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"Enhance Dynamic Heterogeneous Shortest Job first (DHSJF): a Task Scheduling Approach for Heterogeneous Cloud Computing Systems"

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Abstract - *Cloud computing offers utility-oriented IT services to millions of users concurrently. Cloud computing is acting at leading role in world's technical industry .Cloud Computing demand growing drastically, which has imposed cloud service provider to make certain proper resource utilization with less cost and less energy consumptionThis computing paradigm has increased the utility of network where the potentiality of one node can be used by Other node, cloud provides services on demand to distributive resources such as Database, servers, software, infrastructure etc. in pay per use basis, load balancing is One of the unique and important issues for distributing a larger processing lode to smaller processing nodes for increasing total performance of system, in load balancing method the workload not only distribute across multiple computers but also other resources over the network links to gain optimum resource utilization, minimum average response time and avoid overload condition. Different load balancing algorithms have been launched in order to manage the resources of service provider efficiently and effectively. The objective of this paper is to propose efficient scheduling algorithm that can maintain the load balancing and provide improved strategies through efficient job scheduling that would decrease the average response time and increase the availability of more VMs to allocate new jobs from requesting nodes.*

***Key Words*: Cloud computing,Shortest Job First Scheduling, Load Balancing, Resource utilization, Makespan ...**

1. INTRODUCTION

Cloud computing conventionally uses to provide infrastructure, platforms, software and data as a service. It offers three service model Saas, Paas and Iass. computing technology is a new way in Cloud Computing .for that uses the central remote servers and Internet to maintain data and application. A lot of virtual machines(VM) will persist to run concurrently in the cloud, when a testing machine is overloaded, cloud computing dynamically transfers its load into a number of virtual machines[1]. Migration is defined as the process of transferring the virtual machine from a physical machine to the load. Cloud provides two services over the public and private network.

The cloud environment has a number of heterogeneous resources hosted in data centers in different locations. data centers have a large number of physical machines, which enclose Virtual Machines (VM). Each VM has a definite configuration of processing power, communication bandwidth, RAM and storage related with it. So customers do not involve purchasing some hardware and software[2].

Cloud computing is a new emerging applied science that helps to develop a new area in education and industry. This new technology offers distributed virtualized, elastic resources as utilities to clients. It has total capability for supporting full realization of computing as a utility in the near future [1].Cloud technology supports both parallel and distributed system. This distributed architecture deploys resources to distribute services effectively to clients in different geographical channels [2]. In the distributed environment users generate request randomly in any processor.

Load balancing is done with the help of load balancers where each succeeding request is redirected and transparent to users who make the request. Based on different parameters like availability of current load, the load balancer uses different scheduling algorithm to decide which server should handle and forwards the request to the selected server [5].There are different scheduling algorithm exist in load balancing like Round Robin(RR) , First-Come-First-Served (FCFS), and some other scheduling algorithm. Most of these algorithm concentrate on maximizing throughput and minimizing the turnaround time, response time, waiting time and number of context switching for a set of request. In this paper our objective is to approach a new scheduling algorithm which helps to give better performance compare to existing algorithms such as Round Robin (RR), FirstCome-First-Served (FCFS), etc.

In this Paper the three important parameters are studied about the scheduling in multicloud computing. Task scheduling in multicloud computing provide the result based on various parameters like makespan time, load balancing, Resource utlization,

response tome, customer satisfaction rate, performance of the system etc. This parameters decide the proposed scheduling algorithm is good on cloud computing or not[2].

1.1 Related Works

Load balancing [6] algorithm determines the effect of balancing the server workloads. Load balancing algorithm is divided into static algorithm and dynamic algorithm [7]. The static algorithm does not take in to account the previous state or nature of the node while distributing the node. The common static algorithms are Round-Robin Scheduling Algorithm

Round-Robin Algorithm : Round-Robin Scheduling Algorithm is the simplest one which could be most easily be carried out and selects the first node randomly, then allocate jobs to all other nodes in round-robin manner. However, it is only applicable for cloud computing in that case when some nodes might heavily loaded and some are not. The good side of this algorithm is that if any node fails, it will not halt the system; it will only affect the system performance.

