BLM3011 Operating Systems Project

Multi-User Messaging Application

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Problem Definition:

In this assignment, it is expected to build a multi-user messaging application using socket programming and thread operations in C language.

Solution of the Problem:

A multi-user working environment was provided with socket programming and Thread operations. Each client connects with a different port. The appropriate data structure was used by determining what information would be kept on the Server and Client sides. Information exchange between the server and client was achieved through this data structure. Functions suitable for the desired menu structure were coded in the assignment.

Problems Encountered:

Clients can read sent messages even if they are not sent to them. I wrote a function for redirection, but I could not solve this problem.

Extra Things to Do:

The required thread structure for instant message notification could not be used. By listening to a function in the menu that constantly handles new messages, I connected it with a function that shows notifications, but I failed.

When Clients are not connected to the Server, they should be able to see the messages sent to them by storing the message history in a structure, but I could not do this.

Sent messages can be filtered into read messages and unread messages with the help of a flag. But I couldn't do this.

Function Prototypes:

Server Side

```
void HandleClient(void *clientSocket)
void RemoveUserFromServer(int userID)
void AddUserToServer(int userID, SOCKET socket)
void BroadcastMessageToOtherUsers(int senderID, const char *message)
```

void *clientSocket: Represents the information of the socket associated with a client. It enables sending and receiving messages to and from the client.

int userID: This function removes a user from the server. userID represents the unique identifier of the user to be removed.

int userID, SOCKET socket: This function adds a user to the server. userID represents the unique identifier of the user to be added.

socket: This parameter represents the socket of the added user. The socket is a communication tool that allows the user to interact with the server.

int senderID, const char *message : This function is used to broadcast a message sent by a user to other users. senderID represents the unique identifier of the user who sent the message.

message: This parameter represents the message to be broadcast. The message is expressed as a character array and is broadcasted to other users.
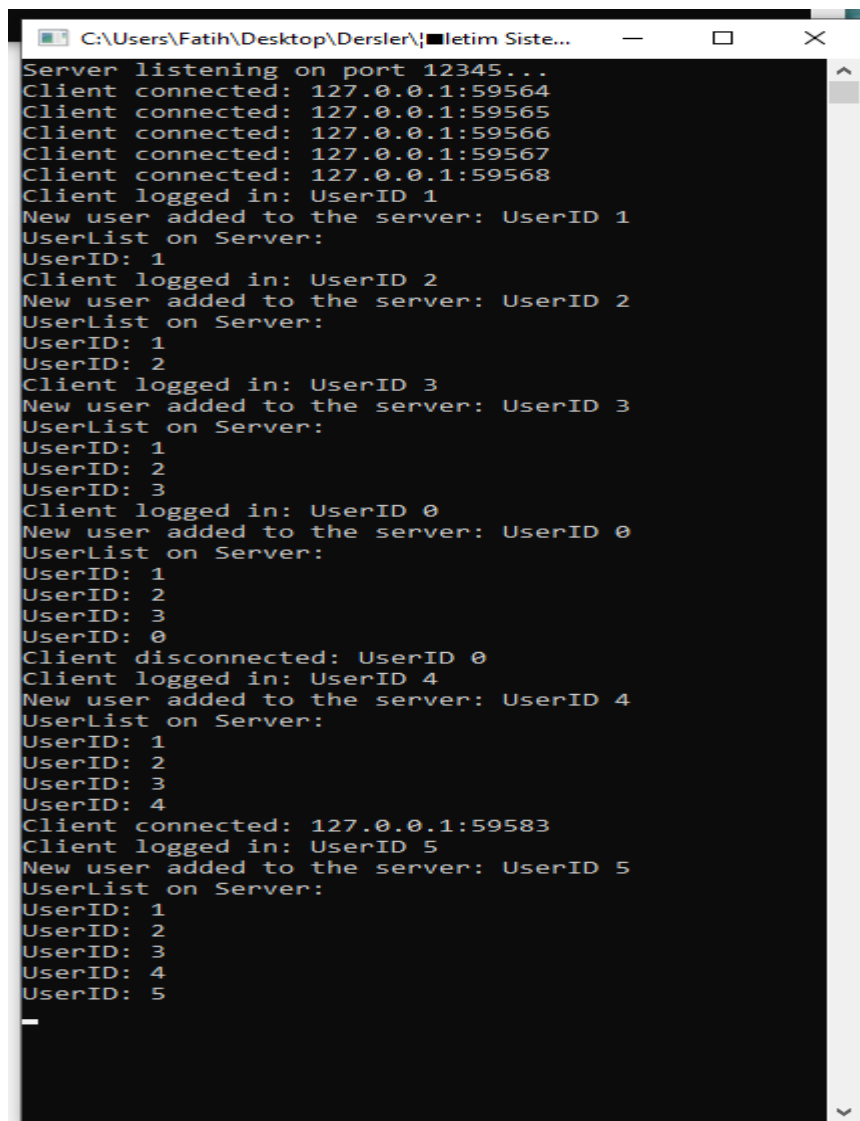
Client Side

```
void ListContacts();
void AddUser();
void DeleteUser();
void SendMessageToUser();
void CheckMessages();
```

