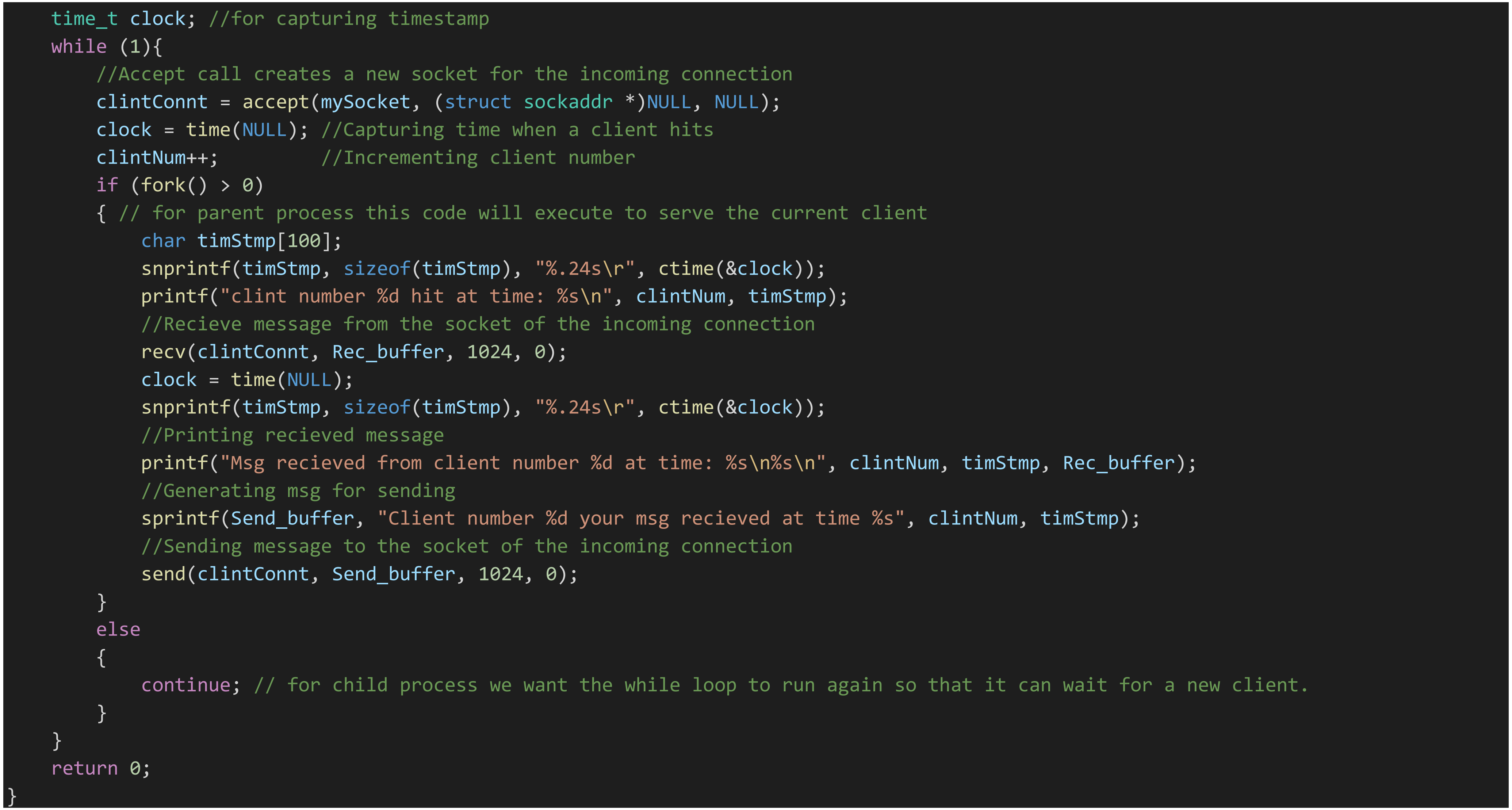
Submitted by – Paras Jain (2018KUCP1006)

Computer Networks Lab Assignment - 4 Socket Programming: Concurrent Client Server Program
1. Use fork () in your program as an additional function.
2. Concurrent server will handle multiple clients at the same time unlike iterative client server.

