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An Efficient Task Scheduling for Multicloud Computing

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Abstact: *The cloud computing is steadily retrieved by miscellaneous users. On the other hand as the amount over the server increments, in such instance to achieve the operational account time some scheduling algorithm is mandatory. Task scheduling in cloud computing is a best-known problem that has been paid attention. This is again more challenging, especially for multicloud computing environment. This paper present the Shortest Job First algorithm, Round Robin algorithm and First Come First Serve Algorithm for task scheduling in multicloud computing.A good task and resource scheduling mechanism must satisfy the QoS requirement of the user and at the same time make an efficient utilization of resources. This paper present an algorithm which tries to achieve application high availability, and minimum makespan, minimum response time and completion time.This paper aims to improve the shortest job first scheduling algorithm in the cloud computing. In tasks scheduling the most important parameters are makespan and response time. Therefore, proposed a Shortest Job First algorithm (SJF) to minimize the completion time of the last task (Makespan) and minimize the average response time with maximizing the resources utilization. We compared the result of proposed algorithm SJF with Round Robin and FCFS. The performance of SJF is better compared to Round Robin and FCFS.*

Keywords: *Cloud Computing, Shortest job First Scheduling, Round Robin scheduling, MakeSpan Time, Response Time, Completion Time.*

I. Introduction

Cloud computing is at this time one of the fastest developing and supreme popular areas of Computer Science and Information Technology. Contrasted with the conventional computing model, the cloud offers numerous advantages as far as execution, adaptability, consistency, profitability and independence is concerned.

The main components in cloud computing are users, resource providers, and task/job scheduling which contains the user request and scheduling strategy. The concept of scheduling means the particular amount of time a resource is assign to the task or job. The various scheduling algorithm are available which is responsible for assign the resources to the requested task in a multicloud environment based on quality of services[2]. Various task are distributed to the various resources in order to maximize the services. But it is the challenging process to scheduling on multicloud computing.

In cloud computing Software as a Service (SaaS) its a first model which is integrate the cloud provider maintaining and installing the software within the multicloud. Customer operate the software from cloud client vie Network[6]. Multi Tenant, Flex Tenancy, Single Instance, Multi Instance this are the four important concepts in SaaS. One of the cloud service is Platform as a Service (PaaS). In PaaS method of cloud computing allow user/customer database services and with application platform. The next cloud computing service is Infrastructure as a Service (IaaS). In the IaaS all the physical device or hardware is Virtualize and done by using IaaS Service.

In this paper present the SJF (shortest job first) algorithm, RR (Round Robin algorithm) and FCFS for the task scheduling in multicloud computing. The multicloud has its own challenges. SJF algorithm select the shortest task for scheduling in the multicloud computing. Where in the Round Robin task scheduling algorithm are uses the time quantum method for scheduling the various task in mulicloud computing[7]. FCFS, This algorithm execute the job which come first. The particular time given to each and every single task for there execution. The multicloud computing platform need to fulfill some solution on makespan time, response time and Finish Time time.

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, costing, 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].

II. Related Work

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, cost, coustomer satisfaction, QoS, etc.

Tamanna Jena, J. R. Mohanty,2017"GA-Based Customer-Conscious Resource Allocation and Task Scheduling in Multi-cloud Computing"[1]. In this paper the This algorithm give the minimum makespan time and minimum cost. Both the parameters are important to satisfy the coustomer needs.Scalability of the simulated multi-cloud environment is considerably high. Data locality cost, latency arbitration, energy consumption and running cost of multi-cloud environment are out of the scope of the simulated scenario[1].

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.

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.

H. Wu, X. Hua, Z. Li, and S. Ren, 2016 "Resource and instance hour minimization for deadline constrained DAG applications using computer clouds"[6]. 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.Ronak R Patel, Kaneria Ojasvee and R K Banyal,2016,"Analysis and Improvement of Load Balancing in Cloud Computing"[12]. This algorithm gives the better response time with Round Robin algorith.Experimental results shows that the proposed algorithm takes little in total task completion cost, and it balances the whole system load effectively.

Li Liu, Zhe Qiu2017, "A Load Balancing Algorithm for Vertual Machine Scheduling in Cloud Computing"[5]. With respect to existing Round Robin the proposed algorithm produce better result.Numerical results showed the potentially higher performances obtained by the proposed algorithm, compared to the greedy approach: the static resources are better exploited, leading to an increase of the CMB total expected revenue.

