

CS 314: Operating Systems Laboratory

Assignment 4

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Part I

1. workload_mix1.sh: A mix of all CPU-intensive processes

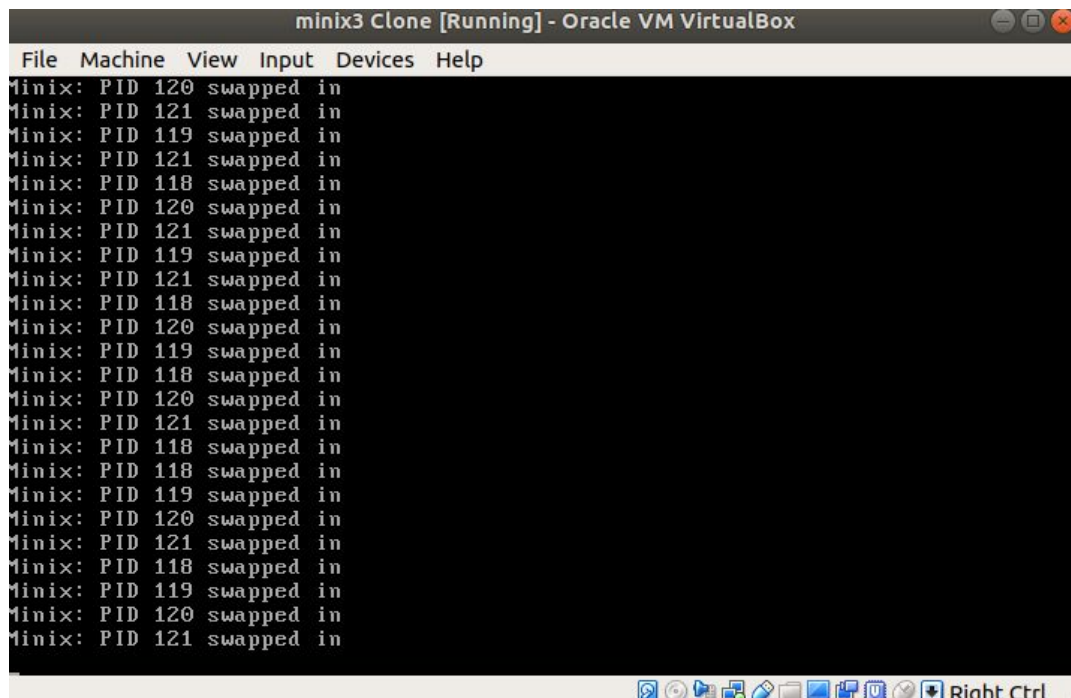
`./arithoh.sh &`

`./arithoh.sh &`

`./arithoh.sh &`

`./arithoh.sh &`

Each process uses its complete time quantum and the scheduler operates in round-robin fashion until the processes finish.

