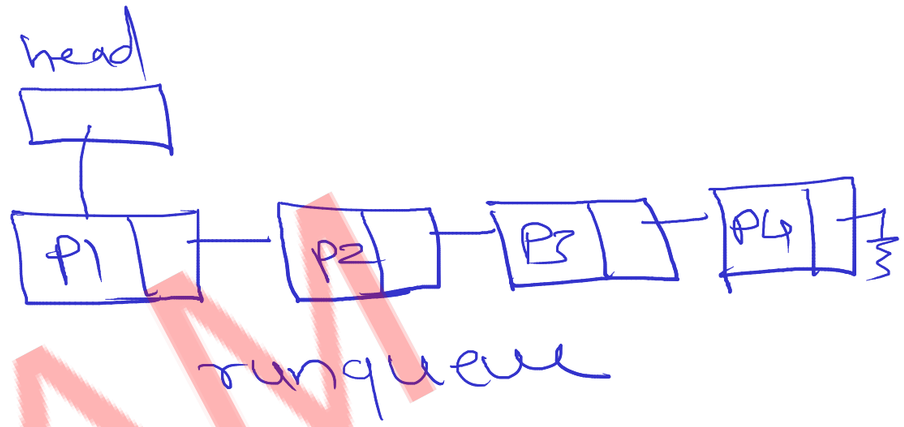
Linux Scheduling

O(n) Scheduler

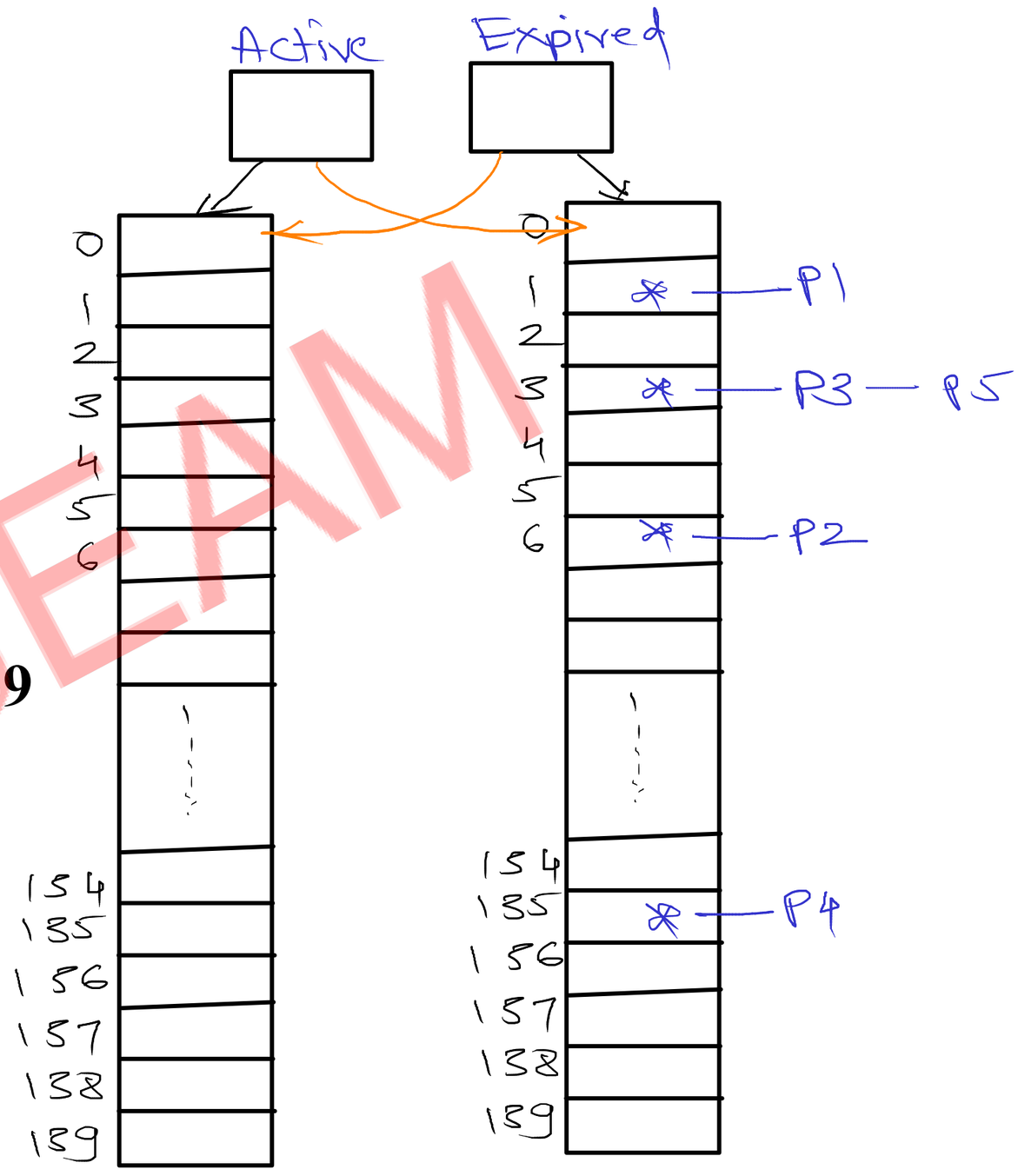


- all processes are kept into single linked list
- to select next process which will run on CPU, scheduler has to traverse whole linked list
- linked list of processes is known as "run queue"
- to select next process, time required is O(n)
- upto linux kernel 2.5 this scheduler was used

Linux Scheduling

O(1) Scheduler

- created two run queue
    1. active runqueue (array)
    2. expired runqueue(array)
- array indices represent priority levels
- size of array = no of level of priority
- task are divided into two categorities
    1. Real time task : Priority - 0 to 99
    2. Other task : Priority - 100 to 139



