GLOBAL MEETING PLUS (GMP)

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ABSTRACT

Global Meeting Plus (GMP) is a Web-based collaborative GroupWare application, which consists of chat-channel, whiteboard, database, communication security, and pillow-talking. The chat-channel is for talking, whiteboard for drawing, database for recording, communication security for avoiding the information leaking out, and the pillow-talking for limiting meeting team. GMP can be used to hold any kind of internet-meeting around the global and can keep meeting proceeding for reviewing and generating necessary minutes. Meanwhile, all information in GMP is safe. In this paper, we describe our design ideas and implementation techniques of GMP.

Key words: Internet chat-channel, whiteboard, client-server model, Database

1. INTRODUCTION

There are several kinds of tools in the Internet for talking using keyboard and mouse, for example chat-channel, whiteboard, and chat-channel with whiteboard. The chat-channel is based on text communication, whiteboard exchanges information with drawings. Unfortunately, currently none of them is suitable for a regular meeting on the Internet.

A regular meeting would consist of registration, distribution of information and question, discussion, and taking records for review and generating necessary minutes. Meanwhile, a meeting should be set up for the right persons, and anything talked and information distributed in the meeting may not leak outside. Therefore, an Internet tool for a meeting should have, at least, a sign-up process, a security system, document/handout distribution, and a store/restore function in addition to communication processes.

Global Meeting Plus(GMP), based on the idea of chat-channel with whiteboard, is an Internet tool developed to hold meeting around the world. In GMP the sign-up, the communication security system, document/ handout distribution, meeting proceeding store and restore, and a module of pillow-talking are designed or considered in order to meet the needs of a regular meeting through the Internet.

This paper is organized as follows. Section 2 describes an overview of GMP system architecture. Sections 3 through 7 highlight the design and implementation ideas. Finally, the future work is briefly discussed in section 8 and a conclusion is brought in section 9.

2. SYSTEM ARCHITECTURE

GMP is a Java-coded, cross-platform, multi-user; text/drawing capable, document/ handout distributable, real-time, interactive internet distributed application featuring a server designed to interact with clients--Java applets--that facilitate group discussions and interactions. The server is the heart of the powerful client/server system, which features a database engine, drop-in server modules, a multithreaded kernel that handles inter-applet communication, and more. The overview of GMP is shown in Figure 1.