Shubham Mittal, Avita Kata 2016, "An Optimized Task Scheduling Algorithm in Cloud Computing"[9]. This algorithm compared with min-min algorithm and min-max algorithm.This algorithm gives the minimum makespan time.The results obtained after simulation shows the effectiveness of NMOMXS over Min-Min and Max-Min algorithm over different scheduling metrics. From the results it is clear that our proposed approach outperforms Min-Min and Max-Min by maintaining trade-off between conflicting objectives

Ronak R Patel, Swachil J Patel ,2016 "Improved GA Using Population Reduction Load Bancing in Cloud Computing"[12]. HBB-LB algorithm gives the better performance in case of response time and makespan time.e integrated the requirement-aware load selection policy, the most remaining load first, into SSS and DSS to handle the contention among different loads with divers computation requirements. Performance evaluation has been done via numerical studies and simulations.

J. Jonasson, and E. Norgren 2016,"Investigating a Genetic Algorithm Simulated Annealing Hybrid Applied to University Course Time Tabling Problem"[7].FCFS, Round Robin algorithm are compared with Genetic Algorithm and proposed algorithm produce the minimum response time result. solutions are better if some of the parameters are increased, inflicting a greater overhead and leading to results identical or worse than the ones obtained with the FIFO scheduler. Genetic scheduler works better if the difference between map tasks input sizes is greater

Kaneria Ojasvee and R K Banyal(2016). "Analysis and Improvement of Load Balancing in Cloud Computing"[13]. International Conference on ICT in Business Industry & Government (ICTBIG). The algorithm in this paper result in load balancinggives better result than other scheduling algorithm.

III. Proposed Work

The presented work is an advancement over the non-preemptive existing scheduling algorithm called SJF (Shortest Job First) in a cloud environment. The cloud environment is the most common distributed system, in which numerous clients are associated with the system and the parallel requests are accomplished on the system. In such circumstance, there is the necessity of an effective scheduler that will designate processes for accomplishment from the queue. One of the effective scheduling practice is SJF, but this method rises the starvation for low priority processes or the processes with higher execution time. The presented work is to resolve all these complications and to diminish the waiting time processes.

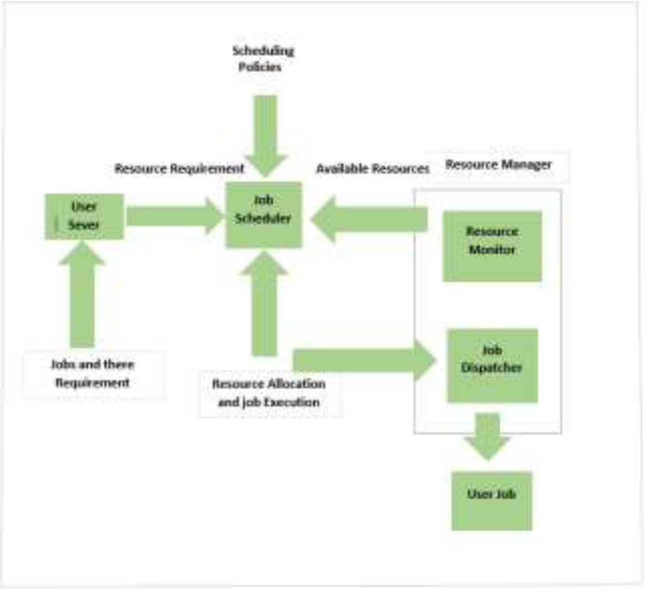


Figure 1. Overview of task scheduling in cloud computing[10]

Cloud computing is paid service for users to use. It has large user groups and there are significant differences between the preferences in user task. All these new features of cloud computing can cause many new problems in the scheduling of cloud task. See Figure 1 for the overview of task scheduling in cloud computing. It can be known from Figure 1 that cloud computing system relies on task scheduler to coordinate user service and resource management. Thus, there’re higher requirements for performance in task scheduling strategy. Users requirements for resources and services shall be paid more attention to.The introduced research work is covering the accompanying examination destinations

The fundamental goal of the work is to outline a powerful procedure scheduling algorithm for multicloud environment so that the waiting time of the procedures gets lessened and the starvation is stays away from. The goal of the work is to outline an easy to use cloud environment to acknowledge the client demands with particular parameters in a successful way. The goal of the work is to characterize a parametric investigation of proposed algorithm with existing SJF regarding waiting time and makespan time. The primary goal of work is to diminish the waiting time of the processes.

