

A Survey on Heterogeneous Resource Scheduling Algorithm in Cloud Computing

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ABSTRACT

Cloud computing is a distributed computing model. This model provides the dynamic service for scheduling task in virtual machines over the internet. The task scheduling and allocation of virtual resource used in distributed dynamic environment. There are more many standard algorithms are used in dynamic service. The virtual resource is specialized in high communication cost and time. This paper presents a comparative analysis of ABC, FIFO, RR, SJF, Priority tasks and merits, demerits scheduling algorithms in the cloud platform; above the algorithms used allocate resources to virtual machines, it varied the cost, time ,speed efficiency time of allocation.

Keywords : Cloud Computing, Virtual Machine, ABC, FIFO, RR, SJF Algorithms

I. INTRODUCTION

A cloud computing is an essential component of the advanced computing system. The computing concepts, technology, and architecture are combined to gather for the goal. Job scheduling is one of the main activities in virtual machine technology, it upcoming latest technology for the cloud. The goal of scheduling, maximizing the resource allocation, minimizing the total number of task execution time. The resources are optimizing the solution to adaptable resource job with sequence time order. The task scheduling schedule for the distribution system, grid system, parallel system. It's emulated many issues for all of the system. There are various types of scheduling algorithms, such as static, and dynamic, preemptive, non-preemptive, centralized and distributed exist. Actually, the cloud service is a virtual product of a supply chain. The service scheduling classified into two types such as (a) User level scheduling (b) System level scheduling.

User Level Scheduling: User level scheduling problem born on between the providers and customers. It mainly focuses the economic concerns, user requirements and demand, competition among the consumer and cost minimizing the under consumer performance.

System Level Scheduling: It handles resource management in cloud datacenters, the customer point of view. These improve the system utilization, real time satisfaction, resource sharing, fault tolerance etc.

From these various scheduling techniques are used for task scheduling. The CloudSim tool helps of simulation every task, the result obtained reduces the total turnaround time, makespan and also increase the speed. The algorithm has three phases; the process consisting of matching, allocating and scheduling. The allocating stage fills the gap between matching and scheduling. The Scheduling can be classified three stages.

Stage1: Determining a resource and filtering them.

Stage2: Choose an object resource.

Stage3 Submission of a specified task to a target source [1]

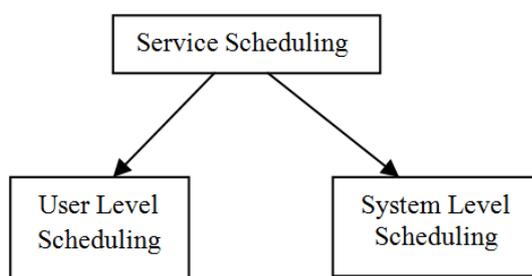


Figure 1. Service Scheduling Types

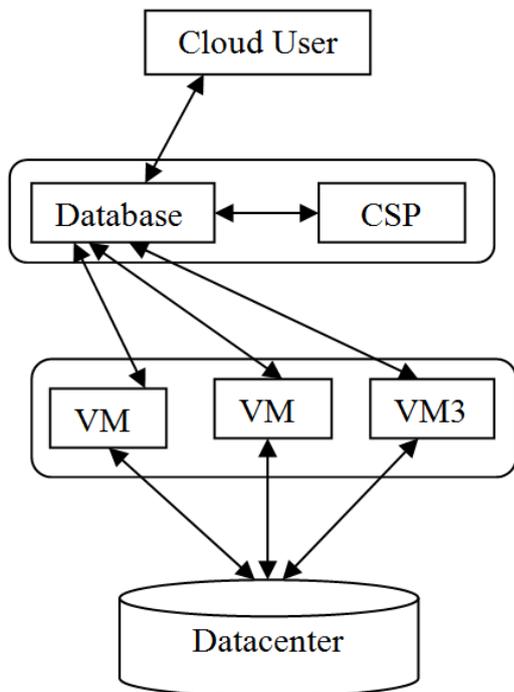


Figure 2. Job Scheduling stages

II. RELATED WORKS

Er.Geetinderkaur et al., [2] the author proposed the Hyper-Heuristic scheduling algorithm. It is a combination of two low levels scheduling algorithms FIFO and Max-Min. It finds the optimal solution of the job, and reduced the calculated time. It consists of two operators (a) **Diversity detection operator**-Automatically detected the algorithm is select. (b)**Perturbations Operator**-this algorithm is to optimize and improve the makespan time. HNSA is applied to job scheduling is minimize the average makespan time.

