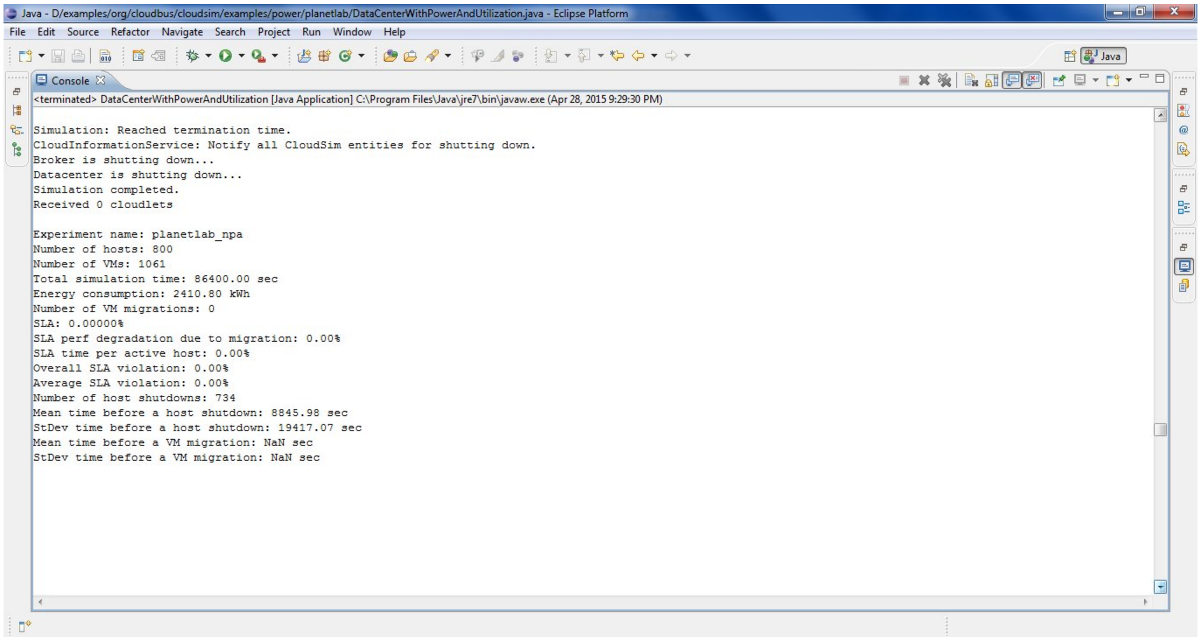

Figure 6.2.10 Times before Shut down 8845 sec

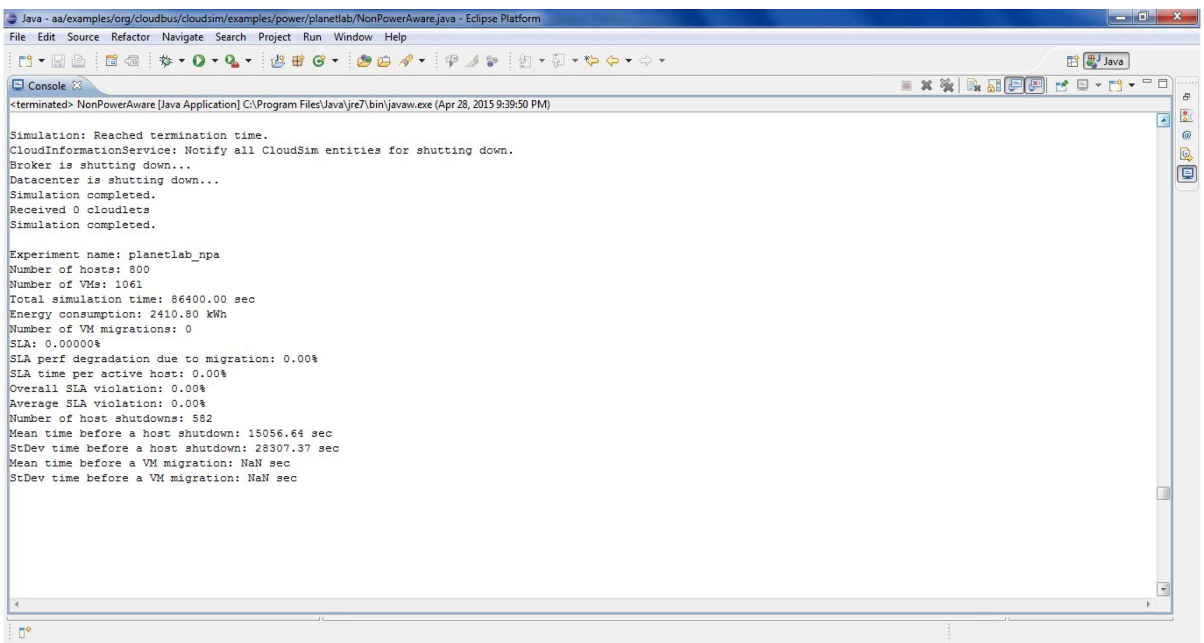

Figure 6.2.11 Times before Shut down 15054 sec

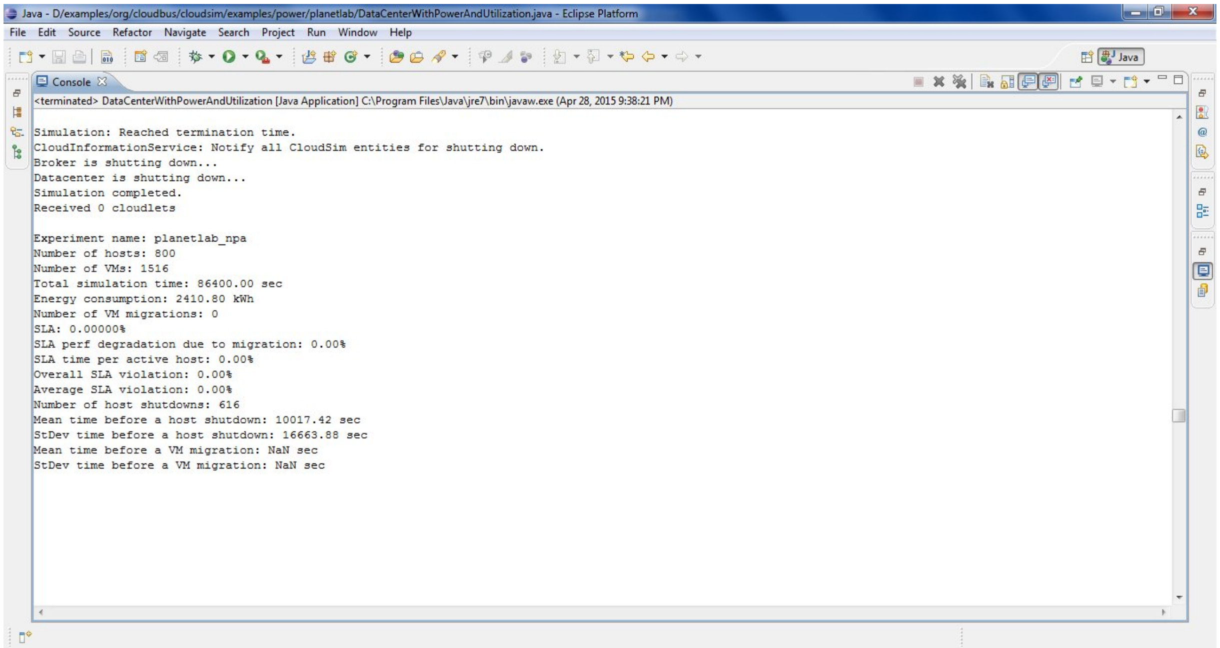

Figure 6.2.12 Times before Shut down 10017 sec

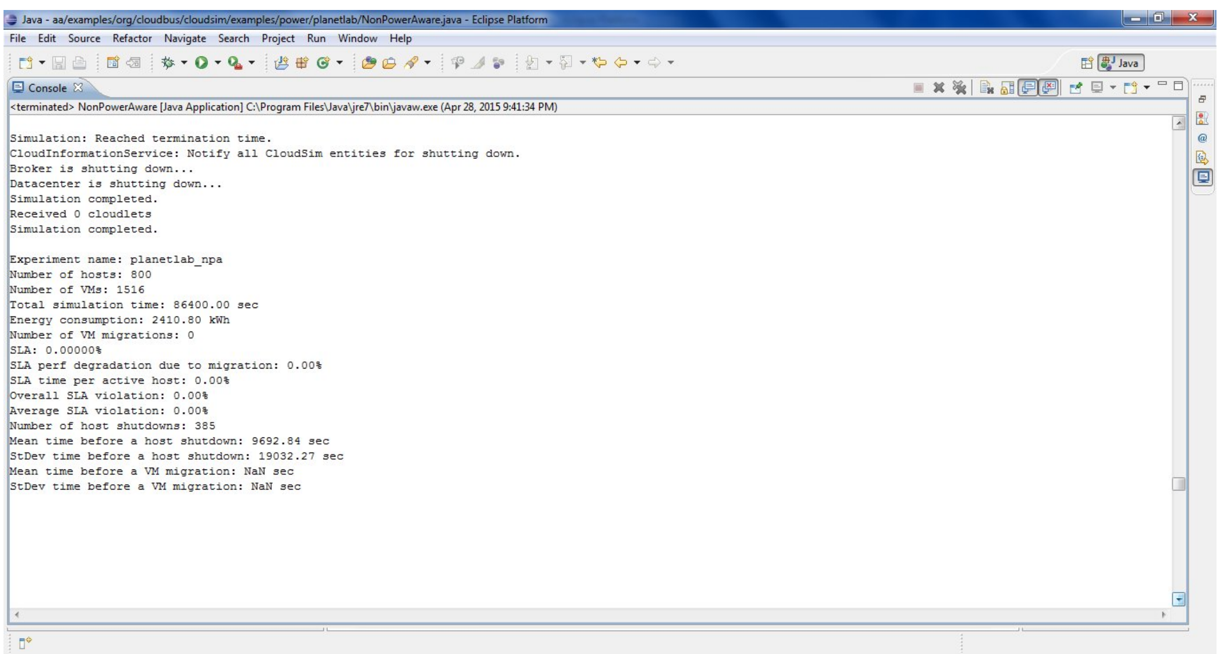

Figure 6.2.13 Times before Shut down 9492 sec

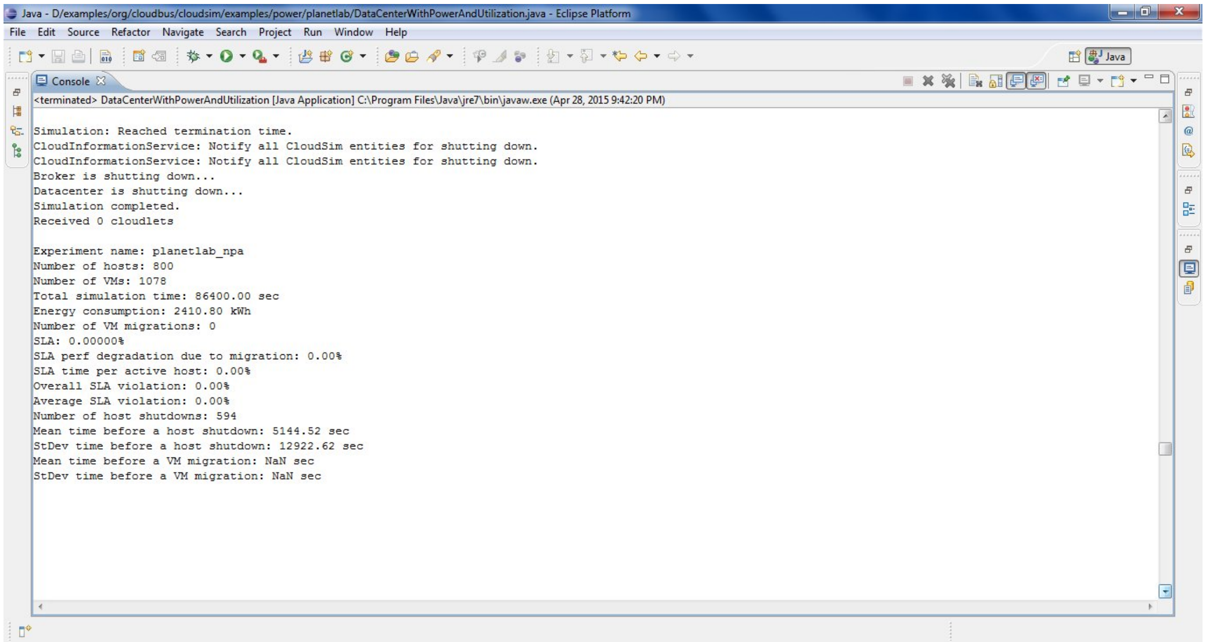

Figure 6.2..14 Times before Shut down 8144 sec

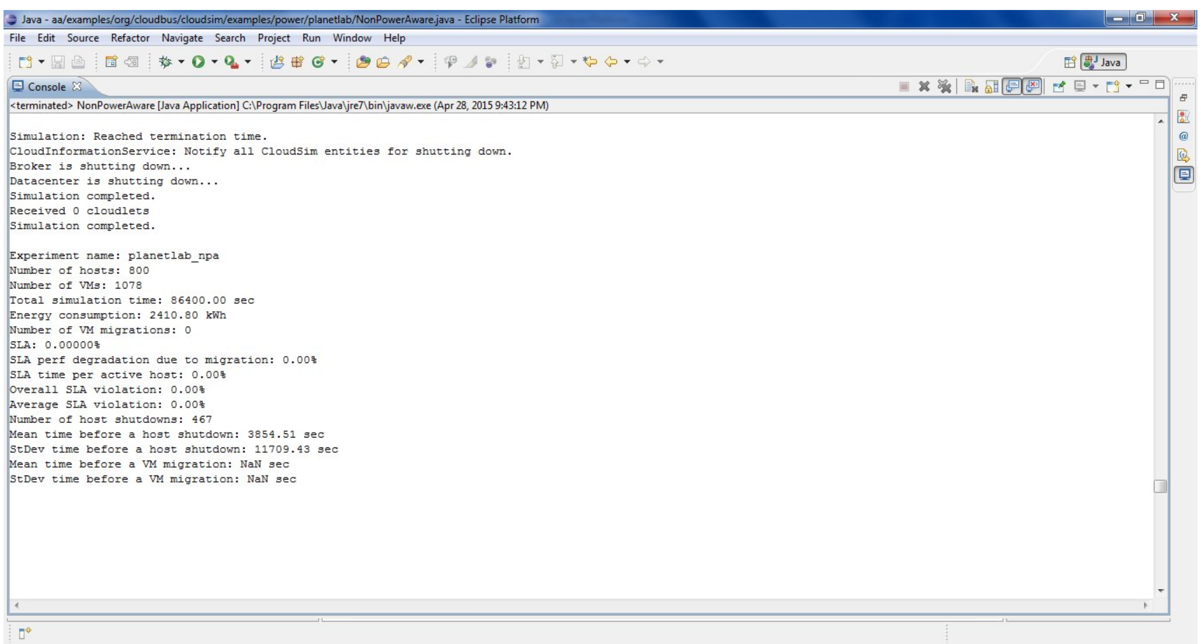

Figure 6.2.15 Times before Shut down 3854 sec

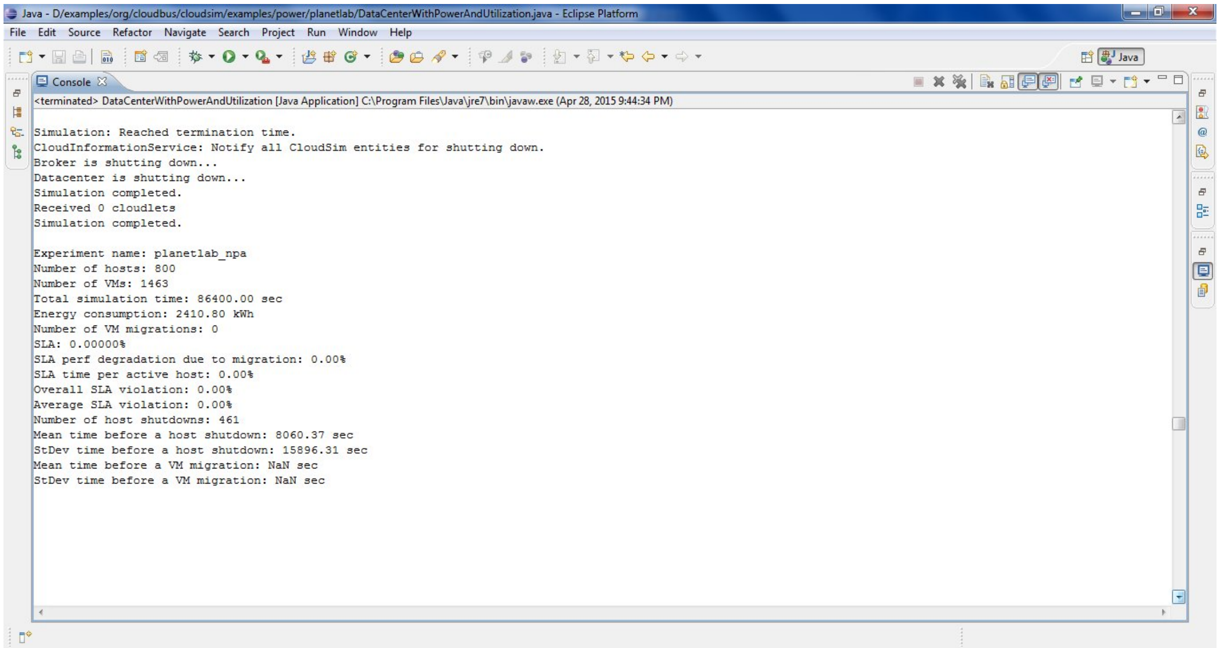

Figure 6.2.16 Times before Shut down 8060 sec

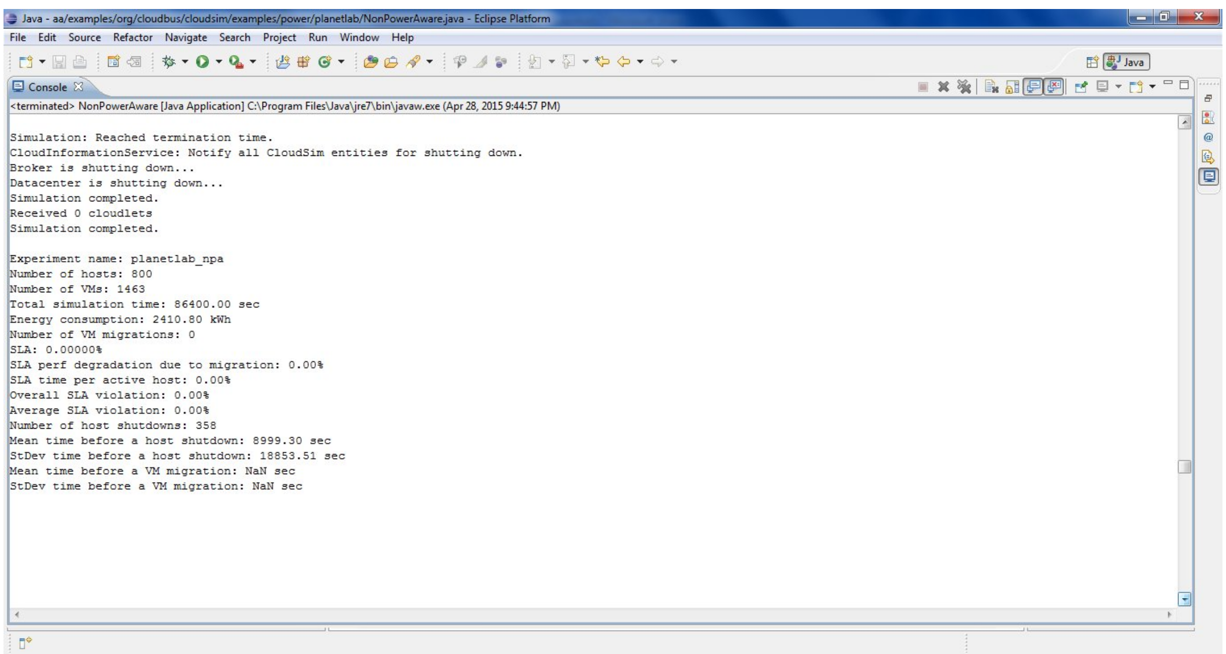

Figure 6.2.17 Times before Shut down 8999 sec

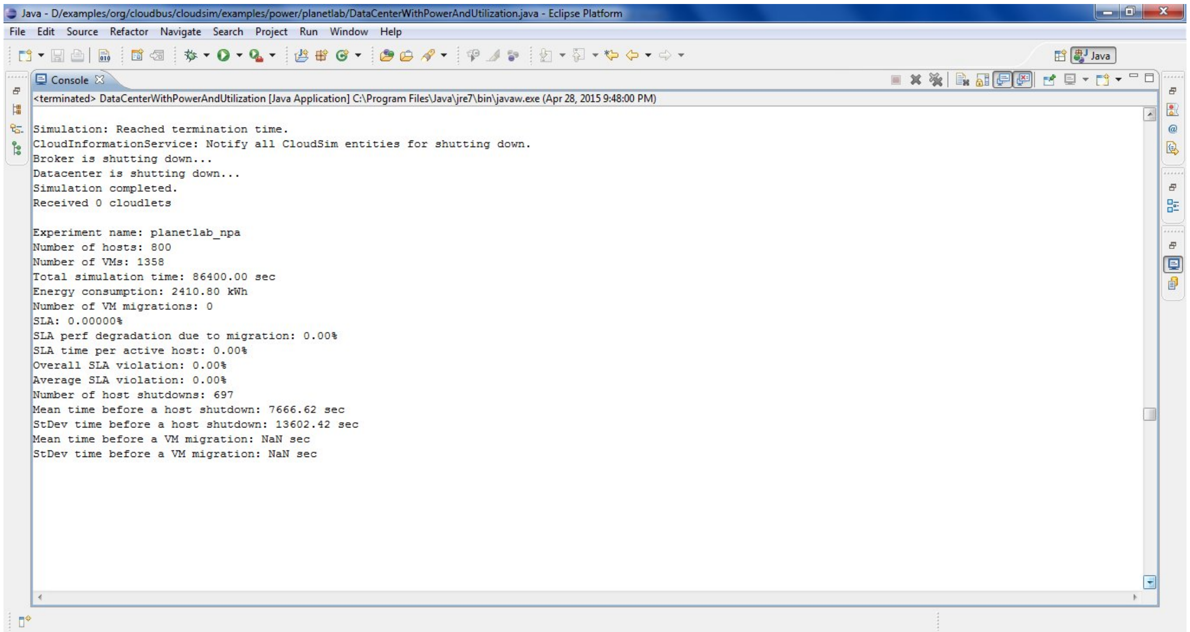

Figure 6.2.18 Times before Shut down 7666 sec

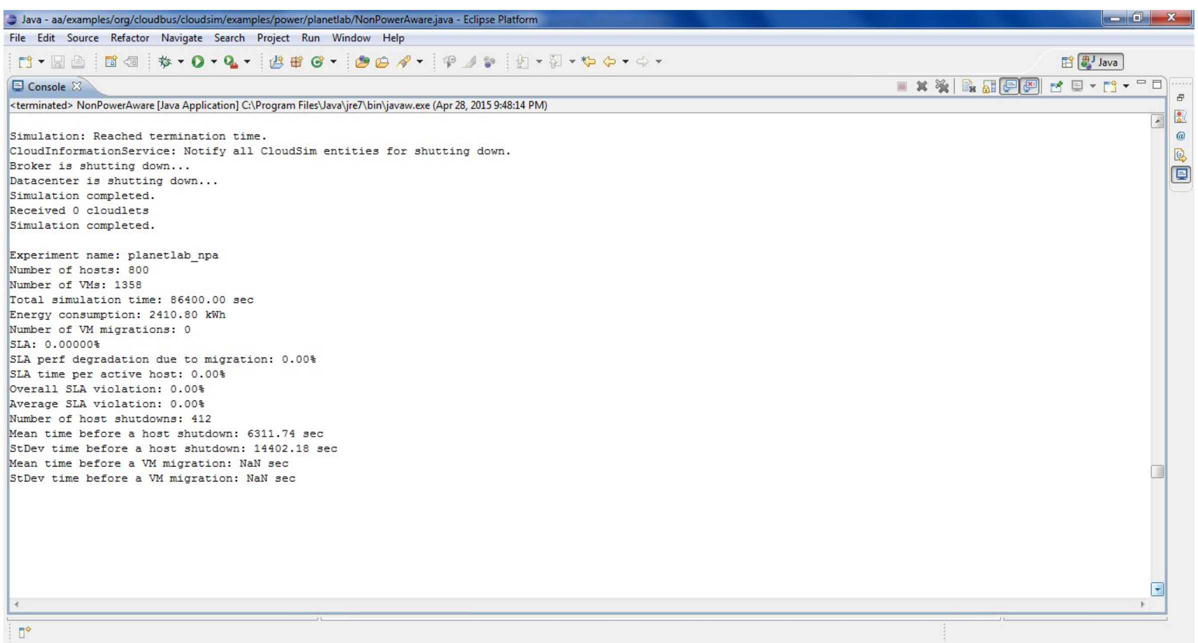

Figure 6.2.19 Times before Shut down 6311 sec

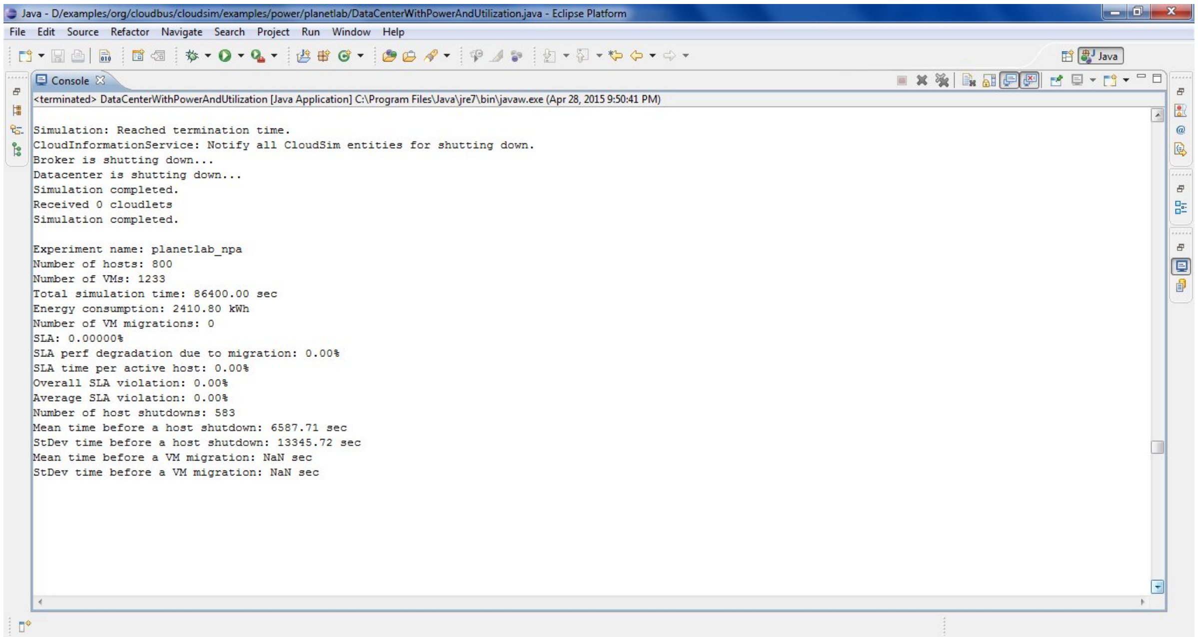

Figure 6.2.20 Times before Shut down 6587 sec

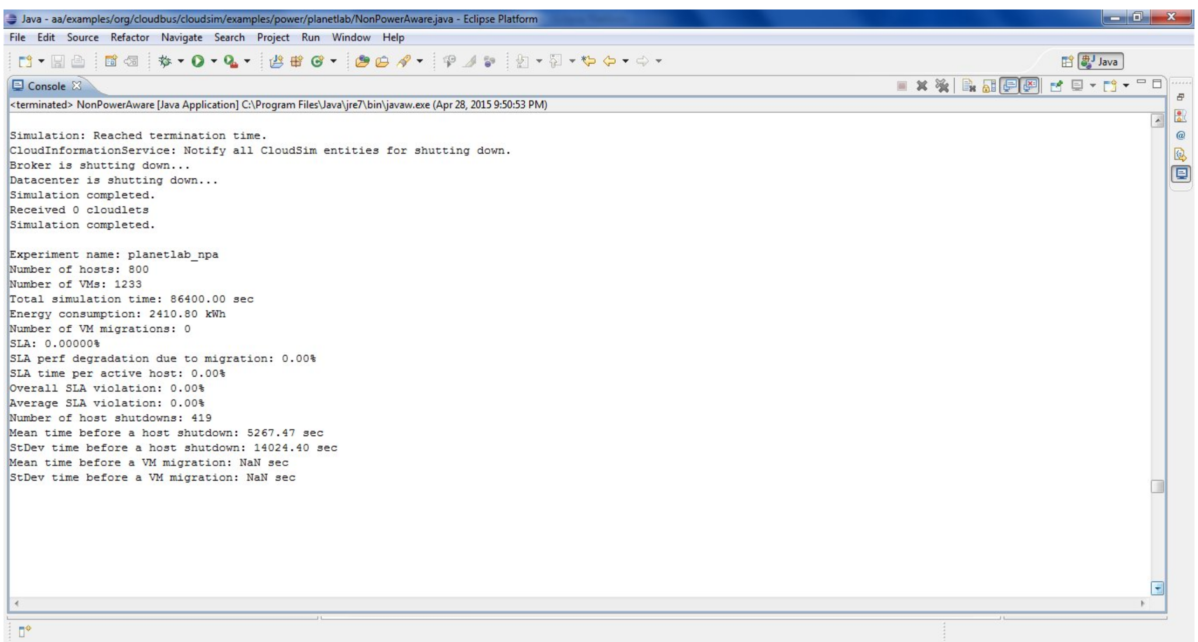

