PERFORMANCE ANALYSIS OF LOAD BALANCING IN CLOUD COMPUTING BY USING SCHEDULING ALGORITHMS

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Abstract: Cloud computing provides an answer of IT infrastructure in low price. A number of difficulties incorporate security issues; Load Balancing is one in all the essential problems in Cloud Computing. Therefore the number of user requests will be a part of the cloud and exit from the cloud whenever there is an execution of applications. There are many scheduling algorithms for analysing the load balancing problem like round robin algorithm, modified round robin, shortest job first, first come first serve, ant colony optimization, swarm particle optimization. By comparing the results of round robin and modified round robin, the MRR is better than the RR algorithm. But that is not the optimized solution. So, this paper gives the introduction about the fundamentals and traits of job shop scheduling through genetic algorithm, as well as the basic functions and the solving procedure. The fitness function is based on objective function. The operative algorithms of crossover, replication and mutation are designed. The job shop scheduling is optimized by designing the program based by using the genetic algorithm. The genetic algorithm in this paper is tested on instances taken from the literature and compared with their results. The computation results show that the genetic algorithm referred in this paper is feasible and effective than round robin algorithm.

Keywords: Cloud Computing, Load Balancing, round robin, modified round robin, job shop scheduling using genetic algorithm.

1. Introduction

Cloud computing is an emerging model for universal for on request community getting right of the section to a common pool of configurable figuring recourses. Various computing resources are storage, network, and servers. There are five vital traits of a cloud like on-call for self-provider; huge community gets entry to, useful resource pooling, fast elasticity, and measured service. There are three distinctive kinds of clouds. They're normally classified into public, non-public, and hybrid clouds. Public cloud is the one which gives get entry to all the people. And coming to the non-public cloud, it presents limit i.e. it can offer to get entry to a particular corporation. Universities and faculties are the high-quality examples those comes beneath the class of the non-public cloud. Hybrid cloud is the kind of cloud which can be handled because of the combination of each the public cloud and personal cloud. There are a number of the demanding situations that make the cloud computing to adapt. Some of them are globalization, growing older statistics centers, garage boom, software explosion and value of ownership and so forth. Globalization refers to the concept of 24*7 availability. Coming to the data centers, the ones vintage traditional data centers need to be virtualized and grew to become to be virtualized information centers. Storage growth also ought to receive importance by means of the efficient usage of the garage through using the concepts of duplication and many others. Utility explosion says that the brand new and technological utility have to be supported. There are a few critical standards within the cloud computing like de-duplication of records. That is in particular performed if you want to make use of the reminiscence in an efficient way. This gets rid of the duplicates of documents. This particularly applies to files. Duplicated documents are to be removed so that we are able to use the storage of cloud in an optimized manner. Cloud protection is any other thing which needs to be considered. It’s far one in every of the flaws that cloud has been encountering. We need to resolve these safety problems by imparting authentication and password mechanisms. We’ve many hash-based totally algorithms like SHA-512, SHA-256, and HMAC etc. the idea in the back of in these has algorithms is this algorithm generate a hash key which acts as
a mystery code. And any other vital idea of cloud computing is its offerings. These cloud computing offerings are widely categorized into 3 sorts. They're as per the following:

**Load Balancing**

Load adjusting to your software just appropriating the upcoming solicitations stack among the available demand executing hubs. Stack adjusting deals with the executing hubs that they don't get over-burden with the patron ask. in order that by utilizing a few planning calculations the weight is dispersed amongst servers [1]. Every server is having a report state, as on hand, occupied, and sits still. Fundamentally there are 2 sorts of load adjusting calculation relying upon their usage technique as indicated by Static Load Balancing Algorithm and Dynamic Load Balancing Algorithm.

### 2. Existing Algorithms

#### 2.1. Round Robin Algorithm

The round-robin (RR) organizing calculation is made particularly for time-sharing structures [2]. It takes after FCFS masterminding, yet pre-emption is further to switch between techniques. A little unit of time, is called as a period quantum or time cut, is unmistakable. The prepared line is considered as an aberrant line. To perform RR booking, we keep the prepared line as a FIFO line of procedures. New systems are incorporated near the prepared line [8]. The CPU scheduler picks the basic approach from the prepared line, masterminds a period quantum to defeat after some time, and dispatches the framework.

**Drawback:** If the time slice is greatly extensive, cause low reaction time and it is like FCFS. On the off chance that the time quantum is to a great degree little this causes an excessive number of setting switches and brings down the CPU effectiveness.

#### 2.2. Modified Round Robin

A modified RR algorithm is proposed. The number of procedures is dwelling in the prepared line, we accept their entry time is relegated to a few procedures and burst times are assigned to the CPU [2]. The burst time and the number of procedures are considered as information. Presently, above all else, we orchestrate all procedures in expanding request as indicated by their given burst time and pick changed time cut will be relying on upon the number of procedures burst time.

### 3. Proposed Algorithm

The performance of the modified round robin algorithm compared to the round robin algorithm is better. For much better performance we are going to implement the job shop scheduling using genetic algorithm.