Dr.Thomasyeboah et al., [3] designed the new algorithm RRSJF, This algorithm using the following factors Context Switches, Average waiting time, Average turnaround time. It is more efficient than Round Robin algorithm. It reduces the starvation of processes of at the CPU burst by assigning higher priority.

Medhat Tawfeek et al., [4] the author proposed the Ant colony of FCFS and RR algorithms with the cloudSim toolkit. This both algorithms are minimizing the makespan time in given task. The compare ACO, RR, FCFS average makespan time ,automatically increase the quantity of task. This improves and compares the ACO algorithm is better than RR and FCFS algorithms.

S.Swathi et al., [5] the author designed the ABC algorithm and CloudSim tool. This algorithm main objective reduces the makespan and response of data processing time. It is helpful for preemptive scheduling job; the highest priority of the job.

Dr.Amit Agarwal et al., [6] the author proposed framework algorithm for FCFS, Round Robin, Generalized priority algorithms. The scheduling stages categorized as, Resource discovering, filtering, Task submission .The CloudSim tool used to find the optimum value VMs task. This tool supports the job host, virtual machine resource allocation, and scheduling, resource provider. The result is compare proposed algorithms are better than FCFS and Round Robin algorithm.

Monica Gahlawat et al., [7] the author designed the CPU scheduling algorithms. It is focused two common CPU algorithms such as FCFS, SJF. Each job set priority and sequential order. It helps to find out the best VM to run the application, used the parameter as size, bandwidth, and cost of VM. It is reduced that SJF turnaround time, waiting time-based on the size of the task.

Javed Hussain et al., [8] author proposed ABC, ABC-LJF, ABC-FCFS, and ABC-SJF algorithms. It is used an analyzed the VM loads balancing and reduced the makespan of data process time. These algorithms combined the job and VM performance is more improvement in scalability. It is based on the number of process time.

Swathi Patel et al.,[9] the author proposed priority based job a scheduling algorithm, it mainly focuses on resource bandwidth, memory . To reduce in job completion time .It is calculated mathematical models for Multi-Criteria decision-making (MCDM) and Multi-Attribute decision-making (MCDM).These algorithm issues are complexity, consistency and finishing time.

III. Various Approaches of Virtual Machine Heterogeneous Scheduling Algorithm

Scheduling Methods:

(a) **Preemptive Scheduling Methods;** the job which is in processing can be Stopped or On hold (b) **Non-Preemptive Scheduling Methods;** the job which is in

execution cannot be stopped until the program execution finishes (c) **Static Priority Algorithm;** Priority cannot be changed (d) **Dynamic Priority Algorithm** user can modify the Priority[17].

The scheduling algorithm applied to between the cloud users and service provider process. These types of algorithms designed and can perform the load balancing and resource allocation, scheduling the task on the Virtual machine [11].The virtual machine scheduling algorithms to solve the job store, execute and reallocate data problems. This type of problem can be categories **Single Cloud Environment:** VM is scheduled within an infrastructure and provides the multiple datacenter, distributed geographically. **Multi-Cloud Scenarios:** It is a cloud infrastructure, the work load assigned to another infrastructure. It consists of improving the service availability [12].

3.1 Introduction to ABC algorithm

Artificial Bee Colony algorithm developed by Dr.Karaboga in 2005.It is used for resolving the optimization scheduling problems.

3.1.1) Step for ABC Algorithm

This algorithm computes the foraging behavior of honey bees. It has three phases. **Scout bee:** It is finding new food randomly. **Onlooker bee:** estimate the fitness and select the greatest food source. **Employee bee:** It searches the food source around the area and shares the information to the onlooker bees.

