PROJECT REPORT

ON

"VOICE OVER Wi-Fi"

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Solapur-413006

2015-2016

PROJECT APPROVAL SHEET

The Project Entitled:

"VOICE OVER Wi-Fi"

Is here by approved in partial fulfilment for the Bachelor's Degree of Engineering in Information Technology and is carried out by,

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2015-2016

CERTIFICATE

This is to certify that the above Project is entitled,

"Voice over Wi-Fi"

Has been carried out by,

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Of BE(Information Technology) class in partial fulfillment for the award of Degree in Bachelor of Engineering in Information Technology as per requirement of Solapur University in the academic year 2015-2016

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Department of Information Technology

2015-2016

ACKNOWLEDGEMENT

It gives us immense pleasure in thanking all those who have helped us in successful completion of the project titled

"VOICE OVER Wi-Fi"

This project itself as an acknowledgement to the intensity, drive and technical competency of many individuals who have completed it.

First and foremost we sincerely thanks to our Guide Prof. Sharmila K.Karpe and Mr Rohan Kore for showing keen interest, the true spirit of engineering and guiding us on the various aspects of our project without which it would have been impossible for us to complete the project.

We are also thankful to our Head of Dept. Prof.L.M.R.J.Lobo and other persons of Department concerned directly or indirectly with our project for their Help and Guidance.

We wish to thank our Principal Dr. S. A. Halkude and all staff members for their whole hearted co-operation for completion of this project.

Last but not the least, the backbone of our success and confidence lies solely on blessings of our dear parents and lovely friends.

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ABSTRACT

Today, we are standing on the edge of wireless connectivity where everyone prefers to be online without a bundle of wires. Colleges, B-Schools, corporate offices, coffee shops provide Wi-Fi facility for sake of internet connectivity.

The purpose of this project, Voice Call over Wi-Fi, is to make use of available resources in order to provide a facility of making free voice calls, free video calls, without using service provider like BSNL, AIRTEL etc. Pre-established **Wireless Fidelity (Wi-Fi)** service is more often used as medium to access internet. This project enhances the use of WLAN (Wireless Local Area Network), offered by Wi-Fi as a medium for voice transmission. Wi-Fi enabled smart phones or Tablets can be connected to the router and can communicate with each other.

This system can prove as the best alternative for existing intercom system with additional facilities.

CHAPTER 1

Introduction

1.1 Problem Statement

1.2 Proposed Work

1.3 Organization of Report

1.1 Problem Statement

Implementation of Android application which allows users to communicate to each other through Wi-Fi (Calling, Messaging, Data – Sharing).

1.2 Proposed Work

Today, people want to adapt their living environment to intelligent environment, which includes a powerful infrastructure and some intelligent objects. People perform their tasks through the intelligent environment. However, it leads to an issue about how users customize computing activity for themselves, because sometimes there are a great number of services around them, how to manage the complexity and tailor them to what users really want. End users are considered non-IT professional.

Then, developers should provide composition tools, which enable users to compose services by themselves. It is just the goal. The challenge is that service composition framework must be sophisticated enough to support correct service composition, as well, must be intuitive enough for ordinary end-users.

Here, we introduce an android platform based application, it comprises of basically two main functions: voice calling between android device users (without any internet connectivity) and any file or data transfer between two devices. The application focuses on using the Wi-Fi (Wireless Fidelity) instead of the Web. And most of the android devices nowadays are Wi-Fi enabled, so it’s very cost efficient as we don’t have to pay for any data packs.

1.3 ORGANIZATION OF THE REPORT

The report for this project is like its mirror which shows the sequence of procedure followed while developing this software. The report defines the problem statement which perused us for developing this project. It describes the complete working of software generated by us.

This report describes the working followed by our project along with simple glimpse of its simulation. The various field of the particular application in the real world are described in this report. **Chapter 1** contains **introductory part** of our project such as problem statement, work to be done and brief idea about the project. **Chapter 2** deals with related work done in this project. **Chapter 3** deals with the software and hardware **requirement** of our project. **Chapter 4** contains block diagram, data flow diagram and UML diagrams of project. **Chapter 5** contains the flow of work done to execute project with Algorithm and Advantages. **Chapter 6** contains the **Execution** & **Results** procedure with snapshots of devices used in project. **Chapter 7** deals with the software and our **Testing strategies**. In our testing strategies unit, integration and system testing are carried out. **Chapter 8** gives the **Conclusion** of our project. **Chapter 9** contains the **References** used to carry out our project.

CHAPTER 2

Related Work

2.1 Introduction

2.2 Literature Survey

2.1 INTRODUCTION

Wireless broadband access to the Internet has recently witnessed excellent growth. Much of this growth has come from the rise of wireless local area networks (WLANs).Wireless LAN network Technologies, commonly in the form of Wi-Fi (802.11) systems, have a huge market growth and penetration in public and private environments, with high speed internet access at numerous locations. Due to high cost, low transmission rate, occupational safety concerns and licensing requirements, this technology was not popular in the past. WLANs today are being widely used in markets such as education, healthcare, manufacturing, retail, hospitality, government and transportation, due to convenience, availability, mobility, reduced cost of ownership and installation flexibility, that making sudden growth in deployment as well as manufacturing of WLAN hardware. At present there are some organizations like FCC, IEEE, the Wi-Fi Alliance and WLANA which are trying to increase the growth of the WLAN technology. WLAN provides mobility to the Users so that we can roam around within the coverage range of WLAN and also it gives fast and less expensive connectivity, without cabling, for reliable data exchange between Users. WLAN used to extend the network by reducing the cost of additional cabling. To connect more than two buildings we can use WLAN technology to make access common network among those Users. Historically, first generation of Wireless modems developed by the amateur groups to an existing short distance radio system such as walkie-talkie. The second generation wireless modems developed for non- military use of the spread spectrum technology. The third generation of wireless modem aimed at compatibility with the present LANs with the data rate on the order of Mbit/s.

The Android platform includes support for the wireless network stack, which allows a device to wirelessly exchange data with other devices. The application framework provides access to the wireless functionality through the Android wireless APIs. These APIs let applications connect wirelessly to other devices, enabling point-to-point and multipoint wireless features.

Depending on your model of Android device and your carrier, you may be able to share your Google™ Android™ device's mobile data connection with a single computer via a USB cable or

via Bluetooth. You may also be able to share your Android device's data connection with up to five devices at once, by turning your phone into a portable Wi-Fi hotspot.

HotSpot is a way to authorize users to access some network resources, but does not provide traffic encryption. To log in, users may use almost any web browser (either HTTP or HTTPS protocol), so they are not required to install additional software. The gateway is accounting the uptime and amount of traffic each client have used, and also can send this information to a RADIUS server. The Hotspot system may limit each particular user's bitrate, total amount of traffic, uptime and some other parameters mentioned further in this document.

The HotSpot system is targeted to provide authentication within a local network (for the local network users to access the Internet), but may as well be used to authorize access from outer networks to access local resources (like an authentication gateway for the outside world to access your network). It is possible to allow users to access some web pages without authentication using Walled Garden feature.

Main goal with this application is making wireless voice communication between android devices. Application enables tethering (via Wi-Fi) for handsets running android. Clients (another android devices) can connect via Wi-Fi (ad-hoc mode) and get access from access point. When communication is established as described above, application opens a connection and it is possible to make voice calls between devices.

This application allows 2 or more Android devices to communicate without using any external resources (without Internet at all, also chat servers). What separates this application from the ordinary ones is usage of only tethering.

2.2 LITERATURE SURVEY

a. Background study:

Following are some of the techniques that provide voice communication over network. Their features along with their limitations are mentioned here in paper **Voice Call Communication over Wi-Fi** by **Omkar V. Manjare. Voice over Internet Protocol (VoIP)** provides facility for connecting two remote clients via voice over the internet. IP phone application can provide the necessary interfaces between telephony signals and IP networks.

Also, caller has to talk through the microphone of the laptop only. He can neither talk nor listen voice on his cell phone. All communication takes place through the laptop. This violates user mobility though he is connected over Bluetooth. (This result is practically obtained with cell phone connected to laptop over Bluetooth).In one more paper **Voice Transmission over LAN Using Bluetooth t**wo cell phones, connected via Bluetooth, can exchange media files. Constraint over this is geographical area covered by Bluetooth is limited. Even today, Bluetooth enabled laptops and desktops are in the market, using which we can obtain the wireless communication. Area covered by Bluetooth's range is very small, resulting in limitations over users' mobility. In ad-hoc network, power consumption is major issue.

b. Existing System:

VOIP (Voice over Internet Protocol) is extensively used in applications like Whatsapp, Hike, Line, Telegram, Facebook messenger, Skype, Nimbuzz, etc. In the existing system like Whatsapp, which implements VOIP, for calling someone & having the conversation properly we need a decent Internet connection, like UMTS (3G) / LTE (4G). Although it works very accurately over these networks, but in developing countries like **India** where the Internet connection over UMTS / LTE is poor & not affordable. Hence, occasionally there are call drops, call relays, crosstalk and delay in message delivery. Not only Whatsapp but other services like Skype, Facebook messenger, which use VOIP, are the same.

Calls over Bluetooth of Laptop in Windows 7: A call initiated from cell phone, connected to laptop via Bluetooth, is charged by the service provider of cell phone. Also, caller has to talk through the microphone of the laptop only. He can neither talk nor listen voice on his cell phone. All communication takes place through the laptop. This violates user mobility though he is connected over Bluetooth. (This result is practically obtained with cell phone connected to laptop over Bluetooth)

CHAPTER 3

Requirements

3.1 Software Requirement

3.2 Hardware Requirement

3.1 SOFTWARE REQUIREMENT:

- **Google Android Studio 2.0**

1. **Android Studio** is the official integrated development environment (IDE) for Android platform development.
2. It was announced on May 16, 2013 at the Google I/O conference. Android Studio is freely available under the Apache License 2.0.
3. Android Studio was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0 and current stable version is 2.0
4. Based on JetBrains' IntelliJ IDEA software, Android Studio is designed specifically for Android development. It is available for download on Windows, Mac OS X and Linux, and replaced Eclipse Android Development Tools (ADT) as Google's primary IDE for native Android application development.

- **Geny Motion**

1. Genymotion is an Android emulator which comprises a complete set of sensors and features in order to interact with a virtual Android environment. With Genymotion, you can test your Android applications on a wide range of virtual devices for development, test and demonstration purposes.
2. Genymotion is fast, simple to install and powerful thanks to user-friendly sensor widgets and interaction features. It is available for Windows, Mac OS X and Linux operating systems

- **Editor - Notepad ++**

1. **Notepad++** is a text editor and source code editor for use with Microsoft Windows. Unlike Notepad, the built-in Windows text editor, it supports tabbed editing, which allows working with multiple open files in a single window. The project's name comes from the C increment operator.
2. Notepad++ is distributed as free software. At first the project was hosted on SourceForge.net, from where it has been downloaded over 28 million times, and twice won the SourceForge Community Choice Award for Best Developer Tool. The project has been hosted on TuxFamily since June 2010. Notepad++ uses the Scintilla editor component.