Screenshots:

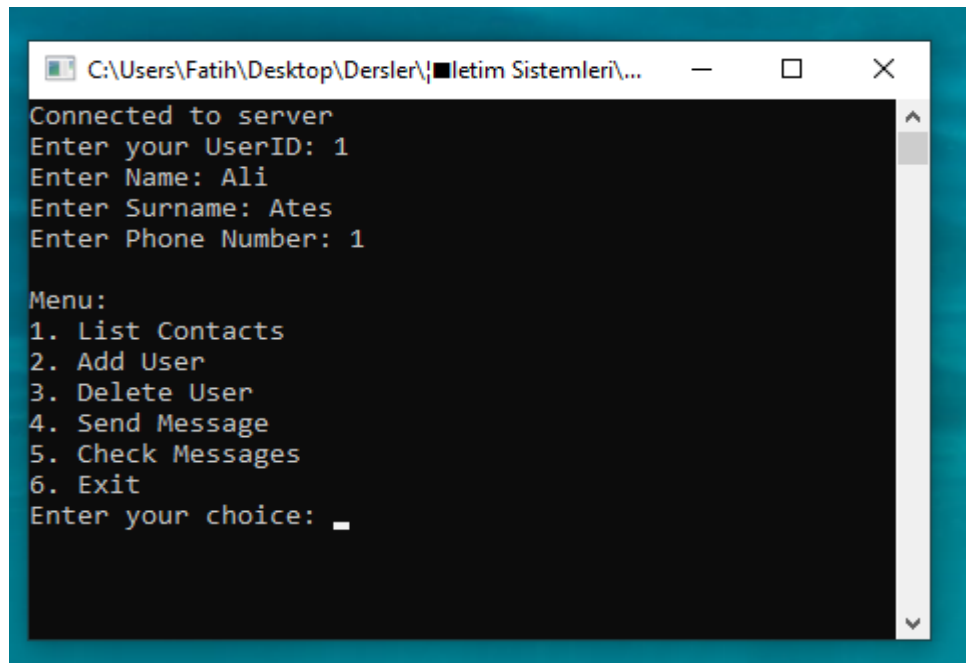OS: Windows, GCC: 4.9.2 x64, IDE: Dev-C++, Compiler Commands: -lws2_32

Server Side

Adding users in the test case. (While adding, I made a mistake with the 4th user and added it from the beginning)

Client Side

Client 1 – Ali Ates

List Contact – Initially Empty

Add User


```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 2
Enter Name: Derin
Enter Surname: Deniz
Enter Phone Number: 2
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 3
Enter Name: Demir
Enter Surname: Bilek
Enter Phone Number: 3
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 2, Name: Derin, Surname: Deniz, Phone Number: 2
UserID: 3, Name: Demir, Surname: Bilek, Phone Number: 3
```

