

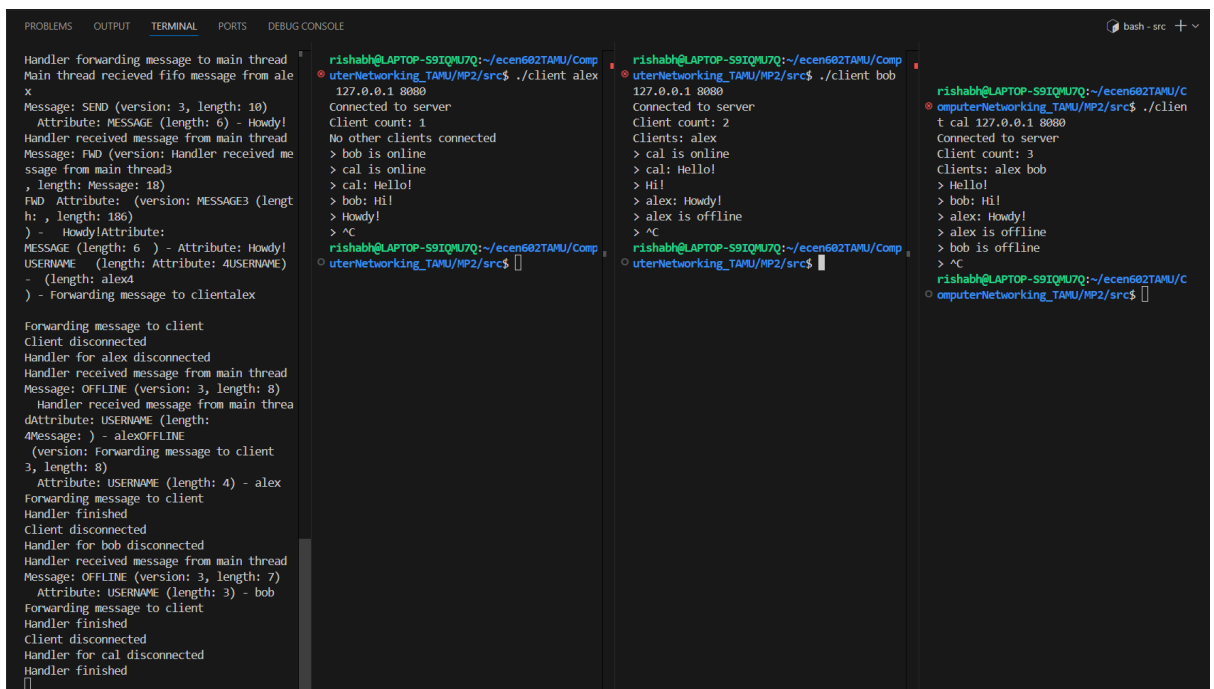
TCP Simple Broadcast Chat Server and Client

ECEN 602 Network Programming Assignment 2

Team ID: 9

Below is the test cases performed on the TCP echo server and client:

1. Normal operation of the chat client with three clients connected:
 - a. Server is run using IP address 127.0.0.1, port 8080, and max clients limit of 5.
 - b. Clients “alex”, “bob”, and “cal” connect to the server.
 - c. The server handles all 3 clients simultaneously and messages from each of the clients are broadcasted to the other 2 clients.
 - d. All 3 clients disconnect one by one. When a client disconnects, Offline notifications are sent to the connected clients.



```
PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE
Handler forwarding message to main thread
Main thread recieved fifo message from alex
Message: SEND (version: 3, length: 10)
Attribute: MESSAGE (length: 6) - Howdy!
Handler received message from main thread
Message: FWD (version: 3, length: 10)
Attribute: MESSAGE (length: 6) - Howdy!
Fwd Attribute: (version: MESSAGE3 (length: 10), length: 186)
) - Howdy!Attribute:
MESSAGE (length: 6 ) - Attribute: Howdy!
USERNAME (length: Attribute: 4:USERNAME)
- (length: alex4
) - Forwarding message to clientalex
Forwarding message to client
Client disconnected
Handler for alex disconnected
Handler received message from main thread
Message: OFFLINE (version: 3, length: 8)
Attribute: USERNAME (length: 4:alexOFFLINE
Message: ) - alexOFFLINE
(version: 3, length: 8)
Attribute: USERNAME (length: 4) - alex
Forwarding message to client
Handler finished
Client disconnected
Handler for bob disconnected
Handler received message from main thread
Message: OFFLINE (version: 3, length: 7)
Attribute: USERNAME (length: 3) - bob
Forwarding message to client
Handler finished
Client disconnected
Handler for cal disconnected
Handler finished
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client alex
127.0.0.1 8080
Connected to server
Client count: 1
No other clients connected
> bob is online
> cal is online
> cal: Hello!
> bob: Hi!
> Howdy!
> AC
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client bob
127.0.0.1 8080
Connected to server
Client count: 2
Clients: alex
> cal is online
> cal: Hello!
> Hi!
> alex: Howdy!
> alex is offline
> AC
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client cal
127.0.0.1 8080
Connected to server
Client count: 3
Clients: alex bob
> Hello!
> bob: Hi!
> alex: Howdy!
> alex is offline
> bob is offline
> AC
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$
```

