Development of a Wireless Interactive Communication Application using Android and Windows PC Platform

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ABSTRACT—This paper presents the development of a wireless interactive communication system using android and Windows PC platform. The goal is to ensure the deployment of a wireless interactive communication system chat app via Bluetooth and Wi-Fi in an ad-hoc environment, to enables multiple users to chat without internet/data bundles. This app will function as Whatsapp, WeChat, Hangouts etc without the use of data/internet at a range of up to 100M. This Chatting Application is based on a research titled "Bluetooth Chat Application: Bluz by Aishwarya, et al., (2015) which is limited to Bluetooth range of 10M. The proposed improvement is on the Bluetooth Chat Application in terms of long-range communication, using both Bluetooth and Wi-Fi connection without the need of any internet service from a provider. The Bluetooth chat app was first developed for Android devices and it worked perfectly through Bluetooth without the use of data. The Bluetooth chat app was then replicated for Windows PC. Then the app was improved by incorporating Wi-Fi as alternate path which has a range of up to 100M. The performance of this application was evaluated in terms of range coverage. Result shows that integrating Wi-Fi as alternate route in the app improved the distance between users by 90%.

INTRODUCTION

The Android platform support for the Bluetooth network stack. It allows a device to wirelessly exchange data with other Bluetooth devices. The new vitality to the mobile space has injected because of the release of Android smart platform (Aishwarya, 2015).

Android is an operating system based on Linux kernel. It is designed for the touch screen mobile devices. The user interface of Android is based on direct manipulation. The Android system provides many Bluetooth APIs for developers to call (Farkade *et al*., 2015)

Bluetooth technology allows users to exchange voice and data transmission between two or more devices. It is basically a wireless communication technology. Bluetooth technology is reflected in the low price, easy to control and non-visual distance limitations. Bluetooth is integrated into the android platform as an android mobile network communication module. BlueZ is used to connect the Android phones into a local area network. It helps to communicate with each other (Aishwarya *et al*., 2015).

Bluetooth does not need a license around the globe for the working frequency band. In the connection initialization phase, firstly, it starts the application and searches the Bluetooth devices. Second, it sends the signals to the server class. After this it can run, pause and stop the application. Third, it shows alert using set Alert function on every changing. Server goes active and sends the signals to other devices (Aishwarya, 2015). Client class works to respond the other Bluetooth device server. This allows a two-way chat over Bluetooth. No GSM or Wi-Fi connection required. In addition to the person-to-person chat, chat rooms can be used to gather more than two persons at a time (Ishupreet *et al*., 2018)

Analysis of the Existing System
During a personal interview from student who are the most user of chatting applications, it was deduced that the current applications runs at highly cost for the user and the high-power consumption is another setback. Users would have to register and get connected online before the user can communicate with one another.

A. *Weakness of the existing Chatting Applications*
The notable weaknesses of the existing system are:
- i. High power consumption
- ii. Costly
- iii. Must be connected to the internet Unable to chat with community
- iv. Short range connectivity

B. *Analysis of the proposed System.*

This wireless interactive communication application is developed in two ways; one for mobile device and the other for PC, in both case you can connect and send messages from one android or PC device using Bluetooth or wireless to other compatible devices around you. No GSM data connection is required, all you need is a Bluetooth or Wi-Fi compatible android device or PC in range of each other and you can text, send Audio, Video, Image and send all kind of Document the through the App.

METHODOLOGY

The research work has both hardware and software components. The methodology adopted are described in the following steps:

The interface design is a milestone in this application development. Starting by the developing simple buttons, text boxes and warning messages. Next, preparing the protocols needed for the application to use Bluetooth/Wi-Fi and Client/Server codes.

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The work has been divided into two phases. First phase involves designing a Windows application and in next phase designing an Android application. Messenger Application in Microsoft Windows Environment: Using the Visual studio.net. The Bluetooth package of a client and a server program were written in Java programming Language.

