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Practice Programs:

1.A) Write a program where client can send a message to the server and the server can receive the message and send, or echo, it back to the client.

Echo Client :

```
import socket
HOST = '127.0.0.1' # The server's hostname or IP address
PORT = 2053
# The port used by the server
with socket.socket(socket.AF_INET, socket.SOCK_STREAM) as s:
    s.connect((HOST, PORT))
    s.sendall(b'Hello, world')
    data = s.recv(1024)
    print('Received Connection')
    print('Server:', data.decode())
```

Echo Server :

```
import socket
HOST = '127.0.0.1' # Standard loopback interface address (localhost)
PORT = 2053
# Port to listen on (non-privileged ports are > 1023)
with socket.socket(socket.AF_INET, socket.SOCK_STREAM) as s:
    s.bind((HOST, PORT))
    s.listen()
    conn, addr = s.accept()

    with conn:
        print('Connected by', addr)
        while True:
            data = conn.recv(1024)
            if data:
                print("Client: ",data.decode())
                data = input("Enter message to client:");
                if not data:
                    break;
                # sending message as bytes to client.
                conn.sendall(bytearray(data, 'utf-8'));

conn.close()
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 pracserver-1.py
Connected by ('127.0.0.1', 59434)
Client: Hello, world
Enter message to client:hello , how are you?
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 praclient-1.py
Received Connection
Server: hello , how are you?
```

2A) Write a program to create TCP time server in Python

Time Client :

```
#client.py
import socket
# create a socket object
s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
# get local machine name
host = socket.gethostname()
port = 9991
# connection to hostname on the port.
s.connect((host, port))
# Receive no more than 1024 bytes
tm = s.recv(1024)
print(' Current time from Sever :', tm.decode())
s.close()
```

Time Server :

```
# server.py
import socket
import time
# create a socket object
serversocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
# get local machine name
host = socket.gethostname()
port = 9991
# bind to the port
serversocket.bind((host, port))
# queue up to 5 requests
serversocket.listen(5)
while True:
    # establish a connection
    clientsocket, addr = serversocket.accept()
```

```
print("Got a connection from %s" % str(addr))
currentTime = time.ctime(time.time()) + "\r\n"
clientsocket.send(currentTime.encode('ascii'))
clientsocket.close()
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 pracserver-2.py
Got a connection from ('172.16.58.220', 38436)
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 praclient-2.py
Current time from Sever : Tue Mar 16 14:17:05 2021
```

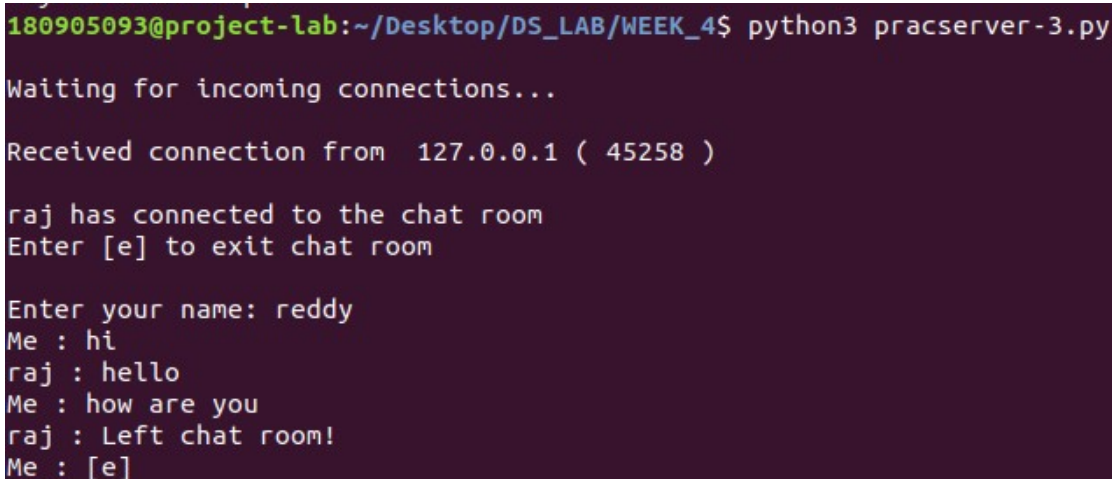
3A) Write a TCP chat server in python using socket programming.

