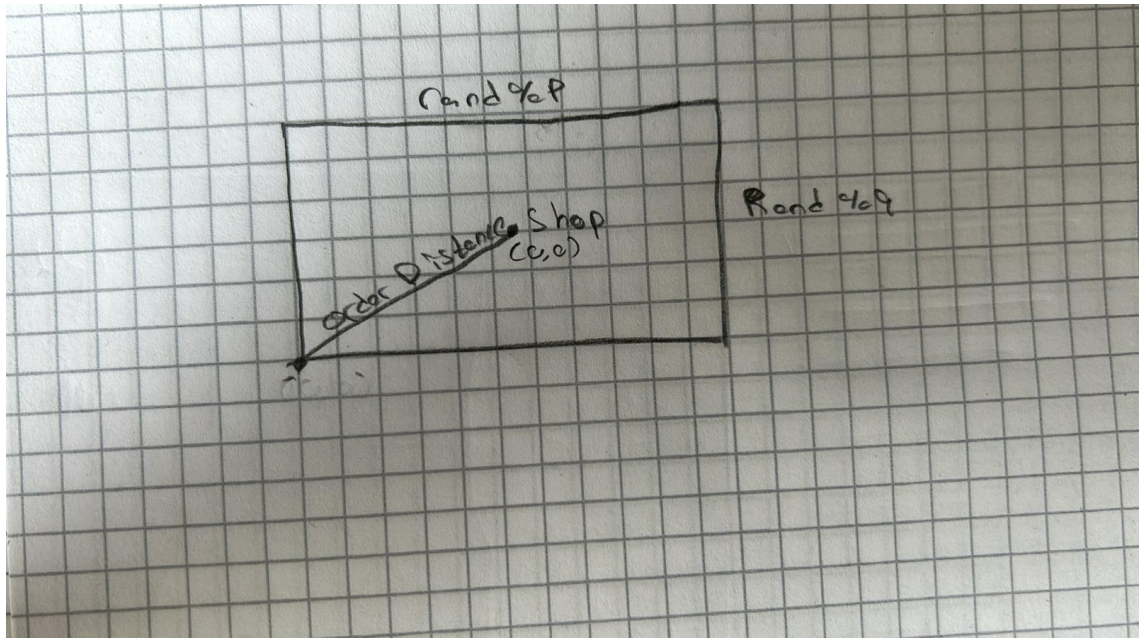


CSE 344 - SYSTEM PROGRAMMING

FINAL PROJECT

Introduction

This report describes the implementation of a food ordering and delivery simulation system. The system consists of two main parts: the server-side (`PideShopServer`) which handles orders and deliveries, and the client-side (`HungryVeryMuch`) which generates and sends orders to the server. The communication between the client and the server is managed using sockets. The system also incorporates multithreading for handling various tasks simultaneously.



Server-Side Implementation

The server-side implementation (`PideShopServer`) is responsible for receiving orders, preparing them, and managing delivery personnel. Key components and functions are described below:

Data Structures

1. **Order**: Represents an individual order with attributes like `orderId`, customer location, and status.
2. **OrderQueue**: A thread-safe queue for managing orders at different stages (waiting, in oven, ready for delivery).
3. **Cook**: Represents a cook thread responsible for preparing and cooking orders.
4. **DeliveryPerson**: Represents a delivery thread responsible for delivering orders to customers.
5. **Oven**: Manages oven apparatus with a specific capacity for cooking meals.
6. **PideShopServer**: The main server structure containing attributes for server configuration, thread pools, mutexes, and log handling.

Initialization Functions

- **initServer**: Initializes the server with the specified port, cook and delivery thread pool sizes, and speed.
- **initCooks**: Initializes cook threads.
- **initDelivery**: Initializes delivery threads.
- **initQueue**: Initializes an order queue.

Thread Functions

- **cookThread**: Handles the preparation and cooking of orders, including placing and removing meals from ovens.
- **deliveryThread**: Manages the delivery of cooked orders to customers.
- **clientHandler**: Processes client connections and handles incoming orders.
- **managerHandler**: Manages the overall state of the server and coordinates the activities of cooks and delivery personnel.