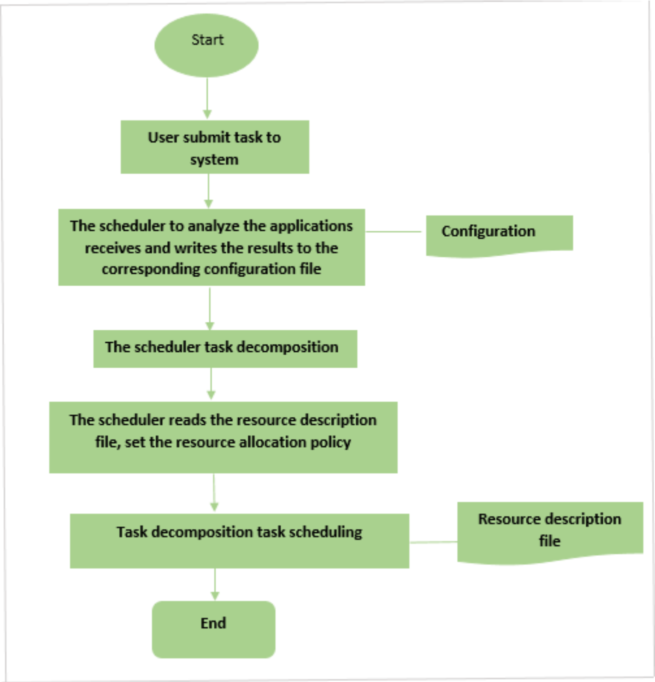

Start
User submit task to system
The scheduler to analyze the applications receives and writes the results to the corresponding configuration file
Configuration
The scheduler task decomposition
The scheduler reads the resource description file, set the resource allocation policy
Task decomposition task scheduling
Resource description file
End

Figure 2. Flow chart of task scheduling.

We can have the flow chart of task scheduling as described (see Figure 2):
Step1. Scheduler analyzes the received application program; identifies application program type; and writes analysis results to application configuration file.
Step2. Scheduler decomposes application program (that is task decomposition).
Step3. Scheduler reads resource description file; selects appropriate resources according to user demand; and set up resource allocation policy.
Step4. According to the set resource allocation policy, tasks shall be mapped to corresponding resources. Task scheduling is executed by this means.

Algorithm for Efficient SJF:
Algorithm 1: SJF (An Efficient Task Scheduling for Multicloud Computing)
Input:

1. Cloudsim toolkit
2. Cloudlet list
3. Virtual machine(VM) list
4. Request task
5. Request VM
6. CloudSim library
7. Create Datacenters
8. Create Broker

Output:

1. Makespan
2. Response time
3. Finish time

Algorithm:

```
    1.  Start
        publicstatic List<SJF1Pojo> main(String[] args) {
        DecimalFormat dft ->new DecimalFormat("###.##");
        SJF1Pojo cl;
        List <SJF1Pojo>cloudList ->new ArrayList();
        Log.printLine("Starting SJF...");

try {
        int num_user -> 1;
        Calendar calendar -> Calendar.getInstance();
        boolean trace_flag >false;
        CloudSim.init(num_user, calendar, trace_flag);
Datacenter datacenter0 ->createDatacenter("Datacenter_0");
SJFBroker broker ->createBroker();
int brokerId -> broker.getId();

    2.  vmlist ->new VmsCreator().createRequiredVms(reqVms, brokerId);

broker.submitVmList(vmlist);
cloudletList->new CloudletCreator3().createUserCloudlet(reqTasks, brokerId);
broker.submitCloudletList(cloudletList);
CloudSim.startSimulation();
List<Cloudlet> newList -> broker.getCloudletReceivedList();
for(int i->0;i<newList.size();i++){
Cl ->new SJF1Pojo();

cl.setVmId(newList.get(i).getVmId());
cl.setResourceId(newList.get(i).getResourceId());
cl.setActualCPUTime(dft.format(newList.get(i).getActualCPUTime()));
cl.setExecStartTime(dft.format(newList.get(i).getExecStartTime()));
cl.setFinishTime(dft.format(newList.get(i).getFinishTime()));
cl.setWaitingTime(dft.format(newList.get(i).getWaitingTime()));
cl.setType("SJF");
cloudList.add(cl);
            }
CloudSim.stopSimulation();                              printCloudletList(newList);
Log.printLine("SJF finished!");
return cloudList;
```

