Faculty of Engineering &Technology

Electrical & Computer Engineering Department

ENCS3320 - Computer Networks

Project #1 Report

Socket Programming

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Instructor

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Section: 2

Date: 25/5/2023

Contents:

Table of Figures:

Part 1:

1.1: Definitions

Ping

Is a tool used to determine a host's reachability on an Internet Protocol (IP) network and estimate the round-trip time for messages delivered from the originating host to a destination computer.

Tracert

A tool for determining the path packets traverse via an IP network from the host machine to the destination device.

Name Server Lookup (Nslookup)

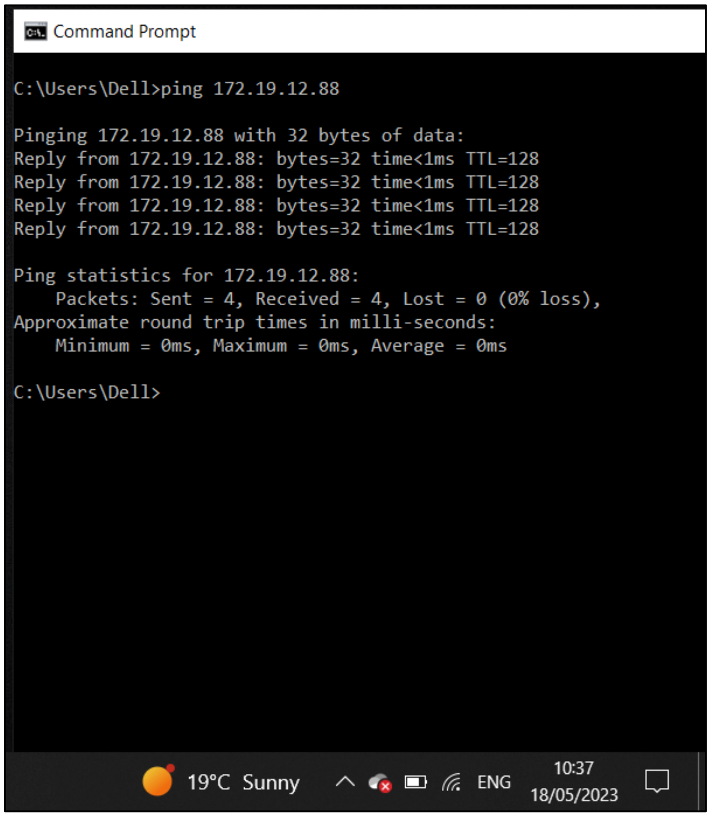
Is a command-line utility that queries the Domain Name System (DNS) to acquire domain name or IP address mapping information, as well as any other specified DNS record.

Telnet

A network protocol that allows a computer to be accessed remotely and provides a two-way, collaborative, text-based communication channel between two machines.

1.2: Running commands

Pinging a device in the same network

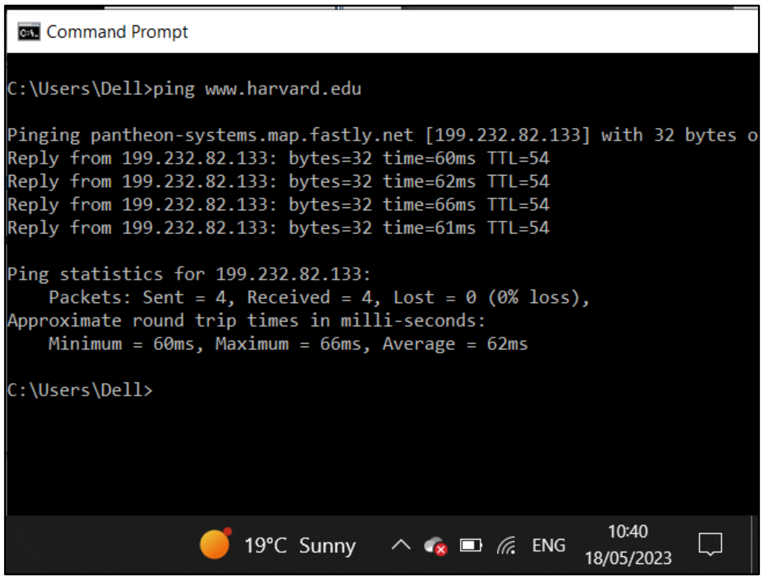


```
C:\Users\Dell>ping 172.19.12.88

Pinging 172.19.12.88 with 32 bytes of data:
Reply from 172.19.12.88: bytes=32 time<1ms TTL=128
Reply from 172.19.12.88: bytes=32 time<1ms TTL=128
Reply from 172.19.12.88: bytes=32 time<1ms TTL=128
Reply from 172.19.12.88: bytes=32 time<1ms TTL=128

Ping statistics for 172.19.12.88:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\Dell>
```

Figure 1 - Ping a device in the same network

In the above figure, we pinged a device on the same network, which resulted in 0% loss in the packets we sent, and all four packets were successfully received by the other device. Because the other device is on the same network, we obtained a min, max, and average time of 0ms.

Pinging www.harvard.edu



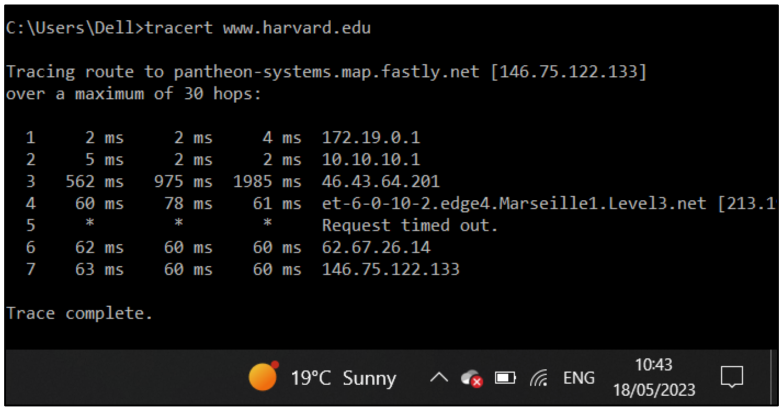
Command Prompt

```
C:\Users\Dell>ping www.harvard.edu

Pinging pantheon-systems.map.fastly.net [199.232.82.133] with 32 bytes o
Reply from 199.232.82.133: bytes=32 time=60ms TTL=54
Reply from 199.232.82.133: bytes=32 time=62ms TTL=54
Reply from 199.232.82.133: bytes=32 time=66ms TTL=54
Reply from 199.232.82.133: bytes=32 time=61ms TTL=54

Ping statistics for 199.232.82.133:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 60ms, Maximum = 66ms, Average = 62ms

C:\Users\Dell>
```

Figure 2 - ping www.harvard.edu

From figure 2 we can see that we have 0% loss in the packets (4 packets) we sent which means that each packet we sent reached www.harvard.edu successfully and returned and that means that the connection of this network is a good use.

Tracert www.harvard.edu

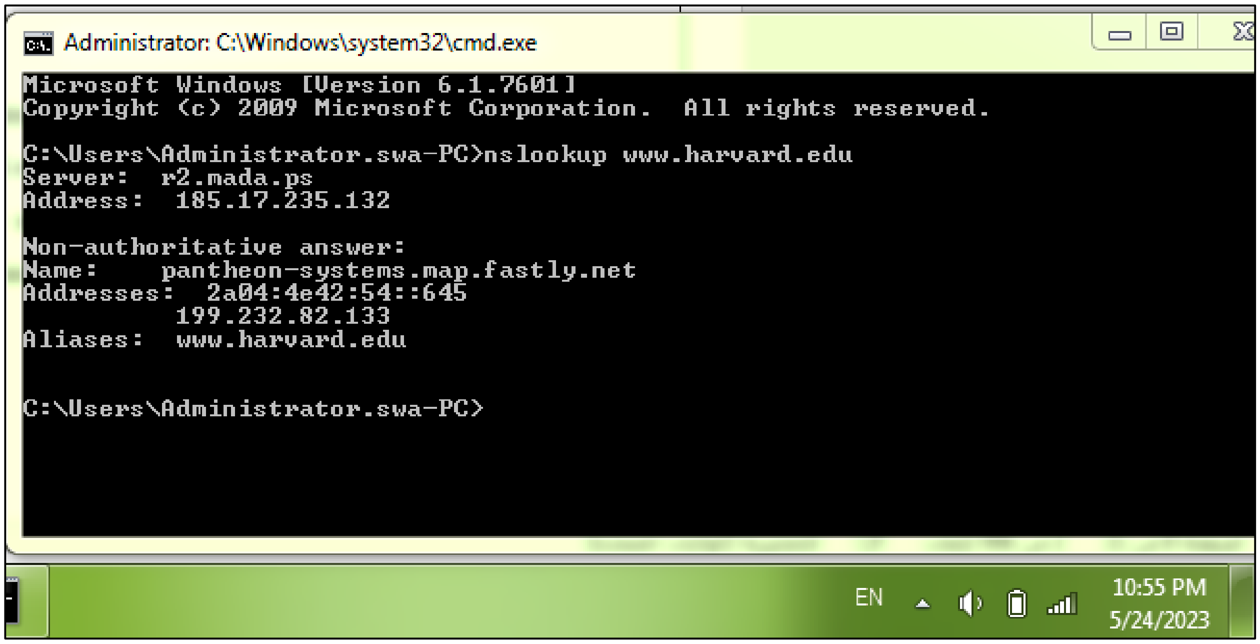


```
C:\Users\Dell>tracert www.harvard.edu

Tracing route to pantheon-systems.map.fastly.net [146.75.122.133]
over a maximum of 30 hops:

  1     2 ms     2 ms     4 ms  172.19.0.1
  2     5 ms     2 ms     2 ms  10.10.10.1
  3   562 ms   975 ms  1985 ms  46.43.64.201
  4    60 ms    78 ms    61 ms  et-6-0-10-2.edge4.Marseille1.Level3.net [213.1
  5     *        *        *     Request timed out.
  6    62 ms    60 ms    60 ms  62.67.26.14
  7    63 ms    60 ms    60 ms  146.75.122.133

Trace complete.
```

Figure 3 - tracert www.harvard.edu

The output shows the path packets took to reach the selected destination, including the IP addresses of the intermediary hops. Each line of output represents a hop along the path and includes the hop number, response time for each of the six packets delivered, and the device's IP address. The traceroute was successful in reaching the target device on the first to sixth hop. The fifth hop, on the other hand, did not answer within the set time limit and is reported as a "Request timed out"

Nslookup www.harvard.edu



```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\Administrator.swa-PC>nslookup www.harvard.edu
Server:  r2.mada.ps
Address:  185.17.235.132

Non-authoritative answer:
Name:    pantheon-systems.map.fastly.net
Addresses:  2a04:4e42:54::645
          199.232.82.133
Aliases:  www.harvard.edu


C:\Users\Administrator.swa-PC>
```

Figure 4 - Nslookup www.harvard.edu

The DNS server returned the name "pantheon-systems.map.fastly.net" along with a list of IP addresses and aliases for the domain "www.harvard.edu." These IP addresses and aliases can be used to connect to the domain's website or other resources. The "Non-authoritative answer" message indicates that the DNS server being used is not the authoritative source of information for the domain "www.harvard.edu."

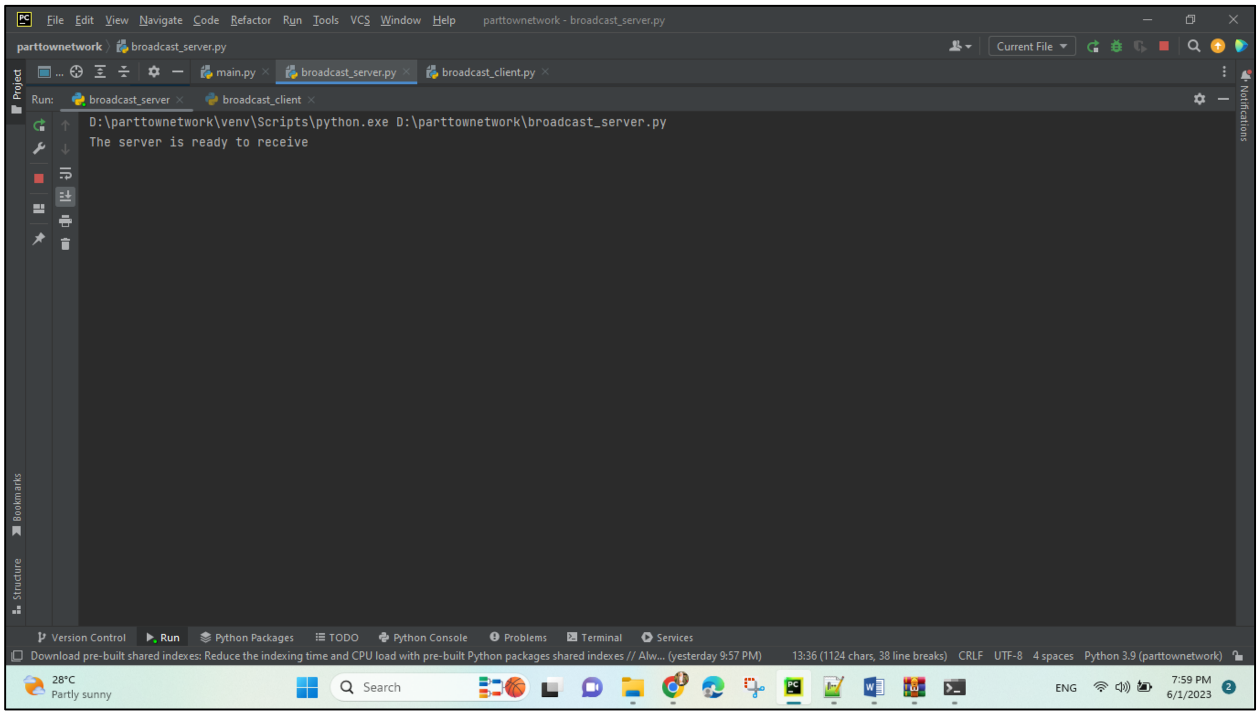
Part 2:

The objective of this part of the project was to develop a UDP client and server application using socket programming in Python, with the aim of facilitating communication between clients and a central server. Additionally, the Python codes for the server and clients used in the experiment can be found in Appendix 1.

The server is designed to listen on port 8855 and receive broadcast messages from two clients every 2 seconds. Each message sent by a client includes the student's name. The server maintains a record of the last received message from each client, using the client's IP address to distinguish between different senders. Once three clients have sent messages, the server displays the last received messages from each client, including the sender's first and last name, as well as the timestamp of the message.

