Homework 1 Report

Introduction to Computer Network (EE4020)

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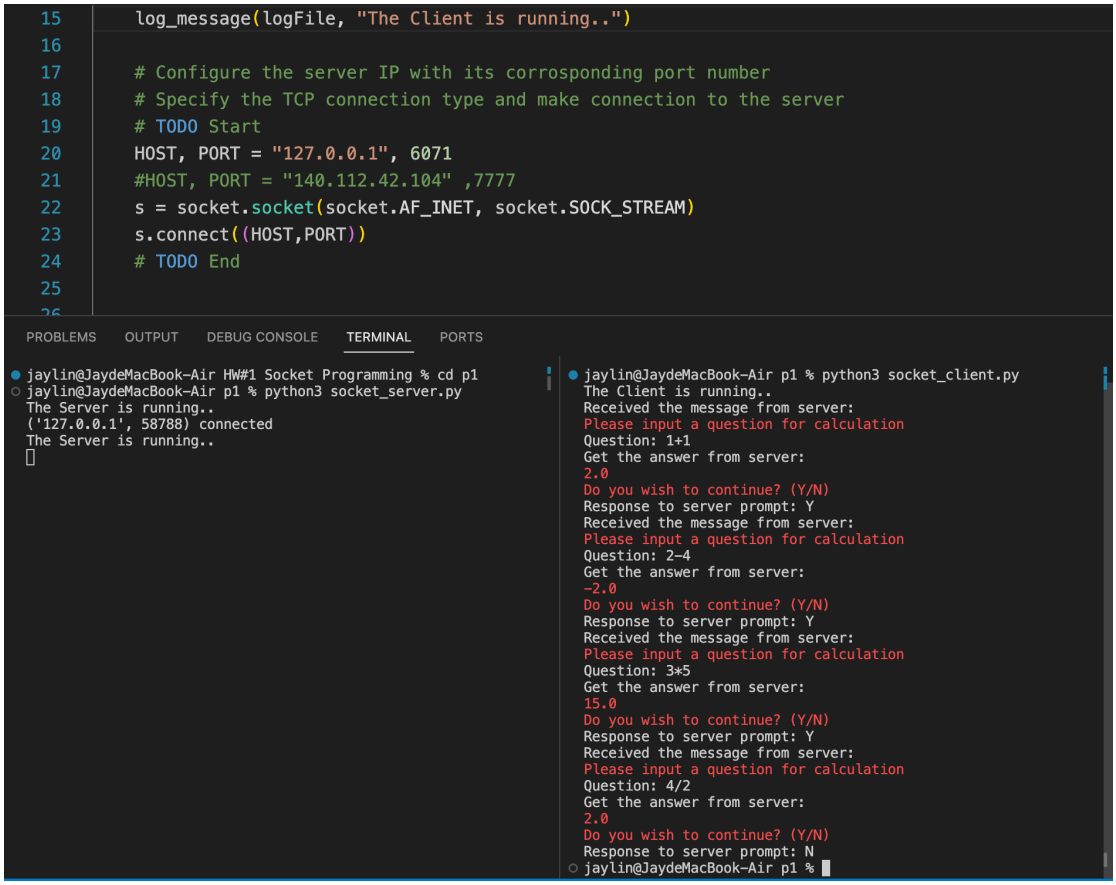
PROBLEM 1

In socket_server.py, the code first binds the socket with the address and host. When the server is running, it listens to the connection request from clients. After the connection is made, the server receive the client's question, and return the answer.

In socket_client.py, it will first specify the IP address and port, and make TCP connection with the server. The code will also receive the question sent by the server, and response by the client's answer.