Log and Signal Handling

- **logMessage**: Logs messages to a file in a thread-safe manner.
- **handleSignal**: Handles termination signals to ensure graceful shutdown of the server.

Server Operation

The server listens for incoming client connections, creates a new thread for each connection to handle the client's order, and coordinates cooks and delivery personnel to process and deliver orders efficiently.

Client-Side Implementation

The client-side implementation (`HungryVeryMuch`) generates and sends orders to the server. Key components and functions are described below:

Data Structures

1. **Client:** Represents a client with attributes like server IP, port, and order details.

Functions

- **sendOrder:** Connects to the server and sends an order message.
- **handle_signal:** Handles termination signals to ensure graceful shutdown of the client.

Client Operation

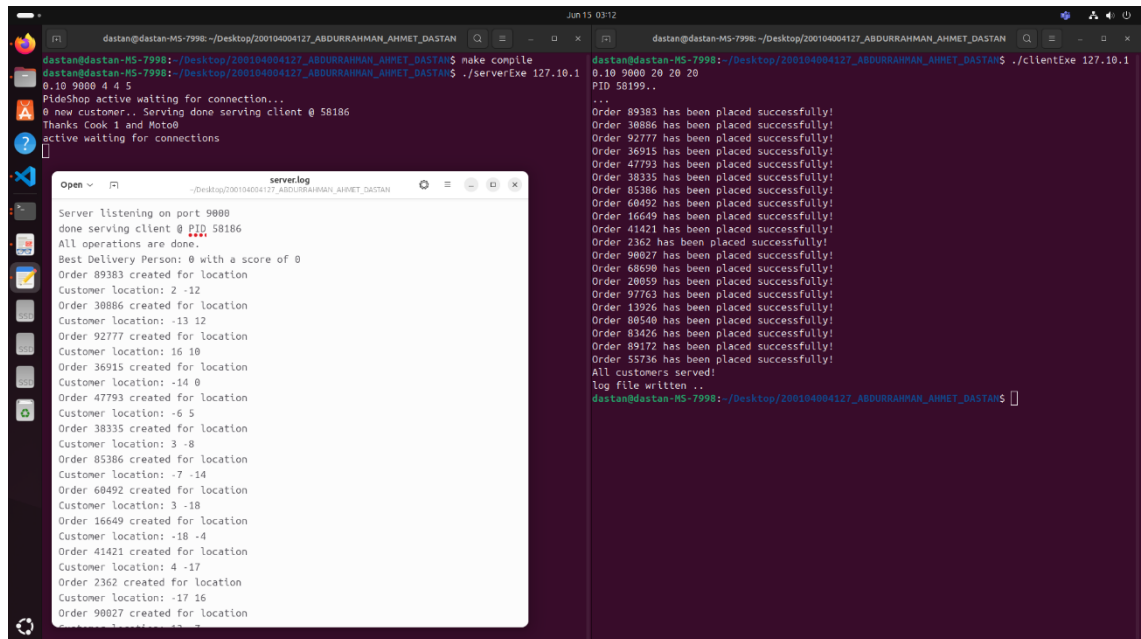
The client generates a specified number of orders with random locations and sends them to the server. Once all orders are sent, a special order with coordinates (-999, -999) is sent to signal the end of the order sequence.

Conclusion

This implementation effectively simulates a food ordering and delivery system using multithreading and socket communication. The server handles multiple clients and coordinates various tasks efficiently, while the client generates and sends orders to the server. The use of thread-safe data structures and proper synchronization ensures the reliability and scalability of the system.