2. Server rejects a client with a duplicate username:
 - a. Server is run using IP address 127.0.0.1, port 8080, and max clients limit of 5.
 - b. A client with username “alex” connects to the server. Server accepts the connection.
 - c. A new client with the same username “alex” tries to connect to the server. It fails to connect as the server rejects the client with a reason “Username already exists”.

```

PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE
AMU/MP2/src$ ./server 127.0.0.1 8080 5
Temp dir: /tmp/sbcp_xlUxd
IP Address provided:127.0.0.1
Server started with pid: 22351
Handler started
Peer: ::ffff:127.0.0.1
Handler received message from client
Message: JOIN (version: 3, length: 8)
Attribute: USERNAME (length: 4) - alex
Handler bootstrapping for alex
Handler sent bootstrap message to main thread
Handler waiting for main thread to connect
Main thread recieved bootstrap message from client
Handler pid: 22378
New user: alex
Sent ACK to handler thread
Sent ONLINE to all other clients
Handler received message from main thread
Message: ACK (version: 3, length: 6)
Attribute: CLIENT_COUNT (length: 2) - 1
Forwarding message to client
Handler started
Peer: ::ffff:127.0.0.1
Handler received message from client
Message: JOIN (version: 3, length: 8)
Attribute: USERNAME (length: 4) - alex
Handler bootstrapping for alex
Handler sent bootstrap message to main thread
Handler waiting for main thread to connect
Main thread recieved bootstrap message from client
Handler pid: 22451
Username alex already exists
Handler received message from main thread
Message: NAK (version: 3, length: 27)
Attribute: REASON (length: 23) - Username already exists
Forwarding message to client
Main thread closed the fifo... I guess we aren't allowed t
o talk anymore
Handler finished
[]

rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/ComputerNetwork1
ng_TAMU/MP2/src$ ./client alex 127.0.0.1 8080
Connected to server
Client count: 1
No other clients connected
> []

rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/ComputerNetworking_T
AMU/MP2/src$ ./client alex 127.0.0.1 8080
Failed to connect to server
Reason: Username already exists
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/ComputerNetworking_T
AMU/MP2/src$

```

3. Server allows a previously used username to be reused:
 - a. Server is run using IP address 127.0.0.1, port 8080, and max clients limit of 5.
 - b. Clients “alex” and “bob” connect to the server and start chatting.
 - c. Client “alex” disconnects from the server. Server clears all its resources.
 - d. A new client named “alex” connects to the server. Server accepts the connection.

```

PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE
Message: SEND (version: 3, length: 16)
Attribute: MESSAGE (length: 12) - Hello
again!
Handler forwarding message to main thread
Main thread recieved fifo message from bob
Message: SEND (version: 3, length: 16)
Attribute: MESSAGE (length: 12) - Hello
again!
Handler received message from main thread
Message: FWD (version: 3, length: 23)
Attribute: MESSAGE (length: 12) - Hello
again!
Attribute: USERNAME (length: 3) - bob
Forwarding message to client
Handler received message from client
Message: SEND (version: 3, length: 16)
Attribute: MESSAGE (length: 12) - Howdy
again!
Handler forwarding message to main thread
Main thread recieved fifo message from alex
Message: SEND (version: 3, length: 16)
Attribute: MESSAGE (length: 12) - Howdy
again!
Handler received message from main thread
Message: FWD (version: 3, length: 24)
Attribute: MESSAGE (length: 12) - Howdy
again!
Attribute: USERNAME (length: 4) - alex
Forwarding message to client
Client disconnected
Handler for alex disconnected
Handler received message from main thread
Message: OFFLINE (version: 3, length: 8)
Attribute: USERNAME (length: 4) - alex
Forwarding message to client
Handler finished
Client disconnected
Handler for bob disconnected
Handler finished
[]

rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client alex
127.0.0.1 8080
Connected to server
Client count: 1
No other clients connected
> bob is online
> bob: Hello!
> Howdy!
> ^C
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$

rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client bob
127.0.0.1 8080
Connected to server
Client count: 2
Clients: alex
> Hello!
> alex: Howdy!
> alex is offline
> alex is online
> Hello again!
> alex: Howdy again!
> alex is offline
> ^C
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$

rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$ ./client alex
127.0.0.1 8080
Connected to server
Client count: 2
Clients: bob
> bob: Hello again!
> Howdy again!
> ^C
rishabh@LAPTOP-S9IQMU7Q:~/ecen602TAMU/Comp
uterNetworking_TAMU/MP2/src$

```

4. Server rejects the client because it exceeds the maximum number of clients allowed:
 - a. Server is run using IP address 127.0.0.1, port 8080, and max clients limit of 2.
 - b. Clients “alex” and “bob” connect to the server and start chatting.
 - c. Client “cal” tries to connect to the server. It fails to connect as the server rejects the client with a reason “Maximum clients limit”.

5. Bonus Feature IPv4 and IPv6

Server uses IPv6 address and clients connect to it:

- Server is run using IPv6 address `:::1`, port 8080, and max clients limit of 5.
- Clients “alex” and “bob” connect to the server and start chatting. Server functions normally and broadcasts the messages as expected.

6. Bonus feature 1

- Server sends ACK message with total client count (including the new client) and list of usernames of connected clients. The clients display the ‘Client count’ and ‘Clients’ when they connect to the server.
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7. Bonus feature 2

- a. Client sends IDLE message to the server if no messages are typed in by the user for 10 seconds. The server sends the IDLE message to the other clients.
- b. All other clients display the username which is idle.

Architecture of the TCP Echo Server and Client