Running with local host using p1_testcase:



Making connection with TA's computer:

socket_client.py > ...

```python
with open('./client_log.txt', 'w') as logFile:
    log_message(logFile, "The Client is running..")

    # Configure the server IP with its corrosponding port number
    # Specify the TCP connection type and make connection to the server
    # TODO Start
    #HOST, PORT = "127.0.0.1", 6071
    HOST, PORT = "140.112.42.104" ,7777
    s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    s.connect((HOST,PORT))
    # TODO End


    # You can change the test case or create other test cases on your own
```

OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
jaylin@JaydeMacBook-Air p1 % python3 socket_client.py
The Client is running..
Received the message from server:
TA's server: Host: 140.112.42.104, Port: 7777
Please input a question for calculation
Question: 1+1
Get the answer from server:
2.0
Do you wish to continue? (Y/N)
Response to server prompt: Y
Received the message from server:
Please input a question for calculation
Question: 2-4
Get the answer from server:
-2.0
Do you wish to continue? (Y/N)
Response to server prompt: Y
Received the message from server:
Please input a question for calculation
Question: 3*5
Get the answer from server:
15.0
Do you wish to continue? (Y/N)
Response to server prompt: Y
Received the message from server:
Please input a question for calculation
Question: 4/2
Get the answer from server:
2.0
Do you wish to continue? (Y/N)
Response to server prompt: N
jaylin@JaydeMacBook-Air p1 %
```

My own arithmetic functions:

In the below functions, x and y should both be positive integers.

1. "x%y": return the value of x mod y.

   Example: "14%5" returns 4.0. (p1_testcase_b1)

```
jaylin@JaydeMacBook-Air p1 % python3 socket_client.py
The Client is running..
Received the message from server:
Please input a question for calculation
Question: 14%5
Get the answer from server:
4.0
Do you wish to continue? (Y/N)
Response to server prompt: N
```

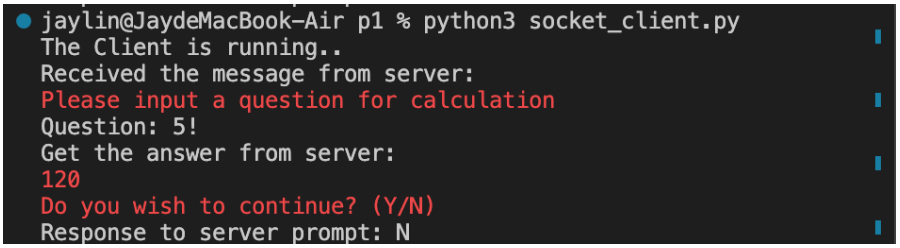
2. "x^y": return x to the power of y.

   Example: "2^3" returns 8. (p1_testcase_b2)