Test Cases:

1) Creating server and casual calling with 20 client orders

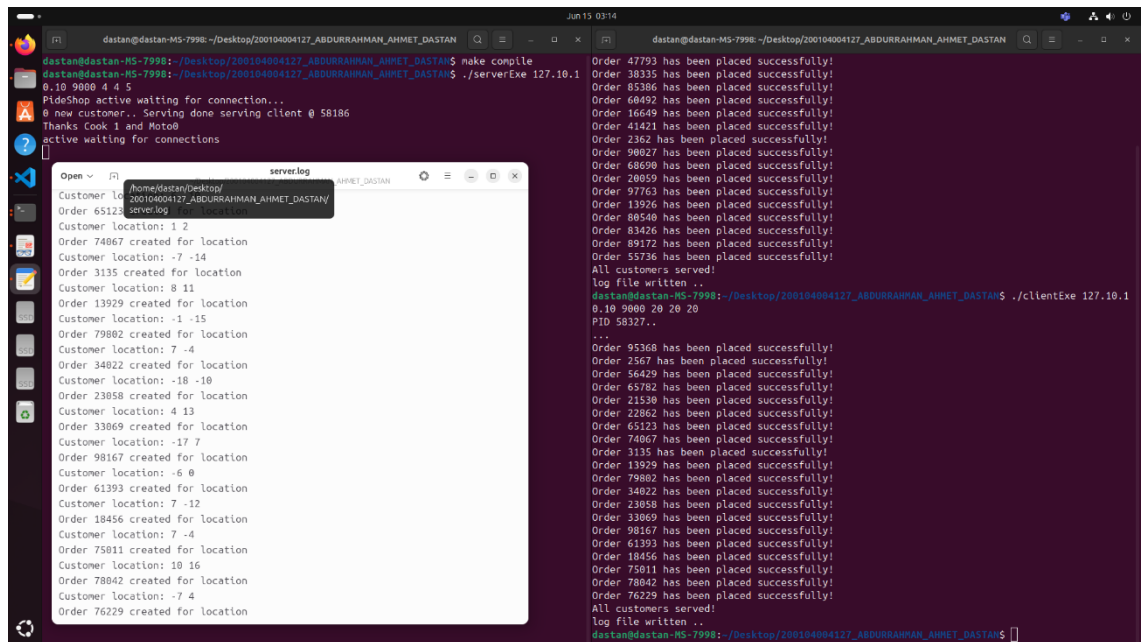


```

dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ make compile
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ ./serverExe 127.10.1
0.10 9080 4 4 5
PideShop active waiting for connection...
0 new customer... Serving done serving client @ 58186
Thanks Cook 1 and Moto0
active waiting for connections

server.log
Server listening on port 9080
done serving client @ PID 58186
All operations are done.
Best Delivery Person: 0 with a score of 0
Order 89383 created for location
Customer location: 2 -12
Order 30886 created for location
Customer location: -13 12
Order 92777 created for location
Customer location: 16 10
Order 36915 created for location
Customer location: -14 0
Order 47793 created for location
Customer location: -6 5
Order 38335 created for location
Customer location: 3 -8
Order 85386 created for location
Customer location: -7 -14
Order 60492 created for location
Customer location: 3 -18
Order 16649 created for location
Customer location: -18 -4
Order 41421 created for location
Customer location: 4 -17
Order 2362 created for location
Customer location: -17 16
Order 90827 created for location
Customer location: 4 -17
Order 89383 has been placed successfully!
Order 30886 has been placed successfully!
Order 92777 has been placed successfully!
Order 36915 has been placed successfully!
Order 47793 has been placed successfully!
Order 38335 has been placed successfully!
Order 85386 has been placed successfully!
Order 60492 has been placed successfully!
Order 16649 has been placed successfully!
Order 41421 has been placed successfully!
Order 2362 has been placed successfully!
Order 90827 has been placed successfully!
Order 68690 has been placed successfully!
Order 20059 has been placed successfully!
Order 97763 has been placed successfully!
Order 13926 has been placed successfully!
Order 80540 has been placed successfully!
Order 83426 has been placed successfully!
Order 89172 has been placed successfully!
Order 55736 has been placed successfully!
All customers served!
log file written
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$
```

2) Secondly connect after first client generator finished.

