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Optimized Energy Efficient Resource Management in Cloud Data Center

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***Abstract:** Prompt growth of the demand for computational power has led to the creation of large-scale data centers. They consume enormous amounts of electrical power resulting in high operational costs and carbon dioxide emissions. Moreover, modern Cloud computing environments have to provide high Quality of Service (QoS) for their customers resulting in the necessity to deal with power-performance trade-off. We propose an efficient resource management policy for virtualized Cloud data centers. Proposed scheme Consider task scheduling algorithm and the maximum and minimum utilization threshold value. If the utilization of CPU for a host falls below the minimum threshold, all VMs have to be migrated from this host and the host has to be switched off in order to eliminate idle power consumption. If utilization goes over maximum threshold value then we migrate VMs from the host according to minimum cpu utilization We present evaluation results showing that dynamic reallocation of VMs brings substantial energy savings, thus justifying further development of the proposed policy.*

***Keywords:** Efficient Energy, CPU Utilization, Virtualization, Allocation of virtual machines, CloudSim,*

I. Introduction

In recent years, IT infrastructures continue to grow rapidly driven by the demand for computational power created by modern compute-intensive business and scientific applications. However, a large-scale computing infrastructure consumes enormous amounts of electrical power leading to operational costs that exceed the cost of the infrastructure in few years. For example, in 2006 the cost of electricity consumed by IT infrastructures in US was estimated as 4.5billion dollars and tends to double by 2011 [1]. Except for overwhelming operational costs, high power consumption results in reduced system reliability and devices lifetime due to overheating. Another problem is significant CO2emissions that contribute to the greenhouse effect .One of the ways to reduce power consumption by a datacenter is to apply virtualization technology. This technology allows one to consolidate several servers to one physical node as Virtual Machines (VMs) reducing the amount of the hardware in use. Recently emerged Cloud computing paradigm influences virtualization and provides on-demand resource provisioning over the Internet on a pay-as-you go basis [2]. This allows enterprises to drop the costs of maintenance of their own computing environment and outsource the computational needs to the Cloud. It is essential for Cloud providers to offer reliable Quality of Service(QoS) for the customers that is negotiated in terms of Service Level Agreements (SLA), e.g. throughput, response time. Therefore, to ensure efficient resource management and provide higher utilization of resources, Cloud providers(e.g. Amazon EC2) have to deal with power-performance trade-off, as aggressive consolidation of VMs can lead to performance loss. Based on the trends from American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), it has been estimated that by 2014 infrastructure and energy costs would contribute about 75%, whereas IT would contribute just25% to the overall cost of operating a data center [3].

II. Related Work

In related study, a scheme for selecting energy efficient allocation of virtual machines in cloud data center. This scheme consider the maximum and minimum utilization threshold value. If the utilization of CPU for a host falls below the lower threshold, all VMs have to be migrated from this host and the host has to be switched off in order to eliminate idle power consumption. If the utilization goes over the upper threshold, some VMs have to be migrated from the host to reduce utilization to prevent potential SLA violation. We propose three policies for choosing VMs that have to be migrated from the host: (1) Minimization of Migrations(MM) – migrating the least number of VMs to minimize migration overhead; (2) Highest Potential Growth (HPG) –migrating VMs that have the lowest usage of CPU relatively to requested in order to minimize total potential increase of the utilization and SLA violation; (3) Random Choice (RC)– migrating the necessary number of VMs by picking them according to a uniformly distributed random variable[4].

III . Proposed Heuristic

Our proposed heuristic using a Task scheduling algorithm that schedule the tasks to the Vms according to cpu power. According to our concept if tasks are scheduled to the Vms earlier, load is managed in a better way and this result in less number of Vms migrations. Further migration of vms is considered with lowest usage of CPU and tasks are totally dependent on it. This process is helpful to minimize total potential increase of the utilization and SLA violation. For validation of our proposed work, we simulate Non Power Aware policy, MM and DVFS, Comparison has been done with these two schemes.

In this scheme we used following task scheduling algorithm:

1. Start Algorithm.
2. Sort the list of the cloudlets (tasks) on the basis of the size of cloudlets.
3. Loop while there are cloudlets to be scheduled.
4. Pick the cloudlet C (i) from the list.
   Where i = {1,2,3,..............,n}.
5. Find the Vm V(j) that may run the cloudlet successfully.
   Where j={1,2,3,.............,m}.
6. Bind Vm V(j) to the Cloudlet C(i).
7. If there are more cloudlets in the list, go to step three.
8. Return control to the simulation.

IV. Evaluation

The proposed heuristics have been evaluated by simulation using CloudSim toolkit [5].The simulated data Centre includes 5 hosts .Each node is demonstrated to have One CPU core with performance equivalent to 3000,2660,2500,1000,2000 MIPS,4 GB RAM and 1 TB of storage. For the benchmark policies we simulated Non Power Aware policy (NPA), Minimum Migration (MM) and DVFS that adjusts the voltage and frequency of CPU according to current utilization.

The simulation results presented in Table 1 show that Minimum CPU Utilization (MCU) policy brings higher energy savings compared MM, NPA and DVFS policies.

Table 1
Simulation Results

Policy	Energy	SLA	Migr.	Overall SLA
MCU	0.03 kwh	0.002%	2	0.07%
MM	0.05 kwh	0.011%	13	0.16%
NPA	0.17 kwh	0.261%	13	0.85%
DVFS	0.09 kwh	0	0	0

V. Conclusion and future scope

In this work our proposed and evaluated heuristics minimize energy consumption, while providing reliable QoS. The obtained results show that the technique of task scheduling and minimum usage of cpu brings substantial energy savings and is applicable to real-world Cloud datacenters. For the future work, we propose to investigate of setting the utilization thresholds dynamically according to a current set of VMs allocated to a host, propose to investigate optimization over multiple system resources in VMs reallocation policies, such as RAM and network bandwidth utilization.

References

[1] R. Brown et al., “Report to congress on server and data center energy efficiency: Public law 109-431,” Lawrence Berkeley National Laboratory, 2008.

[2] R. Buyya, C. S. Yeo, and S. Venugopal, “Market-oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities,” in Proceedings of HPCC’08. IEEECS Press, Los Alamitos, CA, USA, 2008.

[3] A. Beloglazov and R. Buyya,” Energy Efficient Resource Management in Virtualized CloudData Centers”, 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing,2010.

[4] A. Beloglazov and R. Buyya,” Energy Efficient Allocation of Virtual Machines in Cloud Data Centers”, 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing,2010.

[5] R. Buyya, R. Ranjan, and R. N. Calheiros, “Modeling and simulation of scalable cloud computing environments and the CloudSim toolkit: Challenges and opportunities,” in Proceedings of HPCS’09. IEEE Press, NY, USA, 2009.

