

CSEN 310: Distributed Systems

Programming Assignment 1

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Description:

A multithreaded web server is built in Java that listens on a specific port, takes client connections, and serves static files from a user-specified document root. At startup, the server configures logging, parses command-line options and launches a main loop that listens for incoming sockets. Each new client's request line is processed by a different thread, which reads the HTTP method (GET), path, and protocol version. The server examines the presence of the file, its permissions, and the authorized file extensions before returning the appropriate status code (200, 404, 403, 400) and minimal headers. If HTTP/1.1 is used, the connection can be kept open for additional requests, whereas HTTP/1.0 ends automatically after each request. Browsers can load HTML pages and embedded resources from the same connection. The code includes logging to track request details, error conditions and active client sessions, demonstrating the principles of client-server communication, multithreading, and basic HTTP protocol handling.

List of files

Note: one readme.pdf is included

The screenshot shows a dark-themed interface, likely a terminal or file explorer, displaying a directory structure. The root directory is labeled **PROGRAMASSIGNMENT-1**. Inside it, there are several sub-directories and files:

- errors**: Contains three files: 400.html, 403.html, and 404.html.
- logs**: A folder.
- others**: Contains four files: cmd.txt, leader-election-1.pdf, scu.jpg, and scu.mp4.
- www.scu.edu**: Contains three files: assets, media, and index.html, along with a robots.txt file.

Below the directory tree, there is a list of items:

- Server.java** (highlighted in red)
- some.html**

At the bottom of the interface, there are navigation links and status indicators:

- OUTLINE**
- TIMELINE**
- JAVA PROJECTS**
- Launchpad**
- 0 ▲ 0**
- Java: Ready**

Run the program:

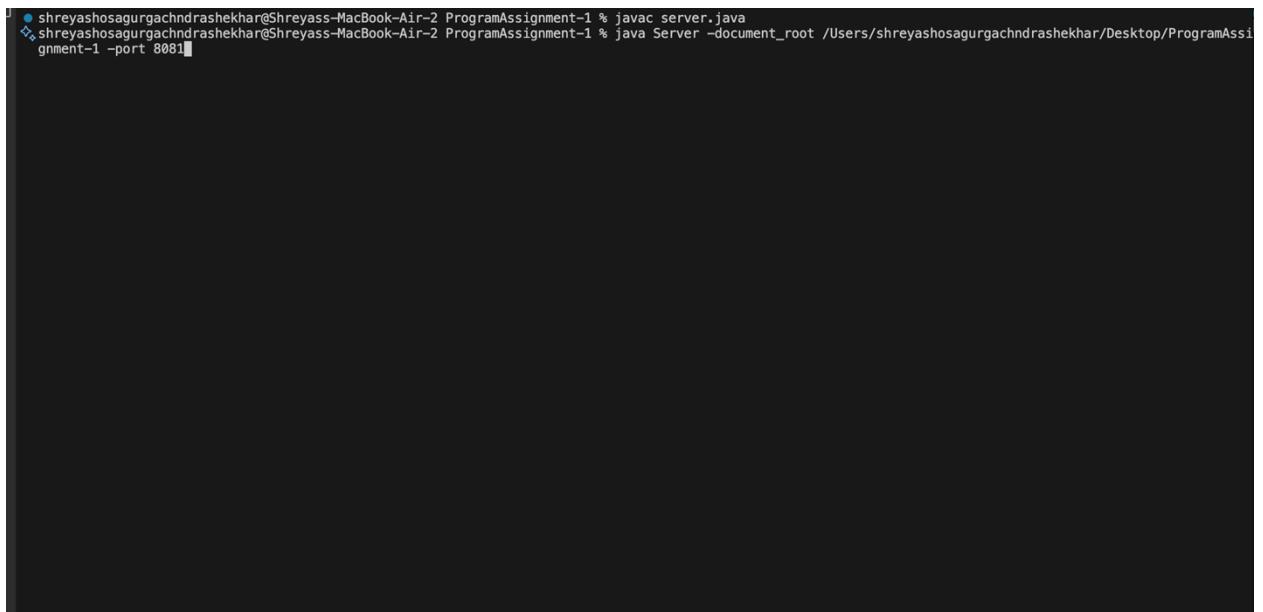
Compile the java code:

Javac server.java

Then

Run

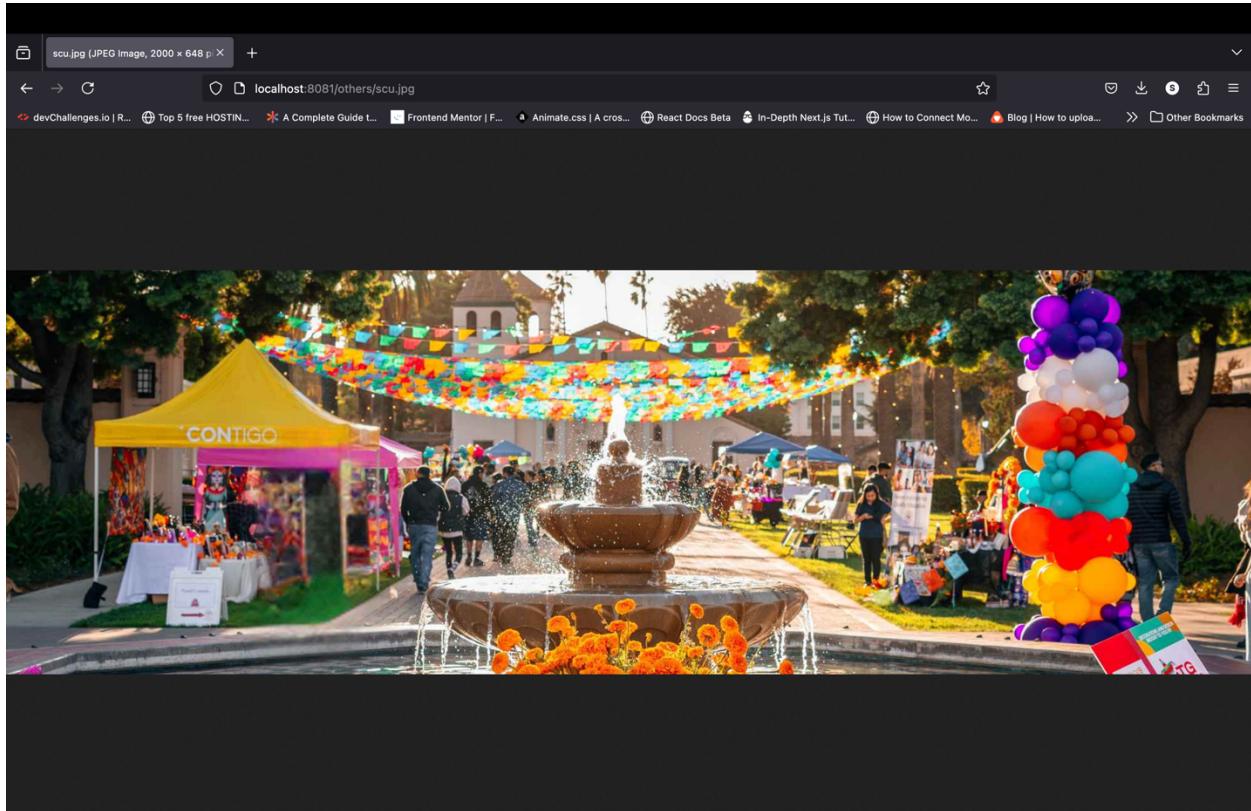
```
java Server -document_root <path> -port <port> [-protocol_version <1.0|1.1>]
```