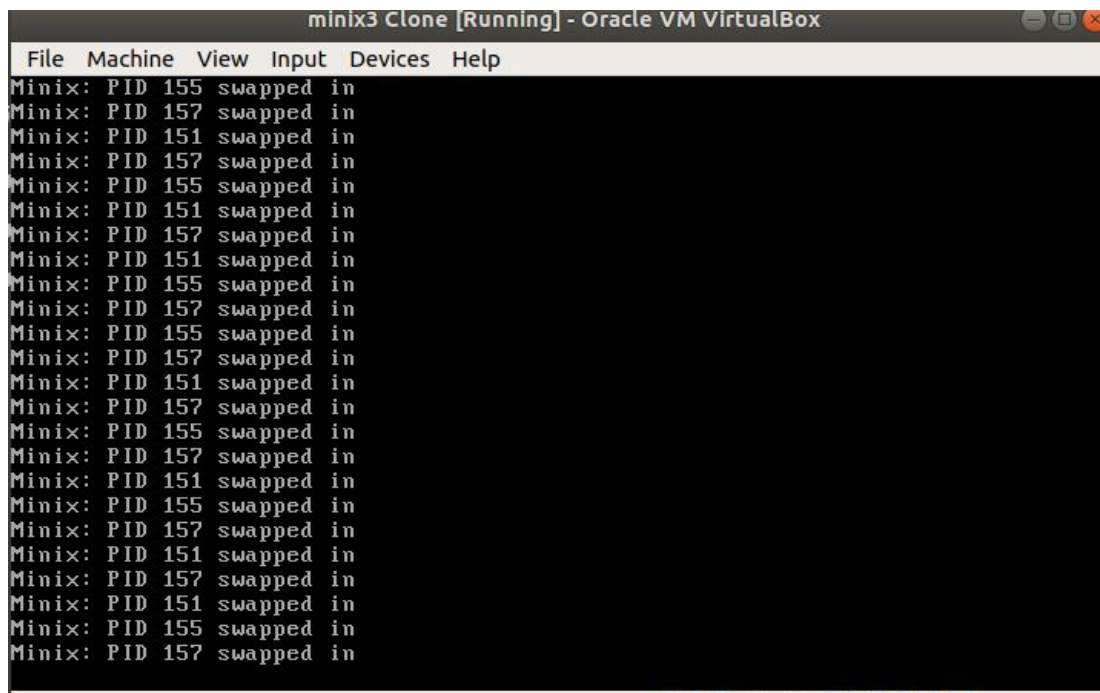


2. workload_mix2.sh: CPU-intensive with I/O intensive

`./arithoh.sh &`

```
./fstime.sh &  
./arithoh.sh &  
./fstime.sh &  
./arithoh.sh &  
./fstime.sh &
```

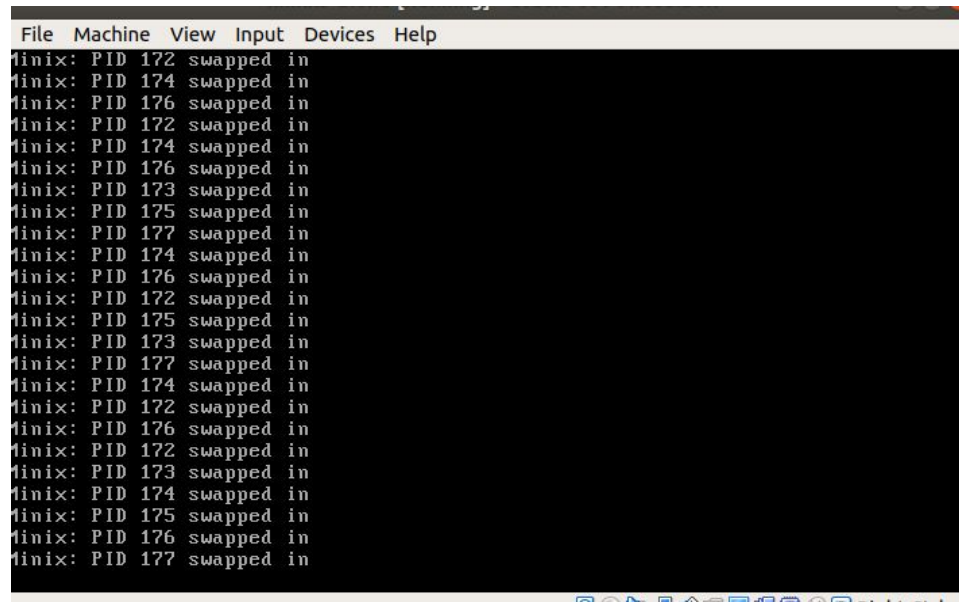
The time command shows 15.16, 0.38 and 3.75 for real, user and sys fields respectively. This means fstime does some I/O work but is idle for a considerable time. Hence, the three arithoh's occupy most of the CPU time till they are completed.



3. workload_mix3.sh: CPU-intensive with I/O intensive

```
./arithoh.sh &  
./syscall.sh &  
./arithoh.sh &  
./syscall.sh &  
./arithoh.sh &  
./syscall.sh &
```

The process syscall also does I/O work but is less in the waiting queue unlike fstime.