ABC algorithm used to find the optimization problem based on jobs scheduling. This algorithm contains single background female and male known as Drones.

This algorithm starts the scout bees for initial populations, first, the bees choose randomly from space. Then, suitable is space planned for bees. The highest suitable is chosen as “**selected bees**” and remaining bees are workers. The particular bees alone walk the site by select neighbors search.

3.1.2) Pseudo coded [13]

Begin

Compute the populace of the scout bees generate randomly scout bees into the food sources and calculate the suitability values

Repeat

1. Each the employed bees search around the food sources and update the new suitable value if the new suitable value is better than the old value
2. Select employee bees and recruit onlooker bees to search around the food sources and compute on their proper values.
3. Choose the onlooker bees with have the best fitness value.
4. Send scout bees into the food sources to discover new food sources

Until (Stopping criterion is not met)

End

3.1.3) Application

It is quite simple and flexible, robust and Neural networks training for the XOR Problem , Scheduling resource to a virtual machine, Resolve the continues problem ,Vision and image analysis.

3.2 Introduction to Round Robin Algorithm

Round Robin algorithm is similar to FCFS for the time sharing Systems. It is a small unit of time used to allocate to the job such as called time slices or quantum. Each process is read to work circular queue with time interval up to 1-time quantum. Actual time quantum is 10-100 milliseconds. When the task assigned to the virtual machine form of circular order with equal portions. The Round robin algorithm categorized two types (a) **Preemptive Round Robin Algorithm;** do not finish with in a time quantum before time expires. Then next job is waiting on the circular queue. (b)**Non-Preemptive Round Robin Algorithm;** The task completed within a time quantum, it is voluntary release the CPU process.

3.2.1 Merits

If preemptive systems guarantee of reasonable, response time, starvation free, it can be improved the parameters like incoming the rate of jobs, cost of resource and communication, makespan [9]

3.2.2 Demerits

The largest job takes enough time for completion. Any point of time some servers may be severely loaded and others remain idle. It simply works on time slicing; it allocates the load on various nodes on bases of time for without considering the need of resource [6].

3.2.3) Pseudo coded [14]

1. RoundRobinVmLoad Balancer maintains an index of VMS and state of VMS (bus/Available).
At start, all VMs have zero allocation
2. a) The datacenter controller data receives the user request/cloudlets.
b) It Store the arrival time and burst time of the request
c) The request are allocated to VMs on the basis the of their states know from virtual machine queue
d) The round robin load balancer will allocate the time of quantum for user request
3. a) the round robin load balancer will calculate the turn – around time of each process
b) It also calculates the response time and average waiting time of user request.
c) It decides the Scheduling order.
4. after the execution of cloudlets, the VMs de-allocated by RoundRobinVmLoadBalancer
5. The datacenterdatacontrolor check for new /pending/waiting for a request in the queue.
6. Continue from step-2

3.3 Priority Scheduling Algorithm

Priority scheduling algorithm each task assigned a priority order and allowed to run. It supposes two or more process same priority over queue to run FCFS order. The priority fixed range as 0 and 7, 0 represent the highest priority, 7 represent the lowest priority. These algorithms can be defined either internally or external measure. The **internally priority** use of measure time limits, memory, File, I/O requirements. The **external priority** measure of the important process, amount to funds pay for computers use.

3.3.1Preemptive priority algorithm

If the priority process is the new arrival, whenever higher priority is currently running.

3.3.2 Nonpreemptive priority algorithm

When the new processes assign the head of the queue and ready to run.

3.3.3 Merits

Task priority order wise job allocated and run the resource

3.3.4 Demerits

Indefinite blocking (starvation), more than highest priority tasks load into CPU, it can be an idle stage (Wait the system long period of time).