First-Come-First-Served: First come first serve is a self-adaptive algorithm, and suitable for a great deal of requests which produce different workloads, which would be unable to be forecasted [8]. Self-adaptive load balancing system includes two processes: monitoring the load states of servers and assigning the request to the servers. So, the ideal load balancing algorithm should achieve the following targets: Leave the collections, computing of load node information for each node; prevent the front-end scheduler from being system bottleneck. Reduce the disturbances of load balancing algorithm as far as possible.

1.2 Scheduling Criteria

For the task scheduling based on RR, FCFS the criteria include the following parameters:

Context Switch: A context switch is computing process of storing and restoring state of a CPU so that execution can be resumed from same point at a later time. Context switch are usually computationally intensive, lead to wastage of time, memory, scheduler .So for optimization purpose CPU needs this switch
Throughput: The number of process completed per unit time is called throughput. Throughput will be slow in round robin scheduling implementation.
CPU Utilization: We want to keep the CPU as busy as possible.
Turnaround Time: Turnaround time is sum of periods spent waiting to get into memory, waiting in ready queue, executing on CPU and doing input output. If the value is less then it will give better for performance.
Waiting Time: The amount of time a process has been waiting in ready queue is called waiting time. The CPU scheduling algorithm does not affect the amount of time during which a process executes or does input-output; it affects only the amount of time that a process spends waiting in ready queue.

2. Literature Review

In the cloud computing environment there are various existing system are present which gives the best result in different parameters. The different parameters are Makespan time Response time, load balancing, energy efficiency, resource utilization, etc.

Sonam Seth1 , Nipur Singh2 ,4 April 2018" Dynamic heterogeneous shortest job first (DHSJF): a task scheduling approach for heterogeneous cloud computing systems" [1]in these papaer HSJF method provides improved performance in terms of low energy consumption and reduced makespan due to the heterogeneity of resources and workload.

Anup Gade, Nirupama Bhat 2018 "Survey on EnergyEfficient Cloud: A Novel Approach towards Green Computing"[2]. Result of this paper is FCFS and greedy based algorithm compared with the greedy algorithm.By Ga The execution time become less. The objective of this algorithm is the optimization of the scheduling of independent tasks in cloud environment and generation of an optimal answer for the assignment of tasks to existing resource

Nelson Mimura, Gonzalez-Escola Politecnica 2016. "Multi-Phase Proactive Cloud Scheduling Framework Based on High Level Workflow and Resource Characterization"[3]. In this paper gives Very good performance gives by Genetic Algorithm Minimum time required for completion.Congjie

Wang1 Zhihui Lu,2017. "Optimizing Multi-cloud CDN Deployment and Scheduling Strategies Using Big Data Analysis"[4]. Result of this paper in performance which is Good performance. Various combinations of genetic operators are tried and the best one which converges faster and gives a promising solution has been identified.

H. Wu, X. Hua, Z. Li, and S. Ren, 2016 "Resource and instance hour minimization for deadline constrained DAG applications using computer clouds"[9]. the result of Min-Min algorithm and Min -Max algorithm are used for comparing with proposed algorithm.This algorithm gives better result in case of costing.

NoroozOliaee M.; Hamdaoui, B.; Guizani, M.; Ben Ghorbel, M., 2014 IEEE Conference"Online multiresource scheduling for minimum task completion time in cloud servers," In this paper, an algorithm for online scheduling of resources is proposed.There are two phases involved. The first phase is triggered when a task arrives for execution and second phase is triggered after the completion of the task. In the first phase , best fit is used to choose the server on which the task will 8 run. In the second phase , all the tasks are sorted based on execution times , and a task that can run on the free VM is chosen

Domanal, S.G.; Reddy, G.R.M.,2014, "Optimal load balancing in cloud computing by ef icient utilization of virtual machines", 2014 In this paper, a novel VM assign algorithm is presented which allocates incoming jobs to available virtual machines. Here the virtual machine assigned depending on its load i.e. VM with least request is found and then new request is allotted. With this algorithm underutilization of the virtual machine is improved significantly and later it is compared with existing Active VM algorithm.

