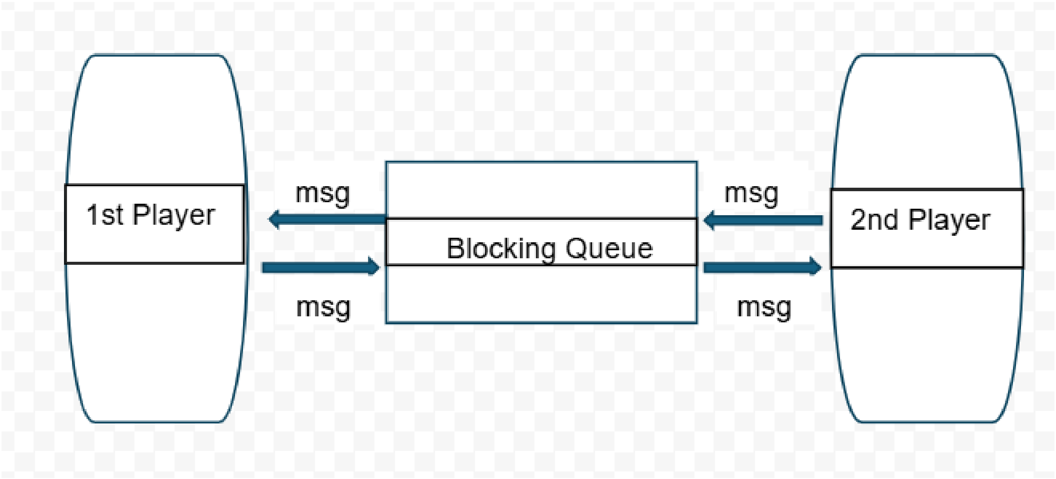
Chat Program

Single Process

In order to perform a chat program between two players, ensuring that both run in the same JVM process, I have chosen the Peer-to-Peer pattern, where the two players chat to each other bypassing a central server.

Design

The two players exchange messages directly using Blocking Queues and Buffers, reading and writing run in different threads to avoid interfering. The system design is as follow.



Implementation

I have implemented the above design pattern using the following built-in classes.

- **Concurrent:** Ensure peer to peer connection between the players.
- **Buffer:** receives messages from player and keep it.
- **Blocking Queue:** Exchanges messages between players.
- **Thread:** separate the read and write operation, maintaining a clear space for each activity.

And here are the data structure and functionalities I have created

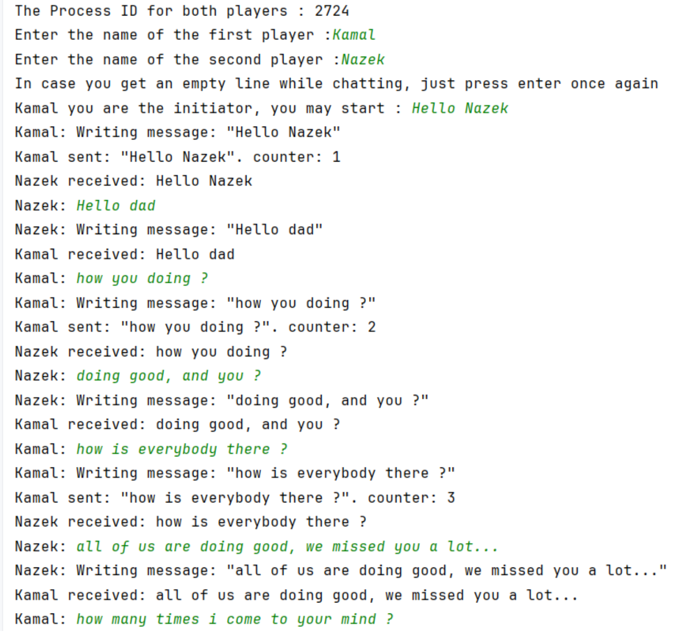
- **Player:** A class represent the player, it consists of a name, read/write Blocking Queues.
- **Chat Room:** A class represent chat area, consists of a Concurrent Linked Queue of players.
- **ReadMessage :** A method that de-Queue a message written by a player and invoke the method (broadCastMessage).
- **WriteMessage:** A method that in-Queue a message written by a player.
- **BroadcastMessage:** A method that send to a player (exclude the player who wrote the message).

