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Green Cloud Framework for Energy Efficiency Using Multilevel Feedback Scheduling and Priority Scheduling

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Abstract: *Lowering the energy usage of datacenters is a challenging and complex issue because computing applications centres resources need to be managed in an energy-efficient manner to drive Green Cloud computing and data are growing so quickly that increasingly larger servers and disks are needed to process them fast enough within the required time period. It is essential for ensuring that the future growth of Cloud computing is sustainable. Otherwise, Cloud computing with increasingly pervasive front-end client devices interacting with back-end data has been proposed in this work using two scheduling algorithms i.e. Multilevel feedback scheduling and Priority based Scheduling. The results evaluation will be done on the basis of total energy consumed during running of tasks.*

Keywords: *Energy Consumption, Multilevel Feedback Scheduling, Priority Scheduling, Green Cloud.*

I. INTRODUCTION

Recently, the emerging cloud computing offers new computing models where resources such as online applications, computing power, storage and network infrastructure can be shared as services through the internet [1]. The popular utility computing model adopted by most cloud computing providers (e.g., Amazon EC2, Rackspace) is inspiring features for customers whose demand on virtual resources vary with time. Energy consumption is the key concern in content distribution system and most distributed systems. These demands an accumulation of networked computing resources from one or multiple providers on data centers extending over the world. This consumption is censorious design parameter in modern data center and cloud computing systems. The power and energy consumed by the computer equipment and the connected cooling system is a major constituent of these energy cost and high carbon emission. The energy consumption of date centers worldwide is estimated at 26GW corresponding to about 1.4% of worldwide electrical energy consumption with a growth rate of 12% per year [2][3]. The Barcelona medium-size Supercomputing Center (a data center) pays an annual bill of about £1 million only for its energy consumption of 1.2 MV [4], which is equivalent to the power of 1, 200 houses [5].

However, minimizing this energy consumption can result to conceal cost reduction. Moreover, apart the enormous energy cost, heat released increases with higher power consumption increases the probability of hardware system failures [6]. Therefore, minimizing the energy consumption has a momentous outcome on the total productivity, reliability and availability of the system. Subsequently, minimizing this energy utilization does not just decrease the gigantic cost and enhances framework unwavering quality, additionally helps in ensuring our regular habitat. In this way, diminishing the energy utilization of distributed computing framework and server centers is a test on the grounds that information and registering application are developing in a quick express that undeniably circles and bigger servers are obliged to process them quick inside of the obliged time of time.

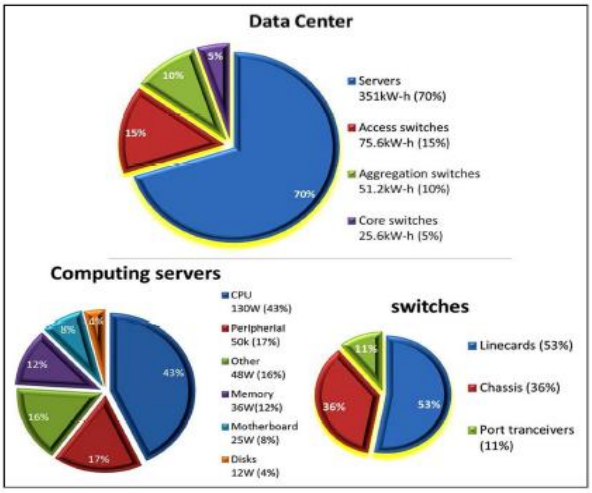

Figure.1 Distribution of Energy Consumption in a Data Center

To deal with this problem and certifying the future growth of cloud computing and data centers is maintainable in an energy-efficient manner, particularly with cloud resources to satisfy Quality of Service (QoS) requirement specified by users via Service Level Agreements (SLAs), thus reducing energy consumption is necessary. The main objective of this work is to present a new energy consumption models that gives detailed description on energy consumption in virtualized data centers so that cloud computing can be more environmental friendly and sustainable technology to drive scientific, commercial and technological advancements for the future.

