Homework Assignment 3
ECE 151 / CMPSC 171 - Spring 2013
Due Monday, April 22

1. (a) Give an example of a name that is not address, and explain why it is a name but not an address.

(b) Give an example of a name that is not an identifier, and explain why it is a name but not an identifier.

(c) Give an example of an address that is not an identifier and explain why it is an address but not an identifier.

2. Consider the Chord system shown in Lecture 5, Slide 18, and assume that node 23 has just joined the system.

(a) Draw the finger table of the new node 23.

(b) Draw the finger tables of all the other nodes, after node 23 joined the system.

3. (a) Explain what it means to *resolve* a name.

(b) Explain the difference between *iterative* and *recursive* name resolution.

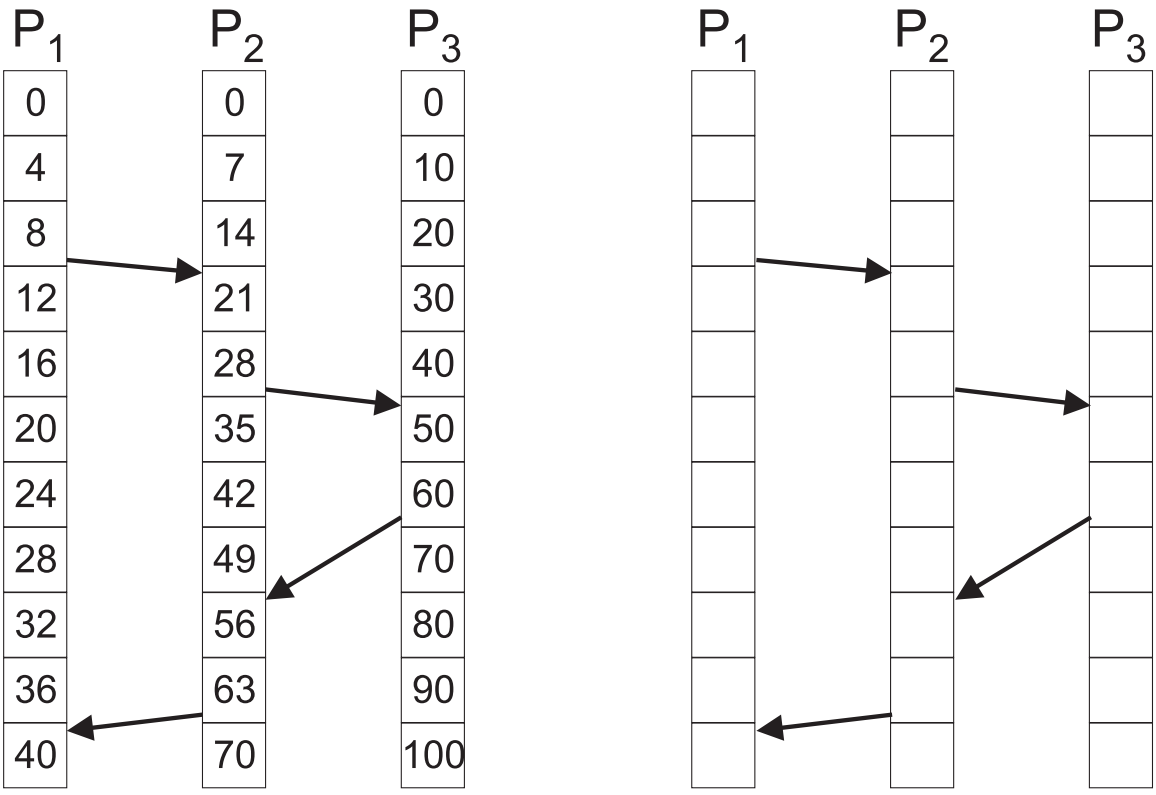
(c) Give an advantage and a disadvantage of recursive name resolution compared to iterative name resolution.

4. In Cristian's algorithm for clock synchronization, a processor makes multiple requests for the time from a remote clock on a time server, and chooses the reply having the smallest round-trip delay. It then uses the time in that reply to synchronize its clock with the remote clock on the time server. A smaller round-trip delay results in a more accurate clock synchronization.

Using discrete probabilities and assuming that the round-trip delay is uniformly distributed between 0 and 1 seconds, calculate the probabilities of various values of the smallest round-trip delay, such as 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0 seconds, for 1, 2, 4, 8 and 16 requests to the time server, and show the resulting graphs where the horizontal axis represents the round-trip delay and the vertical axis represents the probabilities of those round-trip delays.

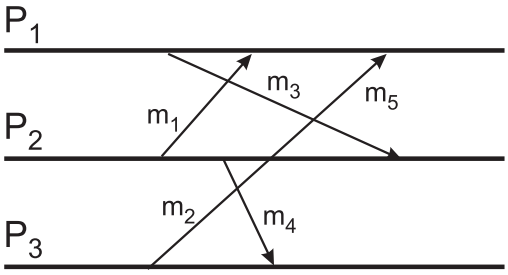
To estimate the probabilities, create a simple program that makes many (say 100) trials. Thus, for example, for 4 requests, your program will consider 100 batches each with 4 requests. For each request, it will determine the round-trip delay using a random number generator. It will then choose the request with the smallest round-trip delay of the 4 requests, for each of the 100 batches. Thus, for the 100 data points it obtains, your program will then find the number of data points with a particular round-trip delay and then divide by 100 to find the probability of that round-trip delay.

5. Consider the logical clocks of three processes, with events occurring at different rates in the different processes, as shown in the diagram on the left. Using Lamport's algorithm, show how each process adjusts its logical clock by filling in the logical clock values in the diagram on the right.

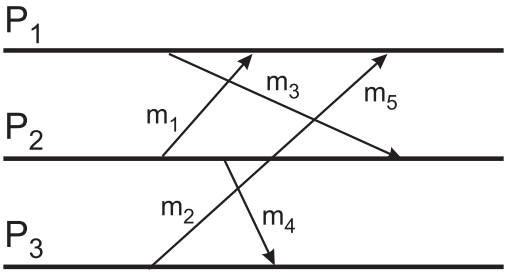


6. In the following diagrams there are three processes with messages sent and received by those processes. In (a), draw a consistent cut (distributed snapshot) at the left, and an inconsistent cut at the right. Similarly, in (b), draw a consistent cut at the left, and an inconsistent cut at the right.

(a)

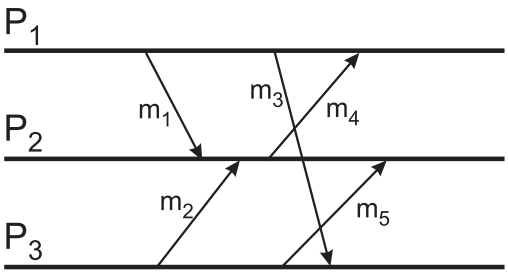


Consistent Cut

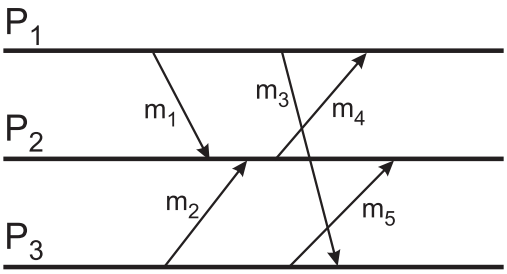


Inconsistent Cut

(b)



Consistent Cut



Inconsistent Cut