Server Side Code:

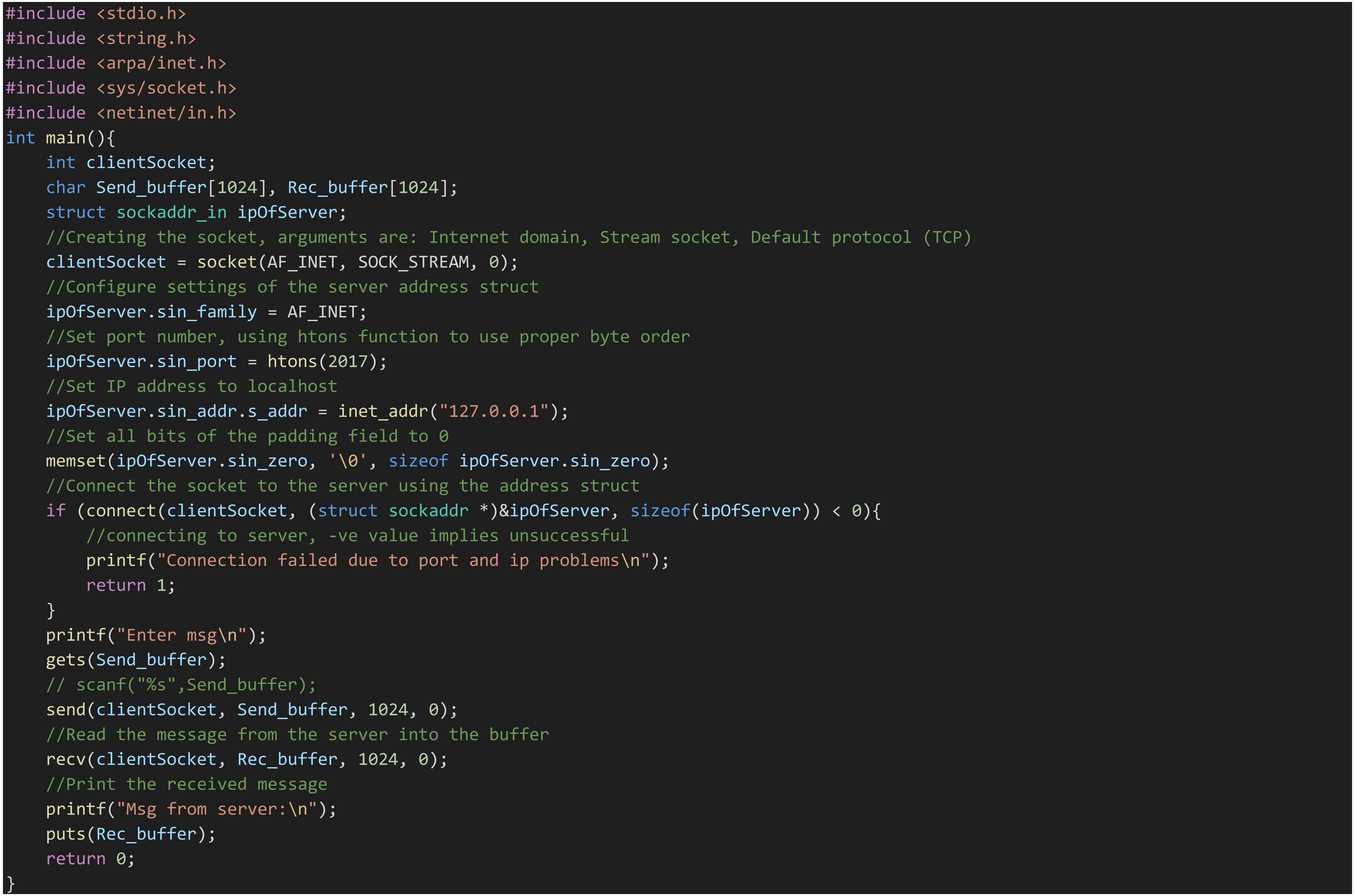
```
//Server Side Code
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <arpa/inet.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <sys/types.h>
#include <unistd.h>
#include <time.h>

int main(){
    int mySocket, clintConnt, clintNum = 0;
    char Send_buffer[1024], Rec_buffer[1024];
    struct sockaddr_in ipOfServer;
    //Creating the socket, arguments are: Internet domain, Stream socket, Default protocol (TCP)
    mySocket = socket(AF_INET, SOCK_STREAM, 0);
    //Configure settings of the server address struct
    ipOfServer.sin_family = AF_INET;
    // Set port number, using htons function to use proper byte order
    ipOfServer.sin_port = htons(2017);
    ipOfServer.sin_addr.s_addr = htonl(INADDR_ANY); //bind to any local address
    // Set all bits of the padding field to 0
    memset(ipOfServer.sin_zero, '\0', sizeof ipOfServer.sin_zero);
    // Bind the address struct to the socket
    bind(mySocket, (struct sockaddr *)&ipOfServer, sizeof(ipOfServer));
    //Listen on the socket, with 20 max connection requests queued
    listen(mySocket, 20);
```



```
    time_t clock; //for capturing timestamp
    while (1){
        //Accept call creates a new socket for the incoming connection
        clintConnt = accept(mySocket, (struct sockaddr *)NULL, NULL);
        clock = time(NULL); //Capturing time when a client hits
        clintNum++;         //Incrementing client number
        if (fork() > 0)
        { // for parent process this code will execute to serve the current client
            char timStmp[100];
            snprintf(timStmp, sizeof(timStmp), "%.24s\r", ctime(&clock));
            printf("clint number %d hit at time: %s\n", clintNum, timStmp);
            //Recieve message from the socket of the incoming connection
            recv(clintConnt, Rec_buffer, 1024, 0);
            clock = time(NULL);
            snprintf(timStmp, sizeof(timStmp), "%.24s\r", ctime(&clock));
            //Printing recieved message
            printf("Msg recieved from client number %d at time: %s\n%s\n", clintNum, timStmp, Rec_buffer);
            //Generating msg for sending
            sprintf(Send_buffer, "Client number %d your msg recieved at time %s", clintNum, timStmp);
            //Sending message to the socket of the incoming connection
            send(clintConnt, Send_buffer, 1024, 0);
        }
        else
        {
            continue; // for child process we want the while loop to run again so that it can wait for a new client.
        }
    }
    return 0;
}
```

