

CS 186 - Fall 2024

Exam Prep Section 11

Distributed Transactions

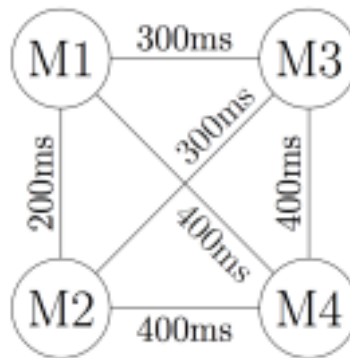
1 Conceptual Distributed Transactions

1. For each of the following statements, mark whether it's true or false and explain your reasoning.
 - (a) Resolving a deadlock at a local node will always resolve distributed deadlock.
 - (b) Suppose we make the changes needed so only a majority of participants need to vote yes for a transaction to commit. Participants can write an ABORT record in phase 1 of 2PC.
 - (c) Presumed abort as presented in lecture no longer works in the scenario described in 1b.
 - (d) If any machine sees COMMIT record in its log upon recovery, the transaction will commit. Additionally, describe how to distinguish whether a machine with a COMMIT record is a coordinator or participant.

2. For the following scenarios, describe what will happen without presumed abort, then describe what will happen with presumed abort.
 - (a) Participant recovers and sees just an ABORT record
 - (b) Participant recovers and sees a PREPARE record
 - (c) Participant recovers and sees a PREPARE and ABORT record
 - (d) Coordinator recovers and sees an ABORT record

2 Two Phase Commit Practice (Fall 2017 Final Question 3)

Our database runs on 4 machines and uses Two-Phase Commit. Machine 1 is the Coordinator, while Machines 2, 3, and 4 are Participants. Suppose our machines are connected such that the time it takes to send a message from Machine i to Machine j is $100 \cdot \max(i,j)$ milliseconds (see graph below). Assume these communication latencies are symmetric: it takes the same amount of time to send from i to j as it takes to send from j to i . For example, sending a message between Machine 2 and Machine 4 takes 400 milliseconds in either direction. Assume that the transaction will commit (i.e. all subordinates vote yes), and that everything is instantaneous except for the time spent sending messages between two machines.



1. What is the first message Machine 1 sends?
 - (a) VOTE YES
 - (b) PREPARE
 - (c) COMMIT
 - (d) None of the above

2. What is the second message Machine 1 sends?
 - (a) VOTE YES
 - (b) PREPARE
 - (c) COMMIT
 - (d) None of the above

3. How much time passes from when Machine 1 sends its first message to when Machine 1 sends its second message?

4. What is the first message Machine 2 sends?

- (a) VOTE YES
- (b) PREPARE
- (c) COMMIT
- (d) None of the above

5. What is the second message Machine 2 sends?

- (a) VOTE YES
- (b) PREPARE
- (c) COMMIT
- (d) None of the above

6. How much time passes from when Machine 2 sends its first message to when Machine 2 sends its second message?

7. True or False. A transaction is considered committed even if over half of the participants do not acknowledge the commit.

Now suppose that our implementation of 2-Phase Commit has an off-by-one bug where the Coordinator receives, but does not use, Machine 4's vote. That is, Machine 4's vote does not affect whether or not the transaction commits or aborts. Answer True or False for the following questions:

- 8. A transaction that should normally commit may be aborted instead.
- 9. A transaction that should normally abort may be committed instead.
- 10. A transaction that should normally commit may be committed properly.
- 11. A transaction that should normally abort may be aborted properly.