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RESEARCH ARTICLE

Improve Performance by Task Scheduling Beneficial to Both User and Cloud Provider in Cloud Computing

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Abstract— Cloud Computing refers to Internet based development and Utilization of computer technology and so it can be described as a Internet Based Computing. Scheduling is a critical problem in cloud, because cloud provider has to give services to many users in the Cloud Environment. The main objective of scheduling is to maximize resource utilization and to minimize processing time of task, where resource utilization is Cloud Service provider's perspective to ensure that resource are utilized efficiently and processing time of task is the User's perspective by considering parameter like task completion time or task execution cost. This paper includes algorithm which satisfies both Cloud Service provider's perspective and User's perspective and improves performance over sequential scheduling

Keywords—Cloud Computing; Task Grouping and Scheduling; Burst Time; Execution Cost; Cloudsim

I. INTRODUCTION

In cloud computing each application of users will run on a virtual operation system, the cloud systems distributes resources among these virtual operation systems called virtual machines. Each application is completely different and is independent like some require more CPU time to compute complex task and come others may need more memory to store data etc[1]. Resources are given on activities performed on each individual unit of service. To measure the direct cost of applications,. every individual use of resources (like CPU time, memory cost, I/O cost, etc.) must be measured. When the direct data of each individual resources cost has been measured, more accurate cost profit analysis can be done

A. The Targets of Task Scheduling in Cloud Computing

In Cloud Computing Environment the specific goals are load balancing, quality of service, economic principle, optimal operation time and system throughput.

1) Load Balance

Load balancing and task scheduling has close contacts with each other in the cloud environment. Task scheduling mechanism is responsible for the optimal matching of tasks and resources. Load balancing states two level load in task scheduling under cloud environment: the first stage is the virtual machine load , the second one is the resource layer load.

2) Quality of Service

The cloud aims to provide users with computing and cloud storage services, resource on demand these all are performed in the form of Quality of Service by cloud provider. When task scheduling management comes to task allocation, it is necessary to assure the resources' QoS.

3) Economic Principles

Cloud Computing resources are widely distributed throughout the world. These resources may belong to different organizations. They have their own management policies. As a business model, cloud computing according to the different requirements provides relevant services, so the demand charges are reasonable. Market economy drives task scheduling and resource management, we must make sure their benefit both (consumer and provider) so that the cloud can move more and more further.

4) Best Running Time

Primarily for applications, tasks can be divided into different categories according to the needs of users and then set the best running time on the basis of different goals for each task. It will improve the QoS of task scheduling indirectly in a cloud environment.

5) Good Throughput of the System

Mainly for cloud computing system throughput is a measure of system task scheduling optimized performance, and it is also a target which has to be considered in business model development. Increase in throughput would be beneficial to both users and cloud providers.

B. Scheduling Process in Cloud

Scheduling theory for cloud computing is receiving growing attention with increase in cloud popularity. In general, scheduling is the process of mapping tasks to available resources on the basis of tasks' characteristics and requirements. It is an important aspect in efficient working of cloud as various task parameters need to be taken into account for appropriate scheduling. The available resources should be utilized efficiently without affecting the service parameters of cloud.

Scheduling process in cloud can be divided into following categories:

- *Resource discovering:* datacenter Broker discovers the resources present in the network
- *Resource Filtering:* After discovering resource datacenter collects status information related to them
- *Resource Selection:* Target resource is selected based on certain parameters of task and resource. This is deciding stage.
- *Task Submission:* Task is submitted to selected resource.

