

Computer Networks Lab 7

TCP Server accepting multiple clients

Arun Ganti

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NOTE: While testing the code, if after running the server once, and you get “Cannot bind -1” error while running again, then wait for some time.

If you run **netstat --tcp --numeric | grep 4444** you will see that the socket on the port 4444 is in TIME_WAIT state. Meaning that connection is closed, so it will be terminated in the timeout specified by the OS. After the timeout expires, the program executes without the error.

1) Server accepts port number and binds to it

lab7 : server
Close terminal
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444

lab7 : bash
Close terminal
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$

lab7 : bash
Close terminal
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$

lab7 : bash
Close terminal
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$

The clients accept port and address and there are 3 instances

lab7 : server	Close terminal	lab7 : client	Close terminal
<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./server 4444 > Server bound to IP : 0.0.0.0 and PORT : 4444 > New connection [127.0.0.1:13442] > New connection [127.0.0.1:13954] > New connection [127.0.0.1:14466] </pre>		<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>	
		<pre>lab7 : client samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>	Close terminal
		<pre>lab7 : client samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>	Close terminal

3) Each client reads line from standard input and sends it to server

lab7 : server	Close terminal	lab7 : client	Close terminal
<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./server 4444 > Server bound to IP : 0.0.0.0 and PORT : 4444 > New connection [127.0.0.1:13442] > New connection [127.0.0.1:13954] > New connection [127.0.0.1:14466] > [127.0.0.1:13442] Client message = revres ot gnidnes 1 enil > [127.0.0.1:13954] Client message = racecar > [127.0.0.1:14466] Client message = tac ocat > Enter message to send to all clients : </pre>		<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : Line 1 sending to server </pre>	
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : racecar </pre>	<pre>Close terminal</pre>
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : taco cat </pre>	<pre>Close terminal</pre>

4) Server receives the lines and sends one line from standard input to all clients

lab7 : server	Close terminal	lab7 : client	Close terminal
<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./server 4444 > Server bound to IP : 0.0.0.0 and PORT : 4444 > New connection [127.0.0.1:13442] > New connection [127.0.0.1:13954] > New connection [127.0.0.1:14466] > [127.0.0.1:13442] Client message = revres ot gnidnes 1 enil > [127.0.0.1:13954] Client message = racecar > [127.0.0.1:14466] Client message = tac ocat > Enter message to send to all clients : I have 3 clients</pre>		<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : Line 1 sending to server > Server response : stneilc 3 evah I > Enter string : </pre>	
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : racecar > Server response : stneilc 3 evah I > Enter string : </pre>	<pre>Close terminal</pre>
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : taco cat > Server response : stneilc 3 evah I > Enter string : </pre>	<pre>Close terminal</pre>

5) The clients print the message received from server in reverse and are ready for new input

lab7 : server	Close terminal	lab7 : client	Close terminal
<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./server 4444 > Server bound to IP : 0.0.0.0 and PORT : 4444 > New connection [127.0.0.1:13442] > New connection [127.0.0.1:13954] > New connection [127.0.0.1:14466] > [127.0.0.1:13442] Client message = revres ot gnidnes 1 enil > [127.0.0.1:13954] Client message = racecar > [127.0.0.1:14466] Client message = tac ocat > Enter message to send to all clients : I have 3 clients</pre>		<pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : Line 1 sending to server > Server response : stneilc 3 evah I > Enter string : </pre>	
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : racecar > Server response : stneilc 3 evah I > Enter string : </pre>	<pre>Close terminal</pre>
		<pre>lab7 : client</pre> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : taco cat > Server response : stneilc 3 evah I > Enter string : </pre>	<pre>Close terminal</pre>

6) The client exits if user types exit

```
lab7 : server
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444
> New connection [127.0.0.1:13442]
> New connection [127.0.0.1:13954]
> New connection [127.0.0.1:14466]
> [127.0.0.1:13442] Client message = revres ot gnidnes 1 enil
> [127.0.0.1:13954] Client message = racecar
> [127.0.0.1:14466] Client message = tac ocat
> Enter message to send to all clients : I have 3 clients
> Closing connection for client [127.0.0.1:14466]...
^
```

Close terminal

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : Line 1 sending to server
> Server response : stneilc 3 evah I

> Enter string : ^
```

Close terminal

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : racecar
> Server response : stneilc 3 evah I

> Enter string : ^
```

Close terminal

```
lab7 : bash
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : taco cat
> Server response : stneilc 3 evah I

> Enter string : exit
> Closing client...
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$
```

Close terminal

7) 2 connections live

The screenshot displays a terminal window titled "samaritan@pop-os: ~/Desktop/3-2/cn/labs/lab7". The terminal shows the execution of a server program and two client connections.

