Improved Algorithm for Task Scheduling on Activity Based Costing in Cloud Computing

Mr. Abhishek Aggarwal[1] Shevani Chaudhary[2]
[1,2]Department of computer science engineering
[1,2]SKIET, Kurukshetra, Haryana, India

Abstract— Cloud computing is the fastest new paradigm for delivering on demand services over internet. In cloud computing, there are many task that needs to be executed by available resources to acquire high performance, reduce task completion time, minimize response time, utilization of resource usage etc. we know that cost of each task in cloud resources is different from one another .The objective of this paper is to schedule task group, whose resources have different cost. The purpose of job grouping is to utilize the resources and decrease the cost. The purposed scheduling approach is improved cost-based scheduling algorithm by utilizing the resources cost and improved the performance by grouping task and sends the task group to the resources which is capable of handling and processing it.

Key words: response time, IAAS, PAAS, SAAS

I. INTRODUCTION

The term cloud computing comes from cloud shape used to denote internet or other large networked environment .It provides platform, software application and hardware infrastructure as service over internet. Cloud computing is becoming a prime requirement for user using computational service.

Computational resource such as processing power , memory and network delivered via infrastructure as a service (IAAS). Software services are provided in form of software as a service(SAAS),Platform as a service (PAAS) is extension of SAAS to use application hosted remotely ,it includes O.S & software solution stack. Day by day the use of cloud computing is increasing because of features like highly flexible ,elastic ,scalable ,reliable, secure and cost beneficial for business by reducing upfront investment in information and communication technology infrastructure.

Majority of cloud service work on pay per use model which is similar to traditional utility –based economic model. The cloud computing environment provide different platform by creating virtual machine that assist the user to complete within reasonable time and cost effective without sacrificing quality of service . The huge growth in virtualization and cloud computing reflect increasing number of jobs that require services of virtual machine .Various type of scheduling algorithm have been applied on various workload .Main aim of scheduling algorithm is to minimize the cost and improve the performance.

II. CONTRIBUTION

The study aim is to minimize the total task completion time and minimum cost. For this purpose, an algorithm of task grouping is purposed. This approach improved cost based scheduling algorithm for making efficient mapping of task to available resources on cloud. As a result, time taken to complete the task take less time with groping of task.

III. RELATED WORK

Suhradam Patel et al.[1] presented a resource management system for dynamic virtual machine provisioning where in heterogeneous virtual machine cloud is created for delivering resources to software as a service application. The goal of this model is to optimize resource utilization by providing exact amount of resources required for user request considering all quality of service parameters into consideration.

Since the virtual network configuration has great impact on performance of virtual environment under given workload scenarios, POOJA et al.[2] represented the impact memory intensive application on performance of cloud virtual machine by monitoring various parameter eg. Available memory, page fault/sec. This will help the service providers to decide how much resource should be allocated.

Qi Cao et al.[3] proposed optimized algorithm for task scheduling based on activity based costing that involves selection of set of resources to be used in computing.

To reduce communication overhead, Yogita Chawal[4] proposed scheduling approach in cloud for efficient mapping of task to available resources. Dynamically optimized task scheduling when combined with task grouping help reducing processing time as well cost.

In cloud computing, resource allocation can be scaled up based on the requirement called elasticity. To minimized cost and deadline are met ,Karthik kumar [5] propose polynomial-time solution to allocate resource efficiently.

To use the resources to fullest capacity so that resource power is left unused . Sachee parikh [7] proposes a priority based scheduling optimization algorithm which addresses the major challenges of task scheduling in cloud. Resource selection in basis of its cost and turnaround time both using greedy approach.

IV. ALGORITHM PROPOSED

A. Activity based costing in cloud computing

Activity based costing is way of measuring both cost of resources and performance of activities .In cloud computing ,each application will run on virtual system ,where the resources will be distributed virtually. Every application is completely different and is independent and has no link between each other. for ex some require more memory to store data and some require more cpu time to compute complex task. In order to measure direct cost of application ,every individual use of resources like cpu cost ,memory cost ,input /output cost etc) must be measured . when direct data of each individual resource cost has been measured ,more accurate cost and profit analysis based on it than those of traditional way can he got .

B. Improved work

To formulate the problem ,define T_i = {1,2,3…..n} as n independent task permutation and R_j , j= {1,2,3….n} as m computing resources with an objective of minimizing completion time and minimizing the cost. The processing capacity of each resource is expressed in million instruction per second (mips) and size of each task is million instruction (mi).