```
jaylin@JaydeMacBook-Air p1 % python3 socket_client.py
The Client is running..
Received the message from server:
Please input a question for calculation
Question: 2^3
Get the answer from server:
8
Do you wish to continue? (Y/N)
Response to server prompt: N
```

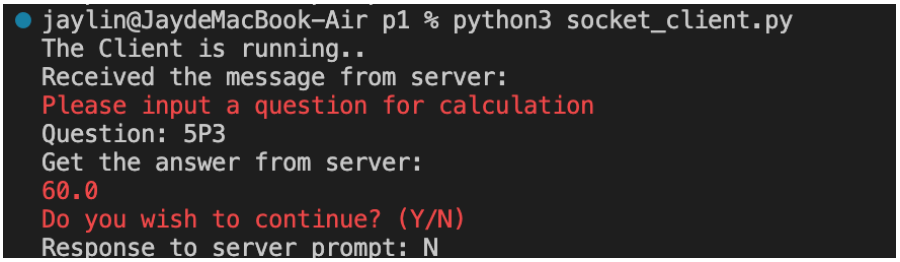
3. “x!”: return x factorial.

   Example: “5!” returns 120. (p1_testcase_b3)



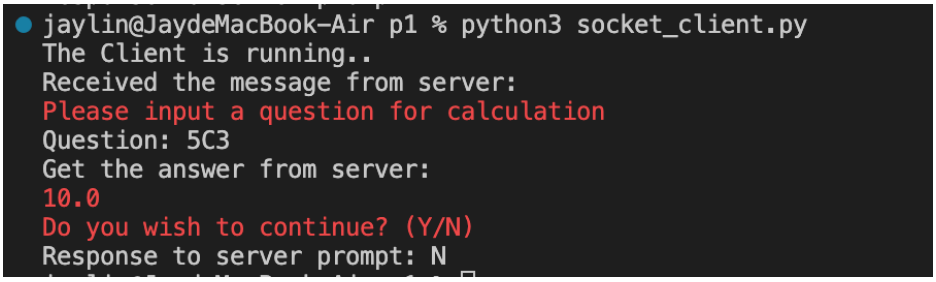
4. “xPy”: return the permutation of P(x,y)（P x 取 y）

   Example: “5P3” returns 60. (p1_testcase_b4)



5. “xCy”: return the value of x choose b.（C x 取 y）

   Example: “5C3” returns 10. (p1_testcase_b5)



PROBLEM 2

In this problem, the code will bind the server socket to the address and listen to the request. If the code gets a request, it will print out the request and see whether the requested file is in the web server.

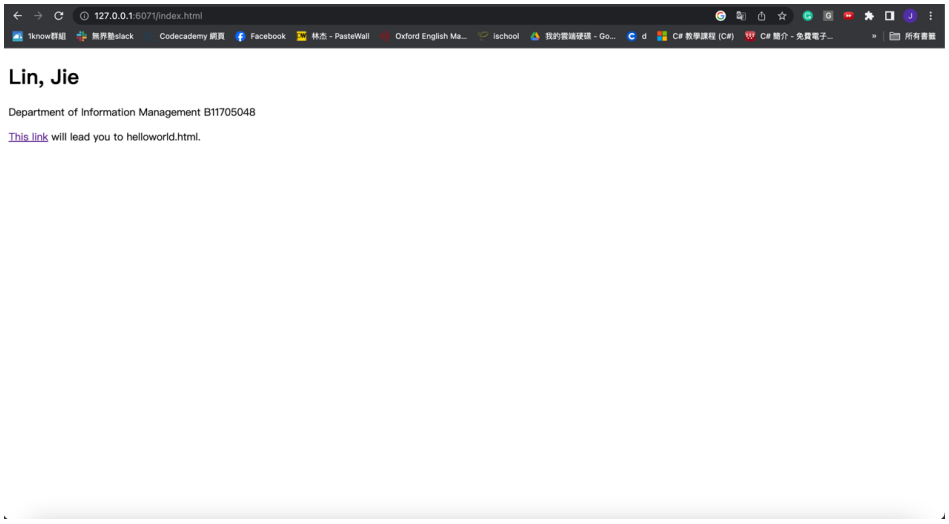
If the requested file is in the web server, the server will return the “HTTP/1.1 200 OK\r\n\r\n” message and the requested content line by line. If the requested file is not in the web server, the server will send the “HTTP/1.1 404 Not Found\r\n\r\n” message back to the client, and the browser will simply show “404 Not Found”.

Output when trying to access index.html:

```
jaylin@JaydeMacBook-Air HW#1 Socket Programming % cd p2
jaylin@JaydeMacBook-Air p2 % python3 web_server.py
Ready to serve...
('127.0.0.1', 58926) connected
client's request message:
 GET /index.html HTTP/1.1
Host: 127.0.0.1:6071
Connection: keep-alive
Cache-Control: max-age=0
sec-ch-ua: "Chromium";v="118", "Google Chrome";v="118", "Not=A?Brand";v="99"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "macOS"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/118.0.0.0 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: zh-TW,zh;q=0.9,en-US;q=0.8,en;q=0.7