Send Message


```
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 2, Name: Derin, Surname: Deniz, Phone Number: 2
UserID: 3, Name: Demir, Surname: Bilek, Phone Number: 3

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 4
Enter UserID to send a message: 2
Enter your message: Hey, how's it going?
Message sent to UserID 2.
```
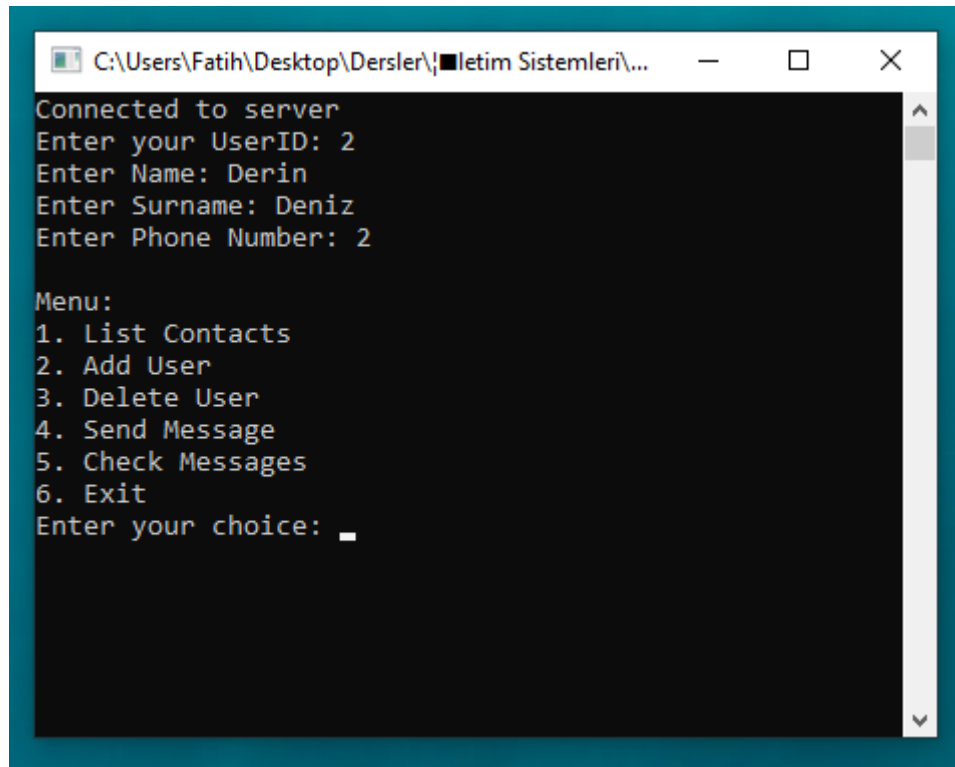
Check Messages (First Empty, After Other Client's Send Messages)


```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 5
Received Message: Client 2 -> @Client 2 -> ♥Client 2 -> Not much, just studying. You?Client 3 -> @Client 3 -> @Client 3 -> I'm good. Let's plan something for the weekend!
```
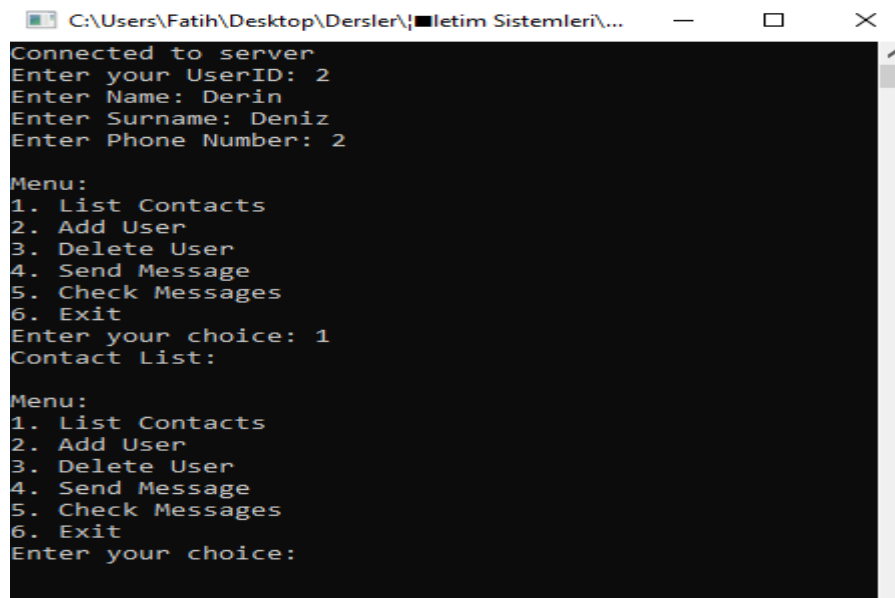
Client 2 – Derin Deniz

```
C:\Users\Fatih\Desktop\Dersler\İletim Sistemleri\...     —     □     ✕
Connected to server
Enter your UserID: 2
Enter Name: Derin
Enter Surname: Deniz
Enter Phone Number: 2

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: _
```

List Contacts – Initially Empty

```
C:\Users\Fatih\Desktop\Dersler\İletim Sistemleri\...     —     □     ✕
Connected to server
Enter your UserID: 2
Enter Name: Derin
Enter Surname: Deniz
Enter Phone Number: 2

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice:
```

Add User

```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 1
Enter Name: Ali
Enter Surname: Ates
Enter Phone Number: 1
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 3
Enter Name: Demir
Enter Surname: Bilek
Enter Phone Number: 3
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 1, Name: Ali, Surname: Ates, Phone Number: 1
UserID: 3, Name: Demir, Surname: Bilek, Phone Number: 3
```

