

IMPLEMENTING AN INTRANET VIDEO CONFERENCING SYSTEM

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ABSTRACT

Remote Conferencing is any kind of multi-way communication carried out in real-time using telecommunications or computer network. It enumerates the basic technology involved in multi-way communication between people within a geographical area. It allows users to overcome problems such as wasting time and manual communication such as sending memo, making calls and having a physical meeting that has been used over the years.

This research work presents the design and implementation of an intranet conferencing system on a local area network (LAN). The design provides a solution that eliminates the use of expensive hard-wired intercoms and Private Automatic Branch Exchange (PABX) by making use of only LAN and full multimedia computer allowing network users the opportunity to still communicate audibly despite the meagre resources. The implementation of conferencing system was based on software written in Java programming Language and Microsoft Access to run on many computer systems which are networked together on a local area network (LAN). Eclipse Kepler was used to design the interfaces and backend. This work implements the design of the video conferencing system in form of a software intercom.

Video conferencing system is a visual and graphical chatting application that makes chatting and data exchange a pleasant experience. It is designed to provide network users with cost effective, easy and reliable multimedia communication over LAN, in essence giving the users a truly multimedia experience.

1.0 INTRODUCTION

In a developing economy like Nigeria financial resources are scarce commodity. Hence, cheaper means of accomplishing tasks even within the presence of scarce resources are always explored. The need for information at the press of a button particularly in a developing economy cannot be overemphasized since telecommunication has long become the backbone in the day-to-day running of most businesses and organizations. Hence, the need to finding new solutions to make it cheap and affordable must be sought. Currently, digital technology is the backbone of the entire information industry. As part of this, the transformation of audio information into digital signals is now a routine process that is incorporated into our telephone, digital networks, televisions and music equipment (Irny, 2005).

Voice communication traditionally has been carried over dedicated Telephone networks operated by Telecommunication service providers such as Etisalat, MTN, Globacom Nigeria Limited (GLO-MOBILE), etc. in Nigeria. These telephone networks have progressively evolved from the initial analog circuits to the current digital networks with bandwidth in excess of 1Gbps. For reasons of varying bandwidth and networking requirements, different services are provided on separate networks. For example, telegraph networks, telex networks, telephone networks, Facsimile networks, Cable networks and Data networks support different services, as their names would suggest. These networks possessed characteristics that satisfied the peculiar requirements of the service they provided. For example, the voice network would support bandwidths of 64 Kbps for voice communication and would ensure Telco-grade voice communication with little jitter and echo cancellation. Likewise, the cable networks would provide even higher bandwidth and improved quality of service (QoS) for video transmission. On the other hand, the data communication networks' bandwidth and

QoS requirements are highly flexible. For most types of data communication applications, reliability is critical, which means that the delivery protocols would implement mechanisms for error checking, acknowledgment, re-transmissions and sequencing. On the other hand, for real-time applications such as voice communications, it would make little sense to retransmit a lost packet for play back at the receiving end, if it is out of sequence and is considerably delayed. Essentially, the main point to be noted is that these networks have been designed differently in terms of their underlying architecture and communication protocols (Wenbiao et al., 2001)

With the immense growth of digital networks, which is the marriage of two technologies i.e. telecommunication technology and computer technology, Networks are being explored to the fullest. Ways, in which existing networks can be used optimally, with minimum additional cost, include facilities like video conferencing and mail serving incorporated into the network, saving cost, granting easier access to remote database and remote programs. Integrating these networks into a single integrated network, such that all services would use common facilities, presents a technological hurdle. This work therefore is designed to provide a service that transmits text, voice and video over a Data network, as against having dedicated voice and cable networks meant for either voice or video communication only. The advantages gained from having an all-purpose network as against having only dedicated networks include Cost Reduction, Simplification and Consolidation (Gurmeet, 2006).

2.0 PROBLEM DEFINITION

Today many organizations want to increase profit by cutting cost spent on the infrastructure they are using. They are ready to invest money in work which is cost saving. Organization running intranet usually used email server to send and receive email and attachment. This work is basically to minimize the cost of messaging using servers to help organization to increase profit by eliminating the use of database.

The existing communication system is not built as a software application. Everybody communicates with each other physically by sending memo, making calls or through sending of mails.

This work enables communication on the intranet to be as simple as it can be through effective means of sending messages(text, video and file) without internet and telecommunication dependencies and most importantly enhance workflow and reduce communication cost of any organization.

3.0 REVIEW OF RELATED WORKS

3.1 Corporate Messenger of an Organization

This corporate messenger is not built as a software application. Everybody communicates with others physically or through the mails. To make this complex communication job simple and allows the users to participate in live communication and save time, there is need to build is as a software application.