UDP Server & Client:

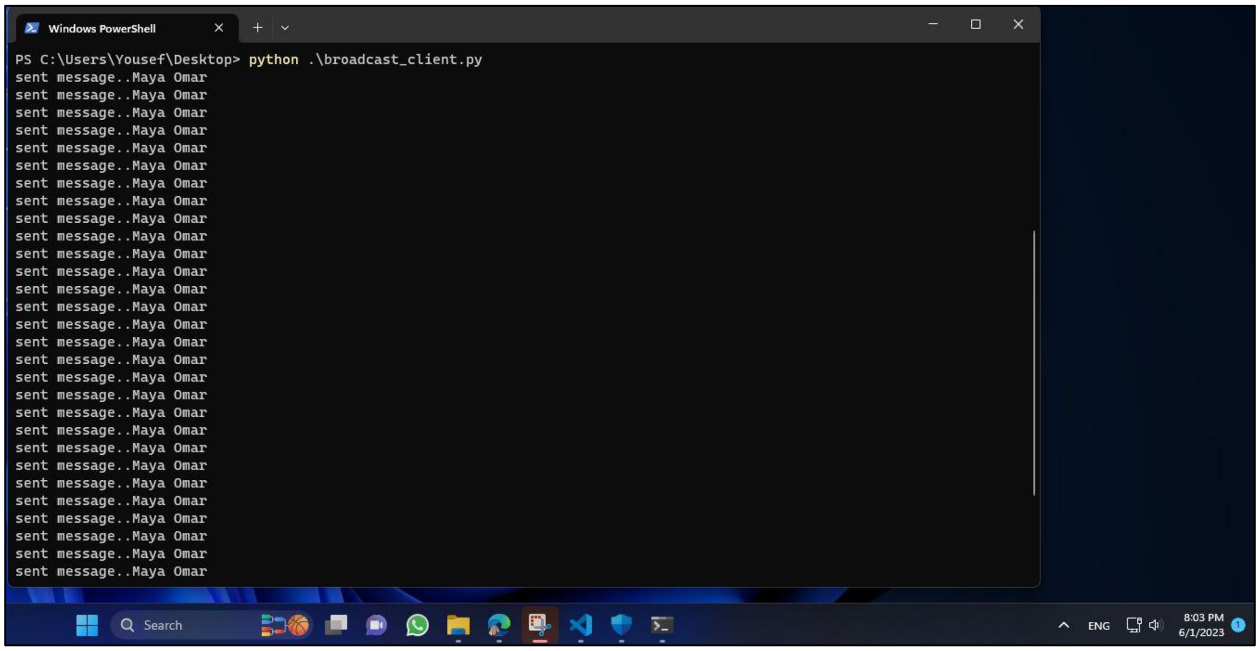
Firstly, the server application was executed to be ready for receiving messages from the other two clients, as shown in Figure 5.


File Edit View Navigate Code Refactor Run Tools VCS Window Help
parttownetwork - broadcast_server.py
main.py
broadcast_server.py
broadcast_client.py
Run:
broadcast_server
broadcast_client

```
D:\parttownetwork\venv\Scripts\python.exe D:\parttownetwork\broadcast_server.py
The server is ready to receive
```

Figure 5:the server application was executed to be ready for receiving messages.

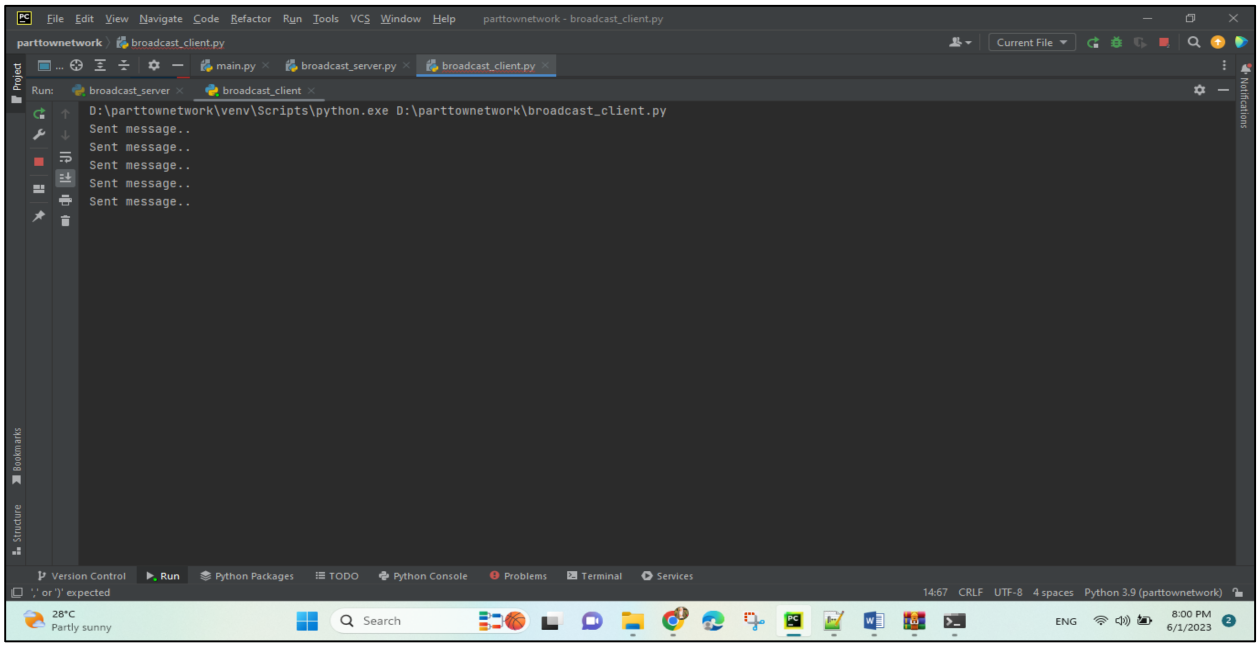
Then, the first client, named 'Maya Omar,' was launched on a different device within the same subnet as the server, as illustrated in Figure 6.



```
PS C:\Users\Yousef\Desktop> python .\broadcast_client.py
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
sent message..Maya Omar
```

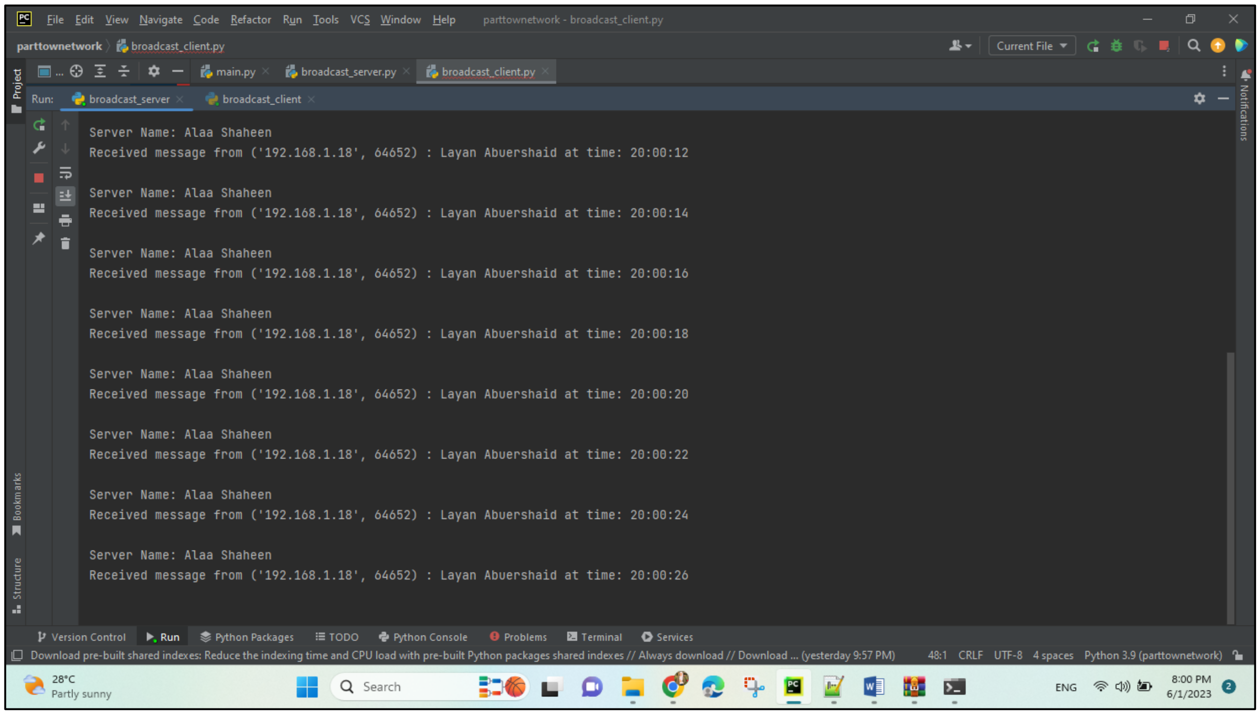
Figure 6: Run the first client.

The client sent a message containing its name to the server. Subsequently, the second client, named 'Layan Aburashid ' was initiated, and it also sent a message with its name, as depicted in Figure 7.



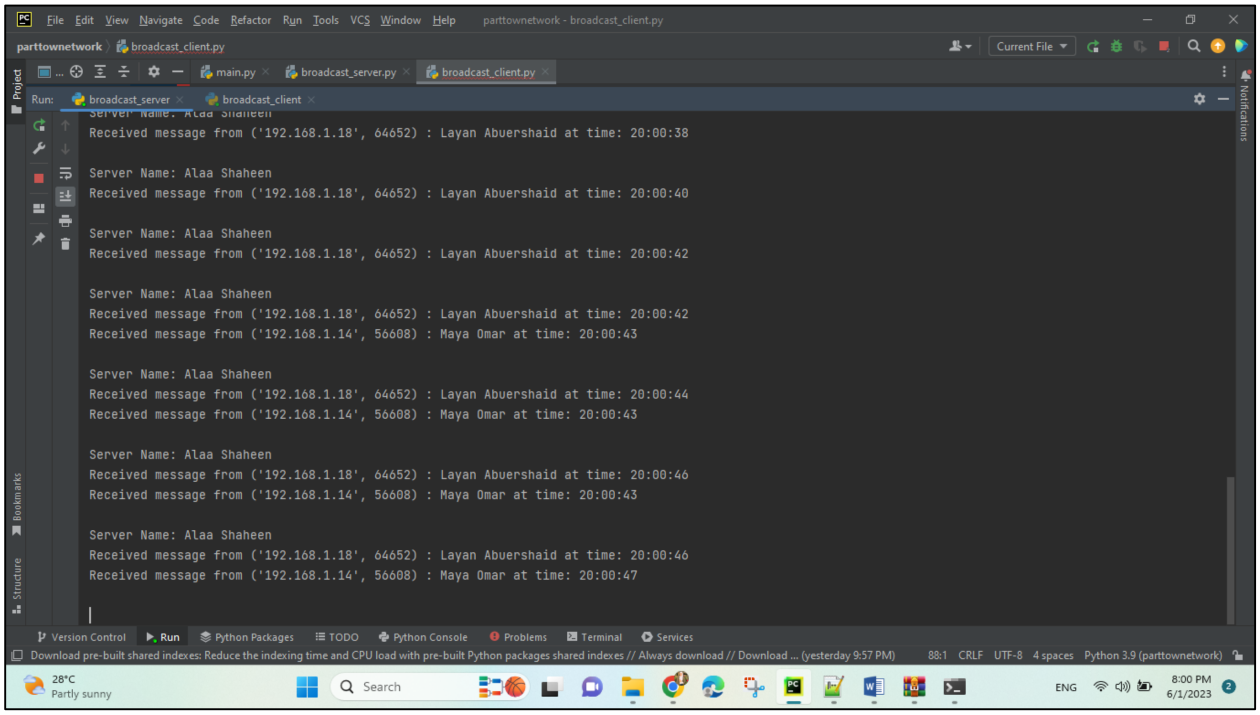
```
D:\parttownetwork\venv\Scripts\python.exe D:\parttownetwork\broadcast_client.py
Sent message..
Sent message..
Sent message..
Sent message..
Sent message..
```

Figure 7: Run the second client.



```
Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:12

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:14

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:16

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:18

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:20

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:22

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:24

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:26
```

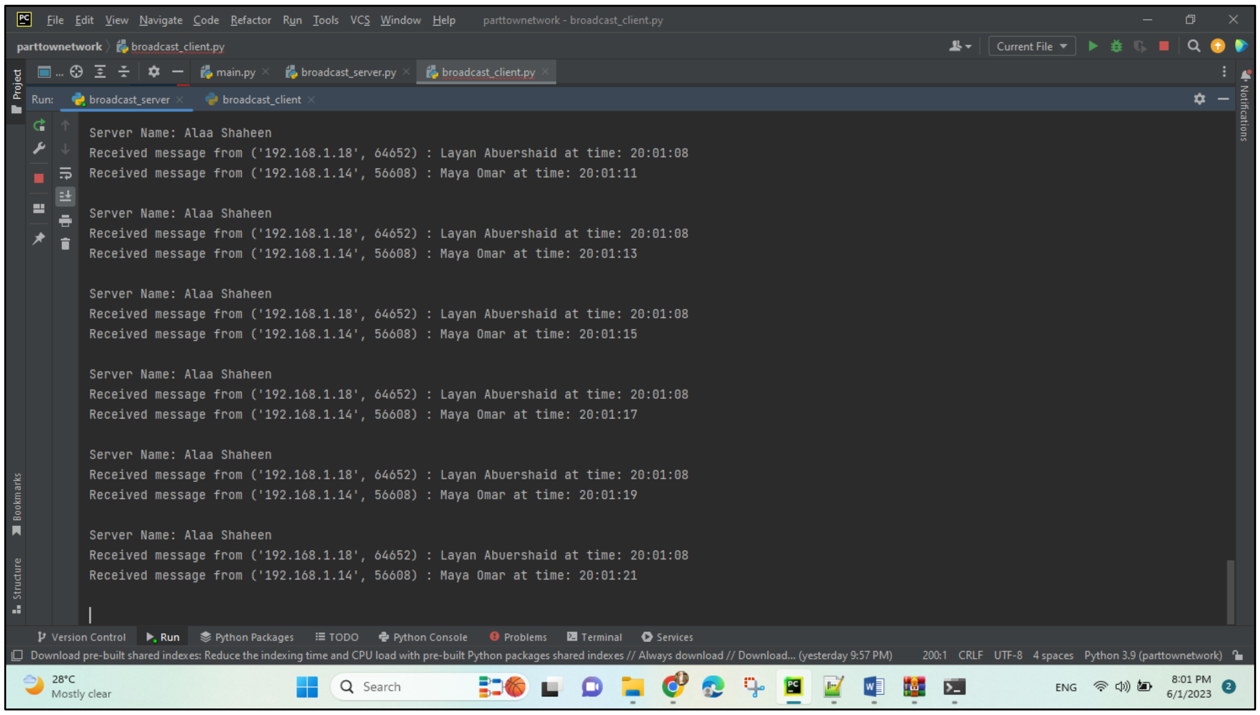
Figure 8: the server receiving messages from Layan client.



```
Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:38

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:40

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:42

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:42
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:00:43

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:44
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:00:43

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:46
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:00:43

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:00:46
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:00:47
```

Figure 9: the server receiving messages from Layan client and Maya client.

