Jiahao Chen: 1118749 Mingyang Liu: 1113531

COMP90015 – Distributed Systems – Project 2

Group 30: Jiahao Chen, Mingyang Liu

Introduction

This report is focused on a shared white board our team has developed, which mainly contains its system architecture, communication protocols and implementation details.

System Architecture

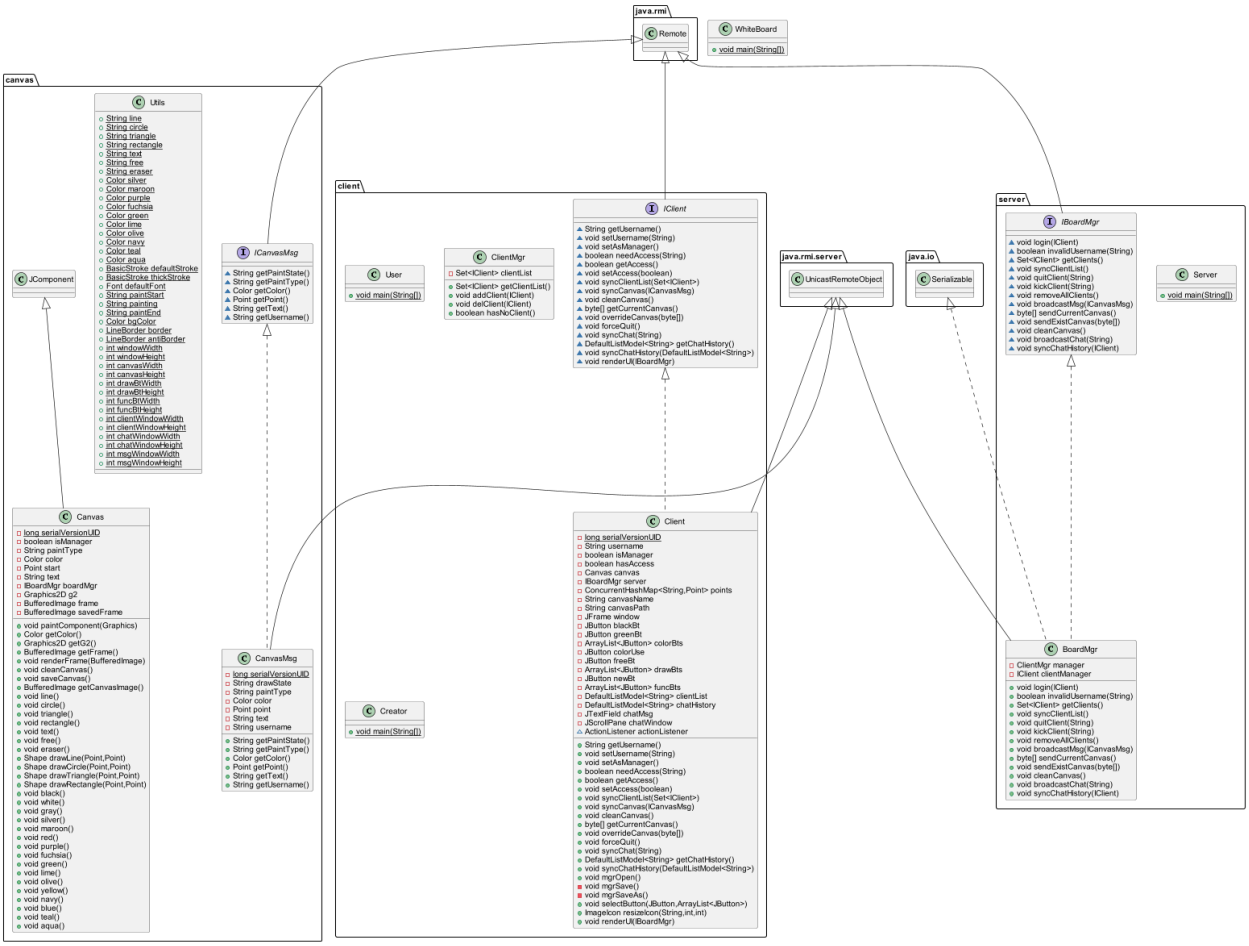

Figure 1: UML diagram

Figure 1 presents the UML diagram of the whole system. It is mainly composed of 3 parts: server, client, and canvas. The communication protocol is based on java RMI (remote method invocation), which is convenient for the three parts to call methods in other parts remotely. There is a corresponding remote interface in each package: IBoardMgr, IClient, and ICanvasMsg.

