



## A Messaging Software using Bluetooth & 802.11 WLAN

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**Abstract:** Messaging service is most widely used to exchange information. Message sending via Bluetooth provide effective and economical ways to connect and communicate devices. Across the world, Wireless technologies are becoming most popular because of our way of life and global economies both are highly dependent on the information flow through wireless mediums. Bluetooth wireless communication technology is also spreading rapidly. Bluetooth is a cheap, power-efficient radio chip that is small enough to fit inside any electronic device or machine and it provides short range, semi autonomous local connectivity. Recently wireless local area networks have emerged as flexible communication systems, which have been implemented as an extension or alternation for a wired LAN within buildings. Industry has been making efforts towards the integration of Bluetooth and LAN. But, most recent solutions do not tackle the issue of simultaneous operation of Bluetooth and WLANs.

The purpose of this research is to develop a messaging software so that any user within a building or a small area who is connected with Bluetooth and wireless LAN through laptop, Pam pc etc is capable of exchanging messages with other people who are also connected with wireless LAN and Bluetooth.

**Keywords:** Messaging service, Bluetooth, wireless LAN.

### I. INTRODUCTION

The past decade has seen explosive growth in the ability of individuals to create solutions and applications for the users that were previously not feasible. Obviously money, range and time are the important factors that need to be addressed while exchanging messages. The advancement in technologies has motivated researchers to provide novel when you are dealing with messaging service. Money saving, range and time saving are the major issues that needed to be discussed. Therefore, there is a growing need for exchanging message via Bluetooth. Bluetooth is smart technology for communicating. It's easy, simple and free. With Bluetooth message can be sent to other people free of charge.

Initially only multimedia data was conveyed via Bluetooth but now with the help of this software, text messages are also delivered to users via Bluetooth. The new developed software extends the range of Bluetooth by merging with WLAN. It's also an effective & economic way of communication between different users at a time. The attacking problem of this research is exchanging the message to a person with in wireless LAN, but not in the range of Bluetooth.

In our research work we have presented a solution for exchanging messages, Tracking of Bluetooth devices, Interface on mobile to send messages and Unicasting. Our project enables devices i.e., mobile phones, laptops; having Bluetooth and 802.11 capabilities to send and receive message from each other within an office environment. The person can send message from his/her mobile phone via Bluetooth to any other person's mobile despite knowing his/her mobile number with in wireless LAN.

The research work accommodates chat services, messaging services, routing etc. It provides Server software, authentication, track of all active users, including IP, status,

neighbor, Bluetooth ID, Desktop/laptop s/w Ethernet client for sending and receiving Messages, Laptop(wi-fi/Bluetooth/Ethernet) client for sending and receiving Message, tracking of Neighboring Bluetooth devices and maintain list of devices/update servers.

The paper is organized as follows; section 2 describes the literature survey, section 3 explains the detailed methodology, section 4 describes the project phases.

### II. LITERATURE SURVEY

Bluetooth and IEEE 802.11 (Wi-Fi) are two communication protocol standards. They define physical layer and Mac layer and are effective for wireless communications within a short range.

Bluetooth connects close devices and serves as a substitute for cables. On the other hand, Wi-Fi is oriented towards computer-to-computer connections, and serves as a substitution for cabled LANs.[1]

In Bluetooth technology connection is established through an asymmetric point to point "sender-receiver" protocol. Senders try to discover "receivers" in the vicinity through this protocol.. [2]

Bluetooth devices connect with each other to form piconet. One of the devices becomes master and the other devices are slaves. Maximum seven devices can connect in piconet at a time. The blue tooth device that initiates the piconet is assigned the master role. All other participants are slaves. [3]

In Bluetooth discovery, Service Discovery Protocol is used to discover services on other devices. Devices working with SDP have the Service record and Service class services. Each service is an instance of a service class. The service class definition provides the definitions of all attributes contained in service records that represent instances of that class. Each service class is assigned a unique identifier, a

UUID. A UUID is a universally unique identifier that is guaranteed to be unique across all space and all time. UUIDs can be independently created in a distributed fashion. No central registry of assigned UUIDs is required. A UUID is a 128-bit value as rule, but also possible aliases (16 and 32 bit UUID) [4]