Demo

The program runs as follow:

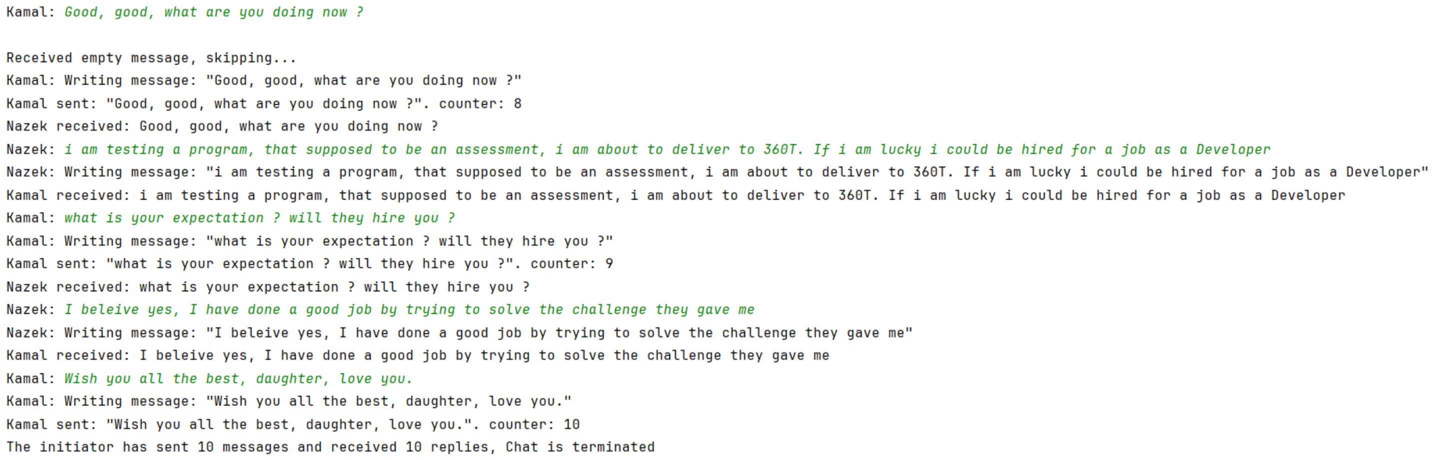
1. Open the *Chat/SingleProcessID* directory.
2. Run the script shell run.sh
3. Type in the players names, one after an other, then the program starts, the player who is going to start the chat will be considered as the initiator.
4. After every message written by the initiator, a reply message (sent message + counter) will be displayed. The second player will have the chance to type a message to the initiator.
5. The program will stop after 10 messages being sent by the initiator.

Below are two screenshots, showing how the program starts and ends
Players are able to exchange messages, counter is increasing by 1 after every message sent by the initiator.



```
The Process ID for both players : 2724
Enter the name of the first player :Kamal
Enter the name of the second player :Nazek
In case you get an empty line while chatting, just press enter once again
Kamal you are the initiator, you may start : Hello Nazek
Kamal: Writing message: "Hello Nazek"
Kamal sent: "Hello Nazek". counter: 1
Nazek received: Hello Nazek
Nazek: Hello dad
Nazek: Writing message: "Hello dad"
Kamal received: Hello dad
Kamal: how you doing ?
Kamal: Writing message: "how you doing ?"
Kamal sent: "how you doing ?". counter: 2
Nazek received: how you doing ?
Nazek: doing good, and you ?
Nazek: Writing message: "doing good, and you ?"
Kamal received: doing good, and you ?
Kamal: how is everybody there ?
Kamal: Writing message: "how is everybody there ?"
Kamal sent: "how is everybody there ?". counter: 3
Nazek received: how is everybody there ?
Nazek: all of us are doing good, we missed you a lot...
Nazek: Writing message: "all of us are doing good, we missed you a lot..."
Kamal received: all of us are doing good, we missed you a lot...
Kamal: how many times i come to your mind ?
```

Here, the screenshot shows the last part of the conversation.