3. Datacenter datacenter ->**new** DataCenterCreator().createUserDatacenter(name, *reqVms*);

```
return datacenter;
SJFBroker broker ->null;
            try {
            broker ->new SJFBroker("Broker");
            } catch (Exception e) {
e.printStackTrace();
returnnull;
            }
returnbroker;
```

4. **End**

IV. Result

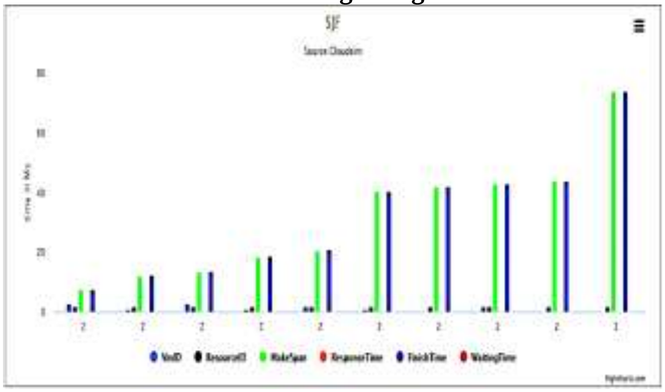
The presented work is a simulation-based work in which scheduling is been performed on multiple user requests. The parameters taken here are the makespan time, Response time, Number of CPU required and the Number of IO required. As all the input are passed, the next work is to process on these input under existing and proposed approach.

cloudSim is simulation toolkits for cloud computing. The default scheduling work provide in clouSim schedules sequentially between a list of virtual machines and a list of task. By extending cloudlet Scheduler Space Shareclass, we can design the proposed scheduling work based on SJF. We used makespan time to evaluate the performance of the default work and the proposed work.

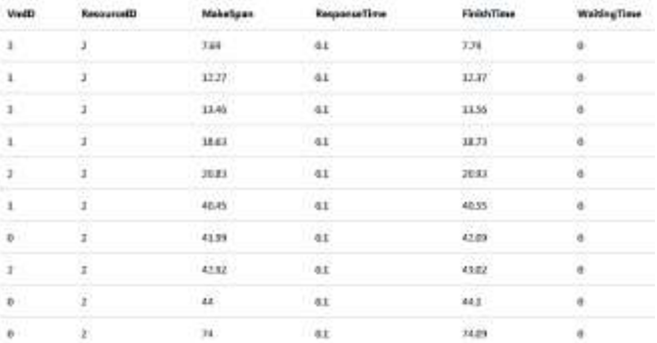
Following are the result in table and graph format for SJF scheduling algorithm, FCFC scheduling algorithm, and RounD Robin scheduling algorithm, withe the parameters are Makespan Time, Response Time and Finishing Time. Here 5 to 10 task are allocated to the VM.

Result show that the SJF scheduling algorithm gives minimum finish time as compare to FCFC scheduling algorithm and Round Robin scheduling algorithm. The response time and Makespan time are also better than other two algorithm.

Task Scheduling Using SJF



(A)

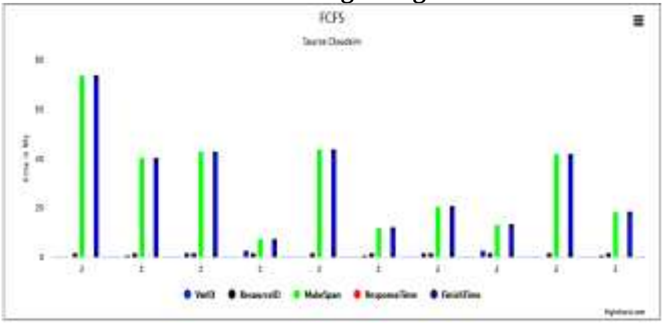


VmID	ResourceID	MakeSpan	ResponseTime	FinishTime	WaitingTime
1	2	7.69	0.1	7.79	0
1	2	12.27	0.1	12.37	0
1	2	13.46	0.1	13.56	0
1	2	18.63	0.1	18.73	0
2	2	20.83	0.1	20.93	0
1	2	40.45	0.1	40.55	0
0	2	41.99	0.1	42.09	0
2	2	42.92	0.1	43.02	0
0	2	44	0.1	44.1	0
0	2	74	0.1	74.09	0

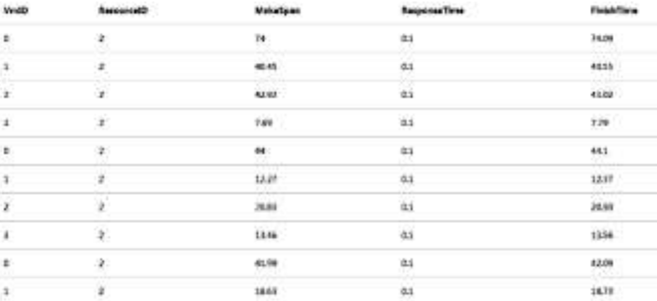
(B)

Figure 3. (A) Shows Graphical Result of SJF Algorithm. (B)Makespan Time, Response Time and Finish Time of SJF algorithms.

