

VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY  
UNIVERSITY OF TECHNOLOGY  
FACULTY OF COMPUTER SCIENCE AND ENGINEERING



## OPERATING SYSTEM (Lab)

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Report

# Assignment

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# Scheduler

## 1.1 Question

What is the advantage of using a priority queue in comparison with other scheduling algorithms you have learned?

**Answer:**

- Easy to use.
- Processes with higher priority execute first which saves time.
- The importance of each process is precisely defined.
- A good algorithm for applications with fluctuating time and resource requirements.

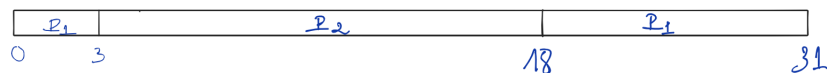
## 1.2 Run sched

### 1.2.1 sched\_0

```

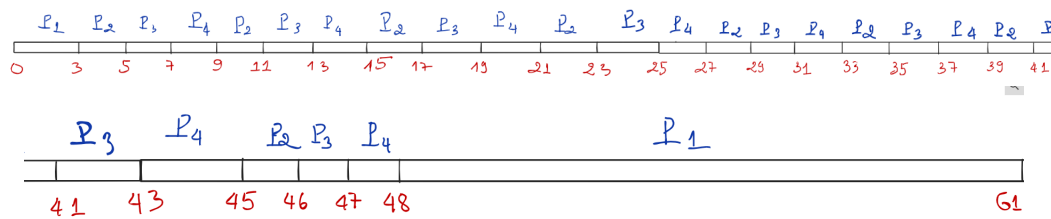
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Time slot 0: Loaded a process at input/proc/s0, PID: 1 PRI0: 4
Time slot 1: CPU 0: Dispatched process 1
Time slot 2: Loaded a process at input/proc/s0, PID: 2 PRI0: 0
Time slot 3: CPU 0: Put process 1 to run queue
Time slot 4: CPU 0: Dispatched process 2
Time slot 5: CPU 0: Put process 2 to run queue
Time slot 6: CPU 0: Dispatched process 2
Time slot 7: CPU 0: Put process 2 to run queue
Time slot 8: CPU 0: Dispatched process 2
Time slot 9: CPU 0: Put process 2 to run queue
Time slot 10: CPU 0: Dispatched process 2
Time slot 11: CPU 0: Put process 2 to run queue
Time slot 12: CPU 0: Dispatched process 2
Time slot 13: CPU 0: Put process 2 to run queue
Time slot 14: CPU 0: Dispatched process 2
Time slot 15: CPU 0: Put process 2 to run queue
Time slot 16: CPU 0: Dispatched process 2
Time slot 17: CPU 0: Put process 2 to run queue
Time slot 18: CPU 0: Dispatched process 2
Time slot 19: CPU 0: Processed 2 has finished
Time slot 20: CPU 0: Dispatched process 1
Time slot 21: CPU 0: Put process 1 to run queue
Time slot 22: CPU 0: Dispatched process 1
Time slot 23: CPU 0: Put process 1 to run queue
Time slot 24: CPU 0: Dispatched process 1
Time slot 25: CPU 0: Put process 1 to run queue
Time slot 26: CPU 0: Dispatched process 1
Time slot 27: CPU 0: Put process 1 to run queue
Time slot 28: CPU 0: Dispatched process 1
Time slot 29: CPU 0: Put process 1 to run queue
Time slot 30: CPU 0: Dispatched process 1
Time slot 31: CPU 0: Processed 1 has finished
CPU 0 stopped
Ln120, Col1 Tab Size: 4 UTF-8 LF C @ GoLive Mac

```



### 1.2.2 sched\_1

[illegible]



## 2 Memory management

## 2.1 Question

What is the advantage and disadvantage of segmentation with paging?

**Answer:**

### Advantages of Paging in OS

- The memory management algorithm is easy to use.
- External Fragmentation is not required.
- Swapping between equal-sized pages and page frames becomes easier.

### Disadvantages of Paging in OS

- Internal fragmentation.
- Additional memory consumption by Page tables.
- Memory reference overhead due to multi-level paging.

### Advantages of segmentation in OS

- Provides protection within segments.
- Segments referencing multiple processes can help achieve sharing.
- No internal fragmentation
- As compared to paging, segment tables use lesser memory.

## Disadvantages of segmentation in OS

- The separation of free memory space into small pieces can cause external fragmentation.
- It is costly.