Send Message

```
C:\Users\Fatih\Desktop\Dersler\İletim Sistemleri\Proje\so...      —    □    ×
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 4
Enter UserID to send a message: 1
Enter your message: Not much, just studying. You?
Message sent to UserID 1.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice:
```
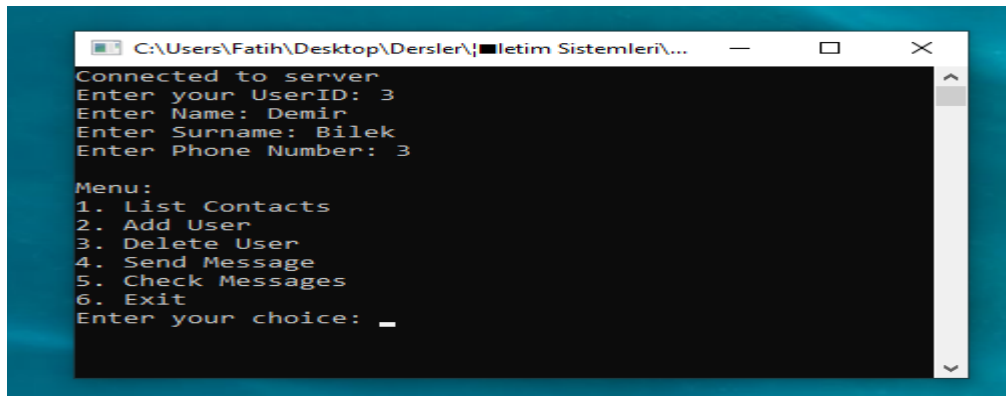
Check Messages

```
C:\Users\Fatih\Desktop\Dersler\İletim Sistemleri\Proje\son hali\20011610_Client.exe      —    □    ×
Message sent to UserID 1.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 5
Received Message: Client 1 -> ☺Client 1 -> ♥Client 1 -> Hey, how's it going?

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: _
```
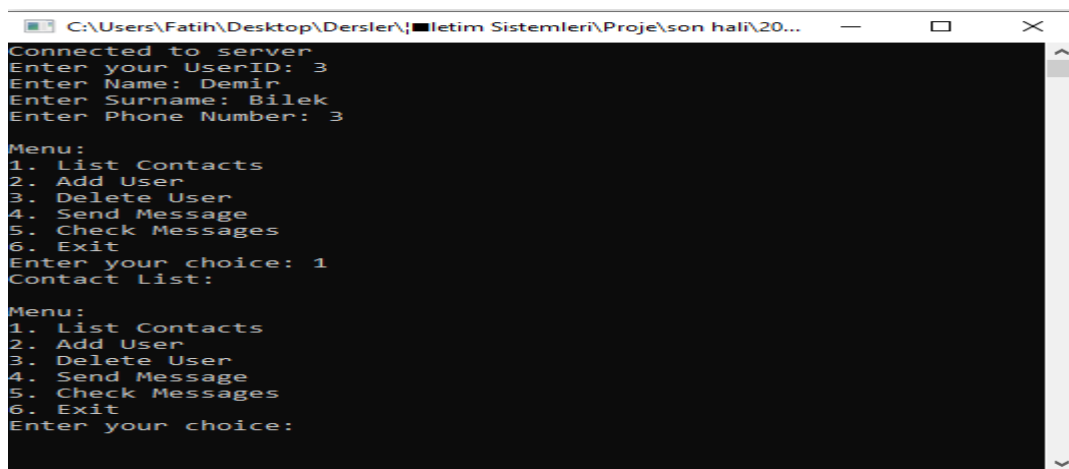
Client 3 – Demir Bilek


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sistemleri\...    —    □    ×
Connected to server
Enter your UserID: 3
Enter Name: Demir
Enter Surname: Bilek
Enter Phone Number: 3

