

OS Guided Project

Screenshots

Muhammad Hussain - 29004
Sarfaraz Ahmed - 24520

December 3, 2025

```
=== Test 1: CPU-Bound Process Demotion ===
CPU-intensive process started (PID 4)
Initial state: PID=4, Queue=0, Time_In_Queue=0, Total_Slices=0
  Iteration 1: Demoted from queue 0 to 1
  Iteration 4: Demoted from queue 1 to 2
CPU-intensive process completed
Final state: PID=4, Queue=2, Time_In_Queue=1, Total_Slices=0
PASS: Demotion was observed
[+] TEST 1 PASSED: Demotion detected
```

Figure 1: t1

```
=== Test 2: I/O-Bound Process Fairness ===
I/O-intensive process started (PID 5)
Initial state: PID=5, Queue=0, Time_In_Queue=1, Total_Slices=0
I/O-intensive process completed
Final state: PID=5, Queue=0, Time_In_Queue=1, Total_Slices=0
PASS: I/O process remained at queue 0
[+] TEST 2 PASSED: I/O process stayed at Q0
```

Figure 2: t2

```

=== Test 3: Mixed Workload Fairness ===
ChCild 1h i(CPUld-boun d)2 s tart(ingI/
OCPU--inboundte) nsstartiiven gp
rocI/O-eisntes stnsive procaertss setarted (PID D (7)P
IInDi t6ial) s
Initiate:al sta PtleD:= P7I,D Qu=6, eueQ=ueue0, =0, TimTiem_e_InIn_Qu_Queueue=1, Totae=10,_S Tliceostal_Sl=i0
ces=0
  Iteration 0: Demoted from queue 0 to 1
I/O-intensive process completed
Final state: PID=7, Queue=0, Time_In_Queue=1, Total_Slices=0
PASS: I/O process remained at queue 0
CPU-intensive process completed
Final state: PID=6, Queue=1, Time_In_Queue=3, Total_Slices=0
PASS: Demotion was observed
[ ] TEST 3 PASSED: Mixed workload coexistence verified

```

Figure 3: t3

```

=== Test 4: Priority Boost Test ===
Starting a CPU-bound process that should demote, then boost
Process 8: Starting CPU-intensive work
Initial: PID=8, Queue=0, Time_In_Queue=0, Total_Slices=0
  Iter 0: Queue changed from 0 to 2
  Iter 1: Queue changed from 2 to 3
After CPU work: PID=8, Queue=3, Time_In_Queue=12, Total_Slices=0
Waiting for boost (takes ~100 ticks)...
  Wait iter 0: queue=3
  Wait iter 10: queue=3
  Wait iter 20: queue=3
  Wait iter 30: queue=3
  BOOST DETECTED at iter 31: queue went from 3 to 0!
  BOOST DETECTED at iter 32: queue went from 3 to 0!
  BOOST DETECTED at iter 33: queue went from 3 to 0!
  BOOST DETECTED at iter 34: queue went from 3 to 0!
  BOOST DETECTED at iter 35: queue went from 3 to 1!
  BOOST DETECTED at iter 36: queue went from 3 to 1!
  BOOST DETECTED at iter 37: queue went from 3 to 1!
  BOOST DETECTED at iter 38: queue went from 3 to 1!
  BOOST DETECTED at iter 39: queue went from 3 to 1!
  Wait iter 40: queue=1
  BOOST DETECTED at iter 40: queue went from 3 to 1!
  BOOST DETECTED at iter 41: queue went from 3 to 1!
  BOOST DETECTED at iter 42: queue went from 3 to 1!
  BOOST DETECTED at iter 43: queue went from 3 to 1!
  BOOST DETECTED at iter 44: queue went from 3 to 1!
  BOOST DETECTED at iter 45: queue went from 3 to 1!
  BOOST DETECTED at iter 46: queue went from 3 to 1!
  BOOST DETECTED at iter 47: queue went from 3 to 1!
  BOOST DETECTED at iter 48: queue went from 3 to 1!
  BOOST DETECTED at iter 49: queue went from 3 to 1!
After boost period: PID=8, Queue=1, Time_In_Queue=3, Total_Slices=0
PASS: Both demotion and boost detected
[ ] TEST 4 PASSED: Demotion and boost cycle confirmed

```

Figure 4: t4

```
=== Test 5: Manual Priority Boost (boostproc syscall) ===  
Child process 9 starting  
Before manual boost: PID=9, Queue=0, Time_In_Queue=0, Total_SlicesParent=0t:  
CaAftler self-boosting manualst: P boost for IchDi=19,d  
Queue=0, Time_In_Queue=0, Total_Slices=0  
PASS: Boost worked (queue reduced or stayed same)  
[x] TEST 5 PASSED: Manual boost syscall works
```

