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Networks Lab 2
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1. Server.c and Client.c files were explained in class.

Code (server.c):

```
/*
                              NETWORK PROGRAMMING WITH SOCKETS

We show the communication between a server
process and a client process.

Since many server processes may be running in a system, we identify the
desired server process by a "port number". Standard server processes have
a worldwide unique port number associated with it. For example, the port
number of SMTP (the sendmail process) is 25. To see a list of server
processes and their port numbers see the file /etc/services

In this program, we choose port number 6000 for our server process. Here we
shall demonstrate TCP connections only. For details and for other types of
connections see:

        Unix Network Programming
                -- W. Richard Stevens, Prentice Hall India.

To create a TCP server process, we first need to open a "socket" using the
socket() system call. This is similar to opening a file, and returns a socket
descriptor. The socket is then bound to the desired port number. After this
the process waits to "accept" client connections.

*/
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<arpa/inet.h>
#include<fcntl.h>
#include<string.h>
main()
{
        int sockfd, fd1, length, i;
```

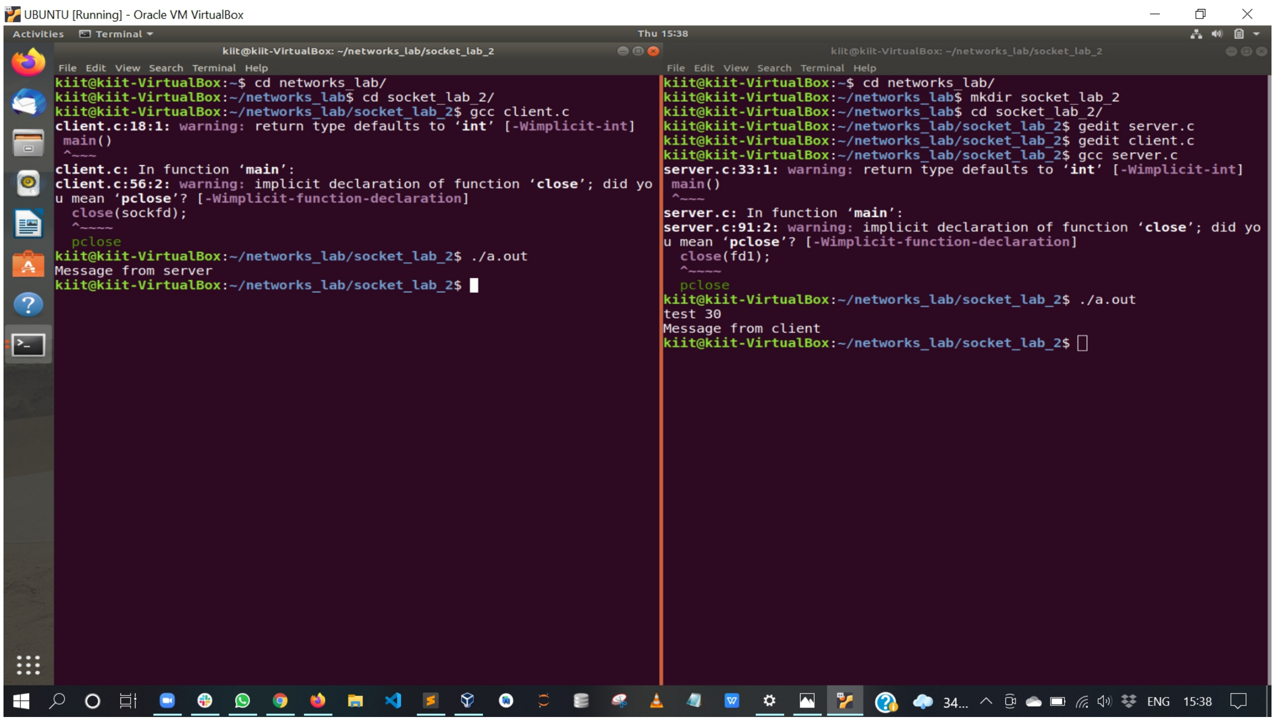
```
char buf[100]; /* We will use this buffer for communication */
struct sockaddr_in sa_addr, cl_addr;

/* The following system call opens a socket. The first parameter
indicates the family of the protocol to be followed. For internet
protocols we use AF_INET. For TCP sockets the second parameter
is SOCK_STREAM. The third parameter is set to 0 for user
applications.*/
sockfd = socket(AF_INET, SOCK_STREAM, 0);

/* The structure "sockaddr_in" is defined in <netinet/in.h> for the
internet family of protocols. This has three main fields. The
field "sin_family" specifies the family and is therefore AF_INET
for the internet family. The field "sin_addr" specifies the
internet address of the server. This field is set to INADDR_ANY
for machines having a single IP address. The field "sin_port"
specifies the port number of the server.*/
sa_addr.sin_family = AF_INET;
sa_addr.sin_addr.s_addr = INADDR_ANY;
sa_addr.sin_port = htons(6000);
memset(sa_addr.sin_zero, '\0', sizeof sa_addr.sin_zero);

/* With the information provided in serv_addr, we associate the server
with its port using the bind() system call. */
i = bind(sockfd, (struct sockaddr *)&sa_addr, sizeof(sa_addr));
printf("test %d%d\n", sockfd, i);

/* This specifies that up to 5 concurrent client
requests will be queued up while the system is
executing the "accept" system call below.*/
listen(sockfd, 5);

/* The accept() system call accepts a client connection.
It blocks the server until a client request comes.

The accept() system call fills up the client's details
in a struct sockaddr which is passed as a parameter.
The length of the structure is noted in clilen. Note
that the new socket descriptor returned by the accept()
system call is stored in "fd1".*/

length = sizeof(cl_addr);
fd1 = accept(sockfd, (struct sockaddr *) &cl_addr, &length);
/* We initialize the buffer, copy the message to it,
and send the message to the client. */
for (i = 0; i < 100; i++)
        buf[i] = '\0';
strcpy(buf, "Message from server");
send(fd1, buf, 100, 0);

/* We again initialize the buffer, and receive a
```

```
        message from the client. */
        for (i = 0; i < 100; i++)
                buf[i] = '\0';
        recv(fd1, buf, 100, 0);
        printf("%s\n", buf);

        close(fd1);

}
```

