

Lab 7: TCP server accepting multiple client

Aryan Tyagi

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Compile and Run

Compilation

```
gcc ./server/server.c -o ./server/server.out  
gcc ./client/client.c -o ./client/client.out
```

OR

```
make build
```

Start the server first

```
./server.out 4444
```

OR

```
make server
```

Then start the clients

```
./client.out 127.0.0.1 4444
```

OR

```
make client
```

Screenshots

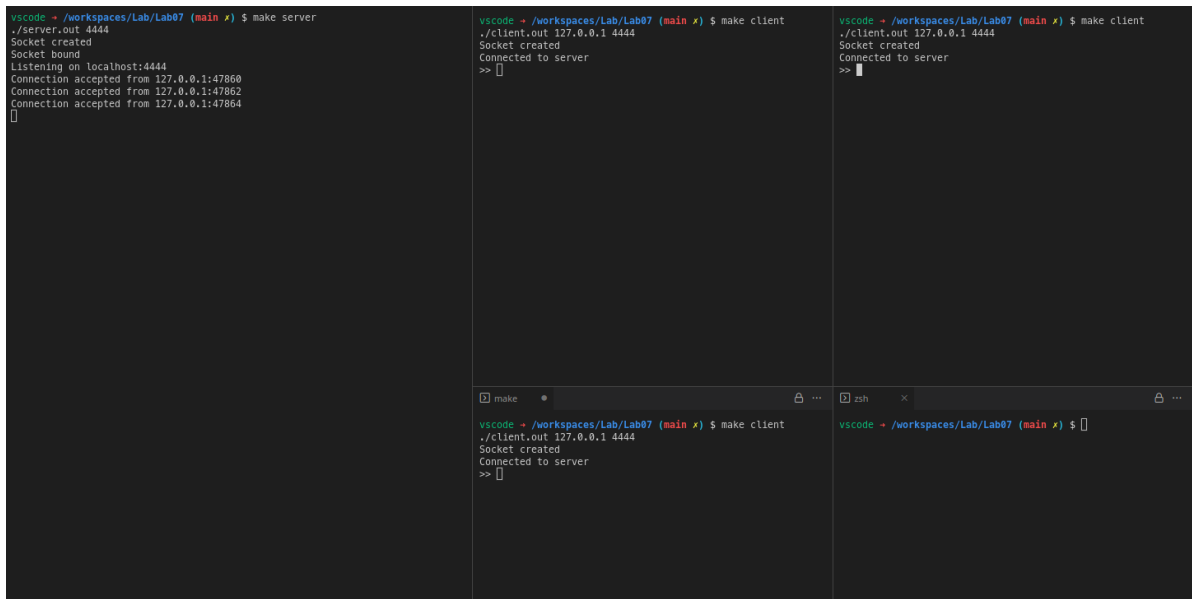
1. The Server as a command line argument accepts the port number to which it should bind.

```
vscode → /workspaces/Lab/Lab07 (main x) $ ./server.out 4444
Socket created
Socket bound
Listening on localhost:4444
█
```

2. The client, as command line arguments, accepts the IP address and the port number at which it will find the server.

```
vscode → /workspaces/Lab/Lab07 (main x) $ ./client.out 127.0.0.1 4444
Socket created
Connected to server
>> █
```

2. Start 3 separate instances of the client.



The image shows three terminal windows side-by-side, illustrating the setup of a server and multiple clients. The leftmost window shows the server process running, listening on port 4444, and accepting connections from 127.0.0.1. The middle and rightmost windows show three separate client processes, each running the client.out program with the IP address 127.0.0.1 and port 4444 as arguments. Each client window shows the output 'Socket created' and 'Connected to server', followed by a prompt '>>'. Below the terminal windows, there is a taskbar with icons for 'make' and 'zsh'.

```
vscode → /workspaces/Lab/Lab07 (main x) $ make server
./server.out 4444
Socket created
Socket bound
Listening on localhost:4444
Connection accepted from 127.0.0.1:47860
Connection accepted from 127.0.0.1:47862
Connection accepted from 127.0.0.1:47864
█

vscode → /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> █

vscode → /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> █

vscode → /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> █

vscode → /workspaces/Lab/Lab07 (main x) $ █
```

