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**Assignment Name:** COEN 317 – Distributed System – Programming Assignment #1

**High-level description of the assignment and what your program(s) does:**

This programming assignment is to develop a HTTP web server application that can handle multiple concurrent client requests and handle error cases as well as log HTTP requests and responses.

My application is an HTTP 1.0 web server that can process and service HTTP GET requests from web browsers. In order to run the program, two command line options are necessary (document\_root and port number). When the program is executed, it continually listens on a port and uses a multi-threaded approach in order to service client requests. Once a request comes to the server, the server will spawn a worker thread in order to handle the request and will continue to listen for more client requests on the same socket. The worker thread will look at the request, and write the file to the client socket (if there are no issues) and will receive an HTTP response (whether that be code 200 or a different error code). For the default page (a request to “/”) we will change the file path to “/index.html”. If a file requested by the client is not found, an error code 404 will be returned, and if a client request is not a GET request, an error code 400 will be returned instead. If the file requested by the client is not world readable, then an error code 403 is returned, and if the client request has no issues, a status code 200 is returned. The socket connection is closed after the client has received the response to its request.

**List of submitted files:**

1. Server.java
2. Readme.pdf
3. Compile\_Instructions.txt

**Instructions for running program:**

1. Prerequisite before running program:
  - a. Java Runtime Version 11.0.16 or higher is required (as I used Version 11.0.16 to write my code).
2. In order to run my HTTP 1.0 web server, it needs to be compiled first.
  - a. To compile my application, run the command `javac Server.java`
3. To run the program, type in `java Server – document_root <$DOCUMENT_ROOT> - port <$PORT>`
  - a. An example of this would be: `java Server – document_root /home/ubuntu/webserver_files – port 8888`

Include snapshots of a web browser accessing your web server and should log all the request from the client to the server. In addition, show the logs including the request contents:

## Client web browser requests “/”:

The image displays a web browser window (Mozilla Firefox) showing the Santa Clara University homepage. The browser's address bar indicates the URL is `localhost:8001`. The page content includes the university's name, "SANTA CLARA UNIVERSITY", and its tagline, "THE JESUIT UNIVERSITY IN SILICON VALLEY". A navigation menu is visible, and a large banner features a photograph of a graduation ceremony with the text "The Inauguration of President Julie Sullivan" and "Santa Clara University formally introduces its 30th President." A button labeled "Watch the Ceremony" is present on the banner.

Simultaneously, a terminal window on the left shows the output of a Java Server application running on port 8001. The terminal displays the following log entries:

```
jm@VRTHE367: ~/Desktop/COEN317-Before
File Edit View Search Terminal Help
jm@VRTHE367:~/Desktop/COEN317-Before$ java Server -document_root /home/jm/Desktop/COEN317-Before/ -port 8001
GET / HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/index.html

HTTP/1.0 response from the server to client request:
HTTP/1.0 200 OK
Content-Type: text/html
Content-Length: 37041
Date: Thu Oct 13 23:17:28 PDT 2022

Closing socket connection.....

GET /media/scuedu/style-assets/stylesheets/f.css HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/css,*/*;q=0.1
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Referer: http://localhost:8001/
Sec-Fetch-Dest: style
Sec-Fetch-Mode: no-cors
Sec-Fetch-Site: same-origin

/home/jm/Desktop/COEN317-Before/media/scuedu/style-assets/stylesheets/f.css

HTTP/1.0 response from the server to client request:
HTTP/1.0 404 Not Found
Content-Type: text/html
Content-Length: 29
Date: Thu Oct 13 23:17:28 PDT 2022

Closing socket connection.....

GET /media/institutional-pages/news-amp-events/Inauguration_20221006_JL_9200.JPG HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: image/avif,image/webp,*/*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
```

# Client web browser requests “/text.txt”:

The image shows a side-by-side comparison of a terminal window and a web browser window, illustrating a client request for a text file.