The server and client program was design in order to exchange messages, in this case perform chatting with each other. The server is also capable of interacting with several clients at the same time, using the concept of piconet. A piconet is an ad hoc network that links a wireless user group of devices using Bluetooth technology protocols. A piconet consists of two or more devices occupying the same physical channel (synchronized to a common clock and hopping sequence). It allows one master device to interconnect with several active slave devices.

System Design

System design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements.

Mobile APP design steps (Android environment setup)

Whether you are building an Android application in unity or programming it from scratch, you must set up the Android Software Development Kit (SDK) before you can build and run any code on your Android device.

Step 1: Install the Java Development Kit
The Java Development Kit (JDK) was downloaded and installed.
Step 2: Download the Android SDK
The Android SDK was installed using command line tools and through Android Studio.
Step 3: Install the Android SDK using the command line tools
The Android SDK was installed or unpacks. After installing, open the Android SDK Manager and add: at least one Android SDK Platform.
Step 4: Install the SDK using Android Studio
Install Android studio from the Android developer portal. The Android developer portal provides detailed installation instructions.
Step 5: Enable USB debugging on your device
To enable USB debugging, you must enable Developer options on your device.
Step 6: Configure the Android SDK path in Unity
The first time you create a Project for Android (or if Unity later fails to locate the SDK), Unity asks you to locate the folder in which you installed the Android SDK.
Step 7: Download and set up the Android NDK
If you are using the IL2CPP

Scripting backend
For Android, you need the Android Native Development Kit (NDK). It contains the toolchains (such as compiler and linker) needed to build the necessary libraries, and finally produce the output package (APK). If you are not targeting the IL2CPP back end, you can skip this step.

Window APP design Steps

Whenever an application is need to be developed, it includes many steps to identify the features provide by the app. This was planned according to SRS (Software requirement Specification)

Step 1:Install visual studio.net on your PC
Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft
Step 2:   Launch the application.
Locate and open the folder on your system from the control panel or systems settings.
Step 3: Draw your Labels and control
This step is to create a graphical control element which displays text on a form. It is usually a dynamic control; having an interactivity.
Step 4: Code each label and control
This is a step where a code was written that will drive each label and control.

Step 5:   Text Run and Deploy
This is the step describes how to deploy and run the application as shown in figure 3.5.
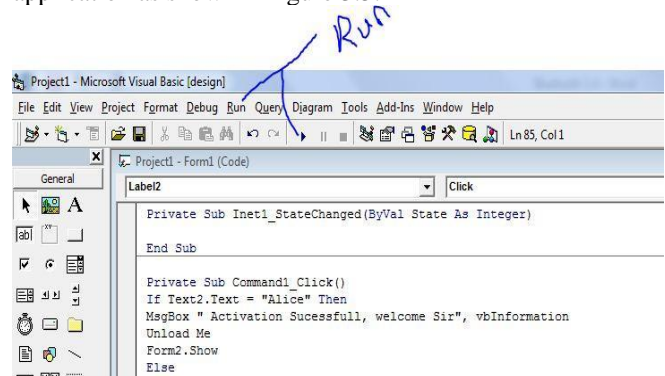

Figure 1. Run and Deploy screen shot

System Requirement

System requirement are the resources used for building a system. It varies from application to application due to system configuration. The most important requirement from this wireless link is that there should be a universal frame work that offers means to access information across a divers set of devices (mobile). This consists of the hardware, software as detailed below.

II.   Software Requirement

A software requirement is a description of a software system to be developed. The following software was use in this project:
 i. Operating system: window 7 or higher
ii. Coding Language: Java1.6and Xml
iii. Tool kit: Android 3.0
iv. IDE: Eclipse
v. Visual studio.net

Hardware Requirement

This is the hardware required for developing this chat app. The following Android phone hardware was use in this project.

i. 1GB Ram
ii. 2GM Rom
iii. Bluetooth
iv. Wireless Device

The following Laptop Computer hardware was use in this project.

i. System: Pentium IV 2.4GHZ or higher
ii. Hard disk: 80GB or higher
iii. Ram: 1G or higher
iv. Bluetooth Device
v. Wireless Device

