IMPROVING REAL TIME TASK AND HARNESSING ENERGY USING CSBTS IN VIRTUALIZED CLOUD

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ABSTRACT

Cloud computing provides the facility for the business customers to scale up and down their resource usage based on needs. This is because of the virtualization technology. The scheduling objectives are to improve the system's schedule ability for the real-time tasks and to save energy. To achieve the objectives, we employed the virtualization technique and rolling-horizon optimization with vertical scheduling operation. The project considers Cluster Scoring Based Task Scheduling (CSBTS) algorithm which aims to decrease task's completion time and the policies for VM's creation, migration and cancellation are to dynamically adjust the scale of cloud in a while meets the real-time requirements and to save energy.

KEYWORDS

Cloud computing, Energy consumption, Virtualization, real time tasks, cluster scoring based task scheduling.

1. INTRODUCTION

Cloud computing that works for the problem of dynamism. Dynamism is the demand keeps on changing. Sharing resource is another advantage that helps the cloud providers to attain optimum utilization of resources. The virtualization technique is to scale up and scale down the resources according to the user demands in figure1.

Cloud computing provides packaged services. It provides that large scale data centers cuddled with the cloud services, which results in consuming enormous energy with huge cost [15]. There is a need for the cloud providers to build and manage for the low cost [12].several techniques have been attempted to minimize the energy consumption such as virtual machine consolidation and dynamic server provisioning [19].there were many techniques for the software problem and the latest development for the hardware solutions are DVFS, power capping [12].renewable energy aware service migration is mainly used to migrate services throughout the geographical locations [8].IAAS-clouds that fully nucleus with the virtualization [10].

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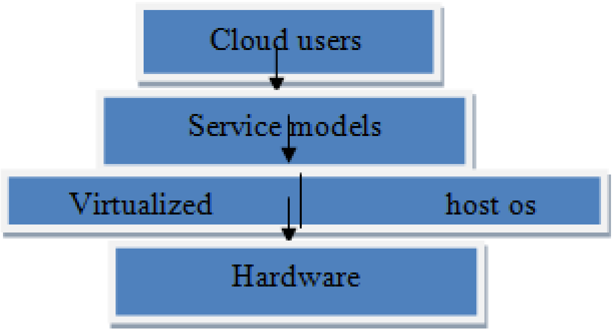

Figure 1 Virtualization Model

The real time tasks are executed in a timely deterministic manner and scalable [15]. It is consider to serve real-time application is to be processed without buffering delays. The time required for processing is measured in seconds.

A key feature of a real time task is the amount of time it takes to accept and complete a task. A hard real-time task has less jitter than a soft real-time task. A real task that can customarily meet a deadline is a soft real-time task, but if it can meet a deadline deterministically it is a hard real-time task.

Objectives:

- To establish an enabling scheduling architecture for rolling-horizon optimization with vertical scheduling operation.
- Dynamically adjust the virtual machines to save the energy.
- Cluster score values are recalculated even during the task is partially completed.
- Storage capacity of cluster resources is considered for the evaluation.
- Multiple a, b and c values are calculated for each sub task and then the cluster assignment is effective than existing system.
- Replication method assists in faster task completion.

Contribution: The extensive contributions of this paper are as follows:

- We proposed a cluster scoring based task scheduling scheme by rolling-horizon (RH) optimization, and we deployed an enabling scheduling architecture for rolling-horizon optimization with vertical scaling.
- We established some policies for VMs' creation, migration and cancellation in order to save the energy.
- We put forward a cluster scoring based task scheduling for real-time independent tasks in a cloud.

The remaining paper is organized as follows: Section 2 presents overview, Section 3 presents the related work, and Section 4 presents proposed work, section 5 conclusions and future work.

2. OVERVIEW

2.1 Energy –wear and tear

The catastrophic in cloud is energy sprawl. This is because of two reasons. Work overload and improper scheduling [5, 10] is the major factor and next is due to the increment in monetary cost of electricity [13]. The manual failure will be overcome by using virtualization and monitoring [12]. Second problem would be resolved by harnessing the renewable energy [9]. The two bulldoze in energy consumption problem are shown in Figure 2

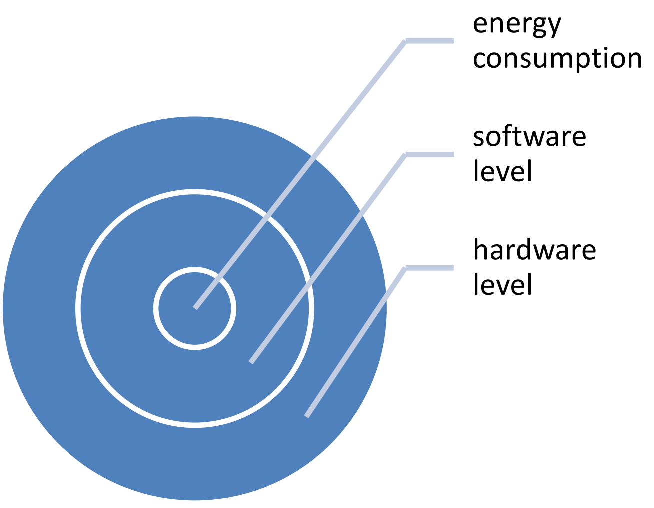

Figure2. Bulldoze in energy consumption

2.1.1 Task Scheduling

The essential for cloud computing is task scheduling. Based on various parameters the task is to be scheduled. It is used to finish the task on time and is responsible to improve flexibility in cloud and reliability of systems in cloud. The tasks are uncertain, so scheduling is deployed to overcome the uncertainty [15].

2.1.2 Virtualization

Virtualization technology which enables the creation, migration and cancellation of virtual machines [5].when the task needs excess space, low and over utilization of resources leads to migration. Virtualization enables the load balancing, consolidation, and hot spot mitigation [4]. It allocates data center resources dynamically based on user needs and optimizing number of servers to support green computing.

2.2 Real Time Tasks

Many applications are deployed in clouds with real time nature [15].real time tasks are not only depends on the correctness it takes time instant on account. Missing deadlines will leads to the severe consequences. The project work considers the real time tasks. The real time tasks are much more important than the energy consumption problem.

3. RELATED WORK

3.1. Workload Consolidation

Srikantaiah et al. [22] have brought up the relationship between energy consumption and resource. In a same while the act of workload consolidation were evaluated. According to the Pareto frontier algorithm, the authors combined the tasks and balance energy consumption by computing optimal points. Profiling step uses an energy aware resource allocation mechanism. It resolves the bin packing and quadratic assignment problems.

3.2. Virtual Machine Power Metering

ChonglinGu et al. [12] used virtual machine power metering to measure the power consumption of data centers. Virtual power metering has a following three steps such as information collection, modelling, and estimation. Power meter is composed with internal and external meter. It has two methods such as white box method and black box method. The black box method is in trend. The virtual machine service billing, power budgeting, power saving scheduling is measured by the power meter.

3.3. Energy Conservation Techniques

MehiarDabbaghet al. [22] have analysed power management techniques that reveal the virtualization technology is used to save energy. The author considered the workload prediction, virtual machine placement and workload consolidation. The unused physical machines are used to save energy by Workload prediction. The overload problem is taken into account and resolved by the virtual machine placement and workload consolidation .It achieves the green computing. Energy savings can be obtained by turning number of servers into lower power state.

3.4. Virtual Machine Scheduling

Dong Jiankang et al. [20] virtual machine scheduling has the combo of vm placement and vm migration. Virtual machine placement is to place the machine to finish the job on time .virtual machine migration is to move the machines according to the workload. Algorithm is implemented by c++.Compared to random algorithm the energy consumption is low. It considers the parameters for evaluation are total communication traffic and maximum link utilization.

3.5. Renewable energy – aware migration

UttamMandalet al. [8] has deployed the virtual machine migration renewable energy aware cloud service to adjust energy demand using resource allocation technique. Renewable energy is used in the place of non renewable energy. By using the renewable energy reduces the carbon foot print and greenhouse gas emission. It has an ability to replace the 40-50%0f brown energy by green energy.

3.6. Tasks Oriented Energy-Aware Scheduling

Xiaomin Zhu et al. [15] have analyzed EARH algorithm. Algorithm employs energy aware scheduling integrated with rolling horizon optimization policy. The real time controller and virtual machine controller are composed in rolling horizon to hold new task along with the waiting task. Resource scale up and scale down are taken into account by the algorithm. It was implemented by cloudsim toolkit. The results indicate that improved the scheduling quality and it conserves the energy.

3.7. Ant Colony System

FahimehFarahnakian et al. [19] used dynamic consolidation of virtual machines and live migration. The virtual machine consolidation is based on the ant colony system. It have the artificial ants to migrate the virtual machines. It have global and local agent. Consolidating virtual machine into reduced number of physical machine by Global agent. The physical machine status is detected by the Local agent. Cloudsim toolkit is used for implementation. The energy consumption is reduced up to 53.4% by this technique.

3.8. Dynamic Resource Allocation

Zhen Xiao et al. [4] explained virtualization technology. Due to excess space capacity, hot spot and load imbalance which migrates the machine. Virtualization enables the load balancing, consolidation, and hot spot mitigation [4]. It allocates data center resources dynamically based on user needs and optimizing number of servers to support green computing. The uneven utilization of server is measured by the SKEWNESSS algorithm. Algorithm is simulated by trace driven simulation. It achieves green computing.

3.9. Energy-Aware Scheduling

Li Hongyou et al. [6] have proposed the workload aware consolidation technique. Algorithm focused to investigate the problem of consolidating heterogeneous workloads and it tries to execute all virtual machines with fewer amounts of physical machines. When the machine is under loaded it turnoff the unused physical servers. It focuses on the multi-dimensional resources. Live migration algorithm to migrate the machines dynamically. cloudsim tool kit for simulation.

3.10. Energy-Aware Task Consolidation

Ching-Hsien Hsu et al. [11] have proposed a technique which minimizes energy consumption is energy-aware task consolidation (ETC) technique. It restricts CPU use below a specified peak threshold. The major work of ETC is Task consolidation. The task migration is considered as network latency by energy cost model. For evaluation ETC is compared with the MAXUTIL. MAXUTIL is aspires to maximize cloud computing resources and is greedy algorithm. The simulation result shows that 17% improvement.

4. PROPOSED WORK

The proposed system which is illustrated in Figure 3 shows how the jobs are assigned to the cluster of resources. Jobs can be divided into n number of jobs based on the data and computation intensive. The task scheduler allocates the job by computing ATP, ACP to the cluster. If there is a need for storage capacity and bandwidth in high rate to assign the job it divides into subtasks. The cluster of resources includes CPU Available, Computation power (CP), CPU Speed, Load and Memory Available.

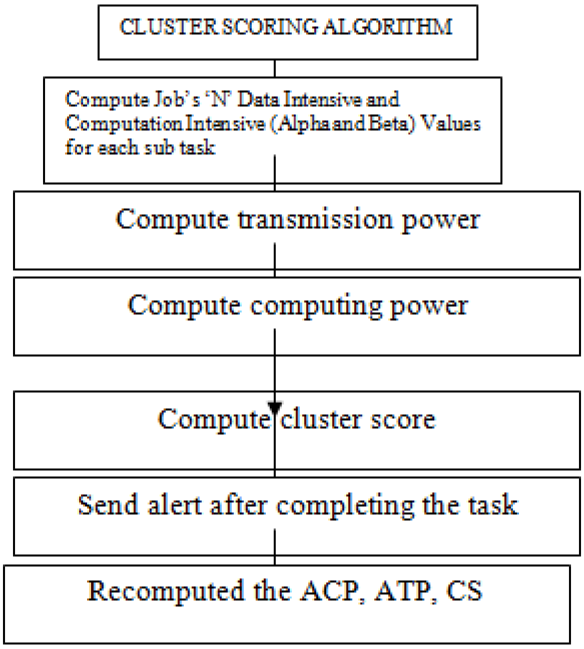

Figure3. Work of the algorithm

Step 1: Cluster Details

In this module, the cluster id is given with ATP (Average Transmission Power) and ACP (Average Computing Power) and CS (Cluster Score) value set to zero. The details are saved in 'Cluster' table.

Step 2: Resource Collection

In this module, collecting the resource id, Resource Name, IPAddress, CPU MHz, CPU MHz available, Load Percent, CP (available computing power) and Storage Capacity. The details are saved in 'Resources' table.

Step 3: Assign Cluster to Resource

In this module, the cluster id is fetched from 'Clusters' table and resource id is retrieved from 'Resource' table. The 'Clusters_Resources' table hold the selected ids.

Step 4: Add Job

In this module, the job id, name, required RAM in MHz, required hard disk storage in MB, CPU MHz and network bandwidth is keyed in and saved into 'Jobs' table.

Step 5: Cluster Score Calculation for Data Intensive and Computation Intensive Strategy

In this module, the clustering score is calculated based on the following formula.

$$\mathbf{CS_i = a. ATP_i + b. ACP_i}$$

Where,

CS_i =cluster score which is computed by using the average transmission power and average computing power.

a and b are the weightage value of ATP and ACP

$Bandwidth\_available_{i,j}$ is the available bandwidth between clusters

ACP_i means the average available CPU power cluster i is provided for the job

ACP= {(CPU_speed_k is the CPU speed of resource k in cluster i +
$load_k$ is the current load of the resource k in cluster i,) /
n is the number of resources in cluster i}

CP_k indicates the available computing power of resource k.

The transmission power and the computing power of a resource direct focus on the performance of task execution. Task scheduling considers the two parameters for evaluation. Large bandwidth in the resources of the same cluster on that time we have to consider the different bandwidth.

To adjust the score, Local update and global update are used. The task is to be obtained from the user and it will be sub divided according to data intensive and computation intensive. Next is to compute the ACP, ATP and CS. the task is allocated to high cluster score. After completing the task the information server sends the alert to the user and recomputes the cluster score.

Step 6 Cluster Score Calculation with Storage Capacity

In addition with existing formula, the storage capacity is also calculated like Average Transmission Power and so sum of a and b is 1. All other calculations are used in same scenario as above module. The job is split into tasks with a and b values for each sub task. So one cluster is assigned for one task and others cluster for other tasks. Likewise jobs are considered as replica units and so more clusters are assigned for each task.

5. CONCLUSION AND FUTUREWORK

The proposed strategy to implement a cluster scoring method to schedule jobs in grid environment. CSBTS selects the feasible resource to execute a job according to the status of resources. Local and global update rules are applied to get the latest status of each resource. Local update rule updates the status of the resource and select the cluster to execute the job and the Job Scheduler uses the latest information to assign the next job. Global update gives the final completion of tasks. The Job Scheduler supplies the latest information of all resources and clusters such that the Job Scheduler can select the feasible resource for the next job. Virtualization technology is to switch off the idle machines. Finally the project aims to reduce the completion time and to harness an efficient energy. The future work is to implement this concept in real time.

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