Each and every user or employee of an organization has to register, get into his inbox and check for his mail which doesn't provide live communication resemblance to the user. This facility does not categorize the users depending on their interests. This type of communication channel fails in providing effective user friendly communication between the users. If this channel grows up to some extent then it will be harder to place some restrictions on the users. As a result, ineffective communication wastes the user time (Waleed, 2000).

3.2 Talkomatic Online System

The first online chat system was called Talkomatic, created by Doug Brown and David R. Woolley in 1974 on the PLATO System at the University of Illinois. It offered several channels, each of which could accommodate up to five people, with messages appearing on all users' screens character-by-character as they were typed. Talkomatic was very popular among PLATO users into the mid-1980s. The first dedicated online chat service that was widely available to the public was the CompuServe CB Simulator in 1980, created by CompuServe executive Alexander "Sandy" Trevor in Columbus, Ohio.

3.3 Distributed Multiparty Desktop Conferencing System: Mermaid

The distributed multiparty desktop conferencing system (MERMAID) and presents its preliminary brief evaluation, obtained as a result of daily use. MERMAID, which is designed based on group collaboration system architecture, provides an environment for widely distributed participants, seated at their desks, to hold real-time conferences by interchanging information through video, voice, and multimedia documents. This system is implemented by using narrow-band ISDN, high-speed data network, and UNIX-based EWSs with

electronic writing pads, image scanners, video cameras, microphone-installed loudspeakers, etc. The system provides participants with the means for sharing information in such multimedia forms as video, text, graphics, still images, and hand drawn figures.(Groth, 2005).

3.4 The Rapport Multimedia Conferencing System

The rapport multimedia supports interactive, real-time, distributed conferences among two or more users. Using computers connected by data and voice networks, this system creates an environment in which many sorts of meetings can take place, including telephone conversations, discussions among colleagues, and lectures. Rapport provides new opportunities for meetings, allowing a user to interact with distant colleagues and to participate in several conferences concurrently at his or her workstation. This system allows many existing computer programs to be used, modified, within its conferencing environment. Although Rapport does not encourage a particular methodology of meeting conduct, such specialized support can be built using Rapport. (Ahmet, et al., 2005).

4.0 RESEARCH METHODOLOGY

The system was developed by using the following; IDE(integrated development environment) such as Netbeans 7.4, Eclipse Kepler, using the Java programming language alongside JMF(Java Media Framework) and(RMI) remote media invocation. The proposed system is a standalone application hence Eclipse helps to create the design and the implementation. JMF and RMI codes are embedded into Java in order to activate or invoke the media functionalities to make video conferencing possible and effective without any security vulnerabilities. More so the use of socket programming was used solely for the implementation of text chatting/conferencing .

5.0 DEVELOPMENT TOOLS

5.1 IDE (Integrated Development Environment)

❖ Eclipse Kepler

In computer programming, eclipse is an IDE.it contains a base workspace and an extensible plug-in system for customizing the environment. Written mostly in java, eclipse can be used to develop applications. By means of various plug-ins, Eclipse can be used to develop applications in other programming languages: Ada, C, C++, COBOL, Haskell, JavaScript etc.

Development environments include the Eclipse java development environment tools (JDT) for java and scala, Eclipse CDT for C/C++ and eclipse PDT for PHP, among others.

❖ Netbeans 7.2.1

Introduced by Oracle, Netbeans is a free, open source IDE available for Windows, Mac, Oracle Solaris, Oracle Linux, and other Linux distributions, that enables developers to rapidly create web, enterprises, desktop and mobile applications for the java applications for the java platform, PHP and C/C++. It enhances developer's productivity, improved performance and the Expands support for creating java applications (Mengual, et al., 2009).

5.2. Java Programming Language

JAVA was developed by SUN Micro system and released in 1995. JAVA is based on C and C++ and incorporates a number of features from other object-oriented language. JAVA includes extensive libraries for doing multimedia, networking, multi reading, graphics, database access and much more. This is why it is the programming language of choice for the software design. JAVA is a high level programming language that was developed solely with the Internet in mind. Most web programs and handset used today are designed using the JAVA programming language. It has unique attributes embedded into its design features, which make it the program of choice for most web application and software developers. Its embedded design feature include; OOP, Platform Independence, High Performance, Multi- Threading, and Dynamic linking. These entire features have made programming complex applications rather simple and straightforward. The design features are explained in detail

❖ Java Platform

Java is ideally suited to become the standard application development language for wireless devices, providing us with lots of benefits. Here are some of the benefits:

- i. **Cross platform compatibility:** The Java application can easily transfer between different devices and different platforms as long as the JVM has been developed for those devices.
- ii. **Object Oriented Programming:** Java has a better abstraction mechanisms and higher level programming constructs than C++.
- iii. **Huge java developer community:** Java has become the most popular programming language taught in schools and universities.
- iv. **Security:** Java is known for its security features (class file verification, cryptography possibilities etc...)
- v. **Dynamic:** Java classes can be easily downloaded dynamically over the network, and easily integrated with the running application.