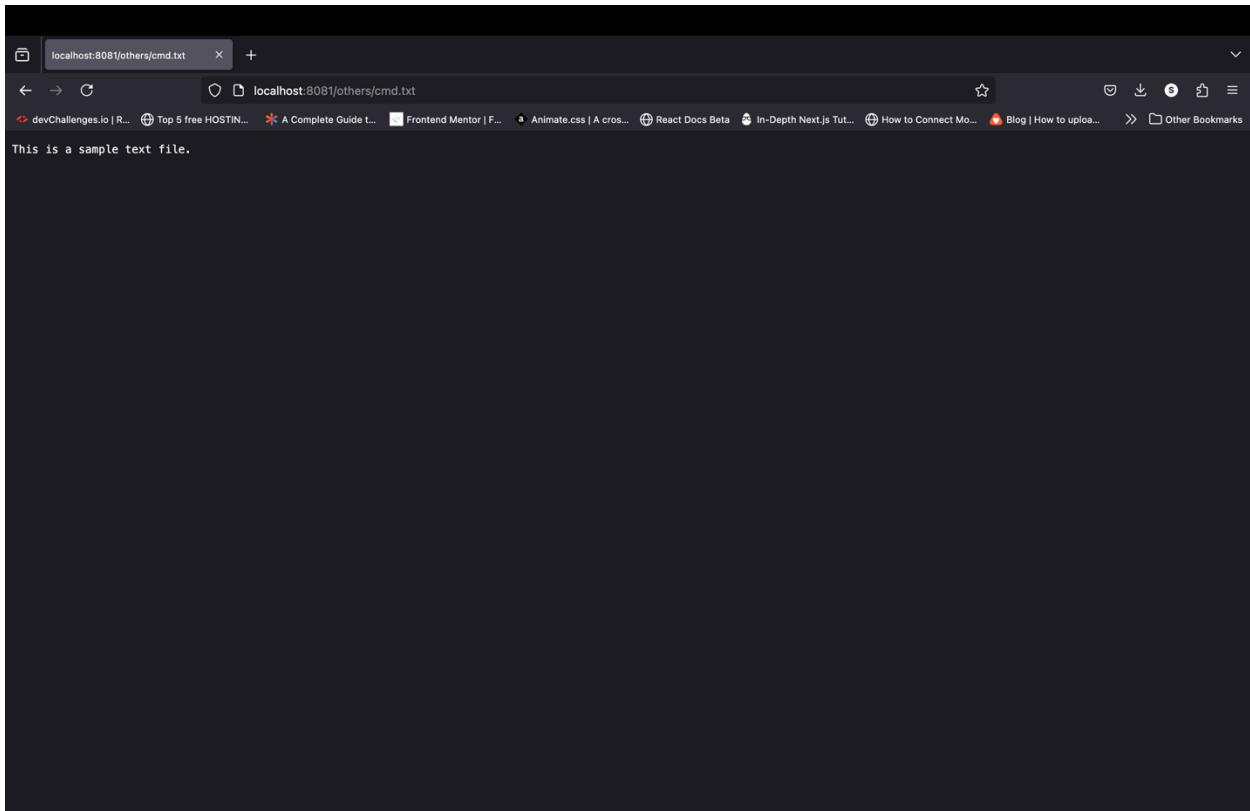
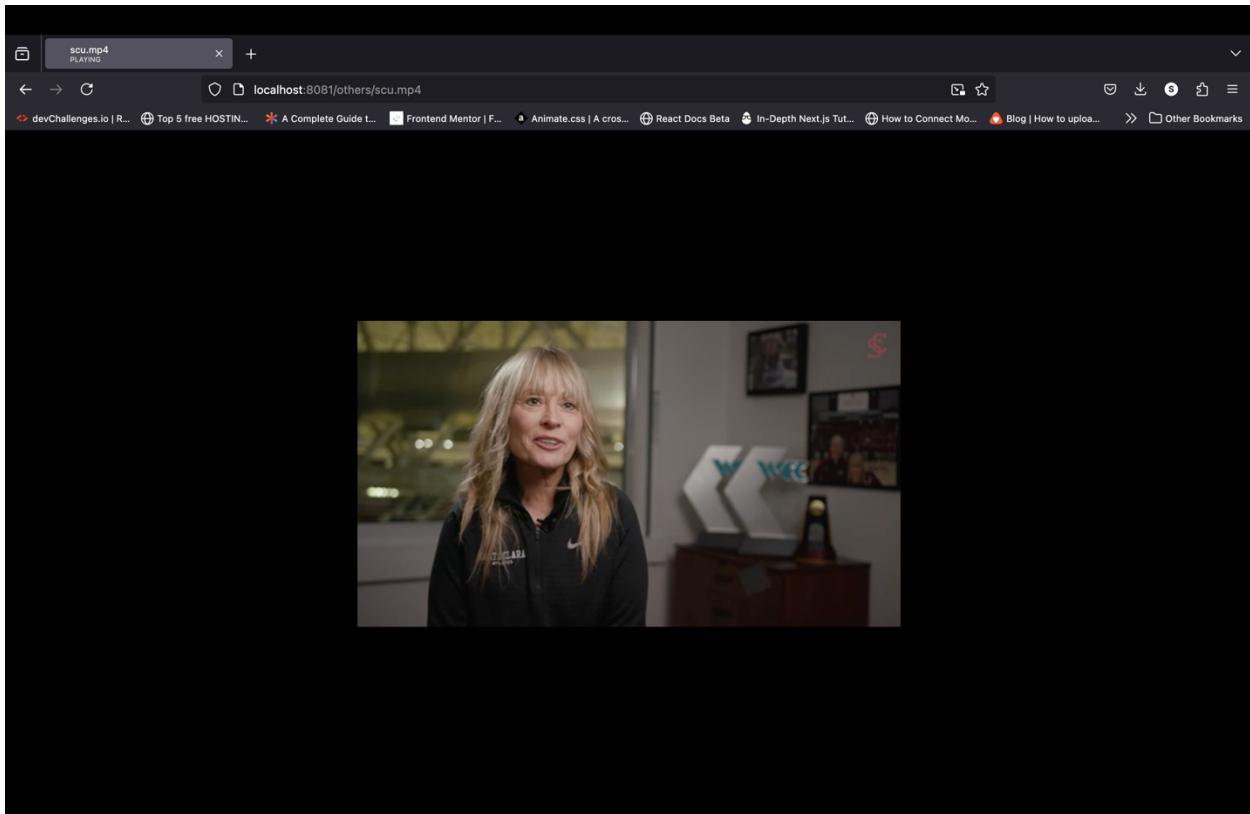
A screenshot of a terminal window on a Mac OS X system. The window title is 'shreyashosagurgachndrashekhar@Shreyass-MacBook-Air-2 ~'. Inside the terminal, the user has run the command 'javac server.java' followed by 'java Server -document_root /Users/shreyashosagurgachndrashekhar/Desktop/ProgramAssignment-1 -port 8081'. The output shows the server is up and listening on port 8081.