Time Share

Process	Nice Value
P1	0
P2	0
P3	0
P4	0

$$\text{Epoch} = \frac{\text{Targeted Lattency}}{} = 100 \text{ ms}$$

$$W_0 = 1024$$

$$TS(i) = \frac{W_i}{\sum W_x} \times TL$$

$$TS(0) = \frac{W_0}{W_0+W_0+W_0+W_0} \times TL$$

$$= \frac{1024}{1024+1024+1024+1024} \times 100$$

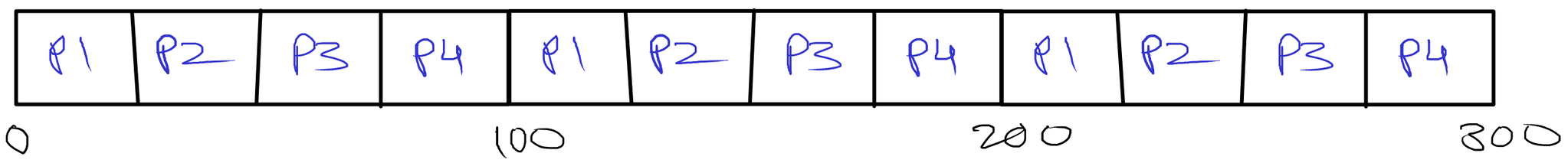
$$= 25 \text{ ms}$$

P1 → 25 ms

P2 → 25 ms

P3 → 25 ms

P4 → 25 ms



Time Share

Process	Nice Value
P1	0
P2	5
P3	5
P4	5

$$\text{Epoch} = \frac{\text{Targeted Lattency}}{} = 100 \text{ ms}$$

$W_0 = 1024 \qquad W_5 = 335$

$$TS(i) = \frac{W_i}{\sum W_i} \times TL$$

$$TS(0) = \frac{W_0}{W_0 + W_5 + W_5 + W_5} \times TL$$

$$= \frac{1024}{1024 + 335 + 335 + 335} \times 100$$

$= 50.46 \text{ ms}$

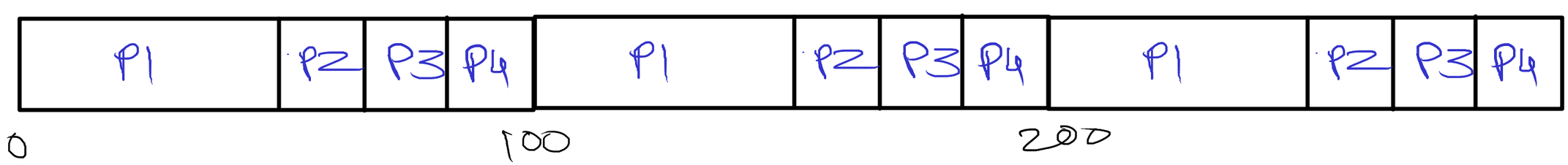
$P1 \rightarrow 50.46 \text{ ms}$

$$TS(5) = \frac{W_5}{W_0 + W_5 + W_5 + W_5} \times TL$$

$$= \frac{335}{1024 + 335 + 335 + 335} \times 100$$

$= 16.51 \text{ ms}$

$P2, P3, P4 \rightarrow 16.51 \text{ ms}$



Time Share

Process	Nice Value
P1	0
P2	0
P3	5
P4	5
P5	5

$$\text{Epoch} = \frac{\text{Targeted Lattency}}{} = 100 \text{ ms}$$

$W_0 = 1024 \qquad W_5 = 335$

$$TS(i) = \frac{W_i}{\sum W_x} \times TL$$

$$TS(0) = \frac{W_0}{W_0+W_0+W_5+W_5+W_5} \times TL$$

$$= \frac{1024}{1024+1024+335+335+335} \times 100$$

$= 33.54 \text{ ms}$

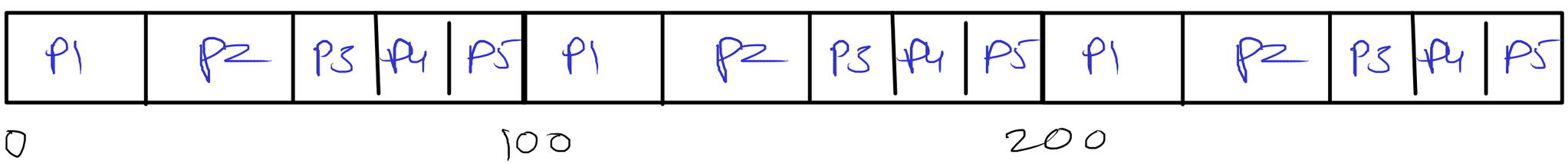
P1, P2 → 33.54 ms

$$TS(5) = \frac{W_5}{W_0+W_0+W_5+W_5+W_5} \times TL$$

$$= \frac{335}{1024+1024+335+335+335} \times 100$$

$= 10.97 \text{ ms}$

P3, P4, P5 → 10.97 ms



Virtual Runtime

vruntime = decay factor x aruntime

$$\text{decay factor} = \frac{W_0}{W_i}$$

nice < 0
factor < 1

nice = 0
factor = 1

nice > 0
factor > 1

nice = 0

$$\text{factor} = \frac{1024}{1024}$$

$$= 1$$

nice = 5

$$\text{factor} = \frac{1024}{335}$$

$$= 3.05$$

task is having actual runtime = 20 ms

vruntime = factor * arun time

vruntime = 1 * 20
= 20 ms

vruntime = 3.05 X 20
= 60.

Linux Scheduling

- There are two types of policies in linux
    1. Real time policies
        - i. SCHED_RR
        - ii. SCHED_FIFO
    2. Non real time policies
        - i. SCHED_OTHER
        - ii. SCHED_BATCH
        - iii. SCHED_IDLE