Homework Assignment 6
ECE 151 / CMPSC 171 - Spring 2013
Due Monday, May 20

1. Consider a k fault-tolerant group of process replicas.

(a) In a group whose function is to synchronize clocks, how many replicas are required to tolerate 5 faults? Justify your answer.

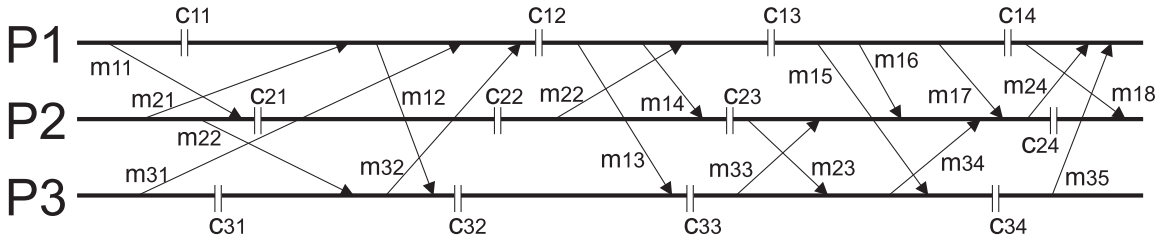
(b) If clocks are synchronized and the group contains 7 process replicas, how may faults can be tolerated? Justify your answer.

2. In the checkout system for an online store, such as Amazon, explain, by example, why you would want to have both at-least-once semantics and at-most-once semantics.

3. Consider a scenario in which the server crashes when it is in the middle of the computation of a result requested by the client. What mechanism would you have at the client to detect this crash in the case of (i) synchronous RPC, and (ii) asynchronous RPC.

4. In a group of six processes, process A detects that process B has failed. Create diagrams that show the messages that are sent between the processes until the processes in the new view have installed the new view so that virtual synchrony is maintained, as in Lecture 11, Slide 13.

5. The following diagram comprises three processes, messages sent and received by those processes, and checkpoints taken by those processes. Show three consistent cuts (distributed snapshots), and mark the three coordinated checkpoints associated with each of the three consistent cuts and also the messages that are in flight at the time of the coordinated checkpoints.



6. For this problem, you will implement the 2-Phase Commit (2PC) protocol in C/C++ using TCP sockets, or in Java using Java sockets, for one client (coordinator) and two participants.

You may work in groups of two for this problem. You will demonstrate your implementation of the 2PC protocol to the TAs as three processes running on three different computers. The demos will take place during the week of May 20. Please schedule a time for your demo with the TAs. At that time, you will also turn in your code and a short report, describing your program and how to run it.