Scu web page:

The screenshot shows the official website of Santa Clara University. At the top, there's a dark navigation bar with links like 'Home - Santa Clara University', 'localhost:8081', and various bookmarks. Below it is a light-colored header with the university's name and logo. A red navigation bar contains links for 'ABOUT SCU', 'ACADEMICS', 'ADMISSION', 'ATHLETICS', 'CAMPUS LIFE', 'GIVING', 'GLOBAL', and 'NEWS & EVENTS'. The main content area features a large, stylized title 'Progress Needs *People*' in blue and red. Below the title is a text block: 'At Santa Clara University, we are rising to the occasion, answering the call of what the world needs.' A button labeled 'Start Your SCU Journey' is present. To the right, there are two video thumbnail cards: one showing a man in a lab and another showing a graduate holding a book.

Other types of files:





The screenshot shows a PDF document titled "Leader Election in Distributed Systems with Crash Failures" by Scott D. Stoller. The document includes the author's affiliation at Indiana University, Bloomington, IN 47405, USA, and the date 17 July 1997. The abstract discusses the adaptation of Garcia-Molina's Bully Algorithm for asynchronous systems. The keywords listed are leader election, synchronous, asynchronous, crash failures, and failure detector.

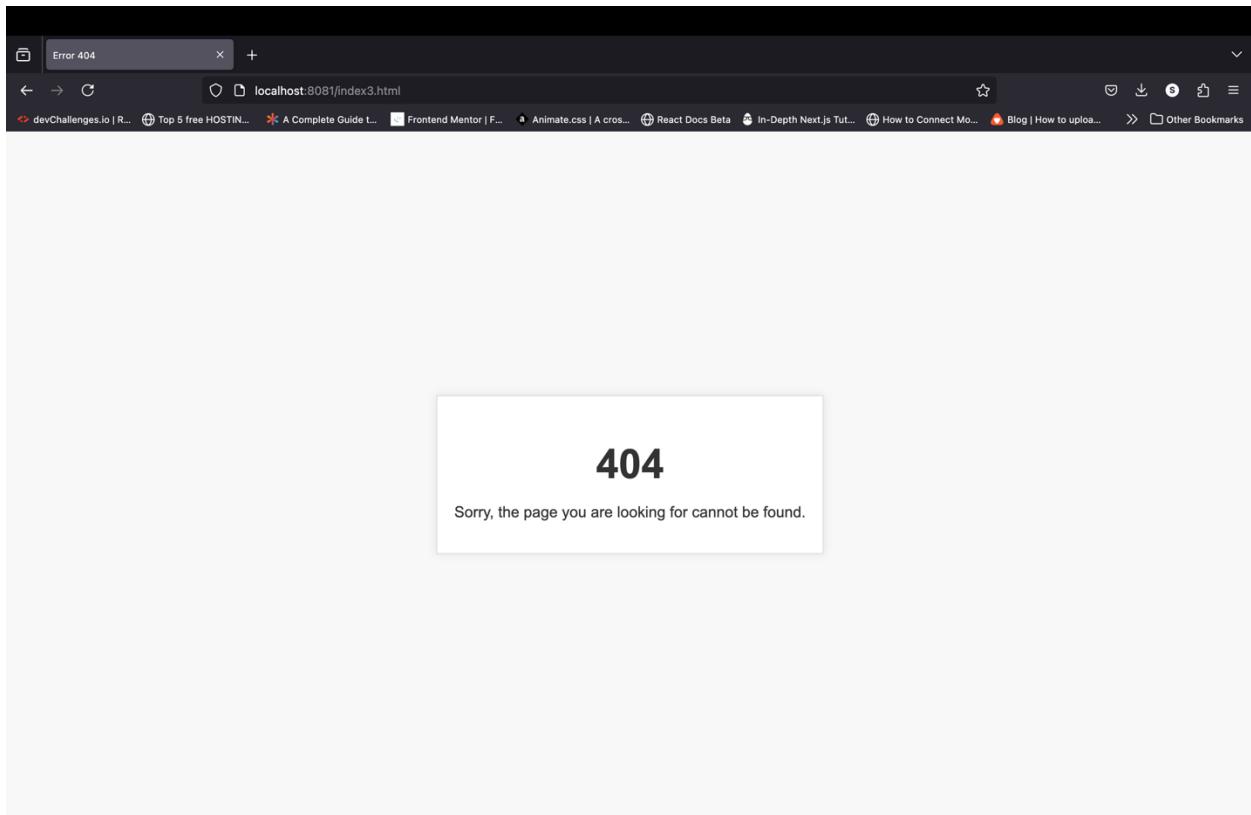
HTTP Codes:

