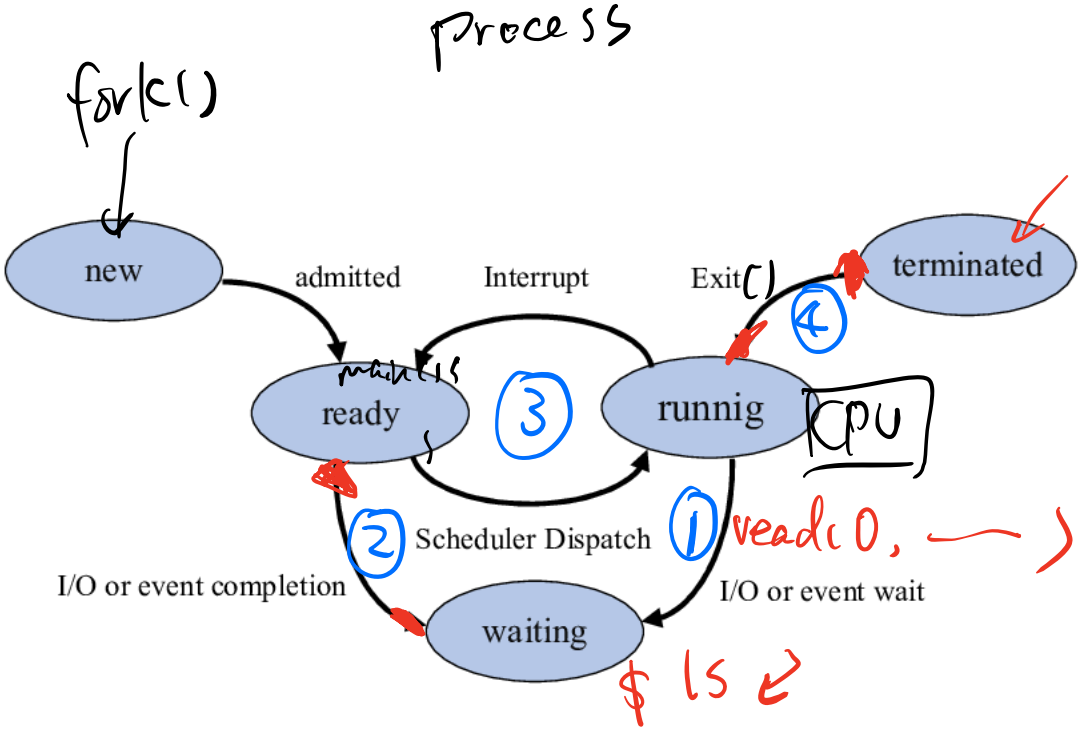
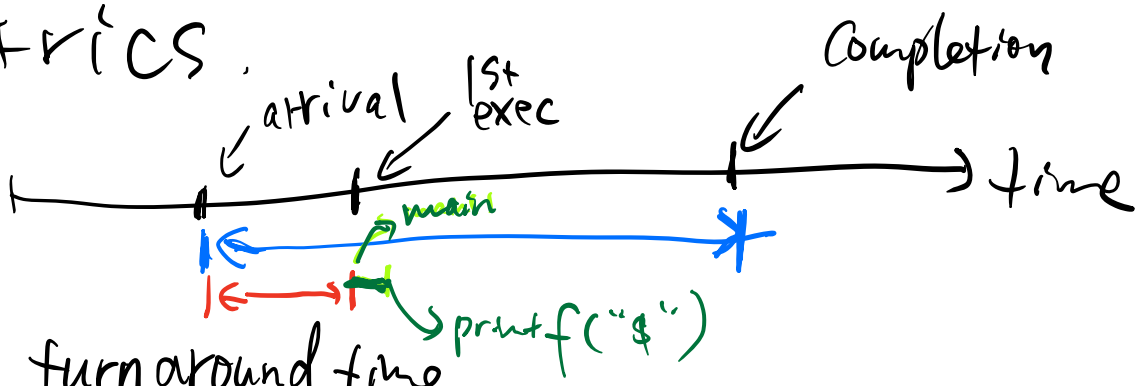


Fig13 from "Priority based round robin (PBRR) CPU scheduling algorithm"

- preemptive : ① - ④

  non-preemptive : ① and ④

- Metrics.



  - turnaround time
  - response time
  - "fairness"
    - no starvation
    - share CPU equally

- proportional to their needs.

