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SORTED BURST TIME AVERAGE ROUND-ROBIN ALGORITHM (SBTARRA)

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Abstract

Cloud computing is a technology changing the way of using data, software, platform and infrastructure on a user demand on pay basis which provides high performance with huge storage services and high scalability which uses virtualization technology, provide the available shared pool of resources present on cloud to the requesting user. Cloud Computing is shifted from buying of product to pay per model as the user requirement and demand. The foremost goal of cloud computing is to offer efficient access to geographical distributed resources remotely. To host an application in real cloud environment is a costly process. So for these different types of simulation tools are available like CloudSim, CloudAnalyst, GreenCloud, iCanCloud, EMUSIM, GroudSim etc. In computer, task scheduling is a method of arranging the submitted task into a particular sequence for execution. There are thousands of jobs to be executed by the resources available on cloud data centers to achieve minimum time, high performance and the proper utilization of CPU and resources. To overcome with these challenges there is a requirement of efficient job scheduling algorithm that minimizes the response time and gives high performance. Different job scheduling algorithms have different perspective and principles. The entire job scheduling algorithms covers some performance metrics.

I. Introduction

In last few years Cloud computing is everywhere. Cloud will definitely catch our eyes in every field whether it is business institute, industry, academics, research Instructions. Cloud computing is a pay-as-you-go utility

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model it means cloud users can access different resources like servers, data, storage, software, hardware, databases, analytics, network component on demand on pay basis, it is also called a provider of dynamic service using huge and virtualized components. The foremost aim of cloud computing is to offer dynamic access to geographical distributed resources remotely .A cloud is collection of interconnected virtualized computers which may be parallel, distributed or grid computing systems based on service level agreements(SLA). There are primarily four types of cloud deployment models, including Hybrid cloud, Community cloud, Public cloud and private cloud. The model for cloud computing is shown in figure1 [1].

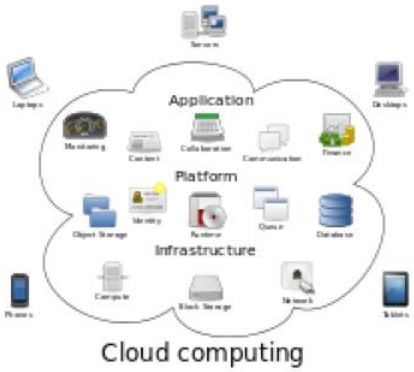

Figure 1. Cloud Computing Model.

There has been a different form of scheduling algorithms in cloud, task Scheduling plays an important role. An important issue in cloud computing atmosphere is scheduling the jobs to be executed in efficient manner. The main purpose of job scheduling is to optimize response time, maximize resource use and reduce work processing time. Scheduling is as significant issue in cloud computing because the cloud facility supplier has to provide services simultaneously to many customers.

The key technology behind cloud computing is virtualisation. This technology changes the way requests are handled by the end-user. Tasks are assigned to Virtual machines. It is very typical to assign the job to virtual machines manually since cloud is elastic environment so we have to require an efficient job scheduling algorithm to provide the task to the cloud resources. These machines can be serving as the collection of task and

physical resources like RAM, Bandwidth, and CPU. This paper presents a analysis study of several task scheduling algorithms in cloud environment Including: RR, MRRA with a case study on Sorted Burst Time Average Round-Robin Algorithm (SBTARRA). It is advisable to use the proposed SBTARRA for tasks scheduling in cloud computing, because it reduces the average waiting time and turnaround time keeps the decent features of the Round Robin such as fairness, avoiding starvation, based on simple rule, dynamic based on CC environment situations.

Tasks scheduling steps are modeled as illustrated in Figure 2 [2].

1. A Cloud Center user submits a job to a scheduler.

2. A scheduler interacts with the Cloud Information System (CIS) to get resource information.

3. The scheduler gets the resource information provided by CIS.

4. The algorithm for scheduling performs its role in mapping tasks to the correct resource and submits the task to the winner resource (decision process for allocating a resource).

5. The user obtains the resource identifier Id and uses it via the cloud interface.

6. According to the schedule, the user sends the input data to the resource.

7. The scheduler gets updated information about a cloud's status over time to manage the plan. This information is sent to the user.