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: _
```
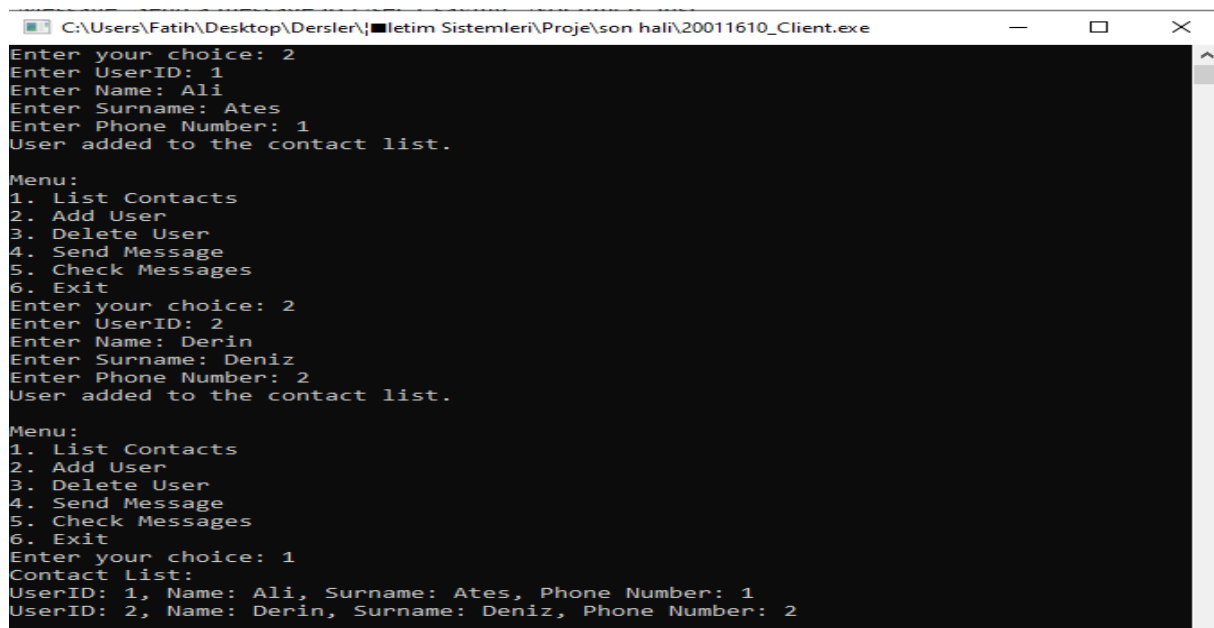
List Contacts – Initially Empty


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sistemleri\Proje\son hali\20...    —    □    ×
Connected to server
Enter your UserID: 3
Enter Name: Demir
Enter Surname: Bilek
Enter Phone Number: 3

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice:
```

Add User


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sistemleri\Proje\son hali\20011610_Client.exe    —    □    ×
Enter your choice: 2
Enter UserID: 1
Enter Name: Ali
Enter Surname: Ates
Enter Phone Number: 1
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 2
Enter Name: Derin
Enter Surname: Deniz
Enter Phone Number: 2
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 1, Name: Ali, Surname: Ates, Phone Number: 1
UserID: 2, Name: Derin, Surname: Deniz, Phone Number: 2
```
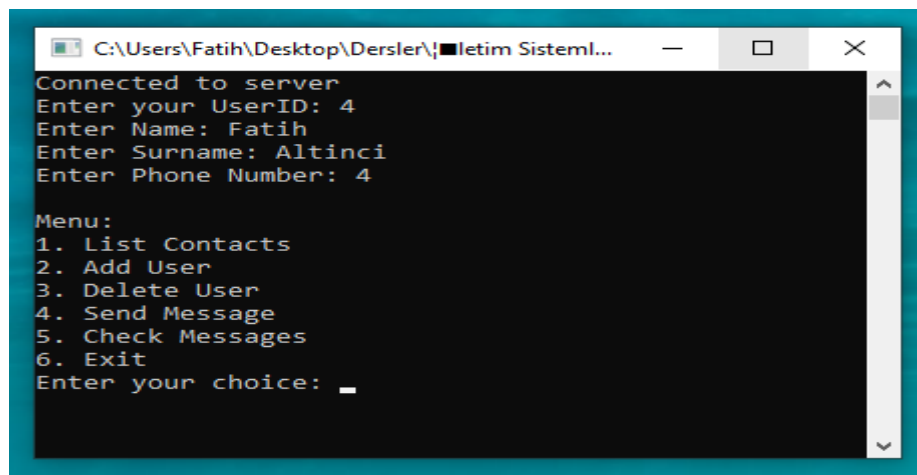
Send Message

```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 4
Enter UserID to send a message: 1
Enter your message: I'm good. Let's plan something for the weekend!
Message sent to UserID 1.
```

Check Messages