Code (client.c):

```
/*                              THE CLIENT PROCESS

        Please read the file server.c before you read this file. To run this,
        you must first change the IP address specified in the line:

                serv_addr.sin_addr.s_addr = inet_addr("144.16.202.221");

        to the IP-address of the machine where you are running the server.
*/

#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<arpa/inet.h>
#include<fcntl.h>
#include<string.h>
main()
{
        int i, sockfd;
        char buf[100];
        struct sockaddr_in sa_addr;

        /* Opening a socket is exactly similar to the server process */
        sockfd = socket(AF_INET, SOCK_STREAM, 0);

        /* Recall that we specified INADDR_ANY when we specified the server
        address in the server. Since the client can run on a different
        machine, we must specify the IP address of the server.

        TO RUN THIS CLIENT, YOU MUST CHANGE THE IP ADDRESS
SPECIFIED
        BELOW TO THE IP ADDRESS OF THE MACHINE WHERE YOU ARE
RUNNING
        THE SERVER.*/
        sa_addr.sin_family = AF_INET;
        sa_addr.sin_addr.s_addr = inet_addr("127.0.0.1"); //Loop back IP
address
        sa_addr.sin_port = htons(6000);
        memset(sa_addr.sin_zero, '\0', sizeof sa_addr.sin_zero);

        /* With the information specified in serv_addr, the connect()
        system call establishes a connection with the server process.*/
        i = connect(sockfd, (struct sockaddr *)&sa_addr, sizeof(sa_addr));

        /* After connection, the client can send or receive messages.
        However, please note that recv() will block when the
        server is not sending and vice versa. Similarly send() will
        block when the server is not receiving and vice versa. For
        non-blocking modes, refer to the online man pages.*/
        for (i = 0; i < 100; i++)
                buf[i] = '\0';
        recv(sockfd, buf, 100, 0);
        printf("%s\n", buf);

        for (i = 0; i < 100; i++)
                buf[i] = '\0';
        strcpy(buf, "Message from client");
        send(sockfd, buf, 100, 0);

        close(sockfd);
}
```

Output:



```
kiit@kiit-VirtualBox:~$ cd networks_lab/
kiit@kiit-VirtualBox:~/networks_lab$ cd socket_lab_2/
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ gcc client.c
client.c:18:1: warning: return type defaults to ‘int’ [-Wimplicit-int]
 main()
 ^~~~
client.c: In function ‘main’:
client.c:56:2: warning: implicit declaration of function ‘close’; did yo
u mean ‘pclose’? [-Wimplicit-function-declaration]
  close(sockfd);
  ^~~~~
  pclose
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ ./a.out
Message from server
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$
```

```
kiit@kiit-VirtualBox:~$ cd networks_lab/
kiit@kiit-VirtualBox:~/networks_lab$ mkdir socket_lab_2
kiit@kiit-VirtualBox:~/networks_lab$ cd socket_lab_2/
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ gedit server.c
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ gedit client.c
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ gcc server.c
server.c:33:1: warning: return type defaults to ‘int’ [-Wimplicit-int]
 main()
 ^~~~
server.c: In function ‘main’:
server.c:91:2: warning: implicit declaration of function ‘close’; did yo
u mean ‘pclose’? [-Wimplicit-function-declaration]
  close(fd1);
  ^~~~~
  pclose
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$ ./a.out
test 30
Message from client
kiit@kiit-VirtualBox:~/networks_lab/socket_lab_2$
```