

Übung 1

Montag, 8. November 2010

09:15

Exercise 1

- Advantages:
 - Break a complex system into pieces
 - easier to manage
 - good reference model
 - eases maintenance / updating

- Disadvantages:
 - data overhead (headers etc.)
 - Optimization of individual layers is difficult in practise
 - adds complexity to the design (cross layer issues)

Exercise 2:

- (a) Transmission delay → R , packet size

- Propagation delay → d (length of connection), s (propagation speed) $\left[\frac{m}{s}\right]$

(b) $s = 2,5 \cdot 10^8 \frac{m}{s}$

$L = 100 \text{ bits}$

$R = 28 \text{ Kbps}$

$$d_{\text{prop}} = d_{\text{trans}} \Rightarrow \frac{m}{s} = \frac{L}{R}$$

$$\Leftrightarrow \frac{m}{2,5 \cdot 10^8 \frac{m}{s}} = \frac{100 \text{ bits}}{28 \text{ Kbps}}$$

$$\Leftrightarrow m = \underline{\underline{892,86 \text{ m}}}$$

(c) $m = 10000 \text{ b}$; $R = 1 \text{ Mbps}$

$L = 60000 \text{ bits}$; $s = \frac{2}{3} c$

Time to transmit 1 bit: $t_1 = \frac{1 \text{ bit}}{1 \text{ Mbps}} \leftarrow R$

$t_2 = t_1 + t_{\text{prop}}$ (first bit reaches receiver)

$$t_1 = 1 \cdot 10^{-6} \text{ sec}$$

$$t_2 = \left[(1 \cdot 10^{-6} \text{ sec}) + 0,05 \right] \text{ sec} \approx 0,05 \text{ sec}$$

$$t_1 = 1.10 \text{ sec}$$

$$t_2 = [(1.10^6 \text{ sec}) + 0.05] \text{ sec} \approx 0.05 \text{ sec}$$

$$d_{prop} = \frac{10000 \cdot 10^3}{1/3 \cdot 3 \cdot 10^8} = 0.05 \text{ s}$$

$$d_{trans} = \frac{40000}{10^6} = 0.04 \text{ s}$$

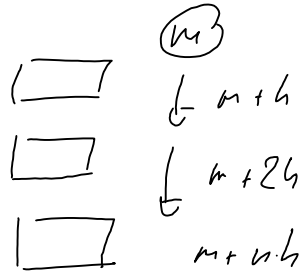
$$1.10^6 + 0.05 = \frac{x}{R} \Rightarrow x = 5,0001 \cdot 10^4 \text{ bits}$$

Exercise 5:

(a) Throughput \rightarrow Rate of successfully delivered data

Goodput \rightarrow Rate of successfully delivered useful information

- (b) . n layers
 . payload bytes
 . headers L bits
 . $T \rightarrow G$?



$$G = \frac{m}{m + n \cdot h} \cdot T$$

(c)

$$G = \frac{512 \text{ B}}{512 \text{ B} + 5 \cdot 20 \text{ B}} \cdot 1.5 \text{ Mbps} = \underline{\underline{1.25 \text{ Mbps}}}$$