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Variable time Quantum Based Round Robin Policy for Cloud Computing Environment

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Abstract— Cloud computing provides on demand accessibility of resources with transparency.The cloud composed of serveral datacenters and customers may acess the computational resources over a network provisioned by cloud service provider. The challenge in cloud environment is to meeting customers demand succesfully by allocating of computational resources.Scheduling is an important criteria that effects performance of systems.Round robin is a preemptive scheduling policy that effects the performance of systems as it provides fairness in scheduling tasks in cloud environment.The current work is based on the time varying time quatum strategy that deals with maximum cpu utilization and minimizes the waiting time,Tunraronud time,Average turn around time ,context switching and provides better performance.

***Keywords*—**round robin,scheduling,time quantum,cloud computing

I. INTRODUCTION

In the current scenario Cloud Computing is one of the popular technique in the Information Technology (IT) world. This computing offers IT resources like cloud Servers, Storage space, Network, Applications as services, when customers demand and over a internet .Due to flexibility of cloud computing customers may access any resources as pay per use manner. Round robin algorithm executes the job based on time quantum and jobs are placed in the ready queue and context switching occurs, CPU allocated to a job till the value of time quantum. Performance of algorithm depends upon the parameters like TAT, WT, AWT and ATAT. In the current work a dynamic round robin policy is proposed for the execution of cloudlet in cloud environment based on variable time quantum.

II. RELATED WORK

An improved dynamic round robin scheduling based n variant quantum time proposed[1] .This approach conducted a comparison between several round robin i.e Dynamic Average Burst time Round Robin (DABRR),static Round Robin (S.R.R),Self-Adjusted Time Quantum in Round Robin Algorithm (SARR), Dynamic Quantum with Re-Adjusted Round Robin Scheduling Algorithm (DQBRR) in the term of average waiting time, average turn around time & context switching , the quantum time was computed dynamically.

Jayanti Khati [2] presents an improved round robin scheduling algorithms based on dynamic time quantum , compared with TRR and SARR for reducing Average Waiting Time , Average Turnaround Time and CS by using median method .Another approach was [3] proposed that modifies classical round robin by using threshold value method.Raman et al [4] proposed an approach for improving the performance of CPU and compared with SRBRR(Shortest Remaining Burst Round Robin & ISRBRR(Improved Shortest Remaining Burst Round Robin) . This approach uses median & mean method for efficient & dynamic time quantum.

Farooq et al [5] developed an efficient dynamic round robin algorithm. This approach used with the uniform arrival times and different arrival times .This algorithms gives the best result in context switches scenario.

Patel [6] proposed a best possible time quantum for advanced round robin with shortest job first scheduling algorithm. This approach is median based approach to calculate the time quantum & merged the SJF and RR scheduling algorithm ,and new formula derived find out the time quantum .

a modified version of SRBRR was proposed[7] to give better results in the term of Average Waiting Time, Average Turnaround Time & Context switching through median method to calculate the time quantum with the help of median and highest burst time.

Sangwan et al [8] proposed enhanced version of RR i.e an improved round robin scheduling in cloud computing. This approach proved that the best/ worst case of original algorithm is equal to the worst case of proposed algorithm .

Mishra [9] describes an improvement in Round Robin. Improved Round Robin picks the first job from the ready queue and allocate the CPU to it for a time interval of up to 1 time quantum. After completion of job time quantum, it checks the remaining CPU time of the currently running job. If the remaining CPU burst time of the currently running job is less than 1 time quantum, the CPU again allocated to the currently running process for remaining CPU time.

Matarneh [10] performed a work Self-Adjustment-Round-Robin (SARR) based on a new approach called dynamic time quantum, in this approach the time quantum repeatedly adjusted according to the burst time of the now running processes. Processes are first arrange according to the execution time/burst time in increasing order that is smallest the burst time higher the priority of the running process. The smart time slice is equal to the mid process burst time of all CPU burst time described by[11].