#### Genetic Algorithm

Moreover, Concepts of virtualization is utilized as a part of cloud which prompts to have a heap adjusting in the cloud. Virtualization implies giving a legitimate name to physical assets and at whatever point this name is eluded it will point towards comparing physical asset. Various clients will get to cloud at same time and it is extremely important to serve them all with least reaction time and better administration. Thus stack adjusting is produced into results to adjust the demand of numerous clients on virtual machines uniformly [8]. It is said that Load adjusting is a NP-Complete Problem strategy in light of the fact that as the extent of the issue expands the measure of arrangement will increment as well. That implies the more the demand comes to cloud it will get harder to do adjusting among the Different Virtual Machines. GA is one of system which has a place with the class of developmental calculations which produces arrangements propelled by regular advancement [7]. The Simple GA Concepts are as per the following:

- **Population:** It gives set of available solutions for proposed algorithm.
- **Chromosome:** The each individual in population. It is also called as genotype.
- **Gene:** Variable in the chromosome.
Fitness Function: A type of objective function which is used to figure out how near the solution is reaching the set goal. The Genetic Algorithm (GA) is derived through 3 main operations:

- Selection: solutions with better fitness are chosen.
- Crossover: for generating a child, more than one parent is chosen.
- Mutation: adjusting the gene value in chromosome.

The coming segment gives the detail about the different procedures of GA for Load Balancing in Cloud Computing explained.

**Job Shop Scheduling**

The job shop scheduling algorithm is being discussed from years and also it is the hardest combinatorial optimization problem. The proposed algorithm is about job shop scheduling using genetic algorithm and the results are discussed on the factors of fitness time and execution value [9].

- Job shop scheduling problem is described as, there are w devices, the need for processing has n jobs, each job tasks processes consisting of m steps, the number of steps and the sequence has been determined.
- Each process matching on one machine or multiple machines can process a number of steps of the work pieces, each step of the processing time is determined by the processing machine [7].

<table>
<thead>
<tr>
<th>Job</th>
<th>Machine 1</th>
<th>Machine 2</th>
<th>Machine 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>M1(7)</td>
<td>M3(8)</td>
<td>M2(10)</td>
</tr>
<tr>
<td>J2</td>
<td>M2(6)</td>
<td>M1(4)</td>
<td>M3(12)</td>
</tr>
<tr>
<td>J3</td>
<td>M1(8)</td>
<td>M2(8)</td>
<td>M3(7)</td>
</tr>
</tbody>
</table>

4. Experimental

In this paper we are comparing the results of round robin, modified round robin and job shop scheduling using genetic algorithm. By comparing these results in the simulator the response time taken by the genetic algorithm is better than the RR and the MRR algorithms. In this simulation the virtual machines are allocated to each data user. For every data user one virtual machine is allocated in the genetic algorithm. But in the RR and MRR algorithms number of users are allocated to the single virtual machine. So that the virtual machine will sometimes be idle, busy states. But in the job shop scheduling algorithm the gnatt chart is designed by using the cross over, mutation and selection functions. Then a chromosome table is derived. According to that table gnatt chart can be drawn. After the completion we can get parameters like make span, completion time, tardiness, earliness. In this we will compare the completion time and response time of round robin and job shop scheduling algorithms.
Figure 6. Allocation of each virtual machine to the user

Figure 7. Configuration of VM

Figure 8. Time taken to the user requesting for virtual machine.

Figure 9. Response time graph

Round Robin Algorithm

Example:

Table 1. Example for the RR and MRR

<table>
<thead>
<tr>
<th>Processes</th>
<th>Arrival Time</th>
<th>Burst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>p2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>p3</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>p4</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>p5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>p6</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Time quantum= 4
In the round robin algorithm the time quantum is same for all the processors if that time quantum completes the machine skips to the other processor and execute it. Round robin is also called as circular process.

Figure 10. Gantt Chart for RR

Modified Round Robin Algorithm

Example:

For the above example the time quantum is same for all the processors but in the MRR the time quantum is different for each and every processor. By using the formula.

Time Quantum= Range*P/Pr*N

Figure 11. Gantt Chart for MRR

Job Shop Scheduling using Genetic Algorithm:

Example:

Figure 12. Gantt Chart for JSP

Completion time for the above algorithms
RR- 56
MRR- 54
JSP- 40

5. Performance Analysis

By comparing the round robin, modified round robin and genetic algorithms. The main parameter here is completion time. It is defined that job shop scheduling is better than the round robin and modified round robin algorithms. Here we are taking some parameters like completion time, turn around time, response time and waiting time. By comparing these parameters it is said that job shop
scheduling is better than the round robin and the modified round robin.

[Figure 13. Completion time]

[Figure 14. Avg. TAT]

6. Conclusion

The existing calculation in cloud stack adjusting is not giving many proficient outcomes like high holding up time, reaction time, setting exchanging and throughput is low. For that here it speaks to a slight change in the round robin calculation, called as adjusted round robin calculation. This changed to round robin calculation is the combination of (SJF) and round robin (RR). By computing the adjusted round robin the parameters like high holding up time, the reaction time is overcome. By also comparing the results of the above algorithms we can say that genetic algorithm is giving better performance we are using job shop scheduling algorithm through genetic algorithm. The results of job shop scheduling algorithm compared to the round robin and modified round is better.

References


