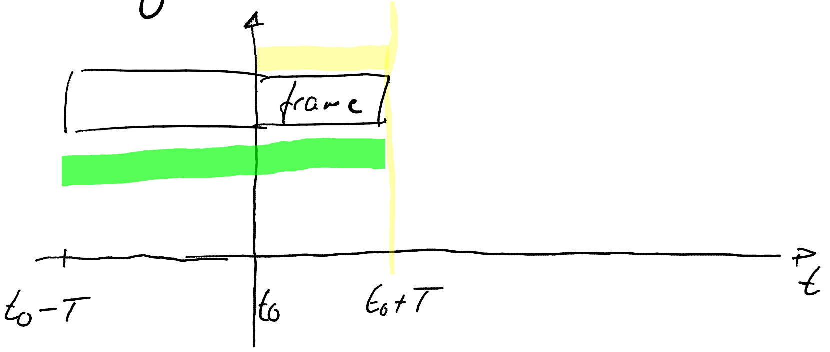
Übung 4

Montag, 29. November 2010
11:54

1) Poisson arrivals $P_G[k] = \frac{G^K \cdot e^{-G}}{K!}$ $\longrightarrow$ probability of K frame arrivals in a frame time

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



Pure ALOHA

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

time interval $T \longleftrightarrow G$

$2T \longleftrightarrow 2G$

$$P_{suc} = P_{2G}[0] = \frac{(2G)^0}{0!} e^{-2G} = e^{-2G} \quad \left(S = G \cdot e^{-2G}\right)$$

Slotted ALOHA

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

$$P_{suc} = P_G[0] = e^{-G} \quad \left(S = G \cdot e^{-G}\right)$$

c) Pure ALOHA

$$S_{max} \longrightarrow \left(G \cdot e^{-2G}\right)' \stackrel{!}{=} 0$$

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

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

Slotted

$$S_{max} \longrightarrow \left(G \cdot e^{-G}\right)' \stackrel{!}{=} 0 \Rightarrow -G e^{-G} + e^{-G} \stackrel{!}{=} 0$$

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

4) CSMA/CD (BEB)

I want: prob. of having $(K-1)$ coll., and then succ. on round K?

Round	after coll. select time slot among	No. of choices
1	0	$1 = 2^0$
2	0,1	$2 = 2^1$
3	0,1,2,3	$4 = 2^2$
4	0,1,2,3,4,5,6,7	$8 = 2^3$
⋮	⋮	⋮
i	$2 \cdot i$	2^{i-1}

Collision at round i

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

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

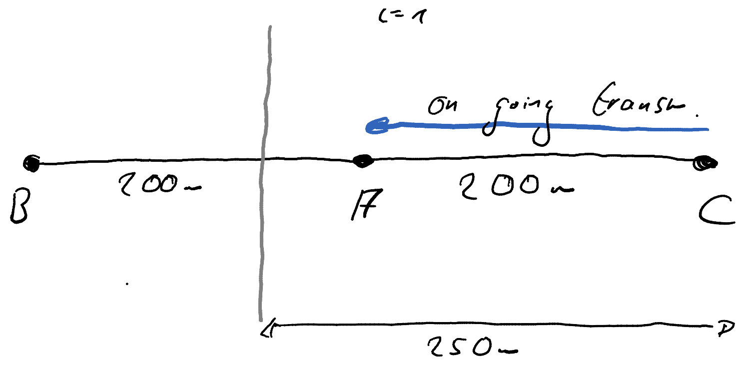
$\Rightarrow$ Collision at 1st $(K-1)$ rounds

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

Final result: $P_K = \prod_{i=1}^{K-1} 2^{-(i-1)} \cdot \left(1 - 2^{-(K-1)}\right)$

6) | on ... frame ...

6)



Hidden Terminal Problem