```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 5
Received Message: Client 1 -> @Client 1 -> ♥Client 1 -> Hey, how's it going?Client 2 -> @Client 2 -> ♥Client 2 -> Not much, just studying. You?
```
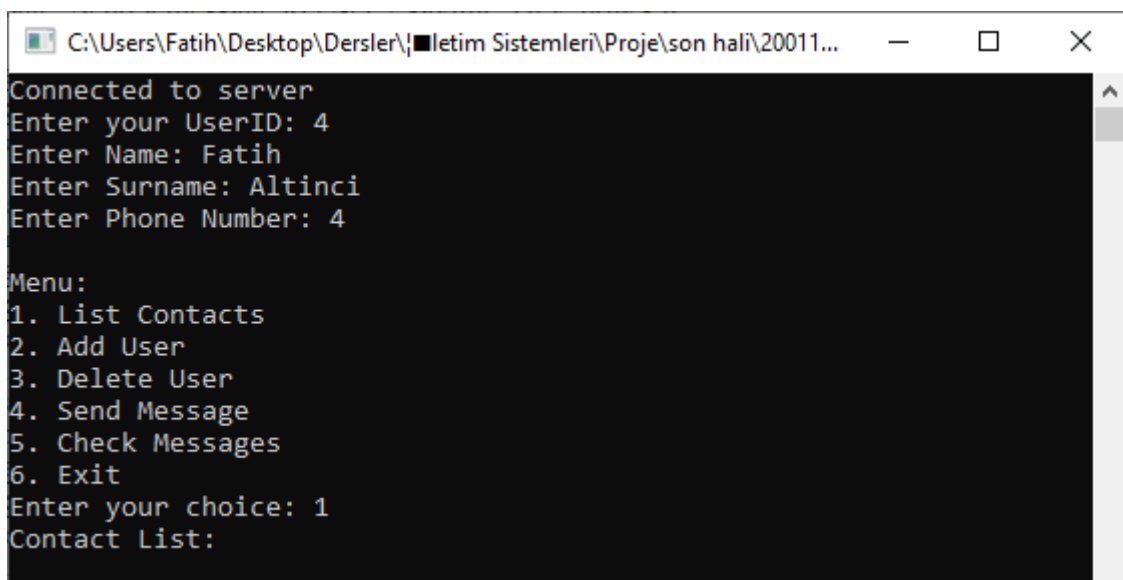
Client 4 – Fatih Altinci

List Contacts – Initially Empty

Add User

Send Message

```
C:\Users\Fatih\Desktop\Dersler\İletim Sistemleri\Proje\son hali\20011...        —    □    ✕
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 1, Name: Ali, Surname: Ates, Phone Number: 1

