Wireless and SIM-less Communication Using Mobile

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***Abstract* - This paper proposes an innovative solution to SIM-less communication using mobile phones. The core objective of this paper is to develop modules that enable communication between two devices without use of SIM card. The first module, the JS and android java application which uses web socket and server socket programming respectfully to create a client-server architecture to establish a connection between two devices over the WIFI-Lan. This allows the devices to communicate with each other as if they were making a normal call but in LAN providing a security. The second module is an Arduino-based device that uses LoRa and CDMA to transmit and receive audio data which is a way where by using Radio we can communicate but with our updated way. This system has the potential to be a valuable tool for a variety of applications. For example, it could be used to create a low-cost communication system for people in remote areas. It could also be used to create a secure communication system for businesses.**

keywords: CDMA, SIM-Less, SIM, LAN, Adriano, LoRa

I. Introduction

Now a day, to make a call mostly we use normal mobile calling system which uses operator service using SIM, which requires their Subscription and ultimately some fees, and as we know it is also harmful for security purpose as it is traceable but we could have solution if we skip the SIM.

Our system named Wireless and SIM-Less communication is an innovative idea and has the potential to revolutionize the way we communicate with other people. By eliminating the need of having SIM cards, this communication system offers a number of advantages over traditional communication methods. In addition to these advantages, this system is also a great replacement to Traditional Walkie-Talkie system for short way communication.

Using this system, users will defiantly get an infinite talk time, with one-time nominal purchasing fees thus giving us an affordable and reliable communication and that's why this solution is well-positioned for today's scenario.

In this paper we will explore the various methods that are used to achieve the true form of wireless and SIM-less communication, and giving us a great innovative and potential applications of wireless and SIM-less communication.

II. Literature review

We all are using a revolutionized and updated Sir Graham bell invention known as simple call. Now a day this work such as first, when you initiate a call on your phone, your device sends a signal to the nearest cell tower indicating that you want to make a call, Next, the cell tower receives this signal and relays it to the mobile switching center (MSC) of your service provider, then it sends a signal to that tower instructing it to establish a connection with the recipient's phone. But still requires to be a prepaid or postpaid member to avail this service and benefit.

The famous radio communication way that is Willkie Talkie which facilitate communication by converting voice signals into modulated RF signals for transmission and then demodulating received RF signals back into audible voice signals.

A novel staggered multicast approach which provides a probabilistic guarantee for seamless communication [6] independent of the communication protocol used. We present experimental results of performance improvements achieved by our scheme, for data transfer using TCP over a wireless network in the presence of active handoffs. The conclusions however, are generic in that they apply to protocols other than TCP.

In [7] they have introduced tools and techniques that enable content and presentation adaptation to improve the access of workers to information/data. In particular, we have introduced the use of proxies that create the illusion of a seamless connection. Moreover, the adaptation is based on user, task, and context models. F

A new seamless communication concept is proposed in [9]. The goal is to be Always Best Connected (ABC) even if the conditions change. Initially, a network link has to be selected and a connection has to be established. The service used should be maintained as long as the conditions are fulfilled. First, a set of Generic Services (GSs), each related to a specific communication task, is defined.

In [10] survey, they presented an overview of the Mobile Cloud Computing (MCC) environment and investigated different techniques recently proposed in the literature to achieve seamless communication in the MCC environment, by taking into consideration recent technological advances in networking and MCC in general such as the deployment of 5G systems and availability of new techniques in artificial intelligence.

III. Problem Definition

Traditional SIM calling requires the user to be either a prepaid or postpaid member to enjoy its benefits. However, this method poses a risk to the user's location and security. Similarly, walkie-talkies are visible handsets that can make a person vulnerable to speculations in public when used. Our solution to this issue is the "Wireless and SIM-less communication using mobile" system. This system aims to fulfill the need for secure and SIM-less communication by enabling communication between mobile devices without the use of physical SIM cards. It takes into account technical, security, user experience, regulatory compliance, reliability, cost-effectiveness, and accessibility considerations for a better solution.

IV. Proposed Working

This system's first two modules - the JS and Android Java application, uses web socket and server socket programming to create a client-server architecture that establishes a connection between two devices over WiFi-LAN. To begin with, the users will be provided with a simple link hosted by a person who wants to use this service. After sharing their temporary room code, the users can connect with each other via a secure video call, similar to Zoom but in a LAN environment. The Android Java development has been used to implement this concept in an Android App. The app checks if it is in range of WiFi and properly connected to it. The user is then shown a QR code for self-communication. Another device in the same LAN can scan the code and press the "call device" button to connect with the user. However, for the connection to work properly, the user who receives the call must press the "accept call" button to accept the request. This module allows devices to communicate with each other as if they were making a normal call, but in a LAN environment.