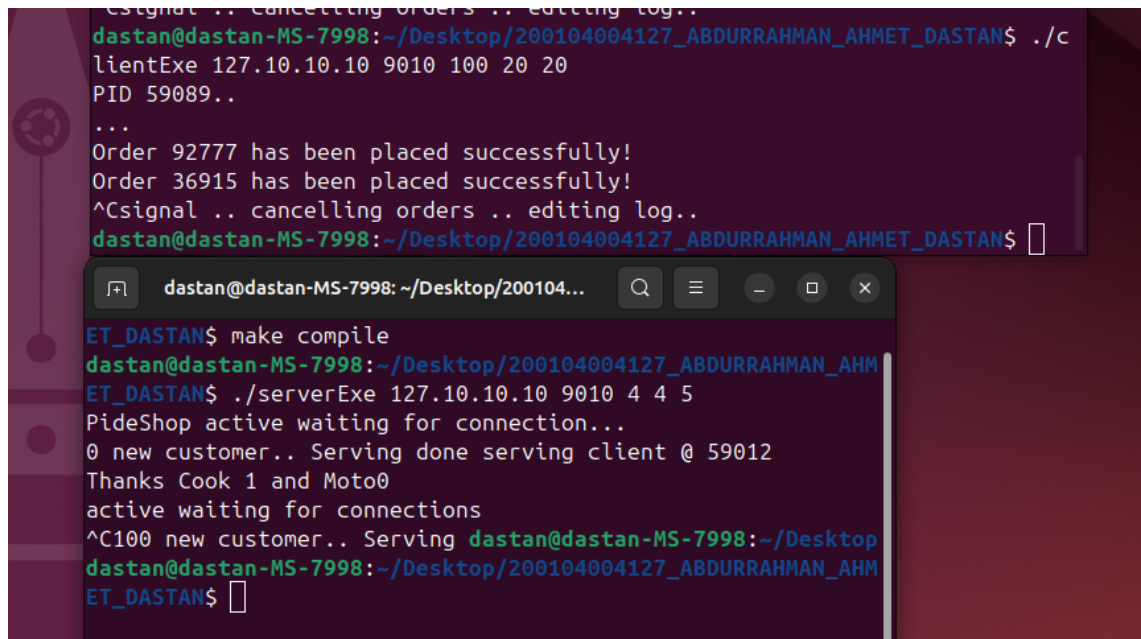


```

dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ make compile
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ ./serverExe 127.10.1
0.10 9080 4 4 5
PideShop active waiting for connection...
0 new customer... Serving done serving client @ 58186
Thanks Cook 1 and Moto0
active waiting for connections

server.log
Customer location: 2 -12
Order 65123 created for location
Customer location: -7 -14
Order 3135 created for location
Customer location: 8 11
Order 13929 created for location
Customer location: -1 -15
Order 79802 created for location
Customer location: 7 -4
Order 34822 created for location
Customer location: -18 -10
Order 23858 created for location
Customer location: 4 13
Order 33869 created for location
Customer location: -17 7
Order 98167 created for location
Customer location: -6 0
Order 61393 created for location
Customer location: 7 -12
Order 18456 created for location
Customer location: 7 -4
Order 75811 created for location
Customer location: 10 16
Order 78042 created for location
Customer location: -7 4
Order 76229 created for location
Customer location: 4 -17
Order 89383 has been placed successfully!
Order 38335 has been placed successfully!
Order 85386 has been placed successfully!
Order 60492 has been placed successfully!
Order 16649 has been placed successfully!
Order 41421 has been placed successfully!
Order 2362 has been placed successfully!
Order 90827 has been placed successfully!
Order 68690 has been placed successfully!
Order 20059 has been placed successfully!
Order 97763 has been placed successfully!
Order 13926 has been placed successfully!
Order 80540 has been placed successfully!
Order 83426 has been placed successfully!
Order 89172 has been placed successfully!
Order 55736 has been placed successfully!
All customers served!
log file written ..
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ ./clientExe 127.10.1
0.10 9080 20 20 20
PID: 58327..
...
Order 95368 has been placed successfully!
Order 2567 has been placed successfully!
Order 56429 has been placed successfully!
Order 65782 has been placed successfully!
Order 21538 has been placed successfully!
Order 22862 has been placed successfully!
Order 65123 has been placed successfully!
Order 74867 has been placed successfully!
Order 3135 has been placed successfully!
Order 13929 has been placed successfully!
Order 79802 has been placed successfully!
Order 34822 has been placed successfully!
Order 23858 has been placed successfully!
Order 33869 has been placed successfully!
Order 98167 has been placed successfully!
Order 61393 has been placed successfully!
Order 18456 has been placed successfully!
Order 75811 has been placed successfully!
Order 78042 has been placed successfully!
Order 76229 has been placed successfully!
All customers served!
log file written ..
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$
```