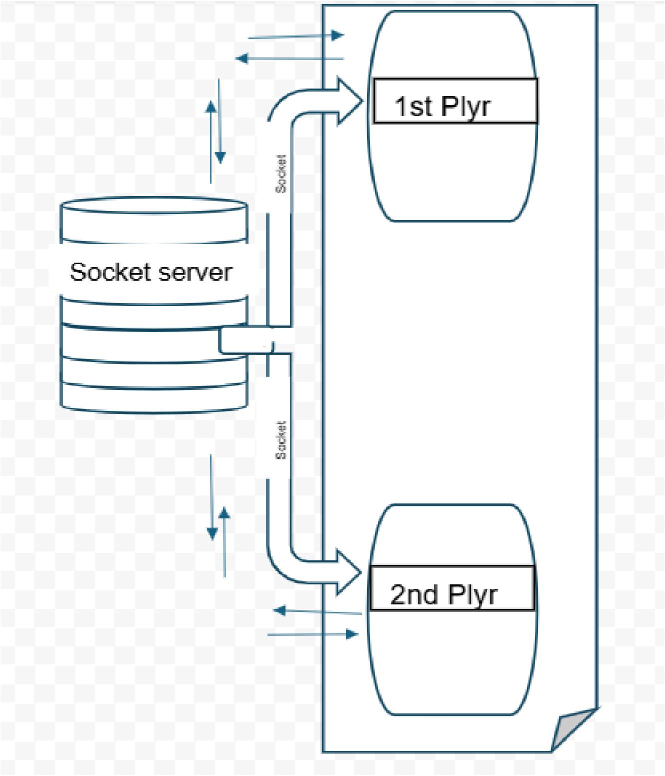
```
Kamal: Good, good, what are you doing now ?

Received empty message, skipping...
Kamal: Writing message: "Good, good, what are you doing now ?"
Kamal sent: "Good, good, what are you doing now ?". counter: 8
Nazek received: Good, good, what are you doing now ?
Nazek: i am testing a program, that supposed to be an assessment, i am about to deliver to 360T. If i am lucky i could be hired for a job as a Developer
Nazek: Writing message: "i am testing a program, that supposed to be an assessment, i am about to deliver to 360T. If i am lucky i could be hired for a job as a Developer"
Kamal received: i am testing a program, that supposed to be an assessment, i am about to deliver to 360T. If i am lucky i could be hired for a job as a Developer
Kamal: what is your expectation ? will they hire you ?
Kamal: Writing message: "what is your expectation ? will they hire you ?"
Kamal sent: "what is your expectation ? will they hire you ?". counter: 9
Nazek received: what is your expectation ? will they hire you ?
Nazek: I beleive yes, I have done a good job by trying to solve the challenge they gave me
Nazek: Writing message: "I beleive yes, I have done a good job by trying to solve the challenge they gave me"
Kamal received: I beleive yes, I have done a good job by trying to solve the challenge they gave me
Kamal: Wish you all the best, daughter, love you.
Kamal: Writing message: "Wish you all the best, daughter, love you."
Kamal sent: "Wish you all the best, daughter, love you.". counter: 10
The initiator has sent 10 messages and received 10 replies, Chat is terminated
```

Different Processes

Here, I have chosen the Client-Server pattern, it provides a centralized component, that control messages-exchanging between players, where each player runs in a different JVM process.

