A
Dissertation On

Device to Device communication in Mobile Adhoc network using Authentication Module

Submitted in Partial Fulfilment of the Requirement
For the Award of Degree of

Master of Technology

In

Software Technology

By

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ACKNOWLEDGEMENT

I take this opportunity to express my deep sense of gratitude and respect towards my guide **Vinod Kumar, Associate Professor, Department of Computer Science & Engineering.**

I am very much indebted to him for his generosity, expertise and guidance I have received from his while working on this project. Without his support and timely guidance, the completion of the project would have seemed a far-fetched dream. In this respect I find myself lucky to have my guide. He has guided not only with the subject matter, but also taught the proper style and techniques of documentation and presentation.

Besides my guide, I would like to thank entire teaching and non-teaching staff in the Department of Computer Engineering, DTU for all their help during my tenure at DTU. Kudos to all my friends at DTU for thought provoking discussion and making stay very pleasant.

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ABSTRACT

These days Mobile Communication vigorously relies on mobile network. Proposed Solution will give a chance to convey without sim card/cell Network. In this document we have mentioned approach to Device to Device Communication (D2D) using RF without violating 3GPP Specification.

In emergency situation like Natural disasters (Earthquake, Flood) as we will be able to communicate without using network. Moreover, the usage of device to device communication can have offloading of some traffic on cellular network, which will make it more robust. Solution is also desirable in rural areas, hill areas, where we don't have good cellular network signal strength. Solution is not violating 3GPP specification. Out of all the communication techniques involving LTE-A, Device-to-Device (D2D) communication can efficiently and directly transfer data between mobile user equipment's (UEs) that are located in close proximity of each other. Thismode of communication can greatly help in improving energy efficiency, delay, throughput along with theefficiency of spectrum use.

D2D communication technique is a combination of ad-hoc and centralized communication mechanisms. So, it also enables researchers to merge together the achievements of long term development in previously separate fields of ad-hoc and centralized networking.

To provide a systematic and in-depth understanding of the technological possibilities in the fieldof D2D communication, we present this paper with comprehensive information of various D2D related research works which range from standard and technical papers to experimental prototypes and activities, along with a brief outline of some research problems which require further analysis.

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LIST OF SYMBOL, ABBREVIATIONS

Mobile Management Entity (MME)

Base Station (BS)

Long Term Evaluation (LTE)

Device-to-Device (D2D)

Home Location Register (HLR)

China Communications Standards Association (CCSA)

Telecommunications Technology Association (TTA)

Universal Terrestrial Radio Access (UTRA)

Time Division Duplex (TDD)

General Packet Radio Service (GPRS)

Universal Mobile Telecommunication System (UMTS)

Radio Frequency (RF)

Radio Interface Layer (RIL)

Short Message Service (SMS)

Authentication Layer (AL)

Session Management layer (SML)

Discovery Module (DM)

CHAPTER 1 INTRODUCTION

1.1 General Concepts

D2D communication is a communication method in which we can establish a direct connection between two mobile devices without the need of connecting to a Base Station (BS) of a network. This method of communication is advantageous in the way that it can occur on the cellular band of frequencies, i.e., unlicensed spectrum band which is completely non-transparent to the cellular networks.

Every communication between devices in a normal cellular network goes through the Base Station even if the devices are in close proximity of each other for D2D communication. The conventional cellular network architecture is suitable for the services which require low data rate such as voice calling and messaging at distances which are too large for direct communication. However, in cellular networks, the clients usually utilize administrations with high data transmission rate. Examples include video sharing, gaming, social networking in which the users could possibly be in close range for direct communication (D2D).

Thus, in the aforementioned scenarios we can greatly increase the network efficiency by employing Device to Device communication. Moreover, the enhancement of spectral efficiency is not the only application of Device to Device communication. Apart from increasing the spectral efficiency, this method of communicationhas potential applications in improving the throughput, energy efficiency, delay, and fairness. The interoperability between public networks whose safety is critical and ubiquitous commercial networkse.g. Long Term Evaluation (LTE) can be facilitated by this method of communication. By utilizing the enormous potential of D2D communication between mobile devices in proximity, we can improve utilization of spectrum, overall throughput, and energy efficiency, with the possibility of emergence of new P2P and geolocation-based applications and services. Long Term Evaluation (LTE) devices that have Device to Device communication enabled have the capability to become a reliable choice when cellular networks are not available or fail as a fallback public safety network.

1.2 Motivation

Device to Device Communication existing approaches include Method for enabling device to device communication controlled from cellular network elements (Enode B and Mobile Management Entity (MME)). It involves Cellular network controlling Device to Device communication.Mobile communication devices, for example, client gear (UE) utilizing 3GPP-LTE or LTE Advanced, may communicate straightforwardly with another UE through a framework called D2D communication. A D2D communication sessions' foundation may include having one of the UEs trigger the signalling methodology.

Regularly, when a UE associates with a system, it might send data about its Device to Device capacities to the eNB. This restriction information may be configured through other means, such as a user's subscription profile that may be contained in a Home Location Register (HLR) or some other network entity. Additionally, a network may be configured with network-specific Device to Device policies/restrictions.