To verify the functionality of the server, it was observed whether it listed the last received message from each client. As an experiment, the first client was paused, and the server successfully displayed the last message received from 'Maya Omar,' along with the corresponding timestamp as shown in Figure 10 below.



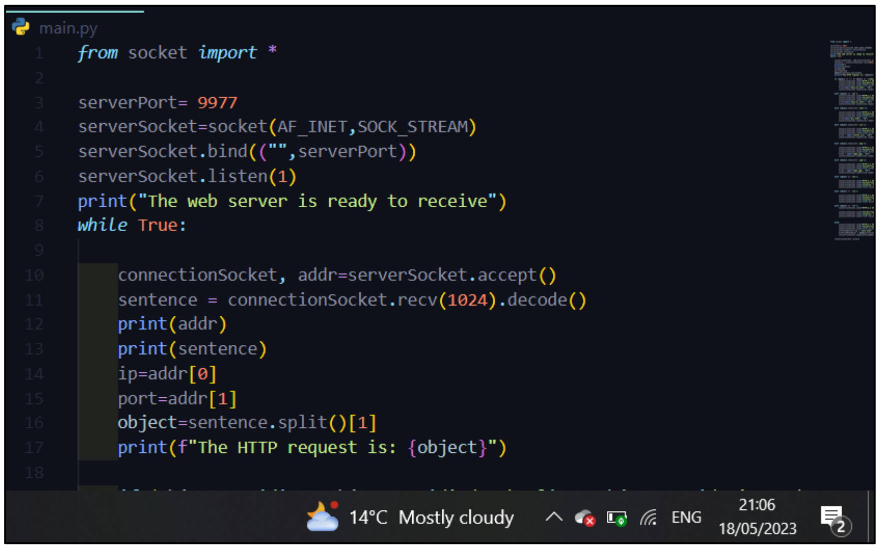
```
Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:11

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:13

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:15

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:17

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:19

Server Name: Alaa Shaheen
Received message from ('192.168.1.18', 64652) : Layan Abuershaid at time: 20:01:08
Received message from ('192.168.1.14', 56608) : Maya Omar at time: 20:01:21
```

Download pre-built shared indexes: Reduce the indexing time and CPU load with pre-built Python packages shared indexes // Always download // Download... (yesterday 9:57 PM)

Figure 10: Server receiving messages from Maya and Layan client after pause the run.

Part3

Begin by opening a Server Socket on a given Port number and waiting for a TCP connection from a single client. If a client requests a connection to the server, a connection socket is created, and after receiving the client's address, we will receive a Client Request. We obtained the object that the client requested by dividing the client request; however, the server response varies.



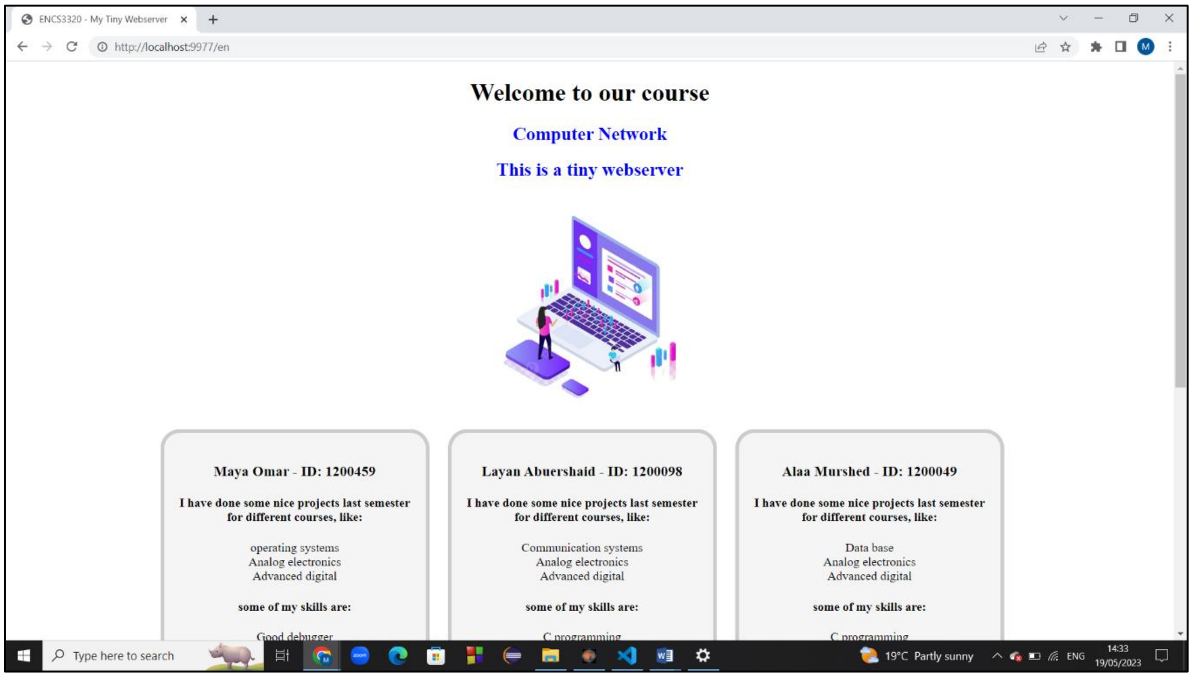
```
main.py
from socket import *

serverPort= 9977
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind(("",serverPort))
serverSocket.listen(1)
print("The web server is ready to receive")
while True:

    connectionSocket, addr=serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()
    print(addr)
    print(sentence)
    ip=addr[0]
    port=addr[1]
    object=sentence.split()[1]
    print(f"The HTTP request is: {object}")

```

Figure 11 - creating socket code

The code starts by creating a Server Socket object on port 9977. On port 9977, this Server Socket is waiting for incoming client connections. By calling the accept method on the Server Socket, the server enters an infinite loop and waits for a client to connect. A Socket object representing the connection to the client is returned by the accept method after a client connects. A Buffered Reader object is used by the server to read the client's request from the input stream of the Socket. By checking for the "GET" request line and extracting the path from it, it parses the URL path from the request. The server verifies the client's URL path and delivers the relevant content.

English HTML request

The server sends the main_en.html page if the URL path starts with "/," "/index.html," "/main_en.html," or "/en." It does this by reading the contents of the file into a byte array and writing those contents to the output stream of the Socket.



ENCS3320 - My Tiny Webserver

http://localhost:9977/en

Welcome to our course

Computer Network

This is a tiny webserver

Maya Omar - ID: 1200459

I have done some nice projects last semester for different courses, like:

operating systems
Analog electronics
Advanced digital

some of my skills are:

Good debugger

Layan Abuershaid - ID: 1200098

I have done some nice projects last semester for different courses, like:

Communication systems
Analog electronics
Advanced digital

some of my skills are:

C programming

Alaa Murshed - ID: 1200049

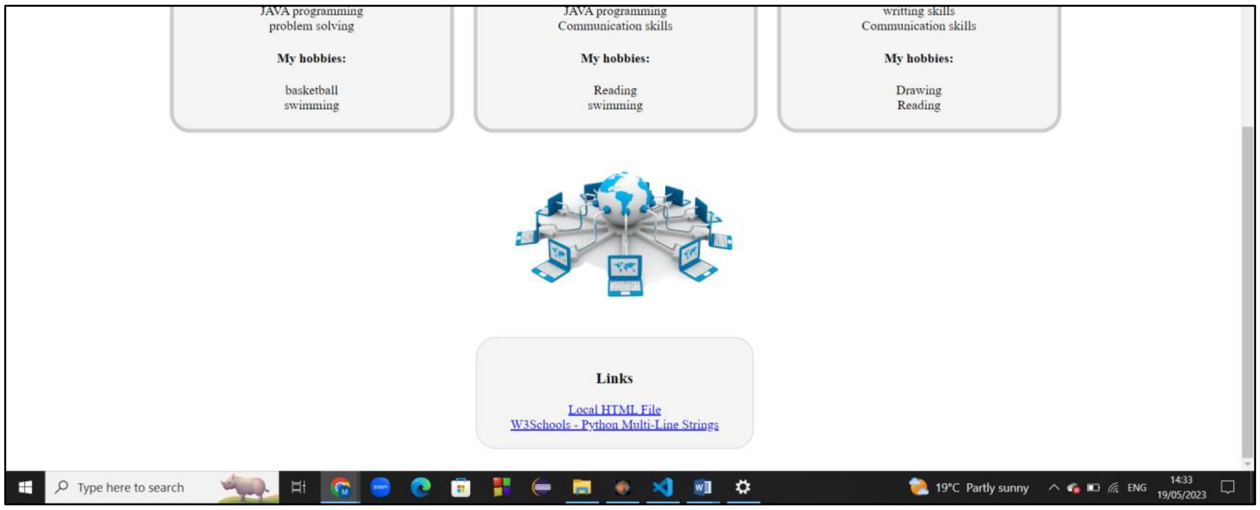
I have done some nice projects last semester for different courses, like:

Data base
Analog electronics
Advanced digital

some of my skills are:

C programming

Type here to search　19°C Partly sunny　ENG　14:33 19/05/2023



JAVA programming
problem solving

My hobbies:

basketball
swimming

JAVA programming
Communication skills

My hobbies:

Reading
swimming

writting skills
Communication skills

My hobbies:

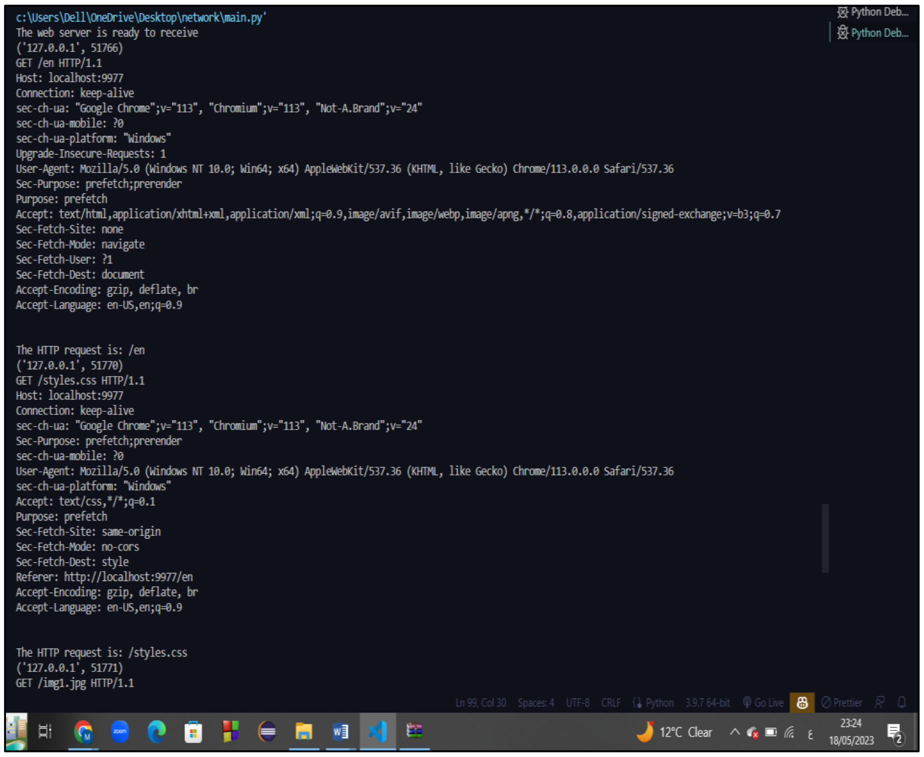
Drawing
Reading

Links

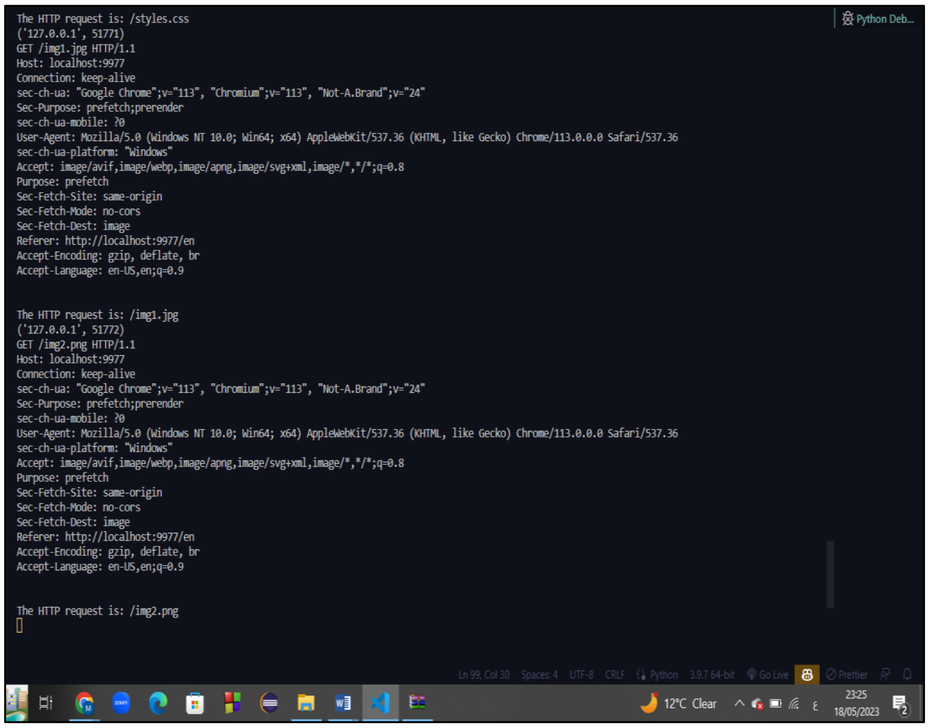
Local HTML File
W3Schools - Python Multi-Line Strings