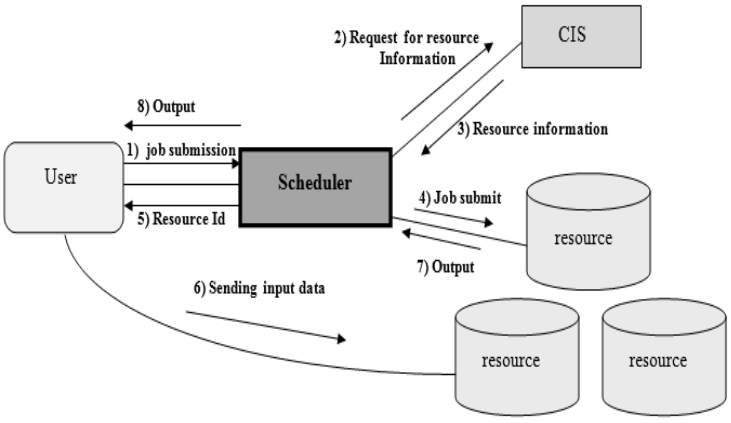

Fig 1 Scheduling Process in Cloud

II. RELATED WORK

The main aim of this paper to develop such an algorithm which would be beneficial to both user and cloud provider. Now target resources in a cloud environment can be selected in different manners like random, round robin or greedy etc. The selection of job(collection of tasks) to be scheduled can be based on Priority based, SJF(Shortest Job First),FCFS(First Come First Serve),Task grouping based on specific parameters etc.

Scheduling algorithm selects job to be executed and selects corresponding resource where job can be executed. Now each algorithm has its own advantages and disadvantages regarding to the User's perspective and Cloud Provider's perspective. For example greedy and priority based scheduling algorithms are beneficial to user as they give quick response but the disadvantage is that priority based algorithm may lead to long waiting time for low priority tasks from users' point of view and greedy algorithm may lead to wastage of resources from providers' point of view and also may lead to displeasure for users on QoS. Similarly task grouping algorithm beneficial to provider as it provides better utilization of resources, but from users' point of view prominent task completion time due to formation of group. So our work is to minimize the disadvantageous points and to maximize advantageous points of these algorithms.

A. Proposed Framework

1)Task Grouping

Task Grouping is a collection of tasks based on specific behaviour or attribute of task. Through task grouping we can group similar tasks together and then schedule them collectively. In our algorithm we are grouping the tasks based on either burst time based or cost based. [2]

2)Giving Priority

Priority specifies the significant of the element with which it is associated. In task scheduling priority specifies the order of tasks which is based on some parameters taken for its computation [3]. In our algorithm burst time based tasks are prioritized according to the burst time of task and task with shorter burst time need to be executed first so they are given higher priority. The task list is rearranged with ascending order of their burst time and given priority accordingly to execute task with minimum constraint first. The based tasks are prioritized based on task profit in descending order so task with higher profit can be executed having minimum cost based machine to get maximum profit.

3)Dynamic Optimization and Scheduling

After grouping and prioritization dynamic optimization of resources and scheduling of tasks are done.

For bust time based group to improve completion time of tasks greedy algorithm is used with aim of minimizing the turn- around time of each task at each available resource which results in overall improvement in completion time. It uses following formula to calculate turnaround time of task.

Turnaround time of task = waiting time + (Task length/MIPS of resource)

After calculating the turnaround time of each task at each resource, the resource with minimum turnaround time is given and task is executed there. When resource is given to the task, it will remain busy for some time in processing of that task then resource status is updated to find out availability of resource.

For cost based group resource with minimum cost is selected and task with maximum cost is scheduled on it and resource status is updated accordingly for finding availability of resource. The cost of task is calculated from following formula.

Resource cost=(RAM of Virtual machine * Cost/memory)+(Size of Virtual machine* Cost/storage)
Cost of Task = (Task length/MIPS of resource) * Resource cost

The selection of task and target resource is sequential once they are prioritized according to requirements of user.

B. Proposed Algorithm

1. *Receive Tasks to broker*
2. *Group tasks according to either task burst time constraint or task cost constrained*
3. *For burst time based group rearrange tasks in ascending order of their burst time and give priority to each task according to highest priority to first task in the tasks list and so on.*
   - For each task until the task is available in tasks list do
     a. Compute turnaround time of task at each resource as
        Turnaround time of task = waiting time + (Task length/MIPS of resource)
     b. Select resource with minimum turnaround time and schedule task on it
     c. Update resource status
4. *For cost based group rearrange tasks in descending order of their cost and give priority to each task according to highest priority to first task in the tasks list and so on.*
   - Arrange Vm list in ascending order on the basis of Resource Cost as
     Resource cost=(RAM of Virtual machine * Cost/memory)+(Size of Virtual machine* Cost/storage)
   - For each task until the task is available in tasks list do
     Compute task cost as
     a. Cost of Task = (Task length/MIPS of resource) * Resource cost
     b. Select resource from resource list sequentially
     c. Select task and schedule on selected resource
     d. Update resource status
     e. Repeat step c and d till resource MIPS <= scheduled task length