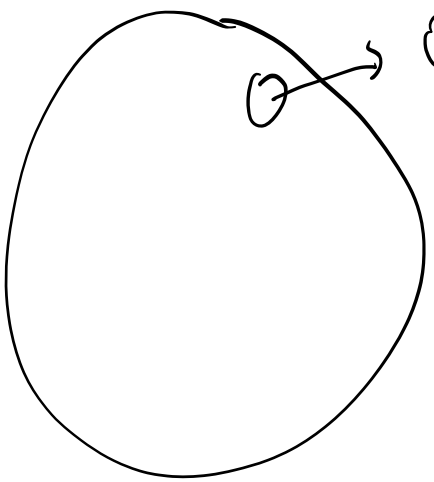
Week 4.b
CS 5600
02/01 2023
https://naizhengtan.github.io/23spring/

1. Last time
2. Scheduling intro
3. Scheduling disciplines
    - FIFO
    - SJF
    - RR
    - Prio
    - MLFQ
    - Lottery
4. Vote for scheduling algorithms

4:10 PM

PCB Context switch

- Scheduling

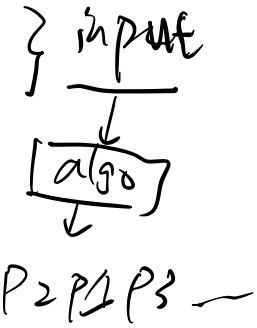


OS schedule

Q: [OS]: which process to run?

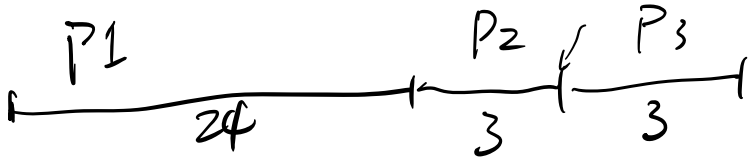
setup: WHEN

- scheduling game
  -- 1 CPU
  -- multiple processes: P1, P2, P3, ...
    -- each with arrival time and running time
  -- ignore context switches
  -- assume no I/O
  -- scheduling ~~output~~:
     a sequence of scheduling decisions



A. FCFS/FIFO

process	arrival	running
→ P1	0 (beginning)	24
P2	0 + ε	3
P3	0 + 2ε	3



avg turnaround time : $\frac{24+27+30}{3} = 27$

avg rsp time : $\frac{0+24+27}{3} = \frac{51}{3} = 17$

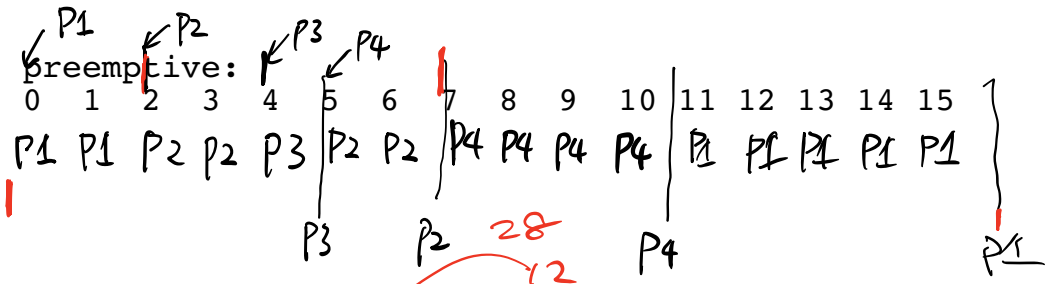
Q: [P2, P3, P1]

avg turnaround time? $\frac{3+6+30}{3} = 13$ avg rsp time? $\frac{0+3+6}{3} = 3$

Shortest Job First (non-pre...)

B. SJF and STCF

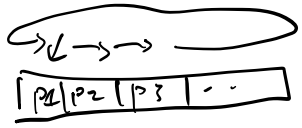
process	arrival	running
P1	0	7 - 2 = 5
P2	2	4 - 2 = 2
P3	4	~~1~~
P4	5	~~4~~



avg turnaround time : $\frac{16+5+1+6}{4} = 7$

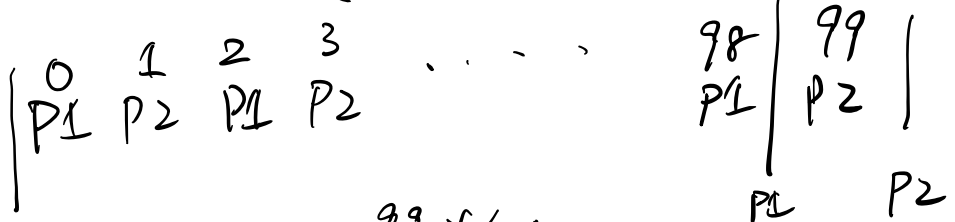
Q = avg rsp time : $\frac{0+0+0+2}{4} = 0.5$