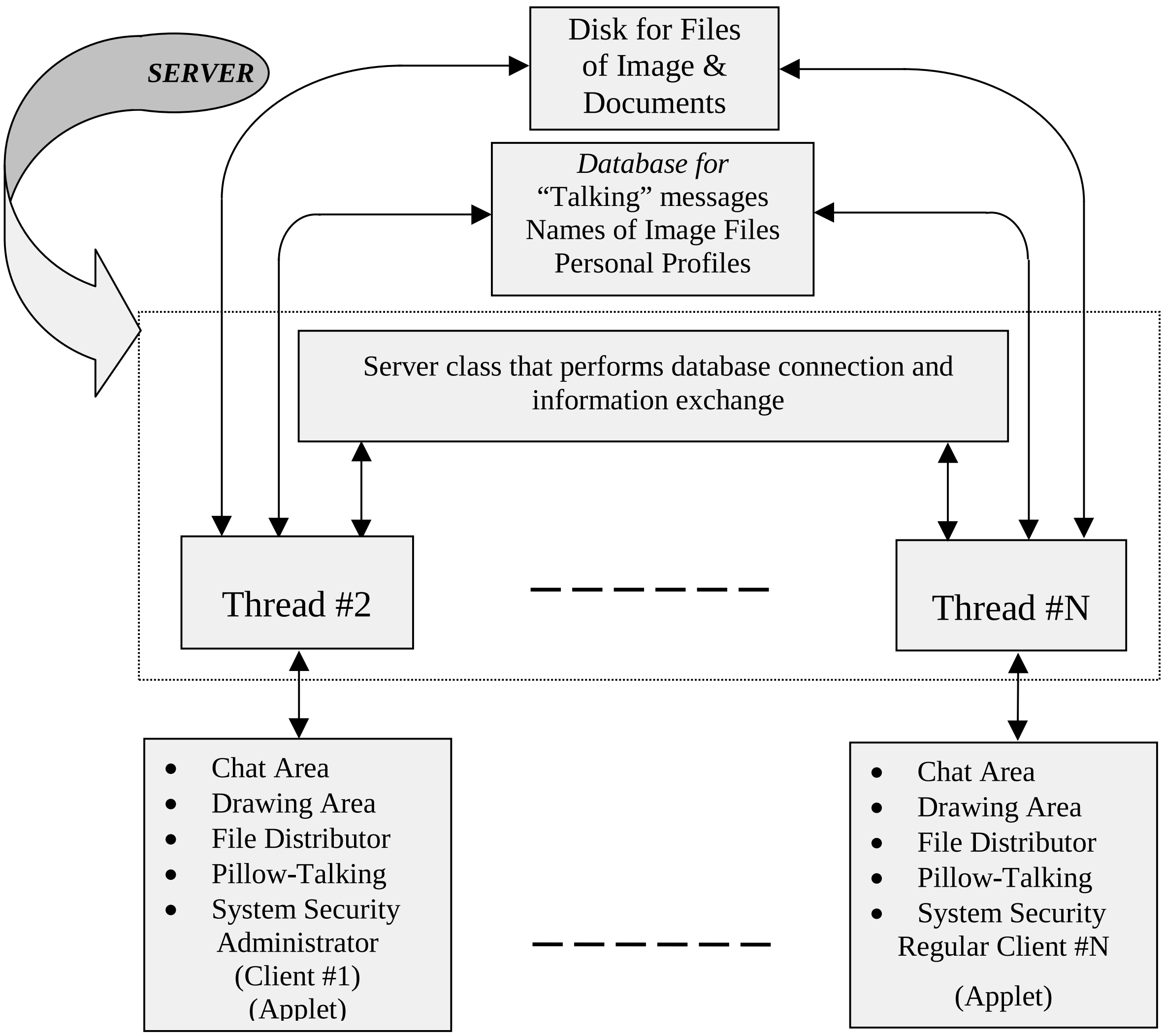

Figure1: Overview Structure of GMP

The primary tool for this development is Borland Jbuilder with JDK. Java is chosen because of its strong capability in networking/ database management, its object-oriented nature, its ability to span across platforms and its use in the Internet applications. Besides, we use InterBase for Window NT and Mini SQL for UNIX as our database management system to approve the platform independence of GMP. Both of them are functional, popular and available in the Internet.

Upon starting the applet, users are greeted with an interface of login dialog (Figure 2). To log in, supply name and password, after server confirms/sets up the personal profile in the database, the participant can communicate with anyone else using the real-time applet on the same server, through a friendly interface meeting place (see Figure 3), which provides a clean design with the six sections integrated into one canvas.

- User's identification area (upper-right in Figure 3), where the session owner name and working status (waiting/running) are shown.
- Pillow-talking (mid-right in Figure 3), created to choose the participant(s) to talk to or to limit meeting group.
- File distributor (mid-right in Figure 3), designed to distribute necessary files such as papers, documents, handout, etc around the participants.
- Whiteboard (upper-left in Figure 3), used for exchanging information/discussing questions with the aids of images (figure, drawing, sketch, etc.)
- Chat channel (lower-left in Figure 3), used to communication/ discussing questions with "words".
- Meeting session handling area (low-right in Figure 3), previous images, documents/ handout, and messages can be loaded/saved from/to database and the information could be encrypted before going into the internet if necessary.

Figure 2. The Interface of Login Greeting of GMP

In a regular meeting, the participants are separated into at least two levels, the meeting chairman/chairwoman and regular participants. The users of GMP contain the regular users and an administrator. Only administrator (meeting chairman) can be the first person who has the authority to start/shut-down the server, start meeting session and restore session from the database if necessary, and is in charge of updating meeting participants' information when somebody enters or quits the meeting room.

The users can view and draw on the whiteboard simultaneously and are presented with a list of logged-in users, and then can click on one or more of the names to set up a pillow-talking. The designated users will get a message inviting them to join.

GMP provides a Database to record the participants' information and the meeting sessions. The information is encrypted before sent out to the network, and decrypted for display or for saving in database when the information is received. All the text-based chat messages are saved in database and it is convenient to be retrieved and shown at message bulletin by activating the related functions. Pictures drawn on the whiteboard can be stored as files with a pointer in the database and restored in a future session, which adds a depth to the communication missing from many chat applications.