Figure 6.2.21 Times before Shut down 5267 sec

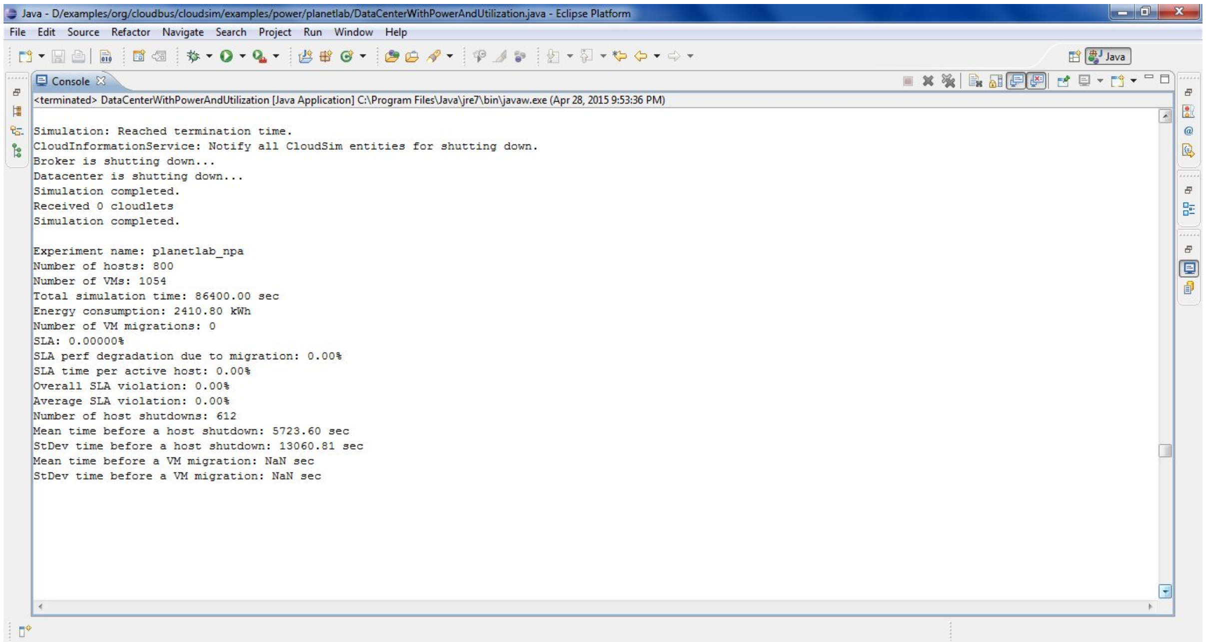

Figure 6.2.22 Times before Shut down 5723 sec

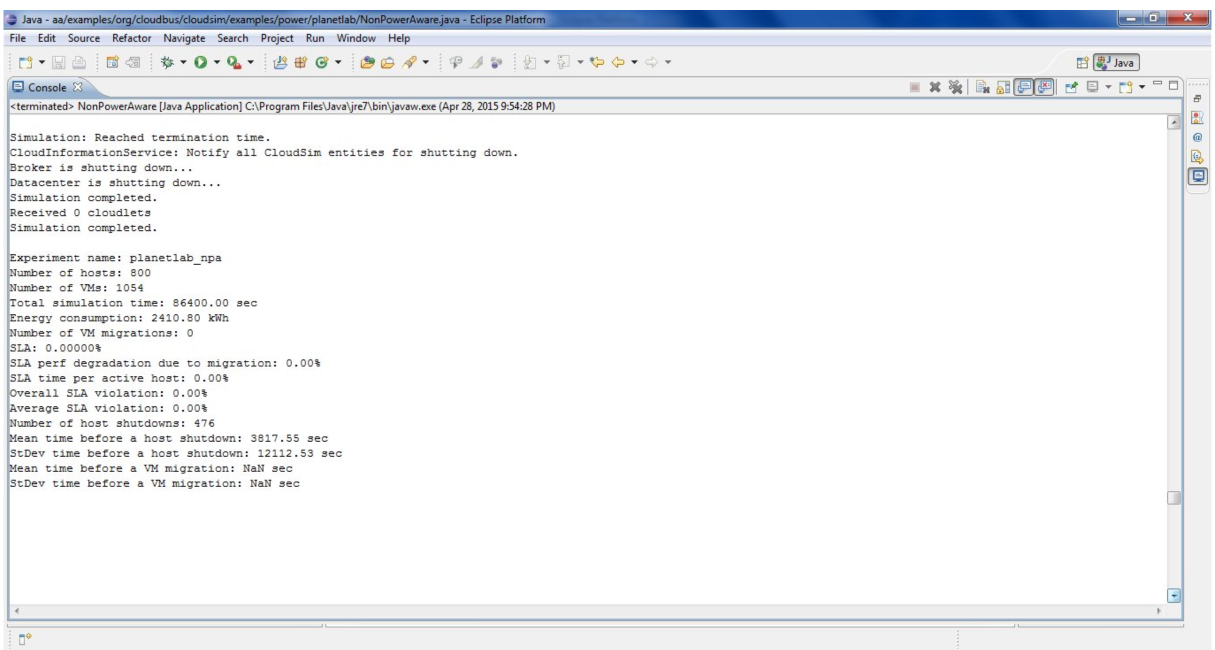

Figure 6.2.23 Times before Shut down 3817 sec

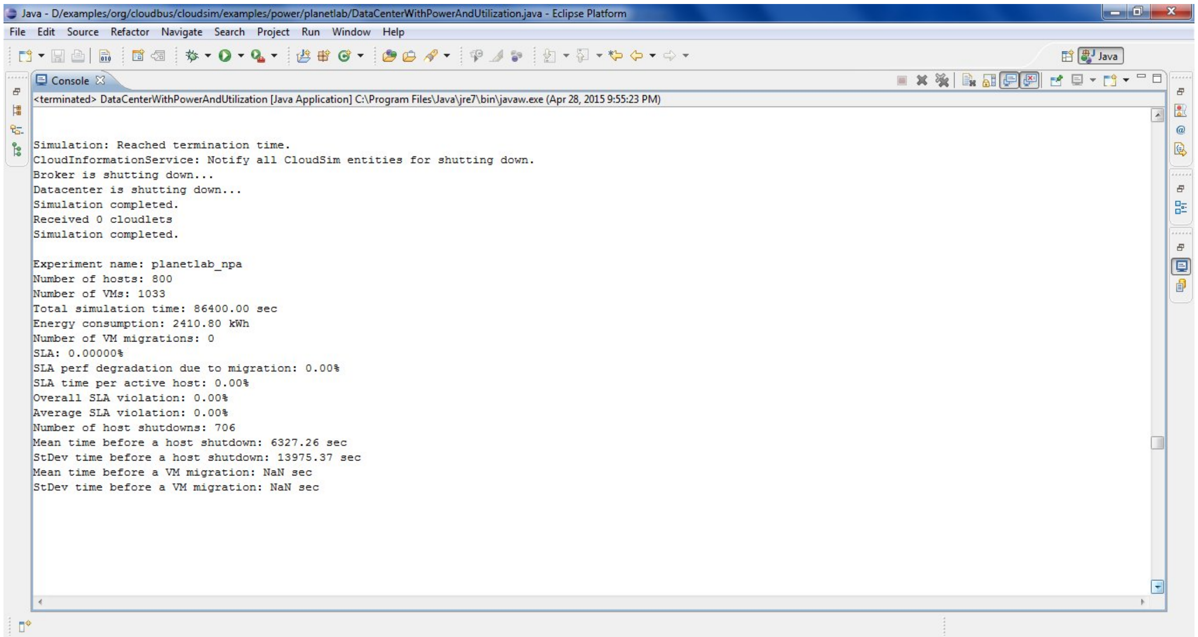

Figure 6.2.24 Times before Shut down 6327 sec

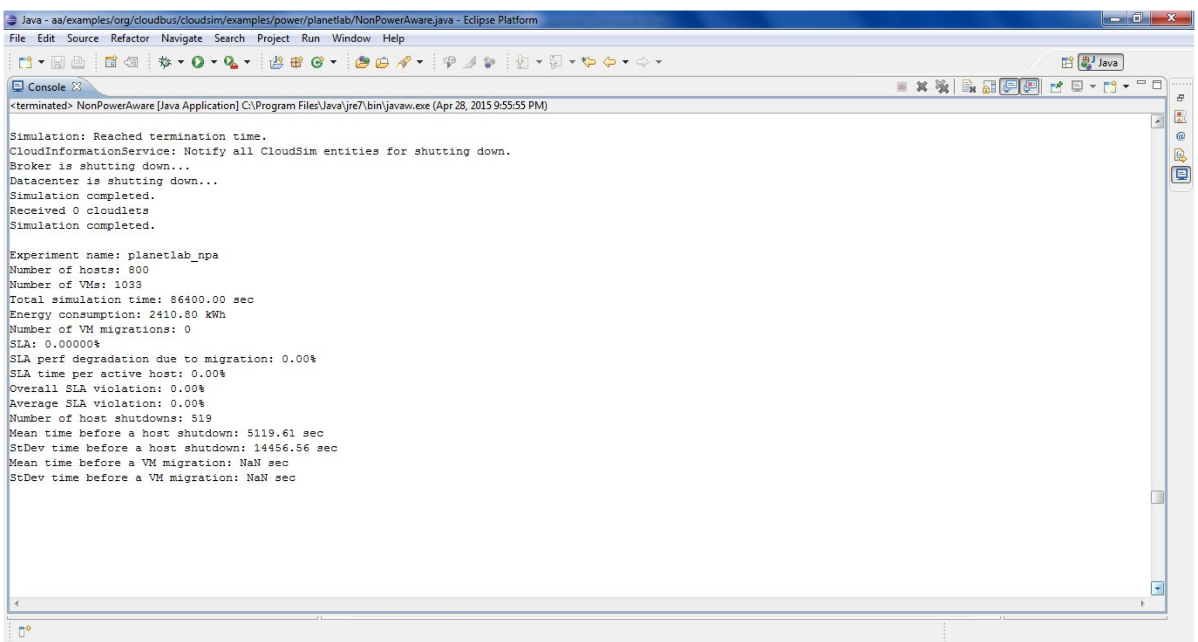

Figure 6.2.25 Times before Shut down 5119 sec

Discussion:

From the above result, analysis has been done. It is clear that our algorithm is much more efficient in regarding to time complexity, standard deviation and energy consumption. Our proposed work includes parameters like RAM (Resource Allocation Module), MIPS (Millions Instruction per Second) and POWER. On the basis of these parameters our proposed work solve the problem of my base paper, they only consider power parameter which is not more effective for the placement of Virtual Machine in cloud environment. For making virtual machine more reliable and efficient we need to do some changes, which we have done