3. Proposed work

Shortest Job First (SJF) scheduling is a priority and Non-Preemptive scheduling. NonPreemptive means, when the allotted time a processor then the processor cannot be taken the other, until the process is completed in the execution. Basically Shortest Job First is a dynamic load balancing algorithm which handles the process with priority basis. It determines the priority by checking the size of the process. This algorithm distributes the load randomly by first checking the size of the process and then transferring the load to a Virtual Machine, which is lightly loaded. In that case that process size is lowest, this process will get first priority to execute whether we suppose lowest sized process executes in minimum time.

The load balancer spreads the load on to different nodes known as spread spectrum technique. The mechanism of Shortest Job First Algorithm is, to schedule the process with the shortest time to completion first, thus providing high efficiency and low turnaround time. In terms of time spent in the current program (job) began to enter in to the system until the process is finished the system, need a short time. Shortest Job First (SJF) scheduling algorithm can be said to be optimal with an average waiting time is minimal, which helps to improve the system performance.

3.1 Algorithm

Step1. Firstly start process, vmloadbalancer maintain the process by priority checking the size of the process and distribute the load to the virtual machine which is lightly loaded.

Step2. The vmloadbalancer, first allocate array size i.e.A [10].

Step3. Take number of elements to be inserted.

Step4. Vmloadbalancer select process which load has shortest burst time among all loads will execute first

Step5. If in the process any load have same burst time length then FCFS (First come First Served) scheduling algorithm used.

Step6. Make average waiting time length of next process.

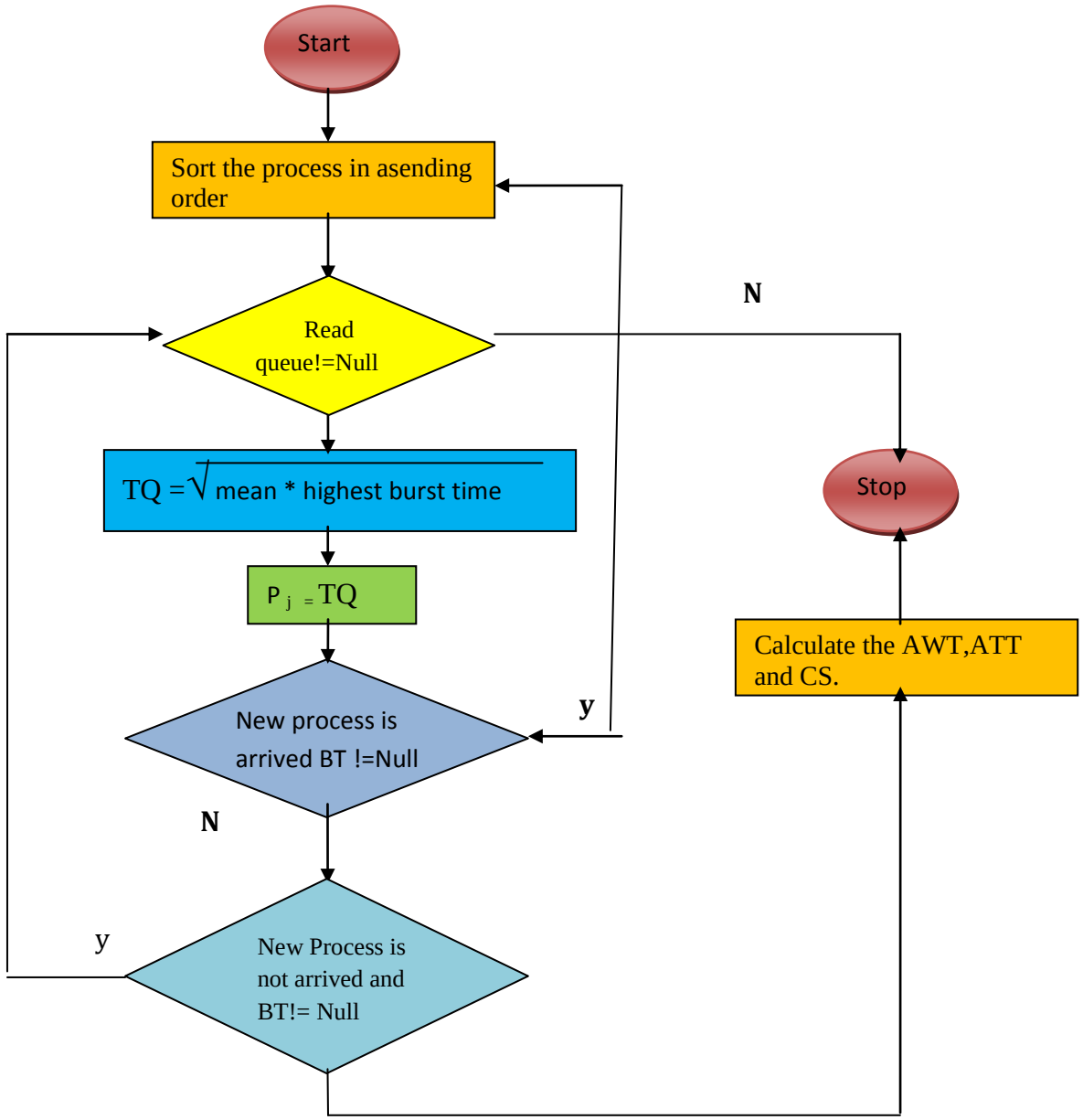
Step7.Start with first process, selection as above as shortest load come first which has minimal average time and other processes are to be in queue

