

Designing a

Web-Sever Using
Sockets

and

Demonstrating the
Client and Server
Communication

NEED HELP?

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CODE:

(2 files to be run individually on different or same systems)

>> server.py

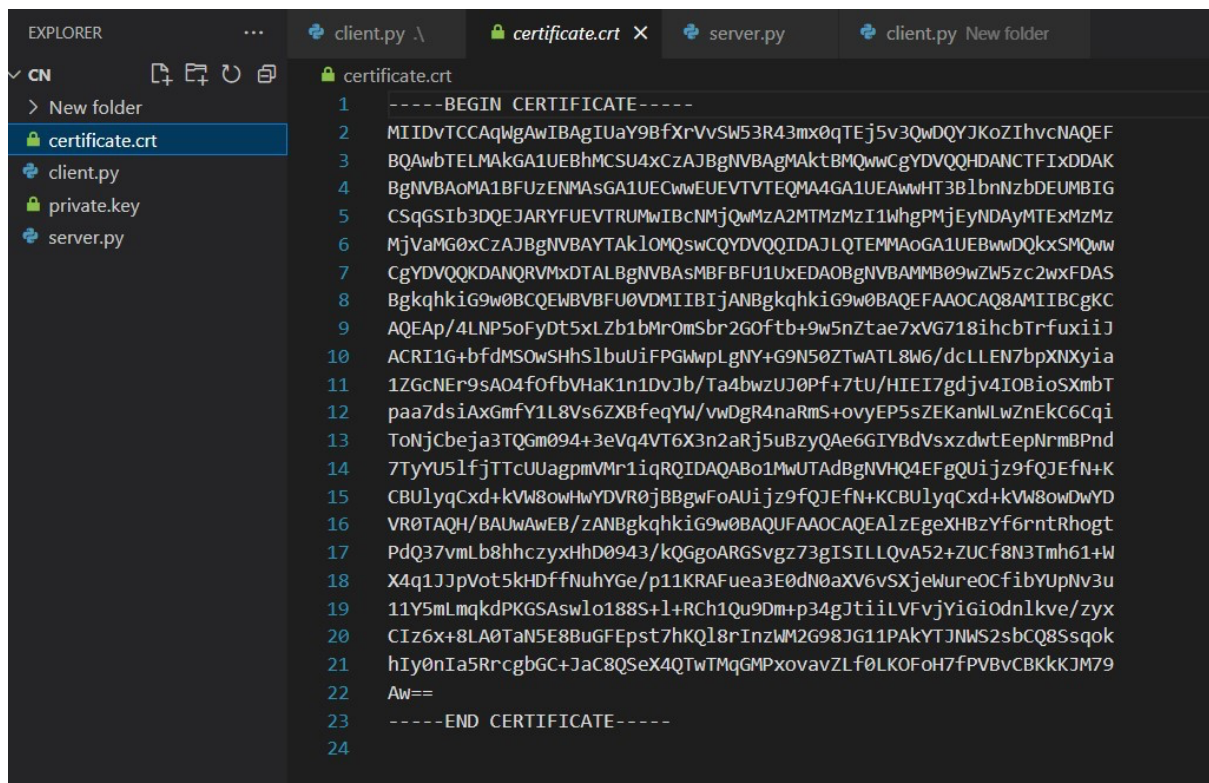
```
import socket import
ssl import threading
def handle_client(conn,
addr):
    print(f"[NEW CONNECTION] {addr}
connected.")    connected = True    while
connected:
        msg    =    conn.recv(1024).decode()
if not msg:
                    break
print(f"[{addr}] {msg}")    response =
"Message received by server."
conn.send(response.encode())    conn.close()
def main():
    context = ssl.SSLContext(ssl.PROTOCOL_TLS_SERVER)
context.load_cert_chain('certificate.crt', 'private.key')
    server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
ssl_server_socket = context.wrap_socket(server_socket, server_side=True)
ssl_server_socket.bind(('192.168.0.216', 5566))
ssl_server_socket.listen(5)
    print("[LISTENING] Server is listening on
192.168.0.216:5566")    while True:
        conn, addr =
ssl_server_socket.accept()
        thread = threading.Thread(target=handle_client,
args=(conn, addr))    thread.start()    print(f"[ACTIVE
CONNECTIONS] {threading.active_count() - 1}")    if __name__ ==
"__main__":
        main()
```

>> client.py

```
import socket
import ssl
def main():
    client = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    context = ssl.create_default_context()
    context.check_hostname = False
    context.verify_mode = ssl.CERT_NONE

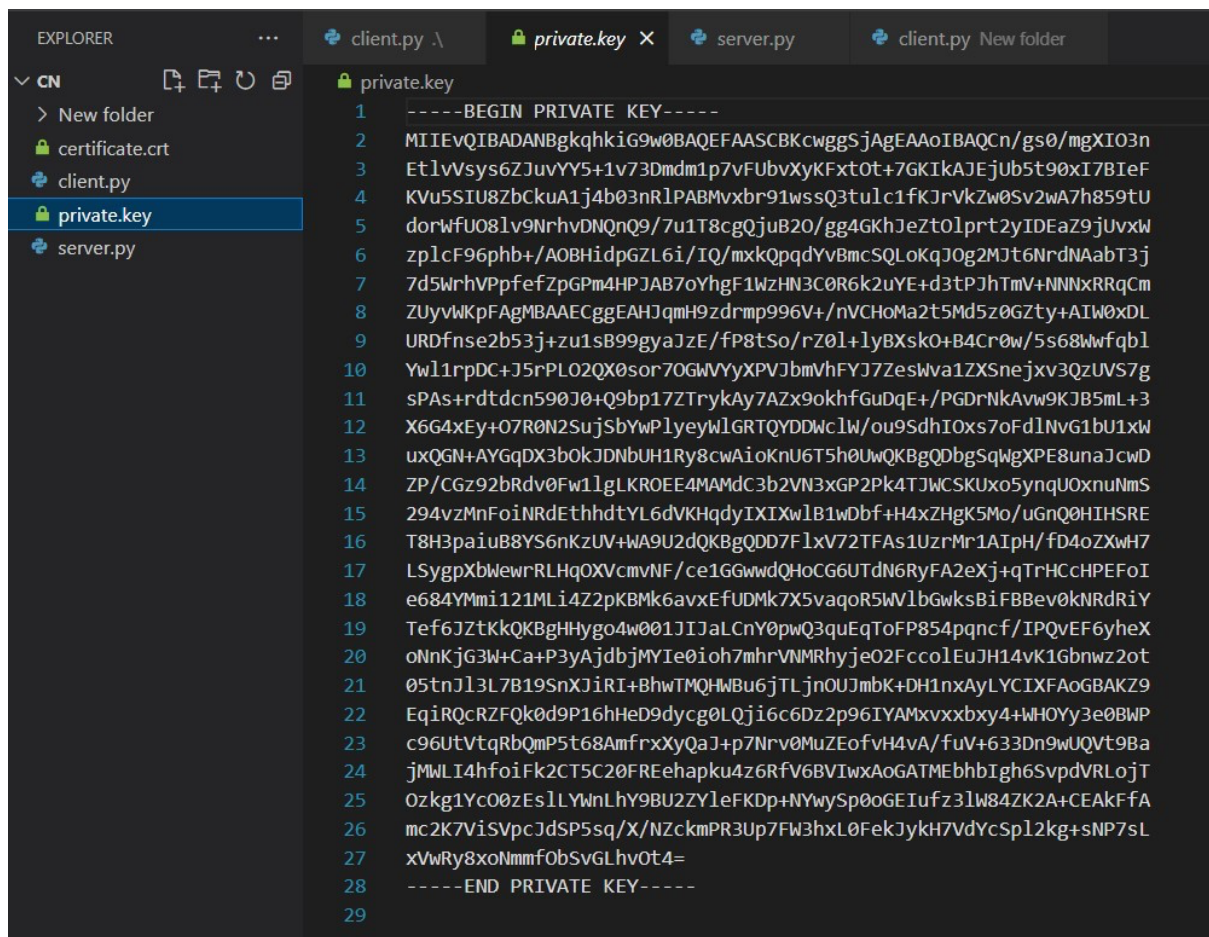
    client = context.wrap_socket(client, server_hostname=None)
    client.connect(('192.168.0.216', 5566))
    print("[CONNECTED] Client connected to server.")    while
    True:        msg = input("Enter message:
    ")        client.send(msg.encode())        if
    msg == 'exit':
        break        response =
    client.recv(1024).decode()
    print(f"[SERVER] {response}")
    client.close()    if __name__ ==
    "__main__":        main()
```

SSL:



The screenshot shows a code editor with a file explorer on the left and a code editor on the right. The file explorer shows a directory structure with files: certificate.crt, client.py, private.key, and server.py. The code editor displays the contents of certificate.crt, which is a PEM-formatted X.509 certificate. The certificate is issued to CN and is valid for 10 years. The private key is not included in the certificate file.

```
1 -----BEGIN CERTIFICATE-----
2 MIIDVTCCAqWgAwIBAgIUaY9BfXrVvSw53R43mx0qTEj5v3QwDQYJKoZIhvcNAQEF
3 BQAwbTELMAkGA1UEBhMCU4xCzAJBgNVBAMtBMQwwCgYDVQQHDANCTFixDDAK
4 BgNVBAoMA1BFUzENMAsGA1UECwwEUeUETVTEQMA4GA1UEAwHT3B1bnNzBDEUMBIG
5 CSqGS1b3DQEJARYFUEVTRUMwIBcNMjQwMzA2MTMzMzI1whgPMjEyNDAYMTExMzMz
6 MjVaMG0xCzAJBgNVBAYTAk1OMQswCQYDVQQLIDAJLQTEEMMAoGA1UEBwwDQkxSMQww
7 CgYDVQQKDANQRVMxDTALBgNVBASMBFBFUF1UxEDA0BgNVBAMMB09wZW5zc2wxFDAS
8 BgkqhkiG9w0BCQEWBVBVU0VDMIIIBiJANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKc
9 AQEAp/4LNP5oFYDt5xLZb1bMrOmSbr2G0ftb+9w5nZtae7xvG718ihcbTrfuxiiJ
10 ACRI1G+bfDMSOWSHhSlbuUifPGWwpLgNY+G9N50ZTwATL8W6/dcLLEN7bpXNxyia
11 1ZGcNEr9sAO4fofbVHaK1n1DvJb/Ta4bwzUJ0Pf+7tU/HIEI7gdjv4IOB1oSXmbT
12 paa7dsiAxGmfY1L8Vs6ZXBfeqYW/vwDgR4naRmS+ovyEP5sZEkanWLWznEkC6Cqi
13 TonJcbeja3TQgm094+3eVq4VT6X3n2arJ5uBzyQAe6GIYBdVsxzdwteepNrmBPnd
14 7TYyU5lfjTTCUuagpmVMr1iqRQIDAQABO1MwUTAdBgNVHQ4EFgQUijz9fQJEFn+K
15 CBULyqCxd+kVw8owHwYDVR0jBBgwFoAUijz9fQJEFn+KCBULyqCxd+kVw8owDwYD
16 VR0TAQH/BAUwAwEB/zANBgkqhkiG9w0BAQUFAAOCAQEALzEgeXHBZyYf6rntRhogt
17 PdQ37VmLb8hhczyxHhD0943/kQGoARGSVgz73gISILLQvA52+ZUCf8N3Tmh61+W
18 X4q1JJpVot5kHdFfNuhYge/p11KRAFuea3E0dN0aXV6vSXJewureOCfibYUvpN3u
19 11Y5mLmqkdPKGSASw1o188S+1+RCh1Qu9Dm+p34gJtiilVFvjYiGi0dnlkve/zyx
20 CIz6x+8LA0Tan5E8BuGFEpst7hKQl8rInzWM2G98JG11PAKYTNJWS2sbCQ8Ssqok
21 hIy0nIa5RrcgbGC+JaC8QSeX4QTWtmqGMPxovavZLf0LKOfoH7fPVBvCBKkKJM79
22 Aw==
23 -----END CERTIFICATE-----
24
```

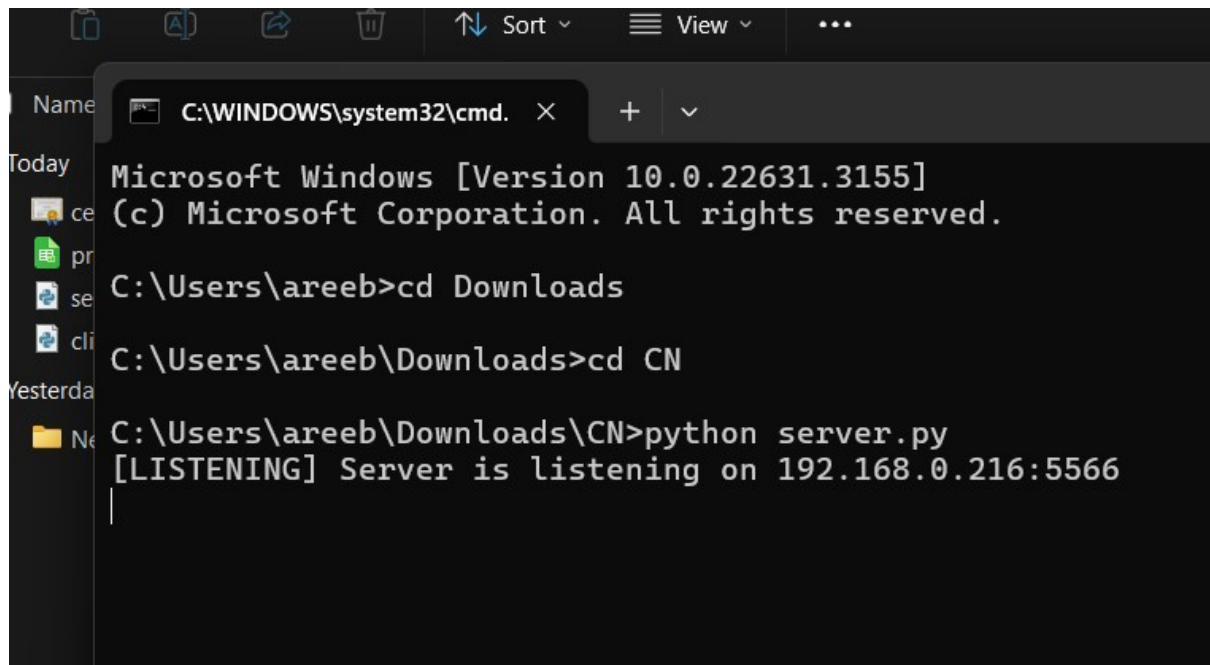


The screenshot shows a code editor with a file explorer on the left and a code editor on the right. The file explorer shows a directory structure with files: certificate.crt, client.py, private.key, and server.py. The code editor displays the contents of private.key, which is a PEM-formatted RSA private key. The key is 2048 bits long and is valid for 10 years. The certificate is not included in the private key file.

```
1 -----BEGIN PRIVATE KEY-----
2 MIIEvQIBADANBgkqhkiG9w0BAQEFAASCBKcwggSjAgEAAoIBAQCn/gs0/mgXIO3n
3 EtlvVs6ZJuvYY5+1v73Dmdm1p7vFubvXyKFxtOt+7GKIkaJEjUb5t90xI7BIeF
4 KVu5SIU8ZbCkuA1j4b03nRlPABMvxb91wssQ3tulc1fkJrVkJw0Sv2wA7h859tU
5 dorWfU08lv9NrhvDNQn9/7u1T8cgjuB20/gg4GKhJeZt0lprt2yIDEaZ9juvXw
6 zplcF96phb+/AOBHidpGZL6i/IQ/mxkQpQdyvBmcSQLoKJOG2Mj2t6NrDNAabT3j
7 7d5WrhVPpfeZpGPm4HPJAB7oYhgF1WzHN3C0R6k2uYE+d3tPjHtmV+NNNRRRQcm
8 ZUyvwKpFAGMBAAECggEAHJgmH9zdrmp996V+/nVChoMa2t5Md50ZGZty+AIW0xdl
9 URdfnse2b53j+zu1sB99gyaJze/fP8tSo/rZ0l+lyBXsK0+B4Cr0w/5s68wWfqb1
10 Ywl1rpDC+J5rPLO2QX0sor70GwVYyXpVJbmVhFYJ7ZesWva1XSneJxv3QzUVS7g
11 sPAs+rdtdcn590J0+Q9bp17ZTrykAy7AZx9okhfGuDqE+/PGDrNkAvw9KJB5mL+3
12 X6G4xEy+07R0N2SujSbYwPlYeywLGRtQYDDWc1w/ou9SdhIOxs7oFd1Nvg1BU1xW
13 uxQGN+AYGqDX3b0kJDnBUH1Ry8cwaioKnU6T5h0UwQKBgQDbgSQWgXPE8unaJcwD
14 ZP/CGz92bRdv0Fw1lGLKROEE4MAMdC3b2VN3xGP2Pk4TJWCSKUXo5ynqU0xnuNmS
15 294vzMnFoiNRdEthhdtYL6dVKHqdyIXIXw1B1wDbf+H4xZHgK5Mo/uGnQ0HIHSRE
16 T8H3paiuB8YS6nKZUV+WA9U2dQKBgQDD7F1xV72TFAs1UzrMr1AIpH/fD4oZXwH7
17 LSygpXbwewrRLHqOXVcmvNF/ce1GGwwdQHoCG6UTdN6RyFA2eXj+qTrHCCHPEFoI
18 e684YMMi121MLi4Z2pKBMk6avxEfUDMk7X5vaqoR5wV1bgwksBiFBBev0kNRdRiY
19 Tef6JZtKkQKBGHygo4w001JIIJaLCnY0pwQ3quEqToFP854pqncf/IPQV6FyheX
20 oNnkjG3W+Ca+P3YajdbjMYIe0ioh7mhrVNMRRhyje02FccolEuJH14vK1Gbnwz2ot
21 05tnJl3L7B19SnXJiRI+BhwTMQHwBu6jTLjnOUJmbK+DH1nxAYLYCIXFAoGBAKZ9
22 EqiRQCRZFQk0d9P16hHeD9dycg0LQji6c6Dz2p96IYAMvxvxbxy4+WH0Yy3e0BWP
23 c96UtVtqRbQmP5t68AmfrxxyQaJ+p7Nrv0MuZEofvH4va/fuV+633Dn9wUQVt9Ba
24 jMWLI4hfoiFk2CT5C20FREehapku4z6RfV6BVwXoAoGATMEbbhIgh6SvpdVRL0jT
25 Ozkg1Yc00zEsLLYwnLhy9BU2ZY1eFKDp+NYwySp0oGEIufz3LW84ZK2A+CEAKFFA
26 mc2K7ViSVpcJdSP5sq/X/NZckmPR3Up7FW3hXL0FekJyKH7VdYcSp12kg+sNP7sL
27 xVwRy8xoNmmfObSvGLhvOt4=
28 -----END PRIVATE KEY-----
29
```

>>Procedure:

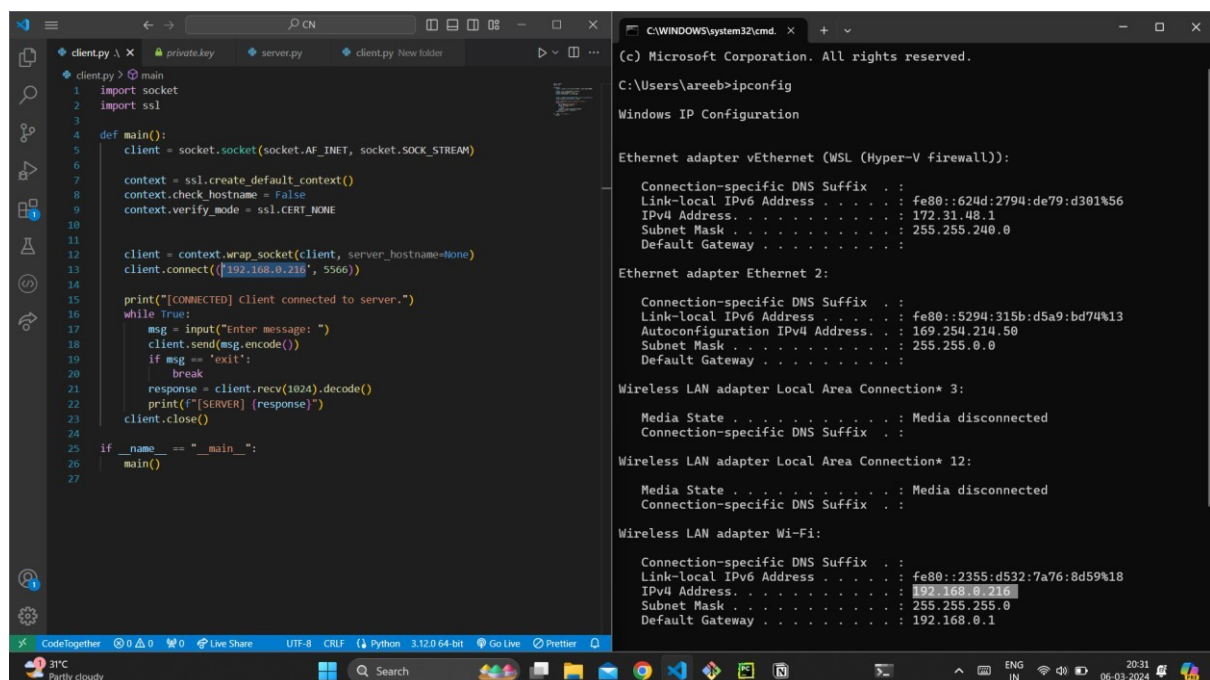
- 1) Run the server.py file on the server system using the command: `python server.py`



```
C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads
C:\Users\areeb\Downloads>cd CN
C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
```

- 2) Make sure the IP Address and Port Number matches the server (use command: `ipconfig`) and run the client.py file on the client system using the command : `python client.py`



```
client.py x private key server.py client.py New folder
client.py > main
1 import socket
2 import ssl
3
4 def main():
5     client = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
6
7     context = ssl.create_default_context()
8     context.check_hostname = False
9     context.verify_mode = ssl.CERT_NONE
10
11     client = context.wrap_socket(client, server_hostname=None)
12     client.connect(('192.168.0.216', 5566))
13
14     print("[CONNECTED] Client connected to server.")
15     while True:
16         msg = input("Enter message: ")
17         client.send(msg.encode())
18         if msg == 'exit':
19             break
20         response = client.recv(1024).decode()
21         print(f"[SERVER] {response}")
22     client.close()
23
24 if __name__ == "__main__":
25     main()
26
27
C:\WINDOWS\system32\cmd. x + v
(c) Microsoft Corporation. All rights reserved.
C:\Users\areeb>ipconfig
Windows IP Configuration

Ethernet adapter vEthernet (WSL (Hyper-V firewall)):

    Connection-specific DNS Suffix . : 
    Link-local IPv6 Address . . . . . : fe80::624d:2794:de79:d301%56
    IPv4 Address. . . . . : 172.31.48.1
    Subnet Mask . . . . . : 255.255.240.0
    Default Gateway . . . . . : 

Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix . : 
    Link-local IPv6 Address . . . . . : fe80::5294:315b:d5a9:bd74%13
    Autoconfiguration IPv4 Address. . : 169.254.214.50
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . : 

Wireless LAN adapter Local Area Connection* 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . : 

Wireless LAN adapter Local Area Connection* 12:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . : 

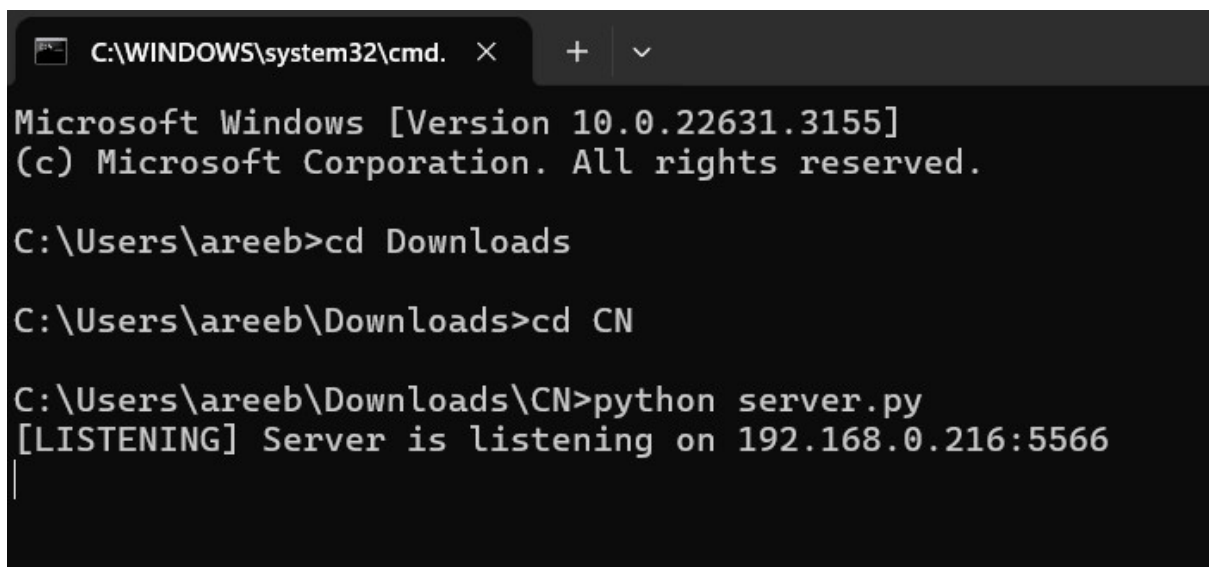
Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . : 
    Link-local IPv6 Address . . . . . : fe80::2355:d532:7a76:8d59%18
    IPv4 Address. . . . . : 192.168.0.216
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.1
```

- 3) Now that the connection is established, type any input text from the server side and the message will reach the client system via the connections established using sockets.
- 4) Similarly other multiple clients can also connect to the server using the same connection at once. This is achieved using multithreading.

>>Output Screenshots:

- Server Initiated:



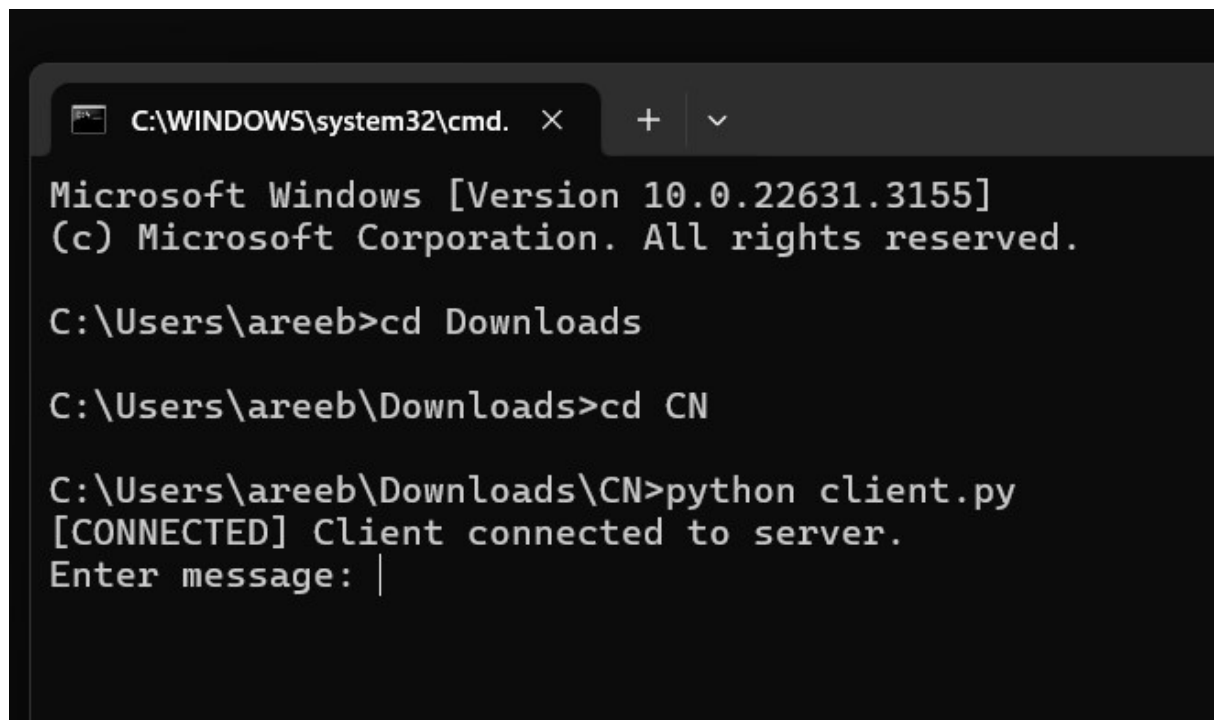
```
C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads

C:\Users\areeb\Downloads>cd CN

C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
|
```


-Client Connection with Server



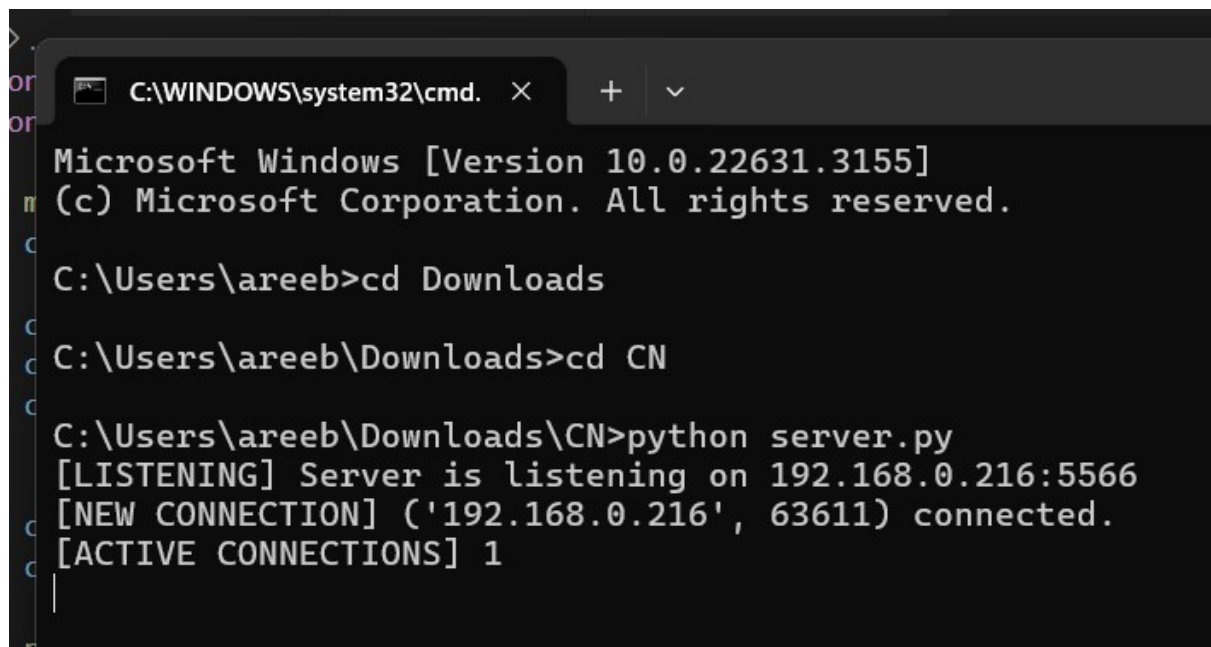
```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads

C:\Users\areeb\Downloads>cd CN

C:\Users\areeb\Downloads\CN>python client.py
[CONNECTED] Client connected to server.
Enter message: |
```

-Server Confirms Client Connection:



```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads

C:\Users\areeb\Downloads>cd CN

C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
[NEW CONNECTION] ('192.168.0.216', 63611) connected.
[ACTIVE CONNECTIONS] 1
|
```

-Client Sending Messages to Server

```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads
C:\Users\areeb\Downloads>cd CN
C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
[NEW CONNECTION] ('192.168.0.216', 63611) connected.
[ACTIVE CONNECTIONS] 1
[('192.168.0.216', 63611)] Hello from client
|

C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads
C:\Users\areeb\Downloads>cd CN
C:\Users\areeb\Downloads\CN>python client.py
[CONNECTED] Client connected to server.
Enter message: Hello from client
[SERVER] Message received by server.
Enter message: This is second message getting delivered!
[SERVER] Message received by server.
Enter message:

C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads
C:\Users\areeb\Downloads>cd CN
C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
[NEW CONNECTION] ('192.168.0.216', 63611) connected.
[ACTIVE CONNECTIONS] 1
[('192.168.0.216', 63611)] Hello from client
[('192.168.0.216', 63611)] This is second message getting delivered!
```


-Connecting Multiple Clients to the Server:

```
C:\WINDOWS\system32\cmd. x + v  
C:\Users\areeb\Downloads\CN>python client.py  
[CONNECTED] Client connected to server.  
Enter message:
```

```
C:\WINDOWS\system32\cmd. x + v  
Microsoft Windows [Version 10.0.22631.3155]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\Users\areeb>cd Downloads  
  
C:\Users\areeb\Downloads>cd CN  
  
C:\Users\areeb\Downloads\CN>python server.py  
[LISTENING] Server is listening on 192.168.0.216:5566  
[NEW CONNECTION] ('192.168.0.216', 63611) connected.  
[ACTIVE CONNECTIONS] 1  
[('192.168.0.216', 63611)] Hello from client  
[('192.168.0.216', 63611)] This is second message getting delivered!  
[NEW CONNECTION] ('192.168.0.216', 63641) connected.  
[ACTIVE CONNECTIONS] 2  
|
```

```
C:\WINDOWS\system32\cmd. x + v  
Microsoft Windows [Version 10.0.22631.3155]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\Users\areeb>cd Downloads  
  
C:\Users\areeb\Downloads>cd CN  
  
C:\Users\areeb\Downloads\CN>python server.py  
[LISTENING] Server is listening on 192.168.0.216:5566  
[NEW CONNECTION] ('192.168.0.216', 63611) connected.  
[ACTIVE CONNECTIONS] 1  
[('192.168.0.216', 63611)] Hello from client  
[('192.168.0.216', 63611)] This is second message getting delivered!  
[NEW CONNECTION] ('192.168.0.216', 63641) connected.  
[ACTIVE CONNECTIONS] 2  
[('192.168.0.216', 63641)] Hello from client 2  
|
```

```
C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads

C:\Users\areeb\Downloads>cd CN

C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
[NEW CONNECTION] ('192.168.0.216', 63611) connected.
[ACTIVE CONNECTIONS] 1
[('192.168.0.216', 63611)] Hello from client
[('192.168.0.216', 63611)] This is second message getting delivered!
[NEW CONNECTION] ('192.168.0.216', 63641) connected.
[ACTIVE CONNECTIONS] 2
[('192.168.0.216', 63641)] Hello from client 2
[('192.168.0.216', 63611)] While I am (ie Client 1) is still active
```

```
[NEW CONNECTION] ('192.168.0.216', 63652) connected.
[ACTIVE CONNECTIONS] 3
```

```
C:\Users\areeb>cd Downloads

C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\areeb>cd Downloads

C:\Users\areeb\Downloads>cd CN

C:\Users\areeb\Downloads\CN>python server.py
[LISTENING] Server is listening on 192.168.0.216:5566
[NEW CONNECTION] ('192.168.0.216', 63611) connected.
[ACTIVE CONNECTIONS] 1
[('192.168.0.216', 63611)] Hello from client
[('192.168.0.216', 63611)] This is second message getting delivered!
[NEW CONNECTION] ('192.168.0.216', 63641) connected.
[ACTIVE CONNECTIONS] 2
[('192.168.0.216', 63641)] Hello from client 2
[('192.168.0.216', 63611)] While I am (ie Client 1) is still active
[NEW CONNECTION] ('192.168.0.216', 63652) connected.
[ACTIVE CONNECTIONS] 3
[('192.168.0.216', 63652)] Oh did I miss anything (I am CLIENT 3 :)
```

Thankyou! Don't forget to let me know how you have found this!