❖ Java Media Framework

Java Media framework (JMF) provides architecture & messaging protocol for managing the acquisition, processing and delivery of time-based media data. JMF is designed to support most standard media content types such as AIFF, AVI, GSM, MIDI, MPEG, WAV etc. JMF implementations can leverage the capabilities of the underlying operating system, while developers can create programs that feature time-based media by writing to the JMF API. With JMF, developers can easily create applets & applications that present, capture, manipulate and store time-based media.

Time-based media is also referred as streaming media- it is delivered in a steady stream that must be received & processed within a particular time frame to produce acceptable results. Media data is in media streams that are obtained from a local file, acquired over network or captured from a camera or microphone. These time-based media is represented through o/p devices like speakers & monitors. An output destination for media data is referred as a Data-Sink. In many cases, the presentation of the media stream can't begin immediately. This is latency experienced before begin of presentation. The data in a media stream is manipulated before it is presented to the user. Time-based media can be captured from a live source for processing & playback. For this we need capture devices. Captures devices can be characterized as either push or pull source. A still camera is a pull source- the user controls when to capture an image. A microphone is a push source-the live source continuously provides a stream of audio.

JMF uses this same basic model. A data source encapsulates the media stream much like a video tape and a *player* provides processing & control mechanism similar to VCR. Playing and capturing audio and video with JMF requires input and output devices (Somerville, 2009).

6.0 EXISTING SYSTEM

The existing communication system is not built as a software application. Everybody communicates with others physically by sending memo, making calls or through sending of mails. To make this complex communication job simple and allow the users to participate in live communication and savetime, it requires building it as a software application.

Each and every staff of the department have to register, get into his inbox and check for his mail which doesn't provide live communication resemblance to the user. This facility does not categorize the users depending on their interests. This type of communication channel fails in providing effective user friendly communication between the users. Figure 1.0 depicts the use case diagram of the existing system showing the communication channels that already exists.

6.1 Problem of Existing System

- i. It is not user friendly.
- ii. It requires more cost
- iii. It wastes lot of time and also stressful

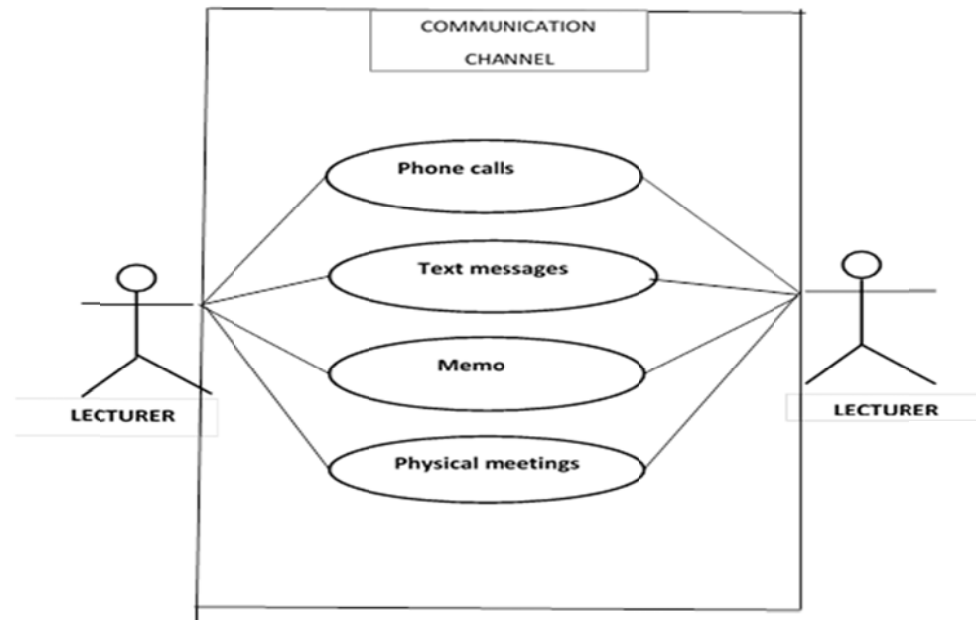


Figure 1.0: Use-case diagram for the existing system

7.0 THE PROPOSED SYSTEM

The first step of analysis process involves the identification of need. The success of a system depends largely on how accurately a problem is defined, thoroughly investigated and satisfying the people's needs by providing user friendly environment. This system has been developed in order to overcome the difficulties encountered while using the mailing system for communication between the users. Providing user friendly communication channel, sending public and private messages, and sending instant and offline messages.