Client Side Code:

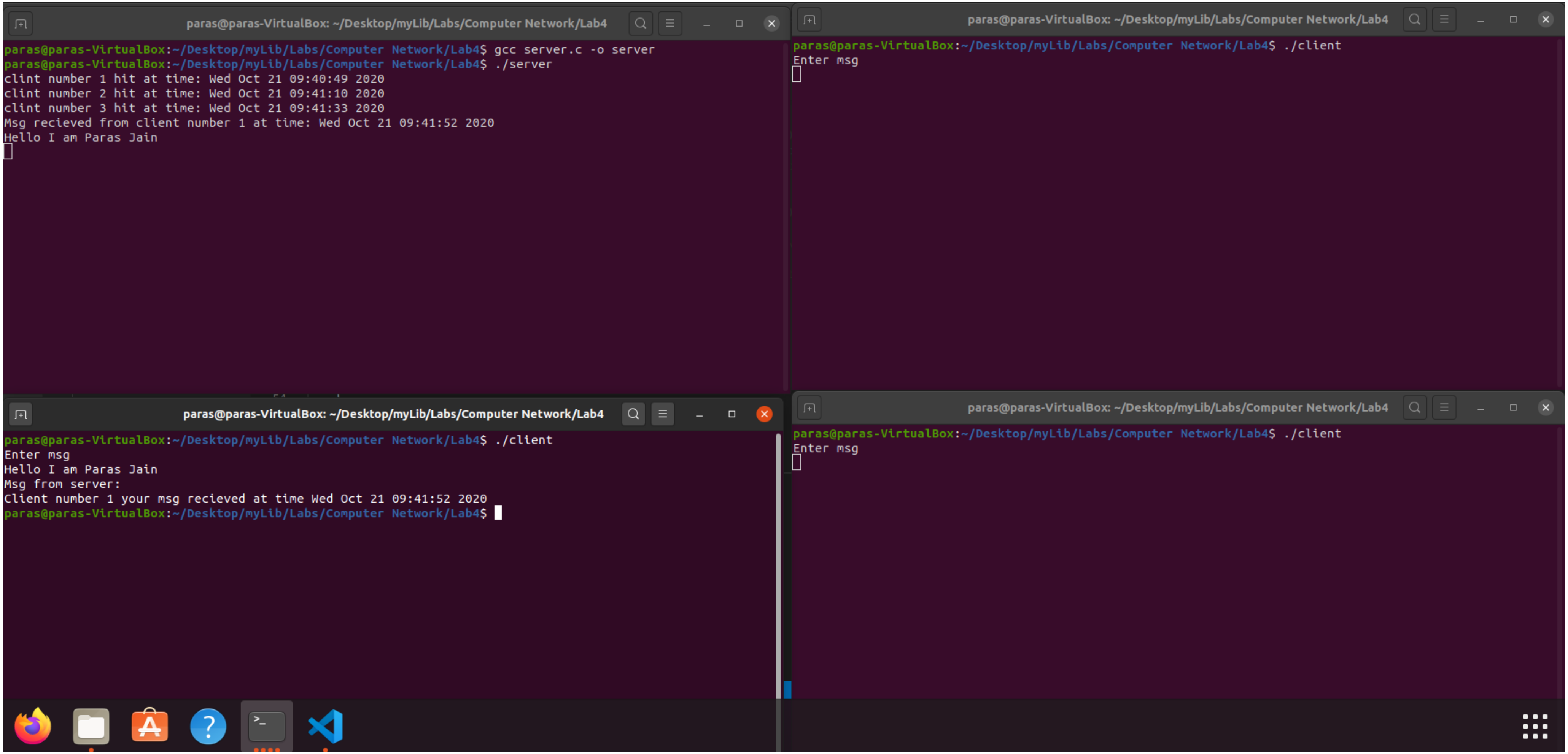


```
#include <stdio.h>
#include <string.h>
#include <arpa/inet.h>
#include <sys/socket.h>
#include <netinet/in.h>
int main(){
    int clientSocket;
    char Send_buffer[1024], Rec_buffer[1024];
    struct sockaddr_in ipOfServer;
    //Creating the socket, arguments are: Internet domain, Stream socket, Default protocol (TCP)
    clientSocket = socket(AF_INET, SOCK_STREAM, 0);
    //Configure settings of the server address struct
    ipOfServer.sin_family = AF_INET;
    //Set port number, using htons function to use proper byte order
    ipOfServer.sin_port = htons(2017);
    //Set IP address to localhost
    ipOfServer.sin_addr.s_addr = inet_addr("127.0.0.1");
    //Set all bits of the padding field to 0
    memset(ipOfServer.sin_zero, '\0', sizeof ipOfServer.sin_zero);
    //Connect the socket to the server using the address struct
    if (connect(clientSocket, (struct sockaddr *)&ipOfServer, sizeof(ipOfServer)) < 0){
        //connecting to server, -ve value implies unsuccessful
        printf("Connection failed due to port and ip problems\n");
        return 1;
    }
    printf("Enter msg\n");
    gets(Send_buffer);
    // scanf("%s",Send_buffer);
    send(clientSocket, Send_buffer, 1024, 0);
    //Read the message from the server into the buffer
    recv(clientSocket, Rec_buffer, 1024, 0);
    //Print the received message
    printf("Msg from server:\n");
    puts(Rec_buffer);
    return 0;
}
```

