CS494 - INTERNETWORKING PROTOCOL

LAB 01: SOCKET PROGRAMMING

Student information:

No.	Name	Student ID	Contribution (%)
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Self evaluation

No.	Requirements	Score	Evaluate
1	Use C/C++, Java, C#	2	2
2	Implement whole gameplay properly	3	3
3	Socket Non-blocking	2	2
4	Have a good GUI (MFC, WPF, Swing, etc.)	3	3
	`Total`	`10`	`10`

GAME 02: RACING ARENA (6 + 4 + 1) % 3 = 2

Demo

Demo gameplay: https://www.youtube.com/watch?v=0LcEe5ik-Lk&feature=youtu.be

Techstacks

- Server side:
  - Using Java - Gradle for project management.
  - Using `java.net.ServerSocket` socket to init a server socket.
  - Using `java.util.concurrent.ExecutorService` to handle request to socket asynchronously (non-blocking handling).
  - Using `org.json`for JSON handling.
- Client side:
  - Using Unity for developing UI and Game Play.
  - Using `TcpClient` to make a TCP connection to server socket.
  - Using `Coroutines` to handle tasks asynchronously.
  - Using `Newtonsoft` for JSON parsing.

Setup

- For client:
  - Unity version 2020.3.14f1
- For server:
  - Openjdk version "18"
  - Gradle 7.2

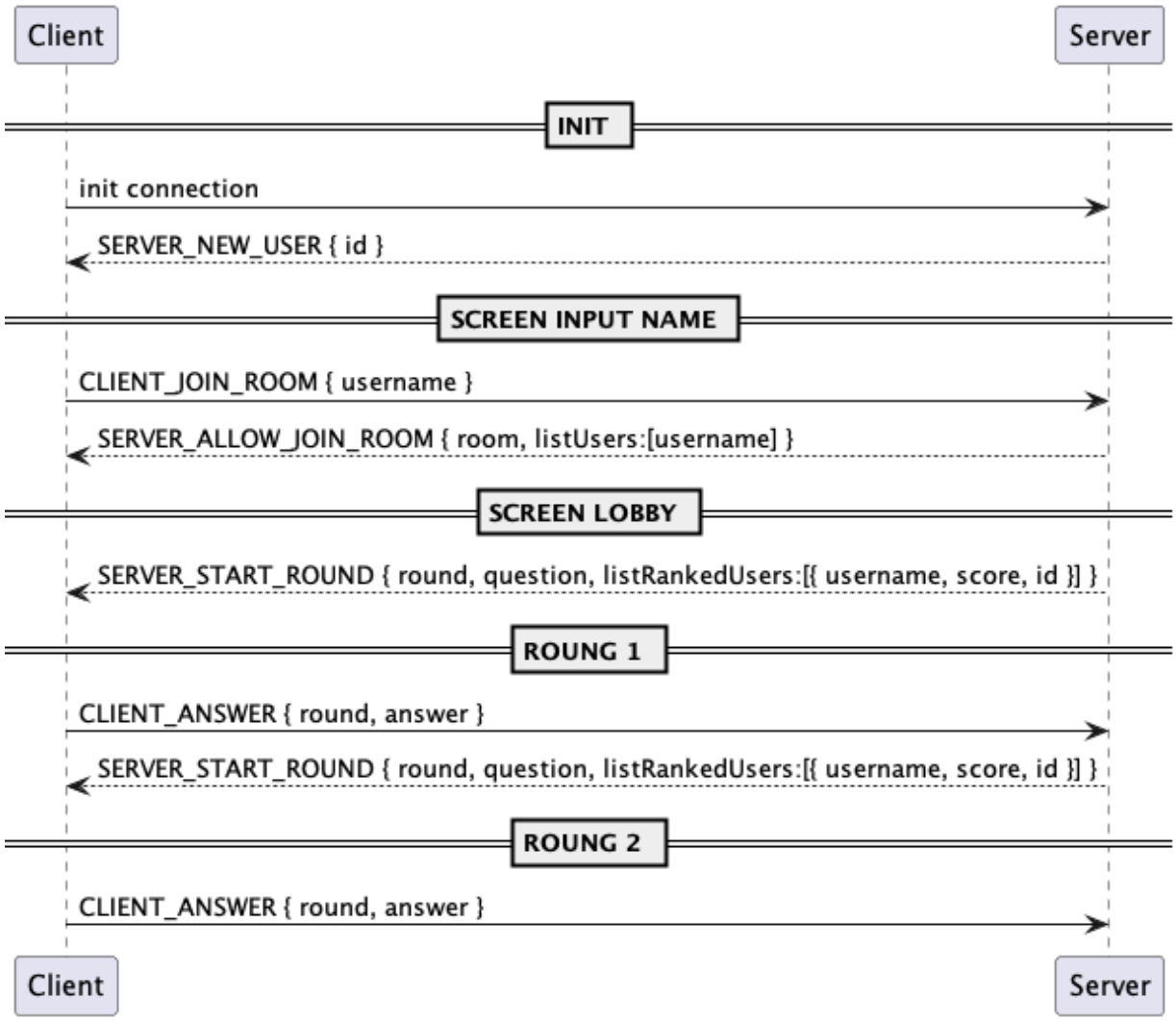
In server directory, run the script beflow for start server:

```
# start socket server
bash scripts/run.bash

# server will run at localhost:5555
```

Specifications

Data transfer flow



Payload structure

Each packet will align to this format:

```
- data:
    - payload: object
    - type: string
```

Packet with the prefix `SERVER_` is from server. Packet with the prefix `CLIENT_` is from client.