## 2.2 Run mem

```

[] > [] ~/Doc/0/a/ossin_source_code > on [] master !4 make test_mem [✓] at 21:43:32 []
----- MEMORY MANAGEMENT TEST 0 -----
./mem input/proc/m0
000: 00000-003ff - PID: 01 (idx 000, nxt: 001)
      003e8: 15
001: 00400-007ff - PID: 01 (idx 001, nxt: -01)
002: 00800-00bff - PID: 01 (idx 000, nxt: 003)
003: 00c00-00fff - PID: 01 (idx 001, nxt: 004)
004: 01000-013ff - PID: 01 (idx 002, nxt: 005)
005: 01400-017ff - PID: 01 (idx 003, nxt: 006)
006: 01800-01bff - PID: 01 (idx 004, nxt: -01)
014: 03800-03bff - PID: 01 (idx 000, nxt: 015)
      03814: 66
015: 03c00-03fff - PID: 01 (idx 001, nxt: -01)
NOTE: Read file output/m0 to verify your result
----- MEMORY MANAGEMENT TEST 1 -----
./mem input/proc/m1
NOTE: Read file output/m1 to verify your result (your implementation should print nothing)

```



### 3 Run all

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
[ ] > [ ] ~\Documents\OS\assignment\osia_source_code> on [ ] master 14: make all
gcc -Iinclude -Wall -g obj/cpu.o obj/loader.o obj/mem.o obj/queue.o obj/os.o obj/sched.o obj/timer.o -o os -lpthread
[ ] > [ ] ~\Documents\OS\assignment\osia_source_code> on [ ] master 14: make test_all
----- MEMORY MANAGEMENT TEST 0 -----
./mem input/proc/m0
000: 00000-003ff - PID: 01 (idx 000, nxt: 001)
003: 00300-007ff - PID: 01 (idx 001, nxt: 002)
007: 00700-00b0ff - PID: 01 (idx 002, nxt: 003)
00b: 00b00-00bfff - PID: 01 (idx 003, nxt: 004)
00d: 01000-013ff - PID: 01 (idx 004, nxt: 005)
00e: 01400-017ff - PID: 01 (idx 005, nxt: 006)
00f: 01800-01b0ff - PID: 01 (idx 006, nxt: 007)
010: 01b00-01bfff - PID: 01 (idx 007, nxt: 008)
011: 01c00-01cfff - PID: 01 (idx 008, nxt: 009)
012: 01d00-01dfff - PID: 01 (idx 009, nxt: 00a)
013: 01e00-01efff - PID: 01 (idx 00a, nxt: 00b)
014: 01f00-01ffff - PID: 01 (idx 00b, nxt: 00c)
015: 02000-023ff - PID: 01 (idx 00c, nxt: 00d)
016: 02400-027ff - PID: 01 (idx 00d, nxt: 00e)
017: 02800-02b0ff - PID: 01 (idx 00e, nxt: 00f)
018: 02b00-02bfff - PID: 01 (idx 00f, nxt: 010)
019: 02c00-02cfff - PID: 01 (idx 010, nxt: 011)
01a: 02d00-02dfff - PID: 01 (idx 011, nxt: 012)
01b: 02e00-02efff - PID: 01 (idx 012, nxt: 013)
01c: 02f00-02ffff - PID: 01 (idx 013, nxt: 014)
01d: 03000-030fff - PID: 01 (idx 014, nxt: 015)
01e: 03100-031fff - PID: 01 (idx 015, nxt: 016)
01f: 03200-032fff - PID: 01 (idx 016, nxt: 017)
020: 03300-033fff - PID: 01 (idx 017, nxt: 018)
021: 03400-034fff - PID: 01 (idx 018, nxt: 019)
022: 03500-035fff - PID: 01 (idx 019, nxt: 020)
023: 03600-036fff - PID: 01 (idx 020, nxt: 021)
024: 03700-037fff - PID: 01 (idx 021, nxt: 022)
025: 03800-038fff - PID: 01 (idx 022, nxt: 023)
026: 03900-039fff - PID: 01 (idx 023, nxt: 024)
027: 03a00-03afff - PID: 01 (idx 024, nxt: 025)
028: 03b00-03bfff - PID: 01 (idx 025, nxt: 026)
029: 03c00-03cfff - PID: 01 (idx 026, nxt: 027)
02a: 03d00-03dfff - PID: 01 (idx 027, nxt: 028)
02b: 03e00-03efff - PID: 01 (idx 028, nxt: 029)
02c: 03f00-03ffff - PID: 01 (idx 029, nxt: 030)
02d: 04000-040fff - PID: 01 (idx 030, nxt: 031)
02e: 04100-041fff - PID: 01 (idx 031, nxt: 032)
02f: 04200-042fff - PID: 01 (idx 032, nxt: 033)
030: 04300-043fff - PID: 01 (idx 033, nxt: 034)
031: 04400-044fff - PID: 01 (idx 034, nxt: 035)
032: 04500-045fff - PID: 01 (idx 035, nxt: 036)
033: 04600-046fff - PID: 01 (idx 036, nxt: 037)
034: 04700-047fff - PID: 01 (idx 037, nxt: 038)
035: 04800-048fff - PID: 01 (idx 038, nxt: 039)
036: 04900-049fff - PID: 01 (idx 039, nxt: 040)
