Implementation and improvement of features and performance of IRC (aim & messenger) and group support system

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Abstract*:* IRC (Internet Relay Chat) is a protocol used by people to communicate or deliver messages through networks. IRC offers services to users for real-time text messages through chat groups defined as virtual communities including people with same interests and hobbies. The communication provided by IRC is known as 'Computer-Mediated Communication' where people gathered at one place for conversations. IRC protocol enables its users or clients to connect to IRC servers providing a real-time interface for communicating with people at remote locations throughout the world. However, communication through IRC channels is not secure sometimes. Data security issue could occur while communicating using IRC protocol. Hence, data security is a major concern which needs to be considered to secure the information over IRC channels for hackers. This research focuses on the basic detail of IRC protocol, its architecture, environment, and features. The research is more focused on IRC system to improve its performance by implementing IRC application using new methodology and techniques.

Index terms: **IRC, IRC protocol, IRC Channels, Server Side, and Client Side**

I. INTRODUCTION

1.1 IRC (Internet Relay Chat)

Internet relay chat is an electronic chat protocol which uses the programs to the device the IRC rules. Internet relay chat is the most popular services on the web which enables numerous communication services to its users. IRC allows the real-time conversations with the people present in the whole planet. IRC enables its users to connect with others through the internet on many websites. People use IRC to chat with other people from all around the world. Many of us use the IRC to keep in touch with the family members, relatives, and the friends. It enables us to contact with the others without inducing the cost of long-distance telephone calls. Some people also use IRC to take knowledge of the various things. For example, Internet relay chat also enables the beginners to learn about the HTML website which brings us the different business opportunities.

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The users can hold the group chats with the other users in the real-time sessions by using the internet services. The IRC system includes the two programs – a server and the client. The server in the IRC system relates to the long-running program on the computer system. The client belongs to the short running program it starts the programs when you connect to the server. It joins one or more channels in one lane. In this system, several clients connected to the one server and interfaces with each other [13].

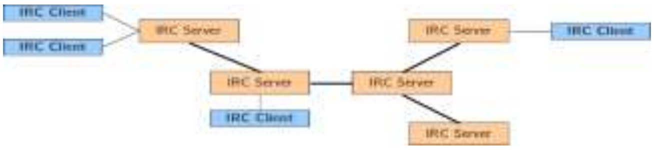

Figure 1: IRC Network

In IRC network, the several open channels are available for freely joined by every user. The message posted by users is promptly shown to all other connected users. This significantly differs from forum users. The IRC broadcast behavior ensures that all users receive single contributed messages while forum users will see messages only within the thread that they can view manually.

1.2 IRC Architecture

An IRC network is defined by a group of servers connected to each other. A single server forms the simplest IRC network. The IRC protocol provides no mean for two clients to directly

Communicate. All communication between clients is relayed by the server. The IRC Protocol is based on the client-server model, and is well suited to running on many machines in a distributed fashion. The IRC architecture is shown in the below figure. IRC system architecture has three sections which are discussed below:

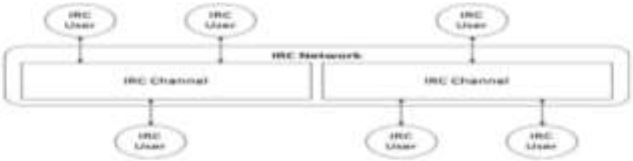

Figure 2: IRC System architecture [9]

Network: IRC channels are linked with huge networks to share channels, enabling numerous specific servers together and increase the number of chat rooms and its users. Every server in the network is connected with one of the alternate servers in the network and shares all their traffic with each other. Therefore, all connected servers have all messages communicated in the chat rooms [9].

Channels: The channels are the chat chambers which are a text-based framework. Each channel is a virtual space where the connected users with the Internet and IRC can communicate with the other individuals presented on the same channel. A client can utilize another channel, leave the channel and, change the channel whenever required [9].

Client and server: The server repeats the communication with client and channel. It channels and network to convey the messages to the individuals who are in the same chat room. When a user login to the IRC channel with the client application or signs into the server, then the client can set the default program in the settings. A user may join open chat room running on that server. Each message transferred in each chat room is then sent by client application over the network to the IRC server that specifically delivers to each other client connected to that chat room [9].