C. Implementation Details

The CloudSim toolkit is used for Simulation with Netbeans 7.1. It provides a series of core function for the establishment and simulation of heterogeneous distributed computing environment[6,7], and particular suitable for simulation and research of task scheduling on cloud. The experiments are performed with sequential assignment which is default in cloudsim.

1) Experimental setup

The Configuration of datacenter created is as shown below:

TABLE 1 CONFIGURATION OF PE

No of PE	*1*
Processing Power	*110000*

TABLE 2 CONFIGURATION OF HOST

No of Hosts	*2*
RAM(MB)	*10240*
VM Scheduling	*Time-shared*

TABLE 3 CONFIGURATION OF VIRTUAL MACHINES

Virtual Machines	***Vm1***	***Vm2***	***Vm3***	***Vm4***
RAM(MB)	*5024*	*5024*	*5024*	*5024*
Processing Power(MIPS)	*22000*	*11000*	*11000*	*22000*

2) Result Analysis

TABLE 4 COMPARISON OF TASK COMPLETION TIME

No. Of Cloudlets	***Time***	
	Sequential Algorithm	***Proposed Algorithm***
5	*342.27*	*250.94*
50	*1458.44*	*1095.30*
75	*3492.16*	*2597.50*
100	*6586.97*	*4945.11*

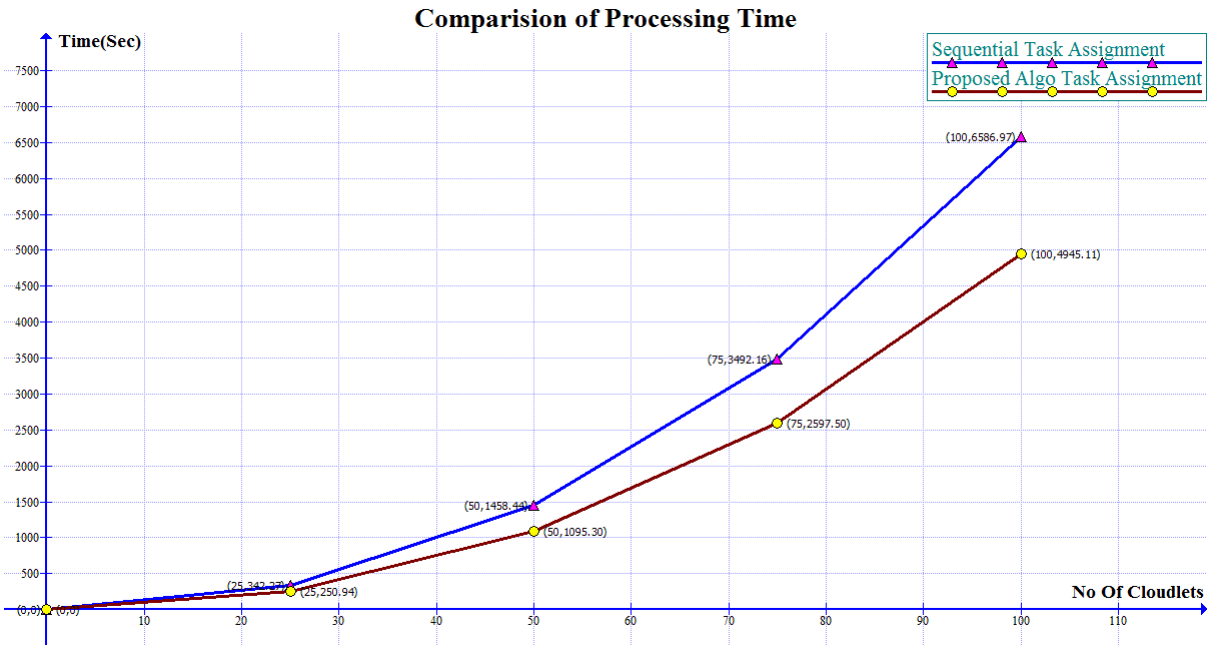

Fig 2 Comparison of Task Completion Time

Improvement in Time: From result we can see that proposed algorithm minimizes the task completion time as compared to sequential algorithm.