Client Chat:

```
import socket
HOST = '172.16.58.193' # Standard loopback interface address (localhost)
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)
s = socket.socket()
name = input(str("\nEnter your name: "))
print("\nTrying to connect to ", HOST, "(" , PORT, ")\n")
s.connect((HOST, PORT))
print("Connected...\n")
s.send(name.encode())
s_name = s.recv(1024)
s_name = s_name.decode()
print(s_name, "has joined the chat room\nEnter [e] to exit chat room\n")
while True:
    message = s.recv(1024)
    message = message.decode()
    print(s_name, ":", message)
    message = input(str("Me : "))
    if message == "[e]":
        message = "Left chat room!"
        s.send(message.encode())
        print("\n")
        break
    s.send(message.encode())
```

Server Chat:

```
# server.py
import socket
HOST = '127.0.0.1' # Standard loopback interface address (localhost)
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)
s = socket.socket()
s.bind((HOST, PORT))
s.listen()
print("\nWaiting for incoming connections...\n")
conn, addr = s.accept()
print("Received connection from ", addr[0], "(", addr[1], ")\n")
s_name = conn.recv(1024)
s_name = s_name.decode()
print(s_name, "has connected to the chat room\nEnter [e] to exit chat room\n")
name = input(str("Enter your name: "))
conn.send(name.encode())
while True:
    message = input(str("Me : "))
    if message == "[e]":
        message = "Left chat room!"
        conn.send(message.encode())
        print("\n")
        break
    conn.send(message.encode())
    message = conn.recv(1024)
    message = message.decode()
    print(s_name, ":", message)
```

A terminal window with a dark purple background and light green text. The prompt is '180905093@project-lab:~/Desktop/DS_LAB/WEEK_4\$'. The command 'python3 pracserver-3.py' has been executed. The output shows the server waiting for connections, receiving a connection from 127.0.0.1 on port 45258, and then interacting with a user named 'reddy'. The user sends 'hi', 'hello', and 'how are you', and the server responds with 'Left chat room!'. Finally, the user enters '[e]' to exit the chat room.

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 pracserver-3.py
Waiting for incoming connections...
Received connection from 127.0.0.1 ( 45258 )
raj has connected to the chat room
Enter [e] to exit chat room

Enter your name: reddy
Me : hi
raj : hello
Me : how are you
raj : Left chat room!
Me : [e]
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 praclient-3.py
Enter your name: raj
Trying to connect to 172.16.58.193 ( 31621 )
Connected...
yash has joined the chat room
Enter [e] to exit chat room

yash : hi
Me : hi
yash : hello
Me : hi
yash : this is cool
Me : yeah
yash : my ip is 172.16.58.19
Me : how to know my ip\
yash : Left chat room!
Me : [e]
```

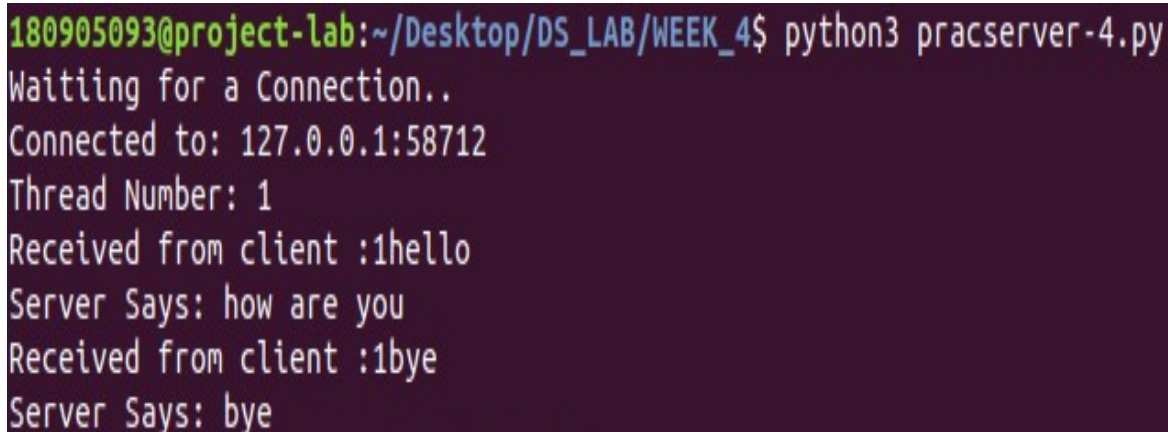
4A. Forking/ Threading (Concurrent Server)

client :