The system also has what is known as the Admin Client, this is the person that controls all the people and activities going on in the chat room.

7.1 Features of the Proposed System

- i. A text chat room that encompasses all in the conference
- ii. Private one-to-one text chats
- iii. File sending to single or multiple participants
- iv. Video and/or Audio streaming from a webcam and microphone

7.2 Benefits of the Proposed System

- i. Reduces the user manual communication work.
- ii. The wastage of time is reduced.
- iii. It also helps in providing instant and offline communication.
- iv. Cost effective

8.0 APPLICATION ARCHITECTURE

Application architecture is the organizational design of an entire software application, including all sub-components and external applications interchanges. There are several design patterns that are used to define this type of architecture, and these patterns help to communicate how an application will complete the necessary business processes as defined in the system requirements. One need to understand and manage the dynamics of the functionalities the model is implementing (Foldoc, 2001). Figure 2.0 and figure 3.0 depicts the architecture of the system showing the basic elements that forms the proposed system and the login flowchart of the proposed system respectively.

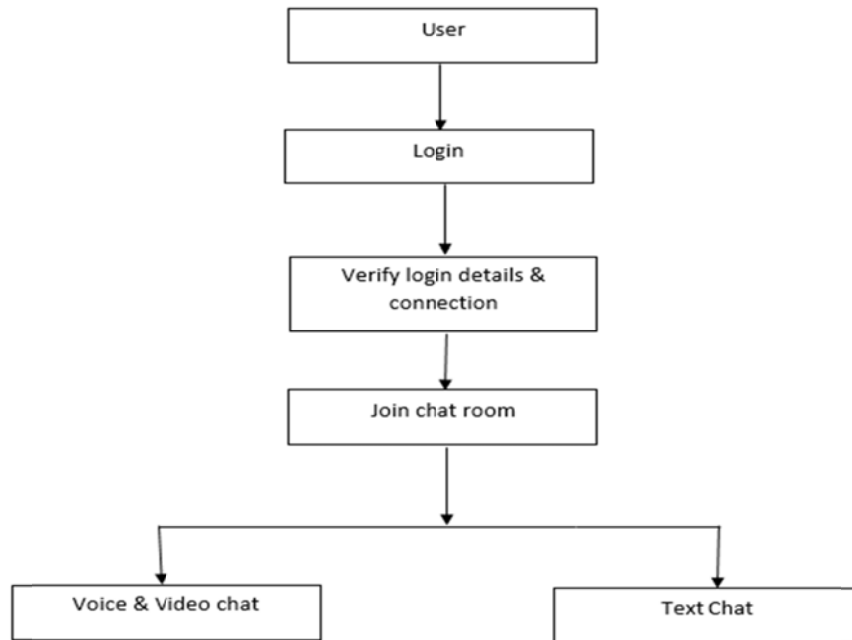


Figure 2.0: Application Architecture of the proposed system

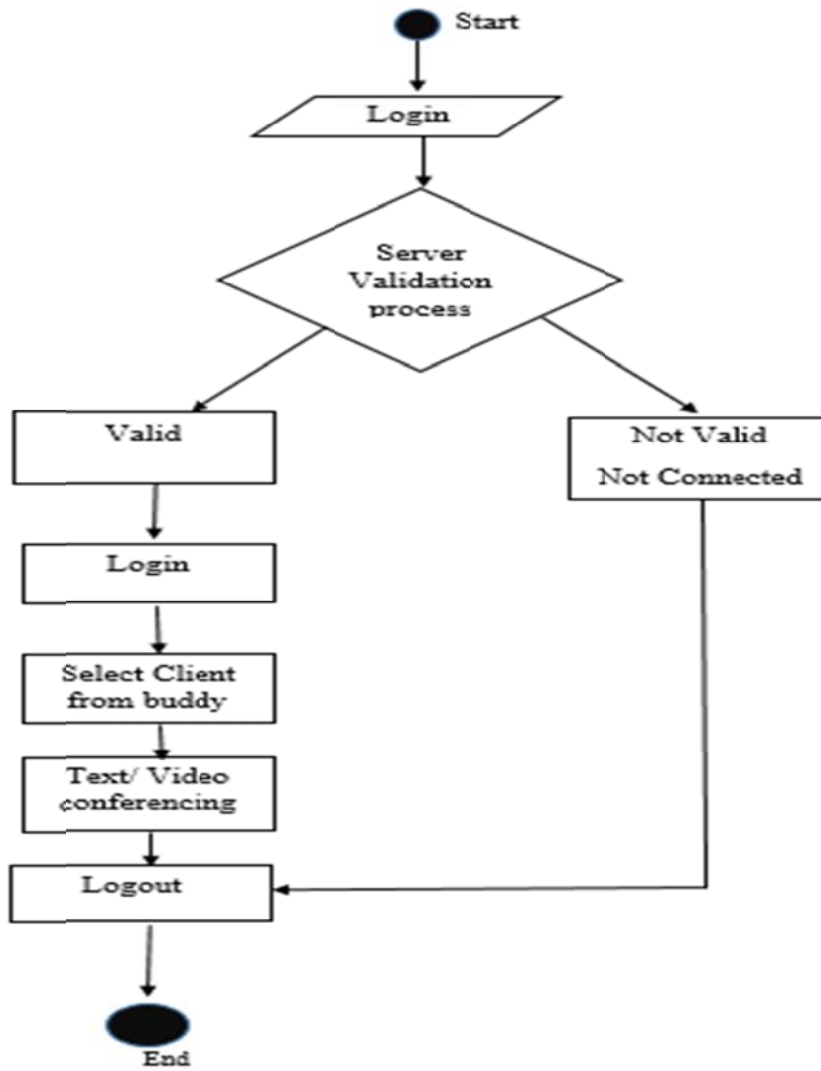


Figure 3.0: Login flowchart of the proposed system

8.1 Data Flow Analysis

This technique is used to show the flow/movement of data within a particular system. This is applied here in order to model the overall behavior of the system. Data flows from where the user presents an image to the application, face is extracted and compared with a template stored in the face database in order to provide authentication, just as illustrated in figure4.0 below.