Type here to search　19°C Partly sunny　ENG　14:33 19/05/2023

Figure 12: English page


Python Deb...
Python Deb...
Ln 99, Col 30 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
12°C Clear
23:24
18/05/2023

```
c:\Users\Dell\OneDrive\Desktop\network\main.py'
The web server is ready to receive
('127.0.0.1', 51766)
GET /en HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Sec-Purpose: prefetch;prerender
Purpose: prefetch
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /en
('127.0.0.1', 51770)
GET /styles.css HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
Sec-Purpose: prefetch;prerender
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: text/css,*/*;q=0.1
Purpose: prefetch
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:9977/en
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /styles.css
('127.0.0.1', 51771)
GET /img1.jpg HTTP/1.1
```

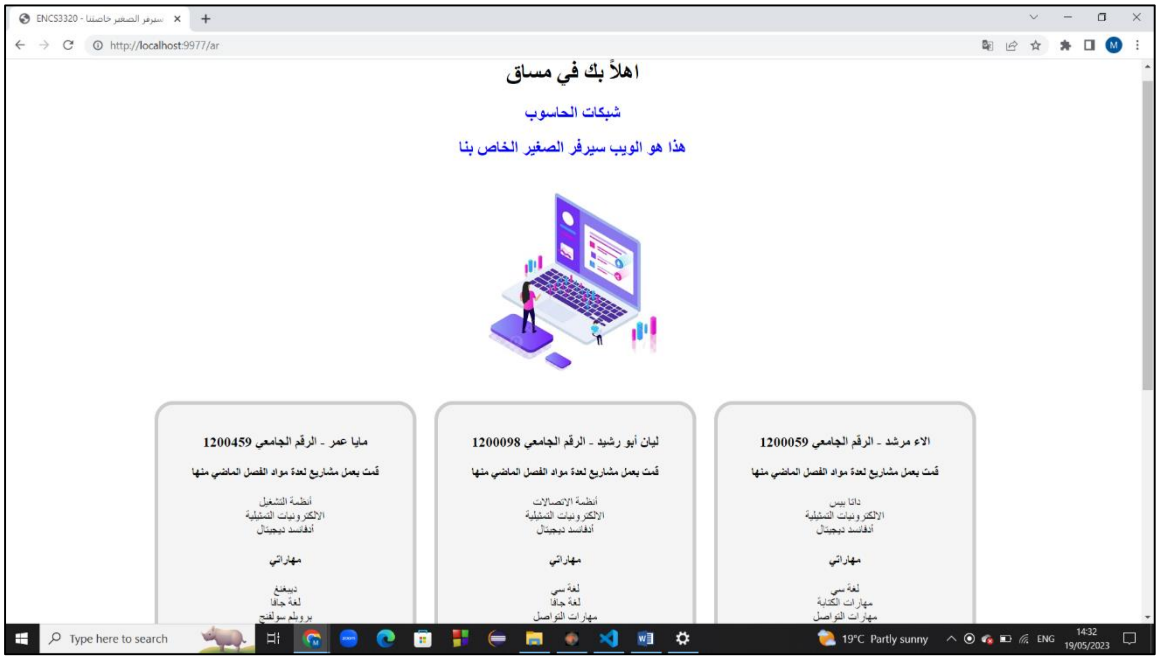

Python Deb...
Ln 99, Col 30 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
12°C Clear
23:25
18/05/2023

```
The HTTP request is: /styles.css
('127.0.0.1', 51771)
GET /img1.jpg HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
Sec-Purpose: prefetch;prerender
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Purpose: prefetch
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/en
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /img1.jpg
('127.0.0.1', 51772)
GET /img2.png HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
Sec-Purpose: prefetch;prerender
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Purpose: prefetch
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/en
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /img2.png
```

Figure 13: output part 3 for English page request

Arabic HTML request

If the URL path is "/ar" or "/main_ar.html", the server sends the main_ar.html page in the same way.



ENCS3320 - سيرفر الصغير خاصتنا

http://localhost:9977/ar

اهلاً بك في مساق

شبكات الحاسوب

هذا هو الويب سيرفر الصغير الخاص بنا

الاء مرشد - الرقم الجامعي 1200059

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

داتا بيس
الالكترونيات التمثيلية
أدفانسد ديجيتال

مهاراتي

لغة سي
مهارات الكتابة
مهارات التواصل

ليان أبو رشيد - الرقم الجامعي 1200098

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

أنظمة الاتصالات
الالكترونيات التمثيلية
أدفانسد ديجيتال

مهاراتي

لغة سي
لغة جافا
مهارات التواصل

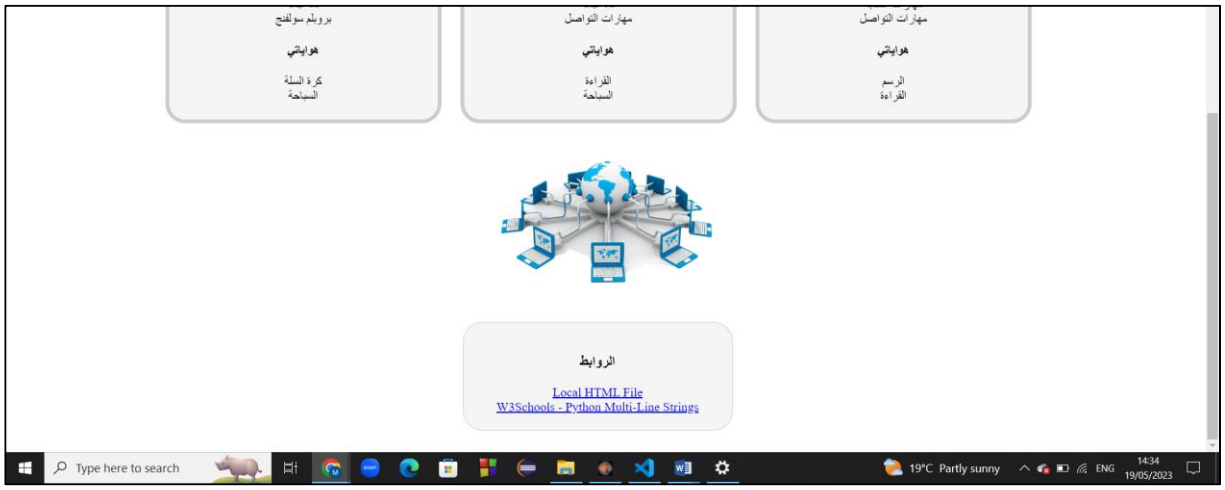
مايا عمر - الرقم الجامعي 1200459

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

أنظمة التشغيل
الالكترونيات التمثيلية
أدفانسد ديجيتال

مهاراتي

ديبغنغ
لغة جافا
بروبلم سولفنج



مهارات التواصل

هواياتي

الرسم
القراءة

مهارات التواصل

هواياتي

القراءة
السباحة

بروبلم سولفنج

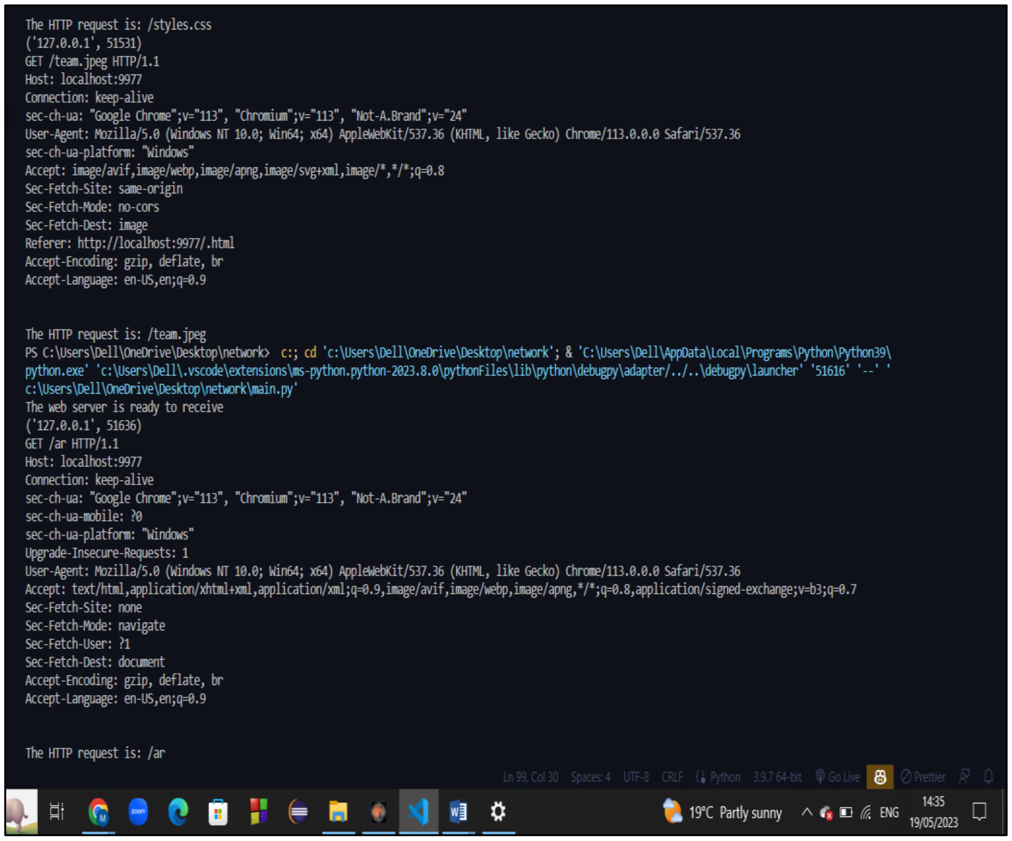
هواياتي

كرة السلة
السباحة

الروابط

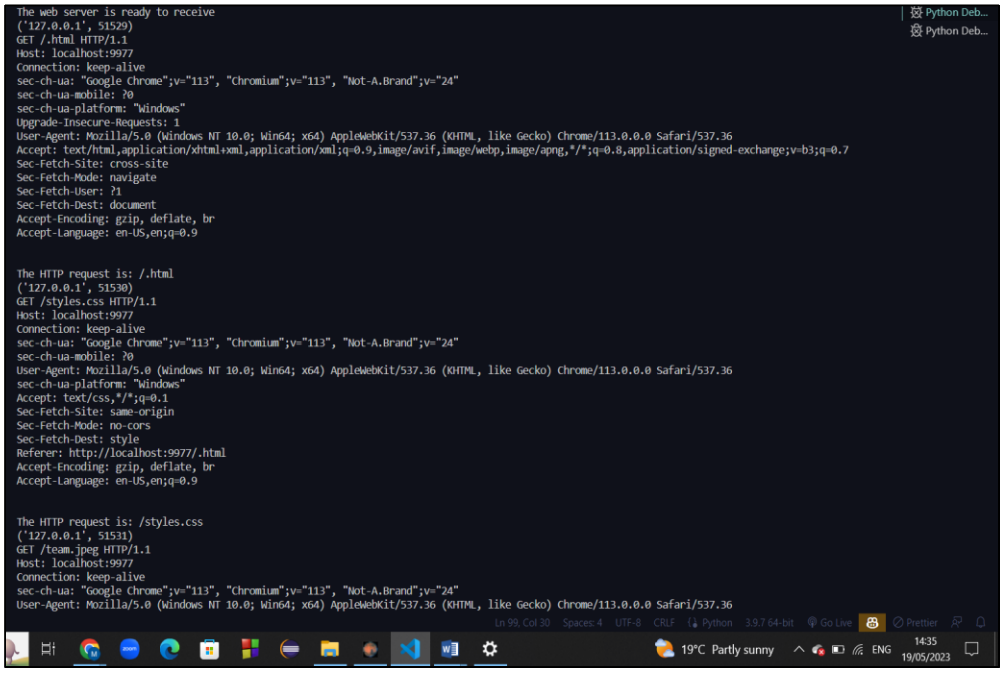
Local HTML File
W3Schools - Python Multi-Line Strings

Figure 14:Arabic page



```
The HTTP request is: /styles.css
('127.0.0.1', 51531)
GET /team.jpeg HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/.html
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /team.jpeg
PS C:\Users\Dell\OneDrive\Desktop\network>  c:; cd 'c:\Users\Dell\OneDrive\Desktop\network'; & 'C:\Users\Dell\AppData\Local\Programs\Python\Python39\
python.exe' 'c:\Users\Dell\.vscode\extensions\ms-python.python-2023.8.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '51616' '--' '
c:\Users\Dell\OneDrive\Desktop\network\main.py'
The web server is ready to receive
('127.0.0.1', 51636)
GET /ar HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /ar
```

Ln 99, Col 30 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
19°C Partly sunny ENG 14:35 19/05/2023



```
The web server is ready to receive
('127.0.0.1', 51529)
GET /.html HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: cross-site
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /.html
('127.0.0.1', 51530)
GET /styles.css HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:9977/.html
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /styles.css
('127.0.0.1', 51531)
GET /team.jpeg HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
```

Python Deb...
Python Deb...
Ln 99, Col 30 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
19°C Partly sunny ENG 14:35 19/05/2023

Figure 15:output part 3 for Arabic page request

HTML file Request

The server serves up the test.html page in the same manner if the URL path ends in ".html".

