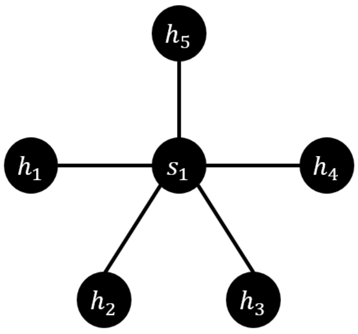
Lab 3: Socket Programming for Chatting Room with Multiple Users

This lab aims to help you get familiar with socket programming, which is a commonly used tool for messaging and file transmission in internet. In this lab, we will build two chatting rooms supporting multiple users with different methods. You need to program in C++ language. You can refer to https://beej.us/guide/bgnet/ for more useful information.

1. Chatting room with one server: client-server model with TCP protocol (50 points)
   Requirements:
   a) Use Mininet to build the following topology, which contains 5 hosts.



   b) The workflow of this chatting room is as follows: Each host in $\{h_i\}_{i\in\{1,2,3,4\}}$ inputs a message into its terminal, and also specifies which host $h_{j:j\in\{1,2,3,4\},j\neq i}$ to receive the message. The message from h_i will be sent to h_5, and then redirected to h_j. For example, in h1's terminal, we input "To h2: Hello!". Then h2 will receive the message from h1, and display it on its terminal "Hello! From h1". (In Mininet, the command to open the terminal of host h1 is 'xterm h1'.
   c) You are supposed to build the above mentioned chatting room using socket programming with TCP protocol. You need to write two cpp file, namely, center.cpp (running on h_5) and user.cpp (running on $\{h_i\}_{i\in\{1,2,3,4\}}$). And the files should be complied by following command.

      `g++ center.cpp -o center` or `g++ user.cpp -o user`

      And you are supposed to run the executable files on terminals of hosts as

      `./center` or `./user`

      Please obey the above mentioned instructions carefully because we will test your code with exactly the same procedures.

2. Chatting room with multiple users: client-only model with UDP protocol (50 points)
   Requirements:
   a) Use Mininet to build the same topology as in Problem 1.
   b) The workflow of this chatting room is as follows: Each host in $\{h_i\}_{i\in\{1,2,3,4,5\}}$ can send the message to the broadcast address. At the same time, they also continuously listen to the messages from the broadcast address. In such way, each client can transmit/receive messages to/from other clients. All the messages from clients should be displayed on each client's terminal.
   c) You are supposed to build the above mentioned chatting room using socket programming with UDP protocol. You need to write one cpp file, udpclient.cpp. It should be complied by following command.

      ```
      g++ udpclient.cpp -o udpclient
      ```

      And you are supposed to run the executable files on terminals of hosts as

      ```
      ./udpclient
      ```

      Please obey the above mentioned instructions carefully because we will test your code with exactly the same procedures.

   d) For each client, it will receive the messages sent by itself from the broadcast address. Can you filter out these messages, such that each client's terminal will not display the message sent by the client itself?

Your final submission .zip file should include a pdf report, center.cpp, user.cpp, and udpclient.cpp. Please put the screenshots of hosts' terminals in your report.