CS 476, Assignment 1

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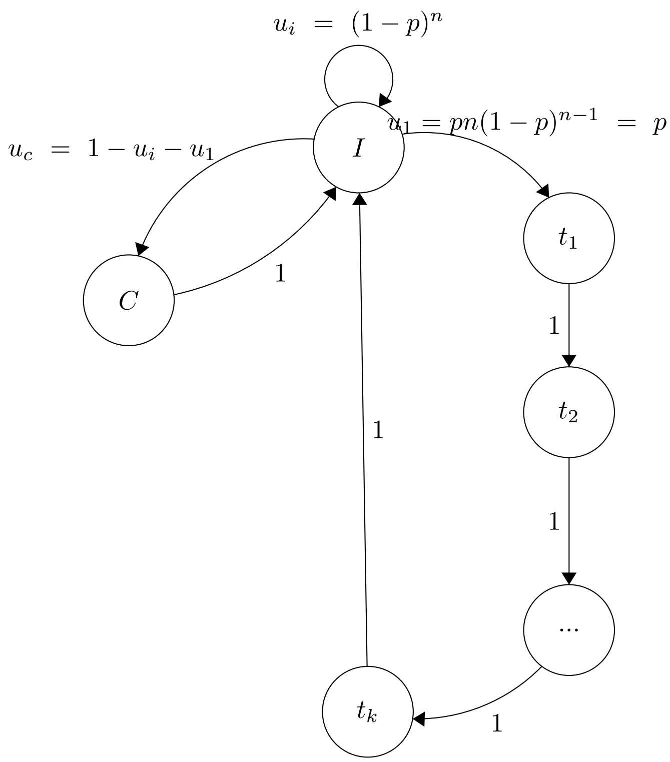
1

a

i



ii

Balance Equations:
State I: $S_i(1-u_i) = u_i(S_k + S_c)$
State C: $S_i u_c = S_c u_i$
State t_1: $U_1 = P$
State t_k: $S_i u_c = S_k u_i$

Stationary Probabilities:

State I: $S_i = \frac{u_i(S_k+S_c)}{1-u_i}$
State C: $S_c = \frac{S_i u_c}{u_i}$
State K: $S_k = \frac{S_i}{u_1}$

iii

System throughput is defined by the average output traffic:

iv

v

1

a

Given that B has a rate of $R_B = \frac{1}{2}$ message per time slot, because it has to send and reveive a message. It then takes two time frames to move one message. C has a rate of $R_C = 1$ message per time slot. The maximum throughput of a given connection is limited by its smallest rate, which is $\frac{1}{2}$

b

The maximum rate would then be two messages per time frame, because both A and D are transmitting unimpaired. Then the maximum rate would be $\frac{2}{1}$ or simply 2 messages per timeframe.

c

For this scenario, A would have to reserve a slot with B, and C with D. With this in mind, then we have to look at what nodes would collide. B and C will collide with a reservation collision. Then, B or C would have to wait until A or D are done sending in order to start. Then the maximum throughput in this case would simply be 1 message per timeframe.

d

In a wired scenario, there would be no issues, and the maximum throughput would simply be 2 messages per timeframe. There are no collisions. For that reason wired is much more efficient.