- SERVER_NEW_USER: when user create a connection to server, server will send to client:

```
// Example:
{
  "payload": {
    "id": "client-id-184f4741-f678-4319-9e97-c6f572e2ba8a"
  },
  "type": "SERVER_NEW_USER"
}
```

- CLIENT_JOIN_ROOM: when user want to send username and join lobby, client will send:

```
// Example:
{
  "payload": {
    "username": "hunggg"
  },
  "type": "CLIENT_JOIN_ROOM"
}
```

- SERVER_ALLOW_JOIN_ROOM: when there is new user in lobby, server will send to all users in lobby to update UI:

```
// Example:
{
  "payload": {
    "listUsers": [
      "client-1",
      "client-2",
      "client-3"
    ],
    "room": "room-id-41685726-9b2d-42d5-9f86-88da3565e93c"
  },
  "type": "SERVER_ALLOW_JOIN_ROOM"
}
```

- SERVER_START_ROUND: when there are enough users, server will send to all users in lobby to start game in round 1

```
// Example:
{
  "payload": {
    "round": 1,
    "question": "69 * 77",
    "answer": "5313",
    "listRankedUser": [
      {
        "score": 0,
        "id": "client-id-94519999-00a8-40da-ae50-cb307a31f484",
        "username": "client-1"
      },
      {
        "score": 0,
        "id": "client-id-4e97ffd0-bb8c-41b2-89c4-972c0e7ce9f9",
        "username": "client-2"
      },
      {
        "score": 0,
        "id": "client-id-73b5dff2-ab72-4042-b2fe-1e9535274da8",
        "username": "client-3"
      },
      {
        "score": 0,
        "id": "client-id-a0acccf9-8cd4-47a8-9f6e-2a564707d114",
        "username": "hung114"
      }
    ]
  },
  "type": "SERVER_START_ROUND"
}
```

- CLIENT_ANSWER: client answer:

```
// Example:
{
  "payload": {
    "round": 1,
    "answer": "20"
  },
  "type": "CLIENT_ANSWER"
}
```

To start next round, server will send the next `SERVER_START_ROUND` packet with different questions

Snipet code

- Server:

```
// SocketServer.java

// Start server socket at client
socket = new ServerSocket(Configs.PORT);

// Submit service of listening new client join for non-blocking
executorService.submit(this::acceptNewClient);
```

```
// ClientManager.java

// Add new client
public void add(Client client) {
    this.clients.put(client.getId(), client);

    // send to user packet SERVER_NEW_USER
    this.executorService.submit(() ->
Providers.completeAddNewClient.handle(client));

    // Submit service of listening packet of this client for non-block
    this.executorService.submit(() ->
Providers.clientListener.handle(client));
}
```

- Client:

```
// Init connection to server
public async Task ConnectAsTcpClient(string ip, int port)
{
    this.IP = ip;
    this.Port = port;
    int tryLeft = MAX_N_TRIAL;
    for(; tryLeft > 0; tryLeft--)
    {
        Debug.Log("[Client] - Trial left: " + tryLeft);
        await Task.Delay(millisecondsDelay: TRY_INTERVAL);
        tcpClient = new TcpClient();
        Debug.Log("[Client] Attempt connection to server " + ip + ":" +
port);

        Task connectTask = tcpClient.ConnectAsync(ip, port);
        Task timeoutTask = Task.Delay(millisecondsDelay: TIMEOUT_MIL);

        if (await Task.WhenAny(connectTask, timeoutTask) == connectTask)
        {
            if (tcpClient.Connected)
```

```
                break;
            }

            if (tryLeft == 1)
            {
                throw new TimeoutException("~ConnectAsTcpClient->Time out
after 10 trail!");
            }
        }

        Debug.Log("[Client] - isConnect: " + tcpClient.Connected);
        Debug.Log("[Client] Connected to server");
        stream = tcpClient.GetStream();
    }
```

Reference

[1] https://learn.microsoft.com/en-us/dotnet/api/system.net.sockets.tcpclient?view=net-7.0

[2] https://gist.github.com/joaoportela/6056200?fbclid=IwAR2NGJHHH0pdoWipQ8mzZcAVbPlBN5dxTpOyUNejbZvaOnZOxaiedJI-eW8