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An Analysis of Energy Consumption in Mobile Cloud Computing

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Abstract-Mobile cloud computing (MCC) has been introduced to be a potential technology for mobile services and computing concept by an explosive growth of the mobile applications and emerging of cloud computing. The performance of mobile computing would be significantly improved by leveraging cloud computing and migrating mobile workloads for remote execution at the cloud . This paper presents a unique VM allocation and migration policy of mobile cloud. VM migration is known as the technique for the optimization of the energy consumption in mobile cloud data center. Thus, aim of this paper is for minimizing the SLA violation, energy consumption with a number of migrations, MBFD algorithm and SVM technique would be used for energy optimization using VM migration.

Keywords: Mobile Cloud Computing, SVM, Virtual Machine, MBFD, SLA Violation

1. INTRODUCTION

HT Dinh et al., 2013 in [1] Focused on the fact that together with an explosive growth of the mobile applications and emerging of cloud computing concept, mobile cloud computing (MCC) has been introduced to be a potential technology for mobile services. MCC integrates the cloud computing into the mobile environment and overcomes obstacles related to the performance (e.g., battery life, storage, and bandwidth), environment (e.g., heterogeneity, scalability, and availability), and security (e.g., reliability and privacy).

K Gai et al 2015 [2] Employing mobile cloud computing (MCC) to enable mobile users to acquire the benefits of cloud computing by an environmentally friendly method is an efficient strategy for meeting current industrial demands. However, the restrictions of wireless bandwidth and device capacity have brought various obstacles, such as extra energy waste and latency delay, when deploying MCC.

S. Esfandiarpoor et al. in [3] have discussed four algorithms for the virtualized data center energy-aware resource management; so that the whole data center energy consumption is lessened. The authors presented OBFD (Our Modified Best Fit Decreasing) algorithm for improving Virtual Machine placement in which the virtual machines list is in descending order according to their MIPS required, rather than the current CPU utilization. After the VM ranking, it tries to find the optimal server for each virtual machine, resulting in data center power consumption is minimum.

2. RELATED WORK

Table 1 Comparative analysis of existing techniques

Reference	Proposed methods	Tool used	Outcomes
[4]	DVFS, Minimum Migration	.NET based platform	The parameters like SLA violation, energy consumption, number of VM migration. SLA violation with 40% interval between thresholds has been attained.
[5]	structural constraint ware virtual machine placement (SCAVP), Minimum Maximum VM grouping	JAVA The parameters are evaluated for VMs ranges from 20VM	The problem of large data size has been resolved by using proposed algorithms. The tome complexity of the proposed algorithm has been measured. Application with

		to 100 VMs.	availability constraint is less complex than with no constraints. Thus the complexity reduced by 30 % for either type of constraints.
[6]	ProfminVmMaxAvaiSpace used to increase the profit by reducing VMs that have maximum accessible space. (ProfminVmMinAvaiSpace is used to reduce the profit by minimizing the cost by reducing Vm that have minimum accessible space	Cloud Sim	The SLA violation of proposed algorithm is less than 13 %. VM migration up to 49% has been reduced.
[7]	MPC Algorithm for Dynamic Capacity Control	MATLAB	This shows that our solution is most effective under highly dynamic conditions (such as flash-crowd effects) where demand may change significantly over time.
[8]	Parallel processing, two algorithms have been proposed for the task scheduling namely dynamic cloud list scheduling and Dynamic cloud min-min scheduling	Cloud Sim	The energy consumption by suing the proposed algorithms has been reduced. Dynamic Cloud min-min scheduling perform better than Dynamic cloud list. DCMMS has the smallest execution time than DCM algorithm
[9]	Proposed three novel algorithms named as the first fit decreasing algorithm, and the remaining two are based on best fit decreasing algorithm.	JAVA	The power degradation upto 3.24% has been observed. resolved the problem of energy efficiency occur in VM migration by using three novel algorithms

3. PROBLEM DEFINES FROM ANALYSIS

(1) Energy efficient management is a challenging problem in the cloud data center. A lot of power in the data centers are wasted due to low server utilization because servers are always on and consume 60% to 70% power. Thus the excessive power cycling of servers needs to be addressed to reduce this indirect power consumption.

(2) We have analyzed that to deal with the problem of energy efficiency, live VM migration technique has emerged as a solution which outperforms static allocation policies to create the cloud data center energy effectively by minimizing the active

physical machine and closure of the idle server for reducing the energy consumption. But turning off resources in a dynamic environment is risky from QoS aspect. Thus proper monitoring and resource utilization need to be measured.

(3) To decide when and which VMs must be migrated to avoid the performance interferences. To select a correct destination host for migration is required for optimizing the VM migration because aggressive VM consolidation can cause performance interferences if the fluctuations on VM footprint rise at an unexpected rate which can lead to congestion. Thus there is a need to select a correct host and reduce the congestion on the network to optimally utilize the network bandwidth.

4. PROPOSED SOLUTION

The optimization of the energy consumption in mobile cloud data centers is done by VM migration technique. If appropriate VM is not selected it may result in SLA violation or may increase the number of migrations which may further negatively affect the energy consumption. The existed implemented algorithms are complex in nature and consumed a lot of time in order to find and allocate a physical machine.

