Distributed Commit - Disposition

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1 Introduction

Goals:

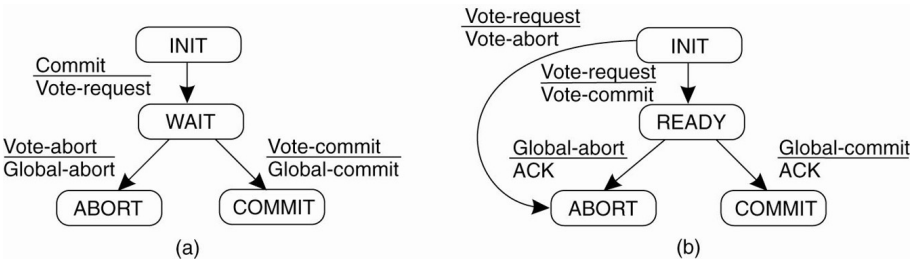
Given a process group and an operation, if the operation is committable at all processes, commit at all processes.
Either everybody eventually commits or everybody eventually aborts, even crashed servers.

One-phase commit

A coordinator tells all other processes whether ot not to perform the operation question.
Drawback: If a process cannot perform the operation, there is no way to tell the coordinator.

Two-phase commit

1. Coordinator sends a VOTE_REQUEST message to all participants.
2. When a participant receives a VOTE_REQUEST, it returns either COMMIT or ABORT.
3. Coordinator collects all votes from the participants, if everyone voted COMMIT, then so will the coordinator. Then it sends a GLOBAL_COMMIT to everyone otherwise it sends GLOBAL_ABORT.
4. Each participant waits for the final reaction, and acts accordingly.



Problems

Several problems arise if the 2PC protocol is used in a system where failures occur.
Timeout mechanisms needed to prevent a process from blocking all the other processes.

Participants in INIT waiting for VOTE_REQUEST, if that message is not received after some time, the participant will simply decide to locally abort the transaction, and thus send an ABORT message.

Coordinator in WAIT, waiting for the votes, if not all votes have been collected after some time, send GLOBAL_ABORT.

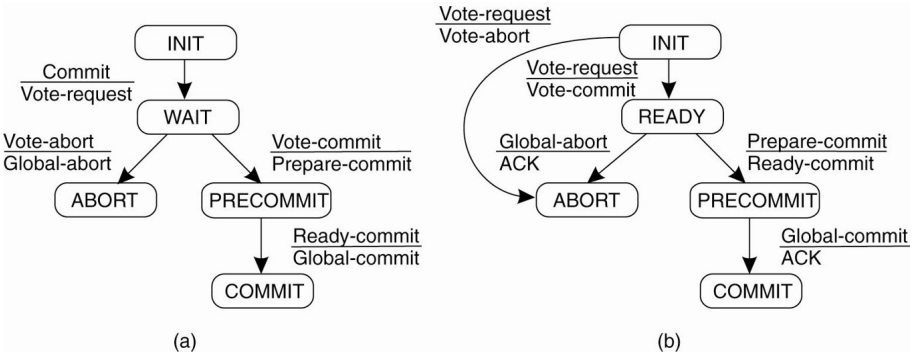
Participants in READY state waiting for global vote, if that message is not received within a given time, it cannot simply abort transaction. It can either wait for the coordinator, or consult other participants.

Logging: 2PC handles crashes by logging the state to a permanent storage.

Conclusion

Two-phase commit has the problem that if the coordinator or one participant crashes at a bad time, it will freeze the entire system untill they are up and running again.

Three-phase commit



Enhances two-phase commit, by being non-blocking in more cases.
As long as the live participants can make a majority decision among both live and dead participants, they can continue on their own.
Very unlikely to block if there are many participants.

IF anyone else in ABORT $\rightarrow$ ABORT. **ELIF** anyone else in COMMIT $\rightarrow$ COMMIT. **ELIF** anyone else in INIT $\rightarrow$ ABORT. **ELSE** everyone else in READY or PRECOMMIT, do a majority vote.