ENERGY EFFICIENT GREEN CLOUD SCHEDULING-A NOVEL APPROACH

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Abstract
With the increment in environmental impacts around the world, energy efficiency is one of the important consideration data centers. In the Cloud Computing techniques have made outstanding remark across the world. High efficiency is the vital concern of Data centers so to maximize the energy efficiency without harming the environment. The concept of green DC has been performed.
In this paper, we proposed an algorithm on the basis of certain existing algorithm limitation, which will help to minimize the environmental impact. We further analyze the efficiency of our algorithm and optimized its performance by applying load balancing algorithm.
Keywords: Green Computing, Resources Scheduling, Task Scheduling, Temperature and Thermal Management.

I. INTRODUCTION

As Cloud Computing is depended on virtual machines for every task VM makes the system easy to host the computation and applications for large number of cloud users by giving illusion of a single system. None of our existing algorithms handles the VM load balancing by using energy efficient schemes. Motivation comes from the literature survey that large amount of data is stored in the Cloud Data centers so lots of power consumed at the large scale [13] but it is mandatory to balance the power of these Cloud data centers. As a survey Data centers consumes 0.5% of electricity consumption of the world [2]. In 2009, the total energy consumption for Cloud data centers and their cooling units were at 1.2% the total U.S energy consumption and it increases every year [3]. High power consumption leads to large amount of carbon dioxide emission so there is a need of a better cloud which will lead to the energy efficient Virtual Machines Load balancing[4]. Numerous of methods can be applied to attain high performance computing like improvement of application's algorithm, energy efficient hardware, Dynamic voltage frequency scaling, virtualization of computing resources etc[5]. Life of a computer system is directly related to its operating temperature. Increasing demand of Cloud computing also increasing dependence on power. Most of the related work in Cloud computing dedicated to resource management and scheduling problems adopt a conventional style where a scheduling component decides which jobs are to be executed at which site based on certain cost functions (Legion [6], Condor [7], AppLeS [8], Netsolve [9], Punch [10]). Such cost functions are often driven by system-centric parameters that enhance system throughput and utilization rather than improving the utility of application processing.

Andrew J. Younge et al. [2] developed a new framework that provided efficient green enhancements within a scalable Cloud computing architecture. In this paper the author defined that using power-aware scheduling techniques, resource management, live migration, and a minimal virtual machine design, overall system efficiency will be greatly improved in a data centers.

Shailesh S. Deoreet et al.[11] defined job allocation strategy to virtual machine as easy-backfilling with first come first serve basis, so amount of energy conserve.

Jun Yang et al.[12] proposed an OS level technique that performs thermal aware job scheduling to reduce the number of thermal treespasses.

Applying the parallel computing paradigm in data centers , Cloud Computing has become popular over last few years Cloud Computing basically a pool of computer resources to provide the computing in terms of utility[17]. The distribution of data centers world wide requires the energy that shows a large operational cost for cloud data centers[15,16]. Energy consumption is 10% of current data center expenses and will rise to 50% in some years[10]. For classical data centers range pf $2 to $5 million per year is the expenses for heat and requires an accompanying cooling system[18] such heat and temperature is effecting on hardware performance and it is violating the SLA with the customers . In this work we have proposed our algorithm base on energy aware temperature control system based on power aware resource management scheduling technique. Based on our previous survey we will implement our work that will demonstrate a simple optimization of data centers architecture and energy aware scheduling of the workload may lead to significant energy savings.

Thus work will be presented on a simulation environment GreenCloud for proper energy aware studies of Cloud Computing data centers energy perspective in a realistic environment. GreenCloud is an extension of NS2[3] packet level simulator having some energy aware computing features unlike Cloud Sim[1] or MDCSim[14]. This paper is organized as follows:

Section 1: proposed algorithm.

Section 2: Deployment of proposed algorithm in GreenCloud

Section 3: Result analysis

II. PROPOSED ALGORITHM

With the SLA (service level agreement) followed by cloud users and provider in cloud system makes in makes it different from other resource load balancing problems of other platforms. The motive of cloud providers is to satisfy the user requirement to increase the benefits. Our proposed algorithm for load balancing is based on system's temperature and power consumption. The technique consists of two levels. In the first level, an administrator whose main functions is to generate the users, different types of tasks and systems with different specifications on which the task performs. After the task is generated system is allocated that matches with its requirement. Each task has some requirements like:

1. Time
2. System Requirements (CPU utilization, Memory)
3. Energy Consumption
4. Temperature

I am proposing the algorithm for load balancer whose purpose will be as follows .The scheduler will generate jobs in the scheduler queue. The jobs waiting in queue till the scheduler schedules it. The scheduler check the system specification like if it schedules a task on the system how much it will increase the temperature of the system. The main purpose of the scheduler is to keep the system temperature lower than the critical temperature. It will regularly check current temp of the system and after job execution on that system how much temp has increased at that time. If it exceeds the critical temperature then the scheduler goes to next system. But if that system is lower than the critical temperature then scheduler check the power consumption of the system. The system with less power consumption is selected, means the task will be performed on the existing system. Every system will have their own features and the parameters are as follows

1. Critical Temperature
2. Minimum Temperature
3. Power Consumption

In the second level separate buffer is to maintain the eligible machine which will schedule the VM again on the power basis during runtime. Again eligible machines in a buffer will undergo a comparison of power with the delpi function which will sort the virtual machines having less threshold power values.

