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A REVIEW ON TASK SCHEDULING ALGORITHMS IN CLOUD COMPUTING

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Abstract: In modern world Cloud Computing is one of the most promising and evolving areas of computer science. In the present scenario, cloud computing covers almost entire internet based activity. It brings a revolution in Information Technology industry by ordering on-demand of resources. Cloud is developing day by day and faces many challenges, one of them is scheduling. Scheduling is a technique which is used to improve the overall execution time of the job. Scheduling in cloud is responsible for selection of best suitable resources for task execution, by taking some parameters into consideration. Efficient scheduling should be provided so that both the user and the service provider gain profit. Cloud users can request/rent resources as they become necessary, in a much more scalable and elastic way. A provision should be made so that all resources are made available to the users to satisfy their need. In this paper various task scheduling techniques are reviewed.
Keywords: Cloud Computing, task scheduling, virtual machines.

I. Introduction

Cloud computing is a construct that allows you to access applications that actually reside at a location other than your computer or other internet-connected device. It has become one of the most talked about technologies in recent times and has got lots of attention from media as well as analysts because of the opportunities it offers [1]. The success of clouds has been driven in part by the use of virtualization as their underlying technology. It is a technology that allows running two or more operating systems side-by-side on just one PC or embedded controller [2]. Virtualization greatly helps in effective utilization of resources and build an effective system. Many applications are having a limited number of concurrent tasks, thus having a number of idle cores. This problem can be solved by using virtualization, allocating a group of cores to an OS (Operating system) that can run it concurrently. It enables the service providers to offer virtual machines for work rather than the physical

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server machines. Virtual machines (VMs) provide flexibility and mobility through easy migration, which enables dynamic mapping of VMs to available resources.

II. Scheduling

Job scheduling is an important task in cloud environment. Job Scheduling is used to allocate certain jobs to particular resources in particular time. In cloud computing, job- scheduling problem is a biggest and challenging issue. The main aim of job scheduling algorithm is to improve the performance and quality of service and at the same time maintaining the efficiency and fairness among the jobs and reduce the execution cost. An efficient job scheduling strategy must aim to yield less response time so that the execution of submitted jobs takes place within a possible minimum time. There are various scheduling strategies which should take care of all these things. But no such strategy exists which is concerned with both the users point of view as well as service providers point of view. The various job scheduling algorithms are the following [3]:

A. First Come First Serve Algorithm

Jobs are served in queue as they come. This algorithm is simple and fast.

B. Round Robin algorithm

In the round robin scheduling, processes are given a limited amount of CPU time called a time-slice or a quantum in FIFO manner. If a process does not complete execution before its CPU-time expires, the CPU is pre-empted and given to the next process waiting in a queue. And the preempted process is placed at the end of the ready queue and processed in the next time slice or quantum.

C. Min–Min algorithm

A type of algorithm in which short jobs execute in parallel and then followed by long jobs.

D. Max – Min algorithm

This algorithm chooses larger tasks to be executed firstly, which make small task delays for long time.

E. Priority scheduling algorithm

Each process is assigned a priority, and then based on priority processes are allowed to be executed. Equal priority processes are executed in FCFS order.

F. Most fit task scheduling algorithm

Job which fit best in queue based on some parameters is executed first.

Scheduling in cloud can be categorized into three stages:

- Resource discovering and monitoring- Here all resources present in the network system are discovered by the Data Broker.
- Resource selection- This is the deciding stage. Here a target resource is selected on the basis of various characteristics of task as well as resources.
- Task submission- Task is submitted to the selected resource.