A screenshot of a terminal window with a menu bar containing 'File', 'Machine', 'View', 'Input', 'Devices', and 'Help'. The terminal displays a list of processes, each with the prefix 'minix: PID' followed by a PID number, a status, and a location. The status is either 'swapped in' or 'exited'. The PIDs listed are 172, 174, 176, 173, 175, 177, and 174, each appearing multiple times.

```
minix: PID 172 swapped in
minix: PID 174 swapped in
minix: PID 176 swapped in
minix: PID 172 swapped in
minix: PID 174 swapped in
minix: PID 176 swapped in
minix: PID 173 swapped in
minix: PID 175 swapped in
minix: PID 177 swapped in
minix: PID 174 swapped in
minix: PID 176 swapped in
minix: PID 172 swapped in
minix: PID 175 swapped in
minix: PID 173 swapped in
minix: PID 177 swapped in
minix: PID 174 swapped in
minix: PID 172 swapped in
minix: PID 176 swapped in
minix: PID 172 swapped in
minix: PID 173 swapped in
minix: PID 174 swapped in
minix: PID 175 swapped in
minix: PID 176 swapped in
minix: PID 177 swapped in
```

4. workload_mix4.sh: All I/O intensive processes

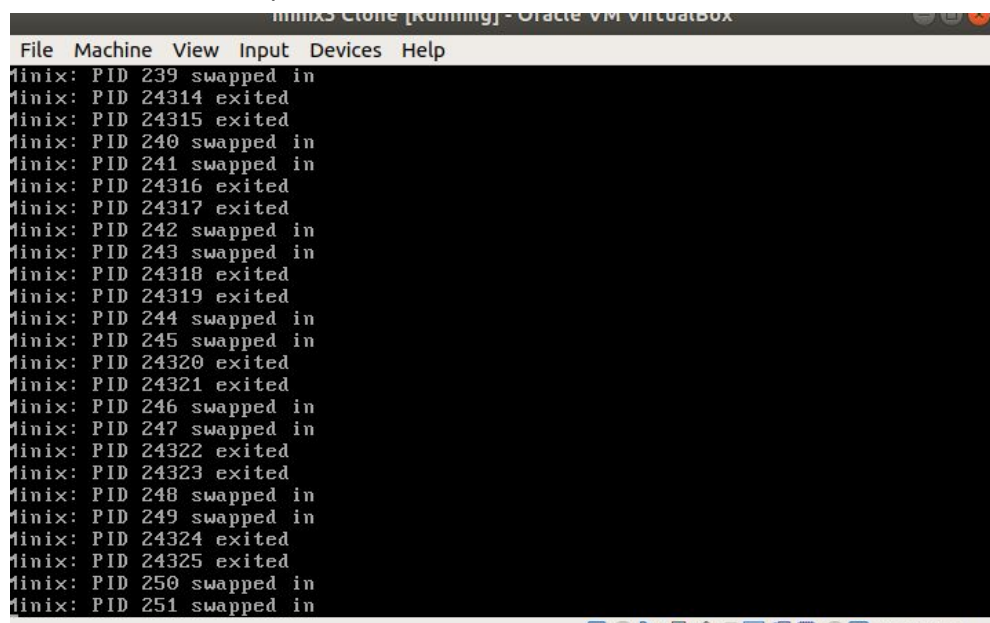
./pipe.sh &

./spawn.sh &

./pipe.sh &

./spawn.sh &

All processes are I/O intensive. Hence, CPU schedules other processes as well (while all these processes are doing their respective I/O works).

A screenshot of a terminal window titled 'minix3 clone [running] - Oracle VM VirtualBox'. The menu bar contains 'File', 'Machine', 'View', 'Input', 'Devices', and 'Help'. The terminal displays a list of processes, each with the prefix 'minix: PID' followed by a PID number, a status, and a location. The status is either 'swapped in' or 'exited'. The PIDs listed are 239, 24314, 24315, 240, 241, 24316, 24317, 242, 243, 24318, 24319, 244, 245, 24320, 24321, 246, 247, 24322, 24323, 248, 249, 24324, 24325, 250, and 251.

```
minix: PID 239 swapped in
minix: PID 24314 exited
minix: PID 24315 exited
minix: PID 240 swapped in
minix: PID 241 swapped in
minix: PID 24316 exited
minix: PID 24317 exited
minix: PID 242 swapped in
minix: PID 243 swapped in
minix: PID 24318 exited
minix: PID 24319 exited
minix: PID 244 swapped in
minix: PID 245 swapped in
minix: PID 24320 exited
minix: PID 24321 exited
minix: PID 246 swapped in
minix: PID 247 swapped in
minix: PID 24322 exited
minix: PID 24323 exited
minix: PID 248 swapped in
minix: PID 249 swapped in
minix: PID 24324 exited
minix: PID 24325 exited
minix: PID 250 swapped in
minix: PID 251 swapped in
```

Part II

1. workload_mix1.sh:

All the processes happen one after another, in the order in which they arrive.