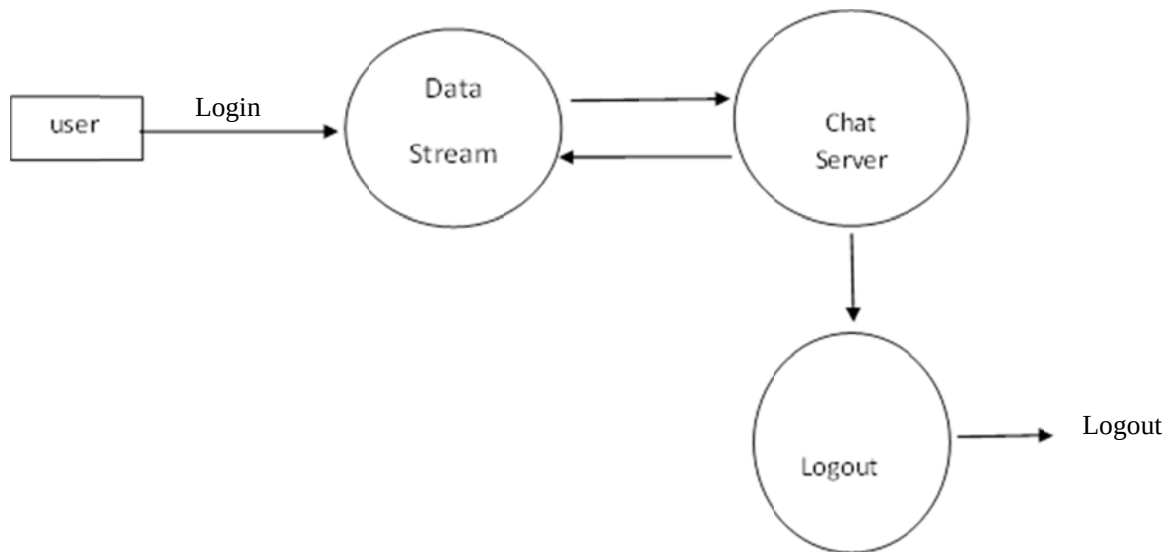


Figure 4.0: Data flow diagram for (chatting) proposed system

9.0 RESULTS AND DISCUSSION

This system has been developed in order to overcome the difficulties encountered while using the mailing system for communication between the users. This has been able to provide user friendly communication channel, sending public and private messages, and sending instant and offline messages. It reduces manual work and time wastage.

The system is a collection of modules or components. In this system, the system is main module, because it consists of discrete components such that each component supports a well-defined abstraction.

9.1 System Modules:

- i. **Chat Room Management module:** This module contains registering the user, in this application we need to give user information such as the username. It also takes care of connecting or disconnecting the users from the application server, that is, the users can logout of the chat room whenever he or she is done by clicking the necessary icon. It also informs other user that a particular user is logged out, allowing us to know the number of users that are presently in the chat room. The users also have the capabilities of blocking and unblocking users thereby giving them the privilege of choosing which user to chat with and have in their log

This module is also used same way like user management module. But in this system we treat the chat room management module differently from user management module. It allows the users to view the member list and to join the chat room. This is shown in figure 4.1, figure 4.2, figure 4.3.

