

PS Algorithms for distributed systems

Exercise Sheet 3

<https://avs.cs.sbg.ac.at/>

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Exercise 3.1

Prove that we can appoint a leader in an arbitrary network in the CONGEST model in $O(D)$ rounds where D is the diameter of the network.

Exercise 3.2

Prove that in the CONGEST model we can compute the diameter D of the network in $O(m)$ rounds where m is the number of edges in the network

Exercise 3.3

Consider a set V of nodes, parameter $p \in [\frac{1}{n}, 1]$ and the randomized leader election algorithm of exercise 2.3. Let L denote the set of leaders. Prove 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 $1 - \frac{1}{n^c}$ for any positive constant c hidden in the asymptotic notation.