Program Lunch

The following steps are taking in lunching the chat app:
Step1: Double click the program icon
Step2: confirm to turn on Bluetooth/Wi-Fi
Step3: click yes to turn on Bluetooth/Wi-Fi
Step4: click menu
Step5: select "make device discoverable"
Step6: select "connect to a device" to get connected
Step7: on available device list, select a device to chat with
Step8: click back to terminate the application
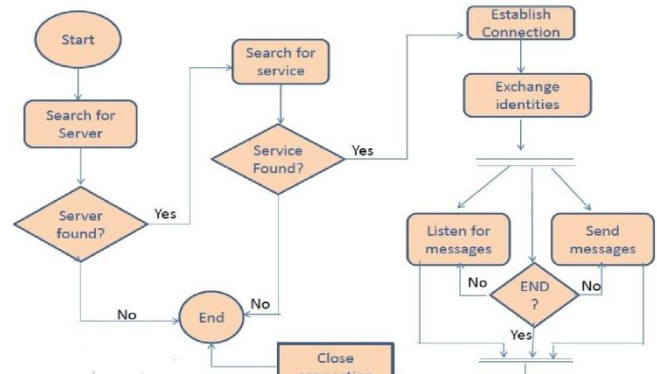Step9: exist

Server Flowchart

This provides a visual representation of basic flowchart of the server in showing the sequence of process steps.
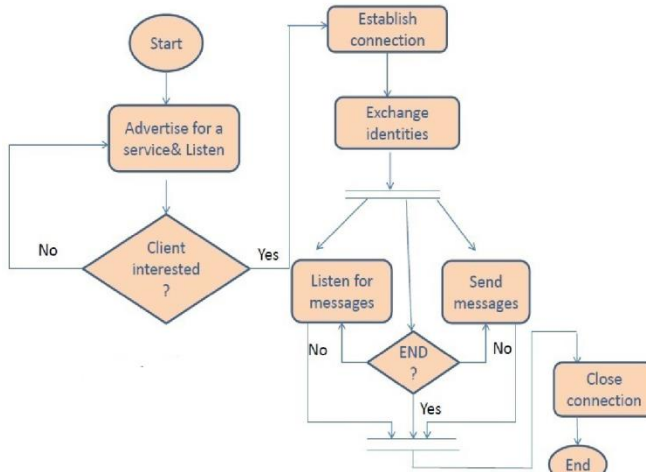
Figure 2 Server Flowchart

Client Flowchart

This provides a visual representation of basic flowchart of the client in showing the sequence of process steps.


Figure 3 Client Flowchart

RESULT AND DISCUSSIONS

Program Development

The purpose of the application is to provide a long range (up to 100M) wireless link capable of transmitting messages among personal mobile devices (supported by android) and Windows PC. This program (wireless interactive communication application using Android and windows PC platform) also intends to eliminate the high-power consumption on internet chatting. The proposed improve system was developed using windows 8, java1.6, Android 23.0 toolkit and Eclipse IDE for interface design and integration of the modules.

System Performance

This is the process of checking the performance of the system alongside with the desired requirement. This has to do with testing the designed system and see if it evaluates. The improved application has been tested using different data to validate its functionalities, accuracy, speed and reliability.

The result of the application after the lunching it on Laptop PC and on Android phone is shown in screenshot below:
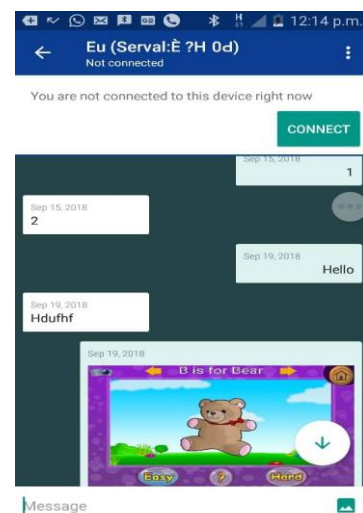
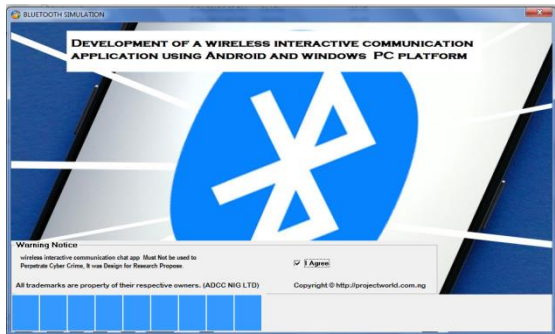**Figure 4** screen shot of the android mobile app

