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A Comparative Parameters Analysis of Different Round Robin Scheduling Algorithm using Dynamic Time Quantum

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Abstract: ***Scheduling is the most important concept in computer system. The concept of scheduling helps in selection of the process for execution. Selection of process is number of ways. Most popular scheduling techniques are First Come First Serve (FCFS), Shortest Job First (SJF), Priority, Round Robin (RR) etc. These algorithm outputs depends mainly three parameters, first is average waiting time, second average turnaround time and other is context switch. In this paper, we focus on RR scheduling techniques. There are two types, one is RR with static time quantum and other is RR with dynamic time quantum. In this paper we compare with different dynamic time quantum techniques and we show that average mid-max scheduling is the best scheduling technique compare to simple RR, min-max RR and efficient RR.***

Keywords: Scheduling, Waiting Time, Context Switch, Turnaround Time.

1. Introduction

Operating system is one type program that controls the execution of application programs and it's also interface between the user of a computer and the computer hardware [8]. Operating system provides a platform in which user can interact with hardware and execute programs in an efficient manner. Operating system provides various types of services like program execution, I/O operation, file system manipulation, communication and error detection [2]. Modern operating system and time sharing system are more complex, they have involved from multitasking environment in which processes run in synchronized manner [5]. Multiprogramming and multitasking operating system allows more than one process to be loaded into the executable memory at a time and for the loaded process to share the CPU using time multiplexing. The scheduling mechanism is the part of the process manager that handles the removal of the running process from the CPU and the selection of another process on the basis of a particular strategy. Selection of processes is done by the "scheduler" [6]. Many parameter effect the scheduling process such as,

1.1 CPU Utilization

This is measure of how much busy the CPU is. Usually, the goal is to maximize the CPU utilization. Actual CPU utilization varies depending on the amount and type of managed computing tasks [6].

1.2 Throughput

Number of processes that complete their execution per time unit. Throughput is defined as the amount of information passed put through or delivered in a specific period of time [6].

1.3 Waiting time

Amount of time a process has been waiting in the ready queue [1]. It is the time between start time and read time. Usually, the goal is to minimize the waiting time.

1.4 Response time

Amount of time it takes from when a request was submitted until the first response is produced that means time when task is submitted until the first response is received [5].

1.5 Turnaround time

Amount of time to execute a particular process. In other words it is the mean time from submission to completion of a process.

1.6 Fairness

In the absence of user or system supplied criteria for selection, the scheduler should allocate all process must be given equal opportunity to execute [6].

1.7 Priority

It gives preferential treatment to processes with higher priorities [6].

2. Background Work

RR scheduling algorithm working with the many strategy. We discuss different strategy working with dynamic time quantum.

2.1 Round Robin Strategy

In this strategy Round Robin scheduling algorithm working with static time quantum. In Round Robin scheduling algorithm the time quantum is fixed and this time quantum given to every process.

2.2 Min Max Round Robin Strategy

In this strategy, RR scheduling algorithm working with Dynamic Time Quantum rather than Static Time Quantum. In this technique time quantum is a difference between maximum and minimum burst time of processes. This time quantum taken as a dynamic time quantum and applying to each process.

2.3 Efficient Round Robin Strategy

In this strategy, RR scheduling algorithm working with Dynamic Time Quantum rather than Static Time Quantum. In this technique first find out the median and mean value of CPU Burst time of all the processes .then we compare mean and median value. Among them greater value multiply with highest burst time and least value multiply with lowest burst time and then we find square root of it. This value taken as a Dynamic time quantum and apply to each processes.

2.4 Average Mid Max Round Robin Strategy

In this strategy, RR scheduling algorithm working with Dynamic Time Quantum rather than Static Time Quantum. In this technique first we find out mid value of burst time. Dynamic time quantum is the average of the summation of mid and max process. This time quantum applies each process [4].

3. Mathematical calculation

The number of processes and CPU Burst Time (BT) are accepted as input and Average Waiting Time (AWT), Average Turnaround Time (ATT), and number of Context Switch (CS) are produced as output. Let's consider five process (P1,P2,P3,P4,P5) with arrival time=0 and burst time (10,11,12,13,14)as shown in table 1.

Process	*Arrival times*	*burst time*
P1	0	10
P2	0	11
P3	0	12
P4	0	13
P5	0	14

Table 1: Process with burst time

P1	P2	P3	P4	P5	P1	P2	P3	P4	P5

0 2 4 6 8 10 12 14 16 18 20

P1	P2	P3	P4	P5	P1	P2	P3	P4	P5

20 22 24 26 28 30 32 34 36 38 40

P1	P2	P3	P4	P5	P2	P3	P4	P5	P4	P5

40 42 44 46 48 50 51 53 55 57 58 60

Figure 1: Gantt chart RR Scheduling

P1	P2	P3	P4	P5	P1	P2	P3	P4

0 4 8 12 16 20 24 28 32 36

P5	P1	P2	P3	P4	P5	P4	P5

36 40 42 45 49 53 57 58 60

Figure 2: Gantt chart Min-Max RR Scheduling

P1	P2	P3	P4	P5	P4	P5

0 10 21 33 45 57 58 60

Figure 3: Gantt chart Efficient RR Scheduling

P1	P2	P3	P4	P5

0 10 21 33 46 60

Figure 4: Gantt chart AMMRR Scheduling

4. Comparison and Result Analysis

Paper	Time Quantum	ATT	AWT	CS
RR	2	53	41	30
Min-Max RR	4,1	51	39	16
Efficient RR	12,2	36	24	6
AMMRR	13	34	22	4

5. Conclusion

According to Mathematical Calculation, we conclude that AMMRR algorithm give better performance than all other RR scheduling strategy. we can reduce Average Waiting Time (AWT), Average Turnaround Time (ATT), And number of Context Switch (CS).

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