**Terminal Window (Left):** The terminal shows the output of a web server. It starts with a closing socket connection, followed by a GET request for /favicon.ico. The response is a 404 Not Found. Then, it shows a GET request for /test.txt. The response is a 200 OK, indicating the file was successfully served. The terminal text is as follows:

```
jm@VRTHE367: ~/Desktop/COEN317-Before
File Edit View Search Terminal Help
ContentType: text/html
ContentLength: 29
Date: Thu Oct 13 23:18:44 PDT 2022

Closing socket connection.....

GET /favicon.ico HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: image/avif,image/webp,*/*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Referer: http://localhost:8001/testing.txt
Sec-Fetch-Dest: image
Sec-Fetch-Mode: no-cors
Sec-Fetch-Site: same-origin

/home/jm/Desktop/COEN317-Before/favicon.ico

HTTP/1.0 response from the server to client request:

HTTP/1.0 404 Not Found
ContentType: text/html
ContentLength: 29
Date: Thu Oct 13 23:18:44 PDT 2022

Closing socket connection.....

GET /test.txt HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/test.txt

HTTP/1.0 response from the server to client request:

HTTP/1.0 200 OK
ContentType: text/plain
ContentLength: 16
Date: Thu Oct 13 23:18:48 PDT 2022

Closing socket connection.....
```

**Web Browser Window (Right):** The browser window shows the address bar with the URL `localhost:8001/test.txt`. The page content displays the text `This is a test.`

# Client web browser requests “/SampleGifImage\_40kbmb.gif”:

The screenshot displays a terminal window on the left and a Mozilla Firefox browser window on the right, illustrating a client web browser request for a GIF image.

**Terminal Window (Left):**

```
jm@VRTHE367: ~/Desktop/COEN317-Before
File Edit View Search Terminal Help
ContentLength: 29
Date: Thu Oct 13 23:18:44 PDT 2022

Closing socket connection.....

GET /test.txt HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/test.txt

HTTP/1.0 response from the server to client request:

HTTP/1.0 200 OK
ContentType: text/plain
ContentLength: 16
Date: Thu Oct 13 23:18:48 PDT 2022

Closing socket connection.....

GET /SampleGifImage_40kbmb.gif HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/SampleGifImage_40kbmb.gif

HTTP/1.0 response from the server to client request:

HTTP/1.0 200 OK
ContentType: image/gif
ContentLength: 40316
Date: Thu Oct 13 23:19:51 PDT 2022

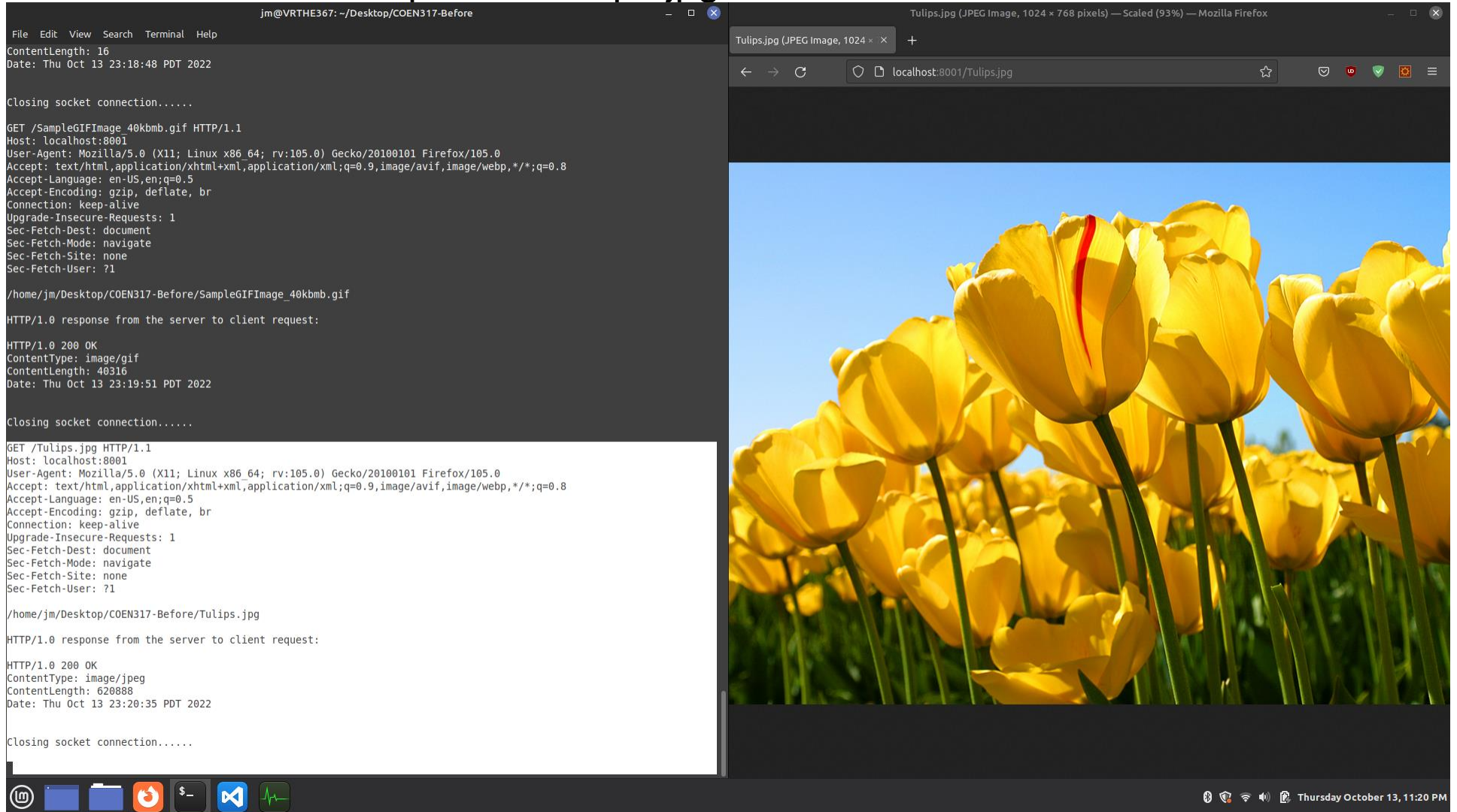
Closing socket connection.....
```