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444
> New connection [127.0.0.1:14978]
> New connection [127.0.0.1:15490]
```

Two separate terminal windows, each titled "lab7 : client", are shown above the main terminal. Both windows show the execution of a client program and a successful connection to the server.

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444
> Enter string : 
```

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444
> Enter string : 
```

Each client terminal window has a "Close terminal" button in the top right corner. The main terminal window also has a "Close terminal" button in the top right corner.

7) 3 connections live (accepted one more)

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

Close terminal

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444
> Enter string : 
```

Close terminal

```
lab7 : client
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./c
> Connected to server IP = 0.0.0.0 and PORT = 44
> Enter string : 
```

```
lab7 : client
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444
> New connection [127.0.0.1:14978]
> New connection [127.0.0.1:15490]
> New connection [127.0.0.1:16002]
```

Close terminal

```
lab7 : bash
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$
```

```
lab7 : bash
```

Close terminal

7) 4 connections live (accepted one more)

lab7 : client

Close terminal

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

lab7 : client

Close terminal

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

```
lab7 : client
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./c>
> Connected to server IP = 0.0.0.0 and PORT = 44
> Enter string : 
```

lab7 : bash

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$
```

samaritan@pop-os: ~/Desktop/3-2/cn/labs/lab7

```
samaritan@pop-os: ~/Desktop/3-2/cn/labs/lab7$ ./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444
> New connection [127.0.0.1:14978]
> New connection [127.0.0.1:15490]
> New connection [127.0.0.1:16002]
> New connection [127.0.0.1:16514]
```

Close terminal

```
ient 4444 0.0.0.0
4
```

Close terminal

7) 4 connections live (rejected one)

lab7 : client

Close terminal

```
samaritan@pop-os: ~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

lab7 : client

Close terminal

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client 4444 0.0.0.0
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

```
lab7 : client
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client
> Connected to server IP = 0.0.0.0 and PORT = 4444

> Enter string : 
```

samaritan@pop-os: ~/Desktop/3-2/cn/labs/lab7

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/Lab7$ ./server 4444
> Server bound to IP : 0.0.0.0 and PORT : 4444
> New connection [127.0.0.1:14978]
> New connection [127.0.0.1:15490]
> New connection [127.0.0.1:16002]
> New connection [127.0.0.1:16514]
```

Close terminal

1444 0.0.0.0

Close terminal

```
lab7 : bash
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client
> Server rejected due to too many clients
> Closing client...
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$
```

7) 4 connections live (rejected one)

Close terminal

```
> Enter string : 
```

Close terminal

```
> Enter string : 
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client
> Connected to server IP = 0.0.0.0 and PORT = 4444
```

```
> Enter string : 
```



```
> Server bound to IP : 0.0.0.0 and PORT : 4444
```

```
> New connection [127.0.0.1:14978]
```

```
> New connection [127.0.0.1:15490]
```

```
> New connection [127.0.0.1:16002]
```

```
> New connection [127.0.0.1:16514]
```

1. **Introduction**

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$ ./client
> Server rejected due to too many clients
```

```
samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7$
```

4444 0.0.0.0

4444 0.0.0.0

7) All client terminals

<p>lab7 : client Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>	<p>lab7 : client Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>
<p>lab7 : client Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>	<p>lab7 : client Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Connected to server IP = 0.0.0.0 and PORT = 4444 > Enter string : </pre>
<p>lab7 : bash Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Server rejected due to too many clients > Closing client... samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$ </pre>	<p>lab7 : bash Close terminal</p> <pre>samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$./client 4444 0.0.0.0 > Server rejected due to too many clients > Closing client... samaritan@pop-os:~/Desktop/3-2/cn/labs/lab7\$ </pre>