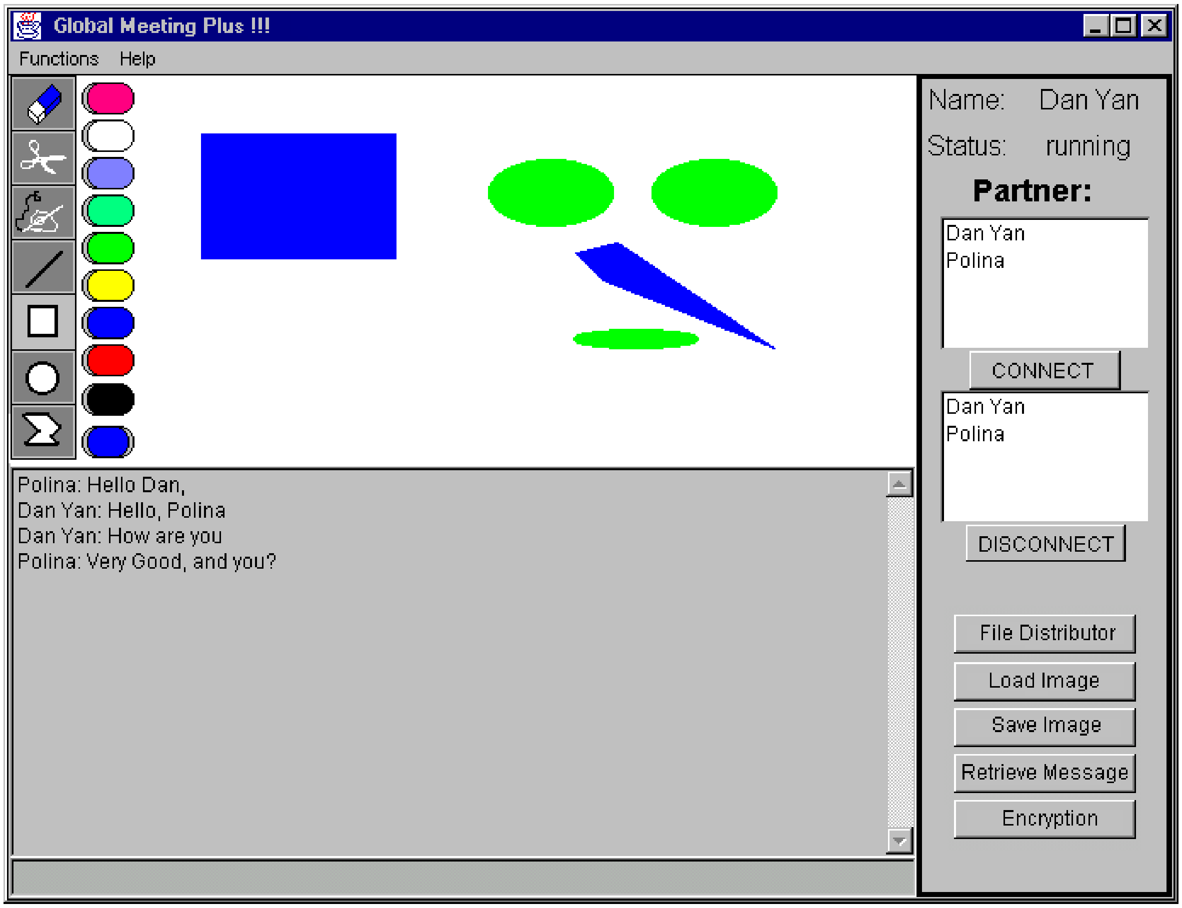

Figure 3. Meeting Place Interface

3. IMAGE COMMUNICATION

In a meeting, the images, such as figures, drawings, and sketches are very important for the participants to explain their idea and to discuss questions. In order to make people be able to use images to explain their ideas, the whiteboard technology is adopted in GMP.

In GMP, as most whiteboards[1], images are transferred by object through object-stream[2,3] instead of header + message body[4]. As well known, the header + message-body is not suitable for mass information transfer. Meanwhile the drawing place is updated by the trigger[5] from ImageObject to avoid the ImageObject being polled continuously. In order to support simultaneous drawing on the whiteboard without mussing up the participant's view, the client's ImageObject for receiving the GraphicObject is locked automatically when the participant starts to draw.

When a participant gets a component of drawing done and releases it, a GraphicObject is generated and sent to the server and the server broadcasts the GraphicObject to all the clients (participants). When a participant makes a sketch done, a ImageObject, which consists of the GraphicObjects, is established for his/her sketch combining with a file name that includes the participant's name, time, and date, and is sent to the sever, and the sever saves the filename into the Database and the image file into a disk.

The traditional way of saving image is inefficient. It requires expensive format setup and special functions to read and write. GMP uses ObjectStream in Java. With ObjectStream images can be saved in file and restored from file conveniently.

If a participant likes to review a previous image stored in the Database and the disk, he/she could send out a request that contains the file name of the image to the server. The server then sends the participant's request to the administrator for permission. The image will be loaded from the Database and the disk as soon as the request is approved and broadcast to all participants. The image information is encrypted for transfer in the Internet if necessary.

