

Communication using socket programming

AIM

To implement a basic **TCP Client–Server communication** program in C where the server listens on a port, accepts a connection, receives a message from the client, and sends a reply back.

To understand network programming concepts such as **socket creation, binding, listening, accepting and connecting**.

THEORY

1. Socket Programming

A **socket** is an endpoint for communication. TCP sockets provide **reliable, connection-oriented** byte streams.

2. Important System Calls

- **socket()** → creates a socket (TCP/UDP).
- **bind()** → assigns an IP address + port number to the socket (server).
- **listen()** → puts the socket into passive mode, waiting for clients.
- **accept()** → accepts a client connection and creates a new socket for communication.
- **connect()** → client connects to the server.
- **send() / write()** → sends data.
- **recv() / read()** → receives data.
- **close()** → closes the socket.

3. Client–Server Model

- The **server** runs first, binds to a specific port, and waits.
- The **client** connects to the server using the server IP + port.
- Messages are exchanged using TCP.
- Both sides close the connection after communication.

4. LAN vs Same Device Communication

- If client/server are on **same device**, use IP **127.0.0.1 (loopback)**.
- If on **different devices**, use the **actual LAN IP of the server** (e.g., 192.168.x.x).

PROCEDURE

A. Server Side

1. Create a socket using `socket(AF_INET, SOCK_STREAM, 0)`.
2. Set socket options using `setsockopt()` to allow reuse of the port.
3. Fill the server address structure with:
 - o Address family → AF_INET
 - o Port → 8080
 - o IP → INADDR_ANY
4. Bind the socket to the IP/port using `bind()`.
5. Call `listen()` to wait for incoming clients.
6. Accept an incoming connection using `accept()`.
7. Read the message sent by client.
8. Print the message.
9. Send a reply back: "Hello from server".
10. Close the connection socket.

B. Client Side

1. Create a socket using `socket()`.
2. Fill server IP and port in the structure.
 - o For local → 127.0.0.1
 - o For remote → Replace with server's LAN IP.
3. Call `connect()` to establish connection with server.
4. Send "Hello from client".
5. Read server's reply and print it.
6. Close the socket.

C. Compilation (Linux GCC)

```
gcc server.c -o server
```

```
gcc client.c -o client
```

D. Execution

1. Run server first:

2. ./server
3. Run client:
4. ./client

RESULT

1. The client successfully established a TCP connection with the server.
2. The client sent the message "**Hello from client**" to the server.
3. The server received and displayed the message.
4. The server sent back "**Hello from server**", which the client received and printed.
5. The program demonstrated correct functioning of **TCP socket programming** and **two-way communication**.

CONCLUSION

The experiment was successfully performed.

We learned how TCP client–server communication works using socket programming in C.

We implemented:

- socket creation
- binding
- listening
- accepting
- connecting
- sending and receiving messages

The practical demonstrated how reliable two-way communication occurs over a network using the TCP protocol.