

# Voice Transmission Through Bluetooth

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**Abstract:** Bluetooth is a low cost, low power, short-range radio technology intended to transfer data between Bluetooth enabled devices at the gross data rate 1M b/s, but the actual data rates are 432 Kbps for full duplex transmission. Bluetooth is also used as a medium for voice communication between cell phones. This paper aim is to establishing the full duplex communication in the department and college. The main source of the transmission media is an embedded Bluetooth protocol within the computer and Android based Mobile Handset. The range limitation of Bluetooth is overcome by the LAN network available in the department. An attempt is made to work in full duplex mode and exploring the utility of the Android OS.

**Keywords:** Local Area Network (LAN), Personal Computer (PC), User Interface (UI).

## I. INTRODUCTION

New technologies and devices have provided easier and fast communication way for exchanging ideas and thoughts. Consumers appreciated the wireless lifestyle, relieving them of the well known “cable chaos” that tends to grow under their desk. Cell phones are the most popular wireless devices. The services that the phone provides such as SMS, voice and video calling, etc. have attracted billions of people across the globe. In order to make use of such facilities, one has to pay a certain amount of service charges to the service provider. But using this technology we can build intercom system in campus to transfer information from one lab to another. Cad 6 Ethernet cable is used which transmit and receives data at 250 M bits/sec. half duplex communication using Bluetooth and computer network have been reported in [1]. This paper proposes a design to develop a Bluetooth network for a campus. This allows mobile phones having Android OS with API 5 and above enabled with Bluetooth version 2.1 to be used for voice communication, without any service charges. The communication medium is Bluetooth, which is a short-range radio service with a range of 10 meters and data rate. Computer network is used to overcome the limitation of short range. These computers are equipped with Bluetooth devices for receiving & sending the digital audio signals from mobile phones.

Fig. 1 shows the Hardware Architecture of the system. It shows computer connected via Local Area Network (LAN). The Bluetooth enabled mobile phones are used for voice communication. Hence, for the communication to take place, the sender and the receiver must be within the Bluetooth range of different Computers. To initiate a call the mobile device should be in the range of host computer. Host computer will broadcast the ID of receiving mobile. The computer which is in sync with the receiving mobile acknowledges the broadcast message. Communication link is established to continue call. The caller now sends the digital audio data to its Computer, which will then be transmitted to the receiver’s Computer via Local Area Network (LAN). This data is later transmitted to the receiver and vice versa.

## 2.2. Software Architecture

The system consists of two users – Caller and Receiver. The person who sets up the call is considered as the Caller. The other person is considered as the Receiver. At the both sides there are two main devices – the Android Mobile Phones and Personal Computers. Mobile System consists of six functional units shown in Fig. 2. They are:

## II. DESIGN

### 2.1. Hardware Architecture

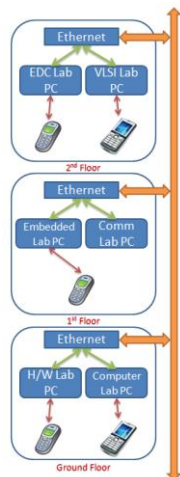


Figure 1. Hardware Architecture

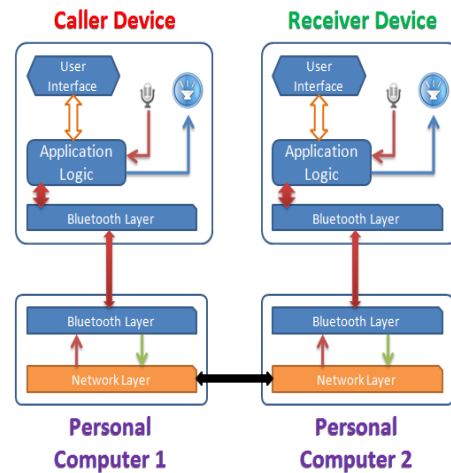


Figure 2 System Design

### 2.2.1 User interface

This unit acts as an interface between the application and the user. It enables the user to view the contacts, add new contact and thus set up the call. Appropriate messages

such as “Found”, “Not Found” “ERROR” etc. are displayed to the user to make the system friendly.

### 2.2.2 Application Logic

This unit is used for manipulating the audio raw data, applying PCM, Call Initiation Protocols Logic.

### 2.2.3 Hardware (microphone)

The microphone is used for reading audio signals from the user and converts it to digital audio data.

### 2.2.4 Hardware (Speaker)

The microphone is used for playing audio signals received from the other user.

### 2.2.5 Bluetooth communication layer

This unit is responsible for transmitting the audio packets and maintaining the connection with sender side host. Also receiving the audio packets and maintaining the connection with receiver side computer.

### 2.2.6 Network Layer

Through network layer we sent requested Bluetooth address to all other PC’s in network for searching in their Bluetooth PAN. Any PC who finds that Bluetooth address phone in surrounding will reply to caller PC. After call setup activity when receiver press receive then voice signals get transmitted and received on streams.

## 2.3. Application Work Flow

This application is built into the Android which handles this Bluetooth Calls. It records & transmits the raw audio data simultaneously in real time, which gives us Full Duplex voice communication shown in Fig. 3.

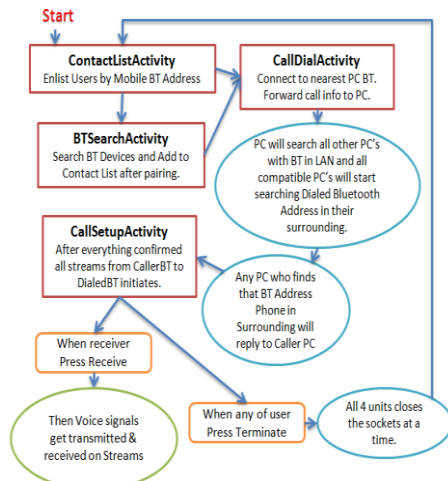


Figure 3 Application Work Flow

### Contact List Activity (ContactListActivity)

Here all the users will be enlisted by their Bluetooth address. New Bluetooth device can be added by searching nearby.

### Bluetooth Search Activity (BTSearchActivity)

It searches Bluetooth devices nearby pair them and address then to the contact list.

### Call Dial Activity (CallDialActivity)

Connect to nearby PC Bluetooth and forward call detail to PC.

### Call Setup Activity (CallSetupActivity)

After dialed Bluetooth device found it initiates streams upto dialed device via network and give call notification to dialed device.

## 2.4. Implementation

### 2.4.1 Initial Setup on Caller and Receivers Mobile

After opening the application first it will check whether Bluetooth is enabled or not. If Bluetooth is enabled then it will setup the chat. And if Bluetooth is disabled then request for enable. After enabling the Bluetooth it setup the chat as shown in Fig. 4.

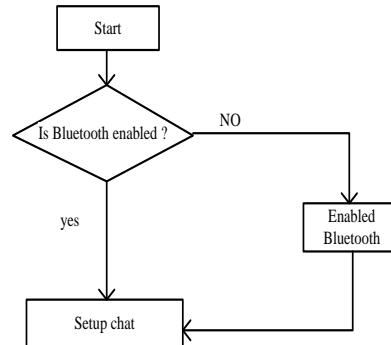


Figure 4 Initial Setup Process

### 2.4.2 Caller’s Mobile Activities

After initial setup the caller may see the already paired devices (only computers) also search other devices which are not already paired. On search request it will search other PCs present in the Bluetooth range and displays the list of already paired and newly paired PCs. On connect request it will start connecting to the selected devices [4]. After connected reading, writing and audio track starts shown in Fig. 5.

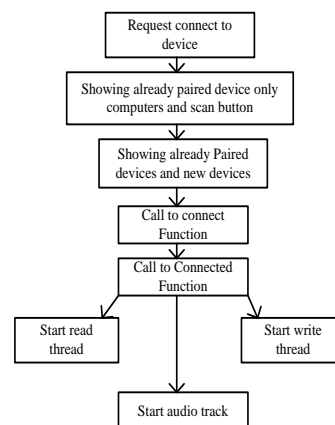


Figure 5 Caller Mobile Activities 1

Once connecting with nearest PC shows the paired mobile devices and on call the requested mobile device address is sent to the connected PC and wait for the response. The caller side PC sends the received address to all the PCs in the network. All the PCs start searching for the received Bluetooth address and if anyone finds then send Found. Caller side PC sends received reply to caller mobile and if reply is found then start recorder and sends the data through buffer of size 8192 byte continuously to PC and receives the data and write to the track. If reply is Not Found stops the recorder shown in Fig. 6.

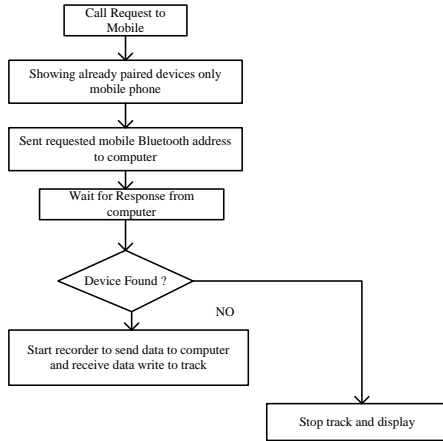


Figure 6 Caller Mobile Activities2

### 2.4.3 Receivers Mobile Activities

On start the bluetooth is continuously in listening state and when any device request for connection it will accept the request and start connecting once connected starts the track and play received data, starts the recorder and sends the raw audio data [4] shown in Fig. 7.

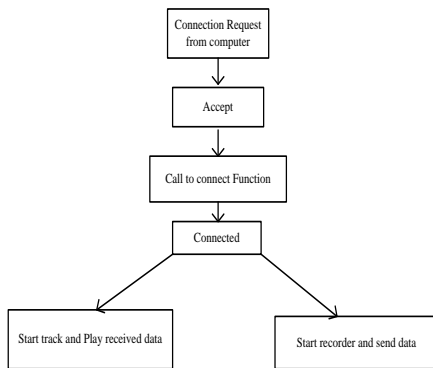


Figure 7 Receivers Mobile Activities

### 2.4.4 Caller Side PCs Activities

This will open sockets to connect with other PCs on LAN. After that accept Bluetooth connection request and connect with requested device. After connection receives the Bluetooth address and send it to other PCs on LAN also wait for reply if any PC sends found then received message sends to the connected mobile device and start transferring data between PC and mobile [3] [6] [7]. If received message is Not Found then stop shown in Fig.8.

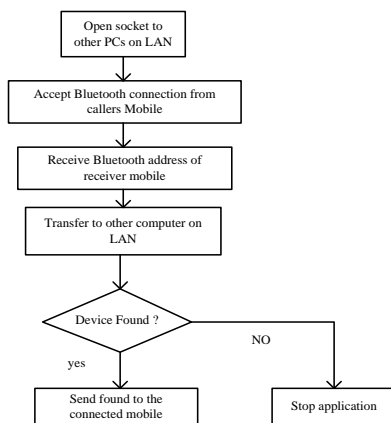


Figure 8 Caller Side PCs Activity

### 2.4.5 Receiver Side PCs Activity

This receives Bluetooth address from other computer and start searching for the received address in its range. If required device Found then search for service in Found device. If not found then sends Not Found to the other PC and start listening. If service founds in the device then it connect to the device and starts transferring data to and from mobile Bluetooth [3] [6] [7] shown in Fig. 9.

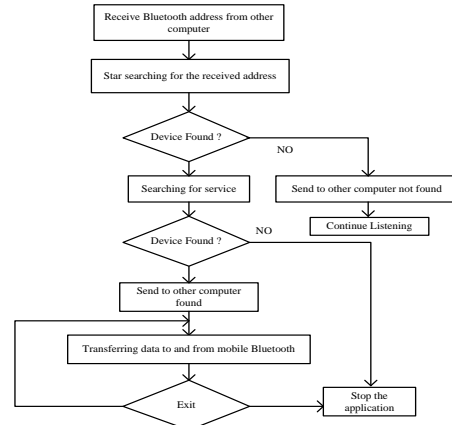


Figure 9 Receiver Side PCs Activity

## III. CONCLUSION

Nowadays everyone uses android mobile phone equipped with a Bluetooth facility. The system communicates by combining Local Area Network (LAN) and Bluetooth technology. The system uses existing LAN network available in the campus or the organization. Full-duplex form of communication is provided in which both user can speak simultaneously. The development of this application is mainly focused on reducing the installation cost of epabex intercom system. The lacuna of the system is it has short buffering time.

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