The canvas package contains the canvas user interface. It also maintains the communication protocol of syncing different users' canvas, which will be discussed in the next section.

The server package includes a board manager which manages all the operations that clients have performed to the system. When the server is started, it will make use of the board manager to sync changes and update clients' status.

The client package is designed for maintaining clients' status and send their operations to the server. ClientMgr is a separate class to define functionalities for the client manager, which is the first client who have created the white board. The client manager has access to several advanced operations, which will be presented in the final section.

Communication Protocols & Canvas formats

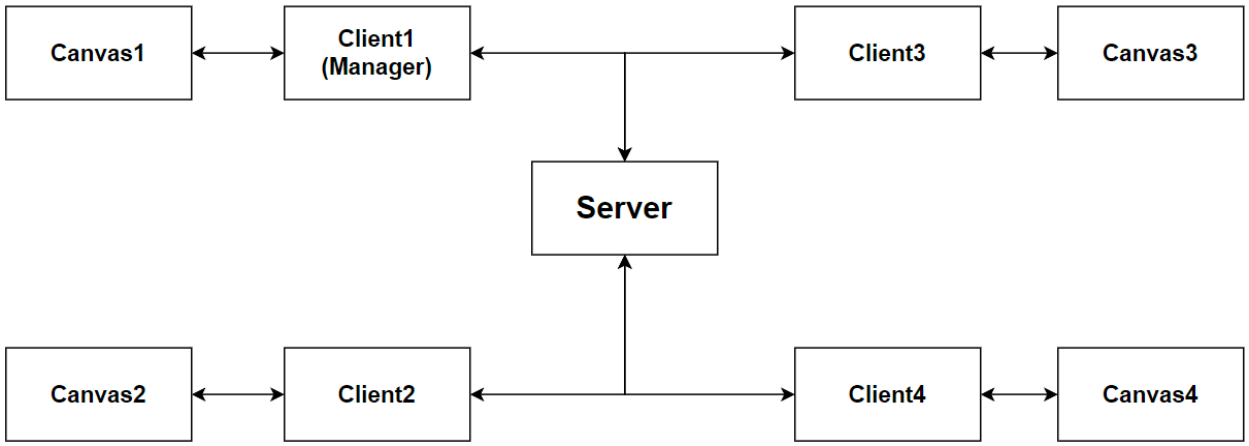

Figure 2: Communication

Figure 2 shows the basic communication flow of the system. There is a centralised server which controls the changes and broadcasts messages to all the clients. There are mainly 3 types of messages that need to be transferred: paintings, clients' list, and chats.

For paintings, 3 types of painting states are record, including paintStart, painting, and paintEnd, so as to help syncing different boards. For shapes other than free-hand drawing, 2 points are enough to locate the shape so that only paintStart and paintEnd are required to be recorded. For free-hand drawing, the motion of mouse is also required to be monitored and the painting state can tell other boards that the motion is still not stopped. Clients' list and chats are similar since they are all stored as a list of strings. Whenever there is change, the list will be updated and synced to the latest status.

In addition, the canvas is directly sent as an image byte array to newly joined clients so that permanently storing the painting steps is not required. The new client only needs to render the canvas based on the image received. Similarly, clients' list and chat history can be directly sent to the new client as well to make it faster for the client to obtain the latest status of the board.

Finally, ConcurrentHashMap is implemented to store temporary painting steps and clients' list to achieve concurrency.

Implementation Details

Figure 3 demonstrates the client manager's UI. The main differences between manager's UI and client's UI are the four buttons on the left top of the window, which allow the manager to create a new canvas, open another canvas, save the current canvas, and save the canvas as an image file. Besides, the manager can double-click on other clients' usernames in the clients' list to kick out others.