Design

With the use of Server and Server-Socket, I have established a connection between the two players and the Server, each player connected to the same server port through a socket, messages are being exchanged through buffers, each has a different thread.



Implementation

The followings are the built-in classes I have used to fulfil the goal.

- **Buffers:** receives a message from player and keep it, write a message to the server.
- **ServerSocket :** A server, where both players are connected to the same port.
- **Socket:** Each player is connected to the server with a socket, both sockets point to the same port
- **Thread:** separate the read activity from other activities.

And here are the data structure, and functionalities I have built

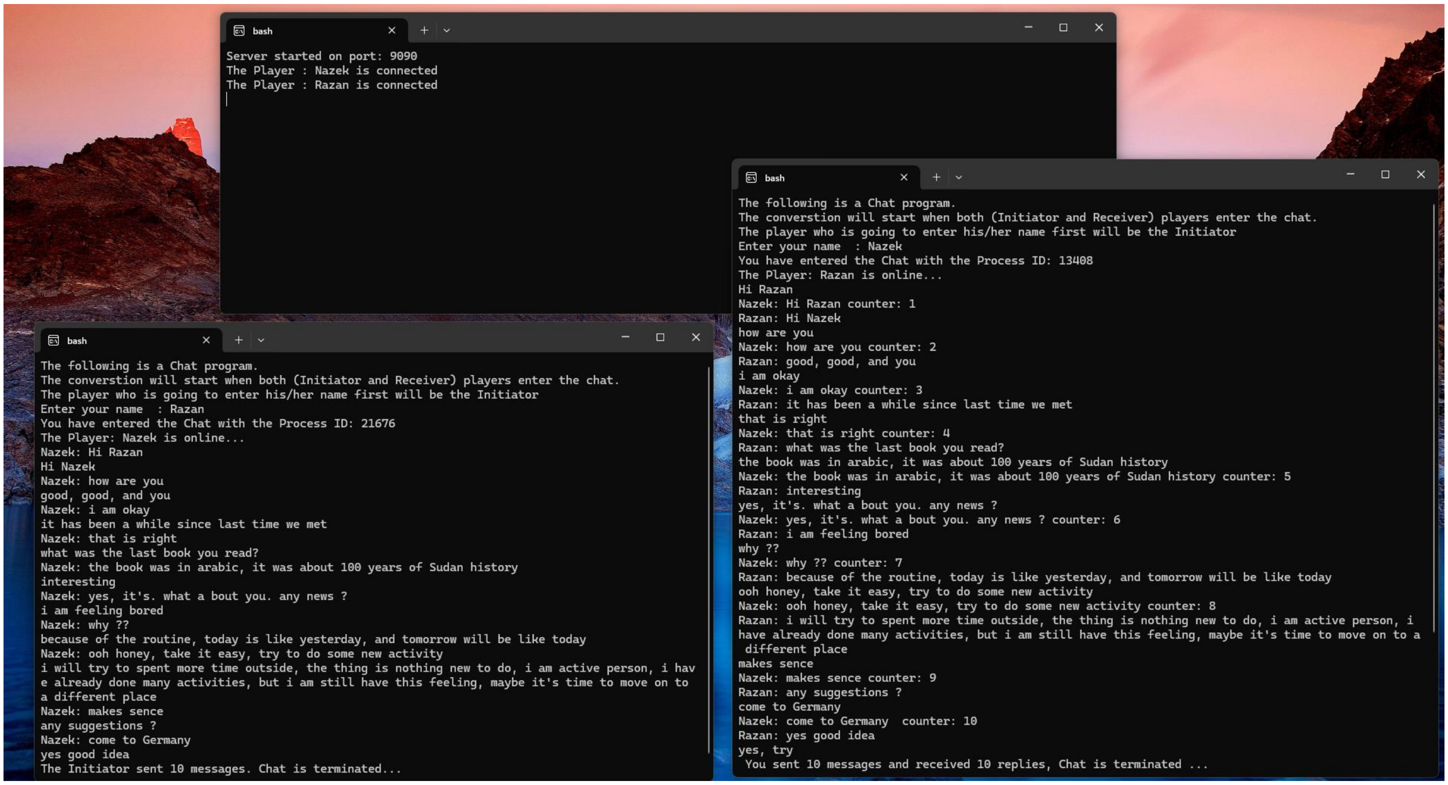
- **Player:** A class represent the player, it consists of a name, a socket, and read/write buffers.
- **HandelPlayer:** Control the buffers and player threads.
- **sendMessage:** write to a player buffer

