

Assignment 1- Preemption

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1. 作业概述

本次作业的目标是修改操作系统内核代码，实现对内核线程的抢占调度。在每个时钟中断时调用 `yield`，使当前进程放弃 CPU 并回到 `scheduler`。经过实现三个checkpoint，现在的操作系统可以实现多CPU下的线程抢占调度。

2. 运行截图

Checkpoint 1

```

Mar 30 15:02
File Edit Selection ... ← → bssignment1-Preemption (1)
oslab@oslab-2025S: ~/bssignment1-Preemption (1)
[INFO 0,4] worker: thread 4: count 75000, sleeping
[sched 0,4] sched: switch to scheduler pid(4)
[sched 0,-1] scheduler: switch to proc pid(5)
[INFO 0,5] worker: thread 5: count 76000, sleeping
[sched 0,5] sched: switch to scheduler pid(5)
[sched 0,-1] scheduler: switch to proc pid(6)
[INFO 0,6] worker: thread 6: count 77000, sleeping
[sched 0,6] sched: switch to scheduler pid(6)
[sched 0,-1] scheduler: switch to proc pid(7)
[INFO 0,7] worker: thread 7: count 78000, sleeping
[sched 0,7] sched: switch to scheduler pid(7)
[sched 0,-1] scheduler: switch to proc pid(8)
[INFO 0,8] worker: thread 8: count 79000, sleeping
[sched 0,8] sched: switch to scheduler pid(8)
[sched 0,-1] scheduler: switch to proc pid(9)
[INFO 0,9] worker: thread 9: count 80000, sleeping
[sched 0,9] sched: switch to scheduler pid(9)
[sched 0,-1] scheduler: switch to proc pid(2)
[WARN 0,2] worker: thread 2: exiting
[sched 0,2] sched: switch to scheduler pid(2)
[sched 0,-1] scheduler: switch to proc pid(3)
[ERROR 0,3] kernel_trap: kerneltrap: not from supervisor mode
[ERROR 0,3] kernel_trap: ===== Kernel Panic =====
sstatus : 0x80000000200006020
- SUM:0, SPP:U, SPIE:1, SIE: 0
scause : 0x0000000000000002
- Interrupt:0, Code:2
sepc : 0x000000008020197c
stval : 0x00000000100024f3
sip : 0x0000000000000000
- Pending: Software:0, Timer:0, External:0
sie : 0x0000000000000220
- Enabled: Software:0, Timer:1, External:1
satp : 0x0000000000000000
kernel trapframe at 0x000000008023ce60
ra: 0x0000000080202364 sp: 0x000000008023ce60 gp: 0x0000000000000000 tp: 0x0000000000000000
00
t0: 0x0000000000000000 t1: 0x000000008023cf48 t2: 0x0000000000001000 s0: 0x000000008023cf
80
s1: 0x0000000000000000 a0: 0x00000000000001f4 a1: 0x000000000000000a a2: 0x0000000000000000
05
a3: 0x000000000004c4b40 a4: 0x00000000b1ddf84 a5: 0x0000000080202364 a6: 0x00000000802062
c0
a7: 0x0000000000000000 s2: 0x0000000000000000 s3: 0x00000000000003e8 s4: 0x0000000000000000
03
s5: 0x0000000080205ad8 s6: 0x00000000802054b0 s7: 0x0000000080206300 s8: 0x0000000000000000
00
s9: 0x0000000080238d98 s10: 0x0000000000000000 s11: 0x0000000000000000 t3: 0x0000000000000000
10
t4: 0x0000000080046dda t5: 0x000000000000000f t6: 0x0000000000000027
[PANIC 0,3] os/trap.c:92: kernel panic

```

Checkpoint 2

```
oslab@oslab-2025S: ~/bssignment1-Preemption (1)
[sched 0,-1] scheduler: switch to proc pid(8)
[WARN 0,8] worker: thread 8: exiting
[sched 0,8] sched: switch to scheduler pid(8)
[sched 0,-1] scheduler: switch to proc pid(9)
[sched 0,9] sched: switch to scheduler pid(9)
[sched 0,-1] scheduler: switch to proc pid(1)
[INFO 0,1] init: thread 2 exited with code 22, expected 22
[INFO 0,1] init: thread 3 exited with code 23, expected 23
[INFO 0,1] init: thread 4 exited with code 24, expected 24
[INFO 0,1] init: thread 5 exited with code 25, expected 25
[INFO 0,1] init: thread 6 exited with code 26, expected 26
[INFO 0,1] init: thread 7 exited with code 27, expected 27
[INFO 0,1] init: thread 8 exited with code 28, expected 28
[sched 0,1] sched: switch to scheduler pid(1)
[sched 0,-1] scheduler: switch to proc pid(9)
[WARN 0,9] worker: thread 9: exiting
[sched 0,9] sched: switch to scheduler pid(9)
[sched 0,-1] scheduler: switch to proc pid(1)
[INFO 0,1] init: thread 9 exited with code 29, expected 29
[INFO 0,1] init: all threads exited, count 80000
[INFO 0,1] init: init ends!
[PANIC 0,1] os/proc.c:225: init process exited
```

Checkpoint 3

```
oslab@oslab-2025S: ~/assignment1-Preemption
[INFO 1,1] init: thread 7 exited with code 27, expected 27
[INFO 1,1] init: thread 8 exited with code 28, expected 28
[INFO 1,1] init: thread 9 exited with code 29, expected 29
[INFO 1,1] init: thread 10 exited with code 30, expected 30
[INFO 1,1] init: thread 11 exited with code 31, expected 31
[INFO 1,1] init: thread 12 exited with code 32, expected 32
[INFO 1,1] init: thread 13 exited with code 33, expected 33
[INFO 1,1] init: thread 14 exited with code 34, expected 34
[INFO 1,1] init: thread 15 exited with code 35, expected 35
[INFO 1,1] init: thread 16 exited with code 36, expected 36
[INFO 1,1] init: all threads exited, count 150000
[INFO 1,1] init: init ends!
[PANIC 1,1] os/proc.c:225: init process exited
[PANIC 3,-1] os/trap.c:45: other CPU has panicked
[PANIC 0,-1] os/trap.c:45: other CPU has panicked
[PANIC 2,-1] os/trap.c:45: other CPU has panicked
```

3. 时间统计

本次作业共计花费 **4.5** 小时完成，其中**2**小时学习知识，**2**小时写代码，**0.5**小时写报告。