```
import socket
ClientSocket = socket.socket()
host = '127.0.0.1'
port = 11596
print('Waiting for connection')
try:
    ClientSocket.connect((host, port))
except socket.error as e:
    print(str(e))
Response = ClientSocket.recv(1024)
while True:
    Input = input('Client Say Something: ')
    ClientSocket.send(str.encode(Input))
    Response = ClientSocket.recv(1024)
    print('From Server : ' + Response.decode())
ClientSocket.close()
```

server:

```
import socket
import os
from _thread import *
ServerSocket = socket.socket()
host = '127.0.0.1'
port = 11596
ThreadCount = 0
try:
    ServerSocket.bind((host, port))
except socket.error as e:
    print(str(e))
print('Waiting for a Connection..')
ServerSocket.listen(5)
def threaded_client(connection):
    connection.send(str.encode('Welcome to the Server'))
    while True:
        data = connection.recv(2048)
        print('Received from client :' + str(ThreadCount) + data.decode())
        Inputs = input('Server Says: ')
        if not data:
            break
        connection.sendall(Inputs.encode())
    connection.close()
while True:
    Client, address = ServerSocket.accept()
    print('Connected to: ' + address[0] + ':' + str(address[1]))
    start_new_thread(threaded_client, (Client, ))
    ThreadCount += 1
    print("Thread Number: " + str(ThreadCount))
ServerSocket.close()
```



A terminal window with a dark purple background. The prompt is '180905093@project-lab:~/Desktop/DS_LAB/WEEK_4\$'. The command 'python3 pracserver-4.py' has been executed. The output shows the server waiting for a connection, then receiving a connection from '127.0.0.1:58712'. It prints 'Thread Number: 1', 'Received from client :1hello', 'Server Says: how are you', 'Received from client :1bye', and 'Server Says: bye'.

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 pracserver-4.py
Waiting for a Connection..
Connected to: 127.0.0.1:58712
Thread Number: 1
Received from client :1hello
Server Says: how are you
Received from client :1bye
Server Says: bye
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 praclient-4.py
Waiting for connection
Client Say Something: hello
From Server : how are you
Client Say Something: bye
From Server : bye
```

Lab Exercise:

1. Write a UDP time server to display the current time and day.

#client.py

```
import socket
# create a socket object
s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
# get local machine name
udp_host = socket.gethostname()
udp_port = 9991
#Send some message so the server gets client address
msg = 'hi'
s.sendto(msg.encode(),(udp_host,udp_port))
# Receive no more than 1024 bytes
tm = s.recv(1024)
print(' Current time from Sever :', tm.decode())
s.close()
```

server.py

```
import socket
import time
# create a socket object
serversocket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
# get local machine name
host = socket.gethostname()
port = 9991
# bind to the port
serversocket.bind((host, port))

while True:
    # receive a udp message
    data,addr = serversocket.recvfrom(1024)
    print("Got a connection from %s" % str(addr))
    currentTime = time.ctime(time.time()) + "\r\n"
```



```
serversocket.sendto(currentTime.encode('ascii') , addr)
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 p1-server.py  
Got a connection from ('172.16.58.220', 51024)
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 p1-client.py  
Current time from Sever : Tue Mar 16 14:42:22 2021
```

2. Write a UDP simple chat program for message send and receive.

#client code :

```
import socket  
HOST = socket.gethostname()  
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)  
s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)  
name = input(str("\nEnter your name: "))  
print("\nTrying to connect to ", HOST, "(", PORT, ")\n")  
s.sendto(b"", (HOST , PORT))  
print("Connected...\n")  
s.sendto(name.encode('ascii') , (HOST , PORT))  
s_name = s.recv(1024)  
s_name = s_name.decode()  
print(s_name, "has joined the chat room\nEnter [e] to exit chat room\n")  
while True:  
    message, addr = s.recvfrom(1024)  
    message = message.decode()  
    print(s_name, ":", message)  
    message = input(str("Me : "))  
    if message == "[e]":  
        message = "Left chat room!"  
        s.sendto(message.encode() , (HOST , PORT))  
        print("\n")  
        break  
    s.sendto(message.encode() , (HOST , PORT))
```


#servercode :

```
import socket
HOST = socket.gethostname()
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)
s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
s.bind((HOST, PORT))

print("\nWaiting for incoming connections...\n")
data,addr = s.recvfrom(1024)
print("Received connection from ", addr[0], "(", addr[1], ")\n")
s_name, addr = s.recvfrom(1024)
s_name = s_name.decode()
print(s_name, "has connected to the chat room\nEnter [e] to exit chat room\n")
name = input(str("Enter your name: "))
s.sendto(name.encode('ascii') , addr)
while True:
    message = input(str("Me : "))
    if message == "[e]":
        message = "Left chat room!"
        s.sendto(message.encode() , addr)
        print("\n")
        break
    s.sendto(message.encode() , addr)
    message, addr = s.recvfrom(1024)
    message = message.decode()
    print(s_name, ":", message)
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 p2-server.py
Waiting for incoming connections...
Received connection from 172.16.58.220 ( 40235 )
rajvardhan has connected to the chat room
Enter [e] to exit chat room
Enter your name: rajvardhan
Me : hello
rajvardhan : hi
Me : how are you
rajvardhan : i'm great
Me : bye
rajvardhan : bye
Me : 
```

```

180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 p2-client.py

Enter your name: rajvardhan

Trying to connect to  project-lab ( 31621 )

Connected...

rajvardhan has joined the chat room
Enter [e] to exit chat room

rajvardhan : hello
Me : hi
rajvardhan : how are you
Me : i'm great
rajvardhan : bye
Me : bye

```

3. Write a TCP/UDP peer to peer chat system between two different machines.

#client-code:

```

import socket
HOST = '172.16.58.111'
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)
s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
name = input(str("\nEnter your name: "))
print("\nTrying to connect to ", HOST, "(", PORT, ")\n")
s.sendto(b"", (HOST, PORT))
print("Connected...\n")
s.sendto(name.encode('ascii'), (HOST, PORT))
s_name = s.recv(1024)
s_name = s_name.decode()
print(s_name, "has joined the chat room\nEnter [e] to exit chat room\n")
while True:
    message, addr = s.recvfrom(1024)
    message = message.decode()
    print(s_name, ":", message)
    message = input(str("Me : "))
    if message == "[e]":
        message = "Left chat room!"
        s.sendto(message.encode(), (HOST, PORT))
        print("\n")
        break
    s.sendto(message.encode(), (HOST, PORT))

```

#server-code:

```
import socket
HOST = socket.gethostname()
PORT = 31621 # Port to listen on (non-privileged ports are > 1023)
s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
s.bind((HOST, PORT))

print("\nWaiting for incoming connections...\n")
data,addr = s.recvfrom(1024)
print("Received connection from ", addr[0], "(", addr[1], ")\n")
s_name, addr = s.recvfrom(1024)
s_name = s_name.decode()
print(s_name, "has connected to the chat room\nEnter [e] to exit chat room\n")
name = input(str("Enter your name: "))
s.sendto(name.encode('ascii') , addr)
while True:
    message = input(str("Me : "))
    if message == "[e]":
        message = "Left chat room!"
        s.sendto(message.encode() , addr)
        print("\n")
        break
    s.sendto(message.encode() , addr)
    message, addr = s.recvfrom(1024)
    message = message.decode()
    print(s_name, ":", message)
```

```
180905093@project-lab:~/Desktop/DS_LAB/WEEK_4$ python3 p3-client.py
```

```
Enter your name: raj
```

```
Trying to connect to 172.16.58.111 ( 31621 )
```

```
Connected...
```

```
Ojas has joined the chat room
```

```
Enter [e] to exit chat room
```

```
Ojas : sup
```

```
Me : hello
```

```
yo, got it
```

```
Ojas : ok Ill take a screenshot of this
```

```
Me : cool cool
```