In this I executed 3 clients. If it were iterative then once a client is being served at that time none other client can hit, but here 3 clients have hit even before client 1 completed its request.

Output:

3 clients are running simultaneously and server received their request. Client 1 sent message. It is also showing time at which each client started.


paras@paras-VirtualBox: ~/Desktop/myLib/Labs/Computer Network/Lab4

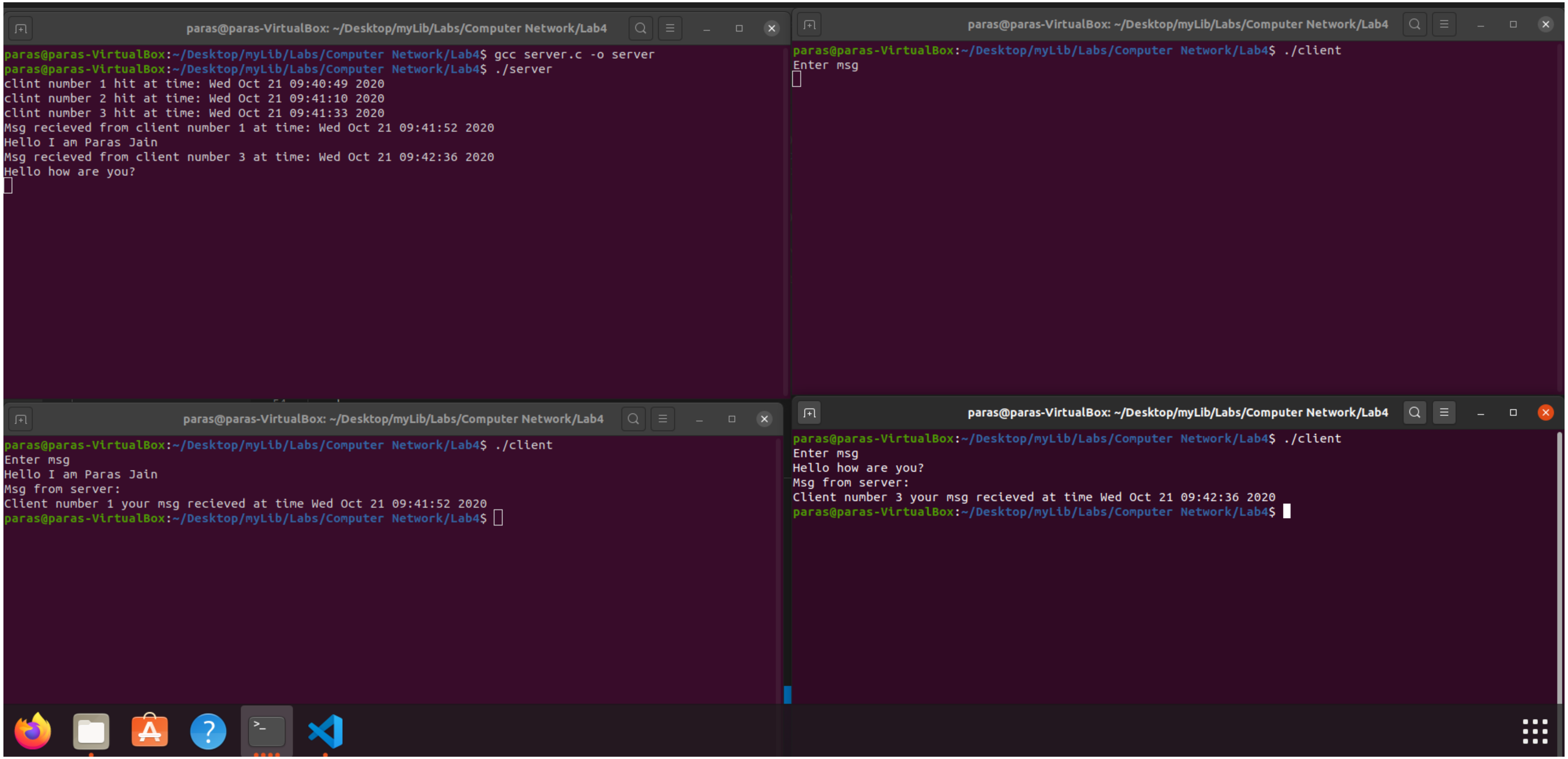
```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ gcc server.c -o server
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./server
clint number 1 hit at time: Wed Oct 21 09:40:49 2020
clint number 2 hit at time: Wed Oct 21 09:41:10 2020
clint number 3 hit at time: Wed Oct 21 09:41:33 2020
Msg recieved from client number 1 at time: Wed Oct 21 09:41:52 2020
Hello I am Paras Jain
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
Hello I am Paras Jain
Msg from server:
Client number 1 your msg recieved at time Wed Oct 21 09:41:52 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
```

Now client 3 sent message



```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ gcc server.c -o server
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./server
clint number 1 hit at time: Wed Oct 21 09:40:49 2020
clint number 2 hit at time: Wed Oct 21 09:41:10 2020
clint number 3 hit at time: Wed Oct 21 09:41:33 2020
Msg recieved from client number 1 at time: Wed Oct 21 09:41:52 2020
Hello I am Paras Jain
Msg recieved from client number 3 at time: Wed Oct 21 09:42:36 2020
Hello how are you?
```