The cost of every individual resources is different .let there be three list of task with high , medium and low priorities. For computation of task the system can take from higher priority list first then medium and then low.
Parameters are defined as followed:

(1) $R_{i,k}$: The ith individual use of resources by the kth task.
(2) $C_{i,k}$: The cost of the ith individual use of resources by the kth task.
(3) P_k : The profit earned from the kth task.
(4) L_k : The priority level of the kth task.

The priority level of each task can be calculated as in Equation (1), the total individual resources use is supposed to be n, so the priority level of the kth task is:

$$L_k = {}^{n}\sum_{i=0} R_{i,k} * C_{i,k} / P_k \quad \text{....Equation 1}$$

C. Methodology

The scheduler accepts number of tasks, average MI of tasks, size and processing overhead of all the tasks. Resources are selected. The priority levels of the tasks are calculated using equation 1. Tasks are sorted according to their priority, and they are placed in three different lists based on three levels of priority namely high priority, medium priority and low priority. Now job grouping algorithm is applied to the above lists in order to allocate the task-groups to different available resources.

1) Improved ABC Algorithm

Algorithm for arranging tasks according to their priority levels

(1) The tasks are received by the scheduler for all available tasks
(2) Calculate their priority levels Lk using equation 1.
(3) Sort the tasks based on their priority.
(4) Store the sorted tasks in three different lists by dividing the tasks into high, medium and low priority levels
(5) If there is new task coming Calculate its priority and then put it into an appropriate list

2) Task grouping and scheduling algorithm

n : Total number of task

r : Total number of Resources available

Ltk_i : List of tasks submitted by the user

LRj : List of Resources available

MI : Million instructions or processing requirements of a user task

MIPS : Million instructions per second or processing capabilities of a resource

$T\text{-}PI_i$: Total processing requirements (MI) of a task group (in MI)

T-MIj : Total processing capability (MI) of j^{th} resource

Ltk_i-MI : MI of i^{th} task

T- Ltk_i : Total length of all tasks (in MI)

R_J-MIPS :MIPS of jth grid resource

GJ_k : List of Grouped task

TargetRk : List of target resources of each grouped job

(1) The scheduler receives Number of tasks 'n' to be scheduled and Number of available Resources 'r'
(2) Scheduler receives the Resource-list R[ ] and tasks are submitted to the scheduler
(3) Set T- Ltk_i = 0
(4) Set the resource ID j to 1 and the index i to 1
(5) Get the MIPS of resource j
(6) Get the length (MI) of the task from the list
(7) IF(Resource MIPS < Task length) then task cannot be allocated to the resource.
ELSE get the MIPS of the next resource and go to step 5
(8) If (Resource MIPS >Task length)
While (T- Ltk_i < = Resource MIPS) and there exists ungrouped tasks in the list
(1) Add previous total length and current task length and assign to current total length (T-PI)
(2) Get the length of the next task
(9) If (T-PI > Resource MIPS) then subtract length of the last task from T-PI
(10) If T-PI is not zero repeat steps 10.1 to 10.4
(1) Create a new task-group of length equal to T-PI
(2)Assign a unique ID to the newly created task-group
(3) Insert the task-group into a new taskgroup list GJ_k
(4)Insert the allocated resource ID into the Target resource list $TargetR_k$
(11) Set Tot-GMI = 0 and get the MIPS of the next resource
(12) Repeat step 5 to 10 until all the task in list are grouped.
(13) When all the tasks are grouped and assigned to a resource, send all the task groups to their corresponding resources GJ_k .
(14) After the execution of the task-groups by the assigned resources send them back to the Target resource list $TargetR_k$.

V. Experiment Result

Cloud sim has been used to create simulation environment .The MIPS of each resource is specified in Table 1