- ii. **Chatting/ Messages Module:** In this module we take the details of how messages are sent and how they get to their appropriate destinations. It also gives the details of sending personal messages (private messages) and also having general discussions (public messages) in the chat room. It also takes care of how individual users view their personal messages and reply back to the message that is being sent and also print out read messages. This is shown in Figure 4.4, and Figure 4.5 where users can read their messages and also send messages to other users that are registered in the chat room.
- iii. **Transfer Module:** In this module, the users can transfer files to other users that have registered files size below 100Mb. This is shown in Figure 4.4 and Figure 4.5. These figures display the file transfer region form where users can send files of different file to other or all users.



Figure 4.1: H-messenger user login.

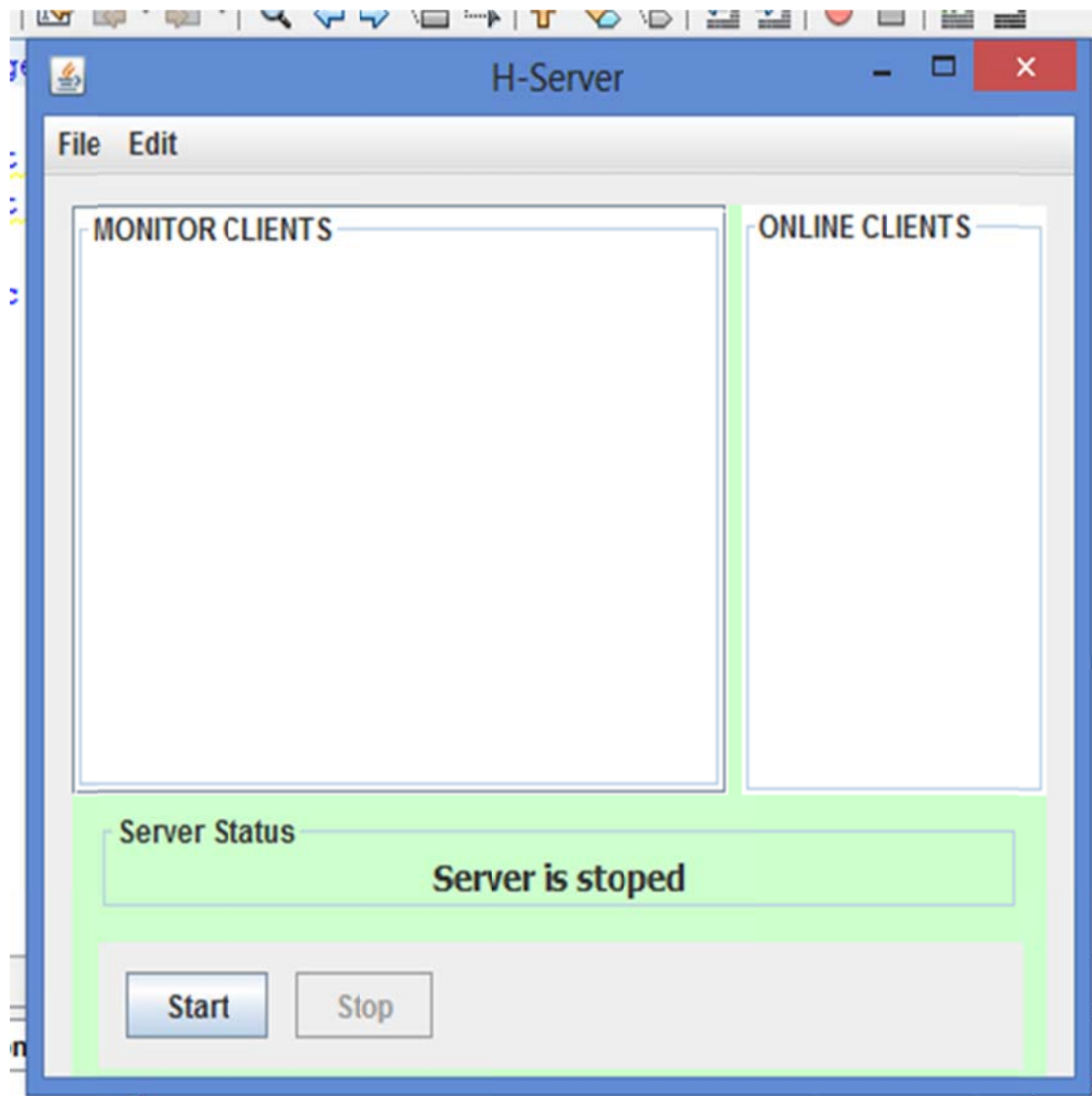


Fig 4.2: H-Server interface for connecting clients on the network



Figure 4.3: H-Messenger video conferencing (Client Adewusi on screen)

