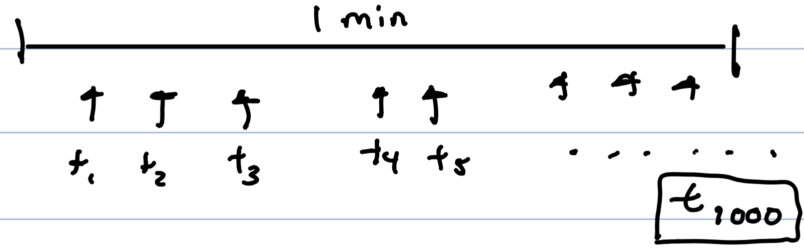
λ = 10 process/min



≈ 50 min

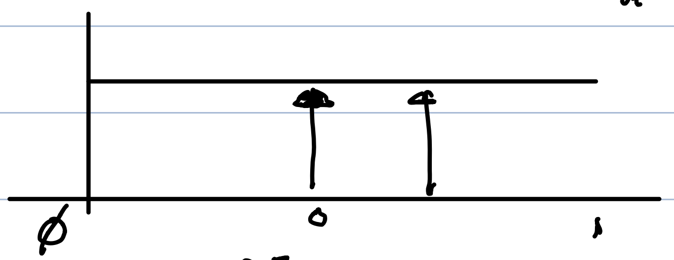
arrival of process

rand()

randmax

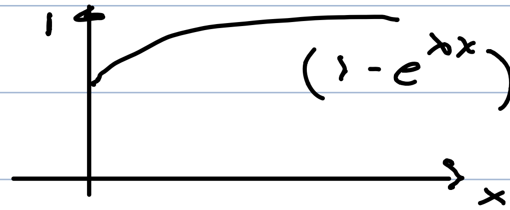
getting numbers up to that point

y = rand();



CDF

$Pr(X \leq x)$



$(1 - e^{-\lambda x}) = y$ } we just need to find X

Using poisson distribution to determine

- Question 6
  - switching 2 processes show increased waiting time.

Real-time Scheduling

- Results must be produced by a specific deadline.
  - Soft real time
    - meeting deadlines are desireable
  - Hard real time
    - you can't miss a deadline

How to provide real time scheduling?

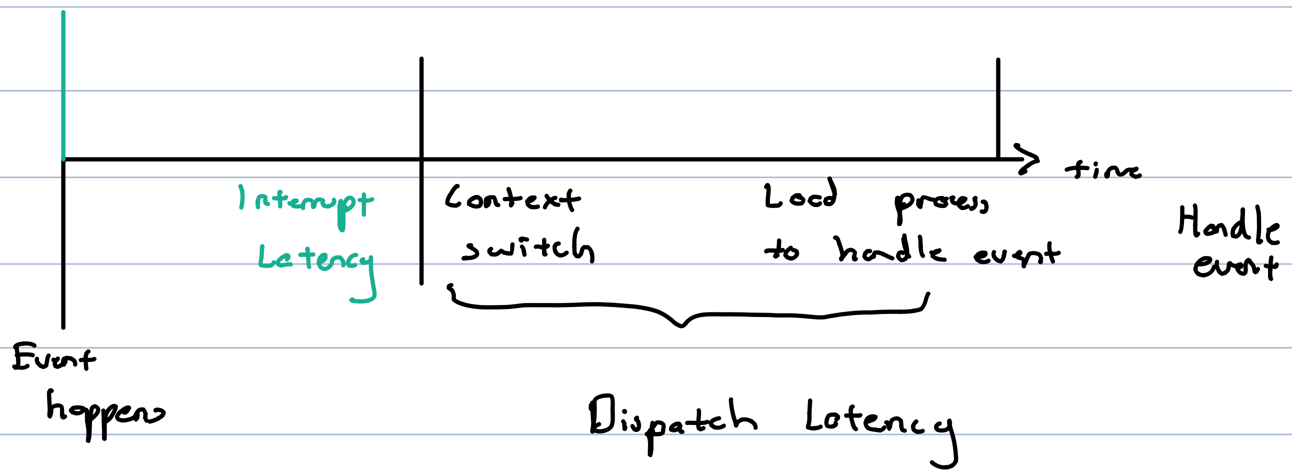
1 → Preemptive Priority-based scheduler

2 → Preemptive Kernel

↳ Allows premption of processes executing kernel code.

con: complex to design

3 → Minimizing Latency

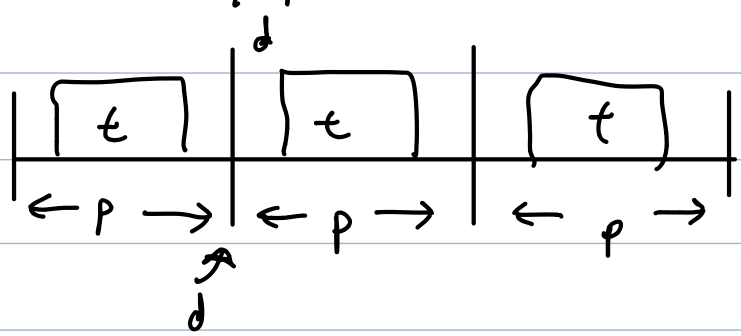


Consider Periodic tasks / processes

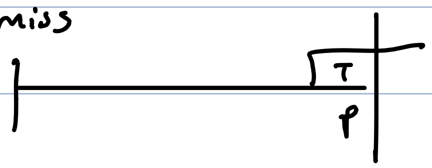
period p

deadline d

service t



miss



- Assume schedulers know p, t, d for all processes and they are fixed
  - Schedulers are designed to admit / reject processes

[1] Rate Monotonic Scheduler [RMS]

Static Priority w/ Premption ← Higher beats lower process priority is inversley based on period $\downarrow \frac{1}{P}$