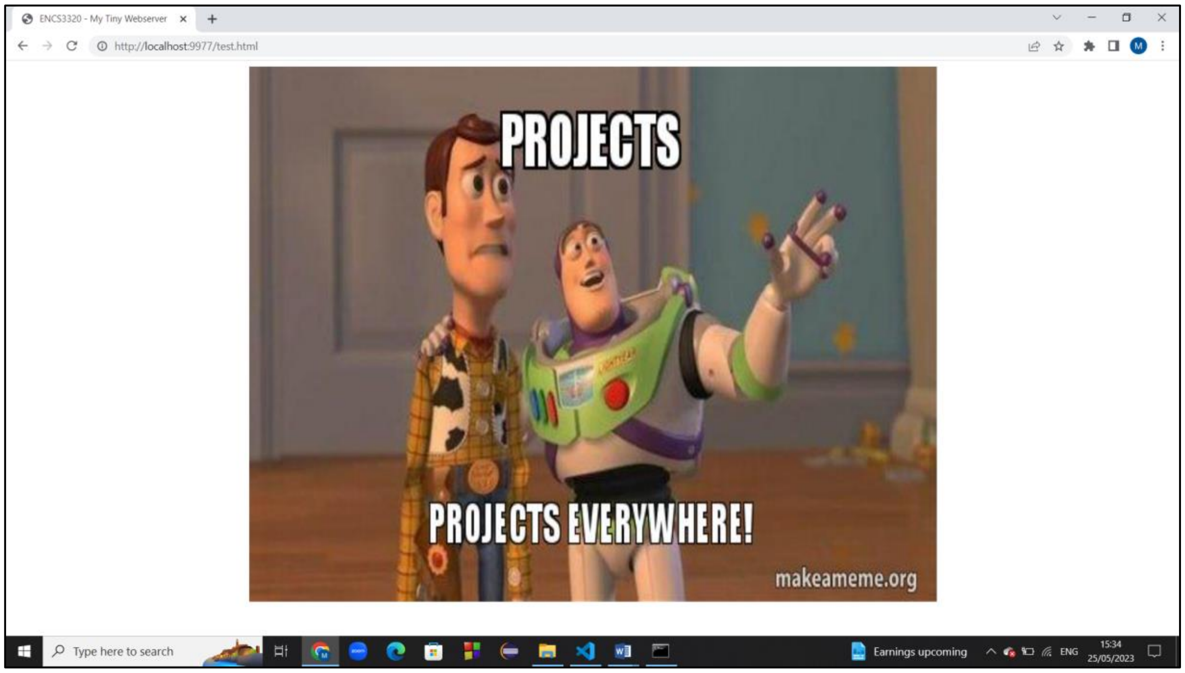
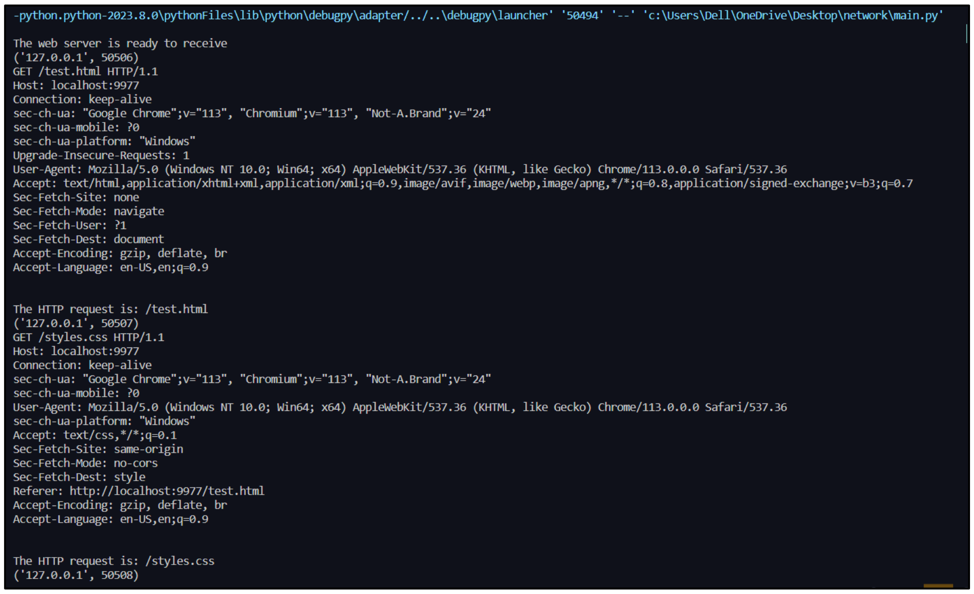
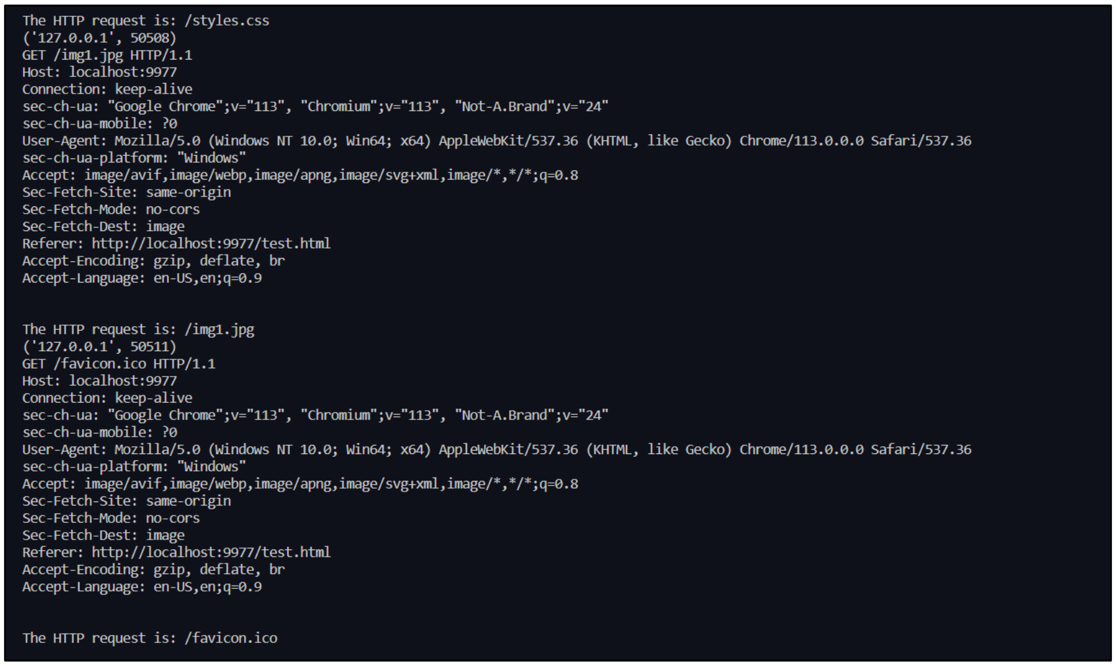


Figure 16: html file



```
-python.python-2023.8.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '50494' '--' 'c:\Users\Dell\OneDrive\Desktop\network\main.py'

The web server is ready to receive
('127.0.0.1', 50506)
GET /test.html HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /test.html
('127.0.0.1', 50507)
GET /styles.css HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:9977/test.html
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /styles.css
('127.0.0.1', 50508)
```

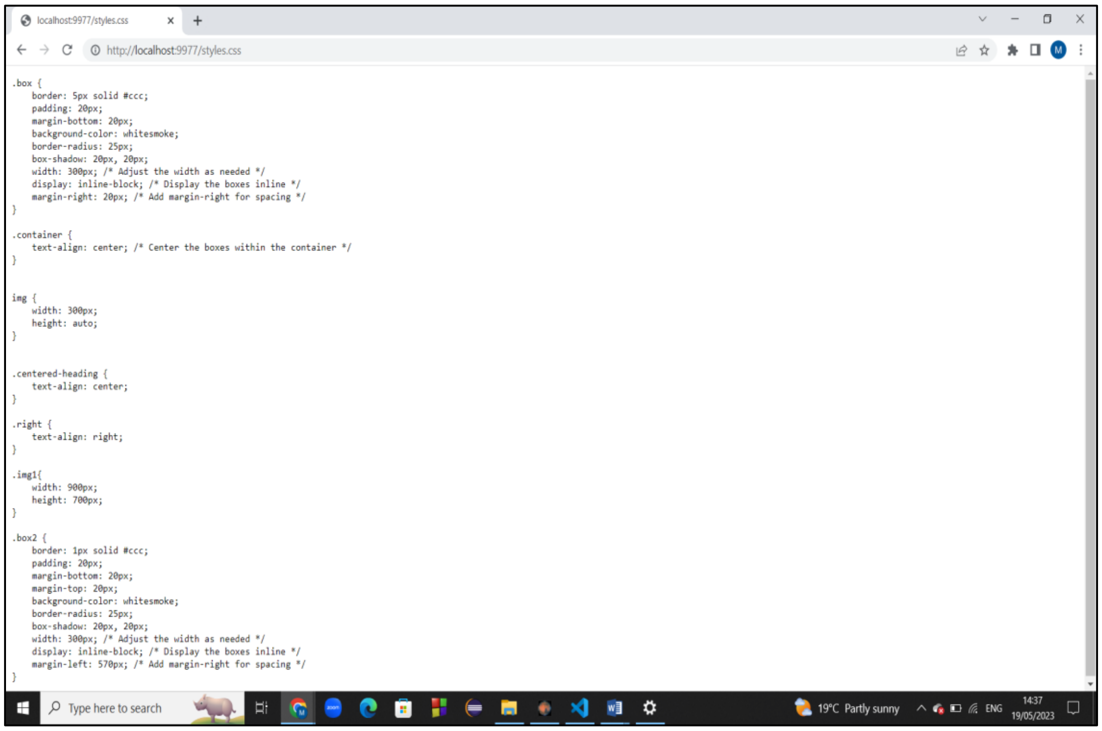
Figure 17: output part 3 for html file request



```
The HTTP request is: /styles.css
('127.0.0.1', 50508)
GET /img1.jpg HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/test.html
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /img1.jpg
('127.0.0.1', 50511)
GET /favicon.ico HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/test.html
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /favicon.ico
```

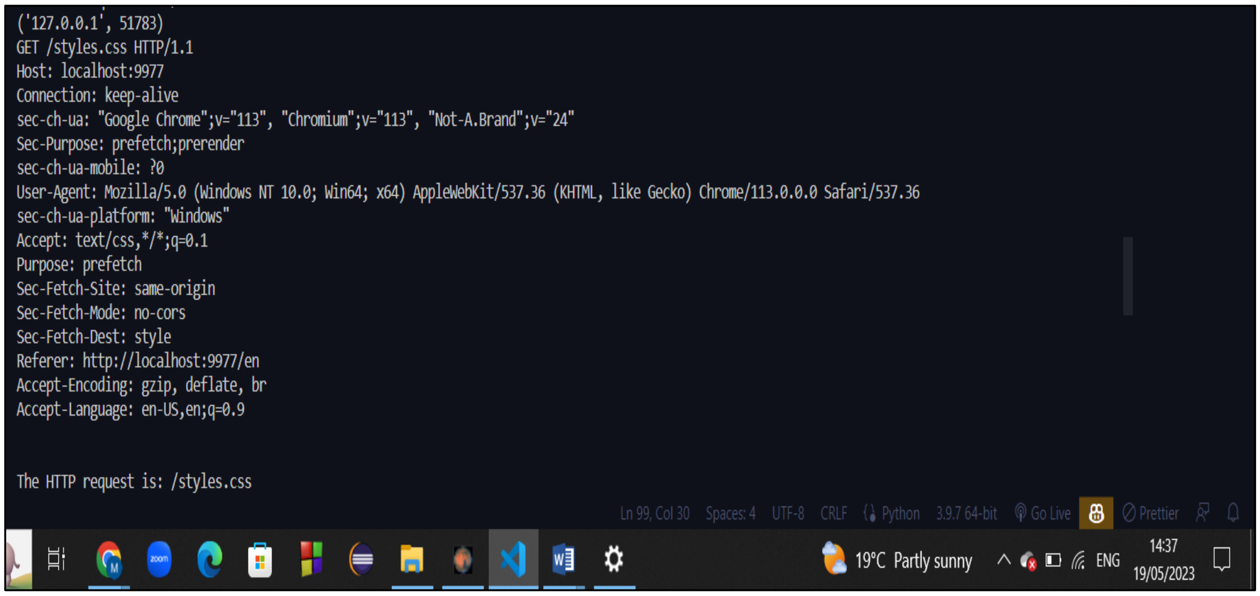
Figure 18 - output part 3 for html file request

CSS file request



```
.box {
    border: 5px solid #ccc;
    padding: 20px;
    margin-bottom: 20px;
    background-color: whitesmoke;
    border-radius: 25px;
    box-shadow: 20px, 20px;
    width: 300px; /* Adjust the width as needed */
    display: inline-block; /* Display the boxes inline */
    margin-right: 20px; /* Add margin-right for spacing */
}

.container {
    text-align: center; /* Center the boxes within the container */
}


img {
    width: 300px;
    height: auto;
}


.centered-heading {
    text-align: center;
}

.right {
    text-align: right;
}

.img1{
    width: 900px;
    height: 700px;
}

.box2 {
    border: 1px solid #ccc;
    padding: 20px;
    margin-bottom: 20px;
    margin-top: 20px;
    background-color: whitesmoke;
    border-radius: 25px;
    box-shadow: 20px, 20px;
    width: 300px; /* Adjust the width as needed */
    display: inline-block; /* Display the boxes inline */
    margin-left: 570px; /* Add margin-right for spacing */
}
```

Figure 19: requesting CSS file

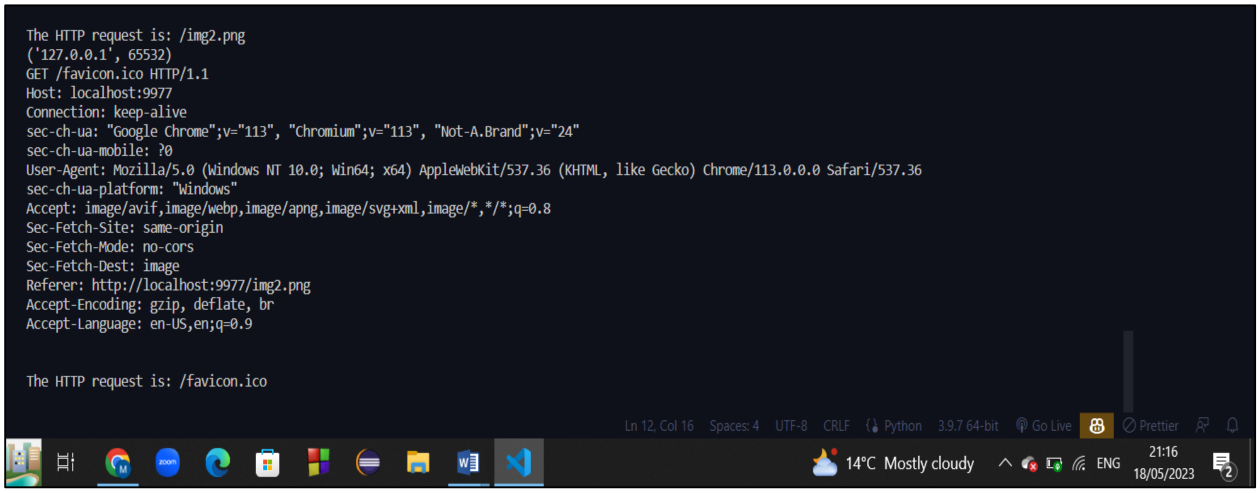


```
('127.0.0.1', 51783)
GET /styles.css HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
Sec-Purpose: prefetch;prerender
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: text/css,*/*;q=0.1
Purpose: prefetch
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:9977/en
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /styles.css
```