037: 04a00-04afff - PID: 01 (idx 040, nxt: 041)
038: 04b00-04bfff - PID: 01 (idx 041, nxt: 042)
039: 04c00-04cfff - PID: 01 (idx 042, nxt: 043)
03a: 04d00-04dfff - PID: 01 (idx 043, nxt: 044)
03b: 04e00-04efff - PID: 01 (idx 044, nxt: 045)
03c: 04f00-04ffff - PID: 01 (idx 045, nxt: 046)
03d: 05000-050fff - PID: 01 (idx 046, nxt: 047)
03e: 05100-051fff - PID: 01 (idx 047, nxt: 048)
03f: 05200-052fff - PID: 01 (idx 048, nxt: 049)
040: 05300-053fff - PID: 01 (idx 049, nxt: 050)
041: 05400-054fff - PID: 01 (idx 050, nxt: 051)
042: 05500-055fff - PID: 01 (idx 051, nxt: 052)
043: 05600-056fff - PID: 01 (idx 052, nxt: 053)
044: 05700-057fff - PID: 01 (idx 053, nxt: 054)
045: 05800-058fff - PID: 01 (idx 054, nxt: 055)
046: 05900-059fff - PID: 01 (idx 055, nxt: 056)
047: 05a00-05afff - PID: 01 (idx 056, nxt: 057)
048: 05b00-05bfff - PID: 01 (idx 057, nxt: 058)
049: 05c00-05cfff - PID: 01 (idx 058, nxt: 059)
04a: 05d00-05dfff - PID: 01 (idx 059, nxt: 060)
04b: 05e00-05efff - PID: 01 (idx 060, nxt: 061)
04c: 05f00-05ffff - PID: 01 (idx 061, nxt: 062)
04d: 06000-060fff - PID: 01 (idx 062, nxt: 063)
04e: 06100-061fff - PID: 01 (idx 063, nxt: 064)
04f: 06200-062fff - PID: 01 (idx 064, nxt: 065)
050: 06300-063fff - PID: 01 (idx 065, nxt: 066)
051: 06400-064fff - PID: 01 (idx 066, nxt: 067)
052: 06500-065fff - PID: 01 (idx 067, nxt: 068)
053: 06600-066fff - PID: 01 (idx 068, nxt: 069)
054: 06700-067fff - PID: 01 (idx 069, nxt: 070)
055: 06800-068fff - PID: 01 (idx 070, nxt: 071)
056: 06900-069fff - PID: 01 (idx 071, nxt: 072)
057: 06a00-06afff - PID: 01 (idx 072, nxt: 073)
058: 06b00-06bfff - PID: 01 (idx 073, nxt: 074)
059: 06c00-06cfff - PID: 01 (idx 074, nxt: 075)
05a: 06d00-06dfff - PID: 01 (idx 075, nxt: 076)
05b: 06e00-06efff - PID: 01 (idx 076, nxt: 077)
05c: 06f00-06ffff - PID: 01 (idx 077, nxt: 078)
05d: 07000-070fff - PID: 01 (idx 078, nxt: 079)
05e: 07100-071fff - PID: 01 (idx 079, nxt: 080)
05f: 07200-072fff - PID: 01 (idx 080, nxt: 081)
060: 07300-073fff - PID: 01 (idx 081, nxt: 082)
061: 07400-074fff - PID: 01 (idx 082, nxt: 083)
062: 07500-075fff - PID: 01 (idx 083, nxt: 084)
063: 07600-076fff - PID: 01 (idx 084, nxt: 085)
064: 07700-077fff - PID: 01 (idx 085, nxt: 086)
065: 07800-078fff - PID: 01 (idx 086, nxt: 087)
066: 07900-079fff - PID: 01 (idx 087, nxt: 088)
067: 07a00-07afff - PID: 01 (idx 088, nxt: 089)
068: 07b00-07bfff - PID: 01 (idx 089, nxt: 090)
069: 07c00-07cfff - PID: 01 (idx 090, nxt: 091)
06a: 07d00-07dfff - PID: 01 (idx 091, nxt: 092)
06b: 07e00-07efff - PID: 01 (idx 092, nxt: 093)
06c: 07f00-07ffff - PID: 01 (idx 093, nxt: 094)
06d: 08000-080fff - PID: 01 (idx 094, nxt: 095)
06e: 08100-081fff - PID: 01 (idx 095, nxt: 096)
06f: 08200-082fff - PID: 01 (idx 096, nxt: 097)
070: 08300-083fff - PID: 01 (idx 097, nxt: 098)
071: 08400-084fff - PID: 01 (idx 098, nxt: 099)
072: 08500-085fff - PID: 01 (idx 099, nxt: 100)
073: 08600-086fff - PID: 01 (idx 100, nxt: 101)
074: 08700-087fff - PID: 01 (idx 101, nxt: 102)
075: 08800-088fff - PID: 01 (idx 102, nxt: 103)
076: 08900-089fff - PID: 01 (idx 103, nxt: 104)
077: 08a00-08afff - PID: 01 (idx 104, nxt: 105)
078: 08b00-08bfff - PID: 01 (idx 105, nxt: 106)
079: 08c00-08cfff - PID: 01 (idx 106, nxt: 107)
07a: 08d00-08dfff - PID: 01 (idx 107, nxt: 108)
07b: 08e00-08efff - PID: 01 (idx 108, nxt: 109)
07c: 08f00-08ffff - PID: 01 (idx 109, nxt: 110)
07d: 09000-090fff - PID: 01 (idx 110, nxt: 111)
