Homework Assignment 1, Part b

Due: Thursday, September 23, 1999

Reading:

Sections 4.1-4.4 of *Distributed Algorithms.* Section 5.1. Sections 6.1, 6.2.

Problems:

1. Consider Ex. 4.8.
   (a) Specify carefully a collection of properties that capture the behavior required of an algorithm that solves the problem outlined in this problem statement. This behavior should include setting up a BFS tree, delivering a given message to everyone, and getting an acknowledgment of receipt from everyone. (Note that these properties include both "safety" conditions and "progress" conditions.) Describe this in terms of specific input and output variables in the process states.
   (b) Describe carefully, in words or in pseudocode, an algorithm that solves this problem. In either case, be sure to say what state variables are maintained by the processes, and what they are used for.
   (c) State carefully key invariant(s) needed for a proof that your algorithm meets the specification. You don't have to hand in, but you should think through: (a) how these invariants can be proved by induction—what are the key steps, and why do they work? (b) why these invariants imply the correctness properties you listed in your answer to part 1.
2. Ex. 4.17.
3. Ex. 5.2.
4. Ex. 6.5