.Step8. Calculates Burst total number of time.

Step9. Display the Related values.

Step10. Now close / Stop process.

3.2 Flowchart



4. Simulation and Result Analysis

In every case we have compare the result of proposed SJF algorithm with the existing RR, FCFS algorithm using java language. The figure 1.Shows the comparisons of these algorithms on the basis of average waiting time. Table 1.shows the sequences according to five processes along with burst time and respective average waiting time for three respective algorithms, such as Round Robin (RR), First Come First Served (FCFS), SJF (Shortest Job First).Here we take arbitrary process burst time. Figure 2.shows the comparisons of the above three respective scheduling algorithms on the basis of average Turnaround Time. Table 2. Shows the sequences according to five processes along with burst time and respective average Turnaround Time for three respective algorithms, such as Round Robin (RR), First Come First Served (FCFS), SJF (Shortest Job First), it is said that our approach shows better performance among them

Table 1. Three different scheduling Algorithm with burst time and average waiting time

Sr No.	Process Burst Time	RR	FCFS	SJF
1.	[15,11,12, 25,7]	39.4	28	20
2.	[10,25,14,13,15]	49	35.4	24.4
3.	[10,27,9,22,11]	37.4	29.4	20
4.	[15,27,16,11,22]	56.2	36.8	28.6
5.	[13,24,9,17,19]	49.6	31.8	25.6
6.	[23,14,22,12,19]	59	36	30