Figure 5 First Screen shot of the app

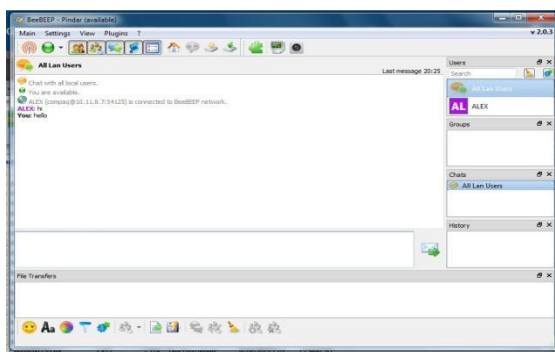**Figure 6** Screen shot of the app home page

Figure 7 Windows PC chat box.

III. Summary

The messenger application using wireless technology was successfully completed in Android and Windows PC platform.

a) Bluetooth consumes low power as compared to Wi-technology and on the other hand Wi-Fi has a range (100M) of almost ten times to that of Bluetooth (10M). In order to account for the limitations in range, I incorporate Wi-communication in the application. Whenever a client application finds that server is not within range, the client may start scanning for the server using Wi-Fi. This will ensure the range limitations do not arise.

b) In a piconet at most 7 clients can connect with the server. In order to connect with more number of devices a client itself need to act as a server.

Java programming language and XML (Extended Markup Language) was chosen as the application development via Android Studio to its effectiveness had being efficient; Eclipse IDE was used for the development of the mobile application; Android virtual machine was used as emulator to demonstrate its workability, while visual studio.net was used to develop the system application.

IV. Limitation

Fig. 1. The limitations of this project work is that; this project work did not consider the possibility of the android device app to communicate with the PC app

CONCLUSIONS

The improved Bluetooth Chat app (wireless interactive communication application using Android and windows PC platform) was successfully developed by incorporating Wi-Fi technology into the conventional Bluetooth Chat app. The improved Chat app was compared with the conventional Bluetooth Chat app. Results showed that the Wi-Fi improved the Bluetooth Chat app better because it increased the range of connectivity by 90% and improved the delivery probability. These results obtained from this application conformed that using Wi-Fi is the preferred medium of connection than Bluetooth for the chat app considered in this project.

REFERENCES

[1] Aishwarya S *at el.,* (2015) *Bluetooth Chat Application: Bluez International Journal of Engineering and Computer Science ISSN:2319-7242 Volume 4 Issue 3 March 2015, Page No. 10674-10679.*

[2] Amrita D and Swarnabha S, '*Bluetooth Messenger: an Android Messenger app based on Bluetooth Connectivity', IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278- 8727Volume 16, Issue 3, Ver. III (May-Jun. 2014), PP 61-66 www.iosrjournals.org.*

[3] Android Platform [online] 27 March 2015, *URL: http://developer.android.com/guide/basics/what-is-android.html Accessed 12 May 2010.*

[4] Andrew D, David C, DongHer S, (2004) *Bluetooth technology: an exploratory study of the analysis and implementation frameworks', Department of DSC and MIS, Miami University, Oxford, OH 45056, USA.*

[5] Bettstetter C, (2003) "Topology Properties of Ad Hoc Networks with Random Waypoint Mobility," *ACM SIGMOBILE Mobile Computing and Communications Review,* Vol. 7, Issue 3, pages 50-52, July 2003.