Task Scheduling Using FCFS



(C)

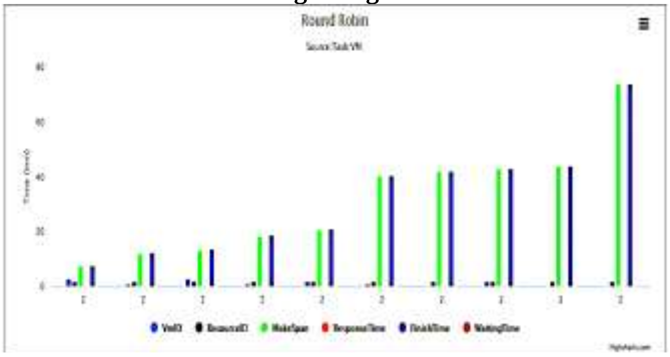


VmID	ResourceID	MakeSpan	ResponseTime	FinishTime
0	2	74	0.1	74.09
1	2	40.45	0.1	40.55
2	2	42.92	0.1	43.02
1	2	7.69	0.1	7.79
0	2	44	0.1	44.1
1	2	12.27	0.1	12.37
2	2	20.83	0.1	20.93
1	2	13.46	0.1	13.56
0	2	41.99	0.1	42.09
1	2	18.63	0.1	18.73

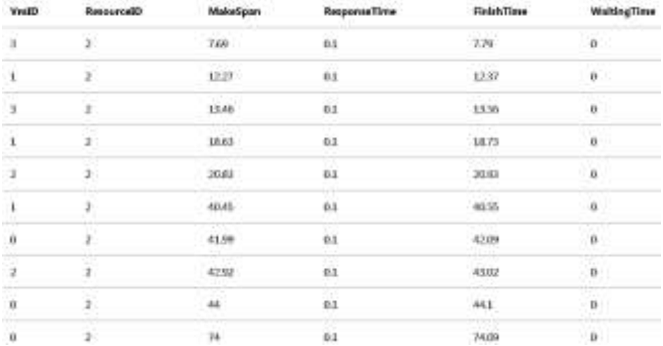
(D)

Figure 4. (C) Shows Graphical Result of FCFS Algorithm. (D)Makespan Time, Response Time and Finish Time of FCFS algorithms.

Task Scheduling Using Round Robin



(E)



VmID	ResourceID	MakeSpan	ResponseTime	FinishTime	WaitingTime
3	2	7.69	0.1	7.79	0
1	2	12.27	0.1	12.37	0
3	2	13.46	0.1	13.56	0
1	2	18.63	0.1	18.73	0
3	2	20.83	0.1	20.93	0
1	2	40.45	0.1	40.55	0
0	2	41.99	0.1	42.09	0
2	2	42.92	0.1	43.02	0
0	2	44	0.1	44.1	0
0	2	74	0.1	74.09	0

(F)

Figure 5. (E) Shows Graphical Result of Round Robin Algorithm. (F)Makespan Time, Response Time and Finish Time of Round Robin algorithms.

V. Conclusions

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, minimum response time and Finish Time time. Also examine the cost of the various scheduling algorithm with there CPU and resource utilization on multicloud computing. The base algorithm used by the scheduler is the Shortest Job first and evaluated it in multi cloud simulator with the number of task varying from 5 to 10. The work demarcated in this research is concentrated on the waiting time and the Makespan problem in a cloud system. The proposed SJF Algorithm is first algorithm to diminish the waiting time and makespan of processes. The result of proposed work demonstrate the effectiveness of the algorithm.

VI. Future Work

Cloud computing is the vast concept and scheduling is the very important role in case of cloud computing. There is a huge scope of improvement in this area. In this paper discuss only few parameters. Proposed new scheduling algorithm the can be applied to cloud but there are still other scheduling algorithm the can be applied in cloud computing environment. The performance of the given algorithm can also be increase by varying different parameters.

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