**III. METHODOLOGY**

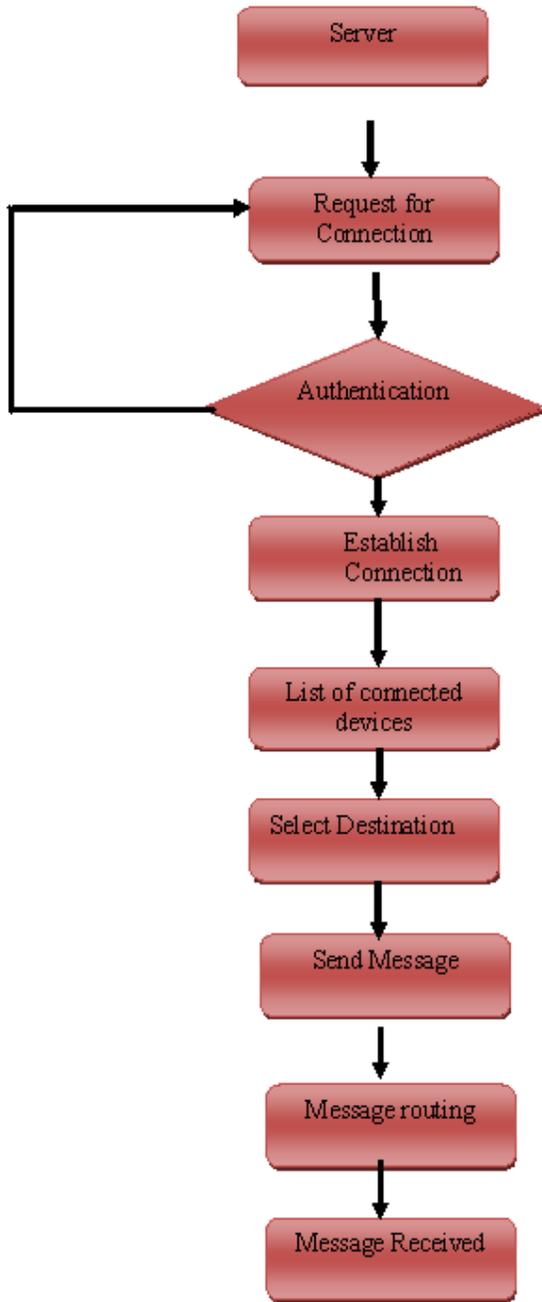


Figure 1: Development methodology

**A. Pre-Processing**

J2ME applications run on nokia generation 3 mobile phones to provide an interface to mobile users.

Server software is installed on any 802.11 based system and client on all 802.11. The cellular phones will send their data via Bluetooth and chat application interface to the laptops which will forward it to server. The server will send the data to specific destination.



Figure 2: Architectural view

**B. Mobile Software**

A mobile application runs on the mobile phone of the end user. S60 3rd edition libraries (S60\_3rd\_MIDP\_SDK\_FP1) have been used. It is basically messaging software. When it runs, it first searches for nearest active Bluetooth devices. After that it checks chat service on all discovered devices. Mobile is connected with the device which runs the chat service. An authentication interface is provided to the mobile user and user is authenticated through valid id and password.

**C. Server Software**

Server software runs on 802.11 based system. Server provides duplex services. Duplex service is one in which client as well as server can initiate the connection. A database is maintained which keeps id and password to authenticate mobile users. All active nodes connect to the server. A list of all active devices including node and mobile phones is send to all connected and registered mobile devices. Whenever a new node or mobile phone is connected, list is updated by server. Server also performs message routing.

**D. Client Software**

Client software runs on 802.11 and Bluetooth enabled devices. Client listens on both TCP/IP and Bluetooth. Mobile devices connected to client. Client gets the device name.

**IV. PROJECT PHASES**

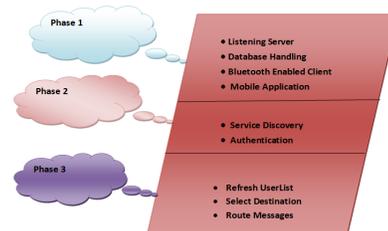


Figure 3: Phase view

The Diagram gives an overview of different phases of our project which are described below:

**A. Phase 1**

**a. Listening Server:** A server application runs on laptop/Desktop. We have designed interface of our server application in Windows Presentation Foundation (WPF). Server provides full duplex service using WCF. It is a part of the .NET Framework that provides a unified programming model for rapidly building service-oriented applications that communicate across the web and the enterprise.