3. After connecting to the server, each client reads a line from the standard input and sends it to the server.

```
vscode - /workspaces/Lab/Lab07 (main x) $ make server
./server.out 4444
Socket created
Socket bound
Listening on localhost:4444
Connection accepted from 127.0.0.1:47860
Connection accepted from 127.0.0.1:47862
Connection accepted from 127.0.0.1:47864
C: hello123
321olleh
FROM 127.0.0.1:47860
>> []

vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> hello123
C: hello123
[]

vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> []

make
vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> []

zsh
vscode - /workspaces/Lab/Lab07 (main x) $ []
```

4. The server prints the received line in reverser order along with IP address and port number from which it received the message.

```
vscode - /workspaces/Lab/Lab07 (main x) $ make server
./server.out 4444
Socket created
Socket bound
Listening on localhost:4444
Connection accepted from 127.0.0.1:47860
Connection accepted from 127.0.0.1:47862
Connection accepted from 127.0.0.1:47864
C: hello123
321olleh
FROM 127.0.0.1:47860
C: hello456
654olleh
FROM 127.0.0.1:47864
C: hello456
654olleh
FROM 127.0.0.1:47862
>> []

vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> hello123
C: hello123
[]

vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> hello456
C: hello456
[]

make
vscode - /workspaces/Lab/Lab07 (main x) $ make client
./client.out 127.0.0.1 4444
Socket created
Connected to server
>> hello456
C: hello456
[]

zsh
vscode - /workspaces/Lab/Lab07 (main x) $ []
```

4. The server then reads a line from standard input and sends it to all the clients.

| | | |
|--|---|---|
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make server ./server.out 4444 Socket created Socket bound Listening on localhost:4444 Connection accepted from 127.0.0.1:47860 Connection accepted from 127.0.0.1:47862 Connection accepted from 127.0.0.1:47864 C: hello123 321olleh FROM 127.0.0.1:47860 C: hello456 654olleh FROM 127.0.0.1:47864 C: hello456 654olleh FROM 127.0.0.1:47862 >> hello from server S: hello from server >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello123 C: hello123 S: hello from server revres morf olleh >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello456 C: hello456 S: hello from server revres morf olleh >> </pre> |
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello456 C: hello456 S: hello from server revres morf olleh >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> |

5. The client prints the received line in reverse order and are ready to accept a new line from the user.

| | | |
|--|--|---|
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make server ./server.out 4444 Socket created Socket bound Listening on localhost:4444 Connection accepted from 127.0.0.1:47860 Connection accepted from 127.0.0.1:47862 Connection accepted from 127.0.0.1:47864 C: hello123 321olleh FROM 127.0.0.1:47860 C: hello456 654olleh FROM 127.0.0.1:47864 C: hello456 654olleh FROM 127.0.0.1:47862 >> hello from server S: hello from server >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello123 C: hello123 S: hello from server revres morf olleh >> new message to server</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello456 C: hello456 S: hello from server revres morf olleh >> </pre> |
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> |

6. The client exits if the user types “exit”.

| | | |
|--|--|---|
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make server ./server.out 4444 Socket created Socket bound Listening on localhost:4444 Connection accepted from 127.0.0.1:47860 Connection accepted from 127.0.0.1:47862 Connection accepted from 127.0.0.1:47864 C: hello123 321olleh FROM 127.0.0.1:47860 C: hello456 654olleh FROM 127.0.0.1:47864 C: hello456 654olleh FROM 127.0.0.1:47862 >> hello from server S: hello from server C: hello from server revres morf olleh FROM 127.0.0.1:47860 >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello123 C: hello123 S: hello from server revres morf olleh >> exit Disconnecting... vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello456 C: hello456 S: hello from server revres morf olleh >> </pre> |
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello456 C: hello456 S: hello from server revres morf olleh >> </pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ </pre> |

7. The server at a time accepts utmost 4 clients.

| | | | |
|--|---|--|--|
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make server ./Server.out 4444 Socket created Socket bound Listening on localhost:4444 Connection accepted from 127.0.0.1:47876 Connection accepted from 127.0.0.1:47875 Connection accepted from 127.0.0.1:47880 Connection accepted from 127.0.0.1:47884 Connection accepted from 127.0.0.1:47886 ERROR: cannot connect more than 4 clients ERROR: cannot connect more than 4 clients C: hello123 !123!len FROM 127.0.0.1:47876 >> []</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> hello123 C: hello123 []</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> []</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> this will not be accepted by the server S: >> []</pre> |
| <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> []</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> []</pre> | <pre>vscode - /workspaces/Lab/Lab07 (main x) \$ make client ./client.out 127.0.0.1 4444 Socket created Connected to server >> []</pre> | |