Distributed Consensus

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Overview

In this project, we implemented a decentralized bank account ledger using the two-phase commit protocol on a single computer.

The distributed computing idea used here is that there is no "central" database. That being said, this is a distributed system that maintains consistency using a simple consensus protocol, and all running instances in the system maintain the same piece of data.

Implementation

- Written in C++
- IPC - UDP sockets
- UDPTools.h
  - wraps around UDP socket utilization functions
  - timer included
- Ledger.cpp
  - Generic program for ledgers
  - defines local port & neighboring ports with commands
  - two threads in parallel: coordinator & participant

Challenge

Failure case handlings

Case 1 - in phase one, coordinator fails before sending/ receiving messages from all participants.

Case 2 - in phase one, one or more participants fails to send reply messages back to the coordinator.

Case 3 - in phase two, one participant fails.

Case 4 - in phase two, the coordinator fails.

Division of Work

Anjie Wang

- building blocks of UDP socket communication between processes
- designing structure of the Ledger program.

Jiachen Wang

- building the logic and error handling of the 2PC Protocol
- wrapping up things in the report and presentation PPT.

Result

The decentralized bank account system (on one computer) was successfully implemented and tested.

Testing includes up to 5 ledgers, but the maximum number can be easily expanded by changing value of the corresponding constant in Ledger program.