# Homework Assignment 6, Part a

**Due:** Thursday, December 2, 1999

## Reading:

Chapter 18, Section 19.1, and the following papers:

1. "Unreliable failure detectors for reliable distributed systems" by Chandra and Toueg;
2. "Fault-Tolerant Broadcasts and Related Problems" by Vassos Hadzilacos and Sam Toueg. Chapter 5 of DISTRIBUTED SYSTEMS. ACM Press and Addison-Wesley. Second Edition. 1993. Pages 97-145. Edited by SAPE MULLENDER. Chapter

## Problems:

1. **CANCELLED!**

   (This is a repeat from Homework 5.)

   The Chandra-Toueg and Hadzilacos-Toueg papers show indirectly how one might implement a causal, FIFO, atomic broadcast tolerating $f$ failures, where $f < \frac{n}{2}$, using an eventually-perfect failure detector $\diamond P$. However, the resulting algorithm consists of several layers and consequently may be more complicated and inefficient than necessary.

   Design an asynchronous algorithm that directly implements $f$-fault-tolerant, causal, FIFO, atomic broadcast ($f < n/2$), using $\diamond P$. Try to make the algorithm simple and efficient. Give precondition/effect code. Present key correctness and efficiency arguments.

2. Exercise 18.10.
3. **MODIFIED!**

   Exercise 18.17. For (a), just state the theorem, no proof. For (b), just give the key ideas, not a detailed formal proof.

4. Exercise 19.1