**Browser Window (Right):**

The browser window shows the URL `localhost:8001/SampleGifImage_40kbmb.gif` in the address bar. The page content displays a black silhouette of a bird in flight against a white background.

The system tray at the bottom indicates the date and time: Thursday October 13, 11:20 PM.

# Client web browser requests “/Tulips.jpg”:



The image shows a side-by-side comparison of a terminal window and a web browser window, illustrating a client web browser request for a file named "/Tulips.jpg".

**Terminal Window (Left):**

- Window title: `jm@VRTHE367: ~/Desktop/COEN317-Before`
- Menu: File Edit View Search Terminal Help
- Initial output:

```
ContentLength: 16
Date: Thu Oct 13 23:18:48 PDT 2022

Closing socket connection.....

GET /SampleGIFImage_40kbmb.gif HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/SampleGIFImage_40kbmb.gif

HTTP/1.0 response from the server to client request:

HTTP/1.0 200 OK
ContentType: image/gif
ContentLength: 40316
Date: Thu Oct 13 23:19:51 PDT 2022

Closing socket connection.....

GET /Tulips.jpg HTTP/1.1
Host: localhost:8001
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:105.0) Gecko/20100101 Firefox/105.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1

/home/jm/Desktop/COEN317-Before/Tulips.jpg

HTTP/1.0 response from the server to client request:

HTTP/1.0 200 OK
ContentType: image/jpeg
ContentLength: 620888
Date: Thu Oct 13 23:20:35 PDT 2022

Closing socket connection.....
```

**Web Browser Window (Right):**

- Window title: `Tulips.jpg (JPEG Image, 1024 × 768 pixels) — Scaled (93%) — Mozilla Firefox`
- Tab: `Tulips.jpg (JPEG Image, 1024 × 768 pixels)`
- Address bar: `localhost:8001/Tulips.jpg`
- Content: A photograph of a field of yellow tulips under a clear blue sky. One tulip in the foreground has a distinct red stripe on its petal.

The terminal output shows the sequence of requests and responses for both a GIF and a JPEG image, with the final request being for `/Tulips.jpg`, which is displayed in the browser window.