Behera [12] proposes a newly improved process scheduling algorithm by using dynamic time quantum along with weighted mean.Kishor and Goyal [13] proposed a median based time quantum scheduling algorithm which is combination of Shortest Job First & Round Robin. H.Behera [14] proposed the summation of mean and standard derviation based time quantum scheduling algorithms which is combination of Shortest Job First & Round Robin. .Bisht [15] performed a work Enhanced Round Robin(ERR), which modified the time quantum of only those processes which require a slightly greater time than the allotted time quantum cycle. The remaining processes will be executed in the conventional Round robin manner.Mohanty & Manas [16] performed a work for a new variant of Round Robin scheduling algorithms by executing the processes according to the new calculated Fit factor „f" and using the concept of dynamic time quantum.Nayak & Kumar Malla[17] performed a work in which a median plus some other value are added in time quantum. This scheduling algorithm was combination of SJF & RR.A priority based Round-robin CPU scheduling algorithm[18] is based on the integration of round robin and priority scheduling. It retains the advantage of round robin in reducing starvation and also integrates the advantage of priority scheduling. The proposed new algorithm also implements the concepts of aging by assigning new priorities to the processes.Behera and Kumar [19] performed a work that gives precedence to all processes according to their priority and burst time, then applies the Round Robin algorithm on it. This Proposed algorithm is developed by taking dynamic mean time quantum into account.A new algorithm Round Robin with Highest Response Ratio next scheduling [20], which uses Highest Response Ratio criteria for selecting processes from ready queue.Zaidi and Rampratap [21] explained fault Tolerance in cloud computing environment. This paper deals with the understanding of fault tolerance techniques in cloud environments and comparison with various models on various parameters .Noon et al proposed a new dynamic Round Robin scheduling algorithm using the mean average as a method to compute a new value for quantum time in each round [22]. The operating system decides the value of quantum time based on the burst time of the existed set of tasks in the ready queue. This algorithm gives a better result in terms of the average waiting and turn-around times compared to the static Round Robin scheme.An Improved round robin scheduling algorithm for CPU scheduling [23] is based on new approach for round robin scheduling algorithm which helps to improve the efficiency of CPU.Improved Efficiency of Round Robin Scheduling Using Ascending Quantum and Minumium-Maxumum Burst Time [24] performed ,in which the Time Quantum studied to improve the efficiency of Round Robin .This new approach was proposed to calculate the TQ, known as Ascending Quantum and MinumimMaxumum Round Robin (AQMMRR).Tanenbaum described[25] process management ,memory management and provided brief overview of scheduling policies in time sharing system.Process management , Memory management , Storage management , Protection and security in operating system well explained in [26,27,28].R. Buyya [29] presents the 21st century vision of computing and identifies various IT paradigms promising to deliver computing as a utility , the work carried out as part of our new Cloud Computing initiative, called Cloudbus , CloudSim supporting modelling and simulation of Clouds for performance studies.Garg and Buyya,[30] extended a popular Cloud simulator (CloudSim) with a scalable network and generalized application model, which allows more accurate evaluation of scheduling and resource provisioning policies to optimize the performance of a Cloud infrastructure.Beloglazov etal.[31,32,33], proposed a Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms proposed CloudSim: an extensible simulation toolkit that enables modeling and simulation of Cloud computing systems and application provisioning environments. The CloudSim toolkit supports both system and behavior modeling of Cloud system components such as data centers, virtual machines (VMs) and resource provisioning policies.

III. BACKGROUND

3.1 Cloud Computing - The cloud computing is a large group of interconnected computers and cloud symbol represents a group of systems or complicated networks. Cloud computing is one way of communication among the various system in the network with the help of internet.Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage.With the advent of this technology, the cost of computation, application hosting, content storage and delivery is reduced significantly. Cloud computing is a marketing term for technologies that provide computation, software, data access, and storage services that do not require enduser knowledge of the physical location and configuration of the system that delivers the services. Cloud Computing is on-demand computing in which we can access any service , resources and application ,platform,software from any location.