4. FILE DISTRIBUTOR

At the beginning of a meeting, some participants may have documents or handouts to distribute to the else in order to make the meeting more efficient. GMP provides a file distributor for the users to distribute their document(s)/handout(s) around the participants. As whiteboard transfers the images through the Internet, the file distributor submits a FileObject of the document/handout with a file name, which contains the title of document, the author's name, and issued date, to the server. The server saves the file name into the Database and the document/handout into the disk. And then the server delivers the document/handout to all the participants or only to the limited meeting group, which is set through the "pillow-talking". All the files could be encrypted before entering the Internet for delivery if necessary.

When the participants receive the document/handout, they could read it by the related software such as MS-Word, Excel, PowerPoint, etc., according to the type of the file received. On the other hand, corresponding software will be launched to display it if the automatic display function is chosen.

5. TEXT COMMUNICATION

A participant can "talk" to any other participant he/she wants through the chat-channel of GMP. The participant's talking will be submitted to the server with the TextObject. The server will broadcast the TextObject to all the participants or to the limited meeting group as set by the "talker". Meanwhile, the server saves the participant's TextObject with the talker's name, time, date, and meeting title together into the Database for further review.

Every participant can review previous "talking" of the participants, including himself/herself. If to do so, the participant could submit the server a request including the talker's name, time, date, and meeting tile, which could be chosen by a browser. The server will feedback the corresponding information to the requester. The information could be encrypted for transfer in the Internet if asked to.

6. MEETING GROUP LIMITING AND MEETING SECURITY

Meeting Group Limiting is designed for a participant to choose a meeting member(s) to whom he/she wants to talk. If the participant limits meeting group, the list of the limited member's names will be included into all his/her TextObjets and FileObjetcs automatically. And his/her TextObjects and File Objects will be only delivered to limited members in the list.

No people like to leak out any message if he/she is joining a special meeting. A security system is built up to protect the participant's rights. GMP choose RSA[6] algorithm to implement a asymmetric cryptosystems[7]. In GMP, a security system of three levels is designed to provide security.

- A new client has to submit an application with necessary information to the administrator to apply for a permission to join a meeting. The administrator will issue a permission to the applicant with a primary password to download the "GMP dog system" from the server, which can run only on the applicant's computer when his/her application is approved .

- Login/password requirement for every client. Every new client will be asked to choose login password when his/her primary password and necessary private information are confirmed. The regular client will be asked to provide his/her name and password to log in.

- The database can only be accessed by the server. The server controls all database transactions to prevent attempts of unauthorized access. A regular participant can get the information from the server only when his/her request is approved. The server randomly picks up two sets of encryption/decryption schemas which are stored in the Database (and also built in the GMP dog system), one for server side, the other for client side. They will be used to encrypt the information for transfer in Internet and decrypt it for display or save when the information was received during the meeting.

7. NETWORKING PROTOCOL AND MEETING PROTOCOL

To hold a meeting around the world, GMP has to communicate through the Internet, which implies the use of the TCP/IP suite. So the choice of transport protocols for GMP would be between UDP and TCP.

UDP protocol[8] is simpler to employ but comes with the potential cost of greatly increasing the complexity of the meeting protocol and the communication software since the Internet is a highly unreliable environment and many problems such as duplicate packets and data corruption may be encountered when transmitting data. TCP[9] was chosen mainly because of its powerful features, such as Object Serialization and ObjectStream in Java. Java provides stream sockets which use TCP as transmission protocol and a superior means object serialization. The power in this technique is its simplicity. The programmer simply has to have the class implement the java.io.Externalizable or java.io.Serializable for it to be serialized.

The Meeting Protocol is the means by which the clients and server are able to communicate in a meaningful manner. By the traditional network model, bytes of data are parsed into discrete messages by preceding the message with a header. There is complexity in the process in which image objects have an encoding layer for converting the image object to a network-transferable form and a corresponding decoding layer that converts the message back into a image object. Problems arise with this design when these encoding/decoding layers increase in size and complexity.

Using object serialization, the complicated information types of GMP have been simplified into the five types of objects: GraphicObject, Text Message Object, Image object, Control Information Object, Security System Object. It makes Meeting Protocol highly modularized and expandable when more and more features are added in the future.

8. FUTURE WORK

GMP will be enhanced by adding more drawing tools on drawing panel, Audio/Video for more convenient communication and multi-conference ability.

9. CONCLUSION

An Global Meeting Plus was built up, which could bring people sit around a big table, the internet, to have any kinds of meeting/conference based on Visual and Audio (in the near future) information exchange.

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