3.3.5 Pseudo coded [15]

1. Input: UserServiceRequest
2. //call Algorithm to form the list of task based on Priorities
3. Get global Available VM t and User List and also available Resource List from each cloud scheduler
4. // find the appropriate VM List from each cloud Scheduler
5. If $AP(R, AR) \neq \phi$ then
6. // call the algorithm to load balancer
7. Deployable=load-balancer (AP(R, AR))
8. Deploy service on deployable VM
9. Deploy=true
10. Else if R has advance reservation and best-effort Task is running on any cloud then
11. // Call algorithm for executing R With advance reservation
12. Deployed=true
13. Else if global Resource Able to Host Extra VM then
14. Start new VM Instance
15. Add VM to Available VM List
16. Deploy service on new VM
17. Deployed=true
18. Else
19. Queue service Request until
20. Queue Time > waiting Time
21. Deployed=false
22. End if
23. If deployed then
24. Return successful
25. Terminate
26. Else
27. Return failure
28. Terminate

3.4) First Come First Server

FCFS algorithm called as FIFO, Run-to-Completion, Run-Until-Don, It is the simplest scheduling algorithm and implement easily, minimize the context, switch overhead problems.

3.4.1 Preemptive FCFS Algorithm:

The process entire in CPU, that process keeps until it releases the CPU based on terminating or requesting I/O.

3.4.2 Non-Preemptive FCFS Algorithm:

The CPU is free it is assigning the process is at the head of the queue to running.

3.4.3 Merits

Long time processes, Minimum overhead, No starvation.

3.4.4 Demerits

The Very small task should wait for turning and come to utilize the CPU.

3.4.5 Pseudo coded [16]:

1. Initialize Tasks.
2. The first tasks assigned to the queue and add tasks up to n numbers.
3. Add next task 'I' at last position in the main queue.

3.5.2 Non-Preemptive SFC Algorithm

When the CPU is free, it is assigning the new process also estimated the completion time of jobs to run next.

3.5.3 Merits

It can be improving the optimal solution to a given set of task that is minimizing the waiting time

3.5.4 Demerits

It can be or may not be starvation for the longest job.

3.5.5 Pseudo coded [16]:

```

for i = 0 to i < main queue-size
  If task i+1 size < task i size then
    Add task i+1 in front of task i in
    the queue
  End if
  If main queue-size = 0 then
    Task i last in the main queue
  End if
End for
    
```

3.5) Shortest Job First Scheduling

SJF algorithm also called the shortest job Next (SJN) or Shortest Process Next (SPN).it is one of the scheduling algorithms is used to choose the job of the smallest execution times. If the job is the smallest time placed in first whereas longest placed in last with the lowest priority [16].FCFS and SJF both algorithms are non-preemptive, because does not useful in timesharing environment. It is specialized in for batch jobs of for the run times.

Difficult of SJF is

1. Knowing the length Of CPU
2. The list of all the process arrival of same time

SJF may be preemptive or non-preemptive process based on job arrival time.

3.5.1 Preemptive SFC Algorithm

The new process arrives with CPU burst length less than remaining time of currently executing a task is preemptive. It is called as Shortest Remaining -Time-First (SRTF).

IV. Comparison of Scheduling Algorithms

TABLE 1

Scheduling Algorithm	Scheduling Parameter	Type of Systems	Complexity	Scheduling Factor	Environment
ABC Algorithm	Shared time. Space and cost, resource	-	Difficult Code	Various task	Cloud
Round Robin algorithm	Size And Time	Time Sharin g	Depends upon the size of time quantum	An array of job	Cloud And Grid
Priority Scheduling algorithm	size, memory, bandwidth schedulin g policy	Batch and Time sharin g	Difficult to Understand	Priority to each queue	Cloud
FCFS algorithm	Time and incoming task	Batch	Simple	An array of job	Cloud
SJF algorithm	Arrival time, process time, deadline and I/O requireme nt	Batch	Difficult to understand and code	An array of small size of job	Cloud

V. V.CONCLUSION

This survey paper is contributed the several of algorithm mainly focused. To summarize the algorithms parameters, job executes environment, types of job, it is used to reducing the makespan time, waiting for time and complexity of the code. The above the algorithm generally used the following factors cost, the size of the task, time, memory; it can resolve optimum solution problem and resource allocation problem.

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