CS4049: Introduction to Blockchain and Cryptocurrency

Assignment #1

Department of Computer Science

Spring 2025

Submission Guidelines

- This assignment is to be completed in groups declared by the students.
- The naming convention for submitting the assignment is: `cs4049-assignment1-section-roll#1-`
- There must be only one submission per group.
- The assignment will be graded based on the most efficient and resilient solution developed by the students.
- Every group must bring a printed copy of their code at the time of the demonstration. Any discrepancy between the printed copy and the submitted code will result in a score of zero for all group members in this and future assignments.
- Plagiarism in the assignment will result in zero marks for all assignments.

Scenario

In this assignment, you are required to build a client-server application. The client programs will request the coordinator for computation on their data. The server will act as a coordinator for n worker processes ($n \geq 3$). The worker processes will be responsible for performing matrix operations, limited to:

- Addition
- Transpose
- Multiplication

The coordinator is responsible for assigning tasks to the workers and sending the results back to the client.

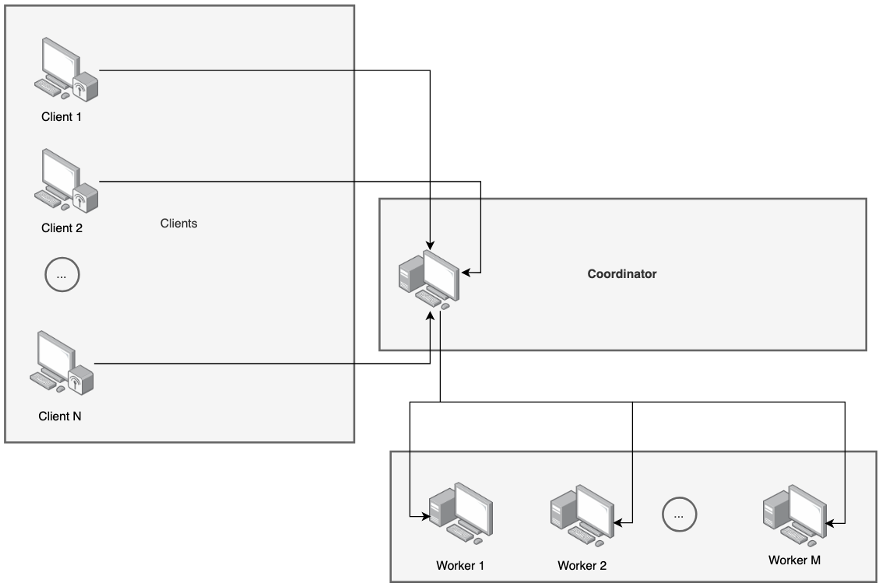

Figure 1: Application Architecture

Client's Role

- The client will initiate computation requests from the coordinator process.
- The client will request services via RPC (Remote Procedure Calls), ensuring that the client and server programs run on different physical devices.

Coordinator's Responsibilities

- The coordinator (server) will schedule the tasks on a First-Come, First-Served (FCFS) basis.
- The coordinator will assign tasks to the least busy workers first (Load Balancing).
- In case of a worker's failure, the server will assign the task to the next available worker (Fault Tolerance).
- The coordinator will gather the results from workers and send them back to the client.

Worker's Responsibilities

- The worker will be responsible for performing matrix operations on the data received from the coordinator process.

Bonus

Simulating a TLS connection between the client and server will earn **2 absolute bonus marks**.