Distributed Peer-to-Peer Computation System

This system facilitates collaboration among participants (clients) for simple computations (mean, addition, multiplication). Participants register with a central server, which keeps track of their capabilities and notifies all the clients about active peers. The computations are performed directly between clients via UDP communication.

The system allows participants to register with a server and find suitable peers for collaboratively performing simple operations: calculating the mean, addition, or multiplication. Each participant connects to the central server via TCP to register, providing their IP address, UDP port for peer to peer communication, and the operation they can perform ('m' for mean, '+' for addition, or '*' for multiplication). The server maintains a directory of active participants along with the operations they support. When a participant registers, the server responds with an updated list of currently active participants and their corresponding operations, enabling the newly registered participant to identify potential peers.

Client side

- ❖ **Listening for updates about the peers**: Clients receive updates from the server over TCP, including the updated list of currently active participants and their corresponding operations.
- ❖ **Sending data for computation**: The client begins by randomly generating a computation task, which includes selecting an operation ('m' for mean, '+' for addition, or '*' for multiplication), generating a random positive natural integer n, and creating a list of n random numbers. It then waits until another client capable of performing the required operation is available in the list provided by the server. Once such a client is identified, the client sends the list of numbers to the peer via UDP and waits for the result. After receiving the result, it repeats the process by generating a new operation, a new random number n, and a new list of n random numbers.
- ❖ **Performing computation**: The client listens over UDP for data sent by other clients. Upon receiving a task (a list of n numbers), it performs the operation it is configured to handle and then sends the result back to the requesting client via UDP.

Server side

- ❖ The central server maintains a list of active peers and the operations they can perform. It updates this list whenever a new peer joins or an existing peer leaves the network, ensuring that the information remains up to date. The server sends updated lists to all clients to notify them of new arrivals or departures, enabling clients to stay informed about available peers. However, the server does not directly facilitate matching or communication between peers; it simply provides the necessary information to help clients establish connections with each other.

For the grade 5: a client sends to the server over TCP a list of n numbers and the operation as a character! The server responds with a greeting message. Check every operation for errors and properly send the data.