200

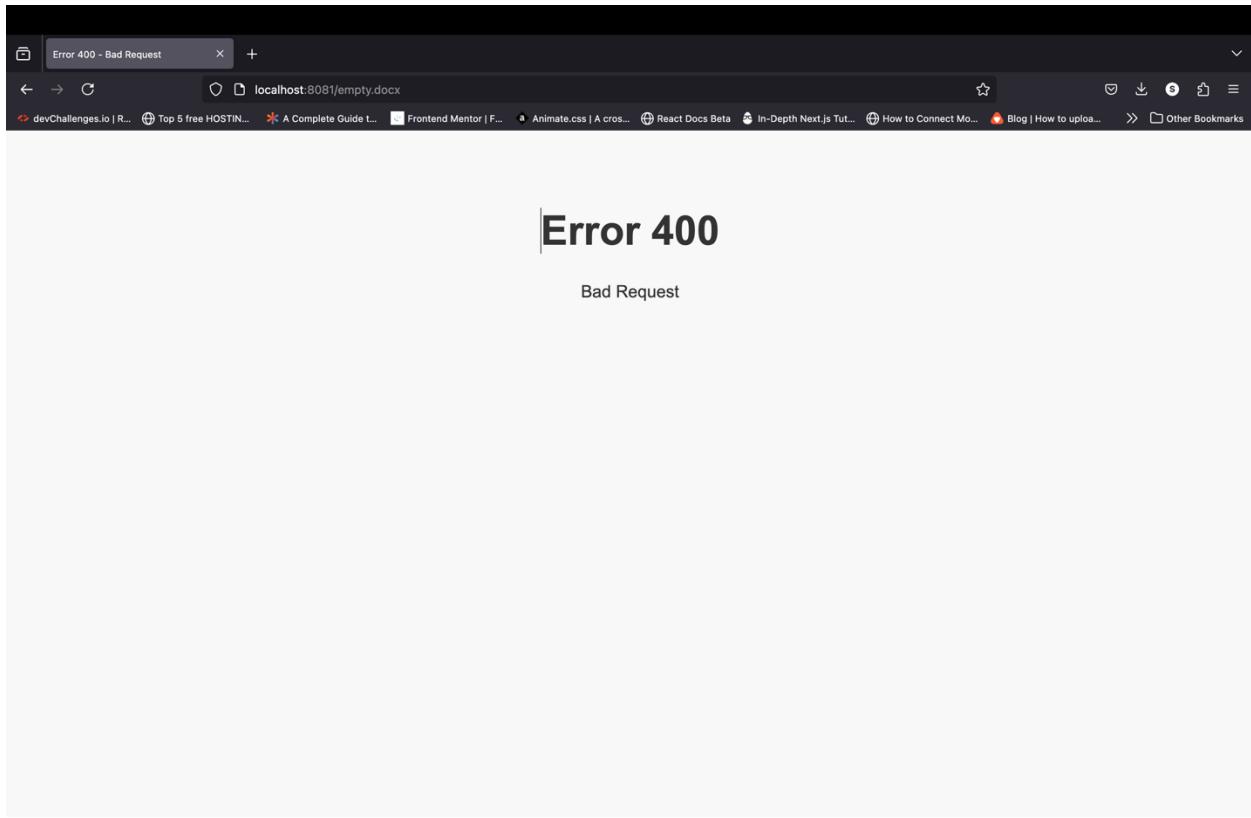
The screenshot shows the Santa Clara University website. The navigation bar includes links for STUDENTS, FACULTY & STAFF, FAMILIES, ALUMNI, VISITORS, OFFICES & SERVICES, and SCHOOLS & CENTERS. The main content area features the university's logo and a search bar. Below the header is a red navigation bar with links for ABOUT SCU, ACADEMICS, ADMISSION, ATHLETICS, CAMPUS LIFE, GIVING, GLOBAL, and NEWS & EVENTS. The bottom portion of the page displays a network traffic analysis tool showing 9 requests, 459.98 KB transferred, and a finish time of 495 ms.

404:

If we find a file that is not present in the directory root

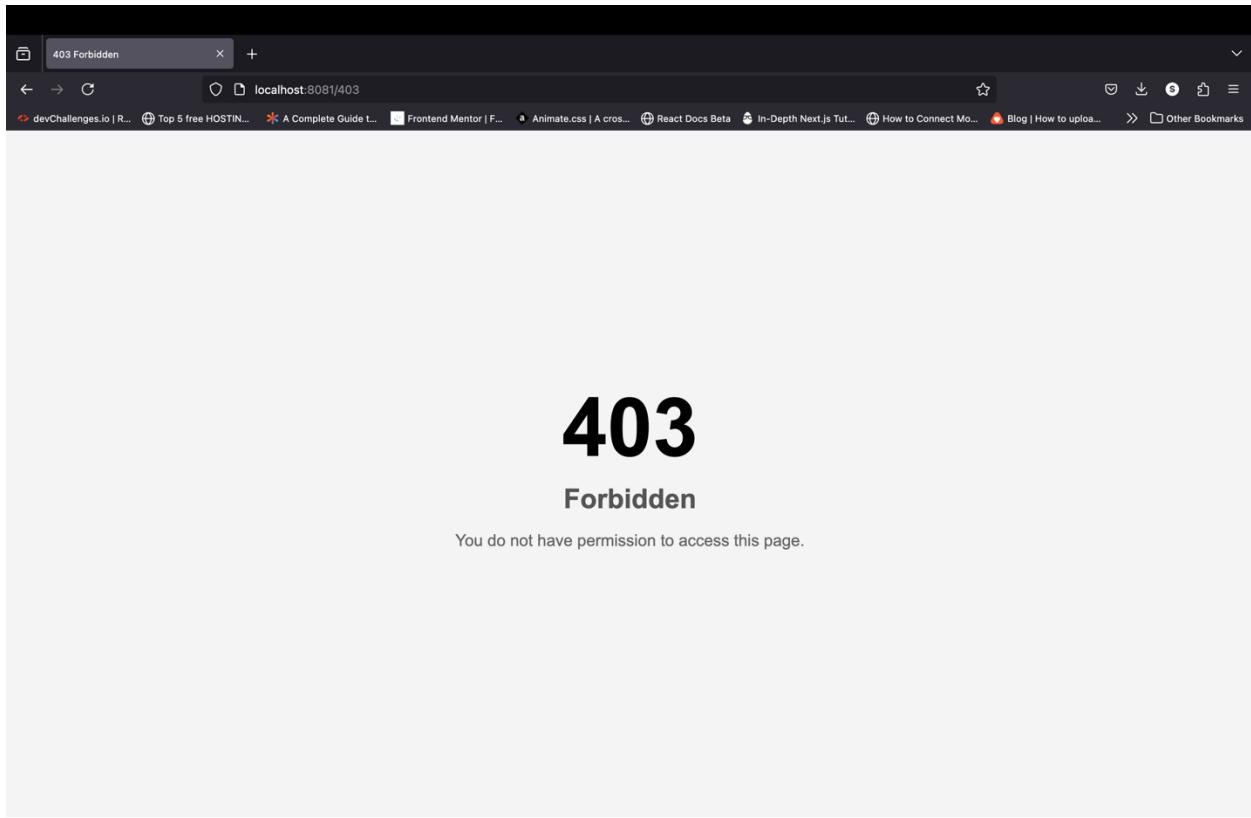


400 :



403:

Note: please change the file permission using “chmod 000 filename” and try it with other user other than the owner because in mac read permission is present even using “chmod” to delete all permission. This is one problem I faced. The code handles forbidden file requests.



