Übung 6

Montag, 20. Dezember 2010
11:47

Task 1

(a) Tanenbaum, 5.2.6 (P 366 ff)

- regionalization → split routers into regions
- router has detailed about routes in own regions
- regions may be aggregated

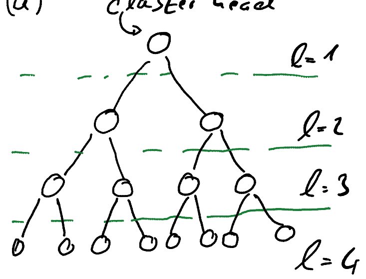
(b) Tanenbaum, 5.6.4 (p. 454 ff)

- 1 level (autonomous system (AS))
- sublevels may exist
- relationships differ peer, transit, multi-homed

(c) Aggregation → low complexity → small routing tables
Information hiding → suboptimal routing

Task 2

(a)



Observation

(a) Node at level l is $(l-1)$ hops away away for CH

(b) Adding a new level approx doubles # of nodes in tree

(c) depth of tree $L \approx \log_2 N$

$$\bar{l} = 0{,}5 \cdot 3 + 0{,}25 \cdot 2 + 0{,}125 \cdot 1 = \sum_{i=1}^{L} (L-i)(0{,}5)^i$$

$$L \gg 10 \quad \bar{l} = \sum_{i=1}^{\infty} (L-i)(0{,}5)^i$$

$$\ulcorner \sum_{i=0}^{\infty} x^i = \frac{1}{1-x} \quad x < 1$$

$$\sum_{i=1}^{\infty} i \cdot x^i = \frac{x}{(1-x)^2} \quad x < 1 \lrcorner$$

$$= \sum_{i=1}^{\infty} L(0{,}5)^i - \sum_{i=1}^{\infty} i(0{,}5)^i$$

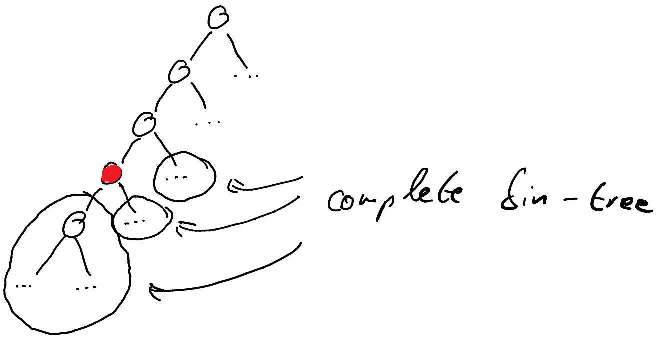
$$= L \cdot \sum_{i=1}^{\infty} (0{,}5)^i - \sum_{i=1}^{\infty} i(0{,}5)^i$$

$$= L \cdot \sum_{i=0}^{\infty} (0{,}5)^i - L - \sum_{i=1}^{\infty} i(0{,}5)^i$$

$$= \frac{L}{1-0{,}5} - L - \frac{0{,}5}{(1-0{,}5)^2} = L - 2$$

(c)

(b)



Observations for example node

(a) tree can be split into subtrees, each several hops away

(b) left subtree has depth $L-l$

(c) size of subtree $\sim 2^{\text{depth}+1}$

$$\bar{l} = \sum_{i=0}^{L-1} \Big(\underbrace{((L-l+i)-2)}_{\text{in-tree depth}} + \underbrace{(i+1)}_{\text{path to subtree}} \Big) \underbrace{\frac{2^{L-l+i+1}}{2^{L+1}}}_{\text{fraction of nodes in subtree}} + \underbrace{((L-l)-2)\,\frac{2^{L-l+1}}{2^{L+1}}}_{\text{left-hand side subtree}}$$

(c)

$$\bar{l}_{M\to CH} > \bar{l}_{M\to M}$$

(d) Assumption $\qquad N = M \cdot N_c$ (M: #Clusters)

(a) $D_{MM} = \log_2 N_c$ — 2.5 direct comm

(b) $2 \cdot \bar{l}_{M\to CH} + 1 \cdot \bar{l}_{CH\to CH}$

(c) all destinations are equally likely

(I) $$\bar{l} = \frac{N_c}{N} \cdot D_{MM} + \left(1 - \frac{N_c}{N}\right)\left(2 \cdot \bar{l}_{M\to CH}(N_c) + \bar{l}_{CH\to CH}(M)\right)$$

$$\frac{\partial}{\partial N_c}\bar{l} \overset{!}{=} 0$$