in this proposed work. So here, in this dissertation virtual machine placement, virtual machine selection and task finder algorithm are consider for making cloud environment more scalable. Task Finder algorithm works on finding the number of task to be handled by the cloudlets which is forwarded by the workloads.

CHAPTER 7
CONCLUSION AND FUTURE WORK

This chapter explains the conclusion and future scope of this work. This explains here under this section. By doing this it helps in studying the research work more on this at any time we needed.

Conclusion

After all the study this dissertation proposes a new technique for resource allocation of cloud which provides better energy restoration and performance in regards of present technique by taking consideration of RAM and Bandwidth of the Virtual Machines with the power.

The simulation results are good and showed much improvement over existing one with increase in execution time shows that proposed approach is correct.

Future Work

In future, new parameters in modules of the vm placement can be added to improve more parameters have to be explored and added in order to increase performance. So it will be really useful if deployed for real time cloud computing.

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GLOSSARY OF TERMS

Arbitrary failure

System produces random output and other processes declare it as plain junk.

Availability

It is defined as an attribute that a system is ready to be used instantly. A system with high availability is the one that will most probably be working at any given instant of time.

Cloud Computing

It uses the ability of other computers and their soft ware's without need of buying them and is provided as service to the people by the means of internet.

Crash Failure

The server works properly until it prematurely halts.

Fault

A fault in a system is a type of behavior of system which is totally different from the expected behavior of the system.

Fault tolerance

Fault tolerance means that our system is able to give us correct results even in the state of failure.

