# 1.Lab Manual: Developing a TCP Client-Server Application using Python Socket Programming

## Lab Setup:

1. **Setting up the Environment:**
    - Ensure that you have a Linux environment with Python installed.
    - Open a terminal.
2. **Creating the Project Directory:**
    - Create a new directory for your project.

```
bash

2. mkdir tcp_message_lab
   cd tcp_message_lab
```

## Part 1: Server Side

### Step 1: Writing the Server Code

1. Create a file named `server.py` in the project directory.

```
python

1. # server.py
   import socket

   PORT = 8080
   MAX_BUFFER_SIZE = 1024

   def main():
       server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
       server_socket.bind(('0.0.0.0', PORT))
       server_socket.listen(3)

       print("Server listening on port", PORT)

       client_socket, client_address = server_socket.accept()
       print("Accepted connection from", client_address)

       data = client_socket.recv(MAX_BUFFER_SIZE).decode('utf-8')
       print("Received message from client:", data)

       client_socket.close()
       server_socket.close()

   if __name__ == "__main__":
       main()
```

### Step 2: Running the Server Code

1. Run the server.

   ```
   bash
   ```

   ```
   1. python server.py
   ```

# Part 2: Client Side

## Step 1: Writing the Client Code

1. Create a file named `client.py` in the project directory.

   ```
   python
   ```

   ```
   1. # client.py
      import socket

      PORT = 8080
      MAX_BUFFER_SIZE = 1024

      def main():
          client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
          server_address = ('127.0.0.1', PORT)

          try:
              client_socket.connect(server_address)
              print("Connected to server on port", PORT)

              message = input("Enter a message to send to the server: ")
              client_socket.sendall(message.encode('utf-8'))

          finally:
              client_socket.close()

      if __name__ == "__main__":
          main()
   ```

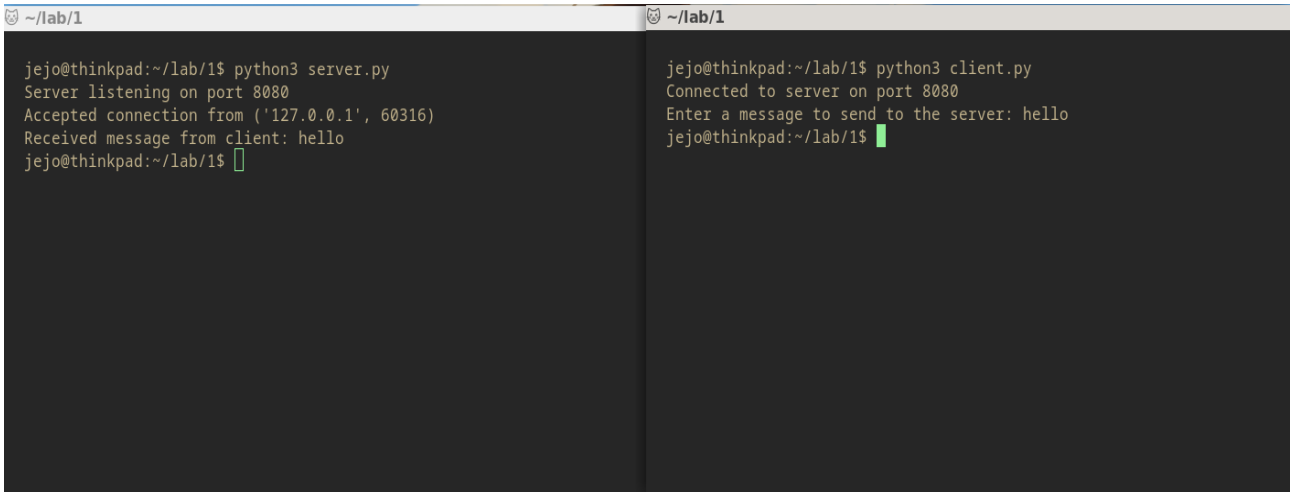
## Step 2: Running the Client Code

1. Run the client (in a separate terminal).

   ```
   bash
   ```

```
python client.py
```

**OUTPUT:**


~/lab/1
jejo@thinkpad:~/lab/1$ python3 server.py
Server listening on port 8080
Accepted connection from ('127.0.0.1', 60316)
Received message from client: hello
jejo@thinkpad:~/lab/1$
~/lab/1
jejo@thinkpad:~/lab/1$ python3 client.py
Connected to server on port 8080
Enter a message to send to the server: hello
jejo@thinkpad:~/lab/1$