[6] Brian P, *et al.,* (1997), "IEEE 802.11 Wireless Local Area Networks", *IEEE Communications Magazine*, pages 116-126, September 1997.

[7] Corson S and Macker J, (1999) "Mobile Ad Hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations," IETF RFC 2501.

[8] David B. and David A., (1996) "Dynamic Source Routing in Ad Hoc Wireless Networks," *Mobile Computing*, edited by Tomasz Imielinski and Hank Korth, Chapter 5, pages 153–181. Kluwer Academic Publishers, 1996

[9] Garcia-Luna-Aceves J. and Marcelo S, (1999) "Source-Tree Routing in Wireless Networks," *Proceedings of the Seventh Annual International Conference on Network Protocols,* pages 273, October 31- November 03, 1999.

[10] Han C, Liang Q, *The Bluetooth Special Interest Group, Bluetooth Specification Core v4.0 (2009-02)., 'Principles and development points of the Android system', Publishing House of Electronics industry, 2010.*

[11] Ing-Ray C, *et al.,* (2002) "Wireless Ad Hoc Messenger," Microsoft Research Grant, Virginia Polytechnic and State University, Microsoft RFP, Section 2: Mobile and Wireless, 2002.

[12] Jackquet P, *et al.,* (2001) "Optimized Link State Routing Protocol for Ad Hoc Network," *IEEE INMIC,* Pakistan, 2001. [Jiang2001] Hong Jiang and J.J. Garcia-Luna-Aceves, "Performance Comparison of Three Routing Protocols for Ad Hoc Networks," *Tenth International Conference on Computer Communications and Networks,* pages 547-554, 2001

[13] Joseph D, *Mastering JXTA: Building Java P2P Applications, USA: John Wiley&Sons: Wiley Publishing Inc; 2002.*

[14] Jin-Hee C, (2016), *Design and Implementation of Ad-hoc Communication and Application on Mobile Phone Terminals: Proc. IEEE ICASP, pp. 2029-2032 (2016).*

[15] Leung, R., *et al.,* (2001) "MP-DSR: a QoSaware multi-path dynamic source routing protocol for wireless ad-hoc networks," *Local Computer Networks, Proceedings of the 26th Annual IEEE Conference,* pages 132-141, November 2001

[16] Mandar L and Pravin R, '*Bluetooth Chat Application: Bluez: International Journal of Engineering and Computer Science ISSN:2319-7242 Volume 4 Issue 3 March 2015, Page No. 10674-10679.*

[17] Nikita M and Garima V, "*Design of Chatting Application Based on Android Bluetooth, International Journal of Computer Science and Mobile Computing, Vol.3 Issue.3, March- 2014, pg. 712-717 © 2014, IJCSMC All Rights Reserved 712.*

[18] Rahul V, *at el.,* (2015) *A Complete Study of Chatting Room System based on Android Bluetooth', Moradabad Institute of Technology, Moradabad, International Conference on Advanced Developments in Engineering and Technology (ICADET-14), INDIA.*

[19] Sung-Ju L, William S and Mario G, (2000) "On-Demand Multicast Routing Protocol (ODMRP) for Ad Hoc Networks," *IETF MANET Working Group*, Internet-draft, 2000.

[20] Tracy C, *et al.,* (2002), "Performance Comparison of Two Location Based Routing Protocols for Ad Hoc Networks," *Proceedings of the 21st Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM 2002)*, pages 1678-1687. 2002.

[21] Tracy C, *et al.,* (2002) "A Survey of Mobility Models for Ad Hoc Network Research," *Wireless Communication & Mobile Computing (WCMC): Special Issue on Mobile Ad Hoc Networking: Research, Trends and Applications*, Vol.2, No.5, pp.483502, 2002.

[22] Yujin N and Hidetoshi Y, (2016), *Design and Implementation of Ad-hoc Communication and Application on Mobile Phone Terminals: Thesis submitted to the Faculty of the Virginia Polytechnic Institute and State University.*

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