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1. I start my multi-threaded web server, hosting on port 1500 and localhost aka 127.0.0.1

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\mtserver.py
Server has been started
```

2. I then use client.py to initiate a TCP connection and send a request to display the HelloWorld.html file. This is the response:

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\client.py 127.0.0.1 1500 HelloWorld.html
run client is called
GET /HelloWorld.html HTTP/1.1
Host: 127.0.0.1:1500
Connection: keep-alive
Cache-Control: max-age=0
DNT: 1
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/85.0.4183.121 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=0.9
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

HTTP/1.1 200 OK
Content-Type: text/html

<html>
<body>
<br>
Hello World!!!
<br>
</body>
</html>
```

2.1 As you can see, I've printed the response I sent to the server, and received the 200 OK message saying the file has been located. I also printed the contents of the file, which is displayed in the <html>...<html> brackets.

3. The server then prints...

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\mtserver.py
Server has been started
[<Thread(Thread-1, started 6316)>]
HTTP/1.1 200 OK Response has been Sent
```

3.1 The first print is the list of separate threads the server has created. Besides the main thread, the server has now created a new thread in order to handle this request I just sent. It seems that the server has found the file which was requested and has sent a 200 OK response back to the client, as you can see in figure 2.1.

#### 4. Now what happens if I request a file which is not found? The client must first send the request.

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\client.py 127.0.0.1 1500 NotHelloWorld.html
run_client is called
GET /NotHelloWorld.html HTTP/1.1
Host: 127.0.0.1:1500
Connection: keep-alive
Cache-Control: max-age=0
DNT: 1
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/85.0.4183.121 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=0.9
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

HTTP/1.1 404 Not Found
```

4.1 As you can see, there is no such file as NotHelloWorld.html in the server, thus it returns a 404 Not Found Error with an empty body.

#### 5. The server prints...

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\mtserver.py
Server has been started
[<Thread(Thread-1, started 5828)>]
HTTP/1.1 200 OK Response has been Sent
[<Thread(Thread-1, stopped 5828)>, <Thread(Thread-2, started 3764)>]
HTTP/1.1 404 Not Found Response has been Sent
```

5.1 In this case, the server first creates a new Thread in order to process this request. It then returns a 404 Not Found Response to the client signifying there is no NotHelloWorld.html file found as shown in figure 4.1.

#### 6. Now let's take a look at how this looks on a browser, rather than client.py.



Hello World!!!

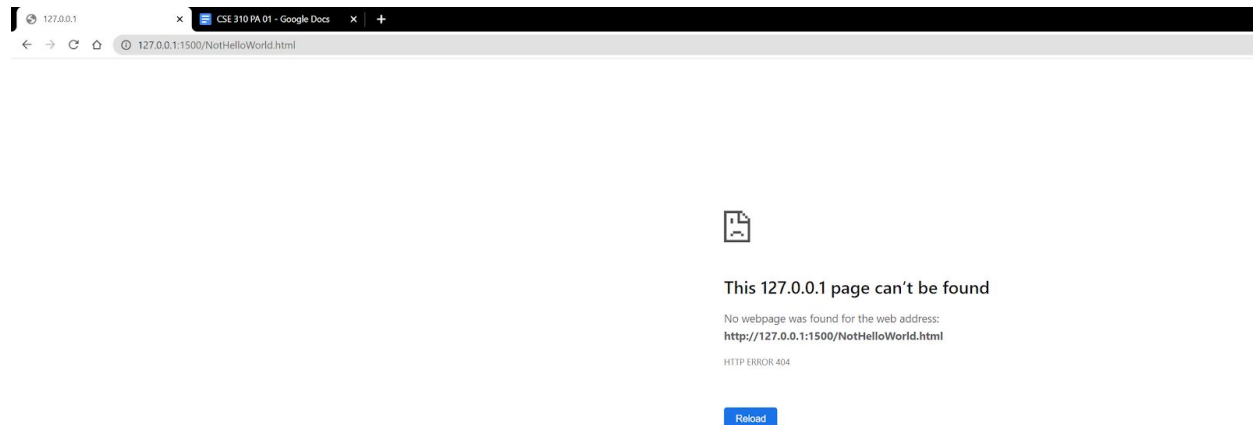
6.1 This image shows that the server has returned HelloWorld.html correctly to the browser, which has displayed it as an html file, including all the html tags.

## 7. The server responds...

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\mtserver.py
Server has been started
[<Thread(Thread-1, started 5828)>]
HTTP/1.1 200 OK Response has been Sent
[<Thread(Thread-1, stopped 5828)>, <Thread(Thread-2, started 3764)>]
HTTP/1.1 404 Not Found Response has been Sent
[<Thread(Thread-1, stopped 5828)>, <Thread(Thread-2, stopped 3764)>, <Thread(Thread-3, started 9432)>]
HTTP/1.1 200 OK Response has been Sent
```

7.1 Once again, the server has created a new thread and sent a 200 OK Response, which the browser has seen and displays the file as shown in figure 6.1.

## 8. How does a browser react when NotHelloWorld.html is requested?



8.1 The browser displays the HTTP ERROR 404 page, showing no file was found.

## 9. The server now has printed that it returned a 404 page error back to the client.

```
PS C:\Users\khurr\Desktop\Fall 2020\CSE 310\CSE310_F20_PA01> py .\mtserver.py
Server has been started
[<Thread(Thread-1, started 19604)>]
HTTP/1.1 200 OK Response has been Sent
[<Thread(Thread-1, stopped 19604)>, <Thread(Thread-2, started 10688)>]
HTTP/1.1 404 Not Found Response has been Sent
[<Thread(Thread-1, stopped 19604)>, <Thread(Thread-2, stopped 10688)>, <Thread(Thread-3, started 10560)>]
HTTP/1.1 200 OK Response has been Sent
[<Thread(Thread-1, stopped 19604)>, <Thread(Thread-2, stopped 10688)>, <Thread(Thread-3, stopped 10560)>, <Thread(Thread-4, started 9196)>]
HTTP/1.1 404 Not Found Response has been Sent
```