3) Sending 100 elements to server



The screenshot shows a terminal window with a dark background and light-colored text. The prompt is `dastan@dastan-MS-7998:~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$`. The user has entered `./c`, which has triggered a series of messages from a client. The messages include: `lientExe 127.10.10.10 9010 100 20 20`, `PID 59089..`, `...`, `Order 92777 has been placed successfully!`, `Order 36915 has been placed successfully!`, and `^Csignal .. cancelling orders .. editing log..`. The terminal window is titled `dastan@dastan-MS-7998: ~/Desktop/200104...` and has standard window controls (minimize, maximize, close) and a search icon.

```
dastan@dastan-MS-7998:~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ ./c
lientExe 127.10.10.10 9010 100 20 20
PID 59089..
...
Order 92777 has been placed successfully!
Order 36915 has been placed successfully!
^Csignal .. cancelling orders .. editing log..
dastan@dastan-MS-7998:~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$
```

Below this, a new terminal window is open with the title `dastan@dastan-MS-7998: ~/Desktop/200104...`. The prompt is `ET_DASTAN$`. The user has entered `make compile`, which has triggered a series of messages from a server. The messages include: `ET_DASTAN$./serverExe 127.10.10.10 9010 4 4 5`, `PideShop active waiting for connection...`, `0 new customer.. Serving done serving client @ 59012`, `Thanks Cook 1 and Moto0`, `active waiting for connections`, and `^C100 new customer.. Serving`. The terminal window has standard window controls and a search icon.

```
ET_DASTAN$ make compile
dastan@dastan-MS-7998:~/Desktop/200104004127_ABDURRAHMAN_AHM
ET_DASTAN$ ./serverExe 127.10.10.10 9010 4 4 5
PideShop active waiting for connection...
0 new customer.. Serving done serving client @ 59012
Thanks Cook 1 and Moto0
active waiting for connections
^C100 new customer.. Serving
dastan@dastan-MS-7998:~/Desktop
ET_DASTAN$
```

5) Sending 200 order to server side

```
dastan@dastan-MS-7998: ~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN
dastan@dastan-MS-7998:~/Desktop/200104004127_ABDURRAHMAN_AHMET_DASTAN$ ./clientExe 127.10.1
0.10 9010 200 20 20
PID 59450..
...
Order 89383 has been placed successfully!
Order 30886 has been placed successfully!
Order 92777 has been placed successfully!
Order 36915 has been placed successfully!
Order 47793 has been placed successfully!
Order 38335 has been placed successfully!
Order 85386 has been placed successfully!
Order 60492 has been placed successfully!
Order 16649 has been placed successfully!
Order 41421 has been placed successfully!
Order 2362 has been placed successfully!
Order 90027 has been placed successfully!
Order 68690 has been placed successfully!
Order 20059 has been placed successfully!
Order 97763 has been placed successfully!
Order 13926 has been placed successfully!
Order 80540 has been placed successfully!
Order 83426 has been placed successfully!
Order 89172 has been placed successfully!
Order 55736 has been placed successfully!
Order 5211 has been placed successfully!
Order 95368 has been placed successfully!
Order 2567 has been placed successfully!
Order 56429 has been placed successfully!
Order 65782 has been placed successfully!
Order 21530 has been placed successfully!
Order 22862 has been placed successfully!
Order 65123 has been placed successfully!
Order 74067 has been placed successfully!
Order 3135 has been placed successfully!
Order 13929 has been placed successfully!
Order 79802 has been placed successfully!
```