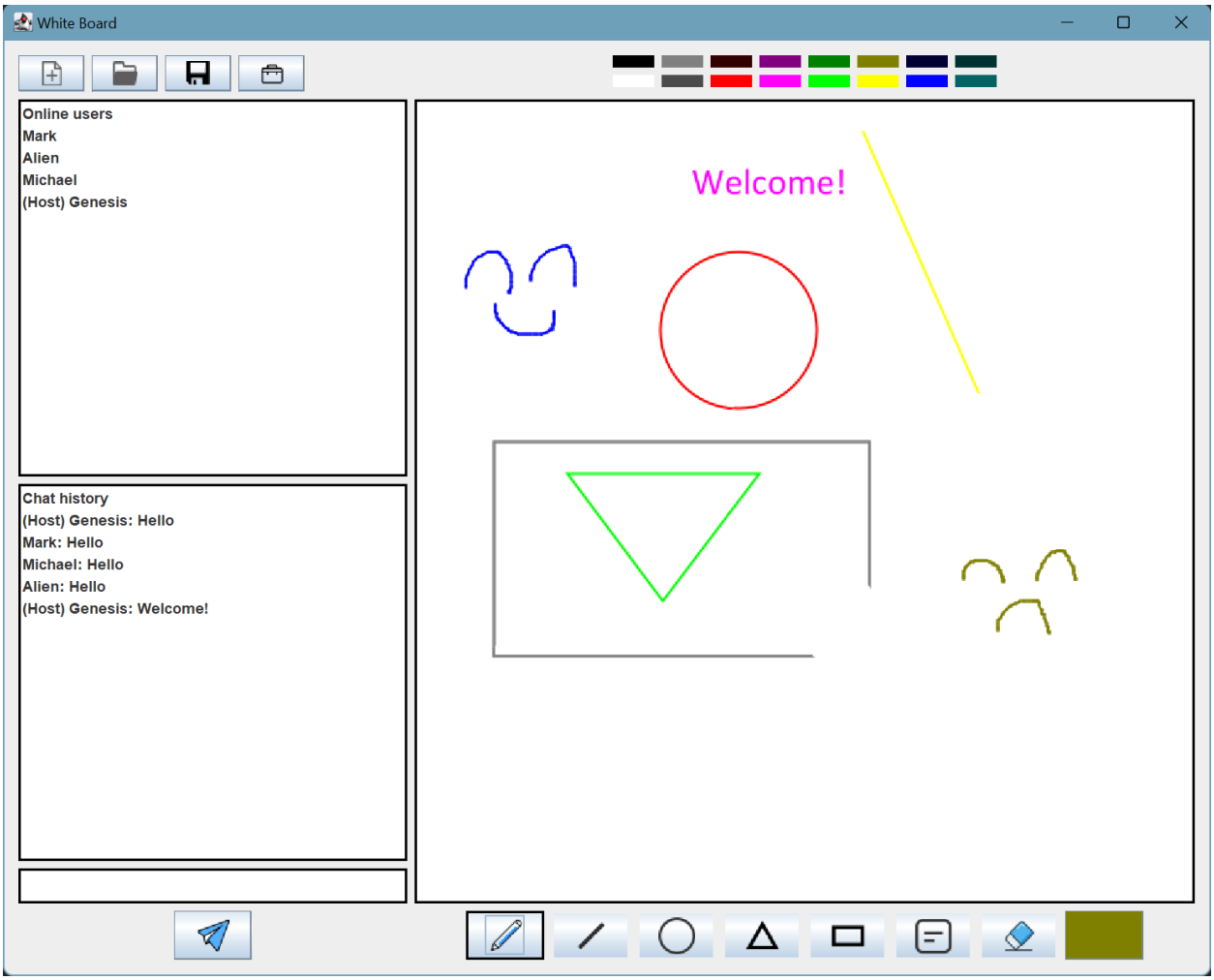

Figure 3: Client manager's UI

Besides, a chat window is merged into the left bottom of the UI so that all the users can communicate to each other in real time.

Finally, the main body of the system is constructed on the right section. There are color palettes on the top, which contains the 16 named colors in HTML. On the bottom, 7 painting modes are set up, including free-hand drawing, straight line, circle, triangle, rectangle, text, plus eraser. The eraser is not listed as a requirement, but its logic is similar to free-hand drawing and seems to be essential to a normal white board. The current using color is displayed at the right most. The shared canvas lies in the middle and all online users can paint whatever they want on it.