# 2.Lab Manual: Developing a UDP Client-Server Application using Python Socket Programming

## Lab Setup:

1. **Setting up the Environment:**
    - Ensure that you have a UNIX-like operating system.
    - Open a terminal.
2. **Creating the Project Directory:**

```
bash

2. mkdir udp_message_lab
   cd udp_message_lab
```

## Part 1: Server Side

### Step 1: Writing the Server Code

1. Create a file named `udp_server.py` in the project directory.

```
python

1. # udp_server.py
   import socket

   PORT = 8080
   MAX_BUFFER_SIZE = 1024

   def main():
       sockfd = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
       server_addr = ('0.0.0.0', PORT)
       sockfd.bind(server_addr)

       print(f"UDP Server is listening on port {PORT}...")

       while True:
           data, client_addr = sockfd.recvfrom(MAX_BUFFER_SIZE)
           message = data.decode('utf-8')
           print(f"Message from client: {message}")

       sockfd.close()

   if __name__ == "__main__":
       main()
```

### Step 2: Running the Server Code

1. Run the server.

```
bash

1. python udp_server.py
```

# Part 2: Client Side

## Step 1: Writing the Client Code

1. Create a file named `udp_client.py` in the project directory.

```
python

1. # udp_client.py
   import socket

   PORT = 8080
   SERVER_IP = '127.0.0.1'
   MAX_BUFFER_SIZE = 1024

   def main():
       sockfd = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
       server_addr = (SERVER_IP, PORT)

       while True:
           message = input("Enter a message to send to the server: ")
           sockfd.sendto(message.encode('utf-8'), server_addr)

       sockfd.close()

   if __name__ == "__main__":
       main()
```

## Step 2: Running the Client Code

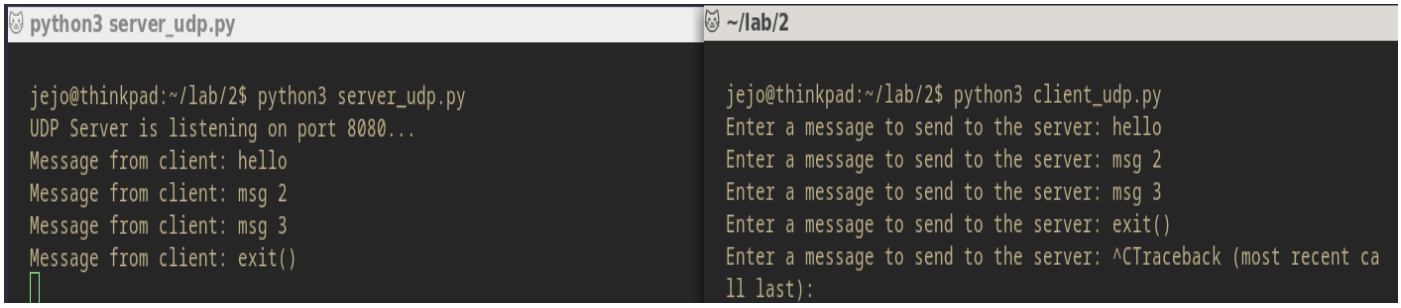
1. Run the client (in a separate terminal).

```
bash

1. python udp_client.py
```

In both the server and client code, the `socket` module is used for creating and managing sockets. The logic is similar to the C code provided, demonstrating the use of UDP for communication between the client and the server. The `recvfrom` method is used to receive data from the client, and `sendto` is used to send data to the server.