Extract the filename: index.html
Ready to serve...
```

The webpage of index.html:

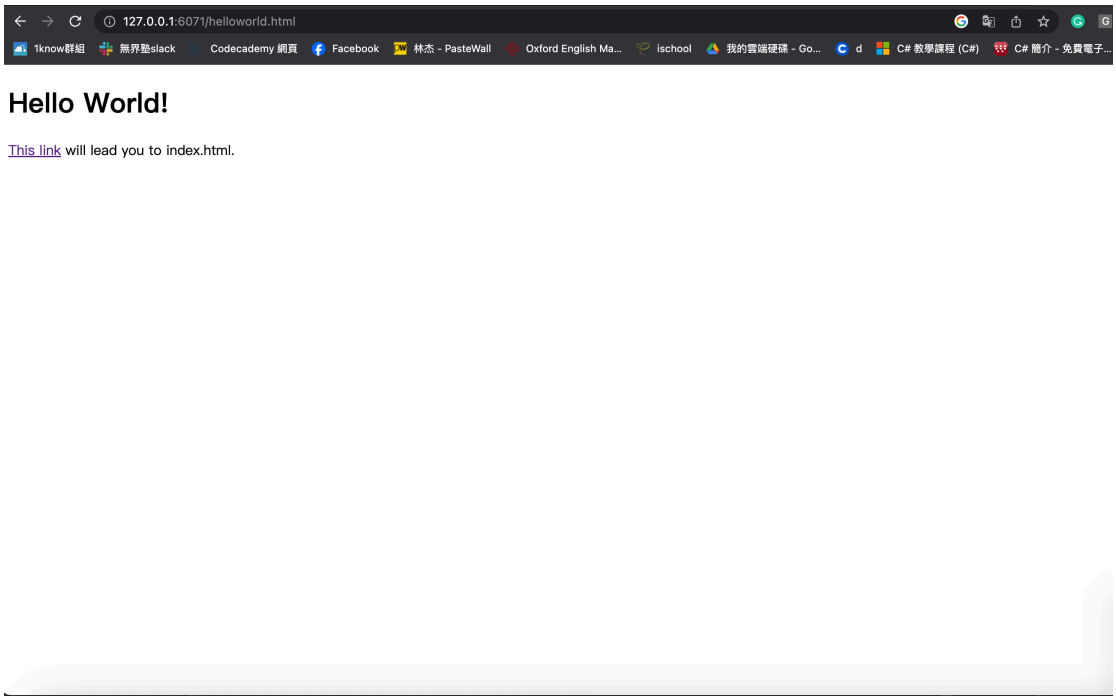


Output when accessing hellworld.html through index.html:

```
Extract the filename: index.html
Ready to serve...
('127.0.0.1', 58931) connected
client's request message:
 GET /helloworld.html HTTP/1.1
Host: 127.0.0.1:6071
Connection: keep-alive
sec-ch-ua: "Chromium";v="118", "Google Chrome";v="118", "Not=A?Brand";v="99"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "macOS"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/118.0.0.0 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: same-origin
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Referer: http://127.0.0.1:6071/index.html
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-TW,zh;q=0.9,en-US;q=0.8,en;q=0.7

Extract the filename: helloworld.html
Ready to serve...
```

The webpage of helloworld.html:

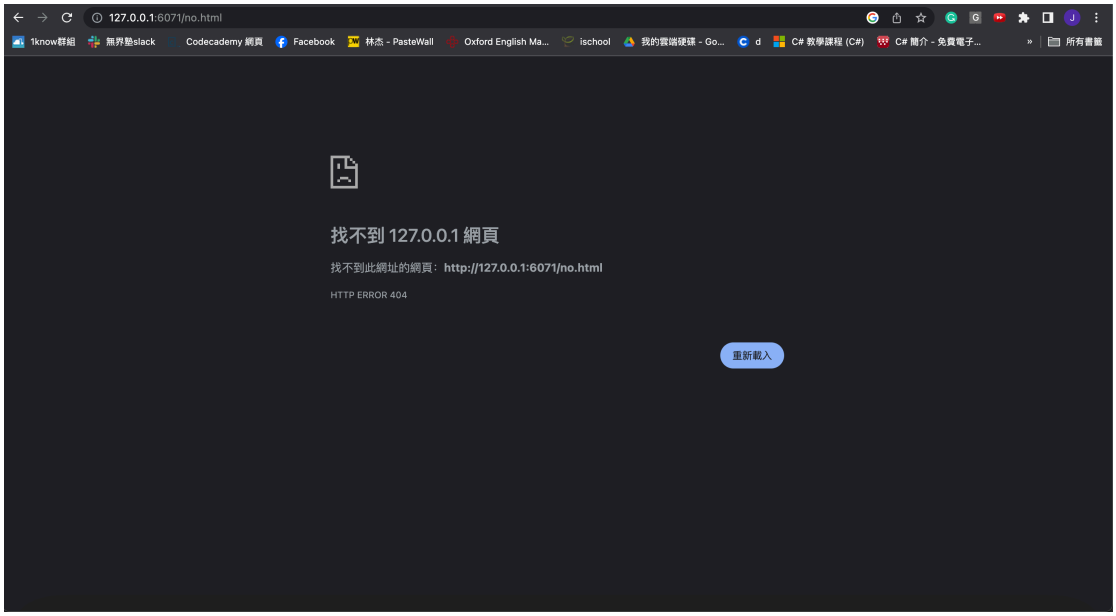


Output of the code when trying to access no.html

