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ENERGY AWARE SCHEDULING AND MIGRATION IN CLOUD USING BEST FIT SCHEDULING AND LOCAL MINIMUM MIGRATION

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ABSTRACT

Past few years, there have been several attempts to reduce energy consumption of data centers. High Power Consumption for VMs is the main issue in Cloud Computing. In this project, we address the VM consolidation problem with the objective to reduce energy consumption of data centers while satisfying QoS requirements. We present a distributed system architecture to perform dynamic VM consolidation to improve resource utilizations of PMs and to reduce their energy consumption. The Proposed algorithm is the hybrid algorithm, which is the combination of Best Fit Scheduling (BFS) and Local Minimum Migration (LMM). In our proposed approach, the user tasks or workloads are initially allocated to VMs based on the Best Fit Scheduling (BFS) algorithm, which is one of the best known heuristics for the bin-packing problem. Local Minimum Migration (LMM) is used for migration process, to reduce the energy by avoiding the use of unused system and efficient usage of unused memory. This method monitors all the virtual machines in all cloud locations centre. It identifies the state virtual machines whether it is sleep, idle, or running (less or over) state. This combination of algorithm will save more energy in cloud and improve the efficiency and quality of the cloud services.

Keywords: Dynamic Memory Allocation, Best Fit Scheduling (BFS), Local Minimum Migration (LMM).

1. INTRODUCTION

Over the past few years, cloud computing has rapidly emerged as a successful paradigm for providing IT infrastructure, resources and services on a pay-per-use basis. The wider adoption of Cloud and virtualization technologies has led to the establishment of large scale data centers that provide cloud services. This evolution induces a tremendous rise of electricity consumption, escalating data center ownership costs and increasing carbon footprints. For these reasons, energy efficiency is becoming increasingly important for data centers and Cloud. The fact that electricity consumption is set to rise 76% from 2007 to 2030 with data centers contributing an important portion of this increase emphasizes the importance of reducing energy consumption in Clouds. According to the Gartner report, the average data center is estimated to consume as much energy as 25000 households, and according to McKinsey report, ”The total estimated energy bill for data centers in 2010 is 11.5 billion and energy costs in a typical data center double every five years”. Face to this electronic waste and to these huge amount of energy used to power data centers, energy efficient data center solutions have become one of the greatest challenges. A major cause of energy inefficiency in data centers is the idle power wasted when resources are under used. In addition, this problem of low resources utilization, servers are permanently switched on even if they are not used and still consume up to 70% of their peak power. To address these problems, it is necessary to eliminate the power waste, to improve efficiency and to change the way resources are used. This can be done by designing energy efficient resource allocation solutions at different Cloud levels. The challenges, provided solutions should scale in multiple dimensions and Cloud providers must also deal with the users' requirements which are being more and more complex. Requested services are more sophisticated and complete since users need to deploy their own applications with the topology they choose and with having the control on both infrastructure and programs. This means combining the flexibility of IaaS and the ease of use of PaaS within a single environment. As a result, the classic three layer model is changing and the convergence of IaaS and PaaS is considered as natural evolutionary step in cloud computing. Cloud resource allocation solutions should be flexible enough to adapt to the evolving Cloud landscape and to deal with users requirements. This key dimension of cloud levels is essential for our research and we address it in depth.