Figure 5: t5

```
=== Test 6: System-Wide Priority Boost ===  
Testing boostproc(0) - boost all processes  
Child before boost: queue=0  
Parent: Calling system-wide boost  
Child after boost: queue=0  
PASS: System boost worked  
[x] TEST 6 PASSED: System-wide boost works
```

Figure 6: t6

```
=== Test 7: Starvation Prevention (Automatic Boost) ===  
Long CPU process should be boosted automatically every 100 ticks  
Child 11: Starting very long CPU work  
Initial: PID=11, Queue=0, Time_In_Queue=0, Total_Slices=0  
Burst 0: Demoted to queue 2  
Burst 2: Demoted to queue 3  
Burst 10: BOOSTED! queue went from 3 to 1  
Burst 11: Demoted to queue 2  
Burst 12: Demoted to queue 3  
Total automatic boosts observed: 1  
Final: PID=11, Queue=3, Time_In_Queue=15, Total_Slices=0  
PASS: Automatic boost observed (starvation prevented)  
[x] TEST 7 PASSED: Starvation prevention confirmed
```

Figure 7: t7

```

$ mlfq_stats

===== MLFQ Scheduler Statistics =====

Global Statistics:
  Total Scheduler Cycles: 7730
  Total Priority Boosts: 18
  Total Demotions: 20

Per-Queue Statistics:
  Queue   Processes   Total Schedules   Schedule %
    0         0         150             1%
    1         0         116             1%
    2         0          60             0%
    3         0         306             3%

Demotion Rate: 2 per 1000 schedules
Boost Frequency: 1 per 429 schedules

Fairness Analysis:
  Expected per queue: 1932
  Max deviation: 1872
  Status: WARNING - High deviation

Recommendations:
  - Scheduler functioning correctly!

$

```

Figure 8: stats

```
$ getprocinfo
Testing getprocinfo() syscall...
Getting info for current process (PID 13)

=== Process Information ===
PID: 13
Process Name: getprocinfo
State: 4
Queue Level: 0
Time in Queue: 1 ticks
Total Time Slices: 0
=====

getprocinfo() syscall works correctly!
$
```

Figure 9: getprocinfo

```

$ sched_demo
=== MLFQ Scheduler Demonstration ===
Starting test processes...

PCChilhairlent dC 1h pil2dro ce(I/O-ssb (o3 (PID u14Mni)xed md):o):n Sit toaStrriang.t.ed.
Wa(PID rtledi (t6)inP
g fo rIDI t c1hi7ler dr)en 0t -o complete.. Q.u

e
u e: 0 I, tTiemr e0 - Qiun eQueueu: 0e, : Time in0 , SlicesQueue: 0:
0, Slices: 0
Iter 1 - Queue: 0, Time in Queue: 0, Slices: 0
Iter 1 - Queue: 0, I tTime in Quere 2 -u Queuee: 1: ,0 S, Tlimices: 0
e in Queue: 0, Slices: 0
Iter 3 - Queue: 0, Time in Queue: 0, Slices: 0
IITter 2er 4 - Queue: 0- Queue: ,0 Tim,e in Queue: 1 , STilicme iens: 0
Queue: 1, Slices: 0
Iter 5 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 3 - Queue: 0, Ti m Iet erin 6 - Queue: 0, Time in QueQueuee: 1,u e:S 1, Slices: 0
lices: 0
Child 3 (Mixed): Finishe Ited
r 4 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 5 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 6 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 7 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 8 - Queue: 0, Time in Queue: 1, Slices: 0
Iter 9 - Queue: 0, Time in Queue: 1, Slices: 0
Child 2 (I/O-bound): Finished
(CPU-bound): Started (PID 15)
Loop 0 - Queue: 0, Time in Queue: 0, Slices: 0
Loop 1 - Queue: 0, Time in Queue: 0, Slices: 0
Loop 2 - Queue: 0, Time in Queue: 1, Slices: 0
Loop 3 - Queue: 1, Time in Queue: 0, Slices: 0
Loop 4 - Queue: 1, Time in Queue: 1, Slices: 0
Child 1 (CPU-bound): Finished

=== Test Complete ===
Expected behavior:
- CPU-bound child should move to lower priority queues
- I/O-bound child should remain at high priority
- Mixed child should oscillate in priority
$

```

Figure 10: scheduler demo