Principles of Distributed Computing  
Exercise 10

1 Determining the Median

Consider a radio packet network with $n$ nodes and without collision detection. Furthermore, assume that each node has a token of size $O(\log n)$ (a number) and is equipped with memory of size $O(\log n)$. Present a uniform algorithm which allows the nodes to determine the median in $O(n)$ time slots w.h.p.

**Hint:** You can assume that $n$ is odd and each token is unique.

**Hint:** Initializing first and then trying to determine the median simplifies the task.

**Hint:** With a memory of size $O(\log n)$ the nodes can count up to $n$.

2 Maximum

Assume a uniform wireless network with collision detection in which every node is given a number. Give a $O(\log^2 n)$ algorithm that finds the highest number w.h.p.

**Hint:** Use the fast Leader Election with CD algorithm from the script.

**Hint:** Use the ideas in the proof of the fast Leader Election with CD algorithm and the union bound to prove that your algorithm succeeds w.h.p.