Logging :

```
≡ server.log ×
logs > ≡ server.log
314  INFO: [Handler-10] Connection closed: 127.0.0.1
315  Feb 18, 2025 9:58:19 PM Server$ClientTask isAllowedResource
316  INFO: [Handler-11] isAllowedResource checking path: /others/cmd.txt
317  Feb 18, 2025 9:58:19 PM Server$ClientTask resolveFile
318  INFO: [Handler-11] resolveFile: relativePath = others/cmd.txt
319  Feb 18, 2025 9:58:19 PM Server$ClientTask resolveFile
320  INFO: [Handler-11] resolveFile: canonicalTarget = /Users/shreyashosagurgachndrashekhar/Desktop/ProgramAssignment-1/logs from 127.0.0.1
321  Feb 18, 2025 9:58:29 PM Server$ClientTask closeClient
322  INFO: [Handler-11] Connection closed: 127.0.0.1
323  Feb 18, 2025 9:58:41 PM Server$ClientTask <init>
Desktop/ProgramAssignment-1/logs from 127.0.0.1
325  Feb 18, 2025 9:58:41 PM Server$ClientTask isAllowedResource
326  INFO: [Handler-12] isAllowedResource checking path: /index3.html
327  Feb 18, 2025 9:58:41 PM Server$ClientTask resolveFile
328  INFO: [Handler-12] resolveFile: relativePath = index3.html
329  Feb 18, 2025 9:58:41 PM Server$ClientTask resolveFile
330  INFO: [Handler-12] resolveFile: canonicalTarget = /Users/shreyashosagurgachndrashekhar/Desktop/ProgramAssignment-1/errors/404
331  Feb 18, 2025 9:58:41 PM Server$ClientTask sendErrorResponse
332  INFO: Looking for error file at: /Users/shreyashosagurgachndrashekhar/Desktop/ProgramAssignment-1/errors/404.
333  Feb 18, 2025 9:58:51 PM Server$ClientTask closeClient
334  INFO: [Handler-12] Connection closed: 127.0.0.1
335  Feb 18, 2025 10:00:36 PM Server$ClientTask <init>
336  INFO: New connection from 127.0.0.1
337  Feb 18, 2025 10:00:41 PM Server$ClientTask closeClient
338  INFO: [Handler-13] Connection closed: 127.0.0.1
339  Feb 18, 2025 10:00:42 PM Server$ClientTask <init>
340  INFO: New connection from 127.0.0.1
341  Feb 18, 2025 10:00:47 PM Server$ClientTask closeClient
342  INFO: [Handler-14] Connection closed: 127.0.0.1
343  Feb 18, 2025 10:00:47 PM Server$ClientTask <init>
344  INFO: New connection from 127.0.0.1
345  Feb 18, 2025 10:00:47 PM Server$ClientTask isAllowedResource
346  INFO: [Handler-15] isAllowedResource checking path: /others/leader-election-1.pdf
347  Feb 18, 2025 10:00:47 PM Server$ClientTask resolveFile
348  INFO: [Handler-15] resolveFile: relativePath = others/leader-election-1.pdf
349  Feb 18, 2025 10:00:47 PM Server$ClientTask resolveFile
350  INFO: [Handler-15] resolveFile: canonicalTarget = /Users/shreyashosagurgachndrashekhar/Desktop/ProgramAssignment-1/errors/404
351  Feb 18, 2025 10:00:57 PM Server$ClientTask closeClient
352  INFO: [Handler-15] Connection closed: 127.0.0.1
```

```
404 Not Found: /media/scuedu/style-assets/stylesheets/preloading.css
404 Not Found: /media/scuedu/style-assets/javascript/lazyloading.js
400 Bad Request: GET
404 Not Found: /media/external/brand-rollout-announcement/scu-vs-gonzaga-50_img-web-1160x831.jpg
404 Not Found: /media/external/brand-rollout-announcement/scu_aquaponics-20190521-jag-1127_img-web.jpg
404 Not Found: /media/external/brand-rollout-announcement/marielle-thumbnail-still-02.jpg
o/ProgramAssignment-1/logs external/brand-rollout-announcement/global-village-2024-60_img-web-759x545.jpg
        external/brand-rollout-announcement/sam-thumbnail-still-02.jpg
404 Not Found: /media/external/brand-rollout-announcement/amelia_fuller_lab_20231115_jg_1219_img-web-759x545.jpg
404 Not Found: /media/external/brand-rollout-announcement/business-commencement-3534_img-web-1160x831.jpg
404 Not Found: /media/external/brand-rollout-announcement/scu-mission-church_img-web-759x545.jpg
404 Not Found: /media/scuedu/style-assets/stylesheets/f.css
404 Not Found: /assets/public/scu.js
404 Not Found: /media/external/brand-rollout-announcement/sam-thumbnail-still-02.jpg
404 Not Found: /media/external/brand-rollout-announcement/marielle-thumbnail-still-02.jpg
400 Bad Request: GET
404 Not Found: /media/external/brand-rollout-announcement/scu_aquaponics-20190521-jag-1127_img-web.jpg
404 Not Found: /media/external/brand-rollout-announcement/scu-vs-gonzaga-50_img-web-1160x831.jpg
404 Not Found: /media/external/brand-rollout-announcement/amelia_fuller_lab_20231115_jg_1219_img-web-759x545.jpg
404 Not Found: /media/external/brand-rollout-announcement/business-commencement-3534_img-web-1160x831.jpg
404 Not Found: /media/external/brand-rollout-announcement/scu-mission-church_img-web-759x545.jpg
400 Bad Request: GET
404 Not Found: /media/external/brand-rollout-announcement/global-village-2024-60_img-web-759x545.jpg
404 Not Found: /media/external/brand-rollout-announcement/beige-badge-background-icon.png
404 Not Found: /media/external/brand-rollout-announcement/sun-pattern-stats.png
404 Not Found: /media/scuedu/style-assets/javascript/lazyloading.js
404 Not Found: /media/scuedu/style-assets/stylesheets/preloading.css
404 Not Found: /scu-logo.png
404 Not Found: /media/external/brand-rollout-announcement/sam-thumbnail-still-02.jpg
Connection closed: 127.0.0.1
New connection from client 127.0.0.1
404 Not Found: /media/external/brand-rollout-announcement/marielle-thumbnail-still-02.jpg
Connection closed: 127.0.0.1
New connection from client 127.0.0.1
Connection closed: 127.0.0.1
New connection from client 127.0.0.1
Error sending file: Broken pipe
Error processing client request: Connection reset
Connection closed: 127.0.0.1
Connection closed: 127.0.0.1
New connection from client 127.0.0.1
404 Not Found: /index3.html
Connection closed: 127.0.0.1
```

References:

<https://www.geeksforgeeks.org/how-to-set-up-a-basic-http-server-in-java/>

<https://docs.oracle.com/javase/tutorial/networking/sockets/>

<https://www.w3schools.com>

<https://medium.com/@sakhawy/creating-an-http-server-from-scratch-ed41ef83314b>