1.3 IRC Chat Environment

IRC consists of several channels in the network which enables its users to connect with the IRC. There are many IRC systems such as EFNET, IRCNET, DELNET and the NEWNET. The clients run the program to connect to the server in the IRC nets. Each user on the IRC channel isrecognized with their nickname. The IRC system provides the nicknames to the users once they are registered. A user can use different channels and communicate with the other users also. There are more than 12000 channels present in the IRC systems.

IRC Chat Environment enables users to join many chat groups simultaneously. The joined group by a client is mentioned below the IRC client-side screen. Clients can switch among different groups by selecting the channel buttons. To agree to the channels, one can utilize the list command which gives a broad list of channels that are accessible on the IRC. After that, in the IRC frameworks, it’s important to hold the channel before you begin the chat with the other client. A channel is depicted as the chat room where the many clients are interfacing with each other and begins the chat. There are multiple channels which are available on the server. After entering the channel, the client composes the messages and presses enter to send it to other clients in the same channel.

1.4 Advantages of IRC [13]

- **Decentralized:** IRC is decentralized which means that no single company is controlling IRC.
- **Privacy:** IRC channel can access complex channel modes.
- **Meeting new People:** Through IRC, people are able to communicate and meet new people all over the world.
- **Flexible and Robust:** IRC allows for real-time discussion with up to hundreds of people at once.

1.5 Disadvantages of IRC [13]

- **Freedom:** It might be difficult to organize and manage chat discussion. It is an open source chat messenger. Any user can easily join the messenger.
- **Informality:** Every person does not understand informal chat in the chat.
- **Chat size:** The length of chat lines is limited.

1.6 Features of IRC

- **Distributed and real time:** IRC brings the people together in real-time at minimal cost across geographical distance. IM appears as an attractive feature that requires more real-time interaction than e-mail. The real-time communication, save time and money.
- **Network Independent:** IRC speeds up the internal and external communication and provides access toindependent network communication.
- **E-mail:** It is a primary feature of communication for people today. This feature allows users to send, receive and manage their messages from different format and storage system.
- **Virtual communities:** Its free-flowing conversation, which included web forums.

1.7 Botnets in IRC

A botnet can be defined as a platform used by the cyber attackers to perform several attacks such as Distributed Denial of Service (DDoS) attacks, keylogging, email spamming, and phishing attacks and so on. A botnet is a network of compromised computers that is controlled and maintained by the attacker secretly. In the botnet, each end host is known as Zombie. Each host end is a

malicious program which is known as a bot. Every bot is responsible for receiving and execution of instructions that are issued by an attacker through a command and control channel. The attacker who is responsible for controlling the bot network is called bot master or bot herder. The botnets utilize command and control channel as their main components.
The botnets in IRC may initiate by the bot master, which sends the first command. The sequence of actions followed by the zombie in IRC networks are:

- Joining the IRC server.
- Joining the botnet channel.
- Execution of channel topic.
- Keep connection and then wait for bot master commands.

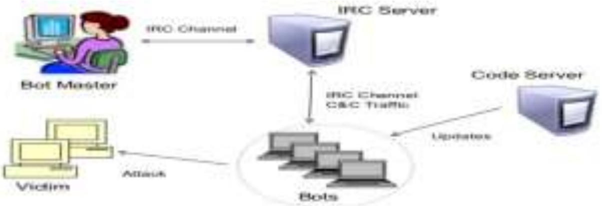

Figure 3: Botnet in IRC

The above figure is showing the botnet concept. The bot herder is giving the instruction to the connected botnets clients for exploiting the users. The commands are given using the command and control channel also called C & C as shown in the figure above.

1.8 Botnet Detection techniques

There exist several techniques to detect botnets on the IRC network. Various authors described the botnet detection techniques. Some of these are:

- If one is able to detect zombies when they are trying to connect to an IRC server, then IRC network can be prevented from botnets attacks by not allowing that zombie to connect to the IRC server.
- Another way we can use is by considering the similarity of the bot names. This can also help in detecting the bot. If the nicknames are showing similarity, then it may come from the similar bot because normal users' nickname has various styles various a bot master assigns the similar nicknames to their zombies or bots. So similarity can help in bots detection and prevention of attacks.
- It is also possible to detect botnets with the help of mean packet length of IRC packets and IRC messages distribution. If there is much variation, then it may be assign of botnet attacks.
- Botnets can also be detected with the help of AT & T Internet protect sensors which will investigate the hosts that perform suspicious activities and also monitor suspicious traffic. The sensor makes identification of botnets commands, and then these sensors report about this suspicious traffic and hosts to the hub server. Which can prevent the suspicious hosts from joining the IRC network or channel.
- Apart from these methods, a system called Rishi can also be used which will help in detection of botnets. This method uses scoring and regular expression for analyzing the nicknames and based on the analysis detect botnets attacks.

