Energy Efficient Resource Allocation Model for Cloud Using Ranking Algorithm

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Abstract
Cloud computing is a kind of computing service used for sharing the resources rather than having local servers or personal devices to handle applications. Cloud computing is otherwise called "Pay-as-you-go" model, in that cloud users have to rent the cloud resources or services for a period of time and make payment according to the usage of resources. In existing system,the mechanism used for allocating the resource is based on demand-supply scenario in the market to discover the users for resource allocation based on their amount capability and set up a compensation policy based on the preferences chosen by the buyers as the Cloud Service Provider(CSP) offers.This demand based preferential technique undergoes bid revisions, re-bidding the prices and provides multiple payment for the cloud user. It provides an advantage to the cloud user for setting the prices for resources based on the current demands. In order to reduce the number of VMs activated at a time, energy efficient scheduling framework using ranking algorithm have been proposed. This scheduling framework mainly focused on energy efficiency of datacenters along with the minimum completion time, provides fair resource allocation to the user, and maintains load balancing.

Keywords:
Cloud computing; resource allocation; ranking algorithm; virtual machines.

1. Introduction

Cloud Computing is one type of utility based computing which offers instant services to the cloud users. It is also called as "Pay-as-you-go" model or "Internet Computing". The main advantage of cloud computing is that it reduces the cost for renting the infrastructure from the Cloud Service Provider(CSP) and also offers a mechanism for the cloud users to access any service from anywhere at anytime with the help of internet.In cloud computing, based on the resource usage, the cloud users have to make the payment according to that usage. Generally, resource allocation is a method of handing over the on-hand resources to the wanted users with the help of internet. The resources may be a hardware resource or a software resource. The resources can be requested through various parameters like processing, memory and the disk needs.Virtualization technique also plays a significant role in cloud computing for running the multiple applications in a single server at a time. It also provides flexibility in managing their system and have a control over that system. It takes care about the energy efficiency of the data center and well suited for the private cloud when compared to the public cloud.

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II.RELATED WORK

Beloglazov et.al [1], had defined the architecture, principles and algorithms for energy aware mapping of VMs. In this paper, the author had used the concept of dynamic consolidation of VM for partitioning the resources. The steps involved in this algorithm are VM placement, VM selection, migration policy minimization and higher potential growth policy. The basic design behind this algorithm is to set up the entry values for host and the total utilization of the Central Processing Unit is calculated through the means of allocating all Virtual Machines to the host between these entry values. The virtual machine with fixed threshold is not suitable for variable workload [1].

GhanshyamParmar et.al [2], had proposed Priority-Based Energy Optimized Scheduling Scheme (PEOSS) for energy optimization. The main objective of this technique is to diminish the energy consumption and improvement in the utilization of Virtual Machines (VMs).In this scheme, auto scheduler software manages all VMs request as per the request of the consumer in reservation or on-demand manner. For reserved instance, VMs are occupied not for one day and some hours of time, but for long period of days with specific time. In case of on-demand instance, VM is occupied at specific date and stipulated time. The consumer request is coming in FCFS manner but the assignment of VM to the request is based on the priority. The priority is based on each and every request of the consumer so that no one had to wait for VM. Using Request Management System (RMS), the requests are collected in queue, VMs are also in queue. Then PEOSS schedules the request to VM.

This scheme is beneficial for the service providers who provide Platform-as-a-Service (PaaS) [2].

Jayshri Damodar Pagare et.al [3], Energy efficiency is measured as an significant issue in Cloud Computing platform. This can be achieved by using virtual machine consolidation. In this, it is mainly focused on introducing an efficient SLA-aware algorithm. In the data center, the host's status are based on three types. They are: Overload, Underload and Idle. Overload host is the one that might create violation of SLA, whereas Underload host is in use but does not generates SLA violation and Idle host is accessible but unoccupied. If the overload host does not create SLA violation, then it will consume more energy. To overcome this problem, VM consolidation algorithm had been proposed. Thus, it minimize the number of migrations of VM, SLA violation and energy consumption [3].

Ziqian Dong et.al [4], had proposed the Most-Efficient-Server-First (MESF) scheduling method in order to diminish the energy use of servers in datacenter. In this scheme, based on an integer programming problem the task is assigned to the server for minimizing the energy consumed by the servers of datacenter. In MESF scheme, it schedules the task to lowest number of servers by maintaining the datacenter response time in highest limitation. MESF reduces datacenter energy consumption 70 times than consumed by other schemes that assign the task randomly. The parameters used in this technique for evaluating the energy consumption are deadline of the task, requirements of the resource and energy profiles of the server. In this scheme, based on their energy efficiency central scheduler sorts the server and assign the tasks to the most energy efficient server initially on the list and so on. But the complexity in this scheme is that sorting the servers based on their energy efficiency. The advantage is that it lowers the average task response time and also the server interconnected energy utilization [4].

R.Vijindra et al [5] , proposed an Energy Efficient Scheduling Framework by considering the energy efficiency of the data centers. This framework minimizes the completion time, provides fair resource allocation to the user, and maintains the load balancing. In this framework, Ranking Algorithm is used for managing the virtual machines. In ranking algorithm, the ranking of virtual machines are based on their resources. The advantage of using this algorithm is that it can run the jobs which has the priority or not.

III. EXISTING METHODOLOGY

In demand based preferential resource allocation technique, the resource allocation process takes place based on the preferences chosen by the user and make the payment accordingly. The components used in this process are Cloud Service Provider(CSP), users and Resource Allocation Unit(RAU).The Cloud Service Provider maintains the number of resources as Virtual Machines(VMs). It also maintains an restructured information about the availability and the demand of VMs involved in the resource allocation process. By maintaining the updated information about all the VMs, at the start of auction it will be helpful in determining the starting price of each VM type. The Resource Allocation Unit(RAU) is categorized into two subunits. They are auction subunit and payment subunit. The auction subunit is responsible for determining the winners among the bidders. The purpose of payment subunit is to charges the winners according to the preferences chosen by the user and the corresponding bid prices. The resource allocation process takes place in three steps.

Steps are as follows:

- In *Preauction phase*, the starting price for the VM instance is provided by CSP. The starting price of a VM instance in the current allocation round will be the average bid price of the same VM instance in the previous allocation round.
- In *Market-driven Open Auction process*, it is necessary to compute the Total Bid Price(TBP) and Mean TBP. By Computing these values, then verify whether TBP>=Mean TBP. If the user satisfy this condition then they are considered as selected users otherwise they are considered as unselected users. The selected users are considered as "winners". The unselected users then undergo bid revisions and start the process from Preauction phase.
- In *Preference-driven Payment process*, the selected users are sorted in decreasing order based on their TBP value. Then the winners are allowed to chose the preference as CSP offers. At the end calculate the actual payment value for the chosen preferences.

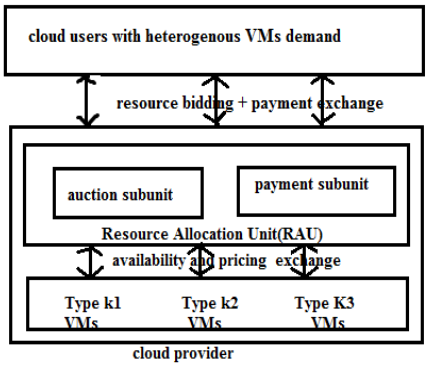

Figure 1. System Model

IV.PROPOSED METHODOLOGY

In Cloud Computing, cloud users may face thousands of virtualized resources with different resource requirements. To service multiple cloud users simultaneously, Cloud Service Provider(CSP) have to establish a resource allocation technique which should be energy efficient. Scheduling the resources is major issue in cloud computing. It is difficult to schedule the available resources manually. Hence, the resource allocation model needs an energy efficient scheduling framework to schedule the resources based on the preferences chosen by the user along with the user satisfaction.

A. Ranking Algorithm

Ranking algorithm is an energy efficient scheduling framework and it is mainly focused on the energy efficiency of the datacenters besides with the minimum completion time, provides fair resource allocation to the user and maintains load balancing. The mechanisms involved in ranking algorithm are the user, resource broker, ranking algorithm and task partitioning.

- User is the one who generates request based on their needs and sends the request to the resource broker.
- Resource broker contains the, resource matcher , scheduler interface, remote monitoring interface ,policy prioritizer, database, job queue.

    a. Policy prioritizer is used to afford priority to the incoming request based on the policies and any respective Service Level Agreements(SLAs).
    b. Scheduler interface is liable for matching the users request with their policies and stores all the history in the database. It also maintains the low priority jobs which is present in the job queue.
    c. Remote Monitoring Interface is responsible for monitoring which user request is running and which request is waiting in the queue for processing.

