

Network Algorithms: Exercise 12

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1. Recall the valency argument to prove that it is impossible to implement wait-free consensus among 2 processes using atomic registers. Using similar techniques, prove that 3-process wait-free consensus using queues and atomic registers in an asynchronous shared memory is impossible. You may assume that there exists a bivalent initial configuration. (40 points)
2. The adaptive collect algorithm using binary trees from the lecture requires to store a complete binary tree of depth $n - 1$, resulting in exponential memory requirements.

Suppose the algorithm is modified the following way: Whenever a process leaves a splitter with result **left** or **right** it flips a coin to replace this result by **left** or **right** with probability $1/2$ each. Prove that for this randomized variant of the algorithm it is *with high probability* i.e., with probability at least $1 - 1/n^c$ for a choosable constant $c > 0$, sufficient to allocate memory polynomial in n . (60 points)