**OUTPUT :**


python3 server_udp.py
jejo@thinkpad:~/lab/2$ python3 server_udp.py
UDP Server is listening on port 8080...
Message from client: hello
Message from client: msg 2
Message from client: msg 3
Message from client: exit()
~/lab/2
jejo@thinkpad:~/lab/2$ python3 client_udp.py
Enter a message to send to the server: hello
Enter a message to send to the server: msg 2
Enter a message to send to the server: msg 3
Enter a message to send to the server: exit()
Enter a message to send to the server: ^CTraceback (most recent ca
ll last):

# 3.Network Tools Demonstration Manual

## 1. Ping:

**Purpose:** To check the reachability of a host on an Internet Protocol (IP) network.

**Command:**

```
bash

ping [hostname or IP address]
```

**Example:**

```
bash

ping www.example.com
```

**Explanation:**

- This command sends ICMP Echo Request messages to the specified host and prints the round-trip time for each packet.
- It's a basic tool for checking network connectivity.

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## 2. TCPDump:

**Purpose:** To capture and analyze network packets.

**Command:**

```
bash

sudo tcpdump [options]
```

**Example:**

```
bash

sudo tcpdump -i eth0
```

**Explanation:**

- This command captures packets on the specified network interface (`-i` option).
- You can apply various filters and options to narrow down the captured data.

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## 3. Traceroute:

**Purpose:** To trace the route that packets take to reach a destination.

**Command:**

```
bash

traceroute [hostname or IP address]
```

**Example:**

```
bash

traceroute www.example.com
```

**Explanation:**

- This command shows the path packets take from your computer to the specified destination.
- It displays the IP addresses and round-trip times for each hop along the route.

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### 4. Netstat:

**Purpose:** To display network connections, routing tables, interface statistics, masquerade connections, etc.

**Command:**

```
bash

netstat [options]
```

**Example:**

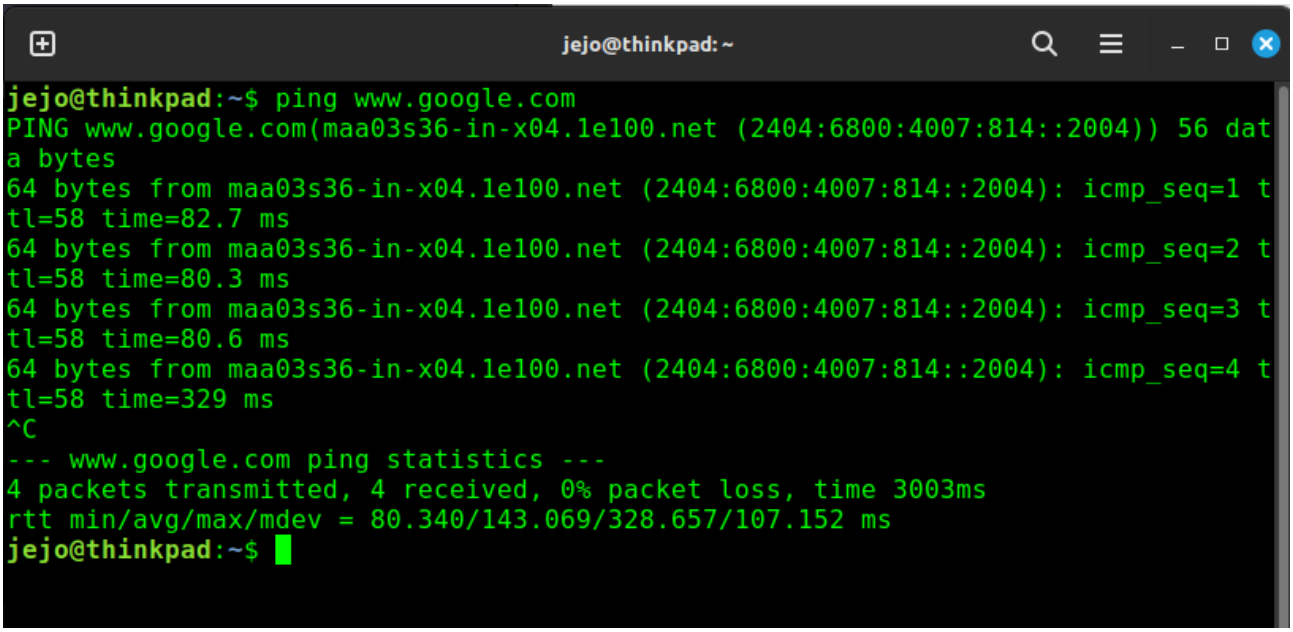
```
bash

netstat -an
```

**Explanation:**

- This command shows various network-related information, such as active connections, listening ports, and routing tables.
- The `-a` option displays all connections and listening ports, and the `-n` option shows numeric addresses.