- Ranking Algorithm is used for virtual machine management. It is used to rank the virtual machine based on the available resources classification.
- The jobs with highest priority will be executed whereas the job with lowest priority will not executed. It will be stored in the job queue by using Backfilling algorithm.
- The jobs with highest priority is forwarded to task partitioning to balance the task among the available Virtual Machines. If all the VMs gets totally free then the task with lower priority will be executed .
- If there is no job to process in the available VM ,then the VMs are kept idle or switch off mode in order to save energy consumption.
- The results are send back to the user in order to identify the status of processing the user request.

B. System Architecture

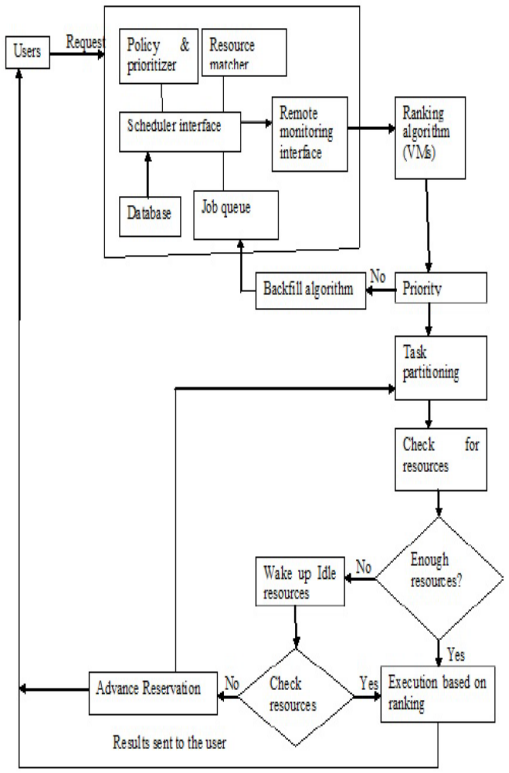

Figure. 2. System Architecture

V.PERFORMANCE ANALYSIS

In this paper,efficiency is calculated by considering the active Virtual Machines.In ranking algorithm, the jobs which contains both priority and non-priority jobs are taken into account, whereas in other scheduling algorithms it will execute either the priority jobs or non-priority jobs.Here,CloudSim simulation framework is used for creating the cloud environment.The results are analyzed by creating a datacenter which consists of more than 50 Virtual Machines(VMs),50 Cloudlets and required number of brokers to submit the Cloudlets. This algorithm gives better energy consumption when compared to other scheduling mechanism used for resource allocation process. The chart represented below shows comparison of energy efficiency of VMs in different energy efficient algorithms.

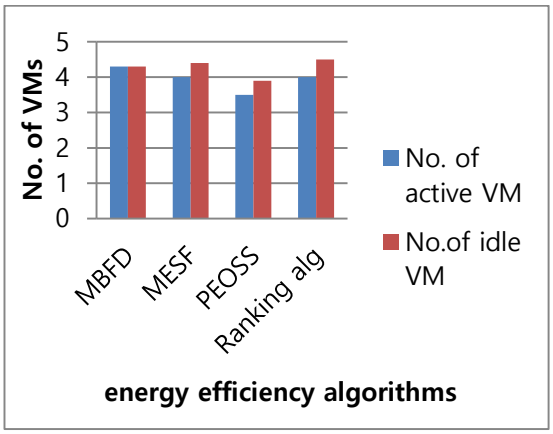

Figure. 3. Comparison of energy efficiency in different algorithm

VI. CONCLUSION

Resource allocation is a major concern in cloud computing. In cloud, user may face thousands of virtualized resources for each task. Scheduling the resources manually in cloud is very difficult problem. The existing resource allocation technique focused only on allocating the resources to the user based on the preferences chosen by the user. It does not consider efficient scheduling of task to minimize the number of active VMs. in order to overcome those problem, it requires an effective framework to schedule the resources according to the preferences chosen by the user along with the user satisfaction. Ranking algorithm is used for ranking the virtual machines management. it minimizes the response time, energy consumption, load balancing along with the fair resource allocation. The project is going to be implementing using the CloudSim toolkit, CloudSim architecture is extended to provide the results.

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