These policies/restrictions may include limitations such as geographical restrictions, roaming restrictions, bandwidth policies .The current approach suggest changes on Network side elements and driven from Network side .The current approach highly depends upon enode B and MME. No dependency on enode B and MME (Network Elements).In current approach to have Device to Device Communication both devices should have cellular network.

1.3Related Work

Existing Approach

Method for enabling D2D communication controlled from cellular network elementsMobile Communication gadgets, for example, user equipment (UE) utilizing 3GPP-LTE or LTE Advanced, may communicate straightforwardly with another UE through a framework called Device-to-Device (D2D) correspondence. The foundation of a D2D communication session may include having one of the UEs trigger the signalling strategies. Normally, when a UE associates with a system, it might send data about its D2D capacities to the eNB. This limitation data might be arranged through different means, for example, a client's membership profile that might be contained in a Home Location Register (HLR) or some other system element. Moreover, a system might be arranged with organize particular D2D policies/restrictions. These policies/restrictions may incorporate constraints, for example, geological limitations, roaming restrictions, bandwidth policies, and so forth**.**

Prior art Solution is network driven and proposed Solution is Device driven.

Proposed solution: Earlier craftsmanship is for LTE mode only. Proposed arrangement is pertinent on all Radio Access Technologies.

Existing Approach recommend changes on Network side components and driven from Network side. Proposed arrangement is autonomous of Network and can be actualize from UE side as it were.

Existing Approach Highly relies on enode B and MME. No reliance on enode B and MME (Network Elements).Not presentation of new modules (likeRM and Communication and Authentication Module)

To have D2D Communication both devices should have cellular network, proposed solution will work even if there is no cellular network. Message Flow is totally different from proposed solution.

1.4 Problem Statements

In current world in case of no network area user will not be able to communicate with each other , in case network is done there is no way user can contact any person

Proposal is to enable communication in no network area , during emergency or in case of no network conditions by taking frequency from RF , by maintaining server to track the nearby frequencies.

1.5 Scope of this thesis

In this project, we tied to provide a method to enable communication between devices that are in no network area at the time of emergency.

The scope of this project is to provide communication between devices, in no network area, all commination mobile devices can be covered from this proposal

CHAPTER 2 LITERATURE REVIEW

2.1 Overview *of 3rd GENERATION PARTNERSHIP PROJECT (3GPP)*

The Third Generation Partnership Project (3GPP) is a cooperation agreement which was built in December 1998 to unite various broadcast communications models bodies, known as "Organizational Partners," that right now incorporate the Association of Radio Industries and Business (ARIB), China Communications Standards Association (CCSA), Telecommunications Technology Association (TTA), Telecommunication Technology Committee (TTC), European Telecommunications Standards Institute (ETSI) and the Alliance for Telecommunications Industry Solutions (ATIS). The foundation of 3GPP was laid down in December 1998 by the "The 3GPP Agreement".

3GPP gives comprehensively material benchmarks as Technical Reports and Technical Specifications for a 3G Mobile architecture in light of developed GSM centre systems and advancements in the field of radio access, e.g., Universal Terrestrial Radio Access (UTRA) for both Time Division Duplex (TDD) and Frequency Division Duplex (FDD) mode. 3GPP likewise gives rules for the Maintenance and advancement of the GSM communication (Global System for Mobiles) as Technical Reports and Specifications which includeinnovations in radio access, e.g., Enhanced Data rates for GSM Evolution (EDGE) and General Packet Radio Service (GPRS).Technical Specifications for current standards related to mobile telephony are generally available to the public from the 3GPP organization.

3GPP is at present concentrate the advancement of the 3G Mobile System and thinks about commitments (perspectives and proposition) coordinated toward the development of the 'UMTS (Universal Mobile Telecommunication System) Terrestrial Radio Access Network' (UTRAN) System. A variety of requirements at the high level werefound by 3GPP workshops which include: lesser cost/bit; betterment in provisioning of services, i.e., services available at reduces cost with good quality; some amount of flexibility in the use of new and existing frequency bands; a simple architecture with open interfaces; and low power usage. An analysis on the UTRA & UTRAN Long Term Evolution (UTRAN-LTE, also known as 3GPP-LTE, E-UTRA or

simply LTE) beganin December 2004 with the vision of developing a framework to make the evolution of the 3GPP radio-access technology towards low latency, radio access technology with packet optimization along with a high data rate easier. The examination considered changes to the physical layer of the radio-interface(uplink and downlink), for example, intends to help data transmission capability upto 20 MHz, presentation of fresh transmission data along with progressive multi antenna technology. 3GPP is additionally at present building up the LTE Advanced standard as a trans-formative headway of LTE to give considerably higher throughput.

