

PS Algorithmen für verteilte Systeme

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Übungsblatt 2

Aufgabe 1 Consider the following zero-round (randomized) leader election algorithm. Each node declares itself the leader with probability p . As always, we say the algorithm is successful if there is exactly one leader.

- (a) Show that the probability that this algorithm is successful is highest for $p = \frac{1}{n}$.
- (b) Show that in this case the algorithm is successful with probability at least $\frac{1}{e}$.

Aufgabe 2 Consider a set V of n nodes. Let $p \in [\frac{1}{n}, 1]$ be a parameter. As above, suppose each node declares itself a leader with probability p . Let L denote the set of leaders. Show that with high probability we have $|L| = O(pn \log n)$.

Hint. ‘With high probability’ (w.h.p.) means that the statement is true with probability at least $1 - n^{-c}$ for any constant c hidden in the asymptotic notation. In this case, the goal is to show that $|L| = O(cpn \log n)$ with probability at least $1 - n^{-c}$.