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Network Algorithms, Summer Term 2015
Problem Set 4
hand in by Tuesday, May 19, 2015

Exercise 1: Concurrent Ivy

Consider the tree for the Ivy shared variable protocol in Figure 1. There are three concurrent requests placed by the nodes v_1, v_2 and v_3. The token is initially held by the the circled node labeled r. We assume a synchronous execution.

1. Give the order of serviced requests.

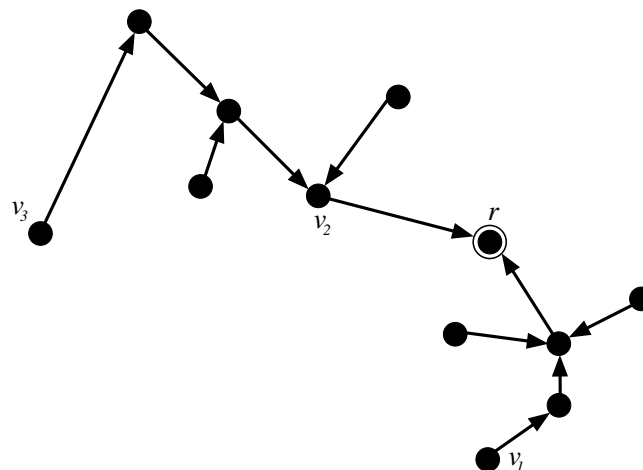2. Draw the tree after the last request has been served.

Figure 1: Tree for Exercise 1.

Exercise 2: Tight Ivy

In Theorem 4.5 in the lecture notes, it was shown that, on average, acquiring a lock requires at most $\log n$ steps, where n is the number of processors.

Show that this bound on the number of steps is tight by constructing a tree consisting of n nodes in which each request requires $\log n$ steps if all requests are performed sequentially by suitable nodes in the tree.[1]

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[1]Hints: Assume that n is a power of 2. Construct a tree whose topology remains the same with respect to the token holder after each request.