GGÜ 4

Montag, 29. November 2010
11:44

4c) with GO-BACK-N

If success at first time $(1-p)$

$\to$ time to transmit frame t_f

If failure at first time (p)

(knowing that we need $(1/1-p)$ transmission attempts on average

time to deliver frame

$t_f + \underbrace{N_f}_{} = t_f\left(\frac{1}{1-p}\right) = t_f + T\left(\frac{1}{1-p}\right)$

number of frames transmitted after the lost one and until timeout $\to N_F = \frac{T}{t_f} \to$ timeout

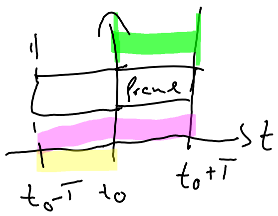
$\Rightarrow$ Total time for frame: $(1-p)t_f + p\left(t_f + T\left(\frac{1}{1-p}\right)\right) = t_f + p\frac{T}{1-p}$

$\Rightarrow$ Utilization $= \frac{t_f}{t_f + p\frac{T}{1-p}} = 0{,}7074$ pkt delivery rate $= 64 \cdot 0{,}7 = 42{,}5$ pkts/sec

Exercice set 4

1.) Poisson arrivals: $P_G[k] = \frac{G^k e^{-G}}{k!} \to$ propability of k frame arrivals in frame time

Throughput: $S = G \cdot P_{suc}$



Pure ALOHA

Vulnerable Period: $\overbrace{[t_0-T, t_0+T]}^{2T}$

time interval $T \leftrightarrow G$

$2T \leftrightarrow 2G$

$P_{suc} = P_{2G}[0] = \frac{(2G)^0}{0!} e^{-2G} = e^{-2G} \Rightarrow S = Ge^{-2G}$

Slotted ALOHA

Vulnerable Period $= [t_0-T, t_0]$

$P_{suc} = P_G[0] = e^{-G} \Rightarrow S = G e^{-G}$

1c) Pure ALOHA:

$S_{max} \rightarrow (G e^{-2G})' \overset{!}{=} 0$

$\Rightarrow G(-2)e^{-2G} + e^{-2G} \overset{!}{=} 0 \Rightarrow G = 1/2$

$S_{max} = \frac{1}{2e} = 0{,}18$

Slotted - ALOHA:

$S_{max} \rightarrow (G e^{-G})' \overset{!}{=} 0 \Rightarrow -G e^{-G} + e^{-G} \overset{!}{=} 0$

$\Rightarrow G = 1 \;,\; S_{max} = 0{,}36$

4.) CSMA/CD (BEB)

Want: prob. of having $(k-1)$ collisions and then success on round k?

Round	after collision select timeslot among	No. of choices
1	0	$1 = 2^0$
2	0, 1	2^1
3	0, 1, 2, 3	2^2
4	0, 1, 2, ..., 7	2^3
i		2^{i-1}

Collision at round i

$$P_{round-i-coll} = \underbrace{\underbrace{\left(\frac{1}{2^{i-1}}\right)^2}_{\text{two stations collide at 1. slot}} + \underbrace{\left(\frac{1}{2^{i-1}}\right)^2}_{\text{collision at 2. slot}} + \dots + \left(\frac{2}{2^{i-1}}\right)^2}_{\boxed{2^{i-1} \text{ choices}}} = \frac{2^{i-1}}{2^{2(i-1)}} = 2^{-(i-1)}$$

$\Rightarrow$ Collision at first $(k-1)$ rounds

$= \prod_{i=1}^{k-1} 2^{-(i-1)}$

Final Result: $P_k = \prod_{i=1}^{k-1} 2^{-(i-1)} \left(1 - 2^{-(k-1)}\right)$

6.) Hidden Terminal Problem