07e: 09100-091fff - PID: 01 (idx 111, nxt: 112)
07f: 09200-092fff - PID: 01 (idx 112, nxt: 113)
080: 09300-093fff - PID: 01 (idx 113, nxt: 114)
081: 09400-094fff - PID: 01 (idx 114, nxt: 115)
082: 09500-095fff - PID: 01 (idx 115, nxt: 116)
083: 09600-096fff - PID: 01 (idx 116, nxt: 117)
084: 09700-097fff - PID: 01 (idx 117, nxt: 118)
085: 09800-098fff - PID: 01 (idx 118, nxt: 119)
086: 09900-099fff - PID: 01 (idx 119, nxt: 120)
087: 09a00-09afff - PID: 01 (idx 120, nxt: 121)
088: 09b00-09bfff - PID: 01 (idx 121, nxt: 122)
089: 09c00-09cfff - PID: 01 (idx 122, nxt: 123)
08a: 09d00-09dfff - PID: 01 (idx 123, nxt: 124)
08b: 09e00-09efff - PID: 01 (idx 124, nxt: 125)
08c: 09f00-09ffff - PID: 01 (idx 125, nxt: 126)
08d: 0a000-0a0fff - PID: 01 (idx 126, nxt: 127)
08e: 0a100-0a1fff - PID: 01 (idx 127, nxt: 128)
08f: 0a200-0a2fff - PID: 01 (idx 128, nxt: 129)
090: 0a300-0a3fff - PID: 01 (idx 129, nxt: 130)
091: 0a400-0a4fff - PID: 01 (idx 130, nxt: 131)
092: 0a500-0a5fff - PID: 01 (idx 131, nxt: 132)
093: 0a600-0a6fff - PID: 01 (idx 132, nxt: 133)
094: 0a700-0a7fff - PID: 01 (idx 133, nxt: 134)
095: 0a800-0a8fff - PID: 01 (idx 134, nxt: 135)
096: 0a900-0a9fff - PID: 01 (idx 135, nxt: 136)
097: 0aa00-0aafff - PID: 01 (idx 136, nxt: 137)
098: 0ab00-0abfff - PID: 01 (idx 137, nxt: 138)
099: 0ac00-0acfff - PID: 01 (idx 138, nxt: 139)
09a: 0ad00-0adfff - PID: 01 (idx 139, nxt: 140)
09b: 0ae00-0aef - PID: 01 (idx 140, nxt: 141)
09c: 0af00-0af - PID: 01 (idx 141, nxt: 142)
09d: 0b000-0b0fff - PID: 01 (idx 142, nxt: 143)
09e: 0b100-0b1fff - PID: 01 (idx 143, nxt: 144)
09f: 0b200-0b2fff - PID: 01 (idx 144, nxt: 145)
0a0: 0b300-0b3fff - PID: 01 (idx 145, nxt: 146)
0a1: 0b400-0b4fff - PID: 01 (idx 146, nxt: 147)
0a2: 0b500-0b5fff - PID: 01 (idx 147, nxt: 148)
0a3: 0b600-0b6fff - PID: 01 (idx 148, nxt: 149)
0a4: 0b700-0b7fff - PID: 01 (idx 149, nxt: 150)
0a5: 0b800-0b8fff - PID: 01 (idx 150, nxt: 151)
0a6: 0b900-0b9fff - PID: 01 (idx 151, nxt: 152)
0a7: 0ba00-0bafff - PID: 01 (idx 152, nxt: 153)
0a8: 0bb00-0bbfff - PID: 01 (idx 153, nxt: 154)
0a9: 0bc00-0bcfff - PID: 01 (idx 154, nxt: 155)
0aa: 0bd00-0bdfff - PID: 01 (idx 155, nxt: 156)
0ab: 0be00-0befff - PID: 01 (idx 156, nxt: 157)
0ac: 0bf00-0bffff - PID: 01 (idx 157, nxt: 158)
0ad: 0c000-0c0fff - PID: 01 (idx 158, nxt: 159)
0ae: 0c100-0c1fff - PID: 01 (idx 159, nxt: 160)
0af: 0c200-0c2fff - PID: 01 (idx 160, nxt: 161)
0b0: 0c300-0c3fff - PID: 01 (idx 161, nxt: 162)
0b1: 0c400-0c4fff - PID: 01 (idx 162, nxt: 163)
0b2: 0c500-0c5fff - PID: 01 (idx 163, nxt: 164)
0b3: 0c600-0c6fff - PID: 01 (idx 164, nxt: 165)
0b4: 0c700-0c7fff - PID: 01 (idx 165, nxt: 166)
0b5: 0c800-0c8fff - PID: 01 (idx 166, nxt: 167)
0b6: 0c900-0c9fff - PID: 01 (idx 167, nxt: 168)
0b7: 0ca00-0cafff - PID: 01 (idx 168, nxt: 169)
0b8: 0cb00-0cbfff - PID: 01 (idx 169, nxt: 170)
0b9: 0cc00-0ccfff - PID: 01 (idx 170, nxt: 171)
0ba: 0cd00-0cdfff - PID: 01 (idx 171, nxt: 172)
0bb: 0ce00-0cefff - PID: 01 (idx 172, nxt: 173)
0bc: 0cf00-0cffff - PID: 01 (idx 173, nxt: 174)
0bd: 0d000-0d0fff - PID: 01 (idx 174, nxt: 175)
0be: 0d100-0d1fff - PID: 01 (idx 175, nxt: 176)
0bf: 0d200-0d2fff - PID: 01 (idx 176, nxt: 177)
0c0: 0d300-0d3fff - PID: 01 (idx 177, nxt: 178)
0c1: 0d400-0d4fff - PID: 01 (idx 178, nxt: 179)
0c2: 0d500-0d5fff - PID: 01 (idx 179, nxt: 180)
0c3: 0d600-0d6fff - PID: 01 (idx 180, nxt: 181)
0c4: 0d700-0d7fff - PID: 01 (idx 181, nxt: 182)