When the server application starts, the IP address will be entered. If the IP address is valid it start listening

**b. Data Base Handling:** Handling database is also performed by server. Data can be viewed, added, deleted and updated by server. Data is an XML file which is simply data storage. In this we store the user ID and password of Mobile users.

**c. BT Enabled Client:** A client application runs on laptop/Desktop. We have designed interface of our client application in Windows Presentation Foundation (WPF). It is a next-generation presentation system for building Windows client applications with visually stunning user experiences. With WPF, we can create a wide range of both standalone and browser-hosted applications.

When the client application starts, the IP address of server will be entered. If the IP address is valid, a connection is established with the server. The chat service which runs on client has a GUID (Globally Unique ID)

**d. Mobile Application:** A mobile application runs on the mobile phone of the end user. S60 3rd edition libraries (S60\_3rd\_MIDP\_SDK\_FP1) have been used. Mobile Application provides an interface to users for sending or receiving messages. We have designed a midlet, mobile application. MIDlets are J2ME optimized servlet APIs and architecture-based applications for wireless Java

When application runs first it searches for nearest active Bluetooth devices.

**B. Phase 2**

**a. Service Discovery:** After finding the service, connection is established with that device. After device inquiry is completed, we start to search for XBTChat services i.e BT Node Chat Service. Every Service has unique id. The unique id is called UUID. The mobile connects with first available service. After finding the service, connection is established with that device.

**b. Authentication Request by Mobile Application:** After service discovery, the user is authenticated by the server. An interface for authentication with “UserName” and “Password” fields is provided by the server. If the “UserName” and “Password” are valid, the user is authenticated.

**c. Authentication of Mobile Application by Server**

When the server receives authentication request, it authenticates the mobile user through id and password. The username and password of all the valid users is stored in the database. If the username and password are not valid, then error is returned.

**C. Phase 3**

**a. Refresh user list:** When the mobile/client applications are connected to the server, the list of all active devices is

sent. As devices connect/disconnect, the list is updated at all clients and mobile applications.

**IV. EXPERIMENTATION AND RESULTS**

In the diagram below, the Server is in the listening mode. In the text fields, the IP address and port number is given. To start the server, we click on the “Start” button.

To stop the server, Stop button is clicked. “Users” show the registered users along with the passwords. We can add or delete users.

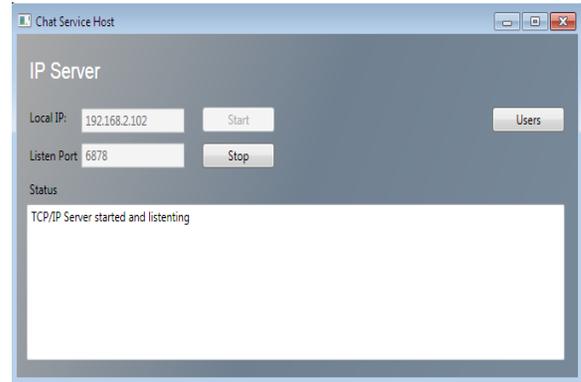


Figure 4: Listening Server

In the figure below, the client is connected with the Server. If user enters valid IP address and port number of server, then connection is established with the server. To make the client listen on Bluetooth, click on “Start BT”. Any number of clients can be connected through server and form a network. Every client has a name “node” followed by digit which increments at every new client is connected i.e. node1, node2 and so on. This is the interface of first client which behaves as node 1 and its user list contains the all other client within the network.

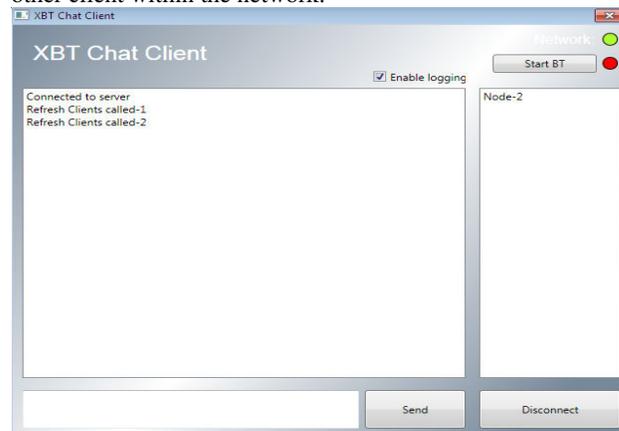


Figure 5: Connected Client

In Mobile application when we click on “Start”, the mobile node searches for the nearest node with “BT Server” enabled. When it discovers devices, it searches for the chat service.

