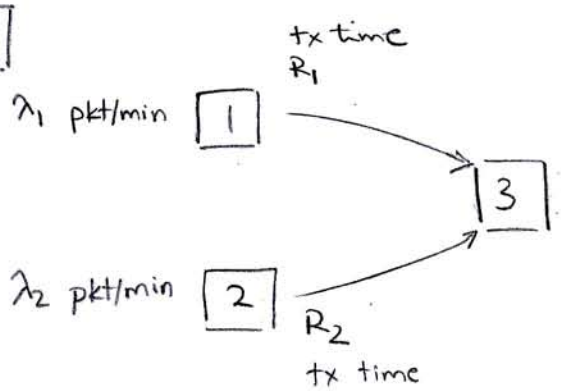
3.2



P_1 : proc. time for file from "node 1"
P_2 : proc. time for file from "node 2"

Required: set of all feasible throughput pairs (λ_1, λ_2)

To operate the system at its "capacity", the system must be busy at all times, either transmission or processing of a file is going on.

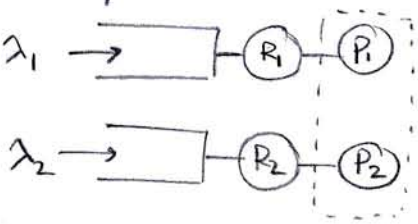
Therefore, in this case, number of files in the system = 1 (at any time)

$\therefore N = 1$

N ↑ average number of files in the system

Next, we will compute N using Little's thm.

We can think of "node 3", as a node containing two servers: one for processing files from "node 1", and another for processing files from "node 2" such that only one is active. The system looks like:



$N_1 = \lambda_1 (R_1 + P_1)$ (Little's Thm)

$N_2 = \lambda_2 (R_2 + P_2)$ (Little's Thm)

$$N = N_1 + N_2 = \lambda_1 (R_1 + P_1) + \lambda_2 (R_2 + P_2)$$

but we know that $N = 1$, then $\lambda_1 (R_1 + P_1) + \lambda_2 (R_2 + P_2) = 1$

$\Rightarrow$ set of all feasible throughput pairs

$$= \{(\lambda_1, \lambda_2) : \lambda_1 \geq 0,\ \lambda_2 \geq 0,\ \lambda_1 (R_1 + P_1) + \lambda_2 (R_2 + P_2) \leq 1\}$$