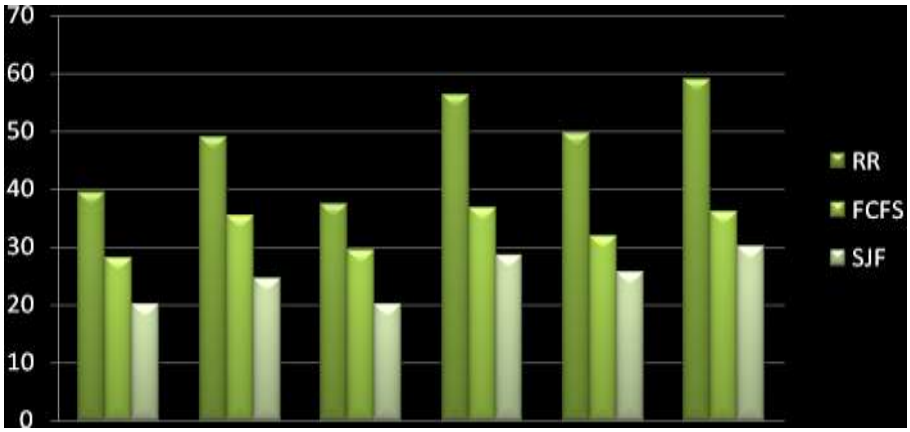


Chart -1 Comparision of Average Waiting Time Three Different Scheduling Load Balancing Techniques

Table 2. Three Different Scheduling Algorithms with Along With Burst Time and Turnaround Time

Sr No.	*Process Burst Time*	*RR*	*FCFS*	*SJF*
1.	*[15,12,11,25,7]*	*53.4*	*42*	*34*
2.	*[26,14,10,15,13]*	*64.4*	*51*	*40*
3.	*[10,27,9,22,11]*	*51.8*	*43.6*	*34.4*
4.	*[16,15,22,27,11]*	*74.4*	*55*	*46.8*
5.	*[17,24,9,13,19]*	*66*	*48.2*	*42*
6.	*[23,12,22,19,14]*	*77*	*54*	*48*

Comparision of Average Turnaround Time

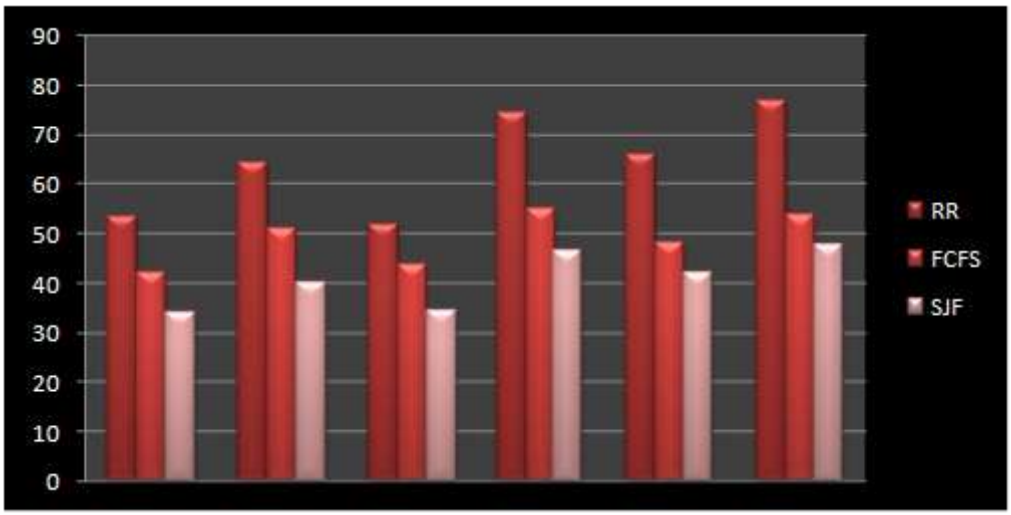


Chart 2:Comparison of Average Turnaround Time of Three Different Scheduling Load Balancing Technique

3. CONCLUSION

In the presented work, an enhancement over the Shortest Job First scheduling is Compassed in a cloud environment. The center of this paper is various Scheduling algorithm like shortest job first Scheduling Algorithm, Round Robin scheduling algorithm and FCFS Algorithm to achieve the minimum makespan time. The result shows that both average waiting time and average Turnaround Time are very less in case of SJF scheduling which helps to improve the performance of the system and maintain an efficient load balancing with very fast manner. But SJF faces some difficulties, such as the burst time of the process have to predict before CPU start the execution. But it is quite impossible to predict the burst time of the process complete execution and if processes did not finish their execution in predicted burst time then in which algorithm process will execute.

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