

GTU Department of Computer Engineering
CSE 344 – Spring 2024
Midterm Report

Bariş Batuhan Bolat
210104004029

Usage

- First at main directory type make to compile both server and client files.

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm$ make
```

- To start the server, type the following command in the **server_side** folder.

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/server_side$ ./neHosServer.out test 5
Server Started PID 27242
Waiting for clients...
```

- To connect the server, type the following command in the **client_side** folder.

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 27242
Connection established
Enter comment:
```

System Architecture

1. Server process:

- Manages client connections and spawns child processes to handle individual clients.
- Listens for client requests on a named fifos (**/tmp/<server_pid>_server_fifo**).
- Maintains a log file (**server.log**) to record server activity.
- Uses a semaphore (**sem**) to ensure mutual exclusion for critical sections.

2. Client process: (Created for each connected client)

- Handles communication with a specific client.
- Opens a named pipe for communication with the client (**/tmp/<client_pid>_fifo**).
- Reads requests from the client and performs necessary actions.

Design Decisions

- **Named pipes (FIFOs):** Used for communication between server and clients for efficient data exchange.
- **Semaphores:** Ensure thread safety for critical sections like updating the `connected_clients` count.
- **Error handling:** The program checks for errors during system calls and exits with appropriate codes.
- **Logging:** Server logs activity to a file (**server.log**) for debugging and monitoring purposes.
- **Maximum connections:** The server limits the number of concurrent client connections using **max_clients**.

Details

- **Command-line arguments:** The program expects two arguments:
 - Directory path (**argv[1]**) to handle client requests (potentially creating files/directories within this directory).
 - Maximum number of clients (**argv[2]**).
- **Server startup:**
 - Creates a named pipe for the server (**/tmp/<server_pid>_server_fifo**).
 - Opens the log file (**server.log**) for writing.
 - Initializes a semaphore (**sem**) with a value of 1.
 - Validates the **max_clients** value.
 - Logs server startup information with the maximum client count.
 - If the directory doesn't exist, creates it.
- **Main loop:**
 - Continuously checks for the server named pipe's existence (indicating server termination if removed).
 - Reads the client's PID from the server named pipe.
 - Handles new client connections:
 - Creates a named pipe for the client (**/tmp/<client_pid>_fifo**).
 - If the connected client count is less than the maximum allowed, forks a child process.
 - The child process:
 - Closes the server named pipe (no longer needed).
 - Opens the client named pipe for writing.
 - Sends an acknowledgement message to the client.
 - Calls the `handle_client` function to handle client communication (implementation not provided).
 - Exits after finishing client interaction.
 - If the server is full, sends a rejection message to the client through their named pipe.

Test Cases

Test Case 1: Successful connection and basic communication

- **Server:** Running with default settings.
- **Client:** Connects to the server using the correct PID.
- **Expected Output :**
 - Connection established message on client.
 - Client prompts for user input.
 - Client sends messages to the server and receives responses.
 - Client exits gracefully using "quit".
- **Outputs:**

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/server_side$ ./neHosServer.out test 2
Server Started PID 3418
Waiting for clients...
Client with PID 3480 connected.
Client PID: 3480 disconnected.
```

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3418
Connection established
Enter comment: quit
Sending write request to server log file
waiting for logfile ...
logfile write request granted
bye..
```

Test Case 2: Connection failure - Server full

- **Server:** Running with a maximum connection limit of 1.
- **Client 1:** Connects to the server successfully.
- **Client 2:** Attempts to connect to the same server.
- **Expected Output (Client 1):**
 - Connection established message.
 - Normal client interaction.
- **Expected Output (Client 2):**
 - Connection Failed message (server full).
 - Client exits.
- **Outputs:**

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/server_side$ ./neHosServer.out test 1
Server Started PID 3509
Waiting for clients...
Client with PID 3518 connected.
```

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3509
Connection established
Enter comment:
```

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3509
Connection Failed. Server is full.
```

Test Case 3: Connection failure - Wrong server PID

- **Server:** Running with default settings.
- **Client:** Connects using an incorrect server PID.
- **Expected Output (Client):**
 - Wrong PID message.
 - Connection Failed message.
- **Outputs:**

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/server_side$ ./neHosServer.out test 2
Server Started PID 3530
Waiting for clients...
█
```

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3529
Wrong PID. Connection Failed.
```

Test Case 4: File upload (12 MB)

- **Server:** Running with default settings.
- **Client:** Connects to the server.
- **Client:** Issues an "upload <filename>" command with a valid file within the allowed size limit
- **Expected Output (Client):**
 - Server prompts or acknowledges the upload.
 - Client receives confirmation message.
- **Outputs:**

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3530
Connection established
Enter comment: upload x.pdf
File transfer request received. Beginning file transfer:
12221622 bytes transferred
Upload successful
Enter comment:
```

Test Case 5: File download (12 MB)

- **Server:** Running with a file available for download.
- **Client:** Connects to the server.
- **Client:** Issues a "download <filename>" command with a filename existing on the server.
- **Expected Output (Client):**
 - Server prompts or acknowledges the download.
 - Client receives the downloaded file.
- **Outputs:**

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3590
Connection established
Enter comment: download x.pdf
File transfer request received. Beginning file transfer:
12221622 bytes transferred
Download successful
Enter comment: █
```

Test Case 6(Others)

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/client_side$ ./neHosClient.out connect 3625
Connection established
Enter comment: help
Available commands are:
help, list, readF, writeT, upload, download, archServer, quit, killServer

Enter comment: list
server.c
client.c
reader.c
test.txt
x.pdf
```

```
Enter comment: readF test.txt 3
Mark
Enter comment: writeF test.txt 3 Bruce
Invalid command

Enter comment: writeT test.txt 3 Bruce
Line added succesfully.
```

```
Enter comment: archServer archive.tar
Client PID: 3666 read test/test.txt.
Archive created successfully:
archive.tar
```

killServer

- Server

```
baris@baris-VirtualBox:~/Desktop/CSE344/Midterm/server_side$ ./neHosServer.out test 3
Server Started PID 3884
Waiting for clients...
Client with PID 3891 connected.
Client with PID 3893 connected.
Client PID: 3891 request server shutdown.
```

- Client 1

```
Connection established
Enter comment: killServer
Server shutting down...

Terminated
```

- Client 2

```
Connection established
Enter comment: Terminated
```

Quit

- Server

```
Server Started PID 3914
Waiting for clients...
Client with PID 3918 connected.
Client PID: 3918 disconnected.
█
```

- Client

```
Connection established
Enter comment: quit
Sending write request to server log file
waiting for logfile ...
logfile write request granted
bye..
>
```