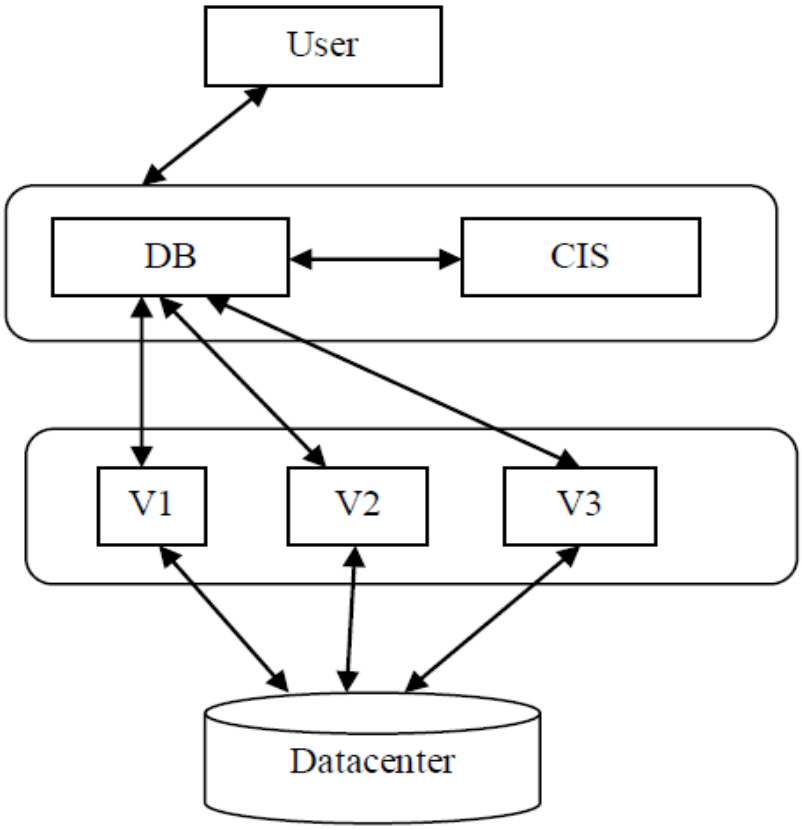

Fig. 1 Stages in scheduling

DB- Data Center Broker

CIS- Cloud Information Services

V1, V2, V3- Virtual Machines

III. Related Work

Scheduling of task in cloud computing is of prime concern in the performance and problem of mapping task on distributed services i.e. scheduling is a N-P problem in dynamic environment. Traditional scheduling strategies are FCFS, SJF, round robin are not beneficial.

The main motive of all these traditional and meta-heuristics scheduling algorithms are the proper utilization of resources. With advancement in time, several strategies are proposed. But each has its own advantages and disadvantages. Pre-emptable shortest job next scheduling algorithm (PSJN) [4]: This algorithm is proposed in a private cloud. In this paper they combine the pre-emption technique of Round-robin algorithm with shortest process next (PSN). Shortest Job scheduling [5]: this algorithm is proposed in a public cloud environment. In this paper includes the allocation of resources on different clouds under over-load and under-load conditions. Grouping based scheduling was introduced in the paper [6]. Grouping technique provides better utilization of resources. But the main disadvantage of grouping technique is the considerable task completion time is taken into account due to formation of groups. A scheduling algorithm [7] can minimize average turnaround time in heterogeneous resource environment. This algorithm was based on greedy method which is used for totally dynamic grid environment where the jobs arrive at different time interval. The turnaround time of each job was minimized individually to minimize the average turnaround time of all submitted jobs in a time slot. But in this method the wastage of resources is more and disappointment for user on QoS parameters. Ant colony Optimization [8][9][10][11]: The basic idea for Ant colony optimization is to simulate the foraging behavior of ant colonies. It improves the efficiency and reliability in all conditions. The proposed algorithm in [12] addresses major challenges of scheduling in cloud computing environment such as: resource utilization, maximum profit, minimum execution cost etc. In this scheduling algorithm users first select their method on the basis of application requirements and then prioritized. As the users select their method and then prioritized, so the algorithm is named as “TPD Scheduling Algorithm”, Here T stands for Task Selection, P Stands for Priority and D stands for Deadline. Another scheduling technique is a priority based job scheduling algorithm (PJSC)[13] for cloud computing environment. Priority job scheduling algorithm considers priority at three levels: scheduling level, resources level, and job level. In priority job scheduling, every job that is required to schedule has a pre-determined priority and scheduling is done on the basis of that priority. But the main disadvantage of using PJSC is the long waiting time for low priority task. All of these existing strategies for scheduling are better than the traditional scheduling strategies in one way or the in other. Some are delivering better time bound results; others are concerned with reducing the cost incurred. Work is already done towards minimizing the execution time and cost tasks but there are

