GGÜ 5

Montag, 20. Dezember 2010
11:47

T1)

(a) Tanenbaum 5.2.6 (p. 360ff)

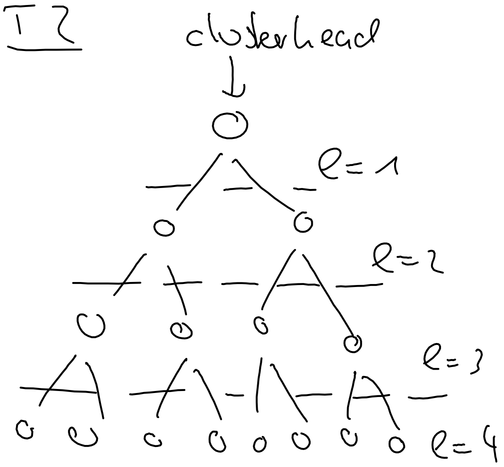
- regionalization → split routers into regions
- routers has detailed knowl. about routers in own region
- regions may be aggregated

(b) Tanenbaum 5.6.4 (p. 454 ff)

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

(c) Aggregation → lower compl. → smaller routing tables
Information hiding → suboptimal routing

T2



Observation

a) Node at level l is (l−1) hops away from CH

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

c) Depth of tree $L \approx \log_2 N$

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

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

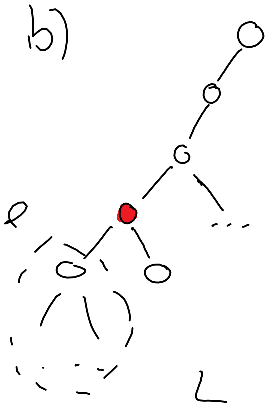
$$= \sum_{i=1}^{\infty} L(0{,}5)^i - \sum_{i=1}^{\infty} i(0{,}5)^i$$

$$\left[\begin{array}{ll} \sum_{i=0}^{\infty} x^i = \frac{1}{1-x} & x<1 \\ \sum_{i=1}^{\infty} i x^i = \frac{x}{(1-x)^2} & x<1 \end{array}\right]$$

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

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

b)



Observation for ex. node

(a) Tree can be split into subtrees, each of them is several hops away

(b) Left subtree has depth $L-e$

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

$$\bar{e} = \sum_{i=0}^{L-1} \Big(\big(\underbrace{(L-e+i)-2}_{\text{in-tree depth}}\big) + \underbrace{(i+1)}_{\substack{\text{path to}\\ \text{subtree}}}\Big) \cdot \underbrace{\frac{2^{L-e+i+1}}{2^{L+1}}}_{\substack{\text{fractional}\\ \text{nodes in subtree}}} +$$

$$+ \underbrace{((L-e)-2)\,\frac{2^{L-e+1}}{2^{L+1}}}_{\text{left hand side subtree}}$$

c) $\bar{e}_{n \to CH} > \bar{e}_{n \to n}$

$N = n \cdot n_c$
$\#\text{clusters}$

d) Assumption

(a) $D_{nn} = \log_2 N_c - 2{,}5$ direct connection

N_c
1

(b) $2 \cdot \bar{e}_{n \to \dots} + \bar{e}_{\dots}$

[illegible]

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

(c) All destinations are equally likely

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

$$\frac{\partial}{\partial N_c} \bar{e} \stackrel{!}{=} 0$$