Cloud computing provides three service models these are:

Software as a services (SAAS)

Platform as a services (PAAS)

Information as a services (IAAS)

Cloud computing provides four types of deployment model these are:

Public cloud

Private cloud

Hybrid cloud

Community cloud

3.2 CPU Scheduling - Scheduling is the one of the most prominent activities that executes in the cloud computing environment. To increase the efficiency of the work load of cloud computing, scheduling is one of the tasks performed to get maximum profit. The main objective of the scheduling algorithms in cloud environment is to utilize the resources properly while managing the load between the resources so that to get the minimum execution time. CPU scheduling classified into two categories . Non-preemptive scheduling in which a process runs to completion when scheduled.

Preemptive scheduling in which a process may be preempted for another process which may be scheduled. A set of processes are processed in an overlapped manner. Various types of Non- preemptive and Preemptive scheduling are: First-Come, First-Served (FCFS) Scheduling,Shortest-Job-Next (SJN) Scheduling,Priority Scheduling,Shortest Remaining Time,Round Robin(RR) Scheduling and Multiple-Level Queues Scheduling.

Recently, the different approaches are used to increases the performance of round robin scheduling algorithm and reduces the average waiting time (AWT) , average turn around time (ATT) and context switches.

3.3 Round Robin Scheduling - Round Robin (RR) algorithm focuses on the fairness.Round Robin uses the ring as its queue to store jobs. Each job in a queue has the same execution time and it will be executed in turn. If a job can't be completed during its turn, it will be stored back to the queue waiting for the next turn. The advantage of RR algorithm is that each job will be executed in turn and they don't have to be waited for the previous one to get completed. But if the load is found to be heavy, RR will take a long time to complete all the jobs. The drawback of RR is that the largest job takes enough time for completion.In the round robin algorithm, each process gets a small unit of CPU time (a *time quantum*), usually 10-100 milliseconds. After this time has elapsed, the process is preempted and added to the end of the ready queue. If there are n processes in the ready queue and the time quantum is q, then each process gets $1/n$ of the CPU time in chunks of at most q time units at once. No process waits more than $(n-1)q$ time units.

IV. PROPOSED WORK

In the proposed work virtual machine (VM) are allocated to cloudlets according to Round robin scheduling policies. At the initial value of average waiting time (AWT) = 0 , average turnaround time (ATAT) = 0, Burst time (BT) = 0 , Time qauntum (TQ) = 0. The context switching of cloudlets is assumed as a 3 cases i.e decreasing order , increasing order and random order until the ready queue became null. Then we calculate the time quantum with the square root of median and highest burst time. If (remaining CPU burst time < time quantum) then CPU is allocated again to the running cloudlet and if cloudlet finished execution then it will be delete from ready queue. If new cloudlet enter in ready queue then cloudlets are o rganize in these 3 cases and repeated from initially .At last we calculate average waiting time , average turn around time.

Algorithm:-

Step-1 Start

Step-2 Create datacenter , PM, VM , cloudlets with characteristics and attributes.

Step-3 Allocate cloudlets to VM's according to Round Robin Scheduling Policy .

Step-4 For Round Robin we have initialize BT = 0 , AWT = 0 , ATAT = 0 and TQ = 0

Step-5 Context Switching of cloudlets is done in decreasing order until ready queue became null.

Step-6 Calculate the median of CPU burst time of all cloudlets and time quantum is equal to median.

Step-7 Dynamic Time Qauntum is assigned to the cloudlets using formula and CPU is allocated to the first cloudlet enter to the ready queue upto 1 time quantum.

TQ = Ceil (Sqrt (median * highest burst time))

Step-8 The ready queue for the remaining cloudlets are created until C_i > TQ

Step-9 If (remaining CPU burst time < time quantum) then

Step-10 CPU is allocated again to the running cloudlet and if cloudlet finished execution then it will be delete from ready queue.

Step-11 If new cloudlet enter in ready queue then cloudlets are organize in decreasing order.

Step-12 Repeated steps from 5.

Step-13 Now , we are calculate average waiting time , average turn around time.