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 4
Enter UserID to send a message: 2
User not found in the contact list.
```
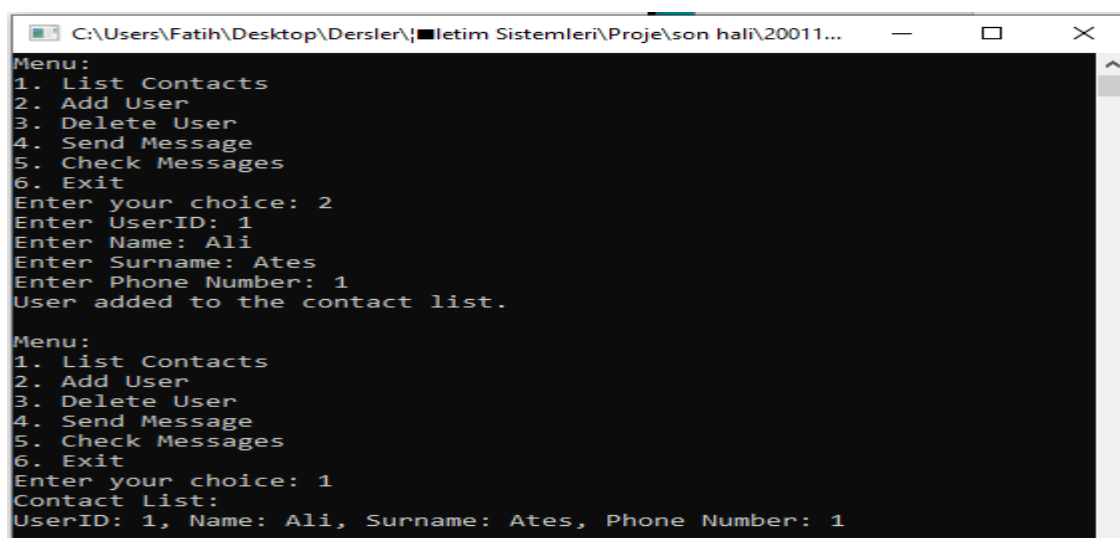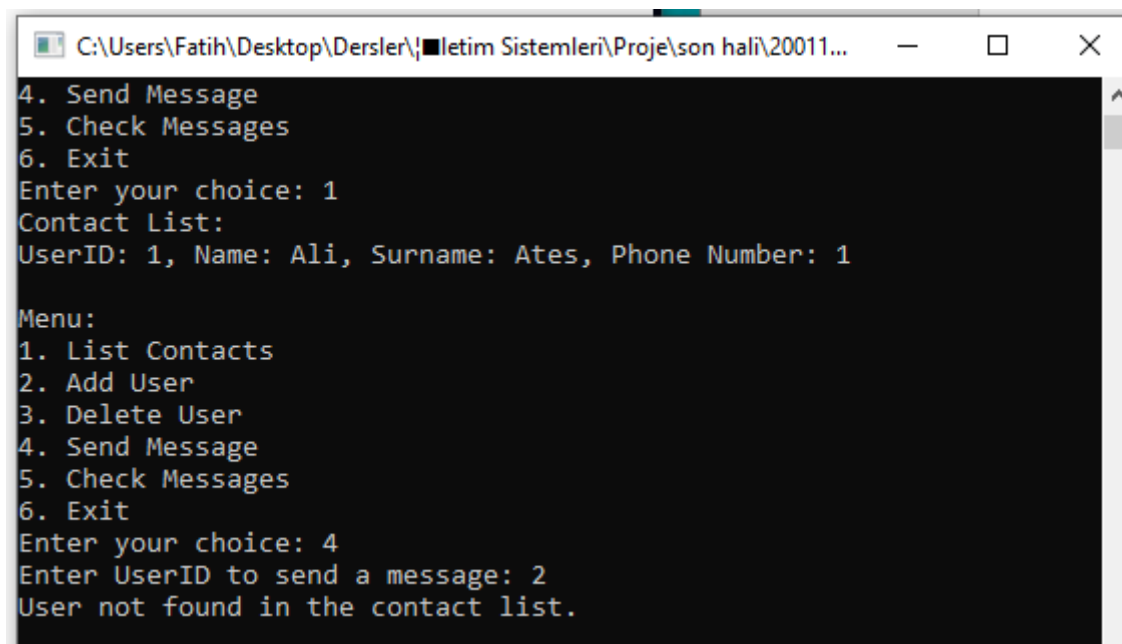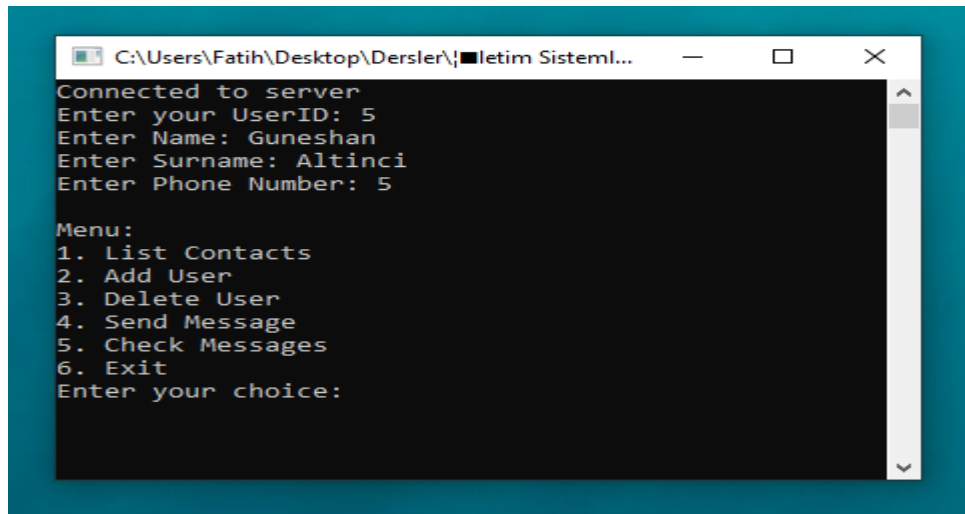
Check Messages

