

OS Lab 4

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Part 1 (Standard Scheduler)

Workload Mix 1

Parallel executions of 2 ./arithoh.sh and 2 ./fstime.sh

./arithoh & ./fstime & ./arithoh & ./fstime &

```
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500
Time Quantum: 500, Time Executed: 28
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 82
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 3.4000, score 73529
COUNT:73529:10:KBps
TIME:3.4
Copy done: 1000004 in 3.6333, score 68807
COUNT:68807:10:KBps
TIME:3.6
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
```

Observation : We see that all the processes are run in round-robin fashion (even though one is CPU intensive and one is IO intensive)

Workload Mix 2

4 Parallel executions of ./arithoh.sh

./arithoh & ./arithoh & ./arithoh & ./arithoh &

```
Minix 3: <PID> 189 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 190 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 191 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 190 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 189 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 191 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 190 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 191 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 189 swapped in
Time Quantum: 200, Time Executed: 200
```



Observation : all the processes are running in round robin fashion as seen in the screenshot attached. As all the processes are CPU intensive they need not to wait for I/O and execute in the time quanta that they are allocated.

Workload Mix 3

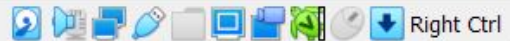
4 Parallel executions of ./fstime

./fstime & ./fstime & ./fstime & ./fstime &

```

[4] Done ./arithoh
# ./fstime & ./fstime & ./fstime & ./fstime &
Minix 3: <PID> 193 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 194 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 195 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 196 swapped in
Time Quantum: 200, Time Executed: 200
# Time Quantum: 500, Time Executed: 500
Write done: 1008000 in 3.4000, score 74117
Write done: 1008000 in 3.4000, score 74117
Write done: 1008000 in 3.4000, score 74117
Write done: 1008000 in 3.4000, score 74117
COUNT:74117:0:KBps
COUNT:74117:0:KBps
COUNT:74117:0:KBps
COUNT:74117:0:KBps
TIME:3.4
TIME:3.4
TIME:3.4
TIME:3.4
Time Quantum: 500, Time Executed: 261

```



Observations : All the 5 processes execute in RR fashion. And since fstime requires a higher quantum, but not all quanta are used to the fullest as they aren't CPU intensive.

Workload Mix 4

Parallel executions of 2 ./pipe and 2 ./arithoh

./pipe & ./arithoh & ./pipe & ./arithoh &

```
Minix 3: <PID> 199 swapped in
Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 197 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 199 swapped in
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500
Minix 3: <PID> 200 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 198 swapped in
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 405
Minix 3: <PID> 197 swapped in
Time Quantum: 200, Time Executed: 164
Minix 3: <PID> 198 swapped in
Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 199 swapped in
Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 200 swapped in
Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 197 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 199 swapped in
Time Quantum: 200, Time Executed: 200
```



Observations ; As pipe.sh involves IPC, it invokes system calls and hence gets a higher quantum (500 ms for system calls). But since arithoh CPU intensive it gets less quanta and is more likely to be scheduled.

Part 2 (Modified pseudo-FIFO Scheduler)

Workload Mix 1

Parallel executions of 2 ./arithoh.sh and 2 ./fstime.sh

./arithoh & ./fstime & ./arithoh & ./fstime &

```

TIME:1.9
TIME:1.9
Time Quantum: 500, Time Executed: 500
Read done: 1000004 in 2.0167, score 123967
Read done: 1000004 in 2.0167, score 123967
COUNT:123967:0:KBps
COUNT:123967:0:KBps
TIME:2.0
TIME:2.0
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500
Copy done: 1000004 in 3.8167, score 65502
COUNT:65502:0:KBps
TIME:3.8
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 4.3167, score 57915
COUNT:57915:0:KBps
TIME:4.3

[1]   Done                ./arithoh
[2]   Done                ./arithoh
[3]   Done                ./fstime
[4]   Done                ./fstime
# <

```



Observations : We see that the arithoh(CPU bound process) has tendency to complete before fstime(IO bound process). Arithoh get 200 quanta whereas fstime gets 500 quanta. As observed in the run arithoh consumes quanta, whereas fstime not always consumes its quanta.

Workload Mix 2

4 Parallel executions of ./arithoh.sh
 ./arithoh & ./arithoh & ./arithoh & ./arithoh &

```

Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 87

[1] Done ./arithoh
[2] Done ./arithoh
[3] Done ./arithoh
[4] Done ./arithoh
#

```

Observation : 5 processes execute one after another in first come first serve basis.

Occasionally, time executed other than 200.

Inference : CPU fairly schedules all the processes on a first come first serve basis. As the processes are CPU intensive process they generally execute I/O in allocated time quota.

Workload Mix 3

4 Parallel executions of ./fstime

./fstime & ./fstime & ./fstime & ./fstime &

```

TIME:3.6
Time Quantum: 500, Time Executed: 500
Time Quantum: 500, Time Executed: 500
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 6.5667, score 38071
COUNT:38071:0:KBps
TIME:6.6
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 7.2333, score 34562
COUNT:34562:0:KBps
TIME:7.2
Minix 3: <PID> 24 swapped in
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 7.5333, score 33185
COUNT:33185:0:KBps
TIME:7.5
Time Quantum: 200, Time Executed: 200
Copy done: 1000004 in 7.7833, score 32120
COUNT:32120:0:KBps
TIME:7.8
Minix 3: <PID> 24 swapped in
Time Quantum: 500, Time Executed: 113

```



Observation : The five process execute in First Come First Serve basis. Most of the time process is allocated 500 and uses a little less than 500 as process doesn't require the full quanta when nearing completion.

Workload Mix 4

Parallel executions of 2 ./pipe and 2 ./arithoh
 ./pipe & ./arithoh & ./pipe & ./arithoh &

```

Time Quantum: 200, Time Executed: 0
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 200
Minix 3: <PID> 192 swapped in
Time Quantum: 200, Time Executed: 56
Minix 3: <PID> 35 swapped in
Time Quantum: 500, Time Executed: 500
Minix 3: <PID> 36 swapped in
Time Quantum: 500, Time Executed: 500
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500
Time Quantum: 200, Time Executed: 200
Time Quantum: 200, Time Executed: 200
Time Quantum: 500, Time Executed: 500

```

Observations : We see that the arithoh(CPU bound process) has tendency to complete before pipe(process that requires IPC).