Step-14 Stop

Case – 1 DECREASING ORDER

We assume five tasks , arriving at time = 0 with decreasing order of burst time as shown in

Table – 1.Burst time in decreasing Order

CLOUDLETS	BURST TIME
C1	87
C2	53
C3	32
C4	21
C5	10

Now , calculating the time Qauntum according to this proposed algorithm:-

TQ = 53

Average Waiting Time = 44.0

Average Turn aroumd Time = 84.5

Table –2. Comparision between Round robin scheduling and proposed algorithm (Case-1)

ALGORITHM	TIME QAUNTUM (TQ)	AVERAGE WAITING TIME (AWT)	AVERAGE TURN AROUND TIME (ATAT)
Round Robin Scheduling	25	111.2	151.8
Proposed Algorithm	53	44.0	84.5

Case – 2 INCREASING ORDER

We assume five tasks , arriving at time = 0 with increasing order of burst time as shown in

Table –3.Burst Time in inceasing order

CLOUDLETS	BURST TIME
C1	15
C2	37
C3	54
C4	63
C5	98

Now , calculating the time Qauntum according to this proposed algorithm:-

TQ = 73

Average Waiting Time = 68.4

Average Turn aroumd Time = 121.8

Table-4. Comparision between Round robin scheduling and proposed algorithm (Case-2)

ALGORITHM	TIME QAUNTUM (TQ)	AVERAGE WAITING TIME (AWT)	AVERAGE TURN AROUND TIME
Round Robin	54	79.2	132.6
Proposed Algorithm	73	68.4	121.8

Case – 3 RANDOM ORDER

We assume five tasks , arriving at time = 0 with random order of burst time as shown in

Table – 5.Burst time in random order

LOUDLETS	BURST TIME
C1	63
C2	89
C3	10
C4	27
C5	44

Now , calculating the time Qauntum according to this proposed algorithm:-

TQ = 63

Average Waiting Time = 54.4

Average Turn aroumd Time = 101.0

Table –6 Comparision between Round robin scheduling and proposed algorithm (Case-3)

ALGORITHM	TIME QAUNTUM (TQ)	Avg. WAITING TIME (AWT)	AVG. TURN AROUND TIME (atat)
RR	**34**	**112.6**	**159.2**
Proposed Algorithm	**63**	**54.4**	**101.0**