some flaws like few only incorporate grouping technique and then using FCFS which is only reducing the communication overhead, but no work is done to improve execution time and cost. Considering all such issues we are attempting to design an algorithm which can provides better results than the existing strategies.

IV. Proposed Work

In our proposed algorithm mainly has 4 steps:

1. Firstly tasks are grouped into two groups deadline based and cost based.
2. In the second step deadline based task are arranged in ascending order of deadline and cost based are arranged in descending order of task length.
3. In the third step there are mainly three queues i.e. HIGH, MID, LOW and tasks are executed from these queues with a time quantum of 16 units.

HIGH queue has tasks with high priority, MID has tasks with priority lower than the tasks in HIGH queue and LOW has tasks having lowest priority and these three queues have their own scheduling criterion.

3(I) Tasks from HIGH queue are executed in round robin fashion with a time quantum of 4 units.

3(II) Tasks from MID are also executed in round robin with time quantum more than the HIGH queue i.e. units.

3(III) And the LOW queue tasks are scheduled in FCFS order.

4. Then the turnaround time or the cost of available resource is calculated and the tasks are scheduled.

The flow chart of the above algorithm is shown as below:

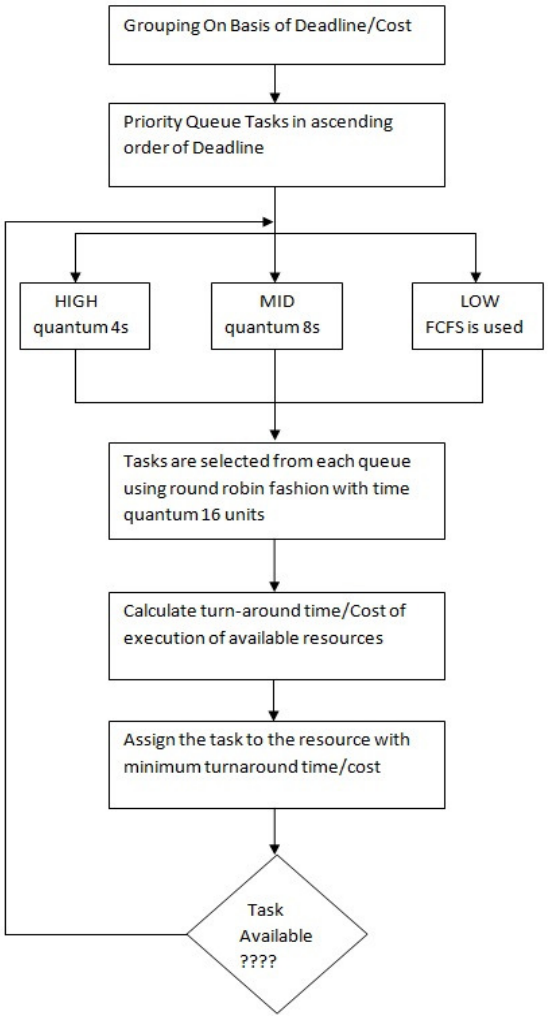

Fig. 2 Scheduling of Deadline/cost based tasks

V. Conclusion and Future Work

Task scheduling in cloud computing is highly challenging in cloud computing. To meet the needs of thousands requests by making best possible use of cloud resources is a challenge for task manager. Traditional methods of scheduling lead to high response time and low throughput. Many algorithms make use of priority scheduling and suffer from long waiting queues. Our proposed algorithm makes use of round robin as well as priority and it will definitely meet all the challenges and will provide efficient results than the traditional scheduling approaches.

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