II. ENERGY CONSUMPTION PROBLEM

The issue of energy utilization in IT sector has been accepting expanding consideration lately and there is developing acknowledgment of the need to oversee energy utilization over the whole information and communications technology (ICT) sector. In the last propel of years, Cloud based server centers are expanding incredibly due to the interest for PC asset. Since more server centers are started to be the energy utilization of these server centers are likewise expanded as it were. Notwithstanding high energy utilization there is an expansion effect on nature by the type of carbon-di-oxide discharges. As indicated by the report of Congress on Server and server centers [4], the server centers are in charge of around 2% of worldwide CO2 outflow and they utilize almost 80 million megawatt-hours of eneergy yearly, it is around 1.5 times the measure of power utilized by the entire New York City.

By 2020 the aggregate sum of Carbon-di-oxide discharged by these server centers will be about 359 megatons. In such a circumstance it is significant significance that the cloud server centers ought to have a decent energy productivity. The Major issue in poor energy productivity is that a large portion of the energy are squandered when servers keep running at low usage.

As per the late research from Pike Research [5], the worldwide business for green server centers will develop from $17.1 billion in 2012 to $45.4 billion by 2016. Indeed on location server with no virtualization will emanate session 46 kg of CO2 every year.

III. ENERGY AWARE GREEN CLOUD ARCHITECTURE

Set of tasks and servers are taken as input. The scheduling of tasks to the servers and the data center server energy consumption is given as output of the algorithm. The users will request for computing various types of tasks. Each task may fall under a particular task type like reading file contents, updating data, uploading files, downloading software, etc. [6, 8]. Based on the type of task selected, the processing time vary. The number of instruction in each task is obtained. Energy slope is calculated for each task of different types in each server with the help of processing time. Energy consumption is calculated by using the number of instructions and the energy slope. Task allocation is done in such a way that most-efficient-server gets the tasks first. Number of active servers among the set of available servers is reduced. The algorithm follows a priority and multilevel scheduling [7, 9, 10].

The flow diagram suggests that there could be multiple READY QUEUE which could be taken into consideration depending upon the jobs since the variation of jobs have either I/O operation taking the CPU BURST or CPU time taking the time duration of the CPU Processing. This way, if efficiency has to be maintained such that I/O Operations are given the highest priority, the multiple READY QUEUE would have (for an example) 1 READY QUEUE divided into 3 READY QUEUE, they could be:

1. Q1
2. Q2
3. Q3

Here are the Jobs which would be as per the priority of execution.

1. Q1 – Handles the I/O Bound Jobs which require more I/O CPU BURST time duration.
2. Q2 – Handles the moderate CPU Requirement time duration.
3. Q3 – Handles the CPU Bound Jobs which require more CPU time duration.

Now the execution of such jobs are in the format as below:

1. Q1- any jobs which are here must be executed at first preference.

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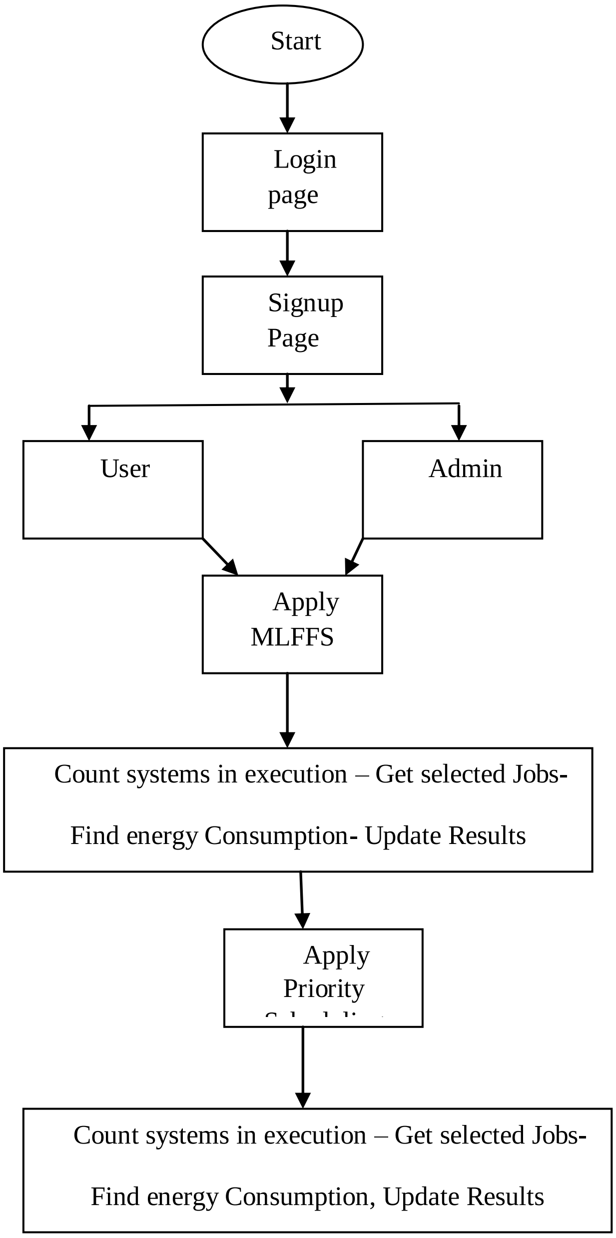
2. Q2 – only after Q1 is empty, the jobs in Q2 are taken. That is all I/O Bound jobs have to be completed first.
3. Q3 – only after both Q1 and Q2 are empty, the jobs pending on Low priority that is CPU Bound jobs are taken.