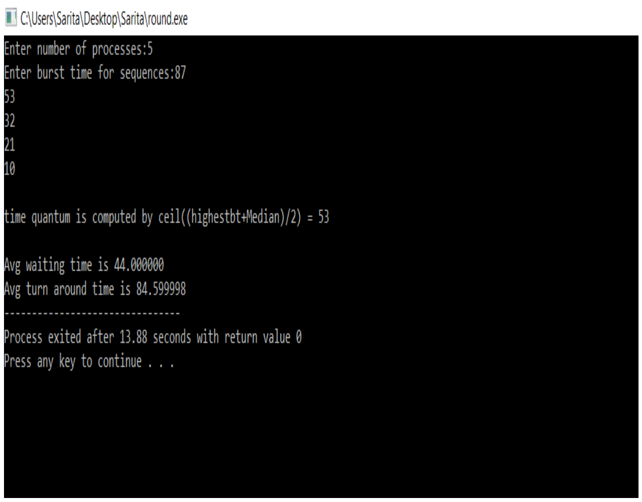

Figure 1: Burst time in Decreasing Order

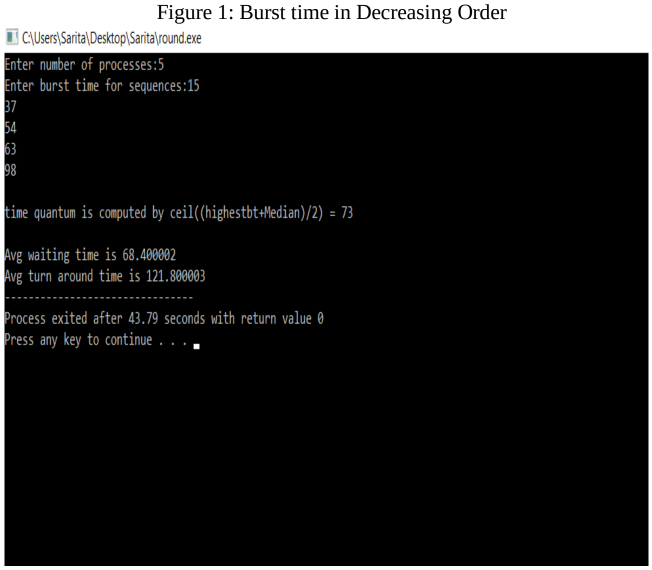

Figure 2:Burst time in Increasing order

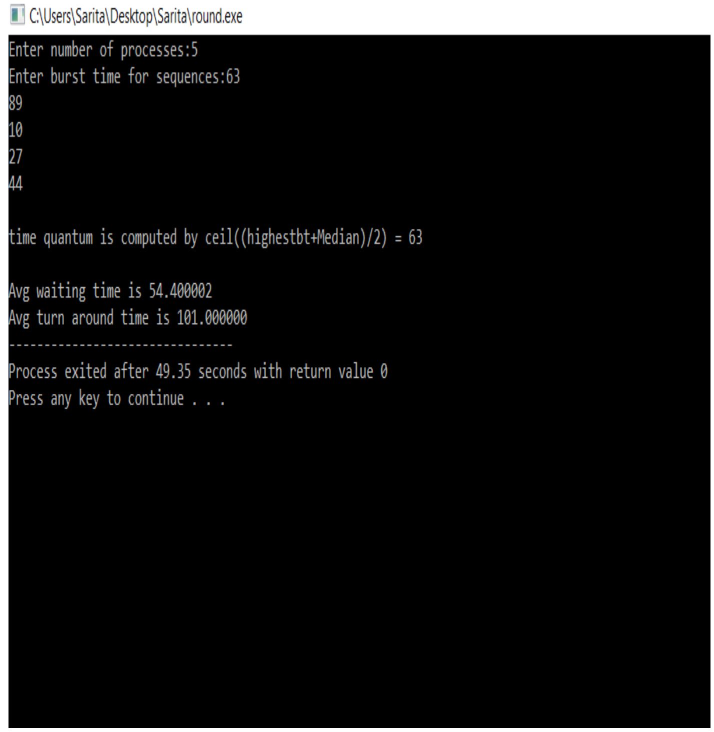

Figure3:Burst time in Random order

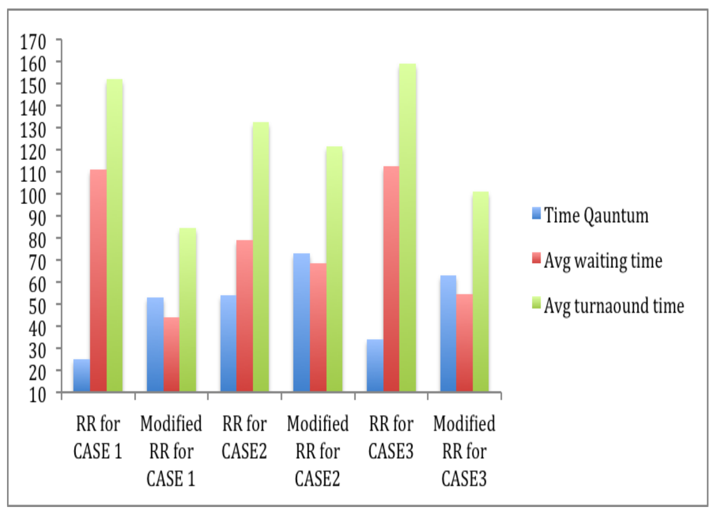

Figure 4. Comparative Analysis of RR and Modified RR

V. Conclusion and Future Scope

As the current work is based on varying time quantum based round robin scheduling approach to execute the task in cloud computing environment.Various cases are represented as execution of tasks has been done by decreasing order of burst time,by increasing order of burst time,random order of burst time and this method is compared with existing round robin scheduling method.It was evaluated from the results that modified round robin is best and efficient to schedule the jobs.

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