```
Ready to serve...
('127.0.0.1', 58938) connected
client's request message:
 GET /no.html HTTP/1.1
Host: 127.0.0.1:6071
Connection: keep-alive
sec-ch-ua: "Chromium";v="118", "Google Chrome";v="118", "Not=A?Brand";v="99"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "macOS"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/118.0.0.0 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: zh-TW,zh;q=0.9,en-US;q=0.8,en;q=0.7


Extract the filename: no.html
```

When I try to access no.html, the web browser will return 404:



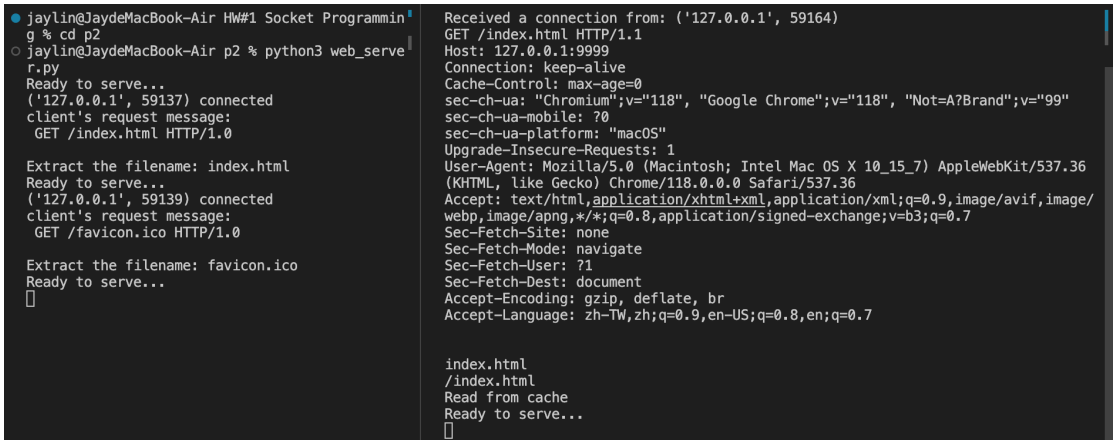
PROBLEM 3

In this problem, I implemented a proxy server. At first, the code creates a socket server, binds the server with the IP address and port and starts listening for requests.

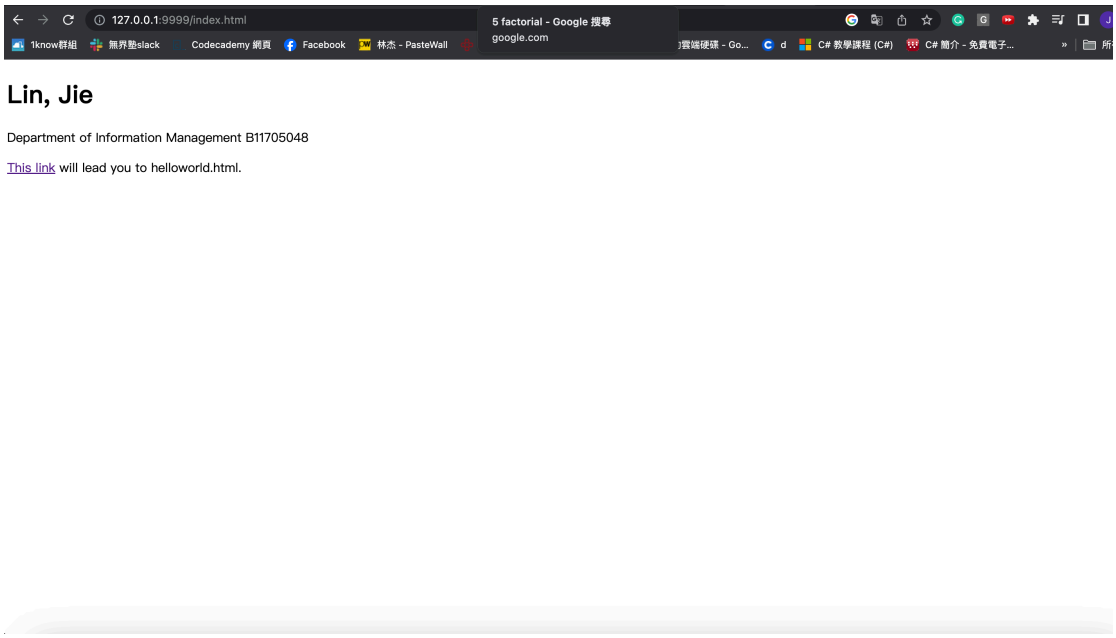
After the connection with the client, the proxy server will look at the request. If the requested file is already in the proxy server, then the proxy server will return 200 and the content of the file directly.