C. Round-robin (RR)



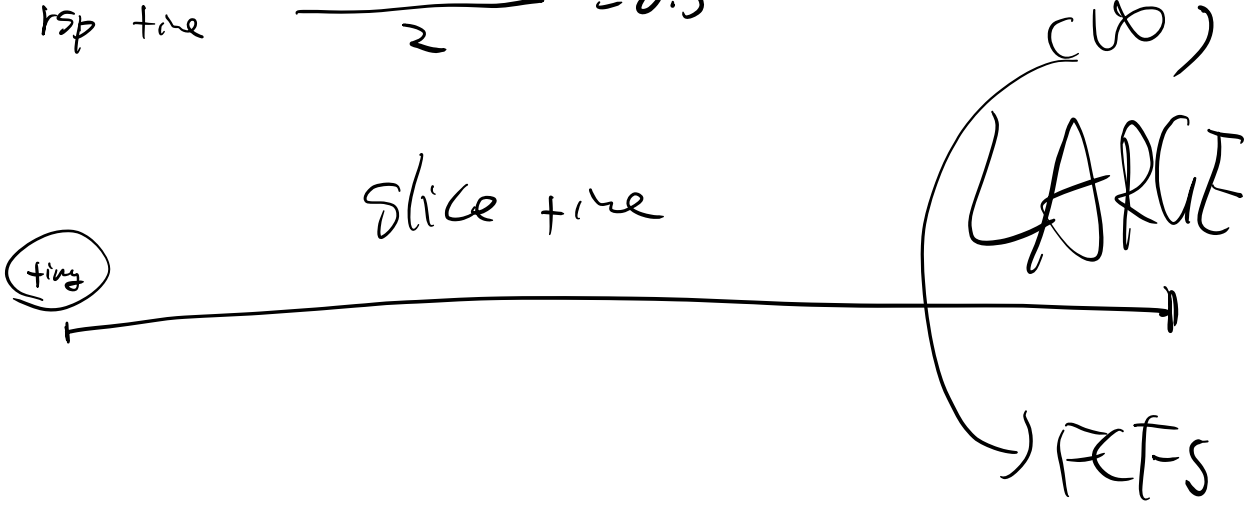
(with slice of 1 unit of time)

process	arrival	running
P1	0	50
P2	0+ε	50



avg turnaround time $= \frac{99+100}{2} = 99.5$

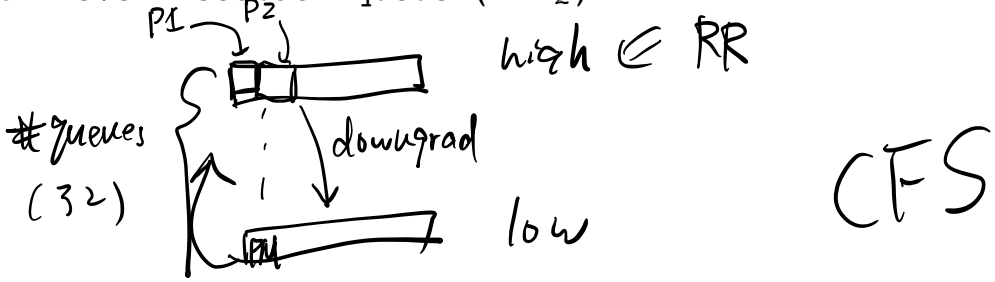
avg rsp time $= \frac{0+1}{2} = 0.5$



D. Priority

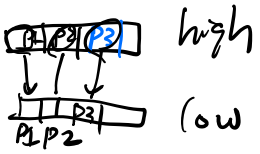
process	arrival	running
P1 (high)	0	10
P2 (low)	0	5

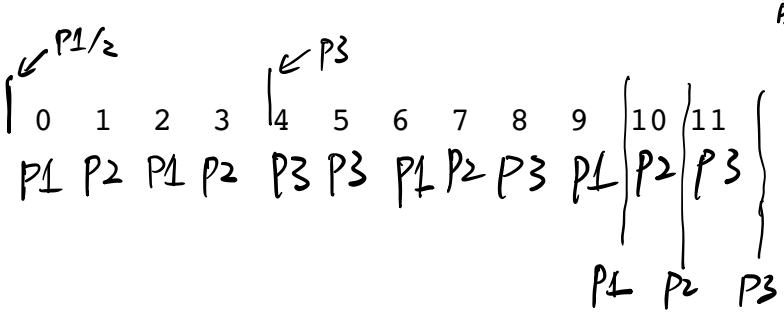
E. Multi-level feedback queue (MLFQ)



(with slice of 1 unit of time; RR
2 units of time to change priority, i.e., "downgrade")

process	arrival	running
P1	0	4
P2	0+ε	4
P3	4	4



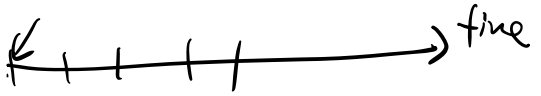


Probabilistic algo

F. Lottery (and stride scheduling) → deterministic algo

(with slice of 1 unit of time)

process	arrival	running
P1 (t_1=20)	0	20
P2 (t_2=10)	0	10



$Pr(P1 \text{ win}) = \frac{20}{20+10} = \frac{2}{3}$

P1 P1 P2 P1 P2 . . .

⇒ P1 P1 P1 . . .

Question: expected turnaround time for (P1, P2):

A. (20, 30)
B. (30, 20)
C. (30, 30)
D. others.

$E_{P2} = \frac{10}{1/3} = 30$

B C B .

$E_{\text{turnaround}}^{(P1)} = \frac{\text{running time}^{(20)}}{E(\text{running time of P1 in 1 unit of time})}$

$= \frac{20}{2/3} = 30$

Candidates: FIFO, STCF, RR, Prio, MLFQ, and Lottery

Awards:

"Best Turnaround Time"

"Best Response Time"

"Best Fairness"

"Most popular algorithm"