IV. PSEUDO CODE

Start
Initialize Login Page {Either Admin, User}
Match Password and Id Found out
{ If id= TRUE, Proceed
Otherwise stop}
Go for Signup
If id = admin (do changes)
If id= user (do changes< then admin)
{Apply Multilevel Scheduling on tasks;
{ int count = 0,taskram=0,taskprocesor=0,systemram=0,systemprocessor=0,timeexe=0;
Count systems in execution
Fill checkbox list with task name that is primary key in data base
Get systems count
Fill check box list
Get selected jobs
For sorting all the values of time
In timetoexe = Convert.ToInt32 (TextBox1.Text);
If (timemng <= timetoexe)
Task independent
Rest jobs in execution suppose system 3 jobs 5.
Find, Energy Consumed During Execution (Cross Breed)
Update results set energy consumption}
Apply Priority Scheduling on Tasks
{ int count = 0, taskram = 0, taskprocesor = 0, systemram = 0, systemprocessor = 0, timeexe = 0;
Count systems in execution
Fill checkbox list with task name that is primary key in data base
Get systems count
Fill check box list
Get selected jobs
For sorting all the values of time
Energy Consumed During Execution



V. RESULTS AND IMPLEMENTATION

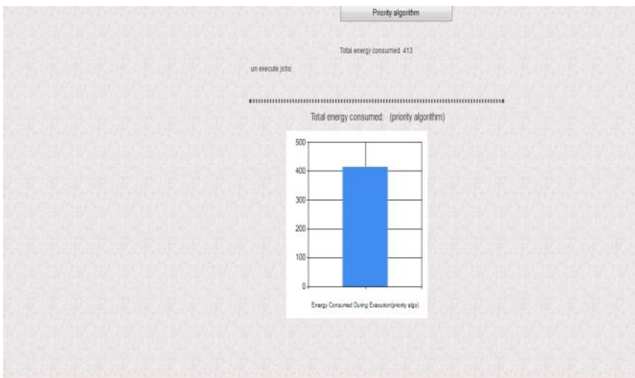


Figure.2 Energy consumed using Priority algorithm

Energy consumption does not only reduce the huge cost and improves system reliability, but also helps in protecting our natural environment. Thus, reducing the energy consumption of cloud computing system and data centre is a challenge. Above figure shows the energy consumption by priority algorithm for execution of tasks is 413 joules.

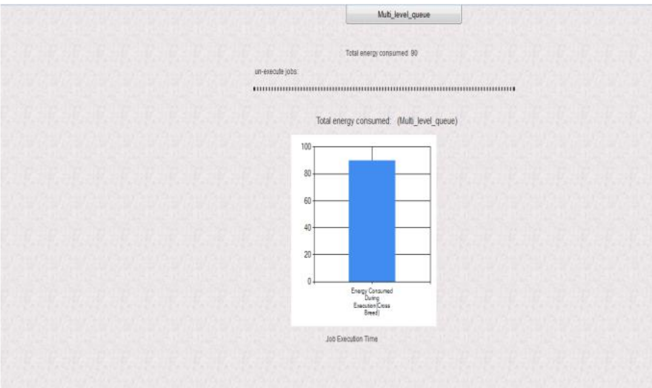


Figure 3. Energy consumed using Multilevel Algorithm

Energy consumption does not only reduce the huge cost and improves system reliability, but also helps in protecting our natural environment. Thus, reducing the energy consumption of cloud computing system and data centre is a challenge. Above figure shows the energy consumption by Multilevel Queue Scheduling algorithm for execution of tasks is 90 joules.

