CMPN303

Operating Systems Project

Phase 1 & 2

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Data Structures used

HPF	Priority Queue with process' priority as the queue's priority
SRTN	Priority Queue with process' remaining time as the queue's priority
Round Robin	Queue (Circular)
Memory Block	Binary Tree (Array Implementation)
Waiting list	Priority Queue with process' memory size as the queue's priority

Assumptions

1- We output in 3 files: Scheduler.log, memory.log & scheduler.perf

2- Input files don't contain any negative values

3- Process' IDs are unique and integers only

4- Arrival times are sorted ascendingly

5- Waiting list in phase 2 is a priority queue with higher priority to the less memory size, so waiting processes can join the ready queue if they have the least memory size and can be allocated.

6- No inputs from terminal are zero, negative or floating: Algorithm, Quantum

7- At time instant T, if a new process arrived and a process got preempted, the newly arrived process is enquired first

8- Calculations in scheduler.perf are based on previously rounded figures

Algorithm

1- The process generator reads the input file and generates a scheduler process and clock process and starts the clock

2- The process generator sends the processes one by one to the scheduler

3- The scheduler gets the processes and tries to allocate them in the memory, if it succeeds in that the process joins the ready queue and if it fails it joins the waiting queue.

4- The scheduler forks the processes in the ready queue gets to work in the processor according to the scheduling algorithm which depends mainly on the data structure of the ready queue.

5- The process either gets preempted by the logic of the scheduler or terminates itself if it has finished its computations.

6- When a process terminate and give up its memory we check if the process that has the least memory can now be allocated or not, if it can it joins the ready queue otherwise it stays in the waiting queue

7- The scheduler runs tell it finishes all the processes it has

Algorithm Experiments and results

RR without memory TQ=3

ProcessID	Arrival	Runtime	Priority	Finish	T.A.T
1	0	10	4	31	31
2	0	5	4	20	20
3	0	4	3	21	21
4	4	9	6	34	30
5	5	6	2	30	25

Timeline

- Each time slot = 1 time unit

1		1	2	2	2	3	3	3	1	1	1	4	4	4	5	5	5	2	2	2	3	3	3	1	1	1	4	4	4	5	5	5	1	1	1	4

Scheduler.perf

- CPU utilization = 100 %
- Average Weighted turnaround = 3.97
- Average waiting = 18.6
- Standard deviation Weighted turnaround = 0.75

HPF with memory:

ProcessID	Arrival	Runtime	Priority	Memory	Finish	T.A.T
1	0	5	3	256	5	5
2	2	5	6	200	14	12
3	3	7	7	256	21	18
4	5	2	4	128	9	4
5	5	2	1	256	7	2

Memory

Time				
0	🟥 256	🟩	🟩	🟩
2	🟥 256	🟥 200	🟩	🟩
3	🟥 256	🟥 200	🟥 256	🟩
5	🟥 128	🟥 200	🟥 256	🟥 256
7	🟥 128	🟥 200	🟥 256	🟩
9	🟩	🟥 200	🟥 256	🟩
14	🟩	🟩	🟥 256	🟩
21	🟩	🟩	🟩	🟩

Work-load Distribution

Task	Handled by	Duration
Phase 1 & 2	• Ahmed Allam • Bassant Loay • Mariam Mohamed Osama	*10 days*
Phase 3	Ahmed Ezzat	*2 days*