Maintainability

It is how simply a failed system can be restored. A highly maintainable system is the one if failures can be detected and repaired automatically.

Omission Failure

A server is not able to response to the incoming requests. It consists of two types: Receiver and sender .A receiver omission failure is the one in which server is not able to receive the messages and sender omission failure in which it fails to send the messages.

Response Failure

The failure in which server provides incorrect reply to the request. Sometimes, web browser gives results which are not related to the term that the user is looking for.

Reliability

It is defined as the property in which a system is able to run continuously without failure. A system with high reliability is the one that will most probably continue to work without interlude during a proportionately extensive period of time.

Safety

It refers to the circumstances when a system temporarily fails to operate appropriately leads to no catastrophic situation.

Timing Failure

The server fails to response within the given time interval. It leads to connection time out. If the server is too late to response, it is performance failure.

Cloud App (Cloud Application)

Short for *cloud application*, cloud app is the phrase used to describe a software application that is never installed on a local computer. Instead, it is accessed via the Internet.

Cloud Application Management for Platforms (CAMP)

CAMP, short for *Cloud Application Management for Platforms*, is a specification designed to ease management of applications -- including packaging and deployment -- across public and private cloud computing platforms.

Cloud Backup

Cloud backup, or cloud computer backup, refers to backing up data to a remote, cloud-based server. As a form of cloud storage, cloud backup data is stored in and accessible from multiple distributed and connected resources that comprise a cloud.

Cloud Backup Service Provider