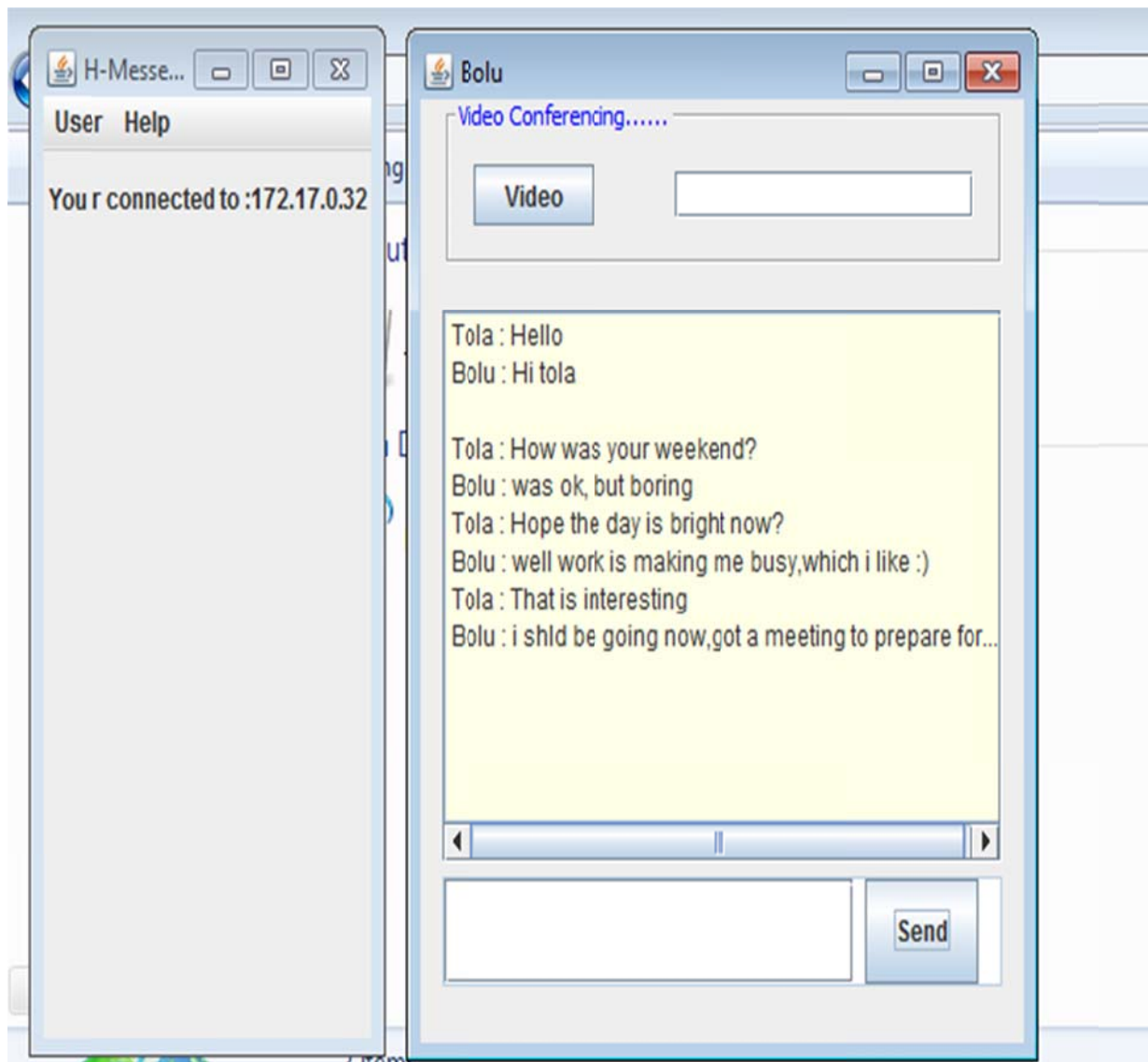


Figure 4.4: H-Messenger chat room (Client Bolu)