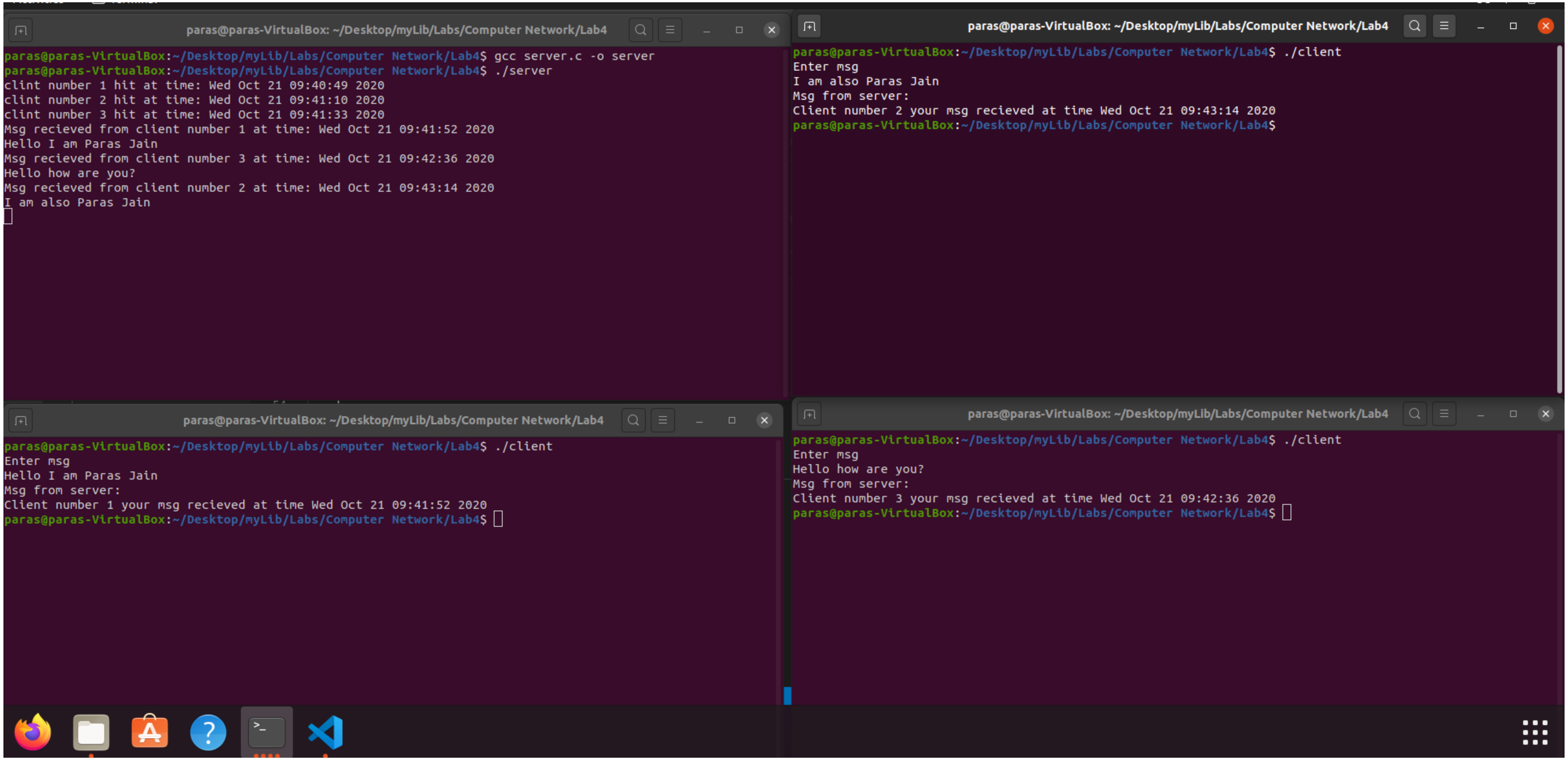
```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
Hello I am Paras Jain
Msg from server:
Client number 1 your msg recieved at time Wed Oct 21 09:41:52 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
Hello how are you?
Msg from server:
Client number 3 your msg recieved at time Wed Oct 21 09:42:36 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```

paras@paras-VirtualBox: ~/Desktop/myLib/Labs/Computer Network/Lab4

Now client 2 sent message



paras@paras-VirtualBox: ~/Desktop/myLib/Labs/Computer Network/Lab4

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ gcc server.c -o server
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./server
clint number 1 hit at time: Wed Oct 21 09:40:49 2020
clint number 2 hit at time: Wed Oct 21 09:41:10 2020
clint number 3 hit at time: Wed Oct 21 09:41:33 2020
Msg recieved from client number 1 at time: Wed Oct 21 09:41:52 2020
Hello I am Paras Jain
Msg recieved from client number 3 at time: Wed Oct 21 09:42:36 2020
Hello how are you?
Msg recieved from client number 2 at time: Wed Oct 21 09:43:14 2020
I am also Paras Jain
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
I am also Paras Jain
Msg from server:
Client number 2 your msg recieved at time Wed Oct 21 09:43:14 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
Hello I am Paras Jain
Msg from server:
Client number 1 your msg recieved at time Wed Oct 21 09:41:52 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```

```
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$ ./client
Enter msg
Hello how are you?
Msg from server:
Client number 3 your msg recieved at time Wed Oct 21 09:42:36 2020
paras@paras-VirtualBox:~/Desktop/myLib/Labs/Computer Network/Lab4$
```