ECE428-HW2

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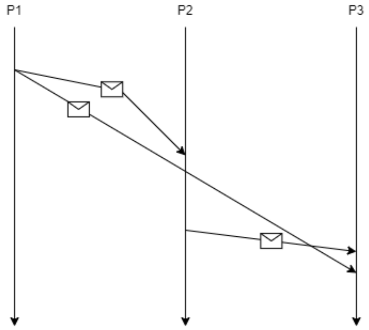
QUESTION 1

FIFO channels. The first diagram we should know is that assume all execution is a huge set, there are several parts in it. The first is causal ordering execution(in the subset of all execution) and the FIFO ordering is the subset of causal ordering. While the totally-ordered ordering is another set including interaction with all causal ordering set, FIFO ordering set and all execution set.

(a) B-multicast, no failure

FIFO ordering would be satisfied with B-multicast with no process failures. Since B-multicast only sends messages out on different channels with no re-send. And since there is no failure, each message receive would just delivered.

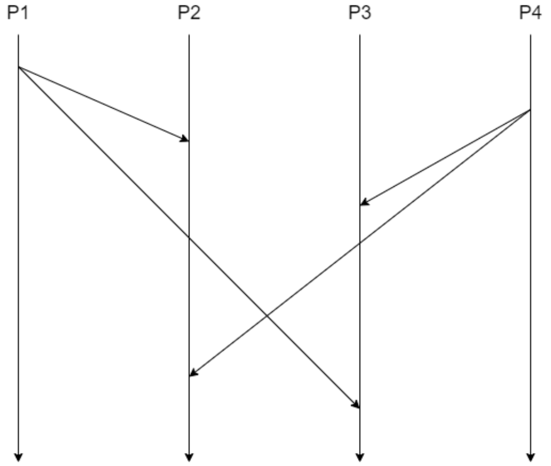
Now I should give an example that B-multicast is not causal ordering.



We can see that P1 send messages to both P2 and P3. But P2's message to P3 arrives first compare with the message from P1. So it is not a causal ordering system. But it should be the FIFO.

(b) R-multicast, no failure

It's causal, so its definitely FIFO. And I need to prove that it is not totally-ordering. And the following is the example.



Now, the diagram above is part of R-multicast. But we can clearly see that it is not following the totally-ordering, since m1 and m2 are not in the same order in P2 and P3. But they are consistent with R-multicast.

(c) R-multicast, with failure

It's still causal with the R-multicast even if it might have failure. Since the delivered order is based on the in-come message, the example is shown above.

(d) sequence-based order

This would be the totally-ordered ordering property since the sequence number select the correct message to be delivered

QUESTION 2

(a) FIFO delay

ABC: in P2, B's message would be delayed until 7; in P3, C's message would be delayed until 15; and in P4, B's message would be delayed until 7;

DEF: in P1, F's message would be delayed until 16

(b) causal delay

Based on the FIFO's change in the subquestion a), we still need some delay on causal property. The first is that on P3, A->D so we should have D delayed in both P2 and P4 after A at time 7.

(c) ISIS final order

The final order would become A 3.4, B 6.3, C 4.4, D 4.1, E 6.1, F 6.4;

So, the final totally-ordered messages would become A-D-C-E-B-F

QUESTION 3

(a). Copies

The number of the total copies should be 100*100 = 10000. Since each process would require to receive then deliver the message once and send it out to all the others nodes.

(b). One-way Transmission Time Upper-Bound

Now, the total number of copies should be 99 + 98 + 97 + ... + 1 + 0 = 4950.

(c). Modify

Just move the deliver(message) above before each unicast.

QUESTION 4

(a). Central Server

P3: 26ms;
P2: 62ms;
P1: 80ms;
P4: 103ms;
P5: 149ms

(b). Token Ring

P2: 16ms;
P3: 34ms;
P5: 62ms;
P1: 92ms;
P4: 115ms

(c). Ricart-Agrawala

P3: 26ms;
P2: 54ms;
P1: 72ms;
P4: 95ms;
P5: 133ms