Resource	Mips
R1	130
R2	125
R3	150
R4	200

R5	120
R6	290

Table 1: Mips Of Cloud Resources

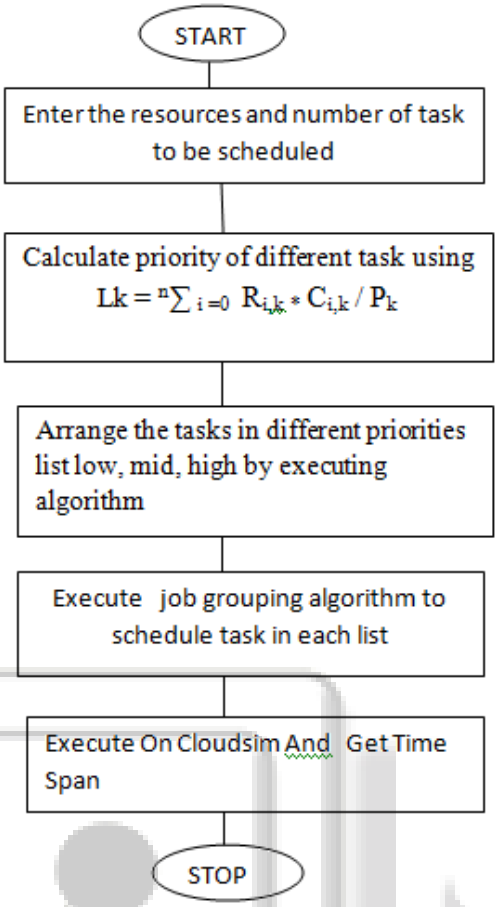

Fig. 1

Processing time in seconds		
No. of cloudlets	**ABC algorithm**	**Improved ABC Algorithm**
25	148.34	126.1
50	265.12	230.01
75	410.4	375.51
100	527.12	481.5

Table 2: Simulation Of Processing Time For Abc And Improved Abc Algorithms

Processing cost in Rs.		
No. of cloudlets	**ABC algorithm**	**Improved ABC Algorithm**
25	300.21	68.70
50	740.01	370.01
75	870.45	390.61
100	1028.12	538.50

Table 3: Simulation Of Processing Cost For Abc And Improved Abc Algorithms

We have compared the result for processing time and processing cost for various numbers of cloudlet namely 25,50,75,100.

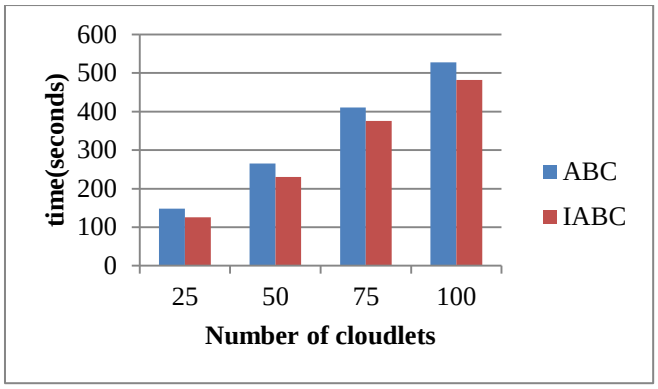

Fig. 2: Comparison of ABC and improved ABC algorithm for processing time.

From the figure 2. It can be seen that for ABC Scheduling the time taken to complete task after grouping the task is very less when compared with time taken to complete task without grouping the tasks.

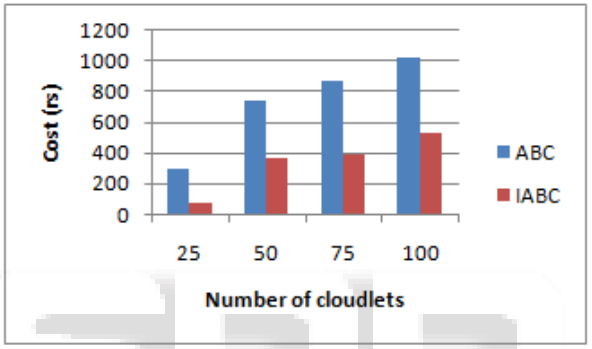

Fig 3: Comparison Of Abc And Improved Abc Algorithms For Processing Cost

From above figure it can be seen that ABC Scheduling the processing cost spent to complete task after grouping task is very less when compared with processing cost spent to complete task without grouping the tasks. so from above graphs, we conclude Improved ABC scheduling algorithm take less completion time and cost than the ABC scheduling algorithm. Hence Improved ABC scheduling algorithm is better than ABC scheduling.

VI. Conclusion

This paper dicusses job scheduling in cloud computing environment. Activity based costing is a way of measuring cost of the objects. But by doing research and analysis ,that aims at task scheduling with minimum total task completion time and minimum cost .This paper introduced improved ABC algorithm on task scheduling in cloud platform. Cloudsim is employed to carry out and stimulate task assignment algorithm and task scheduling. We have compared the results of improved activity based costing scheduling algorithm with activity based costing algorithm and find that improved ABC algorithm is better than ABC costing.

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