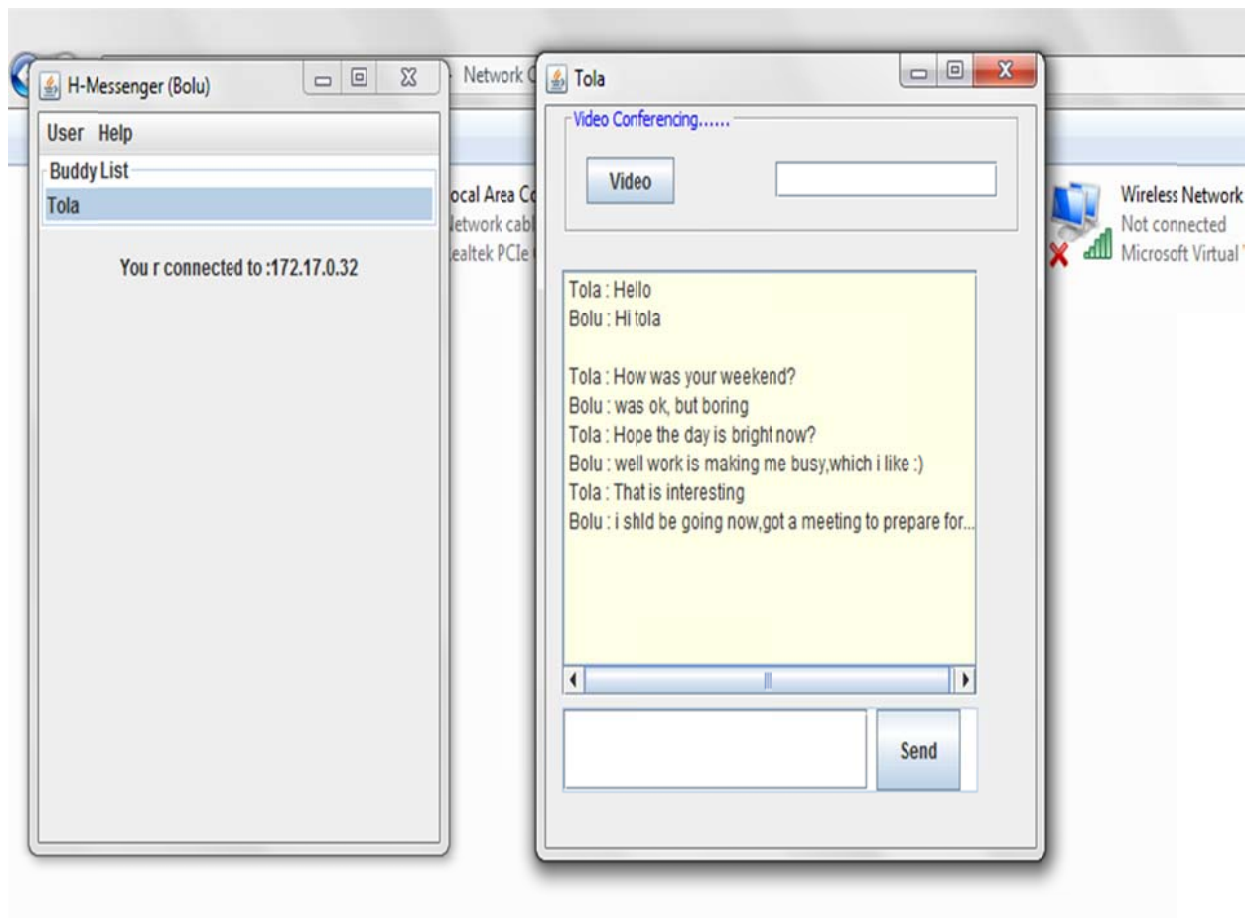


Figure 4.5: H-Messenger chat room (Client Tola)

10.0 CONTRIBUTION TO KNOWLEDGE

This research work has contributed to knowledge through the development of intranet video conferencing system which has culminated in a number of benefits by providing instant and offline communication, reduction of time wastage, very cost effective to maintain and enhance reduction in user's manual communication work.

11.0 RECOMMENDATION

This work has been implemented over Intranet i.e. LAN however the following recommendations are made for future work:

- i. The program could be enhanced to run over a WAN and consequently on the internet so that all the lecturers in the university would have access to it no matter their geographical location.
- ii. File transfer and other interactive features can also be added and improved one

12.0 CONCLUSION

Video Conferencing Chat Room System is a very useful modern communication tool whose advantage is innumerable and outnumbers its disadvantages. It is highly recommended for all categories of people and easy to use.

Chat room system is an application developed according to client requirements. Lot of efforts was put to make it perfectly and efficiently. The developed system is tested with real data and the users are satisfied with the performance of the system and reports.

This project is developed using Java. By using this application we can communicate with different people using different of channels in the department. It saves our lecturers and other staffs time and resources. By this, lot of workload will be reduced to the each staff to communicate with other employee and get things early. This application is very useful for Administrating efficient user friendly communication system. It provides extendibility also. So you can add your modules to the system whenever there is a change in the department or new users are entered. This reduces the physical work, time as well as money saved. The time for sending the problems and getting the solutions is considerably reduced. All the features are implemented and developed as per the requirements.

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