II. OBJECTIVES

IRC is a traditional technology to sending and receiving messages using Messengers or Channels like Facebook Messenger, Yahoo Messenger, and Gmail, etc. These channels were used only for chats or conveying messages to each other. There is needed to be more focus on IRC system to improve and implement their performance using new methodologies. This research will be carried out for the same purpose. The overall objectives of this research are:

- To study and explore the new features of IRC that can be implemented and can result in improved performance of the network.
- Explore the new techniques and methods for the improvement in the IRC channels.
- Implementation of IRC protocol to support multiple channels in the network.

III. RESEARCH METHODOLOGY

This research aimed to design an IRC channel prototype for a secure chat through IRC network. The research focused on new techniques and explored new features of IRC environment. There are few new features that can be included in the IRC implementation and improvement:

- Check the security of network during the chat.
- Attack alert message would appear on the screen in case of insecure transmission.
- Consume less memory of the client device while transmitting and receiving data.
- Increase the chat block size.

We first analyzed the existing IRC systems to achieve the objectives of this research. Then we tried to improve the performance of these IRC clients using some pre-defined methods or techniques. The results of implementation are shown and discussed in further sections of this paper

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IV. RESULTS AND DISCUSSION

4.1 Results

IRC is a chat application designed in MATLAB. It has mainly two parts:

1. **Client Side**
2. **Server Side**

The main function used at both client side and server side is of TCP/IP connection which enables the communication between both client and server. Two Matlab sessions are used for the implementation. One act as a server and other act as a client. In both the sessions, after logging in, there is window display which contains the options for the channels using which the client and the server can communicate.

There are four Matlab function files for channels at client side and four for the channels at the server side. On selecting the particular channel either from client side or server side, it will call the corresponding function file, and the communication will be done on that channel.

All the designing of application is done using GUI (graphical user interface) in MATLAB. It will take approx 10 seconds to send and receive messages between client and server.

There are mainly the below function files used in the implementation part:

In the main function of client side implementation, the particular function for the channel selected by the user is called which can be clientfinal_a.m, clientfinal_b.m, client_finalc.m and client_finald.m. In each channel function, the same procedure is followed for the implementation. Firstly, the client object is created using with TCP/IP MATLAB in built function with two parameters, local host, and network role. In our implementation, we have assumed the local host as ‘5000’ and network role as ‘client’ for client-side implementations. After that, it includes the implementation of aligning the sent and received messages. It further includes the callback for the send button for sending the messages to the server. When the send button is pressed, a push function is called which passes the string written by the user to a server via TCP/IP connection. There are also buttons for settings and logout in the client chat window. For the settings button, the open setting function is called at its callback, and when the user wants to logout the account, then logout button is used which will take you back to the login page of IRC.

The implementation of server part includes the same functions as present at the client side; the difference lies in the parameters of TCP/IP function. In the case of server side, the network role of TCP/IP is considered as ‘server.' All other parameters are same, and other difference is the user Id(Indentity) for server and client, these both are different. When running the application, the server side will always be run first because when the server will be active only then the client will connect and communicate, otherwise the client will refuse to connect. Everytime while running the application, the user needs to login for both client side and server side using two sessions of MATLAB. The stepwise procedure to run the application is given below with the screenshots.

In the first step of running the project, run the server side code and then log in to the application. The figure below shows the Login window where the user will enter his or her username and password to access the IRC services.

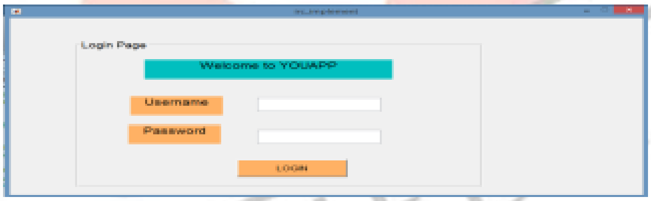

Figure 4: Login screen

After login to the application, the window will display the multiple channels options. The user can select one of the displayed channels for server side. The figure below shows the windowdisplaying multiple channels for server side.

