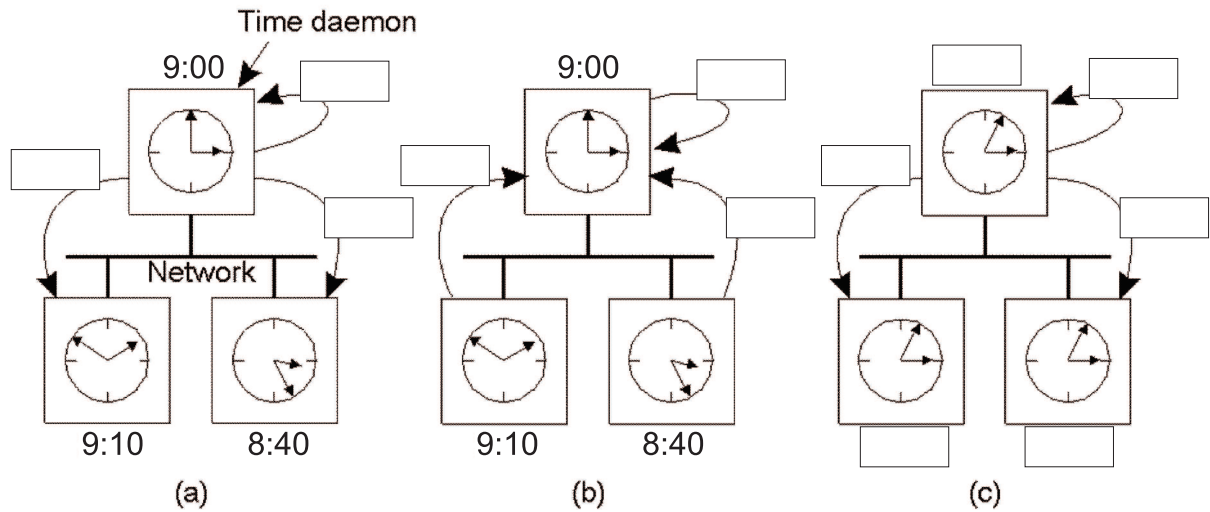


Homework Assignment 4

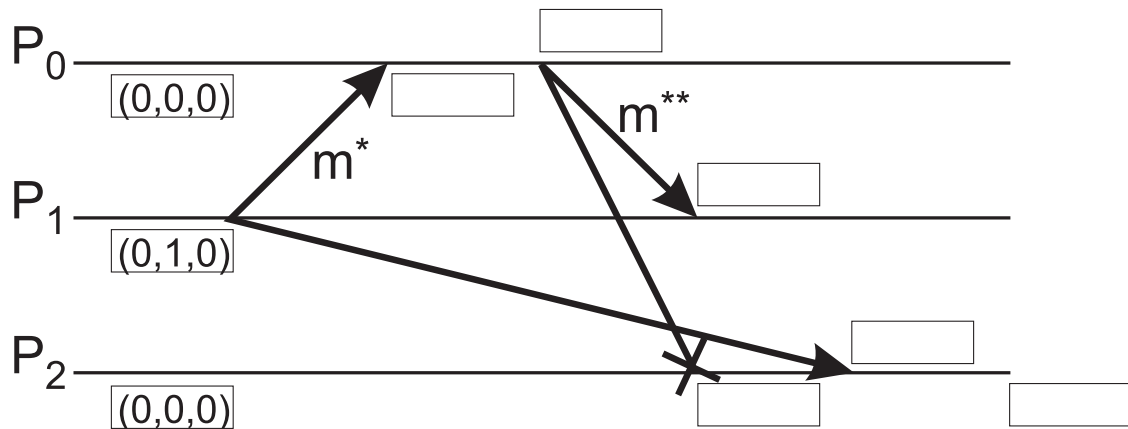
ECE 151 / CMPSC 171 - Spring 2013

Due Monday, April 29

1. The Berkeley Algorithm for clock synchronization consists of three steps: (a) The time daemon asks all the other machines for their clock values, (b) the machines answer, (c) the time daemon tells every machine how to adjust its clock. In the example given below, fill in the boxes to show the times or offsets that are communicated in (a), (b), (c).



2. In the following diagram, fill in the values of the vector clocks for causal ordering and show the point at which process P_2 delivers the message m^{**} .



3. (a) Explain how the distributed mutual exclusion algorithm of Ricart and Agrawala works.
(b) Explain why the distributed mutual exclusion algorithm of Ricart and Agrawala requires: (i) Total ordering of events, and (ii) Reliable delivery of messages.
4. Is a fully distributed algorithm (*i.e.*, one without a coordinator) more robust than a centralized/coordinated algorithm?
5. Give three examples of distributed applications that use GPS receivers.
6. For this problem, you will implement the Bully Algorithm for Leader Election in C/C++ using TCP sockets, or in Java using Java sockets, for n processes on n different computers.

You may work in groups of two for this problem. You will demonstrate your implementation of the Bully Algorithm to the TAs with $n = 4$ processes running on $n = 4$ different computers. The demos will take place during the week of April 29. 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.