0c5: 0d800-0d8fff - PID: 01 (idx 182, nxt: 183)
0c6: 0d900-0d9fff - PID: 01 (idx 183, nxt: 184)
0c7: 0da00-0dafff - PID: 01 (idx 184, nxt: 185)
0c8: 0db00-0dbfff - PID: 01 (idx 185, nxt: 186)
0c9: 0dc00-0dcfff - PID: 01 (idx 186, nxt: 187)
0ca: 0dd00-0ddfff - PID: 01 (idx 187, nxt: 188)
0cb: 0de00-0defff - PID: 01 (idx 188, nxt: 189)
0cc: 0df00-0dffff - PID: 01 (idx 189, nxt: 190)
0cd: 0e000-0e0fff - PID: 01 (idx 190, nxt: 191)
0ce: 0e100-0e1fff - PID: 01 (idx 191, nxt: 192)
0cf: 0e200-0e2fff - PID: 01 (idx 192, nxt: 193)
0d0: 0e300-0e3fff - PID: 01 (idx 193, nxt: 194)
0d1: 0e400-0e4fff - PID: 01 (idx 194, nxt: 195)
0d2: 0e500-0e5fff - PID: 01 (idx 195, nxt: 196)
0d3: 0e600-0e6fff - PID: 01 (idx 196, nxt: 197)
0d4: 0e700-0e7fff - PID: 01 (idx 197, nxt: 198)
0d5: 0e800-0e8fff - PID: 01 (idx 198, nxt: 199)
0d6: 0e900-0e9fff - PID: 01 (idx 199, nxt: 200)
0d7: 0ea00-0eafff - PID: 01 (idx 200, nxt: 201)
0d8: 0eb00-0ebfff - PID: 01 (idx 201, nxt: 202)
0d9: 0ec00-0ecfff - PID: 01 (idx 202, nxt: 203)
0da: 0ed00-0edfff - PID: 01 (idx 203, nxt: 204)
0db: 0ee00-0eefff - PID: 01 (idx 204, nxt: 205)
0dc: 0ef00-0efff - PID: 01 (idx 205, nxt: 206)
0dd: 0f000-0f0fff - PID: 01 (idx 206, nxt: 207)
0de: 0f100-0f1fff - PID: 01 (idx 207, nxt: 208)
0df: 0f200-0f2fff - PID: 01 (idx 208, nxt: 209)
0e0: 0f300-0f3fff - PID: 01 (idx 209, nxt: 210)
0e1: 0f400-0f4fff - PID: 01 (idx 210, nxt: 211)
0e2: 0f500-0f5fff - PID: 01 (idx 211, nxt: 212)
0e3: 0f600-0f6fff - PID: 01 (idx 212, nxt: 213)
0e4: 0f700-0f7fff - PID: 01 (idx 213, nxt: 214)
0e5: 0f800-0f8fff - PID: 01 (idx 214, nxt: 215)
0e6: 0f900-0f9fff - PID: 01 (idx 215, nxt: 216)
0e7: 0fa00-0fafff - PID: 01 (idx 216, nxt: 217)
0e8: 0fb00-0fbfff - PID: 01 (idx 217, nxt: 218)
0e9: 0fc00-0fcfff - PID: 01 (idx 218, nxt: 219)
0ea: 0fd00-0fdfff - PID: 01 (idx 219, nxt: 220)
0eb: 0fe00-0fefff - PID: 01 (idx 220, nxt: 221)
0ec: 0ff00-0ffff - PID: 01 (idx 221, nxt: 222)
0ed: 10000-100fff - PID: 01 (idx 222, nxt: 223)
0ee: 10100-101fff - PID: 01 (idx 223, nxt: 224)
0ef: 10200-102fff - PID: 01 (idx 224, nxt: 225)
0f0: 10300-103fff - PID: 01 (idx 225, nxt: 226)
0f1: 10400-104fff - PID: 01 (idx 226, nxt: 227)
0f2: 10500-105fff - PID: 01 (idx 227, nxt: 228)
0f3: 10600-106fff - PID: 01 (idx 228, nxt: 229)
0f4: 10700-107fff - PID: 01 (idx 229, nxt: 230)
0f5: 10800-108fff - PID: 01 (idx 230, nxt: 231)
0f6: 10900-109fff - PID: 01 (idx 231, nxt: 232)
0f7: 10a00-10afff - PID: 01 (idx 232, nxt: 233)
0f8: 10b00-10bfff - PID: 01 (idx 233, nxt: 234)
0f9: 10c00-10cfff - PID: 01 (idx 234, nxt: 235)
0fa: 10d00-10dfff - PID: 01 (idx 235, nxt: 236)
0fb: 10e00-10efff - PID: 01 (idx 236, nxt: 237)
0fc: 10f00-10ffff - PID: 01 (idx 237, nxt: 238)
0fd: 11000-110fff - PID: 01 (idx 238, nxt: 239)
0fe: 11100-111fff - PID: 01 (idx 239, nxt: 240)
0ff: 11200-112fff - PID: 01 (idx 240, nxt: 241)
100: 11300-113fff - PID: 01 (idx 241, nxt: 242)
101: 11400-114fff - PID: 01 (idx 242, nxt: 243)
102: 11500-115fff - PID: 01 (idx 243, nxt: 244)
103: 11600-116fff - PID: 01 (idx 244, nxt: 245)
104: 11700-117fff - PID: 01 (idx 245, nxt: 246)
105: 11800-118fff - PID: 01 (idx 246, nxt: 247)
106: 11900-119fff - PID: 01 (idx 247, nxt: 248)
107: 11a00-11afff - PID: 01 (idx 248, nxt: 249)
108: 11b00-11bfff - PID: 01 (idx 249, nxt: 250)
109: 11c00-11cfff - PID: 01 (idx 250, nxt: 251)
10a: 11d00-11dfff - PID: 01 (idx 251, nxt: 252)
10b: 11e00-11efff - PID: 01 (idx 252, nxt: 253)