2. LITERATURE REVIEW

In this energy efficient model we analyse previous works. Firstly, an energy consumption model is proposed for the applications deployed across cloud computing platforms, so that we can investigate the challenge in a formal manner. Secondly, an energy-aware resource allocation method is proposed for virtual machine allocation supporting scientific workflow execution based on the energy consumption model. Finally, we conduct comprehensive experiments and simulations to demonstrate the effectiveness and efficiency of the proposed approach.Dynamic Resource Allocation using Virtual Machines for Cloud Computing Environment [1] system that uses virtualization technology to allocate data center resources dynamically based on application demands and support green computing by optimizing the number of servers in use. We introduce the concept of "skewness" to measure the unevenness in the multi-dimensional resource utilization of a server. Towards Pay-As-You-Consume Cloud Computing [2] To solve the unfairness caused by interference, we propose a pay-as-you-consume pricing scheme, which charges users according to their effective resource consumption excluding interference. The key idea behind the pay-as-you-consume pricing scheme is a machine learning based prediction model of the relative cost of interference. Virtualized Clouds And Energy Aware Scheduling Using Earh [3] problem of scheduling a bag-of-tasks application, made of a collection of independent stochastic tasks with normal distributions of task execution times, on platform with deadline and energy consumption budget constraints Energy optimization can be achieved by combining resources as per the current utilization. Meeting Deadlines of Scientific Workflows in Public Clouds with Tasks Replication [4] implement limited contingency strategies to correct delays caused by underestimation of tasks execution time or fluctuations in the delivered performance of leased public Cloud resources. A dataflow-based scientific workflow composition framework [5] dataflow-based scientific workflow composition model in which workflow constructs are fully compositional one with another. We implemented the proposed framework in a new version of our VIEW system and conducted several case studies to validate our proposed techniques. Exploiting Dynamic Resource Allocation for Efficient Parallel Data Processing In Cloud-By Using Nephel's Algorithm [6] the processing frameworks which are currently used have been designed for static, homogeneous cluster setups and disregard the particular nature of a cloud. Consequently, the allocated compute resources may be inadequate for big parts of the submitted job and unnecessarily increase processing time and cost. Cloud Computing and Energy Efficiency Cloud as an Alternative to Green Computing [7] Most consumers are already heavy users of cloud-enabled services, including email, social media, online gaming, and many mobile applications. But with growing use of clouds should we really consider it as an alternate to conventional computing.

3. PROPOSED SYSTEM

The proposed system is the hybrid algorithm, which combines Best Fit Scheduling (BFS) with Local Minimum Migration (LMM). BFS first sorts all user tasks by their utilization weights in the decreasing order. Then, it starts with the user tasks that require the largest amount of resources. The BFS algorithm allocates user tasks in such a way that the unused capacity in the destination VMs is minimized. Thus, it selects a VM for which the amount of available resources is closest to the requested amount of resources by the user tasks. Therefore, BFS algorithm provides an initial efficient allocation of user tasks. However, due to dynamic workloads, the resource utilizations of VMs continue to vary over time. Local Minimum Migration (LMM), this method monitors all the virtual machines in all cloud locations centre. It identifies the state virtual machines whether it is sleep, idle, or running (less or over) state. Also checks number of tasks running and number of tasks can able to run. When a virtual machine is considered overloaded requiring live migration to one or more VMs from the nearby location cloud centres. When a virtual machine is considered to be under loaded (minimum task running) requiring live migration to one or more VMs (which are already running to perform some jobs) from the nearby location cloud centres. Location based VM selection policy (algorithm) has to be applied to carry out the selection process.

BFS is better while working with dynamic workloads, and schedule the best fit VM for the requested dynamic user tasks. It gives allocation of fewer amounts of user tasks to the less capable VMs and more amounts of user tasks to the high capable VMs.

In migration, LMM is used to allocate the nearest machine which gives efficient migration and consume minimum amount of energy, cost and time compare to the existing system.

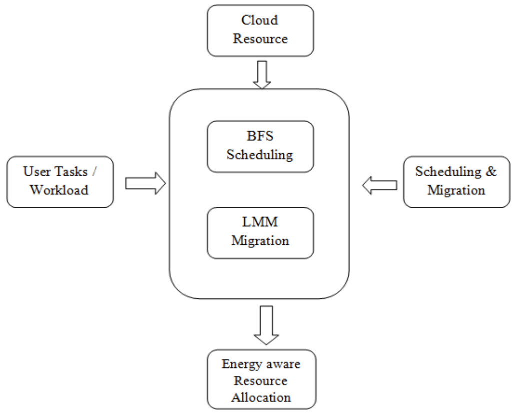


Fig1 : ARCHITECTURE DESIGN

3.1 Resource Assumption and Task Analyze:

For developing one cloud environment, have to analyze the requirements for the resources and the number of resources. In this module, the resource assumption takes place which means need to mention the number of resources and the resources configuration (Processor, RAM, Storage, Capacity, etc). Next work in this module is to analyze the task, the task from the user is analyzed and forward for the allocation process.

3.2 Allocate resource for jobs

In this module, the resources are allocated for the user given jobs. The provision of these computational resources is controlled by a provider, and resources are allocated in an elastic way, according to consumers' needs. To accommodate unforeseen demands on the infrastructure in a scalable and elastic way, the process of allocation and reallocation in Cloud Computing must be dynamic. The trust levels are given for each all resources and the user will give the task with the security demands to run the task in resources. Based on the user demanded security, the resources are allocated for each user jobs.