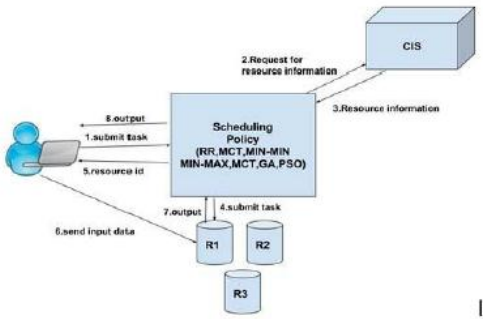

Figure 2. Steps of task scheduling in cloud computing.

2. Round Robin Scheduling Algorithm

In Round Robin the preempted process becomes transferred to the CPU again when all other processes are conducted at their respective times. Round Robin scheduling's effectiveness entirely depends on the chosen quantum time. When the quantity time is too high the algorithm be Comes First Come First Serve (FCFS). On the other side, the turnaround time, waiting time and switching will take significantly more overhead if the quantum is too miniscule.

A lot of RR algorithms have been developed based on dynamic quantum time with technological progress. In this case a dynamic quantum time is chosen instead of a constant quantity time. It may be modified after a process or in a ready queue immediately after. Scheduling is the preemptive process. All the processes get equal share time of CPU. This algorithm is starvation free where there is no process going to die due to CPU unavilabilty.In Round Robin scheduling CPU switches between processes to hold the states of processes which are preempted. After a constant time slot, called quantum at the end of the ready queue, a cycle is blocked and put. In the next section we will discuss the original round robin algorithms, some of the round robin algorithms problem and an analysis of different methods to improve the performance of the round robin scheduling algorithm using dynamic time quantity. Defines a tiny unit of time, a slice of time, or a number. Each running process shall be held in a round queue. This queue is circled by the CPU scheduler and a quantum time interval is allocated for each operation. New processes were applied to the end of the queue. The CPU Scheduler selects from the queue the starting process that sets the timer to interrupt the value and submit the process. If the cycle continues at quantity end then the CPU is preempted and added to the tail of the queue. If it stops before the quantity ends, the process frees CPU willingly. In either case, the scheduler must push the CPU onto the next stage. Whenever a process is handled by the CPU, a context transfer adds a runtime charge.

By Round-Robin

P ID	(AT)	(BT)
Pr1	0.0	45
Pr2	0.0	90
Pr3	0.0	70
Pr4	0.0	38
Pr5	0.0	55

Gantt Chart

Pr1	Pr2	Pr3	Pr4	Pr5	Pr1	Pr2	Pr3	Pr5	Pr2
0	35	70	105	143	178	223	258	278	298

Scheduling criteria		
PID	(TAT)	(WT)
Pr1	188	143
Pr2	298	208
Pr3	258	188
Pr4	143	105
Pr5	278	223
Average	233	173.4

3. Different Round Robin Scheduling Algorithm‘s Analysis

During the review we just looked at CPU dependent processes. Five different processes are analyzed in a uni-processor environment in each test case. The corresponding time of burst and time of arrival of the cycle are known before execution. The whole arrival time and burst time are in

milliseconds. In our research, we test the performance of similar algorithms for several algorithms. Waiting Time and Turn-around time can be calculated using the following formula.

WT = TAT-BT.

TAT = Completion time-Arrival time.

A. Modified Round Robin Algorithm for Resource Allocation based on Average (MRRA) [3]

Procedure

In account to improve the performance of Round Robin algorithm, the algorithm named MRRA proposed by Pandaba Pradhan, Prafullla Ku. Behera, BNB Ray. This algorithm computes and uses an average burst time of processes for every cycle.

The algorithm is as follows:

Algorithm 1. Modified Round Robin Algorithm

Begin

I/P : SR, AR, P_n, BT(Pr), TQ.

Ready Queue New request Pr arrives

Pr Enters ready queue Update

SR and AR

Request Pr is loaded from ready queue into CPU queue to be executed

While (Ready Queue! = NULL) do

Ready Queue Pr Update SR& AR

Load Pr // For Execution

end while

If (Ready Queue = NULL) **then**

TQ =BT (Pr)

Update SR & AR

else

TQ = AVG (BT of all request in Ready Queue) Update SR & AR

// CPU executes Pr by TQ Time

If (Pr terminated) **then**

Update SR & AR

else

Return Pr // To the Ready Queue with its updated

Burst Time (BT) Update SR & AR

end if

B. Self-Adjustment Time Quantum in Round Robin Algorithm Depending on Burst Time of the Now Running Processes (SRBRR ALGO) [4]

To boost Round Robin's efficiency, a SRBRR algorithm is proposed by Rami J. Matarneh. SRBRR measures the phase burst time median and for each loop it is used as the quantum time. Or we might say that TQ= Medium (Ready Queueue BT) measures the quantum time. The median is defined with the equation below.

$$Q = \begin{cases} Y_{(N+1)/2} & \text{if } N \text{ is odd} \\ 1_{Y_{\left(\frac{N}{2}\right)}} + Y_{1+N/2} \mid & \text{if } N \text{ is even} \\ 2 & \end{cases}$$

Where, Y is the number in an ascending order, in the middle of a group of numbers.