A third-party entity that manages and distributes remote, cloud-based data backup services and solutions to customers from a central data centre.

Cloud Backup Solutions

Cloud backup solutions enable enterprises or individuals to store their data and computer files on the Internet using a storage service provider, rather than storing the data locally on a physical disk, such as a hard drive or tape backup.

Cloud Enablement

The process of making available one or more of the following services and infrastructures to create a public cloud computing environment: cloud provider, client and application.

Cloud Management

Software and technologies designed for operating and monitoring the applications, data and services residing in the cloud. Cloud management tools help ensure a company's cloud computing-based resources are working optimally and properly interacting with users and other services.

Cloud Migration

The process of transitioning all or part of a company's data, applications and services from on-site premises behind the firewall to the cloud, where the information can be provided over the Internet on an on-demand basis

Cloudburst Cloud bursting is a technique used by hybrid clouds to provide additional resources to private clouds on an as-needed basis. If the private cloud has the processing power to handle its workloads, the hybrid cloud is not used. It is what happens when your cloud has an outage or security breach and your data is unavailable. The term cloudburst is being use in two meanings, negative and positive:

- Cloudburst (negative): The failure of a cloud computing environment due to the inability to handle a spike in demand.
- Cloudburst (positive): The dynamic deployment of a software application that runs on internal organizational compute resources to a public cloud to address a spike in demand.

Cloudcenter A datacenter in the “cloud” utilizing standards-based virtualized components as a datacenter-like infrastructure that rents its infrastructure.

Cloud client Computing device for cloud computing. Updated version of thin client.