If the requested file is not in the proxy server, the code helps create a socket that connects with the web server. If the file is found in the web server, then return the file to the client and write the file to the proxy server at the same time. If the file is still not found in the web server, then return 404.

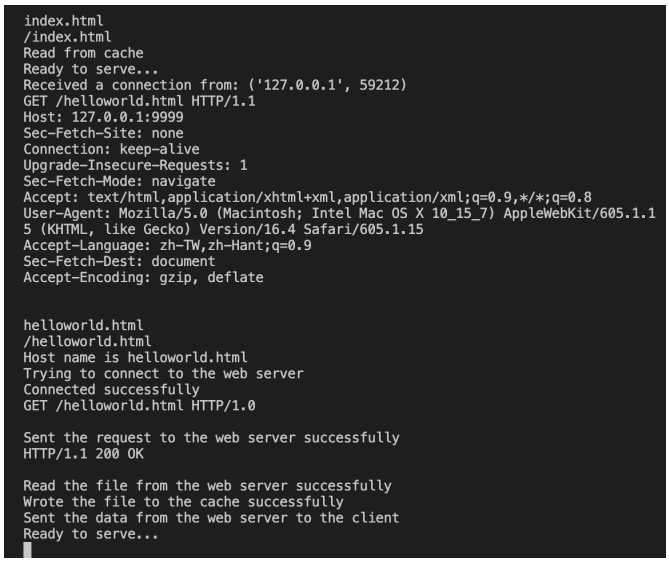
Output when I am trying to access index.html, which is already in the cache:



The web page of index.html from the proxy server:



Output when I am trying to access helloworld.html, which is not in the cache:



```
index.html
/index.html
Read from cache
Ready to serve...
Received a connection from: ('127.0.0.1', 59212)
GET /helloworld.html HTTP/1.1
Host: 127.0.0.1:9999
Sec-Fetch-Site: none
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Mode: navigate
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.1
5 (KHTML, like Gecko) Version/16.4 Safari/605.1.15
Accept-Language: zh-TW,zh-Hant;q=0.9
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate


helloworld.html
/helloworld.html
Host name is helloworld.html
Trying to connect to the web server
Connected successfully
GET /helloworld.html HTTP/1.0