3.3 Model Analyze for Migration

In this module, Model Analyze takes place for migration process, where what all the tasks to be migrated. When a virtual machine is considered to be overloaded requiring live migration to one or more VMs from the nearby location cloud centres. When a virtual machine is considered to be under loaded (minimum task running) requiring live migration to one or more VMs (which are already running to perform some jobs) from the nearby location cloud centres. Location based VM selection policy (algorithm) has to be applied to carry out the selection process.

3.4 Migration of tasks

In this module, the tasks are migrated based on the analyze of the last module. Migration of Virtual machine tasks where less number of tasks are running, Migration of Virtual machine tasks where more number tasks are running and Less number of migrations should be selected. The tasks are migrated from one VM to other VMs.

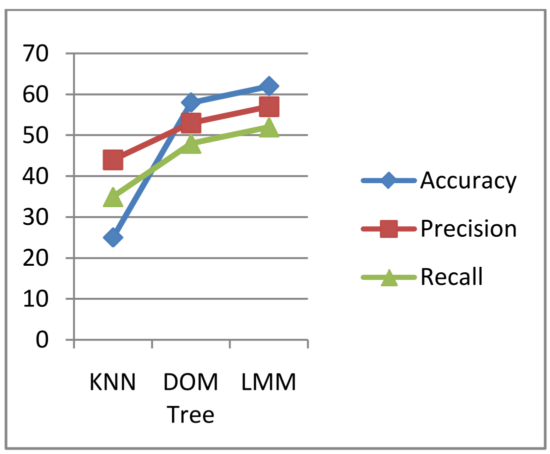
4. METHODOLOGY

This new method called Local Minimum Migration in Cloud (LMM).This method monitors all the virtual machines in all cloud locations centre. It identifies the state virtual machines whether it is sleep, idle, or running (less or over) state. And also checks number of tasks running and number of tasks can able to run. When a virtual machine is considered to be overloaded requiring live migration to one or more VMs from the nearby location cloud centres. When a virtual machine is considered to be under loaded (minimum task running) requiring live migration to one or more VMs (which are already running to perform some jobs) from the nearby location cloud centres. Location based VM selection policy (algorithm) has to be applied to carry out the selection process. The main contributions are shown below, Migration of Virtual machine tasks where less number of tasks are running, which occupies extra energy and power consumption. Migration of Virtual machine tasks where more number tasks are running, which gives overhead to the system performance. Less number of migrations should be selected, to avoid more processing cost for migration process. Migration of Virtual machine tasks to reduce the user provisioning cost, by finishing the user's tasks in their deadline.

5. EXPERIMENTAL RESULT

Our proposed algorithms are evaluated through a Java language implementation and the linear solver. A dedicated simulator is developed to conduct the performance assessments and the comparison.

The answers provided by the numerical analysis concern also the scalability and complexity of the proposed algorithms in the size of the data centers and the arrival rate of requests for resources to host VMs which is also synonymous to load on the system.



However, that the simulation are conducted for an arrival rate strictly lower than the rate of VM job departures from the system; thus simulations correspond to cases where the likelihood of finding an optimal or a good solution is high.

6. CONCLUSION

A cloud data centre consists of m heterogeneous PMs that have different resource capacities. Each PM contains a CPU, which is often a multi-core. The CPU performance can be defined in terms of Millions of Instructions Per Second (MIPS). In addition, a PM is also characterized by the amount of memory, network I/O, and storage capacity. At any given time, a cloud data center usually serves many simultaneous users. Users submit their requests for provisioning of VMs, which are allocated the user tasks. The length of each request is specified in millions of instructions (MI). In our proposed approach, the user tasks allocated to VMs based on the Best Fit Scheduling (BFS) algorithm, which is one of the best known heuristics for the bin-packing problem. BFS first sorts all VMs by their utilization weights in the decreasing order. Then, it starts with the VMs that require the largest amount of resources. The LMM algorithm allocates VMs in such a way that the unused capacity in the destination PMs is minimized. Thus, it selects a PM for which the amount of available resources is closest to the requested amount of resources by the VM. Therefore, BFS algorithm provides an initial efficient allocation of VMs. However, due to dynamic workloads, the resource utilizations of VMs continue to vary over time. Therefore, an initial efficient allocation approach needs to be augmented with a VM consolidation algorithm that can be applied periodically. In our proposed approach, the LMM algorithm is applied periodically in order to adapt and optimize the VM placement according to the workload.

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