10c: 11f00-11ffff - PID: 01 (idx 253, nxt: 254)
10d: 12000-120fff - PID: 01 (idx 254, nxt: 255)
10e: 12100-121fff - PID: 01 (idx 255, nxt: 256)
10f: 12200-122fff - PID: 01 (idx 256, nxt: 257)
110: 12300-123fff - PID: 01 (idx 257, nxt: 258)
111: 12400-124fff - PID: 01 (idx 258, nxt: 259)
112: 12500-125fff - PID: 01 (idx 259, nxt: 260)
113: 12600-126fff - PID: 01 (idx 260, nxt: 261)
114: 12700-127fff - PID: 01 (idx 261, nxt: 262)
115: 12800-128fff - PID: 01 (idx 262, nxt: 263)
116: 12900-129fff - PID: 01 (idx 263, nxt: 264)
117: 12a00-12afff - PID: 01 (idx 264, nxt: 265)
118: 12b00-12bfff - PID: 01 (idx 265, nxt: 266)
119: 12c00-12cfff - PID: 01 (idx 266, nxt: 267)
11a: 12d00-12dfff - PID: 01 (idx 267, nxt: 268)
11b: 12e00-12efff - PID: 01 (idx 268, nxt: 269)
11c: 12f00-12ffff - PID: 01 (idx 269, nxt: 270)
11d: 13000-130fff - PID: 01 (idx 270, nxt: 271)
11e: 13100-131fff - PID: 01 (idx 271, nxt: 272)
11f: 13200-132fff - PID: 01 (idx 272, nxt: 273)
120: 13300-133fff - PID: 01 (idx 273, nxt: 274)
121: 13400-134fff - PID: 01 (idx 274, nxt: 275)
122: 13500-135fff - PID: 01 (idx 275, nxt: 276)
123: 13600-136fff - PID: 01 (idx 276, nxt: 277)
124: 13700-137fff - PID: 01 (idx 277, nxt: 278)
125: 13800-138fff - PID: 01 (idx 278, nxt: 279)
126: 13900-139fff - PID: 01 (idx 279, nxt: 280)
127: 13a00-13afff - PID: 01 (idx 280, nxt: 281)
128: 13b00-13bfff - PID: 01 (idx 281, nxt: 282)
129: 13c00-13cfff - PID: 01 (idx 282, nxt: 283)
12a: 13d00-13dfff - PID: 01 (idx 283, nxt: 284)
12b: 13e00-13efff - PID: 01 (idx 284, nxt: 285)
12c: 13f00-13ffff - PID: 01 (idx 285, nxt: 286)
12d: 14000-140fff - PID: 01 (idx 286, nxt: 287)
12e: 14100-141fff - PID: 01 (idx 287, nxt: 288)
12f: 14200-142fff - PID: 01 (idx 288, nxt: 289)
130: 14300-143fff - PID: 01 (idx 289, nxt: 290)
131: 14400-144fff - PID: 01 (idx 290, nxt: 291)
132: 14500-145fff - PID: 01 (idx 291, nxt: 292)
133: 14600-146fff - PID: 01 (idx 292, nxt: 293)
134: 14700-147fff - PID: 01 (idx 293, nxt: 294)
135: 14800-148fff - PID: 01 (idx 294, nxt: 295)
136: 14900-149fff - PID: 01 (idx 295, nxt: 296)
137: 14a00-14afff - PID: 01 (idx 296, nxt: 297)
138: 14b00-14bfff - PID: 01 (idx 297, nxt: 298)
139: 14c00-14cfff - PID: 01 (idx 298, nxt: 299)
13a: 14d00-14dfff - PID: 01 (idx 299, nxt: 300)
13b: 14e00-14efff - PID: 01 (idx 300, nxt: 301)
13c: 14f00-14ffff - PID: 01 (idx 301, nxt: 302)
13d: 15000-150fff - PID: 01 (idx 302, nxt: 303)
13e: 15100-151fff - PID: 01 (idx 303, nxt: 304)
13f: 15200-152fff - PID: 01 (idx 304, nxt: 305)
140: 15300-153fff - PID: 01 (idx 305, nxt: 306)
141: 15400-154fff - PID: 01 (idx 306, nxt: 307)
142: 15500-155fff - PID: 01 (idx 307, nxt: 308)
143: 15600-156fff - PID: 01 (idx 308, nxt: 309)
144: 15700-157fff - PID: 01 (idx 309, nxt: 310)
145: 15800-158fff - PID: 01 (idx 310, nxt: 311)
146: 15900-159fff - PID: 01 (idx 311, nxt: 312)
147: 15a00-15afff - PID: 01 (idx 312, nxt: 313)
148: 15b00-15bfff - PID: 01 (idx 313, nxt: 314)
149: 15c00-15cfff - PID: 01 (idx 314, nxt: 315)
14a: 15d00-15dfff - PID: 01 (idx 315, nxt: 316)
14b: 15e00-15efff - PID: 01 (idx 316, nxt: 317)
14c: 15f00-15ffff - PID: 01 (idx 317, nxt: 318)
14d: 16000-160fff - PID: 01 (idx 318, nxt: 319)
14e: 16100-161fff - PID: 01 (idx 319, nxt: 320)
14f: 16200-162fff - PID: 01 (idx 320, nxt: 321)
150: 16300-163fff - PID: 01 (idx 321, nxt: 322)
151: 16400-164fff - PID: 01 (idx 322, nxt: 323)
152: 16500-165fff - PID: 01 (idx 323, nxt: 324)
153: 1
```