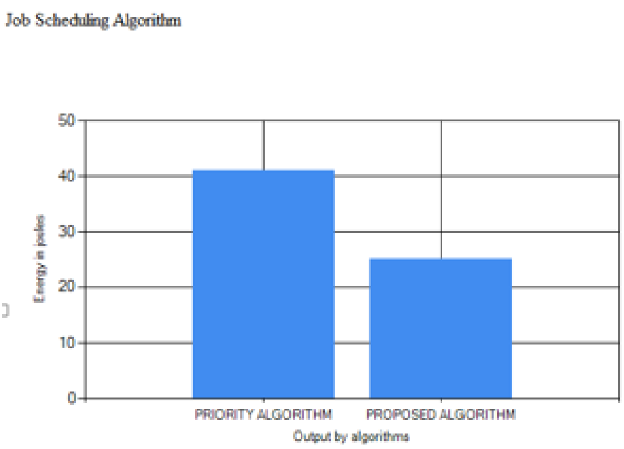


Figure.4 Comparison between Priority and Multilevel Queue Scheduling Algorithm

Above figure shows the energy consumption comparison by Multilevel Queue Scheduling algorithm and priority algorithm. Energy consumption for execution of tasks is 90 joules and 413 Joules for Multilevel Queue Scheduling algorithm and priority algorithm respectively. So proposed algorithm is better in terms of high energy efficiency.

VI. CONCLUSION AND FUTURE SCOPE

An effective and efficient use of computing resources in cloud can help in achieving Green Cloud Computing. The related research proposals are mostly focused on energy-saving approaches for data centers. However, due to increasing demand on bandwidth and network connectivity of data center, energy consumption of data center network and data center servers and network will rapidly grow in the future. This paper presents Multilevel Feedback Scheduling and Priority Scheduling Algorithm used for energy saving in data centers.

REFERENCES

1. Epstein M. and Roy M. (2001), "Sustainability in Action: Identifying and measuring the key performance drivers", Long Range Planning Journal, Vol-34, pp. 585-604.
2. Erek K. (2011), "From Green IT to Sustainable Information Systems Management: Managing and Measuring Sustainability in IT Organisations", Proc. European, Mediterranean & Middle Eastern Conference on Information Systems, pp. 766-781
3. Govindasami A. and Joseph S. (2012), "Optimization of Operating Systems towards Green Computing", International Journal of Combinatorial Optimization Problems and Informatics, Vol-2, No 3, pp. 39-51
4. Hageluken C. and Art S. (2006), "Recycling of e-scrap in a global environment: opportunities and challenges" in Rajeshwari K. et al. (Eds.), "Tackling E-waste towards efficient management techniques", TERI Press, pp. 87-104
5. Hanne F. (2011) , "GREEN IT- Why Developing Countries Should Care?", International Journal of Computer Science Issues, Vol-8, Issue-4, pp. 424-427
6. Harmon R. and Auseklis N. (2009), "Sustainable IT Services: Assessing the Impact of Green Computing Practices", Proc. PICMET Conference, pp. 1707-1717
7. Hedman J. and Henningsson S. (2011), "Three Strategies for Green IT", IEEE's IT Pro, pp. 54-57.
8. Hodge P. (2011), "Virtualization 101: Understand how to do more with less", INTECH, Vol-58(4), pp. 28-30.
9. Jadhwani D. et al. (2012), "Study of Efficient Utilization of Power using green Computing", International Journal of Advanced Computer Research, Vol-2, No-4, Issue-6, pp. 108-113.
10. Jain R. and Agrawal K. (2012), "A Study Of Green Computing Awareness Among Bank Employees", Asian Journal of Research Marketing, Vol-1, Issue-1, pp.11-18