Procedure

Step 1. the process based on A.T comes into ready queue.

Step 2. sort the B.T process found on the ready queue.

Step 3. find the quantum on the ready queue with the average B.T of the process.

Step 4. now set quantum time in the queue for all loaded processes.

Step 5. end the process if process B.T-time quantum=0.

Step 6. when process B.T-TIM QUANTUM!=0 put the process at the end of the ready queue. This process has been completed. Continue step 2 to step 6 until all the process is finished.

P1	P2	P3	P4	P5	P2	P3	
0	45	100	155	193	248	283	298

Scheduling Criteria		
P ID	(TAT)	(WT)
Pr1	45	0.0
Pr2	283	193
Pr3	298	228
Pr4	193	155
Pr5	248	193
Average	213.4	153.8

A modified algorithm of round robin: Sorted Burst Time Average of Round Robin (SBTARR)

This algorithm is an updated round robin version designed to increase round robin performance in cloud computing (SBTARR)

Calculates dynamically the time quantity by measuring the higher and lower average of the processes included in the ready queue.

Algorithm:

Step 1: Add the process in the ready queue based on arrival time.

Step 2: On the basis of burst time, sort the process in the ready queue.

Step 3: TQ =(BTmax + BTmin)/2

With the above equation, finding the burst time processes time quantum

placed in the queue.

Step 4: Time quantum is assigned to the processes that are in ready queue.

Step 5: Terminate the process, if the burst time and time quantum TQ=0

Step 6: Set this process at the end of ready queue if process BT –TQ =0. Repeat step2 to step5 until all processes have been finished.

P ID	AT	BT
Pr4	0.0	38
Pr1	0.0	45
Pr5	0.0	55
Pr3	0.0	70
Pr2	0.0	90

Scheduling criteria		
P ID	TAT	WT
Pr1	83	38
Pr2	298	208
Pr3	272	202
Pr4	38	0
Pr5	138	83
Average	165.8	106.2

	P4	P1	P5	P3	P2	P3	P2
0	38	83	138	197	256	267	298

Round Robin Algorithm's Comparability of Different Variants

After evaluating all three algorithms, we found that Sort Burst Time

Average Round Robin Algorithm (SBTARRA) gives better waiting time and turnaround Time for figure values as shown in figure [3].

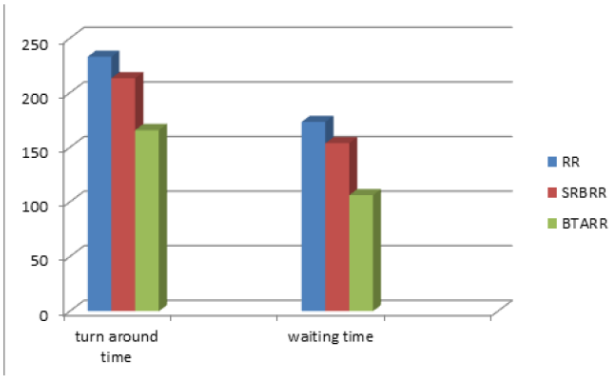

Figure 3

References

[1] https://en.wikipedia.org/wiki/Cloud_computing

[2] Ruba Abu Khurma, Heba Al Harahsheh and Ahmed Sharieh, Task scheduling algorithm in cloud computing based on modified round robin algorithm, Journal of Theoretical and Applied Information Technology, 2018

[3] Pandaba Pradhan, Prafulla Ku. Behera and B N B Ray, Modified round robin algorithm for resource allocation in cloud computing, Procedia Computer Science 85 (2016), 878-890.

[4] Rami J. Matarneh, Self-adjustment time quantum in round robin algorithm dependingon burst time of now running processes, American J. Applied Sciences 6(10) (2009), 1831-1837.