```
essim_source_code
CPU 0: Dispatched process 3
Time slot 12
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 14
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 16
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 18
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 20
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 22
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 24
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 26
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 28
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 30
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 32
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 34
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 36
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 38
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 40
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 42
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 43

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Time slot 40
CPU 0: Put process 2 to run queue
CPU 0: Dispatched process 3
Time slot 42
CPU 0: Put process 3 to run queue
CPU 0: Dispatched process 4
Time slot 44
CPU 0: Put process 4 to run queue
CPU 0: Dispatched process 2
Time slot 46
CPU 0: Processed 2 has finished
CPU 0: Dispatched process 3
Time slot 47
CPU 0: Processed 3 has finished
CPU 0: Dispatched process 4
Time slot 48
CPU 0: Processed 4 has finished
CPU 0: Dispatched process 1
Time slot 50
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 51
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 53
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 55
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 57
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 59
CPU 0: Put process 1 to run queue
CPU 0: Dispatched process 1
Time slot 61
CPU 0: Processed 1 has finished
CPU 0 stopped
NOTE: Read file output/sched_1 to verify your result
--OS TEST 0
./os os_0
Time slot 0
Loaded a process at input/proc/p0, PID: 1 PRI0: 2
Time slot 1
CPU 1: Dispatched process 1
Loaded a process at input/proc/p0, PID: 2 PRI0: 0
Time slot 2
CPU 0: Dispatched process 2
Loaded a process at input/proc/p0, PID: 3 PRI0: 0
Time slot 3
Loaded a process at input/proc/p0, PID: 4 PRI0: 0
Time slot 4
Time slot 5
```