Figure 20:output part 3 for CSS file request

Png request

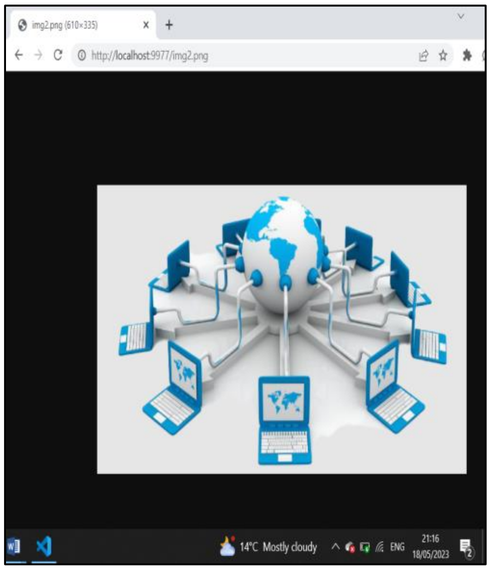
If the URL path ends with ".jpg" or ".png", the server sends the corresponding image file in the same way.



```
The HTTP request is: /img2.png
('127.0.0.1', 65532)
GET /favicon.ico HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
sec-ch-ua-platform: "Windows"
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:9977/img2.png
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /favicon.ico
```

Ln 12, Col 16 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
14°C Mostly cloudy ENG 21:16 18/05/2023

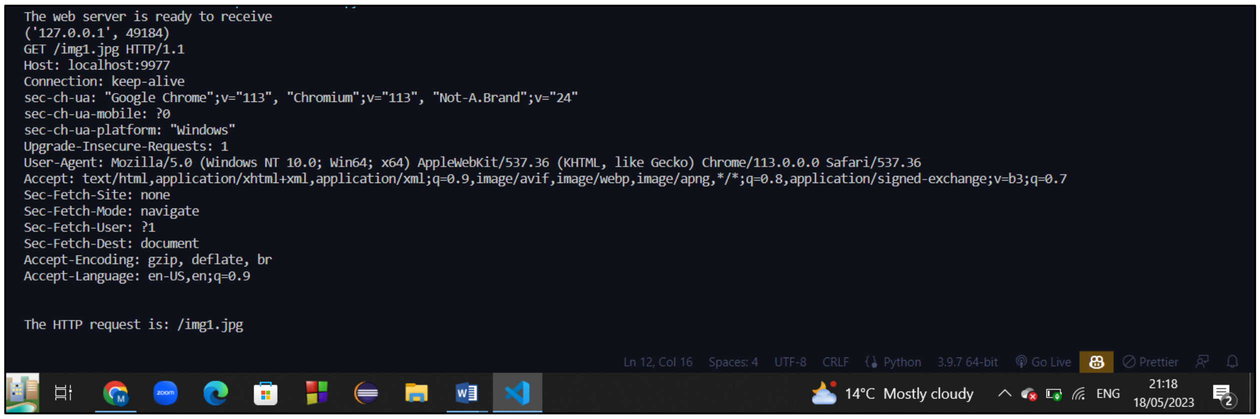
Figure 21: output of part 3 for request png



img2.png (610×335)
http://localhost:9977/img2.png
14°C Mostly cloudy ENG 21:16 18/05/2023

Figure 22: Png photo request

Jpg request



```
The web server is ready to receive
('127.0.0.1', 49184)
GET /img1.jpg HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /img1.jpg
```

Figure 23: output of part 3 for request Jpg

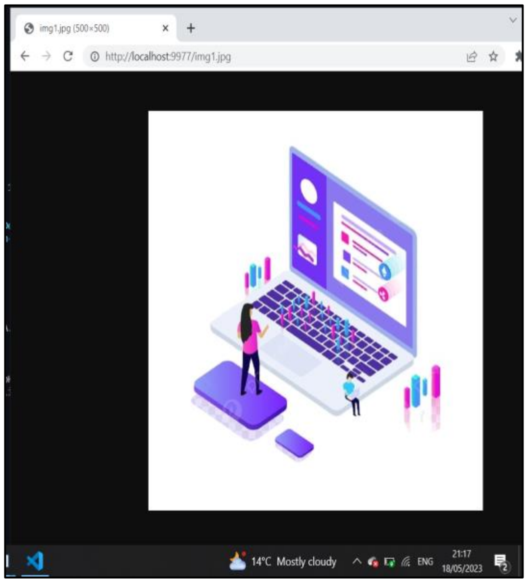


Figure 24:Jpg photo

If the path is "/vt" or "/so" or "/rt", the server will redirect the client to another location (vt: YouTube, so: Stack overflow, rt: ritaj)

yt request

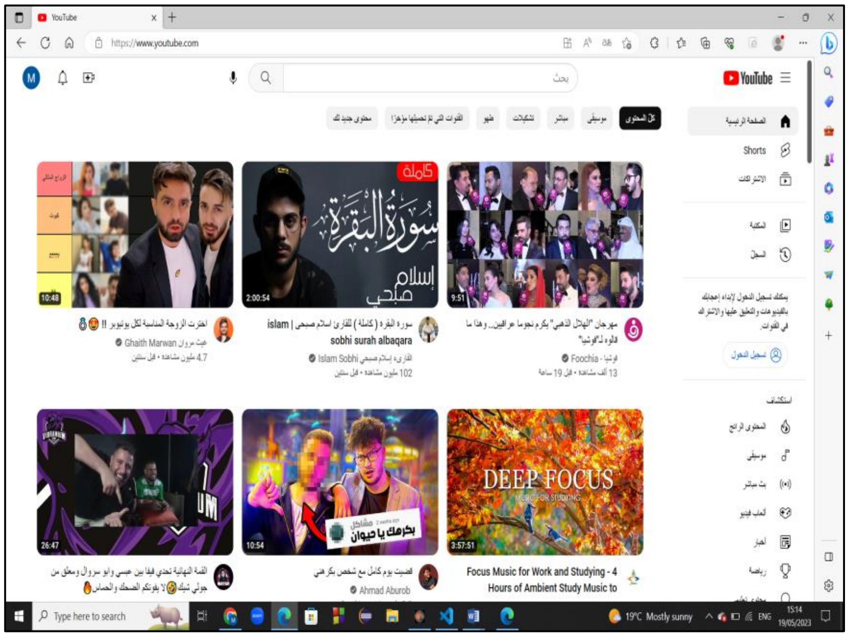
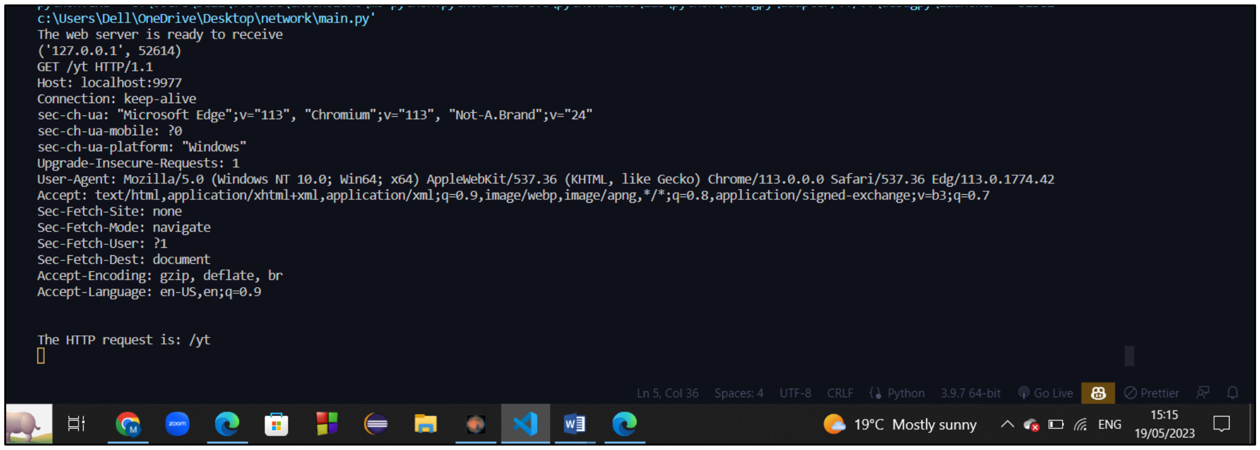


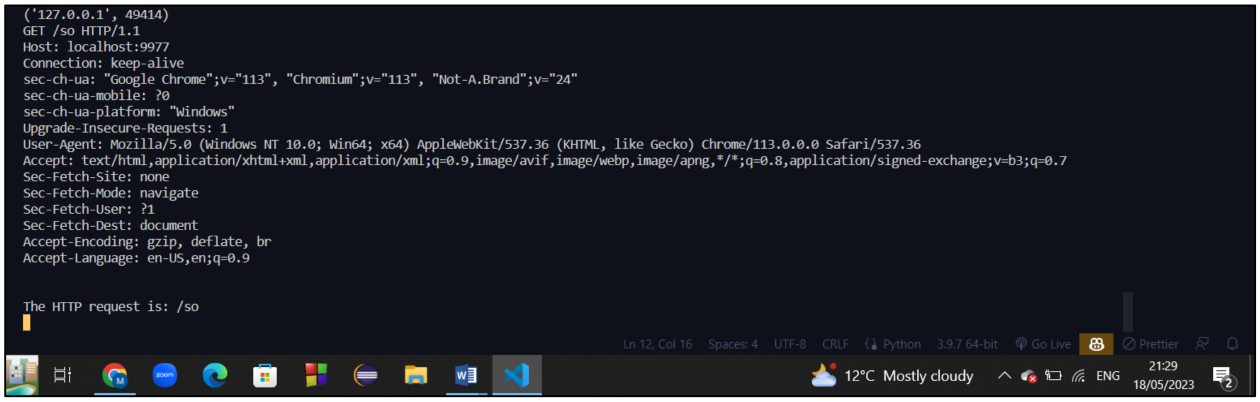
Figure 25: request yt redirect to YouTube



```
c:\Users\Dell\OneDrive\Desktop\network\main.py'
The web server is ready to receive
('127.0.0.1', 52614)
GET /yt HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Microsoft Edge";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36 Edg/113.0.1774.42
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /yt
```

Figure 26: output of part 3 for request yt

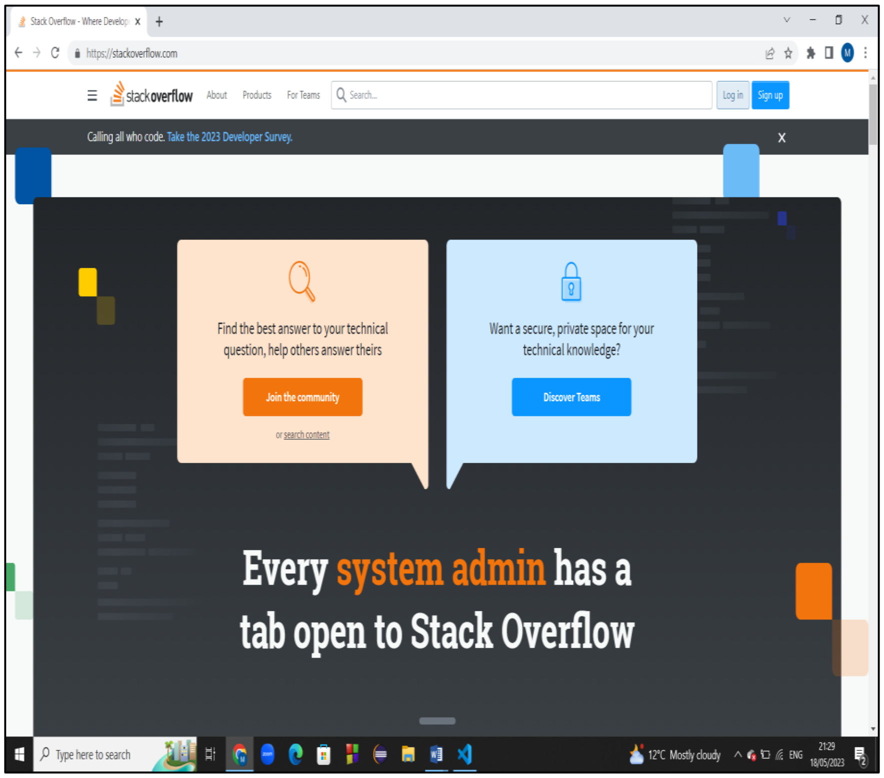
so request



```
('127.0.0.1', 49414)
GET /so HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /so
```

Ln 12, Col 16 Spaces: 4 UTF-8 CRLF Python 3.9.7 64-bit Go Live Prettier
12°C Mostly cloudy
ENG
21:29
18/05/2023

Figure 27: output of part 3 for request so



Calling all who code. Take the 2023 Developer Survey.

