22C: 166 Distributed Systems and Algorithms

Homework 6

Total points = 50

Assigned 12/04/07, due 12/11/07 in class

Please submit typewritten solutions.

Question 1. (20 points)

Bob is the president of the Milky Way club of sky-watchers, and also the president of the Himalayan Hikers club of nature lovers. From time to time, Bob will send out messages to the members of these groups, and these messages will be delivered in the FIFO order among the group members.

Now assume that some members of the Milky Way club also joined the Himalayan Hikers club, as a result, the two groups overlapped. Argue why the FIFO-ordered multicast algorithm may not work for the members who belong to both clubs. Also suggest modifications that will preserve the FIFO order of message delivery among members of both clubs, including those in the intersection of the two memberships.

Question 2. (10 points)

Three processes 0,1,2 of a group communicate with one another, and the requirement is causal order multicast. A message from process 0 has a vector timestamp (2, 1, 0) reaches node 2 whose local vector clock is (1, 3, 2).

(a) Draw a diagram showing a exchange of all the messages in the group.

(b) Will the message be accepted by process 2? Explain.

Question 3. (20 points)

Transis group communication system considers a multicast message delivery to be *safe*, when every member receives the acknowledgment from every one in the group. Assume process 0 sent a *safe message* M to a group of six members {0, 1, 2, 3, 4, 5}, and meanwhile the configuration changed from {0, 1, 2, 3, 4, 5} □ {0, 1, 2, 3, 6, 7}.

(a) Assume that {0, 1, 2, 3} received acks from themselves, but due to the partition, did not receive acks from {4, 5}. Can {0, 1, 2, 3} deliver the safe message M to their

application layer? Explain.

(b) If {4, 5} acked M before the partition, but did not receive the acks from {0, 1, 2, 3} due to the partition, and then received the new view {4,5}, then will {4, 5} deliver M to its application layer? Explain.