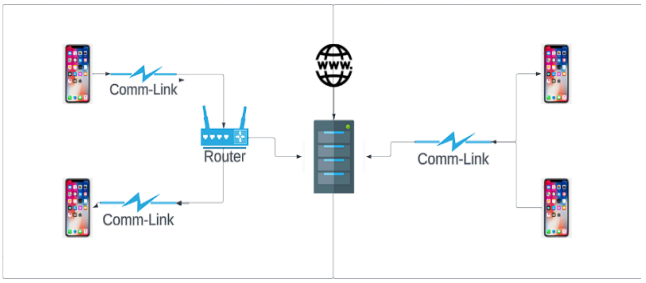


Fig 1. Module -1 Structure Diagram

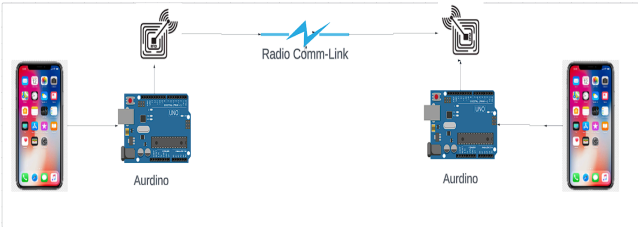


Fig 2. Module -2 Structure Diagram

The third module is an Arduino-based device that uses LoRa and CDMA to transmit and receive audio data. The audio data is then transmitted to a mobile device via Bluetooth. The client device initiates a connection to the server device, and the two devices then exchange data. The data is transmitted in the form of packets. The Arduino device uses LoRa to transmit the audio data to the receiving device. The receiving device then uses CDMA modulation technique for decode. The audio data is then transmitted to a mobile device via Bluetooth.

V. Implementation of Proposed System

We have made a functional system which is able to connect to a peer and can see its video and hear its audio here we have also add hang up part where u can disconnect the connection after successful verbal, video or both communication as you can see Fig 1, here the top left corner shows the secure Random room id and below it shows self-video captured by web cam in laptop/PC and by front camera by mobile And in right side we can see the other users video and can hear the audio simultaneously.

In the Mobile Application way after checking for connection between mobile to the WiFi it shows the QR code containing useful connection data which can be shared to any person by pressing Scan QR code and scanning the QR thus will give user the IP connectivity data then pressing connect to device will try to connect and will connect to the another device only if the accept call button is clicked, when connected we can record and send the audio to another device and hear their voice too.

In the Second module the mobile will first connected to the Arduino module with Bluetooth that is receiving the date from and mobile and sending it to the Arduino and getting the data packets to mobile, and the

Arduino connected to the LoRa is sending the data packets by radio through 433khz frequency band and that can range up to 10KM without interference but giving 1-2 km with some disturbance, the module is as per Fig.2.

Algorithm for Module-1

1. Start by initiating the server.js code using local server (Apache) used for connections between LAN.
2. Starting a tunnel using Ngrock to create a unique link so users can be also able to connect who are not in LAN
3. Then running launch.json function to initialize connection modules like peer.js and index.html
4. Opining of index.html file by directly opining the file by its location or using specific link to to first create a unique room.
5. After starting all the codes and modules it checks for integrity and establish a socket for connection
   Code:
   const socket = io({ debug: true });
6. Displaying of unique Room id shown to the creator of the room to be used to connect to the room
   Code:
   peer.on('open', (id) => {
   const myId = document.getElementById('myId');
   myId.innerText = `My ID: ${id}`;
   });
7. Lisining for another user using peer conection .
   Code:
   const peer = new Peer();
8. Compulsory accepting the permissions of Audio + Video to user and then to be able to transfer the data stream to user when connected
   Code:
   navigator.mediaDevices.getUserMedia({ video: true, audio: true })
   .then((stream) => {
   localVideo.srcObject = stream;
9. Then listening for incoming call request and accepting/answering the call using.
   Code:
   //Listen for incoming call
   peer.on("call", (call) => {
   call.answer(stream);
10. The another user will input the unique Room code join the room in promt while wanting to join the call Room when pressed “Call” button.
    Code:
    document.getElementById("callButton").addEvent Listener("click", () => {
    const remotePeerID = prompt("Enter ID of remote peer:");
11. Call can be ended by pressing hangup button witch disconnects the peer from the room Thus ending the connection.
    Code:
    call.close();
12. End of module with de initialization and stopping all the process.

Algorithm Module-2

1. Starting of App (CaliFi) initiating Activity_main.xml for graphic + MainActivity.java for main codec by android Os when clicked the app icon .
2. Execution start the background function like onStart() and onCreate().
3. Showing of System data and IP Using the Zxing library used for QR code generation.
   import com.google.zxing.
4. Scanning of another user’s users QR to get is Ip and connection Data.
   Code:
   scanButton.setOnClickListener(v -> startQRCodeScanner());
   private void startQRCodeScanner() {
   IntentIntegrator integrator = new IntentIntegrator(this);

   integrator.setDesiredBarcodeFormats(IntentIntegrator.*QR_CODE*);
   …
   }
5. Choice between initialization of call and acceptance of call by pressing “connect to device” button of “accept call” button, which starts “StartClientserver() ,startServer() ” respectively.
6. If pressed connect to device button then will start new Activity which uses java Socket programming to do the connection request to another device, which also requires a seprate thread to run and establish new sockets
   code:
   Socket socket = new Socket(IPA, SERVER_PORT);
   runOnUiThread(new Runnable() { …}
7. If chosen acceptance of call the system will start new activity 3 which initiates the server socket for connections
   Code:

ServerSocket serverSocket = new ServerSocket(*SERVER_PORT*);
Socket clientSocket = serverSocket.accept();

8. While in activity 3 initiating call when conneted to another user it records the audio and put it in the filestream

   Code :

   FileInputStream fileInputStream = new FileInputStream(audioFile);
   BufferedInputStream bufwferedInputStream = new BufferedInputStream(fileInputStream);

9. Same as in activity 3 it lisens the audio from in byte Stream and then we can hear the audio from the other device, and vice versa
10. After call on destroy () method is called and the app comes on default state
11. Removing the app from background will end all the functioning of app and end.

VI. Result

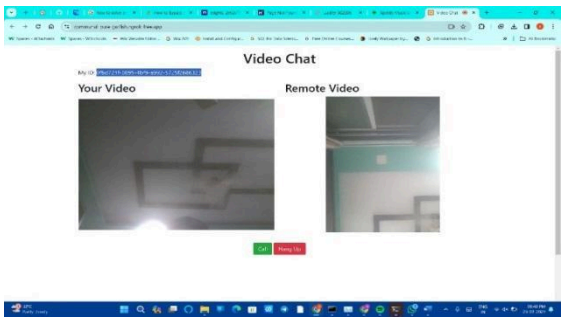


Fig 3. Video Chat Web

In Module 1 of our system, once two peers have successfully connected, you can immediately begin seeing and hearing the live audio and video of the other user. The delay is minimal, which ensures a seamless experience. Additionally, the user who initiates the room can easily access it without needing a link. They can use raw combined code to start the room, which allows both peers in the LAN and the World Wide Web to connect. This feature ensures that users can collaborate and communicate with each other without any barriers.

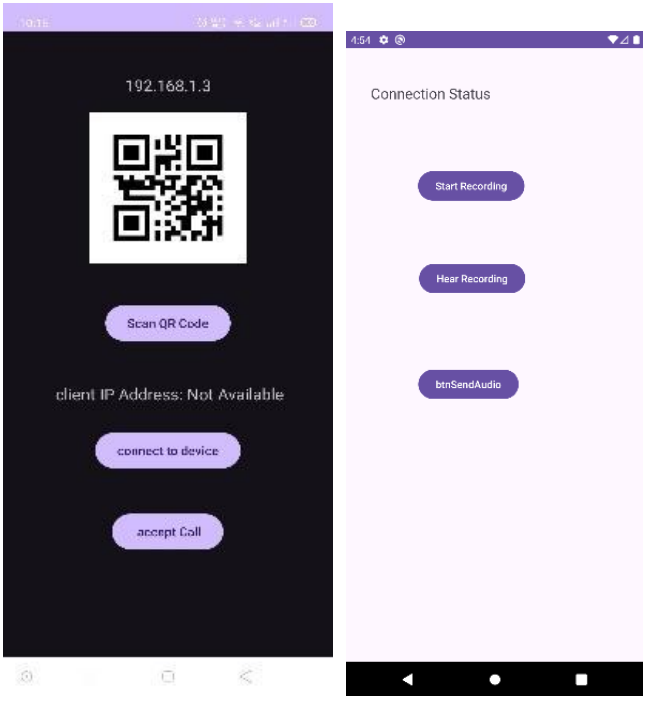


Fig 4. Connecting through QR code & IP Address

In Module 2, when you press the "Connect to Device" button, a connection request is sent to another device. The other device will then be prompted to accept the request by pressing the "Accept Call" button. The app uses Server Socket connection, which enables sending and hearing audio communication specifically within a LAN. This provides better security to the connection as it will not allow any other users from outside the LAN to access the communication.

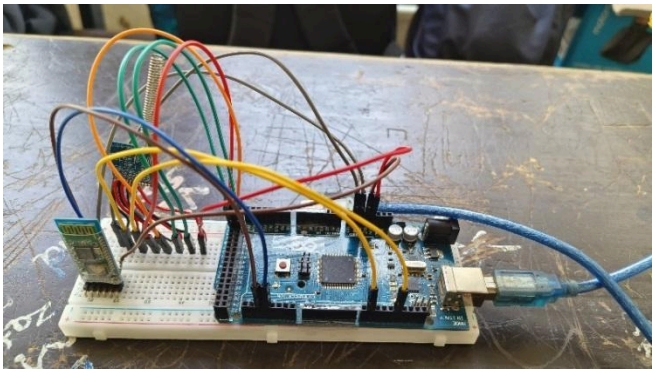
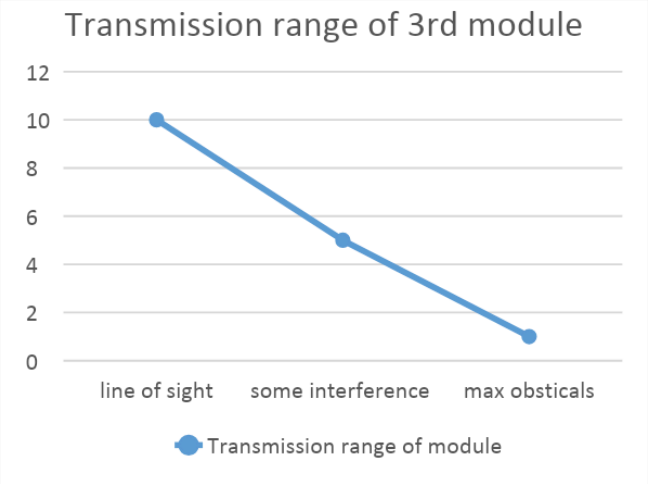


Fig 5: Arduino with LoRa (second module)

In the third module, we are utilizing radio communication by integrating it with mobile devices using Arduino, Lora, and HC-05 modules. This allows us to establish radio telecommunication similar to a walkie-talkie. However, we have incorporated this functionality into an Android

application, enabling us to make radio calls without anyone noticing that we are utilizing radio communication.



These statistics on the graph display the communication range in various scenarios. In a line of sight scenario, the transmission range is almost 10 km. However, the range decreases to 5-3 km depending on the concentration of natural or man-made objects. In urban areas, due to low power decapitation, it becomes even harder to obtain a range of 1 km.

VI. Conclusion

The proposed wireless and SIM-less communication system presents a promising solution for diverse applications requiring low-power, low-data rate communication in remote or challenging environments. Its affordability, extended range, reliability, and security render it invaluable across various sectors. Despite limitations such as restricted range, data rate, susceptibility to interference, and complexity, the system's advantages outweigh these constraints. Its capability to function in areas devoid of cellular or internet infrastructure is particularly advantageous for applications like remote monitoring, disaster response, and industrial automation. The system's robust security measures render it suitable for transmitting sensitive data, with encryption safeguarding against unauthorized access. Furthermore, its reliability is assured by employing established communication technologies and robust design principles, ensuring operation even in harsh conditions. With its minimal power consumption, the system is well-suited for battery-powered devices, benefiting applications such as environmental monitoring and wearable technology. In conclusion, the proposed wireless and SIM-less communication system emerges as a versatile solution, offering cost-effectiveness, extended reach, reliability, security, and adaptability across various sectors.

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