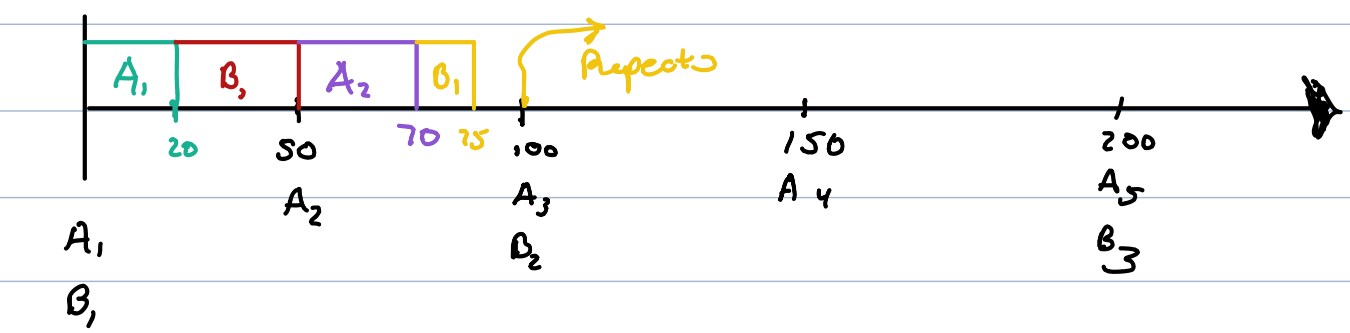
Shorter period = Higher priority

$A(t, p)$ $\quad$ $\left.\begin{matrix} A(20, 50) \\ B(35, 100) \end{matrix}\right\}$ $\frac{20}{50} + \frac{35}{100} = \frac{75}{100}$

since it's less than 1 it can be scheduled

75% busy

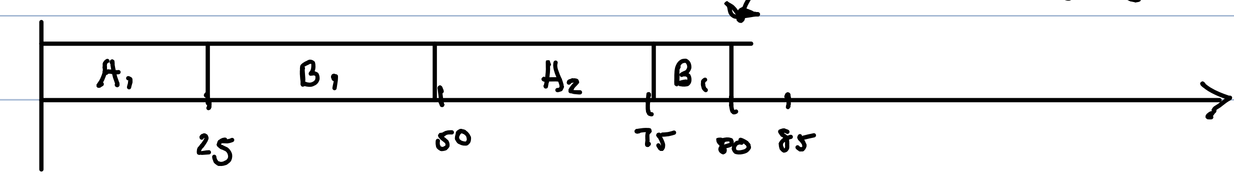
• Any time A & B compete A will win



Next example

$\left.\begin{matrix} A(25, 50) \\ B(35, 80) \end{matrix}\right\}$ $\frac{25}{50} + \frac{35}{80} = 0.94$

B misses deadline



A_1
B_1

this is due to B only allowed to finish within 80

RMS Bound

n processs

$n = 1 \rightarrow 1$

$n = 2 \rightarrow 0.82$

$n = 3 \rightarrow 0.779$

$n = \infty \rightarrow 0.69$

$$n\left(2^{1/n} - 1\right)$$

If it is above the bound you u would need to test which conditions work

- When RMS below it will always meet the deadline at hand.

$\rightarrow$ RMS is optimal under static-priority scheme

A (t_a, P_a)

B (t_b, P_b)

C (t_c, P_c)

$X > 1$ Impossible

RMS $< X < 1$ we don't know

$X <$ RMS works

$$\frac{t_a}{P_a} + \frac{t_b}{P_b} + \frac{t_c}{P_c} \ldots = X$$

ex// A $(20, 100)$

B $(40, 150)$

C $(100, 350)$

$$\frac{20}{100} + \frac{40}{150} + \frac{100}{350} = 0.753$$

$0.753 \leq 0.779$

All process meet deadline,

Lets take the case

$$\frac{25}{50} + \frac{30}{80}$$ $\leftarrow$ Check LCD

which in this case would be 400

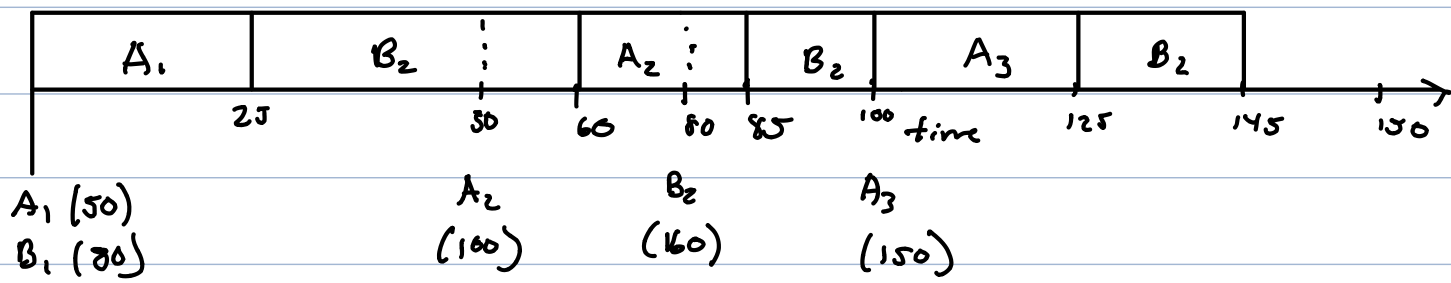
2 Earliest Deadline First [EDF]

The earlier the deadline, higher the priority (dynamically assigned)

e.g.

A(25, 50)

B(35, 80)



since A2 has deadline of 100 that's how it picks

3 Proportional Share Schedules

T shares

A = 50

B = 20

C = 15

shares

T = 100

Q7