```
PROCESSES  OUTPUT  DEBUG CONSOLE  TERMINAL
Time slot 4
Time slot 5
Time slot 6
CPU 1: Put process 1 to run queue
CPU 1: Dispatched process 3
Time slot 8
CPU 1: Put process 2 to run queue
CPU 1: Dispatched process 4
Time slot 10
Time slot 11
Time slot 12
Time slot 13
CPU 1: Put process 3 to run queue
CPU 1: Dispatched process 2
Time slot 14
CPU 1: Put process 4 to run queue
CPU 1: Dispatched process 3
Time slot 15
Time slot 16
Time slot 17
CPU 1: Processed 2 has finished
CPU 1: Dispatched process 4
Time slot 18
CPU 1: Processed 3 has finished
CPU 1: Dispatched process 1
Time slot 19
Time slot 20
Time slot 21
CPU 1: Processed 4 has finished
CPU 1: stopped
Time slot 22
CPU 1: Processed 1 has finished
NOTE: Read file output/res_0 to verify your result
OS TEST 1
Time slot 0
Time slot 1
Loaded a process at input/proc/p0, PID: 1 PRIO: 2
CPU 1: Dispatched process 1
Time slot 2
Loaded a process at input/proc/p0, PID: 2 PRIO: 0
CPU 1: Put process 1 to run queue
CPU 1: Dispatched process 2
Time slot 3
Loaded a process at input/proc/p0, PID: 3 PRIO: 0
CPU 1: Dispatched process 3
CPU 1: Dispatched process 1
Time slot 4
Loaded a process at input/proc/p0, PID: 4 PRIO: 0
CPU 1: Put process 1 to run queue
CPU 1: Dispatched process 1
Time slot 5
CPU 1: Put process 2 to run queue
Loaded a process at input/proc/p0, PID: 5 PRIO: 0
CPU 1: Put process 3 to run queue
CPU 1: Dispatched process 5
CPU 1: Dispatched process 2
CPU 1: Dispatched process 4
Time slot 6
Loaded a process at input/proc/p0, PID: 6 PRIO: 0
CPU 1: Dispatched process 4
Time slot 7
CPU 1: Dispatched process 4
Time slot 8
Loaded a process at input/proc/p0, PID: 6 PRIO: 0
CPU 1: Put process 1 to run queue
CPU 1: Put process 5 to run queue
Loaded a process at input/proc/p0, PID: 7 PRIO: 0
CPU 1: Put process 4 to run queue
CPU 1: Dispatched process 5
CPU 1: Put process 5 to run queue
CPU 1: Dispatched process 7
CPU 1: Dispatched process 2
Time slot 10
CPU 1: Dispatched process 4
Time slot 11
CPU 1: Put process 4 to run queue
CPU 1: Dispatched process 6
CPU 1: Put process 8 to run queue
CPU 1: Dispatched process 3
CPU 1: Put process 7 to run queue
CPU 1: Dispatched process 5
CPU 1: Put process 2 to run queue
CPU 1: Dispatched process 4
CPU 1: Put process 6 to run queue
CPU 1: Dispatched process 8
Time slot 15
CPU 1: Put process 8 to run queue
CPU 1: Dispatched process 3
CPU 1: Put process 7 to run queue
CPU 1: Dispatched process 5
CPU 1: Put process 2 to run queue
CPU 1: Dispatched process 4
CPU 1: Put process 6 to run queue
CPU 1: Dispatched process 8
Time slot 16
CPU 1: Put process 3 to run queue
CPU 1: Dispatched process 7
CPU 1: Put process 5 to run queue
CPU 1: Dispatched process 2
CPU 1: Put process 4 to run queue
CPU 1: Dispatched process 6
CPU 1: Put process 8 to run queue
CPU 1: Dispatched process 3
Time slot 18
CPU 1: Put process 7 to run queue
CPU 1: Dispatched process 9
CPU 1: Processed 2 has finished
CPU 1: Dispatched process 4
CPU 1: Put process 6 to run queue
CPU 1: Dispatched process 8
CPU 1: Processed 3 has finished
CPU 1: Dispatched process 7
Time slot 20
CPU 1: Processed 5 has finished
CPU 1: Dispatched process 6
CPU 1: Processed 4 has finished
CPU 1: Dispatched process 1
CPU 1: Put process 8 to run queue
CPU 1: Dispatched process 8
CPU 1: Processed 7 has finished
CPU 1: stopped
Time slot 22
CPU 1: Processed 6 has finished
CPU 1: stopped
CPU 1: Put process 1 to run queue
CPU 1: Dispatched process 1
CPU 1: Processed 8 has finished
CPU 1: stopped
Time slot 24
CPU 1: Processed 1 has finished
CPU 1: stopped
NOTE: Read file output/res_1 to verify your result
C:\Users\master\Documents\assignment\main_source_code> python main.py
```