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Exercise No. 6

Peer-To-Peer Networks

Winter 2015

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Exercise 1 *Distance Halving*

Consider a perfectly balanced Distance Halving network.

1. The network has $n = 2^k$ peers $v_0, v_1, \ldots, v_{n-1}$ where $k = 4$ bits. A peer is at position $x \in [0, 1]$, and we move LRLR, being L left and R right. Where is the target in $[0, 1]$ depending on x? At which peer do we end up (depending on x)?

2. What is the destination peer for an undetermined k? Do you see any pattern?

3. Imagine the lookup is done by moving $2 + \log n$ steps to the left and then following the left reverse edges to the target, as explained in the slides. If the network has $k = 4$ bits, how would the lookup from the peer 1010 to the peer 0111 be?

4. Discuss this lookup method with respect to the network congestions, i.e. the maximum number of messages sent through a peer. How can the network congestion be minimized?