4.1 Proposed work

In the proposed work, an energy optimization model is presented with the concept of VMM in cloud computing. When VMs are allocated to host machines during job scheduling process using MBFD technique, the host machines become overloaded, normal loaded or underloaded. In such a case, an allocation algorithm is required which can effectively migrate the virtual machines to the specific physical machine in an efficient manner with low energy consumption. SVM technique is used to classify overutilized and underutilized hosts according to the energy consumption parameter. VMs are migrated from overutilized hosts to underutilized host to maintain the energy consumption on host machines with SVM training and classification module. In the end, the simulation parameters like energy consumption, SLA violation, and a number of migrations will be calculated.

4.2 Implementation strategy

To implement the proposed work initially find the resources, if the resources are found, then the proposed methods are selected to handle the request, the next resource is selected and the process is repeated. The flow of the work is written below:

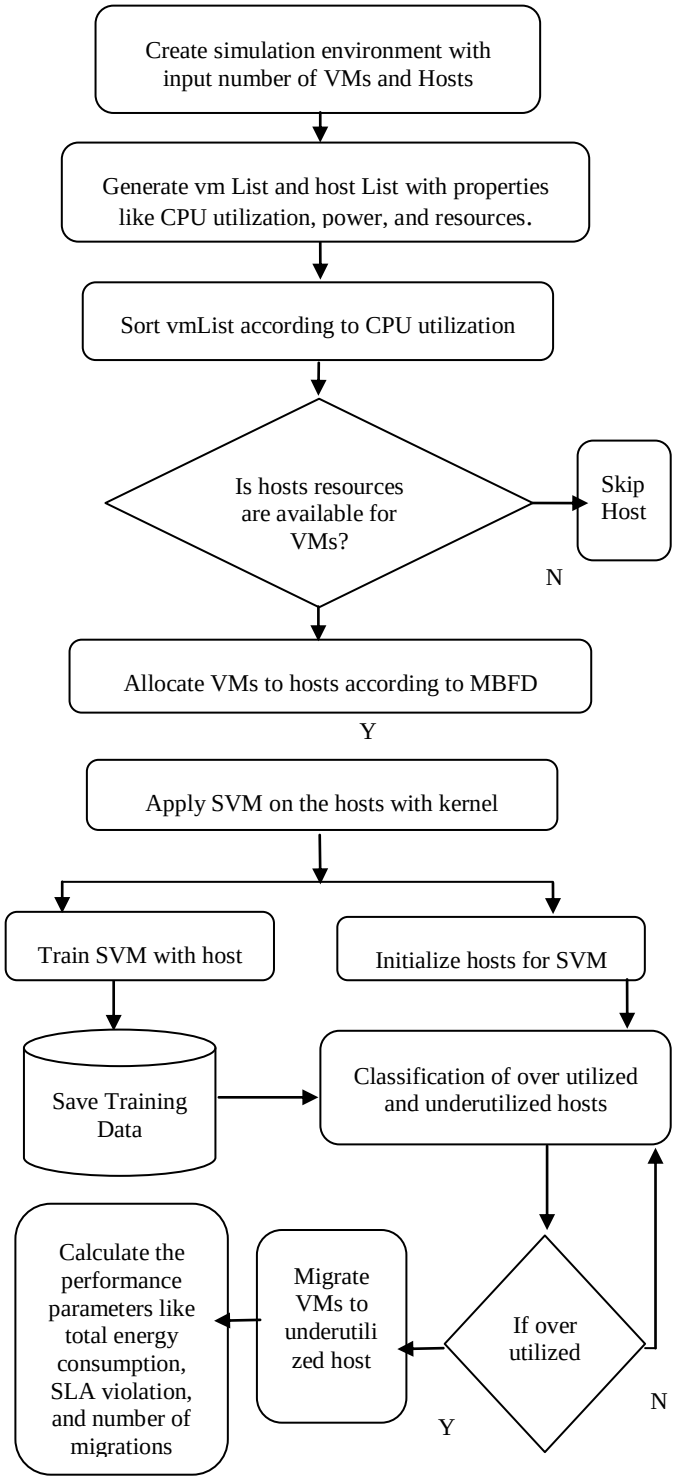

Fig 1 Flowchart of the proposed work

Step1: Input number of Virtual Machines and number of Hosts.

Step 2: Generate VM List and host List with their properties like CPU utilization, power, and resources.

Step 3: Sort vmList in descending order according to CPU utilization.

Step 4: check if host resources are available for VMs.

Step 5: Allocate VMs to host machines according to MBFD algorithm.

Step 6: Apply SVM technique on the hosts and save training data.

Step 7: Classification of over utilized and underutilized hosts.

Step 8: Migrate VM from over utiized host to underutilized suitable host.

Step 9: When the energy consumption of the hosts get balanced, calculate the performance parameters like energy consumption, SLA violation, and a number of migrations.

5. CONCLUSION

Mobile Cloud computing is the developing technology that is scattering its families very quickly. It is reaching to its users and providing numerous services to its consumers to show their interest towards itself. Since there is no need to buy the resources, therefore it also used to save money. In this research work, we have discussed the VM migrations and the algorithms used in the proposed work. It also contains the concept of the virtual machine, virtualization, and migration of virtual machine- its methods. In this paper, the implementation strategy has been discussed. Using this strategy it is possible to implement algorithm and actual work for energy consumption in mobile cloud computing.

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