Network Algorithms, Summer Term 2014
Problem Set 3
hand in by Thursday, July 3, 2014

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.](image)

Exercise 2: Tight Ivy

In Theorem 5.5 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.$^1$

$^1$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.