3.2 HARDWARE REQUIREMENTS:

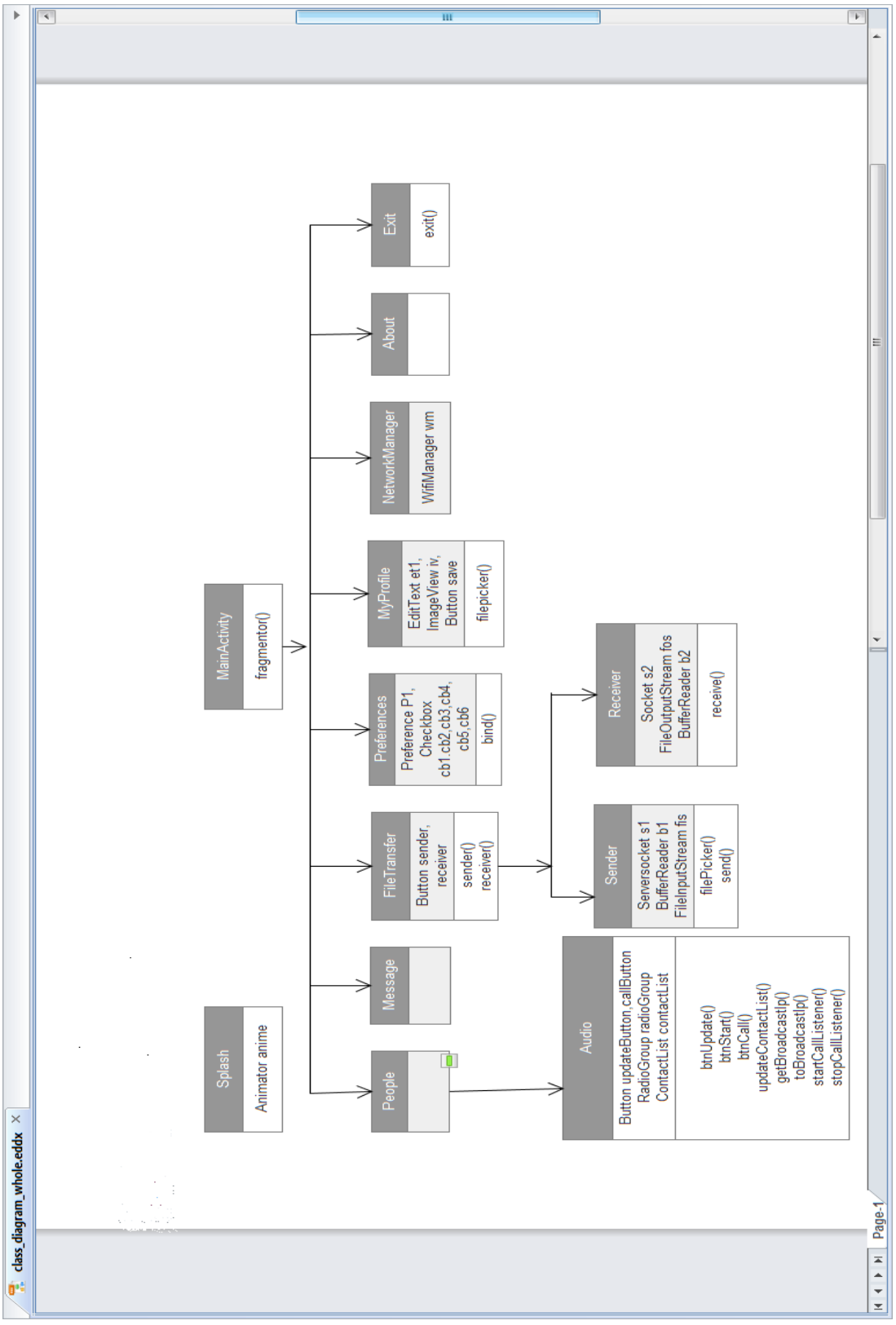
- Wi-Fi Router
- Android Mobile Phone Hotspot
- Wi-Fi enabled Smartphone's and Tablets

CHAPTER 4

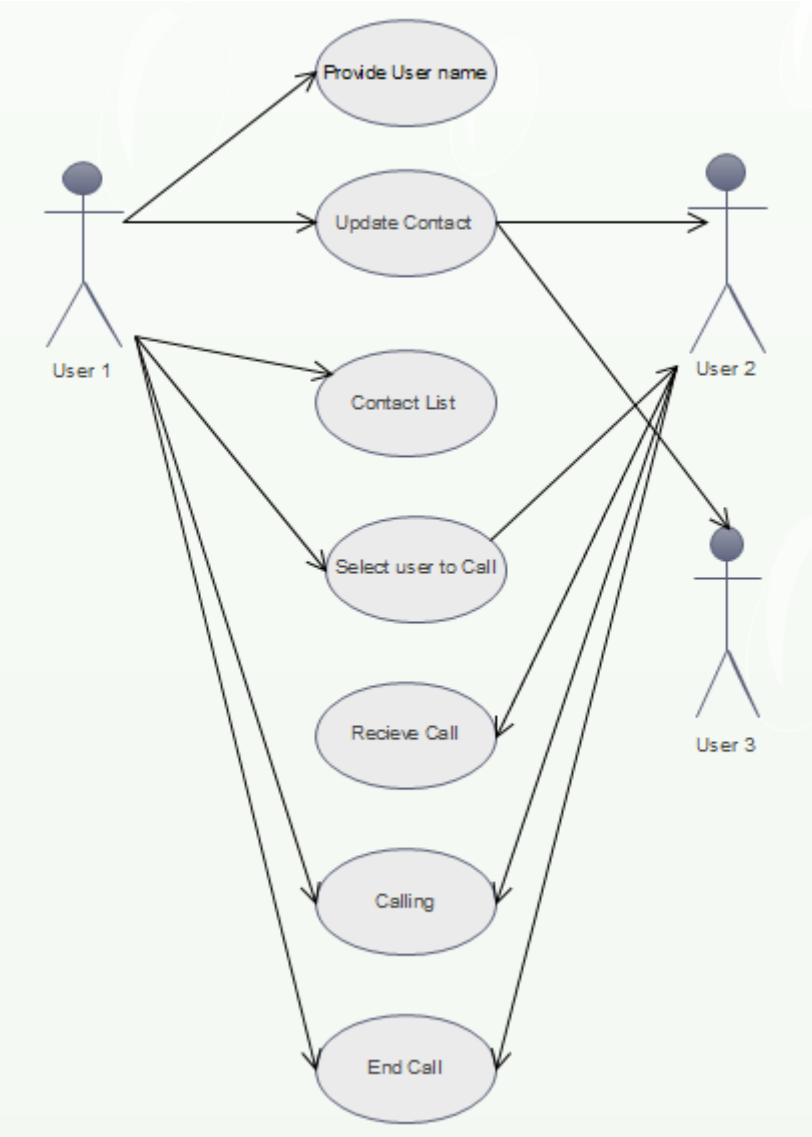
Diagrams

No.	Diagram Name
4.1	Class Diagram
4.2.1	Use Case Diagram(Call Module)
4.2.2	Use Case Diagram(File Transfer Module)
4.3.1	Activity Diagram(Call Module)
4.3.2	Activity Diagram(File Transfer Module)
4.4.1	Sequence Diagram (Call Module)
4.4.2	Sequence Diagram (File Transfer Module)

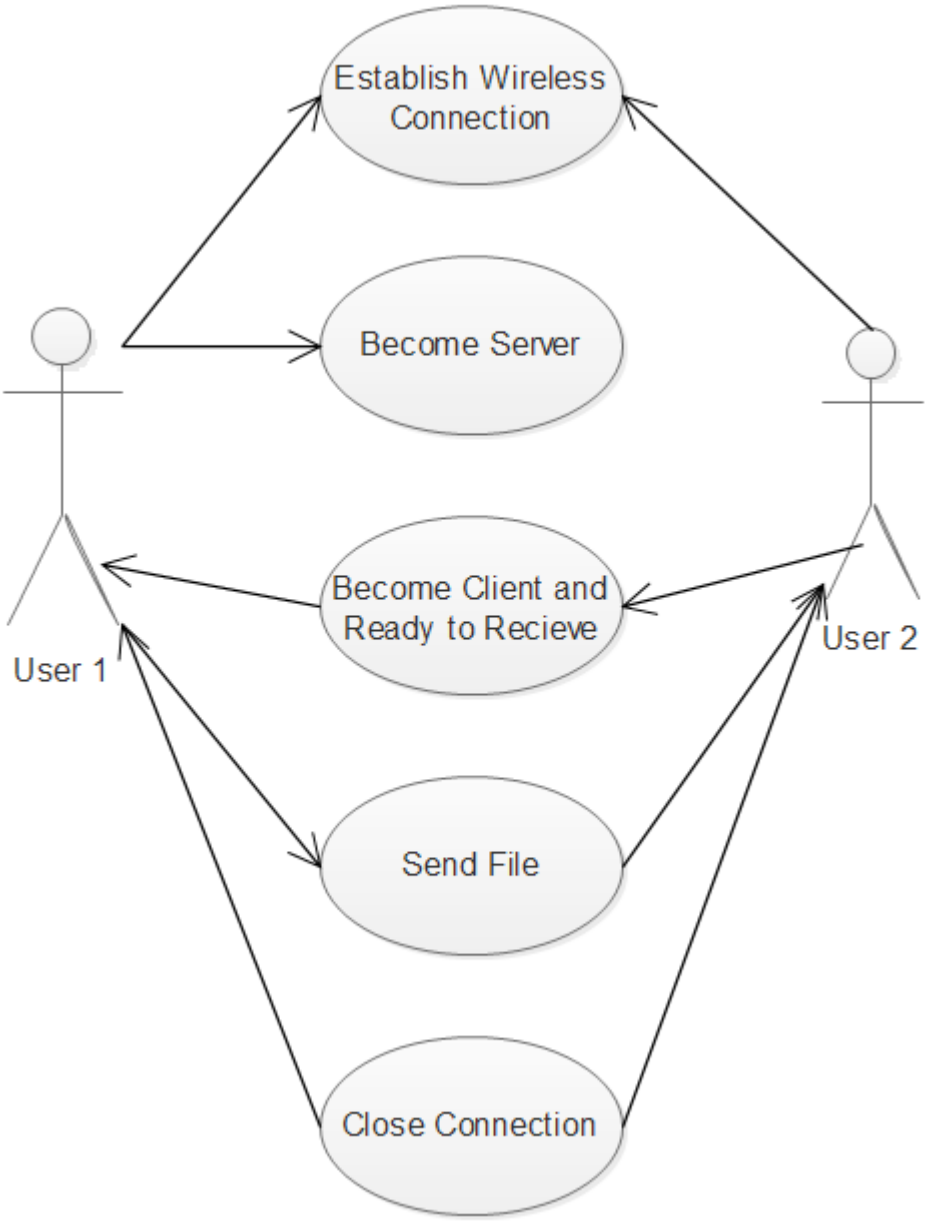
4.1


class_diagram_whole.eddx
Page-1
Splash
Animator anime
MainActivity
fragmentor()
People
Message
FileTransfer
Button sender, receiver
sender()
receiver()
Preferences
Preference P1, Checkbox cb1,cb2,cb3,cb4, cb5,cb6
bind()
MyProfile
EditText et1, ImageView iv, Button save
filepicker()
NetworkManager
WifiManager wm
About
Exit
exit()
Audio
Button updateButton,callButton
RadioGroup radioGroup
ContactList contactList
btnUpdate()
btnStart()
btnCall()
updateContactList()
getBroadcastIp()
toBroadcastIp()
startCallListener()
stopCallListener()
Sender
Serversocket s1
BufferReader b1
FileInputStream fis
filePicker()
send()
Receiver
Socket s2
FileOutputStream fos
BufferReader b2
receive()

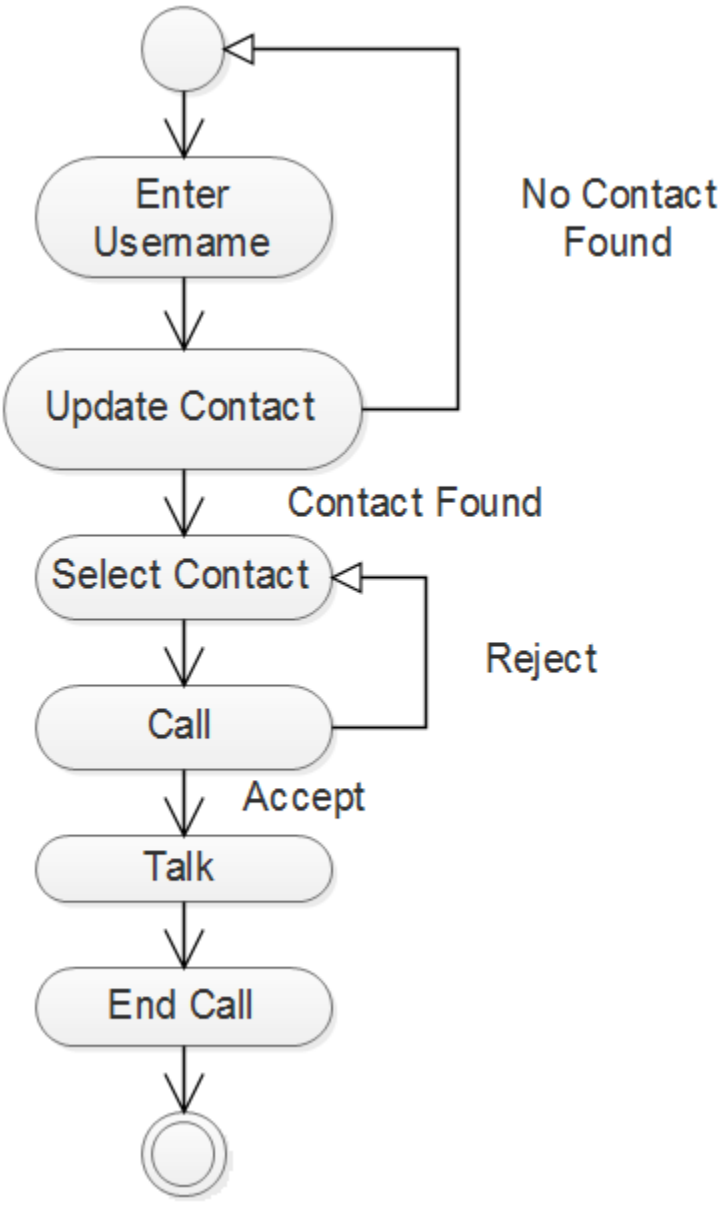
4.2.1


Provide User name
Update Contact
Contact List
Select user to Call
Recieve Call
Calling
End Call
User 1
User 2
User 3

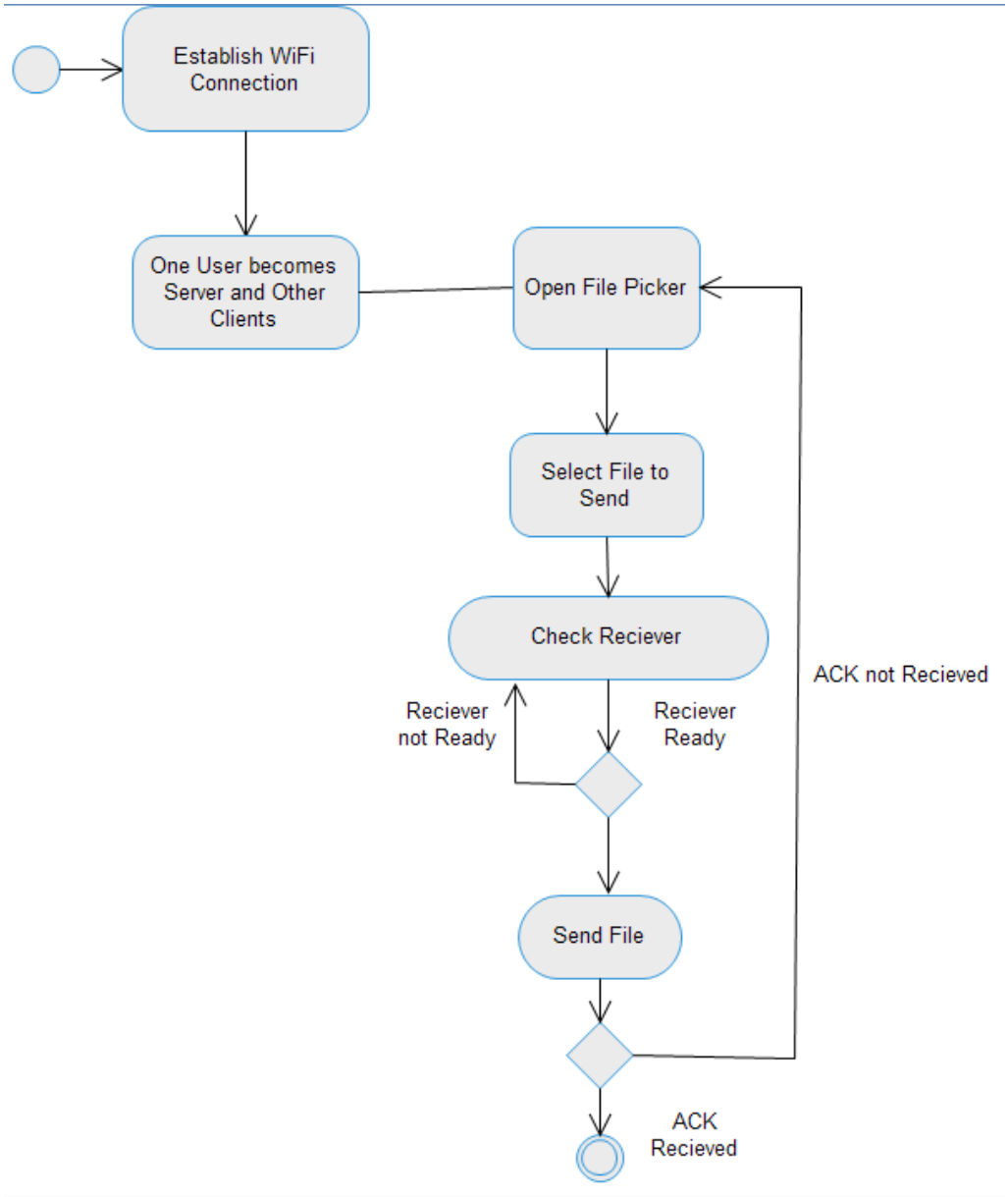
4.2.2


Establish Wireless Connection
Become Server
Become Client and Ready to Recieve
Send File
Close Connection
User 1
User 2

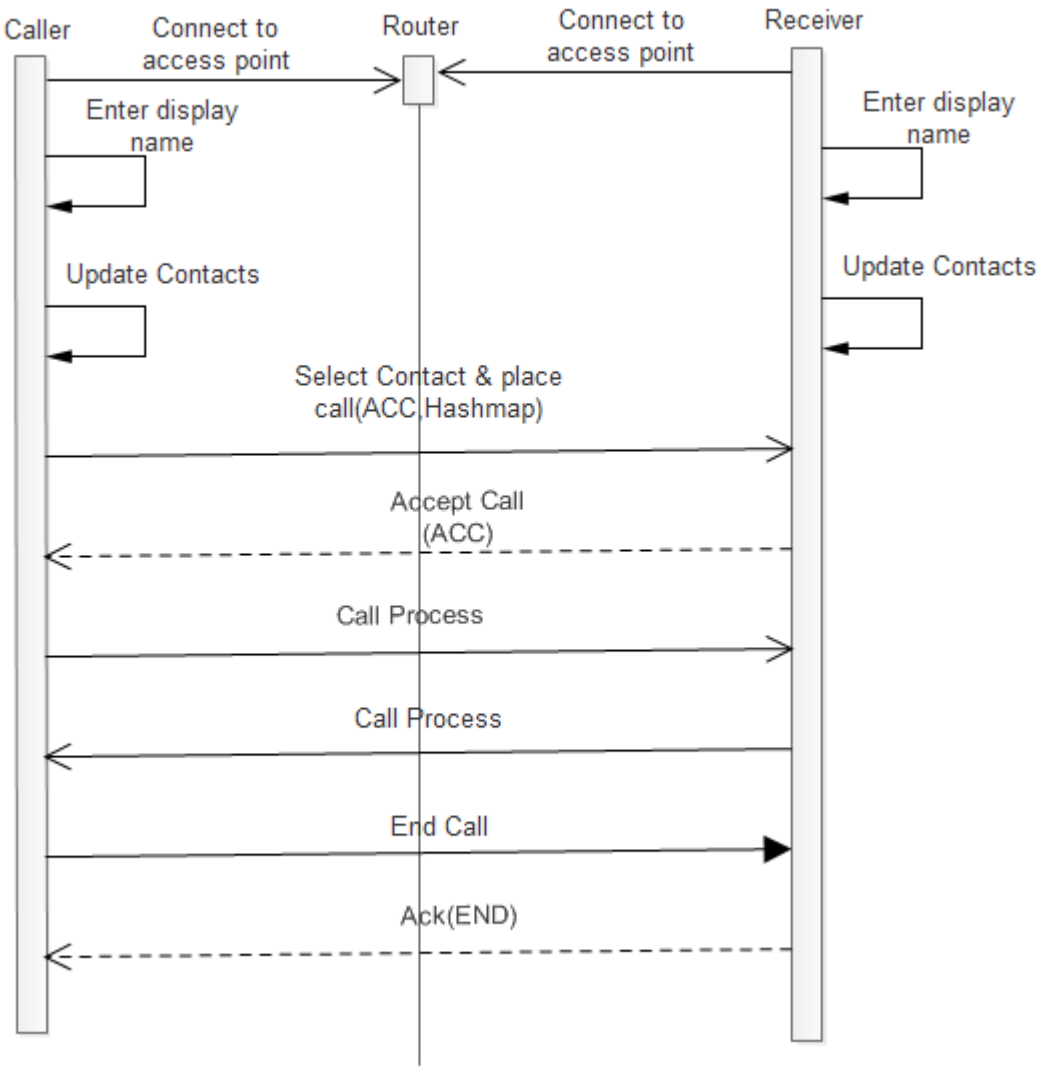
4.3.1


Enter Username
No Contact Found
Update Contact
Contact Found
Select Contact
Reject
Call
Accept
Talk
End Call

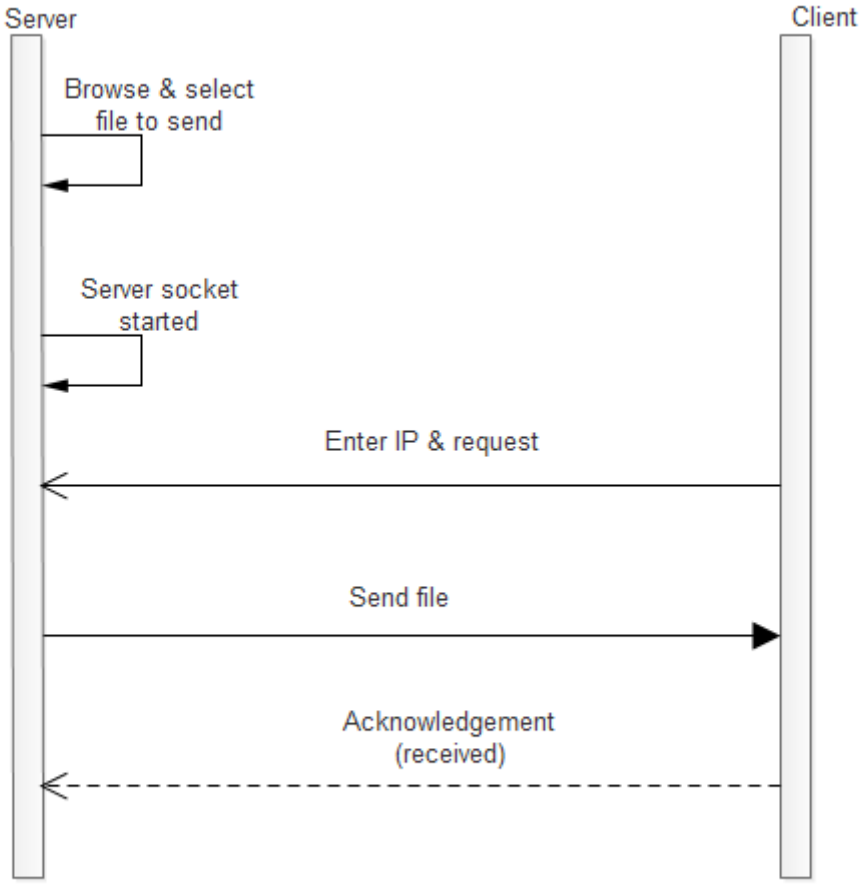
4.3.2


Establish WiFi Connection
One User becomes Server and Other Clients
Open File Picker
Select File to Send
Check Reciever
Reciever not Ready
Reciever Ready
ACK not Recieved
Send File
ACK Recieved

4.4.1


Caller
Connect to access point
Router
Connect to access point
Receiver
Enter display name
Enter display name
Update Contacts
Update Contacts
Select Contact & place call(ACC Hashmap)
Accept Call (ACC)
Call Process
Call Process
End Call
Ack(END)

4.4.2


Server
Client
Browse & select file to send
Server socket started
Enter IP & request
Send file
Acknowledgement (received)

CHAPTER 5

Proposed Work

5.1 Working

5.2 Algorithm

5.3 Advantages

5.4 Future Work

5.1 WORKING

To establish voice call communication over WLAN by using Wi-Fi facility of the cell phone.

In this project we are focusing on following features:

1. Establishing voice call over Wi-Fi.
2. The user places call through the Android Application Developed.
3. It selects the contact then places the call.
4. If user is in the network the call will be placed.
5. Here at starting we will be developing for call & then eventually for Messaging and File Sharing.

   The Following Diagram should be proposed ideal System:

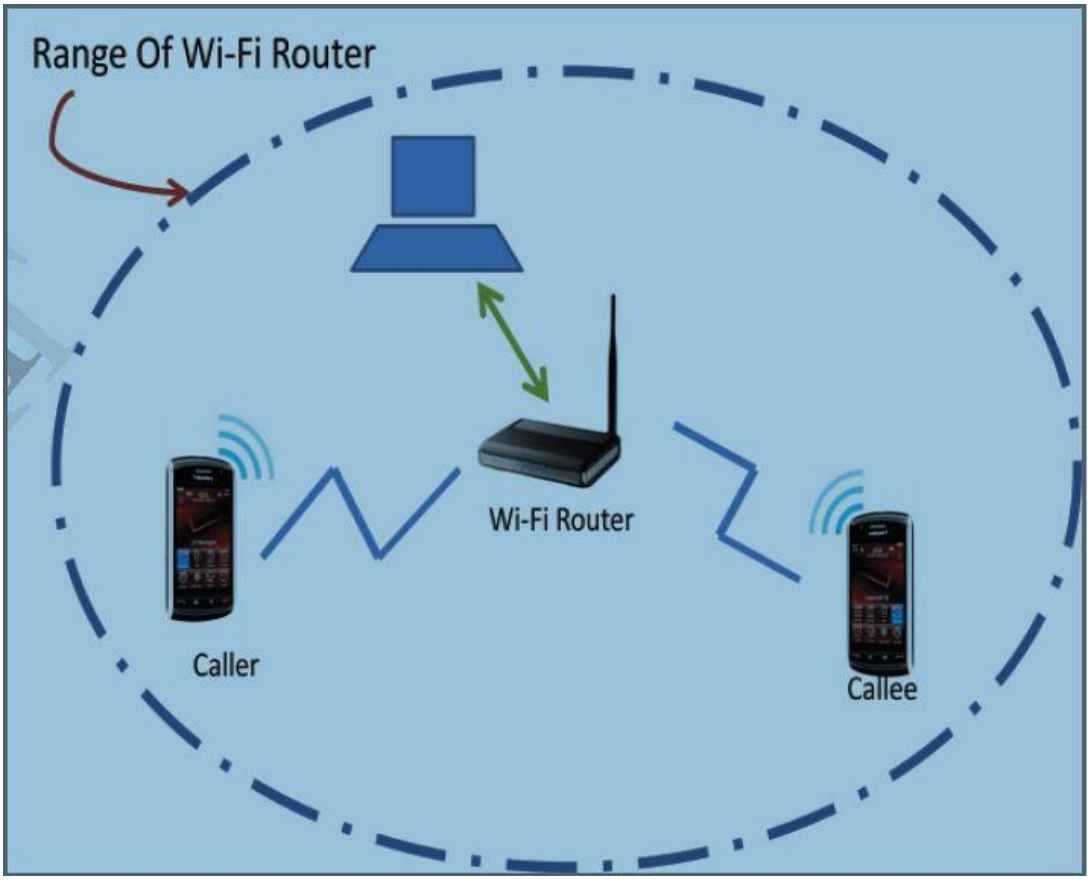


Fig. 2 Area covered by Wi-Fi router

Fig. 2 shows caller, callee (i.e. receiver), and Wi-Fi router The Wi-Fi coverage area boundary is shown as well. Voice is exchanged between caller and callee through Wi-Fi router.

Fig.3: Simultaneous Voice communication

Wi-Fi router acts as access point which detects nodes, currently active in the network. As per caller's choice, cell phone sends request to connect with callee and in turn , router forwards the voice connection request which is tagged with the sender and receiver name (i.e. address). Simultaneous communication between two pairs of users is shown in fig. 2. Number of calls supported simultaneously depends on router's capacity. In fig. 4 caller A has placed a call for receiver B. Voice is exchanged between A and B via router.

Modules of System:

The proposed system consist of three modules namely,

1. Caller Module
2. Router Module
3. Receiver Module

1. Caller Module:

- Wi-Fi enabled cell phone with Android operating system opens the application and then it takes the user name and shows the online available users.
- User selects the name of callee. He is provided with facility to identify the callee as per the selection of department, designation. Once he is connected to the callee, he can start voice communication.

2. Router Module:

- Here, in the Router acts as a gateway or a medium of Communication between the devices.
- Accepting the request from caller and placing a call is another responsibility of this module. On demand of user, server has to refresh the list of available users.

3. Receiver Module:

- This module allows receiver to receive call.
- Now, it depends upon the receiver to pick up the call or not.

5.2 ALGORITHM

1. Start.
2. Connect the phones to the Access Point (Hotspot, Wi-Fi Router, AdHoc).
3. For "CALLING", take user's contact name and store in a text variable EdtName.
4. Use HashMap **contacts** to store user name & IP Address, simultaneously broadcast the HashMap pair to all the devices in the Network.

   HashMap<String, InetAddress> contacts = contactManager.getContacts();
5. Get the selected contact and initialize the functions **startListener()** & **makeCall()** .
6. Send caller Id & flag = **ACC:**.

   On the receiver end

   if flag = **ACC:**

   if ready to accept call

   then

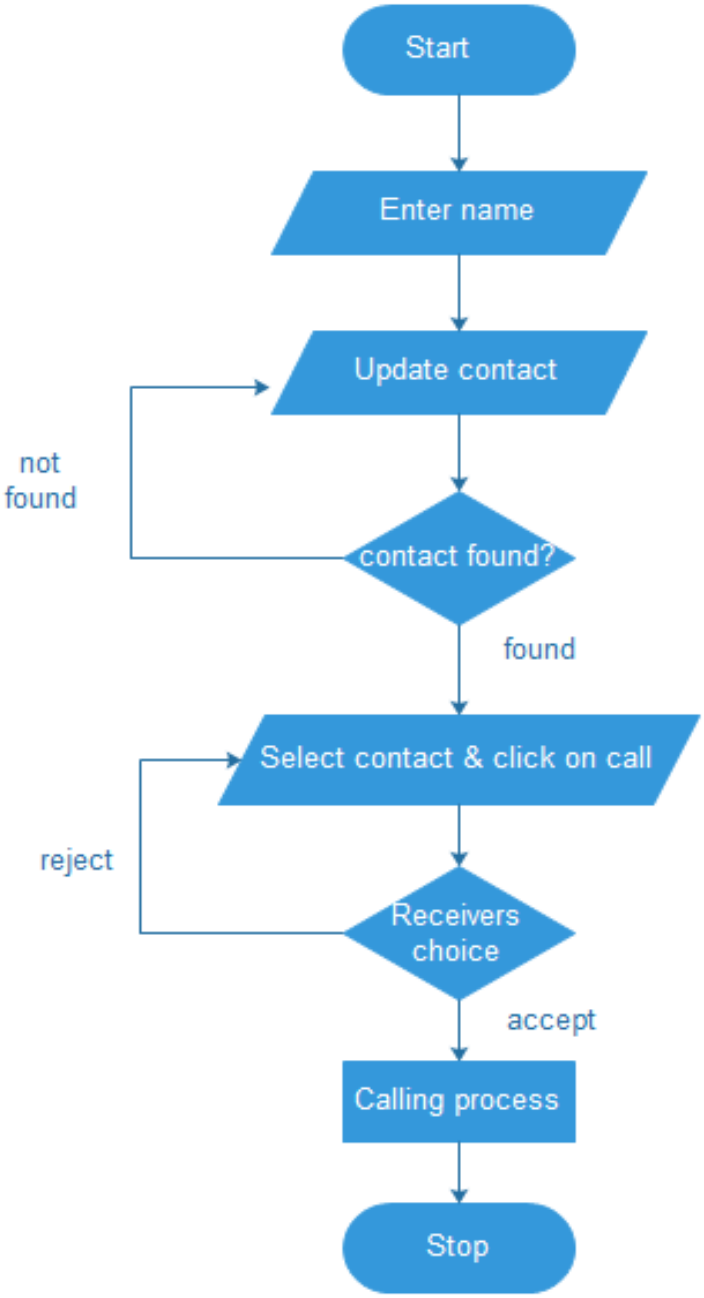
   reply with acknowledgement as "**ACC:**" & ready to accept the streams.

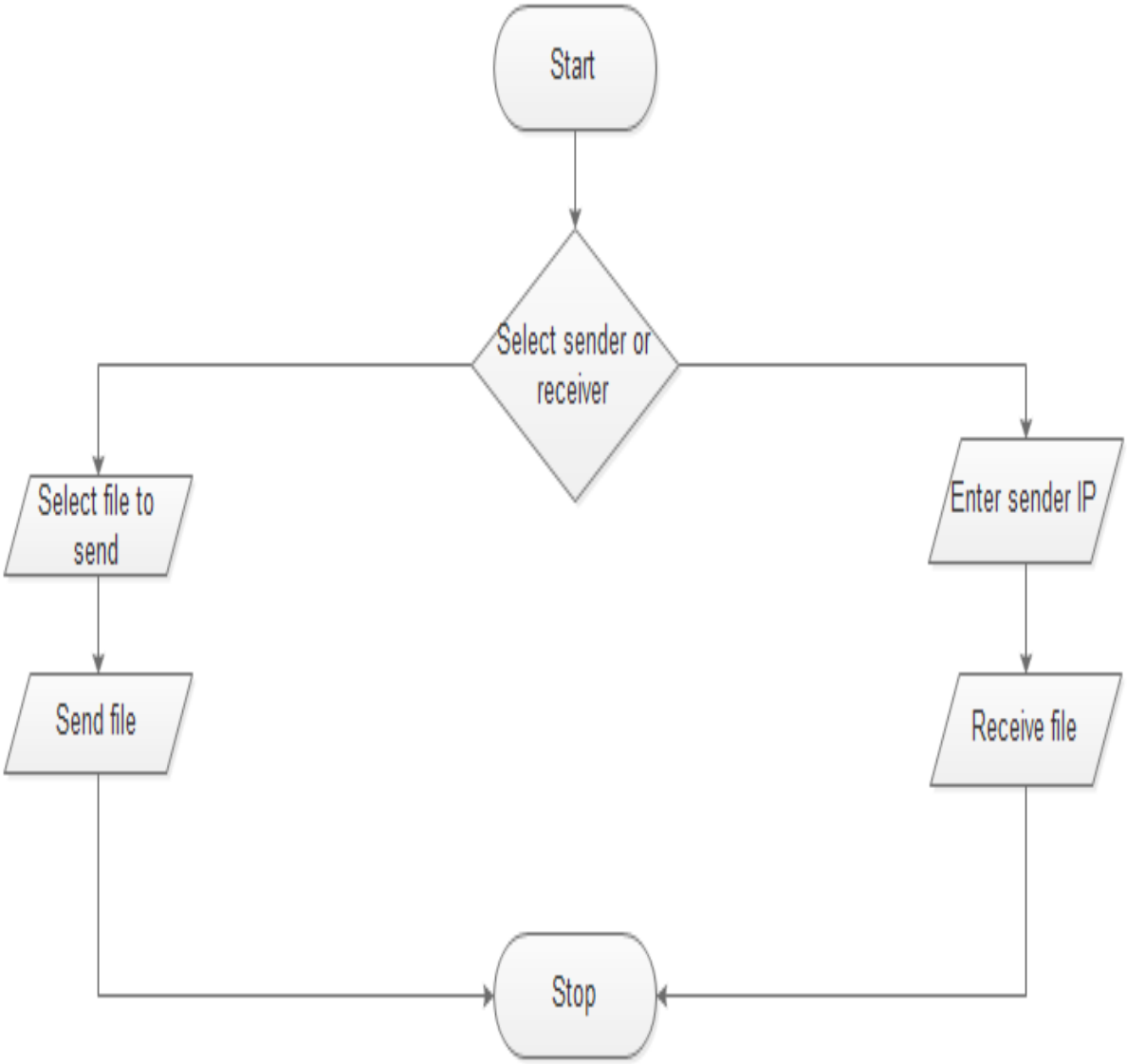
   else

   reply with acknowledgement as "**REJ:**"
7. For ending the call, send "**END:**" packet.
8. For "**FILE TRANSFER**" select either **Sender** or **Receiver**.
9. if **Sender**,

   then browse file via **FilePicker** class , then start **Socket.listen()** method.
10. if **Receiver**,

    then enter the **IP address** of **Sender** and start receiving the file.
11. The received file is Saved in the folder **sdcard0/ConnectAll/Received Files**.
12. Stop


Start
Enter name
Update contact
not found
contact found?
found
Select contact & click on call
reject
Receivers choice
accept
Calling process
Stop


Start
Select sender or receiver
Select file to send
Send file
Enter sender IP
Receive file
Stop

5.3 ADVANTAGES

Advantages of Voice over Wi-Fi

- Single & uniform voice dialer on their smartphone.
- Allows voice services over any Wi-Fi network (home, office, hotspots).
- Wi-Fi Calling provides better indoor coverage in comparison with cellular network.
- Seamless call transfer support between next generation devices.
- Coverage in local areas where the networks operators lack in connectivity.
- Better than the wired services as it is cost effective and better to work.
- Best suitable for College campuses, Offices and Hospitals,
- Wi-Fi can be best medium for communication in space and cruiser ships.
- Provide inbuilt Encryption facility of Wi-Fi of WPA2 PSK and WEP.

5.4 FUTURE WORK

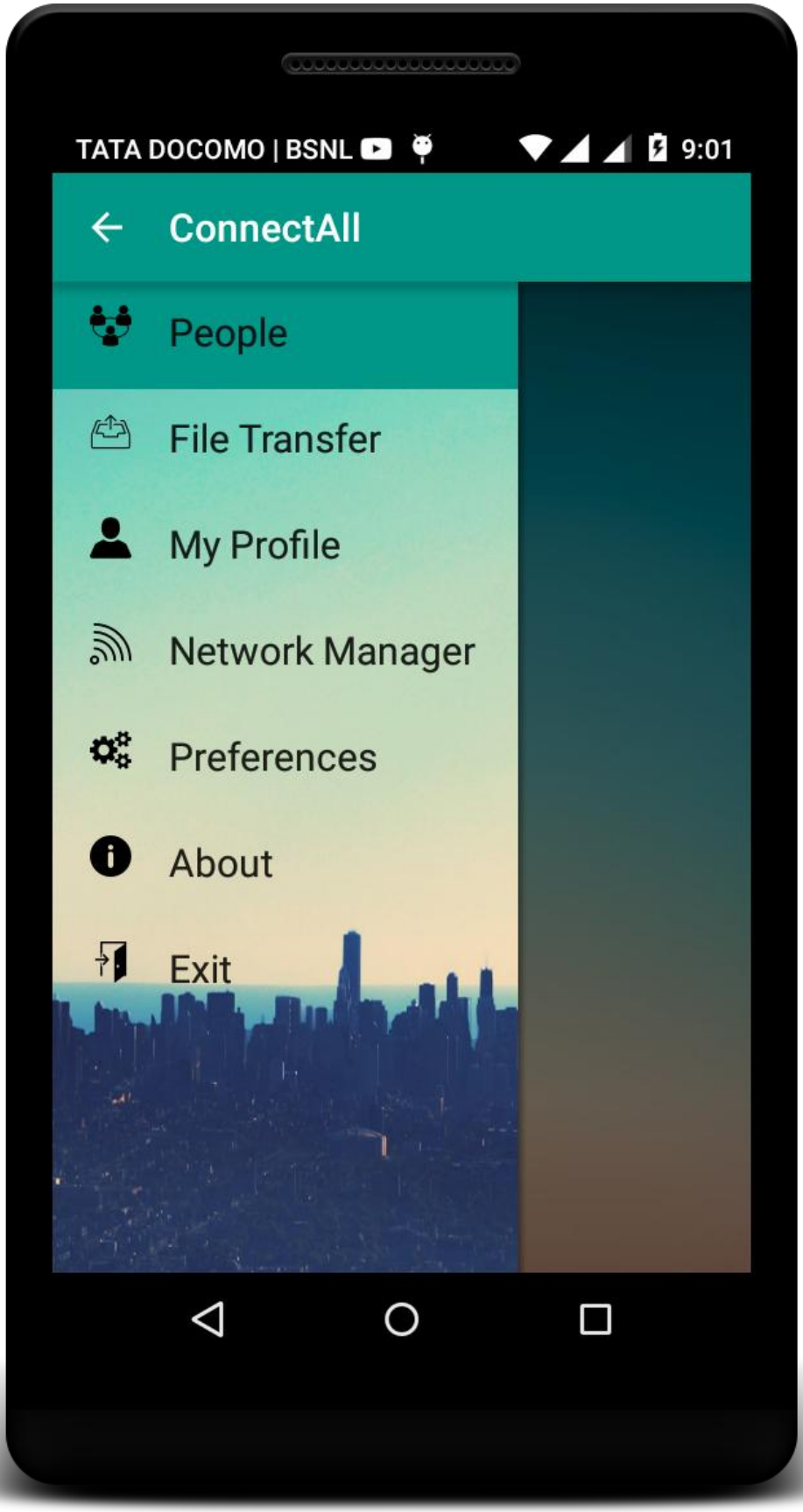
Future Work

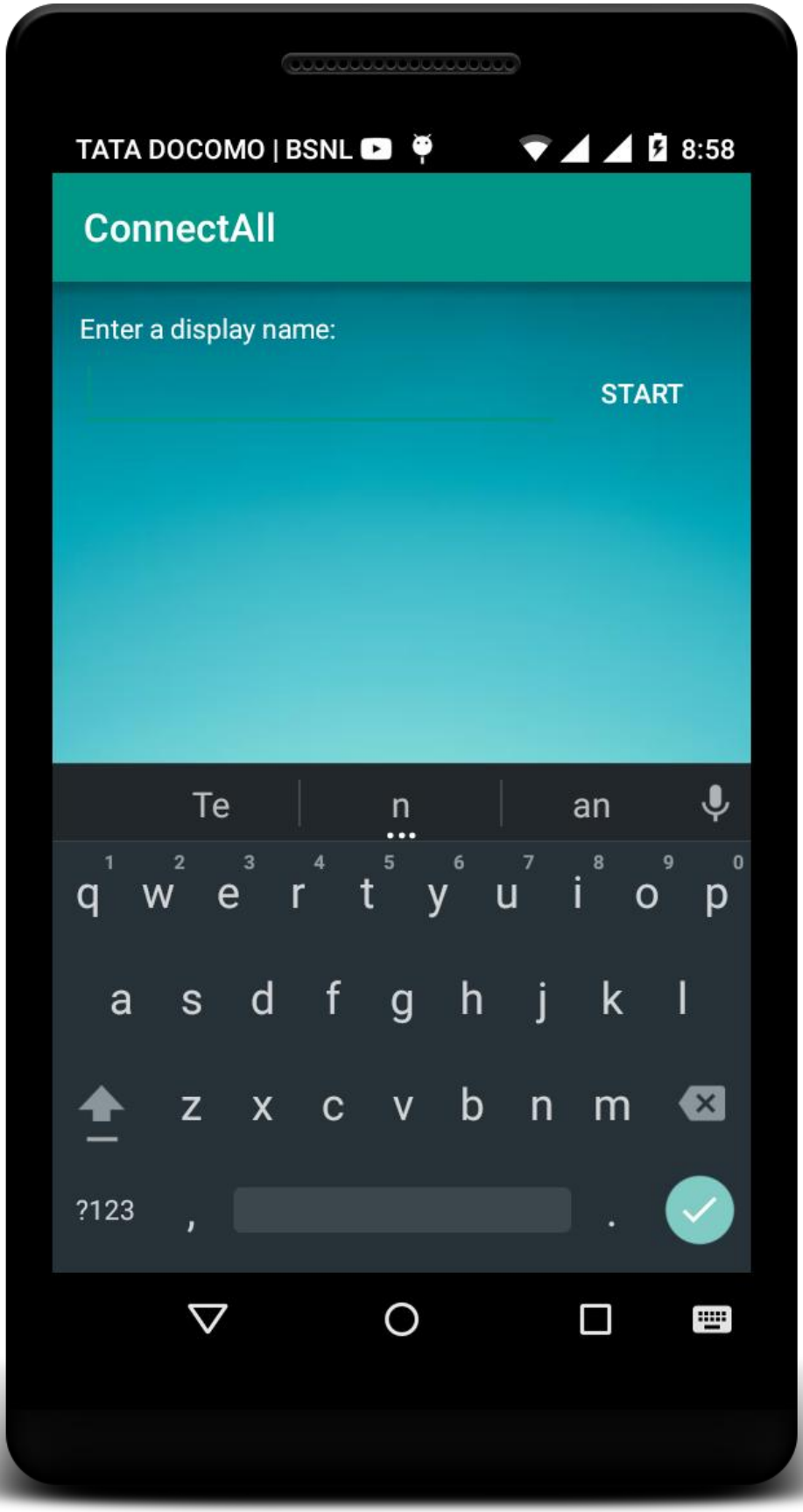
Currently the application is developed for Android based System and can be developed for other platforms like Apple (iOS), Windows and Blackberry (RiM).

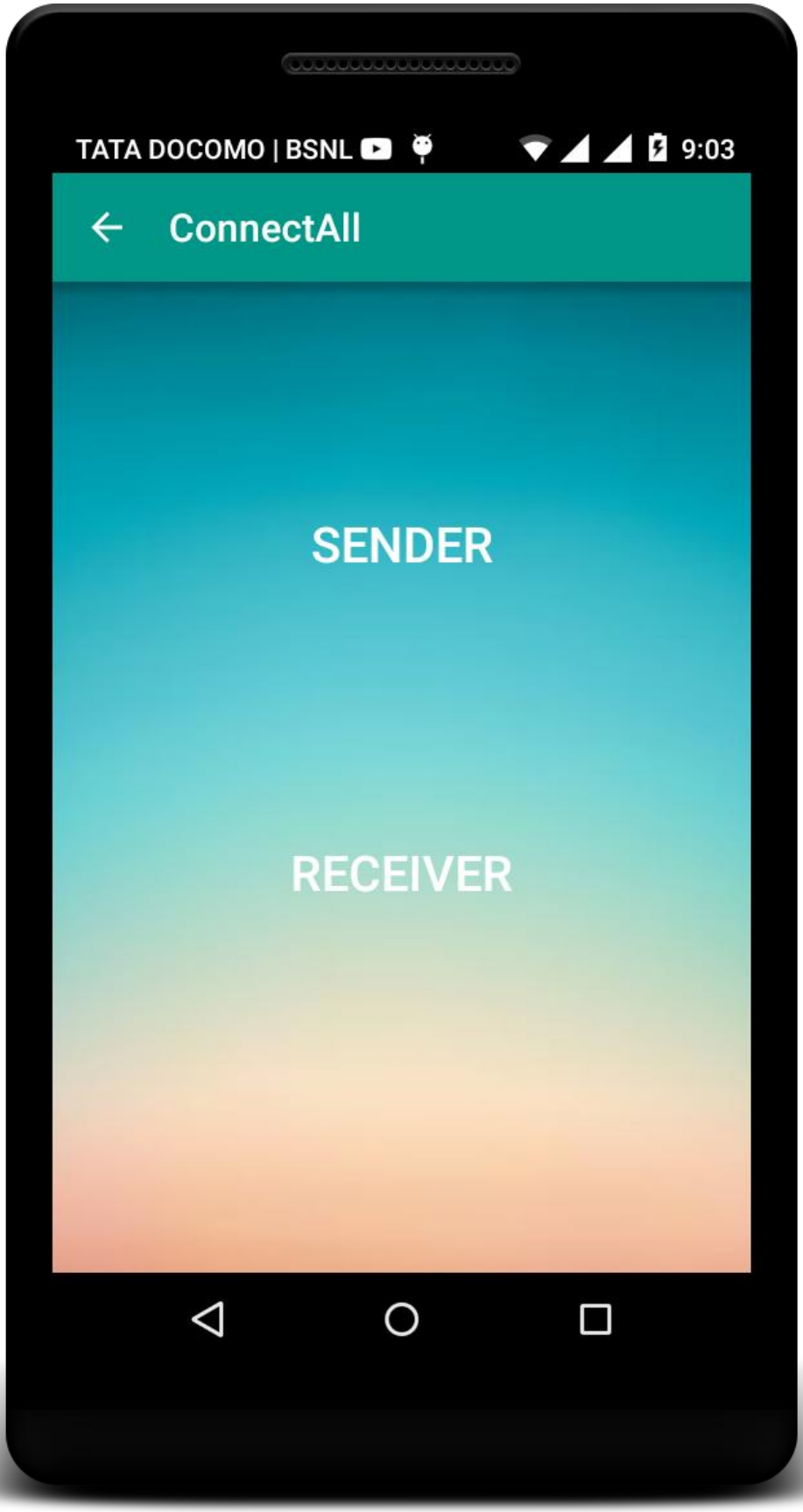
Our project can be tweaked to place conference calls .The project can also be modified to place Video Calls. It can also be used as a Web Based Interface so as to fully use features of our project over the Browser Applications.

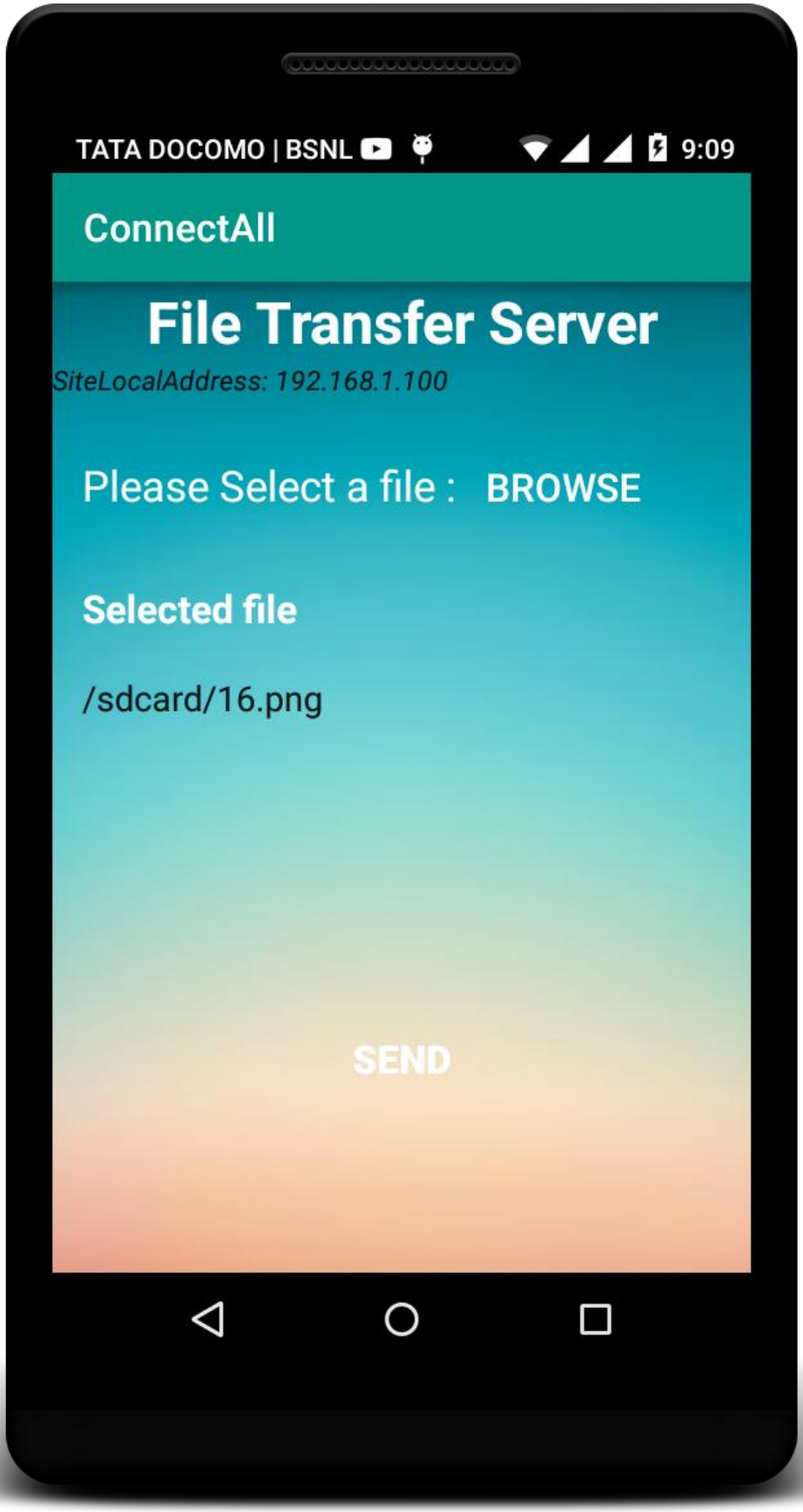
CHAPTER 6

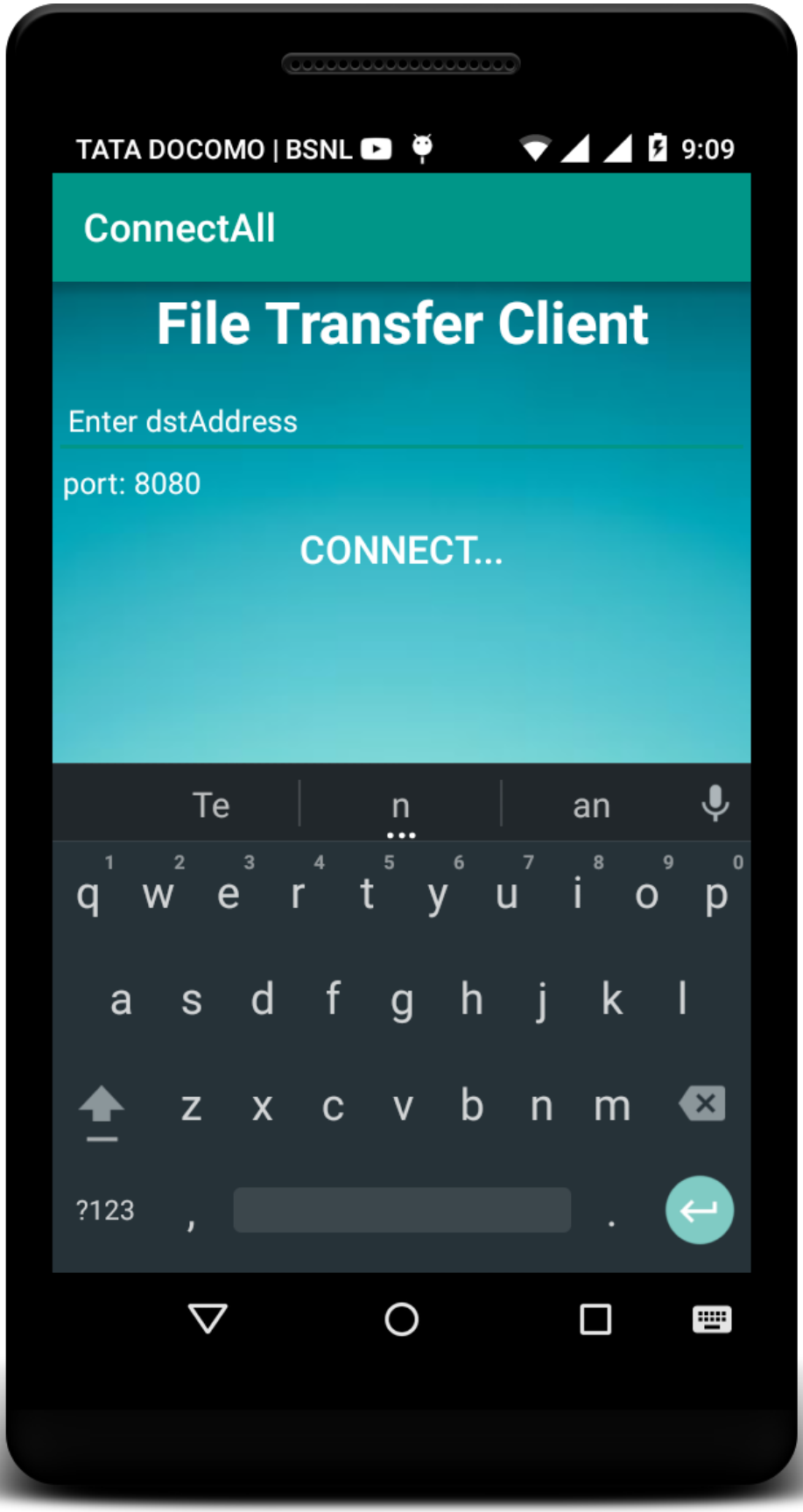
Execution & Result

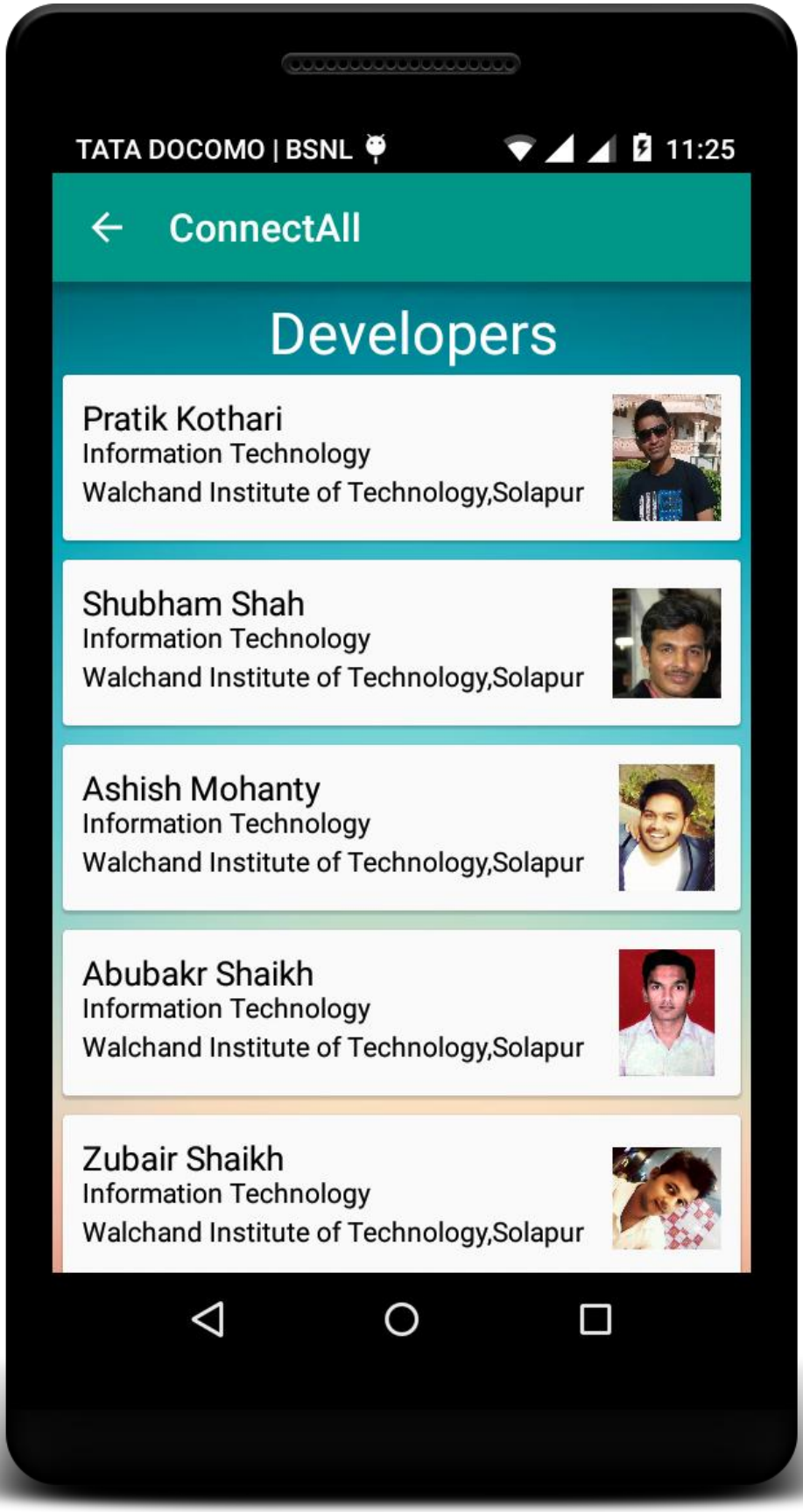

TATA DOCOMO | BSNL
9:01
ConnectAll
People
File Transfer
My Profile
Network Manager
Preferences
About
Exit


TATA DOCOMO | BSNL
8:58
ConnectAll
Enter a display name:
START
Te
n
an
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
?123
,
.


TATA DOCOMO | BSNL
9:03
ConnectAll
SENDER
RECEIVER


TATA DOCOMO | BSNL
9:09
ConnectAll
File Transfer Server
SiteLocalAddress: 192.168.1.100
Please Select a file : BROWSE
Selected file
/sdcard/16.png
SEND


TATA DOCOMO | BSNL
9:09
ConnectAll
File Transfer Client
Enter dstAddress
port: 8080
CONNECT...
Te
n
an
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
?123


TATA DOCOMO | BSNL
11:25
ConnectAll
Developers
Pratik Kothari
Information Technology
Walchand Institute of Technology,Solapur
Shubham Shah
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Ashish Mohanty
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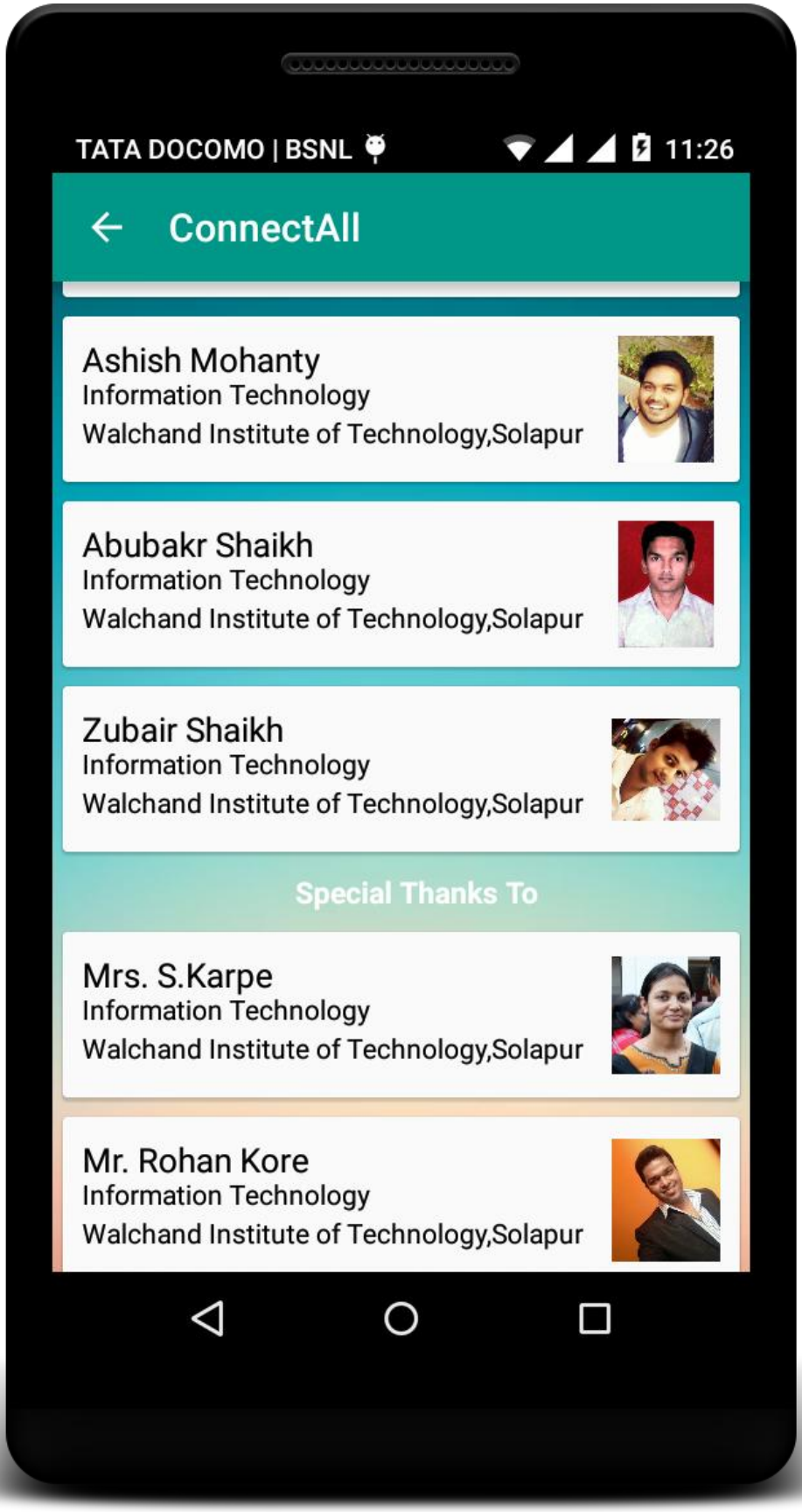
Walchand Institute of Technology,Solapur
Abubakr Shaikh
Information Technology
Walchand Institute of Technology,Solapur
Zubair Shaikh
Information Technology
Walchand Institute of Technology,Solapur


TATA DOCOMO | BSNL
11:26
ConnectAll
Ashish Mohanty
Information Technology
Walchand Institute of Technology,Solapur
Abubakr Shaikh
Information Technology
Walchand Institute of Technology,Solapur
Zubair Shaikh
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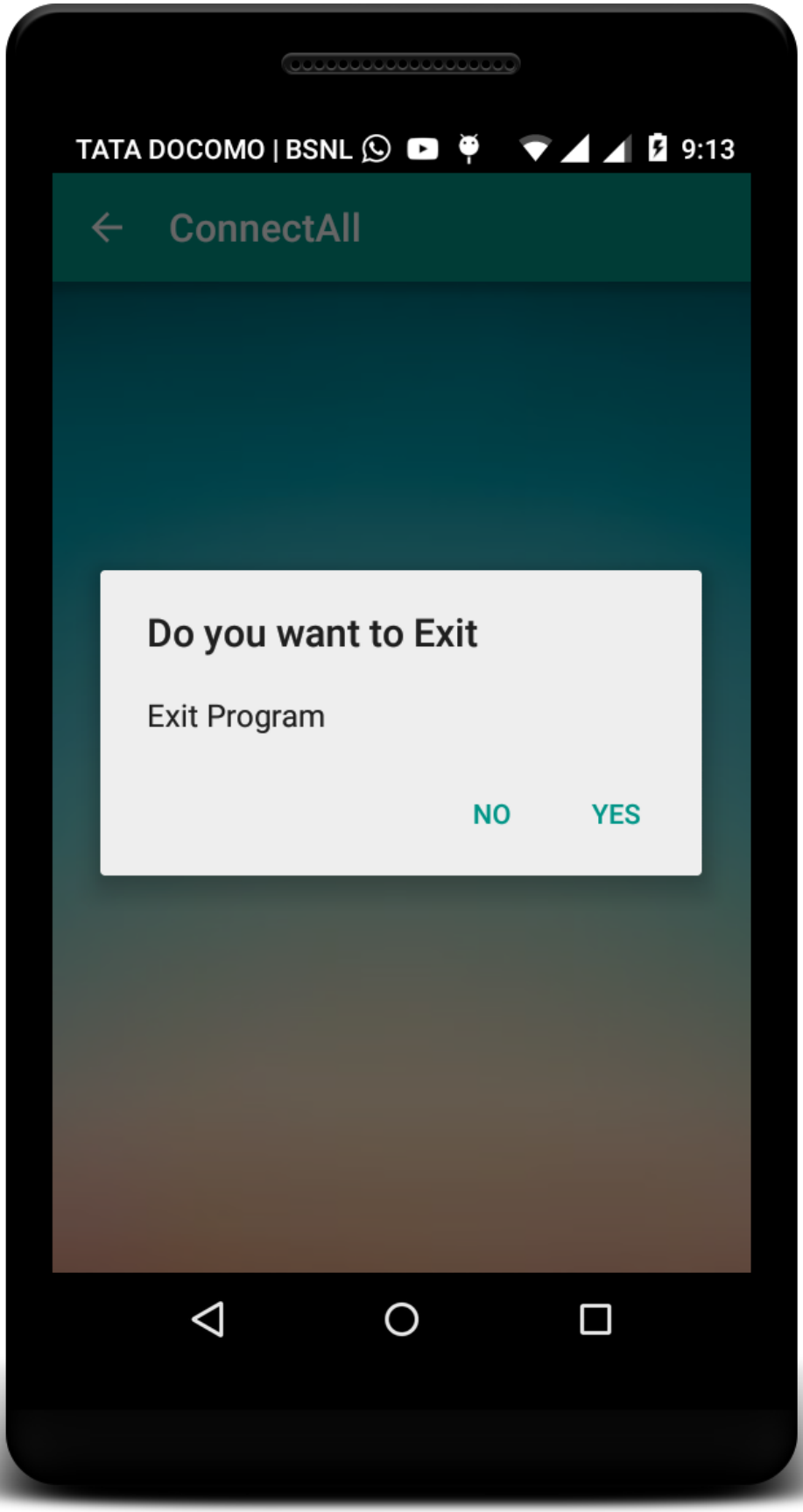
Walchand Institute of Technology,Solapur
Special Thanks To
Mrs. S.Karpe
Information Technology
Walchand Institute of Technology,Solapur
Mr. Rohan Kore
Information Technology
Walchand Institute of Technology,Solapur


TATA DOCOMO | BSNL
9:13
ConnectAll
Do you want to Exit
Exit Program
NO
YES

CHAPTER 7

Testing

7.1 Software Testing Strategy

7.2 Our Testing Strategy

7.1 SOFTWARE TESTING STRATEGY

A test strategy is an outline that describes the testing approach of the software development cycle. It is created to inform project managers, testers, and developers about some key issues of the testing process. This includes the testing objective, methods of testing new functions, total time and resources required for the project, and the testing environment.

Test strategies describe how the product risks of the stakeholders are mitigated at the test-level, which types of test are to be performed, and which entry and exit criteria apply. They are created based on development design documents. System design documents are primarily used and occasionally, conceptual design documents may be referred to. Design documents describe the functionality of the software to be enabled in the upcoming release. For every stage of development design, a corresponding test strategy should be created to test the new feature sets.

7.2 OUR TESTING STRATEGY

7.2.1 Unit Testing

The system consists of several modules that work together.

Following are the steps taken for unit testing.

1. Every module held by the respective was checked & tested, if it works properly for expected inputs.
2. If error occurs for certain conditions or boundary cases, they were rectified.
3. It is made sure that the system does not crash for any inputs.
4. It is made sure that necessary error message is displayed to user.
5. The code was developed in small chunks & then integrated.

7.2.2 Integration Testing

Integration testing is the phase in software testing in which individual software modules are combined and tested as a group. Following are the steps of integration are testing:

1. Merge the required individual functional components created.
2. Tests if they produce correct results for all inputs.
3. Check if there is no interface problem between individual components.

7.2.3 System Testing

1. System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified required.
2. System testing falls within the scope of black box testing, and as such, should require no knowledge of the inner design of the code or logic.
3. As a rule, system testing takes, as its input, all of the "integrated" software components that have passed integration testing and also the software system itself integrated with any applicable hardware system(s).
4. The purpose of integration testing is to detect any inconsistencies between the software units that are integrated together (called *assemblages*) or between any of the *assemblages* and the hardware.

CHAPTER 8

Conclusion

Voice over Wi-Fi was a very challenging problem. Use of Sockets and UDP functionality and using prebuilt Wi-Fi, proved useful and the resultant system developed is a Full Functional Android Application.

REFERENCES

[1] Arun Biradar, Dr. Ravindra C. Thool, Dr. Rajappa Velur Voice Transmission over Local Area Network Using Bluetooth IEEE paper published at TENCON 2009.

[2]Omkar V. Manjare , Sagar S. Bamnikar , Prathamesh N. Deshmane ,Om U. Dongre , Guide: Dr. Preeti S. Patil International Journal of Engineering Research & Technology (IJERT)Vol. 2 Issue 7, July – 201ISSN: 2278-0181

[3] Venkatraman.S, Siddharth Natarajan and T.V. Padmavathi, Member, IAENG Voice calls over Wi-Fi. WCECS 2009, October 20-22, 2009, San Francisco, USA

[4] Mr. R. D.Bhosale, Mr. A. R. Nigavekar ,Department of Electronics Engineering, KIT's College of Engineering Kolhapur, India, Throughput Analysis of Unlicensed Mobile Access using WIFI

[5] Real 802.11 Security: Wi-Fi Protected Access and 802.11i, JonEdney, William A. Arbaugh

[6] H.C.-H. Rao, Y.-B. Lin and S.-L. Chou, iGSM: VoIP service formobile networks, IEEE Communications Magazine 4(38) (2000)62–69.

[7] Voice over WLAN (VoWLAN) – A wireless voice alternative? Trond Ulseth

Paal Engelstad

[8] Proxim. White Paper: Voice-Over Wi-Fi Capacity Planning (2005, July, 5) [online]

[9]Android Developers, Android API Levels, Retrieved June 18, 2012, from http://developer.android.com/guide/appendix/api-levels.html#level12.

[10]Wikipedia (2012a), Codec, Retrieved June 18, 2012, from http://en.wikipedia.org/wiki/Codec.

[11]Wikipedia (2012b), Audio Codec, Retrieved June 18, 2012, from http://en.wikipedia.org/wiki/Audio_codec.