Table 5 COMPARISON OF TASK EXECUTION COST

No. Of Cloudlets	*Cost*	
	Sequential Algorithm	***Proposed Algorithm***
25	*342.27*	*250.94*
50	*1458.44*	*1095.30*
75	*3492.16*	*2597.50*
100	*6586.97*	*4945.11*

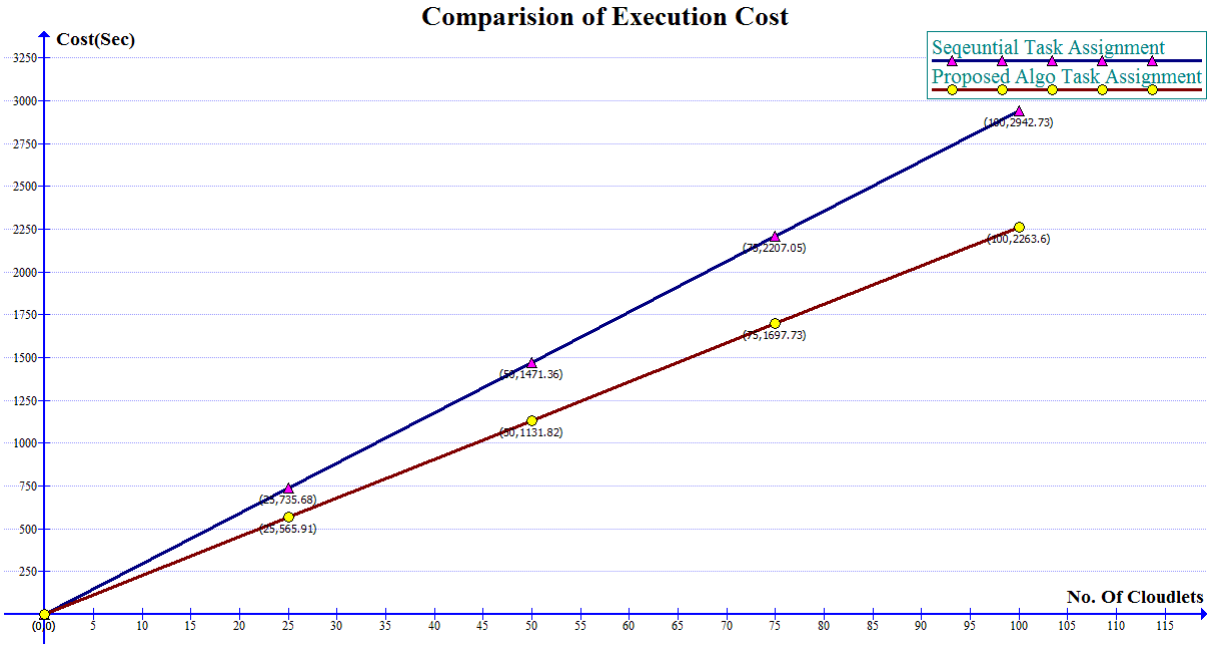

Fig 3 Comparison of Execution Cost

Improvement in cost : From result we can see that proposed algorithm reduces execution cost as compared to sequential algorithm.

III. CONCLUSIONS

There are many task scheduling algorithms for cloud computing environment which have their own advantages and disadvantages. As these algorithms are not beneficial to both user and cloud provider, some are biased to the users and some are biased to the provider. So this paper includes proposed algorithm which improves task completion time and execution cost as compared to sequential assignment which is beneficial to both user and cloud provider. The result improves with the increase in task count.

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