

P3 - Group Communication Application on LAN

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Design Decisions:

We implement a program for group communication on a local area network(LAN) according to the specified requirements.

Implementation:

Creating a group:

Groups are uniquely identified by multicast IP addresses. For creating a group, we add the client's socket as a member of the multicast IP address of the group.

Searching for a group:

This is done by sending a broadcast message on the LAN with the specified keyword. Clients check if they are part of the group with that keyword, if yes, they reply back by sending that group's multicast IP address.

Joining a group:

Joining a group is identical to creating a group, except in this case, the group already has at least one more member.

Sending a group message:

Each client maintains a hashmap with (group name, multicast IP address) pairs, so for sending a group message, we get the corresponding multicast IP address from the hashmap and send the message.

Viewing file list:

Each client also maintains a hashmap with (file name, IP address) pairs, the IP address is the client that has that file. On viewing the file list, the program also reads the local directory and adds it to the file list.

Downloading a file:

Since we are maintaining a file name hashmap, to download a file, we send a file request message to the corresponding client and get the file. In the case when we want to download a file that is not in the file list, a special message is sent to all the groups that this client belongs to, the receiving clients check if they have the file, in which case, they will send the file to this client. In the case, when that client doesn't have the requested file, they will further forward the message to groups they are part of.

Group poll:

Group polls are sent to a specific group, the receiving clients choose an option and the reply is sent back to the client that initiated the poll.

Execution Flow:

The main menu-driven program runs on the main thread and there is another thread that handles the received messages.

SIGALRM is used to synchronize the file list within group members every minute.