Homework Assignment 1, Part a

Due: Thursday, September 20, 2001

Reading:

Skim Chapters 1 and 2 of *Distributed Algorithms*. Read Chapter 3 carefully, but skip 3.7.

Basic or Advanced?

1. Tell us whether you are signing up for the "Basic" or "Advanced" version of the course.

2. If you are signing up for the Advanced version, then tell us what topic and papers you are most interested in reading and presenting, and who the other members of your group are. Also please give us at least one alternative, so we can help sort out conflicting choices. You should avoid the following topics, which are likely to be covered in the regular lectures: (1.1.) Vector timestamps, (2.1.) Failure detectors, and (2.2.) Fault-tolerant broadcasts.

Basic Problems:

1. 1. Ex. 3.2, part (a)
   2. Ex. 3.2, part (b)
   3. Give a UID assignment for which $\Theta(n \log n)$ messages are sent.

2. Ex. 3.10.

Regular Problems:

3. In class we proved a lower bound for the number of messages needed to elect a leader for a comparison based algorithm. This question will focus on the *number of rounds* needed for that task.
   1. What is the best lower bound you can find for the number of rounds required to elect a leader in a *unidirectional* network? (We require all processes to know the identity of the leader when the algorithm terminates.)
   Please be specific, e.g., if you think the lower bound is $n^2 - 1$, do not write $O(n^2)$, but rather the exact number. State the assumptions you make, and prove your bound.
   2. Is the lower bound different for a *bi-directional* network ?

4. Ex. 3.8.

To clarify the statement in the book: The modification is that each process initiates sending tokens in one direction only; however, responses travel back to the process in the opposite direction.

5. Ex. 3.9 (You may find this hard.)

6. Ex 3.18

   (Here and in other homework problems, you are free to invoke theorems proved in the book without re-proving them.)