```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 5
Received Message: Client 1 -> @Client 1 -> ♥Client 1 -> Hey, how's it going?Client 2 -> @Client 2 -> ♥Client 2 -> Not much, just studying. You?
Client 3 -> @Client 3 -> @Client 3 -> I'm good. Let's plan something for the weekend!Client 5 -> ♥
```
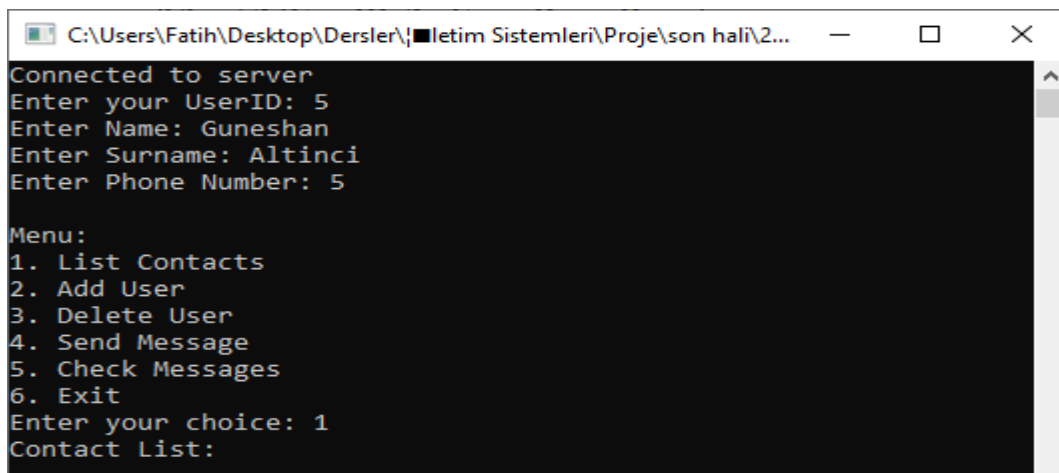
Client 5 – Guneshan Altinci


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sisteml...      —    □    ×
Connected to server
Enter your UserID: 5
Enter Name: Guneshan
Enter Surname: Altinci
Enter Phone Number: 5

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice:
```

List Contacts – Initially Empty


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sistemleri\Proje\son hali\2...   —   □   ×
Connected to server
Enter your UserID: 5
Enter Name: Guneshan
Enter Surname: Altinci
Enter Phone Number: 5

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
```
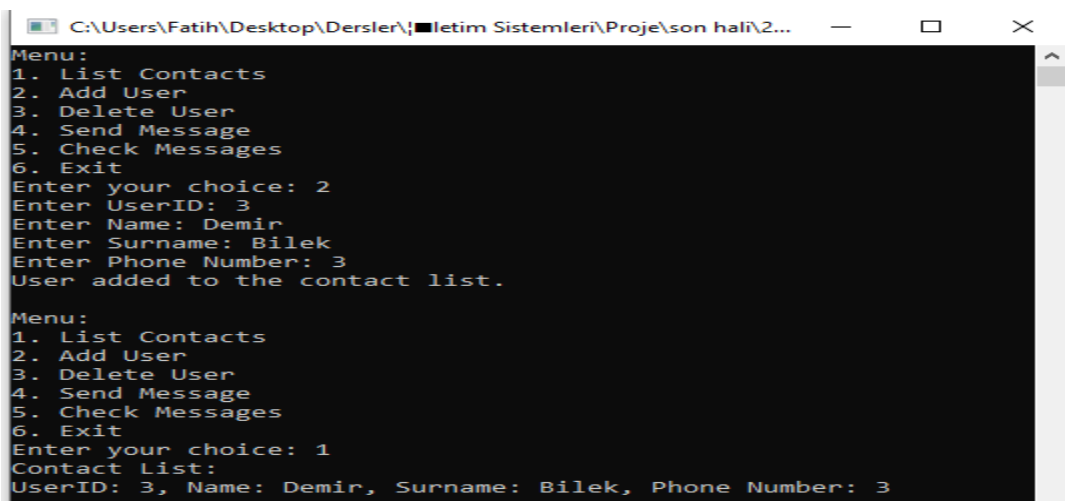
Add User


```
C:\Users\Fatih\Desktop\Dersler\¦■letim Sistemleri\Proje\son hali\2...   —   □   ×
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 2
Enter UserID: 3
Enter Name: Demir
Enter Surname: Bilek
Enter Phone Number: 3
User added to the contact list.

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 1
Contact List:
UserID: 3, Name: Demir, Surname: Bilek, Phone Number: 3
```

Send Message

```
C:\Users\Fatih\Desktop\Dersler\!■letim Sistemleri\Proje\son hali\2...    —    □    ✕

Enter your choice: 1
Contact List:
UserID: 3, Name: Demir, Surname: Bilek, Phone Number: 3

Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 4
Enter UserID to send a message: 1
User not found in the contact list.
```

Check Messages

```
Menu:
1. List Contacts
2. Add User
3. Delete User
4. Send Message
5. Check Messages
6. Exit
Enter your choice: 5
Received Message: Client 1 -> @Client 1 -> ♥Client 1 -> Hey, how's it going?Client 2 -> @Client 2 -> ♥Client 2 -> Not much, just studying. You?
Client 3 -> @Client 3 -> @Client 3 -> I'm good. Let's plan something for the weekend!Client 4 -> @
```