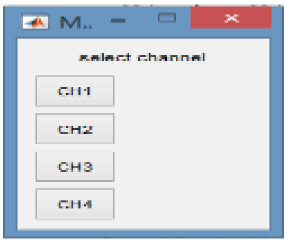

Figure 5: Multiple channels

After selecting one of the channels among four channels for server side, the Server side chat window will open as shown in the figure below.

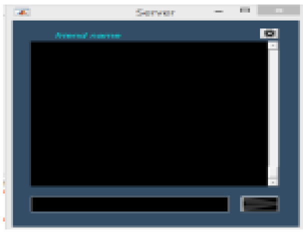

Figure 6: Server side window

Follow the similar process for Client Side. The user will run the client side code and log in with the username and password.Now, select the channels for client side, and a client-side window will appear. The figure shows the Client Side window.

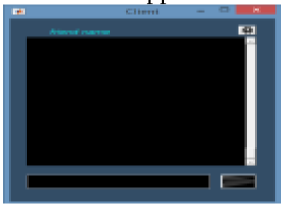

Figure 7: Client-side window

After login into the Server Side and Client Side, the users can start the communication. The figure below shows that how the communication can be done between both the client and server.

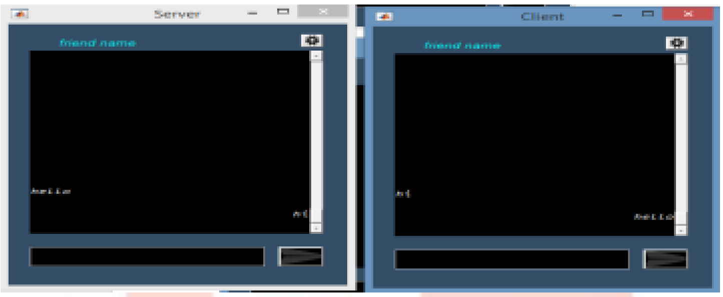

Figure 8: Communication between Server and Client

The proposed prototype of IRC channel also offers some other services for a chat. There are two options in the settings for changing the background colour and log out option.

After the communication, the user can click on Logoutbutton, and the Logout window will open the login screen. The figure below shows the Settings window.

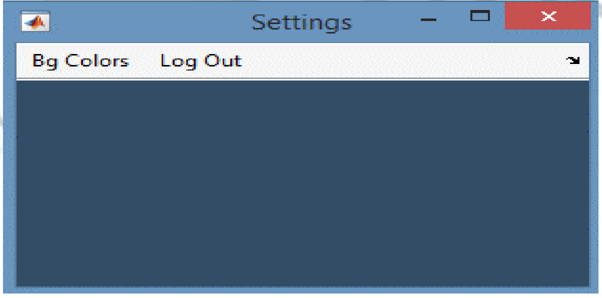

Figure 9: Settings window

4.2 Comparison with Previous Works:

In this implementation of IRC in MATLAB, we have reduced the communication time between the client and server and make the graphics design simpler because of the GUI feature of MATLAB. The IRC is created using MATLAB first time due to enhanced and user-friendly capabilities of MATLAB. In future works, we can increase the number of communication channels for both client side and server side.

Table 1.1 Comparison between Present work and previous work.

Parameter	Values (Previous researches)	Our Current Research
Time required in Communication	In seconds. Can vary from 30-50 seconds[19]	Approx. 10 seconds
Confidentiality	Not there	Present in current system

4.3 Discussion

In this research, we implemented an IRC design prototype using MATLAB GUI. In this design, we created TCP/IP objects for the communication between server side and client side. The results of this implementation include the multiple IRC channels for communication through which both the server and client can communicate with each other using different channels.

V. CONCLUSION

In this research, we implemented and improved the features of IRC network using new methodology. IRC has gained the popularity for sending and receiving messages all over the world. Though IRC is a chat based protocol which enables its users a real-time communication interface over IRC channels. These IRC channels sometimes are vulnerable to cybercrimes caused by botnets. Security is a major concern for communicating any confidential information through messages over IRC networks. People want to communicate their messages in the chat environment which are securely supported by the system. Therefore, the implementation of the IRC network in the group support system is the most challenging task. In this research, we provided an IRC environment prototype to improve the performance of the IRC network and to increase the number of chat lines are also described in the study. Throughout this research, the detail for an understanding of IRC network is discussed to design a more sophisticated technique to deal with issues faced by IRC network and also develop methods to improve the performance of the Internet relay chat.

VI. REFERENCES

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