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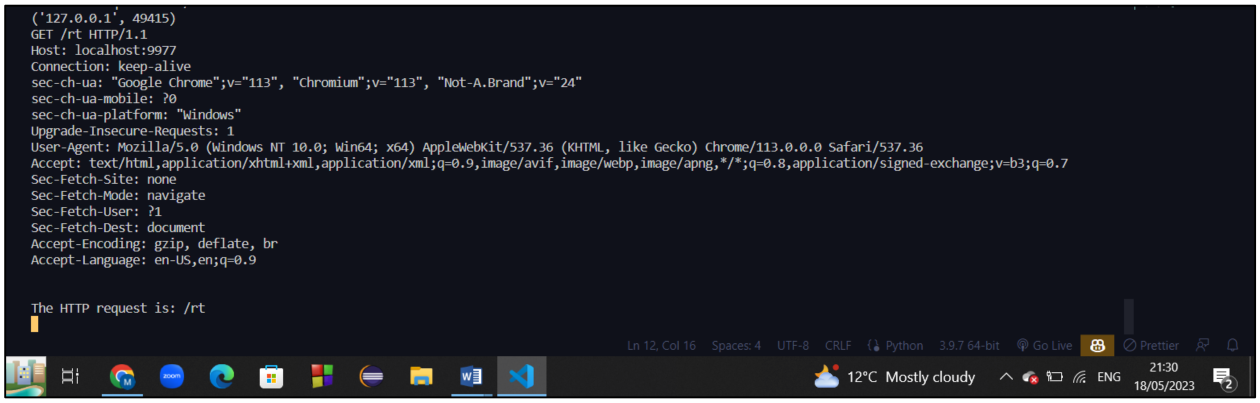
Every system admin has a tab open to Stack Overflow

Figure 28: request so redirect to stackoverflow.com

rt request

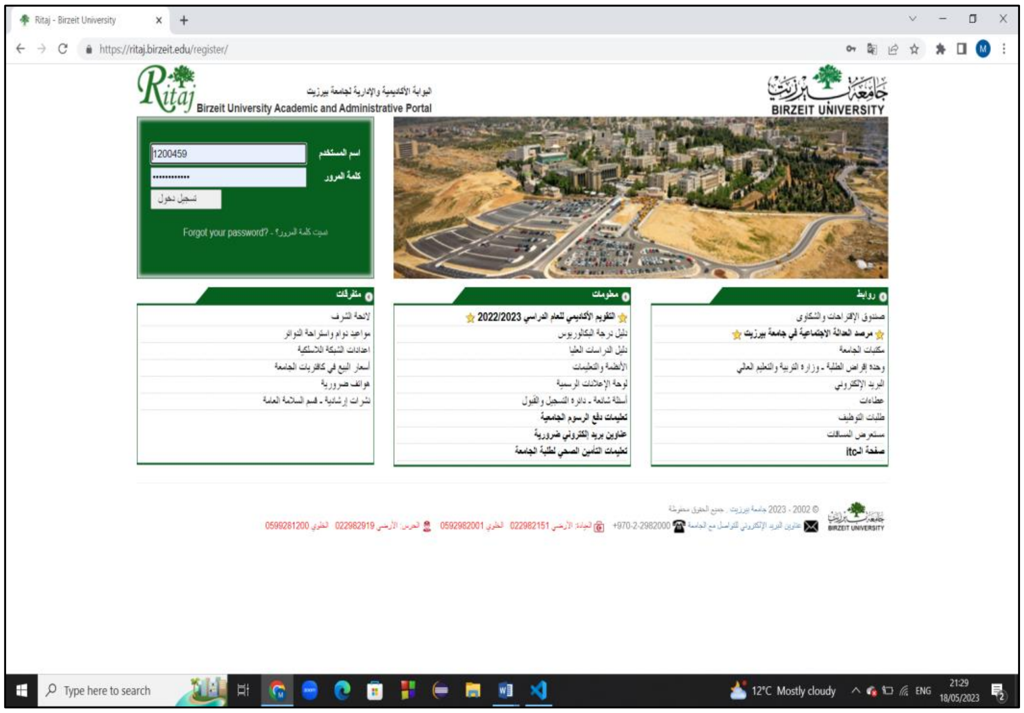


```
('127.0.0.1', 49415)
GET /rt HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /rt
```

Ln 12, Col 16   Spaces: 4   UTF-8   CRLF   Python   3.9.7 64-bit   Go Live   Prettier
12°C Mostly cloudy   ENG   21:30 18/05/2023

Figure 29: output of part 3 for request rt

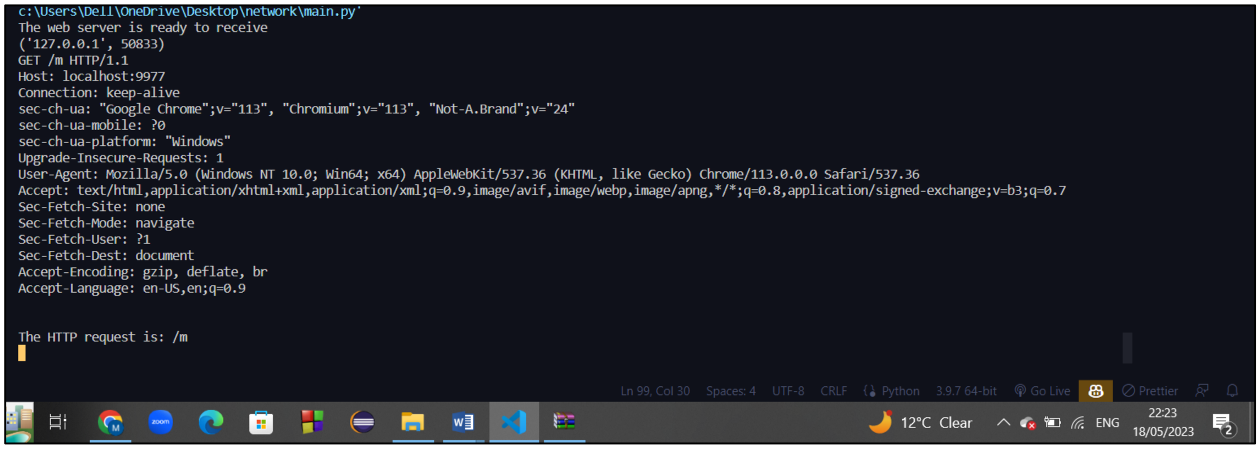


Ritaj - Birzeit University
https://ritaj.birzeit.edu/register/
البوابة الأكاديمية والإدارية لجامعة بيرزيت
Birzeit University Academic and Administrative Portal
BIRZEIT UNIVERSITY
اسم المستخدم 1200459
كلمة المرور
تسجيل دخول
Forgot your password? - نسيت كلمة المرور؟
متفرقات
معلومات
روابط
التقويم الأكاديمي للعام الدراسي 2022/2023
Type here to search
12°C Mostly cloudy   ENG   21:29 18/05/2023

Figure 30: request rt redirect to ritaj.com

Wrong request

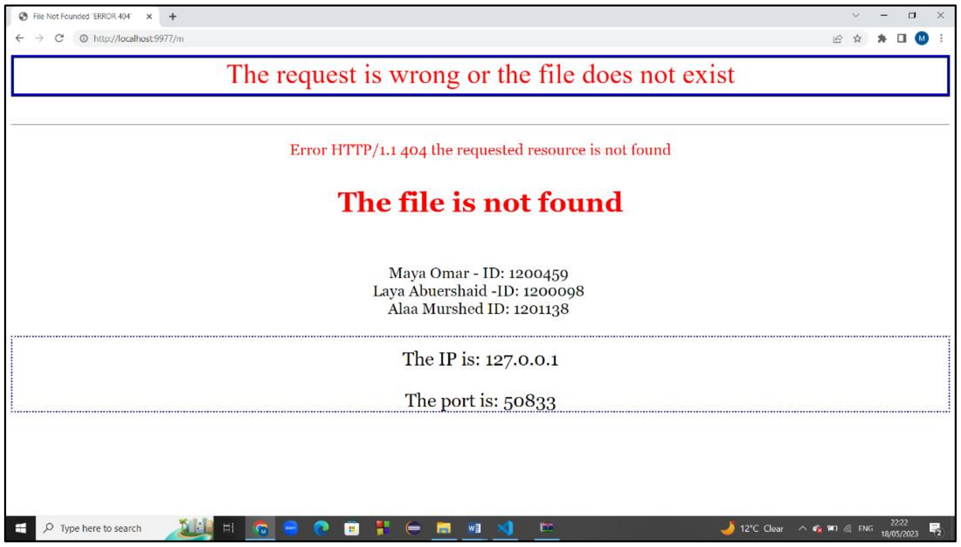
If the URL path is not recognized, the server returns a 404 error by writing the appropriate HTTP response header and a message to the output stream.



```
c:\Users\Dell\OneDrive\Desktop\network\main.py'
The web server is ready to receive
('127.0.0.1', 50833)
GET /m HTTP/1.1
Host: localhost:9977
Connection: keep-alive
sec-ch-ua: "Google Chrome";v="113", "Chromium";v="113", "Not-A.Brand";v="24"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "Windows"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/113.0.0.0 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9


The HTTP request is: /m
```

Figure 31: output of part 3 for wrong request



The request is wrong or the file does not exist

Error HTTP/1.1 404 the requested resource is not found

The file is not found

Maya Omar - ID: 1200459
Laya Abuershaid -ID: 1200098
Alaa Murshed ID: 1201138

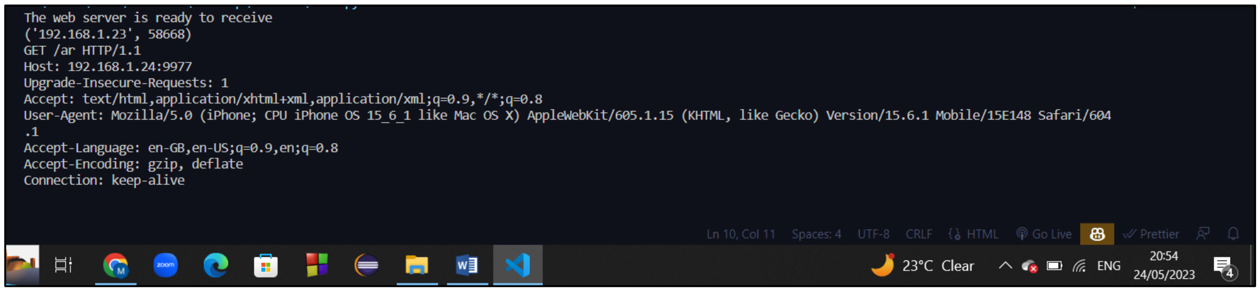
The IP is: 127.0.0.1

The port is: 50833

Figure 32: error page

Each response message has a header that contains the following information: 200 OK if the request is valid; 307 for a temporary redirect; and 404 for files that cannot be located. Additionally, it includes the content type, which depends on the file format HTML, CSS, PNG, JPEG, etc. When a new client connection is requested, the server returns to the beginning of the loop and closes the Socket and the Server Socket.

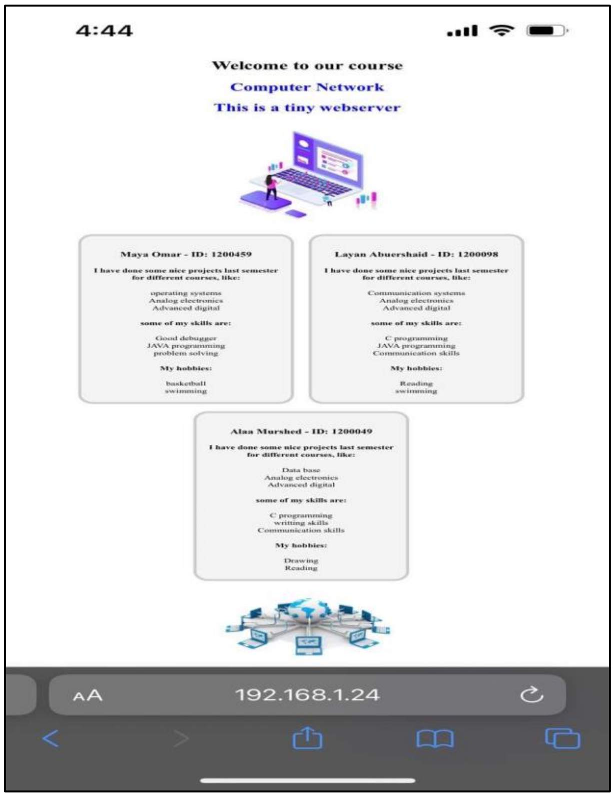
Testing part 3 using phone



```
The web server is ready to receive
('192.168.1.23', 58668)
GET /ar HTTP/1.1
Host: 192.168.1.24:9977
Upgrade-Insecure-Requests: 1
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
User-Agent: Mozilla/5.0 (iPhone; CPU iPhone OS 15_6_1 like Mac OS X) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/15.6.1 Mobile/15E148 Safari/604
.1
Accept-Language: en-GB,en-US;q=0.9,en;q=0.8
Accept-Encoding: gzip, deflate
Connection: keep-alive
```

Figure 33: testing using phone

The phone connected from the IP address (192.168.1.23) to the server of address (192.168.1.24).



4:44

Welcome to our course

Computer Network

This is a tiny webserver

Maya Omar - ID: 1200459

I have done some nice projects last semester for different courses, like:

operating systems
Analog electronics
Advanced digital

some of my skills are:

Good debugger
JAVA programming
problem solving

My hobbies:

basketball
swimming

Layan Abuershaid - ID: 1200098

I have done some nice projects last semester for different courses, like:

Communication systems
Analog electronics
Advanced digital

some of my skills are:

C programming
JAVA programming
Communication skills

My hobbies:

Reading
swimming

Alaa Murshed - ID: 1200049

I have done some nice projects last semester for different courses, like:

Data base
Analog electronics
Advanced digital

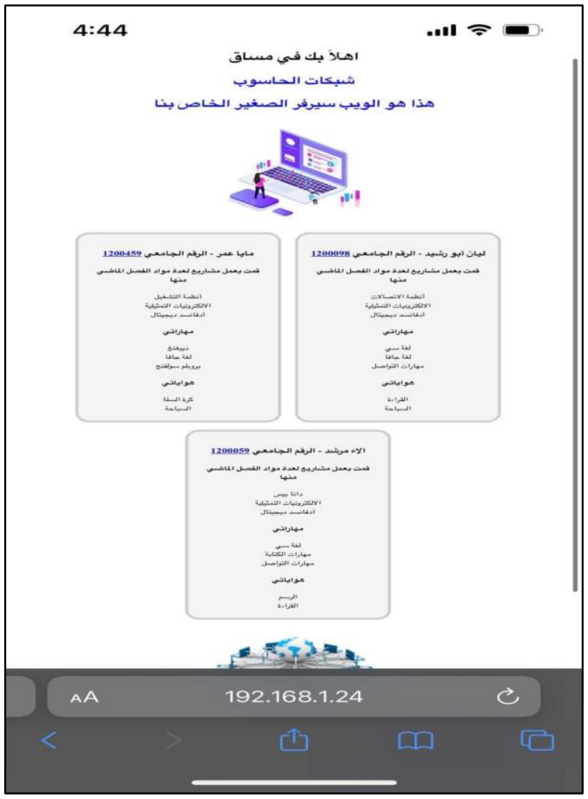
some of my skills are:

C programming
writting skills
Communication skills

My hobbies:

Drawing
Reading

Figure 35 - English html phone request



4:44

اهلاً بك في مساق

شبكات الحاسوب

هذا هو الويب سيرفر الصغير الخاص بنا

مايا عمر - الرقم الجامعي 1200459

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

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الالكترونيات التمثيلية
ادفانسد ديجيتال

مهاراتي

ديبغنغ
لغة جافا
بروبلم سولفنغ

هواياتي

كرة السلة
السباحة

ليان ابو رشيد - الرقم الجامعي 1200098

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

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الالكترونيات التمثيلية
ادفانسد ديجيتال

مهاراتي

لغة سي
لغة جافا
مهارات التواصل

هواياتي

القراءة
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الاء مرشد - الرقم الجامعي 1200059