Sent the request to the web server successfully
HTTP/1.1 200 OK

Read the file from the web server successfully
Wrote the file to the cache successfully
Sent the data from the web server to the client
Ready to serve...
```

The helloworld.html webpage accessing by proxy server:

Output when I am trying to access no.html, which does not exist:

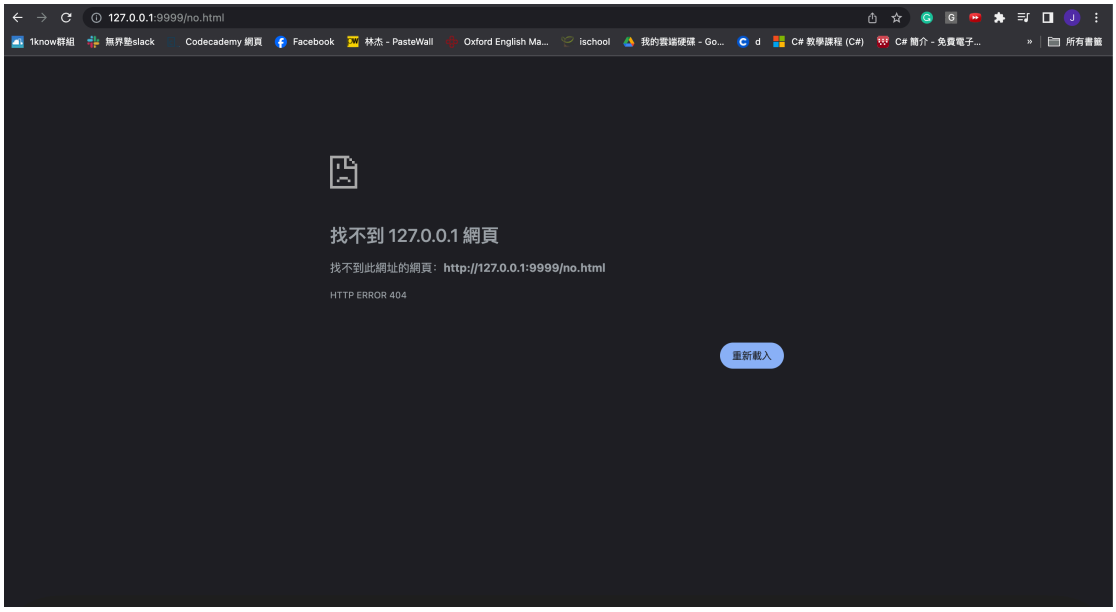
```
Ready to serve...
Received a connection from: ('127.0.0.1', 59221)
GET /no.html HTTP/1.1
Host: 127.0.0.1:9999
Connection: keep-alive
sec-ch-ua: "Chromium";v="118", "Google Chrome";v="118", "Not=A?Brand";v="99"
sec-ch-ua-mobile: ?0
sec-ch-ua-platform: "macOS"
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/118.0.0.0 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: zh-TW,zh;q=0.9,en-US;q=0.8,en;q=0.7


no.html
/no.html
Host name is no.html
Trying to connect to the web server
Connected successfully
GET /no.html HTTP/1.0

Sent the request to the web server successfully
HTTP/1.1 404 Not Found

Ready to serve...
```

When I try to access no.html via the proxy server, the web browser will return 404:



The output when using Safari (instead of Chrome) to access index.html:

```
index.html
/index.html
Read from cache
Ready to serve...
Received a connection from: ('127.0.0.1', 59201)
GET /index.html HTTP/1.1
Host: 127.0.0.1:9999
Sec-Fetch-Site: none
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Mode: navigate
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.1
5 (KHTML, like Gecko) Version/16.4 Safari/605.1.15
Accept-Language: zh-TW,zh-Hant;q=0.9
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate


index.html
/index.html
Read from cache
Ready to serve...
```

Trying to access index.html via proxy server using Safari:

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This link will lead you to helloworld.html.