After finding the nearest node with chat service, the client is authenticated by the Server. The client enters the “User Id” and “Password”. If id and password are valid, client is authenticated and joined to the network. The given user is authenticated with the user id as client1 and another mobile

using client 2 hence the list is updated at each connected devices as shown in figure.

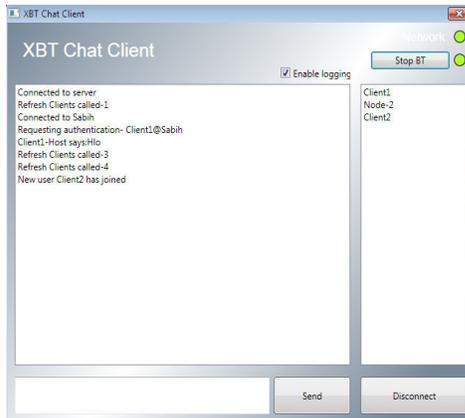


Figure 6: User List Updated at nodes

After authentication, the list of online users is displayed. Any device can be selected from the list for sending message by pressing “Select”.



Figure 7: List of Online Users

Up till now server is in listening state. One mobile namely client 1 is connected via Bluetooth interface to node 1 which is a client in network and another mobile acts as client 2 which is connected via Bluetooth interface to node 2. Now client 1 sends message to client 2 which lies outside the range of client 1, using Bluetooth and our developed chat application.



Figure 8: Client 1 sends message while client 2 receives message

The internal mechanism involve is:

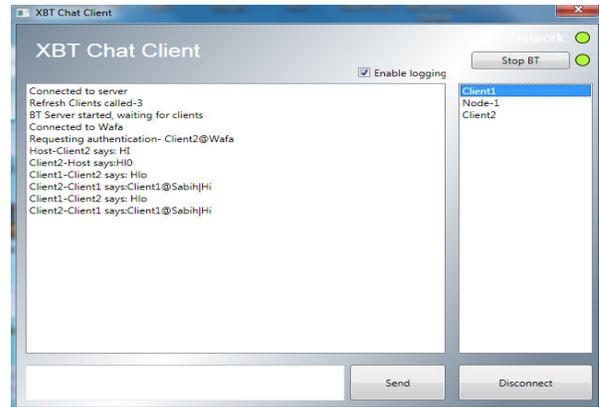


Figure 9: Sending/Receiving Message

## V. CONCLUSION

Our research provides a cost effective method to send a message via Bluetooth and 802.11 WLAN. We integrate the Ad hoc and Wireless Technology and extend the range of Bluetooth.

During the Research, we had the opportunity to learn Visual Studio C#, J2ME and Network Programming. We have also had the opportunity to explore Bluetooth and wireless technology.

There is still work to be done. Bluetooth and wireless technology is a cutting edge research topic with room for exploration and improvement. We hope that one day our developed software will become common for effective communication within WLAN.

## VI. FUTURE WORK

We have done with the transmission of simple text message via Bluetooth inside the range of 802.11 but outside the range of Bluetooth. In future plans we are trying to send File and voice. Further we would like to have Bluetooth to Bluetooth communication and message broadcasting.

## VII. ACKNOWLEDGEMENT

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## VII. REFERENCES

- [1] Erina ferro, Francesco potortì, “Bluetooth and wi-fi Wireless protocols:a survey and a comparison”, isti - cnr (Institute of the National Research Council)via Moruzzi 1, 56124 Pisa, Italy
- [2] Theodoros Salonidis, Pravin Bhagwat and Leandros Tassioulas, “Proximity awareness and fast connection establishment in Bluetooth”, Electrical and Computer Engineering Department,University of Maryland at College Park. AT&T Research, Holmdel NJ

[3] aapc. Haartsen and Sven Mattisson, “Bluetooth—A New Low-Power Radio Interface Providing Short-Range Connectivity”

[4] Eugene A. Gryazin, “Service Discovery in Bluetooth”, Group for Robotics and Virtual Reality, Department of Computer Science, Helsinki University of Technology

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