قمت بعمل مشاريع لعدة مواد الفصل الماضي منها

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ادفانسد ديجيتال

مهاراتي

لغة سي
مهارات الكتابة
مهارات التواصل

هواياتي

الرسم
القراءة

Figure 34 - Arabic html phone request

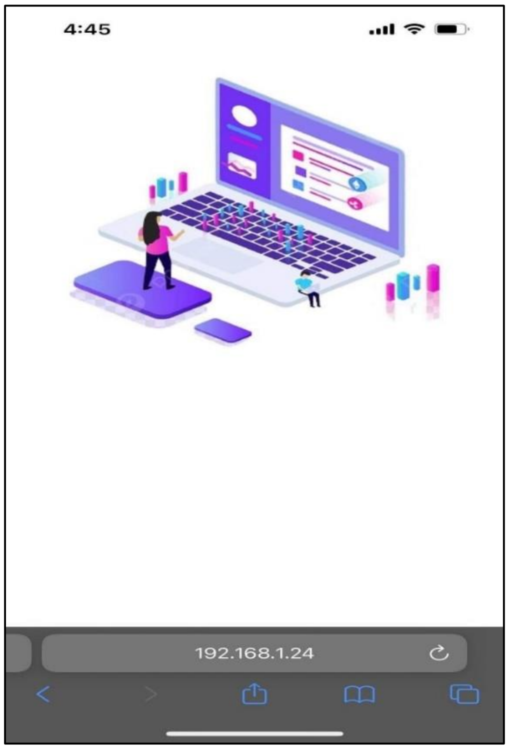


Figure 36 - jpg phone request

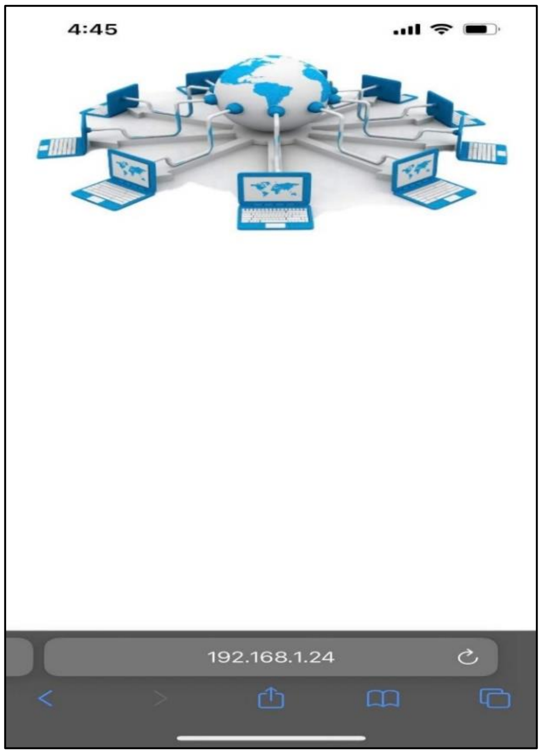


Figure 37 - Png phone request

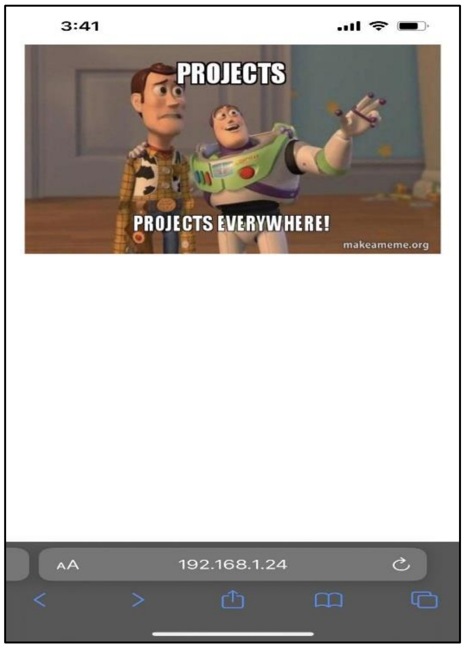
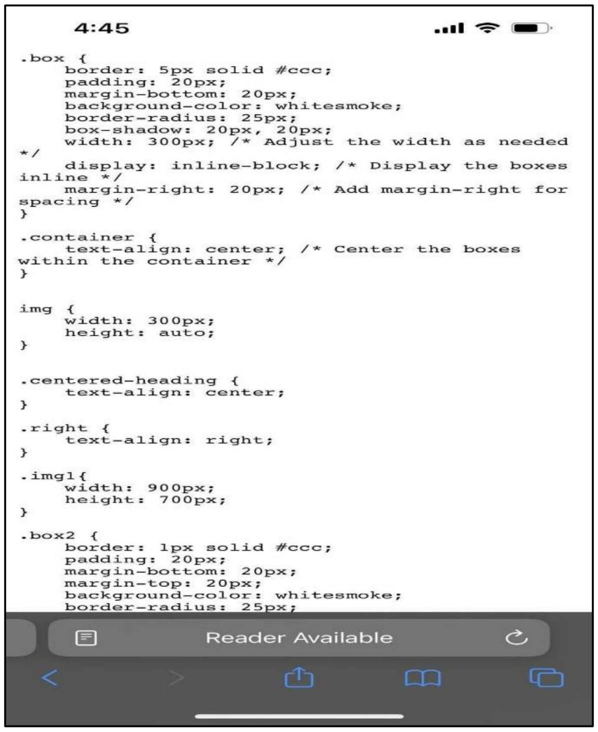


Figure 38 - HTML file phone request



```
.box {
    border: 5px solid #ccc;
    padding: 20px;
    margin-bottom: 20px;
    background-color: whitesmoke;
    border-radius: 25px;
    box-shadow: 20px, 20px;
    width: 300px; /* Adjust the width as needed
*/
    display: inline-block; /* Display the boxes
inline */
    margin-right: 20px; /* Add margin-right for
spacing */
}

.container {
    text-align: center; /* Center the boxes
within the container */
}


img {
    width: 300px;
    height: auto;
}


.centered-heading {
    text-align: center;
}

.right {
    text-align: right;
}

.img1{
    width: 900px;
    height: 700px;
}

.box2 {
    border: 1px solid #ccc;
    padding: 20px;
    margin-bottom: 20px;
    margin-top: 20px;
    background-color: whitesmoke;
    border-radius: 25px;
```

Figure 39 - CSS phone request

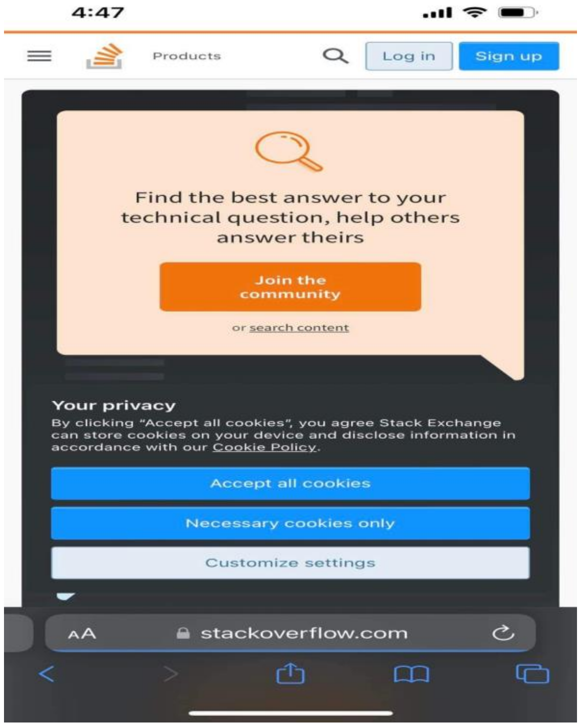


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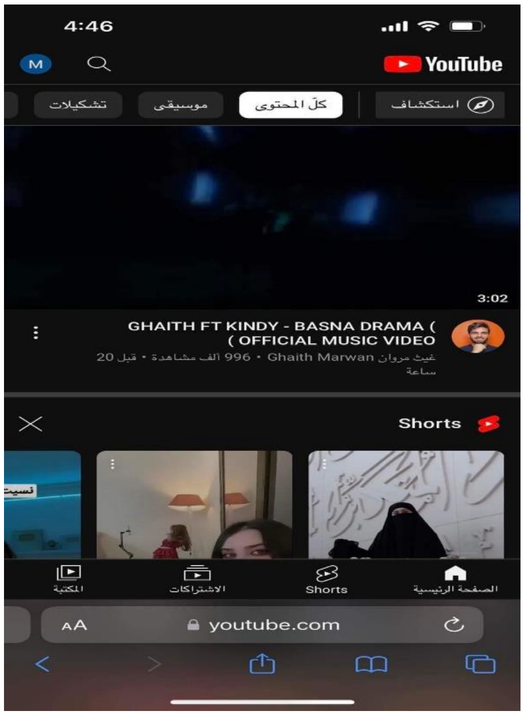
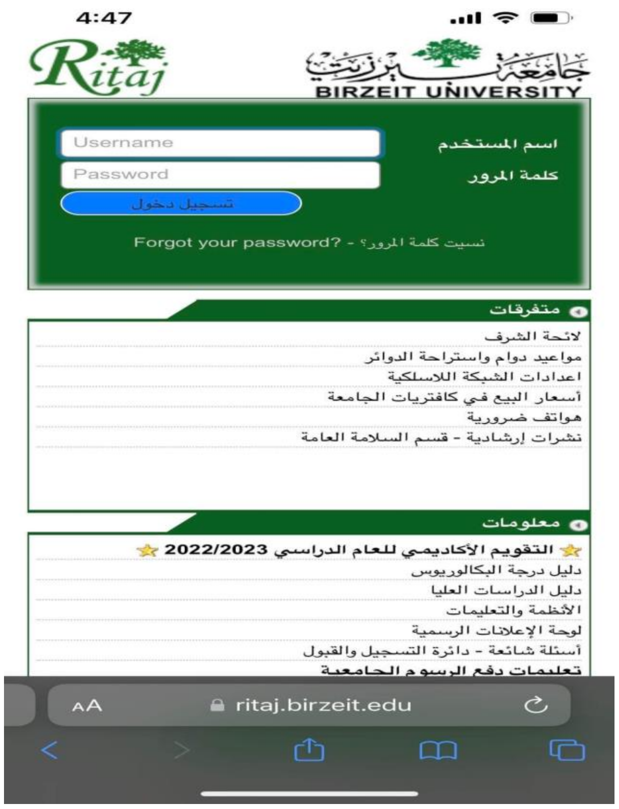
Figure 41 - so phone request



GHAITH FT KINDY - BASNA DRAMA (OFFICIAL MUSIC VIDEO)
غيث مروان Ghaith Marwan • 996 ألف مشاهدة • قبل 20 ساعة

Figure 40 - yt phone request



اسم المستخدم
كلمة المرور
Forgot your password? - نسيت كلمة المرور؟

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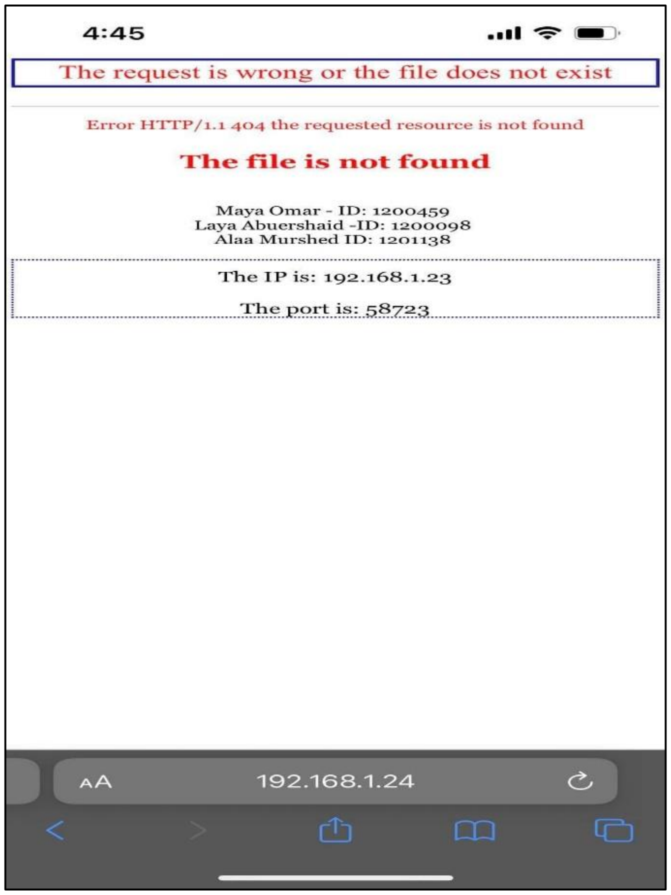
اعدادات الشبكة اللاسلكية
أسعار البيع في كافتيريات الجامعة
هواتف ضرورية
نشرات إرشادية - قسم السلامة العامة

معلومات
التقويم الأكاديمي للعام الدراسي 2022/2023
دليل درجة البكالوريوس
دليل الدراسات العليا
الأنظمة والتعليمات
لوحة الإعلانات الرسمية
أسئلة شائعة - دائرة التسجيل والقبول
تعليمات دفع الرسوم الجامعية

Figure 42 - rt phone request



The request is wrong or the file does not exist

Error HTTP/1.1 404 the requested resource is not found

The file is not found

Maya Omar - ID: 1200459
Laya Abuershaid -ID: 1200098
Alaa Murshed ID: 1201138

The IP is: 192.168.1.23

The port is: 58723

Figure 43 - wrong phone request

Appendix 1:

UDP server code

```
from socket import *
import time

serverPort = 8855
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("", serverPort))

print('The server is ready to receive')

clients = {}  # Dictionary to store client addresses and messages

while True:
    # Receive message and client address
    message, clientAddress = serverSocket.recvfrom(1024)

    # Get current time
    T = time.strftime('%H:%M:%S')

    # Decode message from bytes to string
    message_str = message.decode('utf-8')

    # Store client address and message with timestamp
    clients[clientAddress] = (message_str, T)

    # Print server name
    print("Server Name: Alaa Shaheen")

    # Print received messages from clients
    for address, (msg, timestamp) in clients.items():
        print("Received message from", address, ":", msg, "at time:",
timestamp)
    print()

    # Check if the client sent a special message to close the connection
    if message_str == 'CLOSE':
        del clients[clientAddress]
        print(f"Client {clientAddress} has closed the connection.")

    last_message = message_str  # Store the last received message
```

UDP client code

```
# Client UDP
from socket import *
import time

serverPort = 8855
serverName = "192.168.1.255"
clientSocket = socket(AF_INET, SOCK_DGRAM)

while True:
    # Message to send
    message = "Layan Abuershaid"

    # Send message to server
    clientSocket.sendto(message.encode(), (serverName, serverPort))
    print("Sent message..")

    # Wait for 2 seconds
    time. Sleep(2)
```