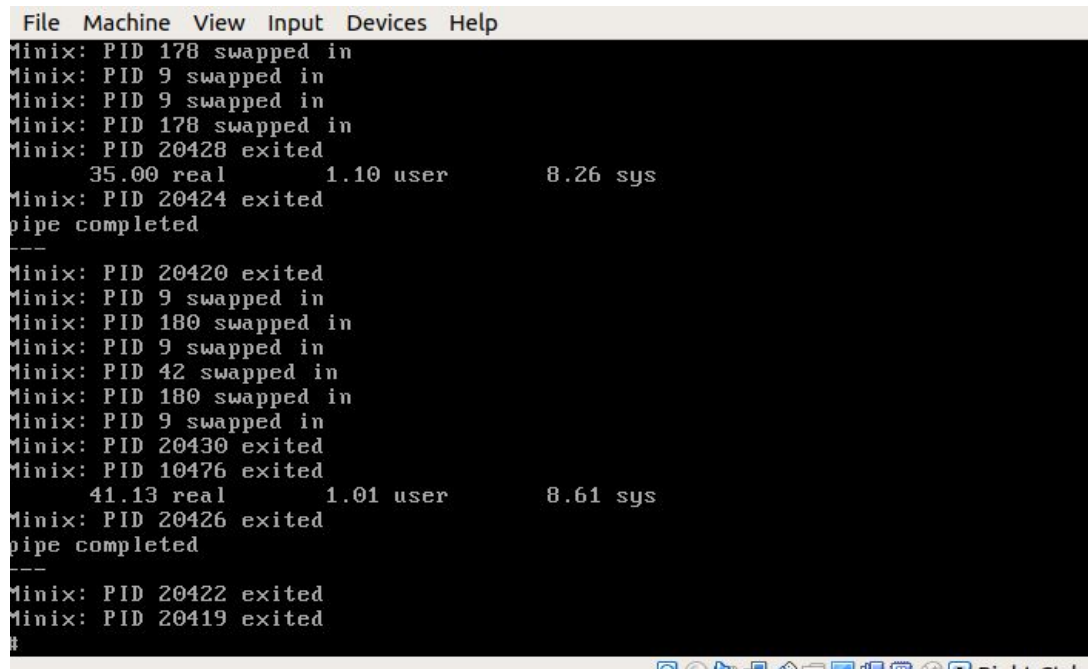
[illegible]

2. workload_mix2.sh:

The three arithoh's and fstime's were ordered alternatively in the file but since fstime had some I/O work to do, it left the CPU and the next process got scheduled. This way, all the three arithoh's completed first and then all the fstime's. Hence, **pseudo-FIFO**.

4. workload_mix4.sh:

All the processes are I/O intensive. The scheduler executes a process as soon as it is available after its I/O work. Hence, it becomes similar to the round-robin case.



```
File Machine View Input Devices Help
Minix: PID 178 swapped in
Minix: PID 9 swapped in
Minix: PID 9 swapped in
Minix: PID 178 swapped in
Minix: PID 20428 exited
      35.00 real      1.10 user      8.26 sys
Minix: PID 20424 exited
pipe completed
---
Minix: PID 20420 exited
Minix: PID 9 swapped in
Minix: PID 180 swapped in
Minix: PID 9 swapped in
Minix: PID 42 swapped in
Minix: PID 180 swapped in
Minix: PID 9 swapped in
Minix: PID 20430 exited
Minix: PID 10476 exited
      41.13 real      1.01 user      8.61 sys
Minix: PID 20426 exited
pipe completed
---
Minix: PID 20422 exited
Minix: PID 20419 exited
#
```