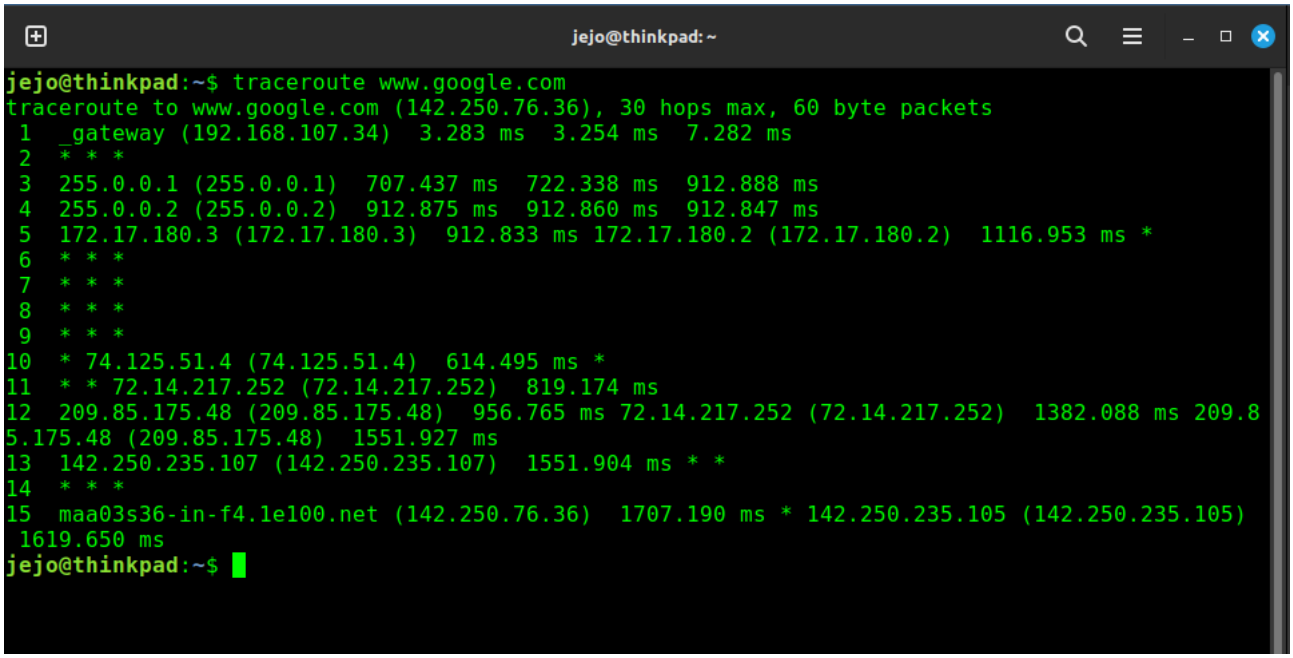
## OUTPUT:



## TCPDump:

```
jejo@thinkpad:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on wlp3s0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
18:13:30.612019 IP6 thinkpad.59770 > maa05s22-in-x0a.1e100.net.https: UDP, length 29
18:13:30.664437 IP thinkpad.56237 > _gateway.domain: 23265+ PTR? a.0.0.2.0.0.0.0.0.0.0.0.0.0.0.0
.0.d.1.8.0.7.0.0.4.0.0.8.6.4.0.4.2.ip6.arpa. (90)
18:13:30.973439 IP6 maa05s22-in-x0a.1e100.net.https > thinkpad.59770: UDP, length 28
18:13:31.383084 IP _gateway.domain > thinkpad.56237: 23265 1/0/0 PTR maa05s22-in-x0a.1e100.net
. (129)
18:13:31.383427 IP thinkpad.57122 > _gateway.domain: 21143+ PTR? e.9.a.7.0.4.0.4.c.2.e.c.5.7.b
.0.e.3.5.9.2.9.e.1.d.8.0.4.9.0.4.2.ip6.arpa. (90)
18:13:31.390760 IP _gateway.domain > thinkpad.57122: 21143 NXDomain 0/0/0 (90)
18:13:31.391708 IP thinkpad.47916 > _gateway.domain: 51307+ PTR? 34.107.168.192.in-addr.arpa.
(45)
18:13:31.587928 IP _gateway.domain > thinkpad.47916: 51307 NXDomain* 0/1/0 (104)
18:13:31.588400 IP thinkpad.33574 > _gateway.domain: 14110+ PTR? 125.107.168.192.in-addr.arpa.
 (46)
18:13:31.595613 IP _gateway.domain > thinkpad.33574: 14110 NXDomain 0/0/0 (46)
18:13:33.028414 IP thinkpad.34425 > _gateway.domain: 60838+ A? network-test.debian.org. (41)
18:13:33.028434 IP thinkpad.34425 > _gateway.domain: 4514+ AAAA? network-test.debian.org. (41)
18:13:33.169563 IP _gateway.domain > thinkpad.34425: 4514 2/0/0 CNAME debian.map.fastlydns.net
., AAAA 2a04:4e42:25::644 (107)
18:13:34.873457 IP _gateway.domain > thinkpad.34425: 60838 2/0/0 CNAME debian.map.fastlydns.ne
t., A 151.101.158.132 (95)
18:13:34.874106 IP thinkpad.35850 > 151.101.158.132.http: Flags [S], seq 546386806, win 64240,
 options [mss 1460,sackOK,TS val 2925865683 ecr 0,nop,wscale 7], length 0
18:13:34.927871 IP thinkpad.49096 > _gateway.domain: 525+ PTR? 132.158.101.151.in-addr.arpa. (
46)
18:13:35.023378 IP 151.101.158.132.http > thinkpad.35850: Flags [S.], seq 539355995, ack 54638
6807, win 65535, options [mss 1370,sackOK,TS val 3306311557 ecr 2925865683,nop,wscale 9], leng
th 0
18:13:35.023432 IP thinkpad.35850 > 151.101.158.132.http: Flags [.], ack 1, win 502, options [
nop,nop,TS val 2925865833 ecr 3306311557], length 0
18:13:35.023610 IP thinkpad.35850 > 151.101.158.132.http: Flags [P.], seq 1:84, ack 1, win 502
, options [nop,nop,TS val 2925865833 ecr 3306311557], length 83: HTTP: GET /nm HTTP/1.1
18:13:35.176207 IP 151.101.158.132.http > thinkpad.35850: Flags [.], ack 84, win 283, options
[nop,nop,TS val 3306311726 ecr 2925865833], length 0
18:13:35.176228 IP 151.101.158.132.http > thinkpad.35850: Flags [P.], seq 1:338, ack 84, win 2
83, options [nop,nop,TS val 3306311726 ecr 2925865833], length 337: HTTP: HTTP/1.1 200 OK
18:13:35.176245 IP thinkpad.35850 > 151.101.158.132.http: Flags [.], ack 338, win 501, options
 [nop,nop,TS val 2925865986 ecr 3306311726], length 0
18:13:35.176253 IP 151.101.158.132.http > thinkpad.35850: Flags [F.], seq 338, ack 84, win 283
, options [nop,nop,TS val 3306311726 ecr 2925865833], length 0
18:13:35.176395 IP thinkpad.35850 > 151.101.158.132.http: Flags [F.], seq 84, ack 339, win 501
, options [nop,nop,TS val 2925865986 ecr 3306311726], length 0
18:13:35.195922 IP _gateway.domain > thinkpad.49096: 525 NXDomain 0/1/0 (106)
18:13:35.327386 IP 151.101.158.132.http > thinkpad.35850: Flags [.], ack 85, win 283, options
[nop,nop,TS val 3306311836 ecr 2925865986], length 0
```

## Traceroute:




## NETSTAT: