

Socket Programming: Web Server Lab by Abhinav Sivanandhan (as17904)

Content:

- Code (including solutions for optional exercises and comments for explaining code line by line)
- Screenshots
- ip config

Code and Report:

<https://github.com/AbhinavSivanandhan/SocketProgramming>

Server.py

```
#import socket module

from socket import *

import sys # In order to terminate the program

import threading # threading module for handling multiple clients


# Function to handle individual client requests
def handle_client(connectionSocket):

    try:

        message = connectionSocket.recv(1024).decode() # Receive and decode the client's
        request

        # Check if the message is empty or malformed

        if not message:

            raise ValueError("Empty request received")

        # Split the message and check if it has enough parts (e.g., method, path, version)

        message_parts = message.split()

        if len(message_parts) < 2:
```

```

        raise ValueError("Malformed HTTP request")

filename=message_parts[1] # Extract requested file name

# Open and read the requested file
f = open(filename[1:], 'r') # Skip the leading "/" in the filename
outputdata = f.read()
f.close()

# Send HTTP header
connectionSocket.send("HTTP/1.1 200 OK\r\n\r\n".encode())

#Send the content of the requested file to the client
for i in range(0, len(outputdata)):
    connectionSocket.send(outputdata[i].encode())

except (IOError, ValueError) as e:
    #print(e)
    # Handle file not found (IOError) or malformed request (ValueError)
    try: #send http response and content
        connectionSocket.send("HTTP/1.1 404 Not Found\r\n\r\n".encode())
        connectionSocket.send("<html><head></head><body><h1>404 Not Found</h1></body></html>".encode())

    except BrokenPipeError: #this error occurs when connection closes or moves on at client level before server has actually sent data
        print("Broken pipe when sending 404 response to client")

finally:

```

```

    # Ensure that the connection is closed even if there's an exception
    connectionSocket.close()

def webServer(port=6789):
    serverSocket = socket(AF_INET, SOCK_STREAM) # Prepare a server socket
    serverSocket.bind(('', port)) # Bind server to port
    serverSocket.listen(1) # maximum number of queued connections that the server will
allow so server will listen to 1 client at a time
    print(f"Server is ready to serve on port {port}...")

    while True:
        # Establish the connection
        connectionSocket, addr = serverSocket.accept() # Accept the connection from the
client
        # print(f"Connection established for {addr}")
        # Start a new thread to handle the client request. so new thread for every request
        threading.Thread(target=handle_client, args=(connectionSocket,)).start()

if __name__ == "__main__": #as we're running the func as main program
    webServer(6789)

```

Client.py

```

import sys
from socket import *

def http_client(server_host, server_port, filename):

```

try:

Create a TCP socket

clientSocket=socket(AF_INET, SOCK_STREAM)

Establish connection to the server

clientSocket.connect((server_host, int(server_port)))

Form the GET request to be sent to the server

request = f"GET /{filename} HTTP/1.1\r\nHost: {server_host}\r\n\r\n"

Send the request to the server

clientSocket.send(request.encode())

Receive the response from the server

response = ""

while True: # to keep receiving data as long as it is being sent

Receive data in chunks of 4096 bytes

data = clientSocket.recv(4096).decode()

if not data:

break

response += data

Print the full server response (headers and content)

print("Server response:")

print(response)

Close the client socket

clientSocket.close()

except Exception as e:

print(f"Error: {e}")

if __name__ == "__main__":

```

# Check if correct number of arguments is provided

if len(sys.argv) != 4:

    print("Correct command is :- python3 client.py server_host server_port filename")

else:

    # Extract command line arguments

    server_host = sys.argv[1]

    server_port = sys.argv[2]

    filename = sys.argv[3]

    # Call the client function

    http_client(server_host, server_port, filename)

```

Screenshots:

Server side:

```

○ abhinavsivanandhan@Abhinavs-MacBook-Pro ComputerNetworking % python3 server.py
Server is listening on port 6789...
Connection established for ('192.168.1.16', 54965)
Connection established for ('192.168.1.16', 54966)
Connection established for ('192.168.1.16', 54967)
Connection established for ('192.168.1.16', 54968)
Connection established for ('192.168.1.16', 54969)
Connection established for ('192.168.1.16', 54970)
Connection established for ('192.168.1.16', 54971)
Connection established for ('192.168.1.16', 54973)
Connection established for ('192.168.1.16', 54975)
Connection established for ('192.168.1.16', 54976)
Connection established for ('192.168.1.16', 54980)
Connection established for ('192.168.1.16', 54983)

```

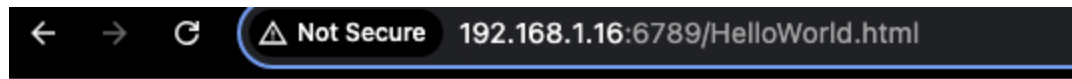
Client side:

```

● abhinavsivanandhan@Abhinavs-MacBook-Pro ComputerNetworking % python3 client.py 192.168.1.16 6789 HelloWorld.html
Server response:
HTTP/1.1 200 OK

<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Hello World</title>
</head>
<body>
  <h1>Hello World!</h1>
  <p>This is the HTML page</p>
</body>
</html>

```



Hello World!

This is the HTML page

My PC's ipconfig:

```
abhinavsivanandhan@Abhinavs-MacBook-Pro ~ % ipconfig getifaddr en0
```

```
192.168.1.16
```

```
abhinavsivanandhan@Abhinavs-MacBook-Pro ~ %
```

```
abhinavsivanandhan@Abhinavs-MacBook-Pro ~ % ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
    options=1203<RXCSUM, TXCSUM, TXSTATUS, SW_TIMESTAMP>
    inet 127.0.0.1 netmask 0xff000000
    inet6 ::1 prefixlen 128
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
    nd6 options=201<PERFORMNUD,DAD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:04
    media: none
    status: inactive
anpi2: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:05
    media: none
    status: inactive
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:03
    media: none
    status: inactive
en4: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:e3
    nd6 options=201<PERFORMNUD,DAD>
    media: none
    status: inactive
en5: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:e4
    nd6 options=201<PERFORMNUD,DAD>
    media: none
    status: inactive
en6: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether ca:a5:a0:70:c9:e5
    nd6 options=201<PERFORMNUD,DAD>
    media: none
    status: inactive
en1: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    options=460<TSO4,TSO6,CHANNEL_IO>
    ether 36:fa:a4:d2:b4:80
    media: autoselect <full-duplex>
    status: inactive
en2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    options=460<TSO4,TSO6,CHANNEL_IO>
    ether 36:fa:a4:d2:b4:84
    media: autoselect <full-duplex>
    status: inactive
en3: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    options=460<TSO4,TSO6,CHANNEL_IO>
    ether 36:fa:a4:d2:b4:88
    media: autoselect <full-duplex>
    status: inactive
bridge0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=63<RXCSUM, TXCSUM, TSO4, TSO6>
    ether 36:fa:a4:d2:b4:80
    Configuration:
        id 0:0:0:0:0:0 priority 0 hellotime 0 fwddelay 0
        maxage 0 holdcnt 0 proto stp maxaddr 100 timeout 1200
        root id 0:0:0:0:0:0 priority 0 ifcost 0 port 0
        ipfilter disabled flags 0x0
    member: en1 flags=3<LEARNING,DISCOVER>
        ifmaxaddr 0 port 10 priority 0 path cost 0
    member: en2 flags=3<LEARNING,DISCOVER>
        ifmaxaddr 0 port 11 priority 0 path cost 0
    member: en3 flags=3<LEARNING,DISCOVER>
        ifmaxaddr 0 port 12 priority 0 path cost 0
    nd6 options=201<PERFORMNUD,DAD>
```

```
ap1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
    ether 32:30:3b:b9:46:fe
    nd6 options=201<PERFORMNUD,DAD>
    media: autoselect (none)
    status: inactive
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
    ether ae:0d:5c:94:f1:bb
    inet6 fe80::45f:7e83:89c2:c343%en0 prefixlen 64 secured scopeid 0xe
    inet6 fd92:57be:ac98:c9f5:401:75f:f3e:ff43 prefixlen 64 autoconf secured
    inet6 2600:4808:5692:9600:490:3868:eb7b:7608 prefixlen 64 autoconf secur
    inet6 2600:4808:5692:9600:90a2:428f:4d0c:87d4 prefixlen 64 autoconf temp
    inet6 2600:4808:5692:9600::e606 prefixlen 64 dynamic
    inet 192.168.1.16 netmask 0xfffff00 broadcast 192.168.1.255
    nd6 options=201<PERFORMNUD,DAD>
    media: autoselect
    status: active
utun0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::1f11:6032:9ed5:83d9%utun0 prefixlen 64 scopeid 0x10
    nd6 options=201<PERFORMNUD,DAD>
awdl0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
    ether 82:c3:84:4d:5c:a8
    inet6 fe80::80c3:84ff:fe4d:5ca8%awdl0 prefixlen 64 scopeid 0x11
    nd6 options=201<PERFORMNUD,DAD>
    media: autoselect
    status: active
llw0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    options=400<CHANNEL_IO>
    ether 82:c3:84:4d:5c:a8
    inet6 fe80::80c3:84ff:fe4d:5ca8%llw0 prefixlen 64 scopeid 0x12
    nd6 options=201<PERFORMNUD,DAD>
    media: autoselect (none)
utun1: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
    inet6 fe80::e725:1053:7c6a:1ef8%utun1 prefixlen 64 scopeid 0x13
    nd6 options=201<PERFORMNUD,DAD>
utun2: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 2000
    inet6 fe80::4b60:7646:d865:a6c7%utun2 prefixlen 64 scopeid 0x14
    nd6 options=201<PERFORMNUD,DAD>
utun3: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1000
    inet6 fe80::ce81:b1c:bd2c:69e%utun3 prefixlen 64 scopeid 0x15
    nd6 options=201<PERFORMNUD,DAD>
abhinavsivanandhan@Abhinavs-MacBook-Pro ~ %
```