Performance Analysis of Scheduling Algorithms Under Different Power Models

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***Abstract:* Cloud computing attain mul ti-level virtualization and abstraction through effective integration of variety of computing, storage, facts, applications and other resources, users can be easy to use powerful computing and Storage capacity of cloud computing only need to attach to the network. In the study it has been observed that the consumption had been doubled while year 2000. These of surveys has given birth to a new advocacy called green computing which is rising with the aim to make the system power efficient and efficient utilization of resources. Studies shows average consumption of data centers can be nearly 20% and power consumed by the idle resources is can be as much as 60% of the peak power. It had grown so fast and had attracted organizations to move in single dimension called cloud. At the same time it encountered problems addressed by the research community across the world. The problems are related to security, scheduling the problem. The operational cost of the cloud infrastructure is also going high because we are deploying data centres rapidly to meet the customer's requirement. In order to balance load on various systems virtual machine migration is used and we could save energy by turning OFF the idle machines. Greencloud model is introduced with objective To propose mechanism that would contribute to energy consumption Performance analysis of scheduling algorithms under different power models.**

Keywords: Cloud Computing Architecture, Infrastructure as a Service (IaaS), Deployment Model, On-demand self-service

1. INTRODUCTION

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared group of configurable computing resources (e.g., servers networks, storage, applications, and services) that can be quickly provisioned and freed with nominal management effort or service provider interaction [1].

1.1 CLOUD COMPUTING ARCHITECTURE

The cloud architecture generally has two blocks the front end and back end. Both of them are connected to each other through network. The front end consists of the user computer and the application required accessing the cloud computing system. No all cloud computing systems have the same user interface. Services like Web-based e-mail programs manipulate existing Web browsers like Internet Explorer or Firefox.

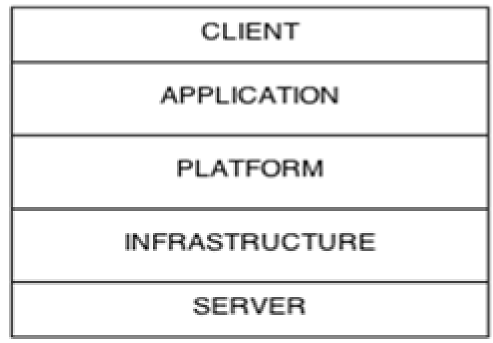


Figure 1.1: Cloud Computing Architecture

1.2 SERVICE MODELS

Cloud computing has three service models on which whole cloud computing relies. It incorporates Infrastructure as a Service (IaaS), (PaaS) Platform as a Service, and (SaaS) Software as a facility and provides these services like utilities, so the end users are billed by how much they used.

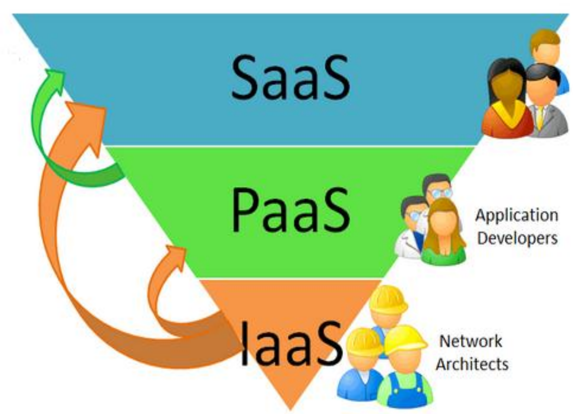


Figure1.2: Service Models

1.2.1 Infrastructure as a Service (IaaS)

Infrastructure as a service (IaaS) provides transportation to users. The infrastructure could be in terms of facts storage space, or consumer computing services which can be used by user to run or install capricious software's. The infrastructure such as operating system, storage disks and former software's installed on user system can be managed by purchaser. Example: Amazon S3. The S3 stands for simple storage facility which provides the storage infrastructure at low cost which is divided into three parts first standard storage, compact redundancy storage, glacier storage. The Amazon S3provides storage from 1Tb to over 5000Tb which price from0.010$ to 0.095$ per Gb for a month. The price of storage varies with amount and category of storage [2].

1.3 DEPLOYMENT MODEL

The cloud can be deploying according to the content, by the organizations. It is quite feasible to handle the content by cloud computing system. We can create diverse clouds as public, private and hybrid cloud suite.

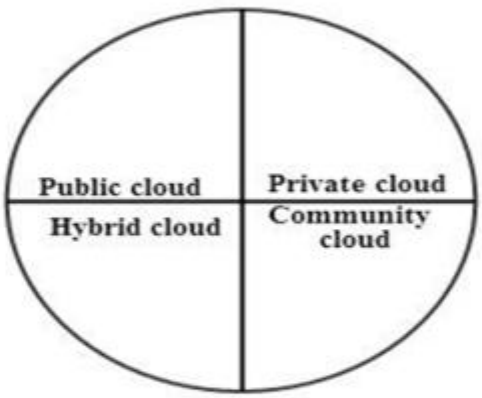


Figure 1.3: Deployment Models

1.4 ESSENTIAL CHARACTERISTICS

On-demand self-service: A customer can unilaterally provision computing capabilities, such as server time and network storage, as required repeatedly without requiring human interaction with each service's provider.

Broad network access: Capabilities are presented over the network and accessed through standard mechanisms that promote use by heterogeneous thin or broad client platforms (e.g., mobile phones, laptops, and PDAs).

Resource pooling: The provider's computing resources are pooled to serve abundant consumers using a multi-tenant model, with different physical and essential resources vigorously assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer commonly has no control or knowledge over the exact location of the provided resources but may be able to denote location at a higher level of abstraction (e.g., country, state, or data enter). Examples of resources comprise storage, processing, memory, network bandwidth, and virtual machines [3].

2. RELATED WORK

The research work performed in this area by different researchers is presented as follows:

AkhilBehl[1] had focused on security challenges in cloud environment. The author says that Loop hole in the security of any component in the cloud can be both disasters for the customer and defacing for the service provider. The paper discusses the security issues related to the cloud there are many security threats which emerge inside or outside of cloud provider's/consumer's environment and these can be mostly classified as Insider threats, outsider malicious attacks, data loss, issues related to multi-tenancy, loss of manage, and service disruption. The paper also discusses the existing security approaches to safe the cloud infrastructure and applications and their drawbacks.

Muhammad Baqer Mollah[2] presents all about the promising cloud computing knowledge i.e. its architecture, compensation, platforms, issues and challenges, applications, future and explore options of cloud computing. There four generations of computing like as mainframe relayed computing, personal computing; client server relayed computing and web server relayed computing respectively. As there are several advantages over current generation of web server relayed computing like as fast microprocessor, huge memory, high-speed network, reliable system architecture etc.

Mohammed A. AlZain et al.[3] urveys about the recent research related to single cloud and multi cloud security and addresses possible solution. The use of multi cloud providers to maintain security has received less attention as compare to single cloud. Currently used cloud environment architecture has three layers first is characteristics layer second is three layer model and lastly four deployment models (public cloud, private cloud, community cloud and hybrid cloud). The author had discussed about security risk in cloud computing. The data stored in cloud may suffer from damage during transition, also another security risk that may occur with cloud provider such as data intrusion. The focus of author is to promote multi cloud due to its ability to reduce security risk that affect the cloud computing user.

Anton Beloglazov et al.[4] consider other issues like in sufficient cooling system which leads to reducing system reliability and devices lifetime. Co_2 emission is caused due to high power consumption by cloud infrastructure. The author presents decentralized architecture of resource management in which there are three layers called dispatcher, global manager and local manager. The local manager looks after the CPU operation and thermal state. Any of the feature is tend to gets violated the local manager inform the global manager. The diverse conditions are when CPU utilization is near to 100%, underutilization of resources and lofty temperature. The decentralization removes single point failure and improves scalability. Moving towards allocation policies it had separate the VM reallocation in two parts firstly selection of VM to migrate, secondly determining novel placement for these VMs on physical node.

Kejiang Ye et al.[5] had given energy efficient datacenter architecture. The architecture consisted of four main modules. Out of four the author had focused on energy management module and monitoring module. The monitoring module is responsible for monitoring both virtual machines and physical machines including the power consumption, resource utilization etc. Management module is responsible for all management issues in datacenter cloud, which includes energy management sub module, security management sub module etc.

Anton Beloglazov et al.[6] had given architectural framework of cloud computing in which the cloud environment has consumer, green service allocator, virtual machines and physical machines. The green service allocator includes green negotiator, service analyzer, purchaser profiler, pricing, energy monitor, service scheduler, VM manager accounting. The also includes modified best fit decreasing algorithm for allocation of VMs. This allows leveraging heterogeneity of resources by choosing most power efficient node first. The minimization migration policy minimizes number of migrations. This has the upper threshold and lower threshold limit.

Chao-En Yen et. al [7] describes a hierarchical distributed cloud computing system with pluggable component architecture. The component plug ability gives administrators the flexibility to use the most appropriate subsystem as they wish. The component plug ability of Roystonea is based on specifically designed interfaces among Roystonea restricting system and infrastructure subsystems components. The component plug ability also encourages the development of communications subsystems in cloud computing. Roystonea provides a test bed for designing decision algorithms used in cloud computing system. The decision algorithms are entirely isolated from other components in Roystonea architecture, so the designers of the decision algorithms can centre on algorithm design without worrying about how his algorithm will interact with other Roystonea components.

3. PROPOSED WORK

3.1Problem Formulation

The operational cost of the cloud infrastructure is also going high because we are deploying data centres rapidly to meet the customer's requirement with all this the cooling auxiliaries are also getting installed together these two are consuming a lot of electricity. Among the various techniques for saving energy of the physical infrastructure one of the technique is virtual machine migration, the state of creating virtual machine is related to virtualization which creates identical images and provide heterogeneity and we can deploy various machines on single machine. In order to balance load on various systems virtual machine migration is used and we could save energy by turning OFF the idle machines.

3.2 Proposed Work

The evaluation of Greencloud on the basis of the two models it had used in for energy calculation, the Linear power model and Powerblade model. In the two models we used four different scheduling algorithms the Green scheduler, Green scheduler using virtual machines, Round-Robin scheduling via host and Round Robin using virtual machines. The greencloud is based on three tier architecture which uses L3/L2 switches in its layers. We have used one switch in core network layer two in aggregation layer and 144 physical machines in its last layer. The PMs are arranged in TOR topology which uses switches either L2 or L3. From the simulator we can choose which algorithm we have to use at a particular instance and can choose the appropriate power model. The number of servers and switches can be customized and the number of users can also be fixed. Robin-Robin is one of the algorithms of Greencloud simulator that employs process and network schedulers. Round Robin scheduling uses time slices to complete the task, it is easy to implement tasks in it and it provides equal priority to each task in the queue, to show how the algorithm works we have taken simple example to show the working of it.

4. RESULTS AND ANALYSIS

Working of greencloud simulator, the simulator works with Ubuntu 12.04 and above, we have used 12.04 versions in it. Firstly go into the terminal and write cd greencloud, this will move into the greencloud directory.

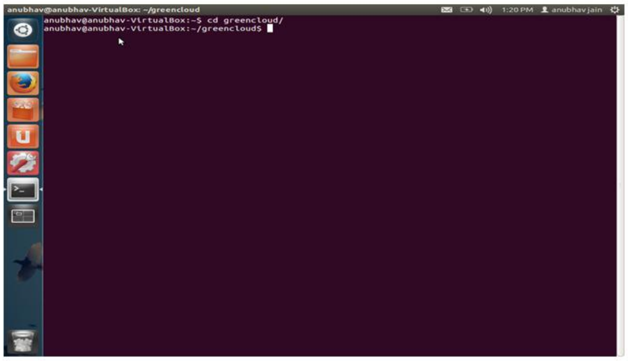


Figure 4.1 How to get into the directory

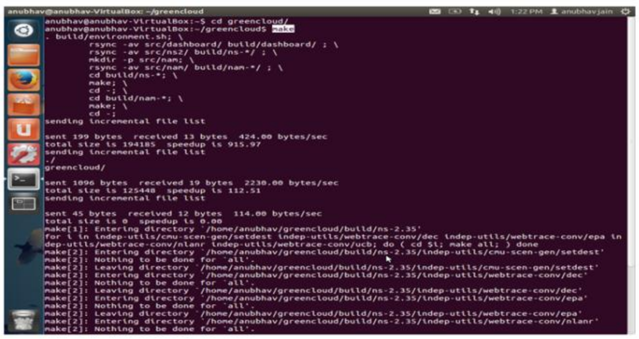
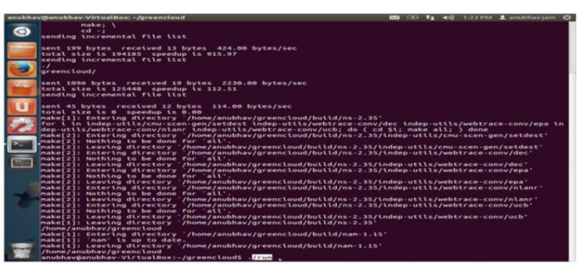


Figure 4.2: compile the code

After you entered the directory to compile the code after the changes you have performed use command “make” this will compile all those codes in which the changes you have performed. The make command is executed in the next image. You can also clean the previous compilation by with the “make clean” command first and then using “make” command run. The compilation is needed only when the changes are performed in the C++ files, there is no need to compile when the changes are performed in the TCL files.

Figure 4.3: how to run the code

After compiling the code use command “./run” to run the code as in diagram.



The out will be displayed in the firefox browser as shown in figure 4.4 the output will contain summary of simulation in the form of pie chart. The details are also shown with duration of simulation, architecture used, task allocation total and average number of task per server, load on datacenter and energy consumed by transmission media and server.

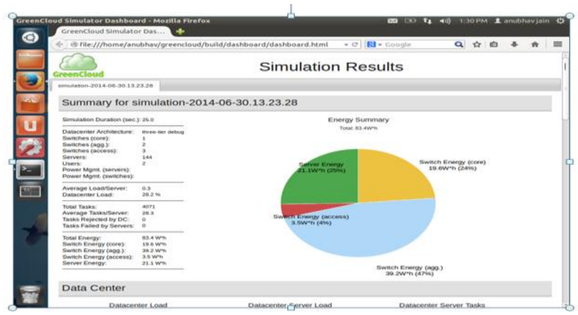


Figure 4.4: Output after executing the program using power blade model

The graphical representation of different power models with different scenarios as scheduling algorithms is shown in graphs the parameters are total energy, energy consumption from switches, server energy, simulation time, task rejected by datacenter and task failed by server. From the results the energy saved by power blade model is almost 1/3rd of the liner power model. During the simulation it has been encountered that some task were rejected by the datacenter and some failed to complete. The energy consumption by these schedulers is low but at the same time numbers of tasks submitted were quite less and lot of tasks failed to complete the scenario. This is clear that it will violate service level agreement (SLA) and moreover it hampers the Quality of service (QoS) parameter. In the end there are two tables which gives two scenarios which shows some important parameters for energy efficient cloud computing.

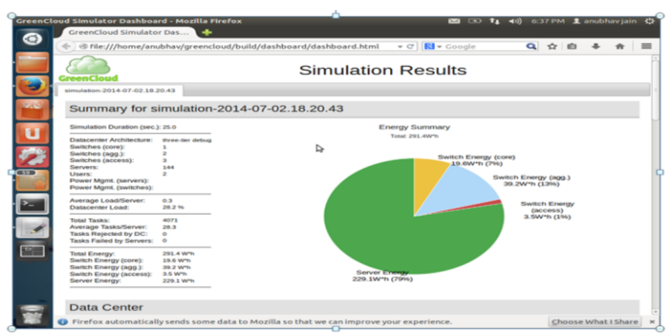


Figure 4.5 Output after executing the program using Linear Power Model

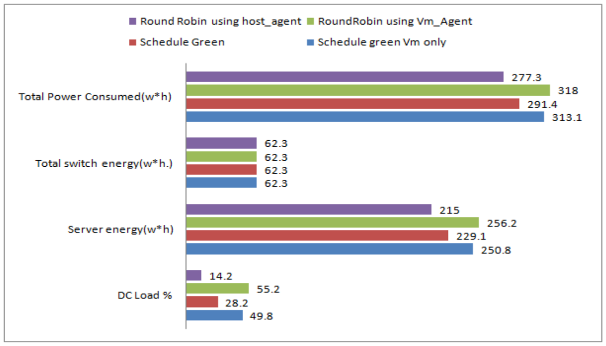


Figure 4.6: Power Consumption in Linear Power Model

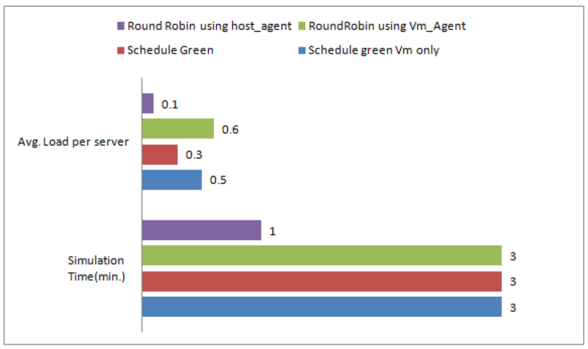


Figure 4.7: Load and Time of Linear Power Model

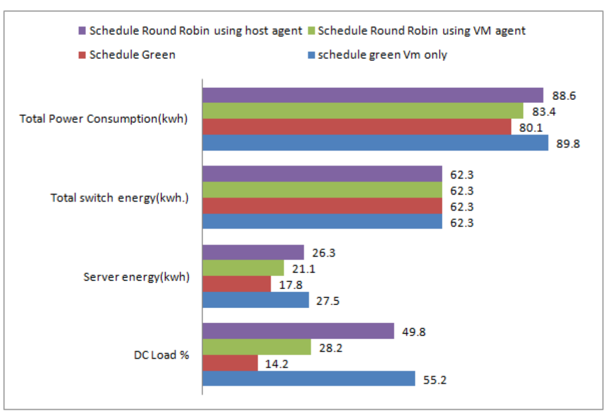


Figure 5.8: Power Consumption in Power Blade Energy Model

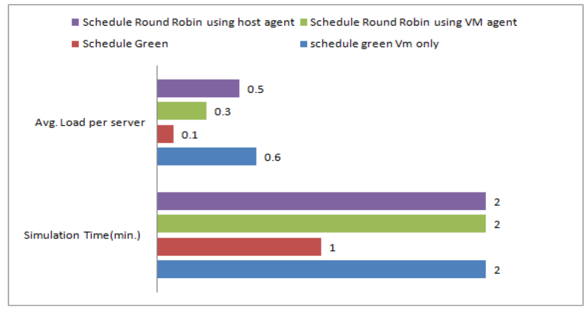


Figure 5.9: Load and Time Consumed In Power Blade Model

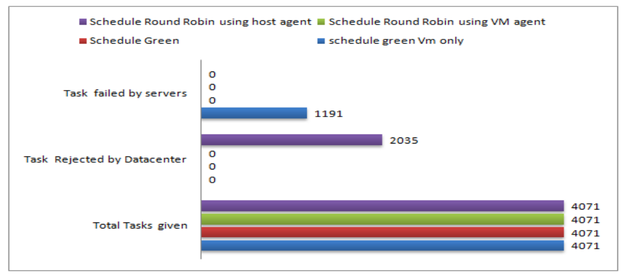


Figure 5.10: Tasks Failed and Rejected

Table 5.1: Comparison between various algorithms using Linear Power Model

Algorithms	Total Tasks Given	Tasks Completed	Task Rejected By DC	Task failed by server	Total power consumed
RR using VMs	4071	4071	0	0	318
RR using host	4071	2036	2035	0	277.3
Green scheduler	4071	4071	0	0	291.4
Green scheduler using Vms	4071	2880	0	1191	313.1

Table 5.2: Comparison between various algorithms using Power blade Model

Algorithms	Total Tasks Given	Tasks Completed	Task Rejected By DC	Task failed by server	Total power consumed
RR using VMs	4071	4071	0	0	88.6
RR using host	4071	2036	2035	0	83.4
Green scheduler	4071	4071	0	0	80.1
Green scheduler using Vms	4071	2880	0	1191	89.8

5. CONCLUSION AND FUTURE SCOPE

Cloud computing has grown so fast that it had made almost every organisation rely on it. Since the time it had developed and now there is vast technological change in the field. It requires huge effort to build a technology that could help consumers as well as service providers. Currently we are facing energy as a challenge in the field because due to steep increase in demand the deployment of hardware infrastructure is being deployed at pace. This infrastructure not only consume electricity by itself it also need auxiliaries which also consumes electricity in order to keep the temperature down for these machines.

In our work we have evaluated the energy consumption using different power models. The traditional linear model and power blade model with two algorithms each with two different scenarios. The consumption of energy varies much and moreover we saw two abnormalities as task refutation by data center and task failed on servers which is an issue. In our future work we'll try to rectify these problems and we can formulate strategies to diminish the power consumption, better task allotment policies in future for fine utilization of resources.

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