3.2

\[ \lambda_1 \text{ pkt/min} \]

\[ \lambda_2 \text{ pkt/min} \]

\[ R_1 \]

\[ R_2 \]

\[ p_1 \text{ proc. time for file from "node 1" } \]

\[ p_2 \text{ proc. time for file from "node 2" } \]

Required: set of all feasible throughput pairs \((\lambda_1, \lambda_2)\)

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

\[ N = 1 \]

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 \(\lambda_1 (R_1 + p_1) + \lambda_2 (R_2 + p_2) = 1\)

\[ \Rightarrow \text{ set of all feasible throughput pairs} \]

\[ \{(\lambda_1, \lambda_2) : \lambda_1 \geq 0, \lambda_2 \geq 0, \lambda_1 (R_1 + p_1) + \lambda_2 (R_2 + p_2) \leq 1\} \]