- **receiveMessage :** read from a buffer.
- **sendNotification:** display a note when an instance is created.
- **sendReply:** write back to the initiator buffer, after each sending activity.
- **closeSockets:** stop buffers from accepting/sending more messages, and close the connection to the server.

Demo

The program runs as follow:

1. Open the *Chat/MultiProcessIDs* directory.
2. Run the script shell run.sh
3. Type in the players names, one after an other, then the program starts, the player who is going to start the chat will be considered as the initiator.
4. After every message written by the initiator, a reply message (sent message + counter) will be displayed.The second player will have the chance to type a message to the initiator.
5. The program will stop after 10 messages being sent by the initiator



```
Server started on port: 9090
The Player : Nazek is connected
The Player : Razan is connected
```

```
The following is a Chat program.
The converstion will start when both (Initiator and Receiver) players enter the chat.
The player who is going to enter his/her name first will be the Initiator
Enter your name  : Nazek
You have entered the Chat with the Process ID: 13408
The Player: Razan is online...
Hi Razan
Nazek: Hi Razan counter: 1
Razan: Hi Nazek
how are you
Nazek: how are you counter: 2
Razan: good, good, and you
i am okay
Nazek: i am okay counter: 3
Razan: it has been a while since last time we met
that is right
Nazek: that is right counter: 4
Razan: what was the last book you read?
the book was in arabic, it was about 100 years of Sudan history
Nazek: the book was in arabic, it was about 100 years of Sudan history counter: 5
Razan: interesting
yes, it's. what a bout you. any news ?
Nazek: yes, it's. what a bout you. any news ? counter: 6
Razan: i am feeling bored
why ??
Nazek: why ?? counter: 7
Razan: because of the routine, today is like yesterday, and tomorrow will be like today
ooh honey, take it easy, try to do some new activity
Nazek: ooh honey, take it easy, try to do some new activity counter: 8
Razan: i will try to spent more time outside, the thing is nothing new to do, i am active person, i
have already done many activities, but i am still have this feeling, maybe it's time to move on to a
 different place
makes sence
Nazek: makes sence counter: 9
Razan: any suggestions ?
come to Germany
Nazek: come to Germany  counter: 10
Razan: yes good idea
yes, try
 You sent 10 messages and received 10 replies, Chat is terminated ...
```

```
The following is a Chat program.
The converstion will start when both (Initiator and Receiver) players enter the chat.
The player who is going to enter his/her name first will be the Initiator
Enter your name  : Razan
You have entered the Chat with the Process ID: 21676
The Player: Nazek is online...
Nazek: Hi Razan
Hi Nazek
Nazek: how are you
good, good, and you
Nazek: i am okay
it has been a while since last time we met
Nazek: that is right
what was the last book you read?
Nazek: the book was in arabic, it was about 100 years of Sudan history
interesting
Nazek: yes, it's. what a bout you. any news ?
i am feeling bored
Nazek: why ??
because of the routine, today is like yesterday, and tomorrow will be like today
Nazek: ooh honey, take it easy, try to do some new activity
i will try to spent more time outside, the thing is nothing new to do, i am active person, i hav
e already done many activities, but i am still have this feeling, maybe it's time to move on to
a different place
Nazek: makes sence
any suggestions ?
Nazek: come to Germany
yes good idea
The Initiator sent 10 messages. Chat is terminated...
```