Power Management achieves higher efficiency, while keeping the minimum temperature . Methods furnishes the natural discrepancies in power behaviour in different workloads, and schedule them to keep the chip temperature below a given threshold temperature. To evaluate scheduling algorithms [11], a lighter runtime temperature analysis is developed to enable informed scheduling decisions.

Flow Chart of our proposed algorithm is illustrated below:

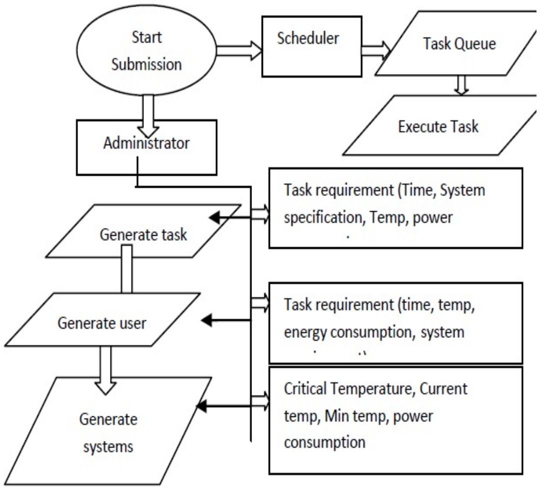

Figure 1 Thermal and Power Aware Workload Scheduling.

Algorithm Used:
System queue: contains all the available system list.
Stemp queue: contain system with temp less then threshold temp.
Tth: threshold temp.
Tsys: System temperature.
Sysm(n): System n
P(n): power of system n
S[i]: array that contain system with lowest power increment rate
del(p).
*/
Algo START
while(event(task==true))do
Foreach system in system queue do
If(Tsys < Tth)
Add system to Stemp queue
ENd if
End Foreach
Foreach system in Stemp queue
Calculate Power(Sys(n) ,P(n))
Pb : power consuming before allocation of task
Pa : power consuming after initiating the task
del(P): Pa-Pb
End For each
Sort system acc. to the ascending order of del(P) in array S[] Allocate task to the system with list del(P) from S[i]
Check system temperature (during task execution)
If (Tsys >= Tth)
Add system to system queue
Allocate task to system from S[i+1]
End if
Add system to system queue

III. EXPERIMENTAL SETUP

For the experimental setup of the algorithm we have deployed our algorithm in Green Cloud Simulator using Java for the simulative analysis and then we have calculated the time complexity i.e in how much minimum time our algorithm will take to schedule the eligible virtual machines.

IV. SIMULATION ANALYSIS AND RESULTS

We have implemented our proposed algorithm in Object Oriented Language and we have made the program dynamic by using the random function. We have executed the program three times for the evaluation of time complexity as well as the average time taken by the Scheduler to maintain the eligible VM queue. Results are:

Table 1

VM Name	Temperature (1)	Temperature (2)	Temperature (3)
VM0	201	200	200
VM1	198	201	200
VM2	204	198	200
VM3	195	199	198
VM4	195	198	197
VM5	200	203	195
VM6	203	202	195
VM7	202	205	194
VM8	195	201	194
VM9	200	196	199

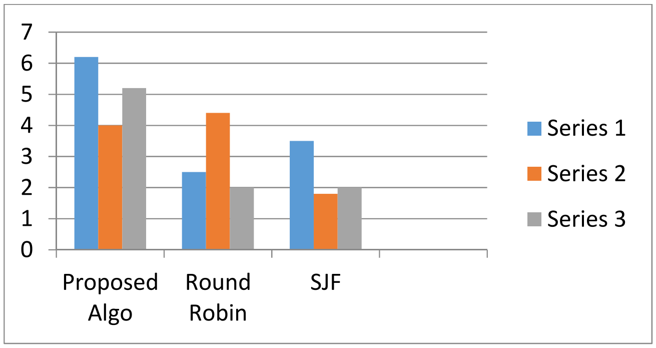

Figure 2 Comparison of Proposed Algorithm with Existing Algorithm

Table 2

VM Name	Power-1(Del P) KW	Power-2 (Del P) KW	Power-3 (Del P) KW
VM0	50	45	54
VM1	50	44	50
VM2	55	47	47
VM3	44	48	48
VM4	54	50	50
VM5	56	51	44
VM6	52	46	48
VM7	51	44	52
VM8	50	49	48
VM9	51	50	54

Table 3

Phase (temperature-n & power-n)	Average time to schedule
1	8.2 seconds
2	8.4 seconds
3	7.08 seconds

V. CONCLUSION

In the table 1 we have executed the program three times with different values of VM0 to VM9.In temperature 1 column of the table 5 eligible machines are there whose temperature is below 200F.During the run time now these eligible machines will again verified with delpi function with respective power whose power is below 50KW so eligible machines are VM0,VM1,VM3,VM8 according to the table 2. So now these machines are responsible for load scheduling by VM. Time taken by for scheduling was 8.2 Seconds.

On the basis of the simulation analysis in Green Cloud we put forward this task scheduling algorithm and it can be a better solution in terms of energy efficiency. In our future work we will compare our existing algorithm with some of the enterprise cloud scheduling algorithms for a better solution for energy efficient task scheduling.

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