2.2 Existing Approach

3GPP-LTE depends on a radio-interface fusing orthogonal recurrence division multiplex (OFDM) strategies. OFDM is an advanced multi-transporter balance arrange that uses a substantial number of firmly separated orthogonal sub-carriers to convey individual client data channels. Single-Carrier Frequency Division Multiple Access (SC-FDMA) can also be used as a part of uplink transmissions. Each sub-transporter is balanced with a customary balance conspire, for example, quadrature adequacy adjustment (QAM), at a (generally) low image rate when contrasted with the radio recurrence (RF) transmission rate.

Cell phones with the capacity to impart by means of cell advances, for example, LTE and LTE Advanced, have turned out to be exceptionally pervasive in numerous nations. These gadgets may incorporate PDAs, tablets, tablets, versatile hotspots, and so forth. Customarily, such gadgets convey to different gadgets through the centre system. For instance, information may go from a cell phone through an advanced Node B (eNB) before being directed to its inevitable goal. Be that as it may, there is an expanding want to have gadgets convey specifically to each other, without the utilization of an eNB.

2.2Existing Module

Telephony Application (Dialler/Contacts/Messaging):

Application Layer is the UI layer which initiate the flow application layer include applications like Dialler, Contact, Music player, Call. Application in which user interact directly comes under application layer For example: to search a contact Contact application is getting used. To make a call we used Call Application.

Application Layer interact with user as well as Call lower layer functionality i.e., interact with system and give system response to user for further action.

Telephony Framework:

This is the framework layer that interact with UI and RIL Layer. This framework maintain the state of call and keep updating the UI and RIL layer. In our design there will be will be 2 phone module inside Telephony Framework one that will start typically other that will be a piece of our answer and will be dynamic amid no network Device to Device Communication.

Radio Interface Layer (RIL):

The RIL is a scaffold between the equipment and the Android phone system administrations. At the end of the day, it's the stack which is the convention for Telephone. The Radio Interface Layer comprises of following parts:

1. RIL Daemon
2. Vendor RIL

Short Message Service (SMS):

SMS is a messaging service for text and it is an indispensablepart of most of the telephones, every mobile device and the World Wide Web.In order to allow mobile devices to transmit or send short texts, a standardized communication protocol is used. If text to voice conversion is required in case of landlines, an intermediate service can be used.By the end of 2010, SMS became an immensely popular data application with an estimated user base of about 3.5 billion users, which account for about 80% of all mobile users.

The origin of the Short Messaging Service can be traced back to the radio telegraphy used in radio memo pagers that were based on standard phone protocols. The Global System for Mobile Communications (GSM) standards include these protocols. Messages with length of up to 160 alpha-numeric characters can be sent to and from GSM mobiles using these protocols. Though most of the applications of the SMS serviceare limited to text messages, the service can also be expanded to other technologies, such as Digital AMPS and ANSI CDMA networks.

Chapter 3: PROPOSED WORK

3.1 Technical Overview

1- In proposed solution RF channel (Radio Frequency) will be used by UIM card and Smart Card (Virtual smart card) simultaneously in a Time-sharing and event sharing Method.

2- In Idle state, devices will listen to pages and perform mobility procedures, including cell reselection and periodic LAU/RAU (Location / Routing Area Update)on main sim card. When Subscription is in Active state, the other card (Virtual smart card) will be shut off and will not be able to communicate.

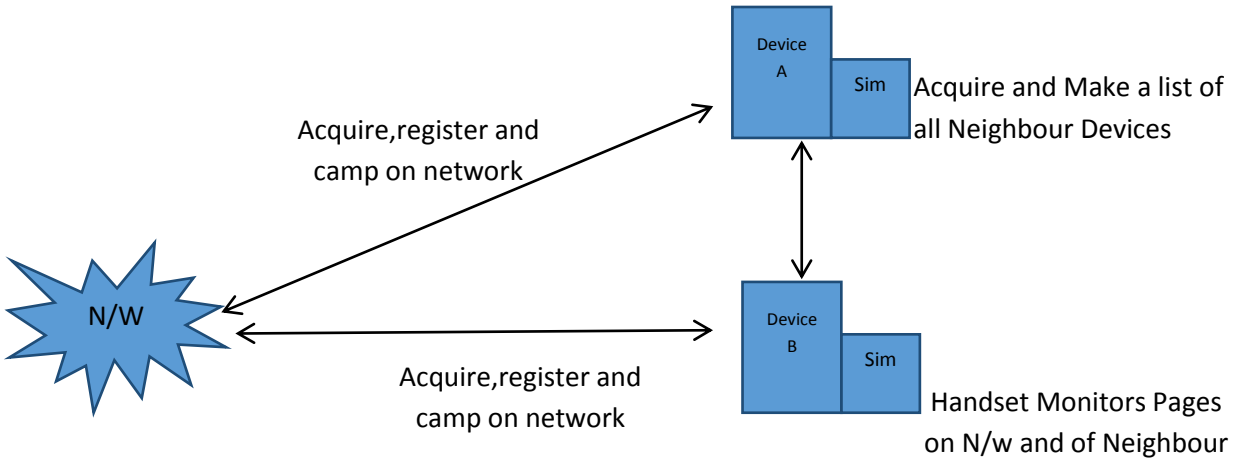
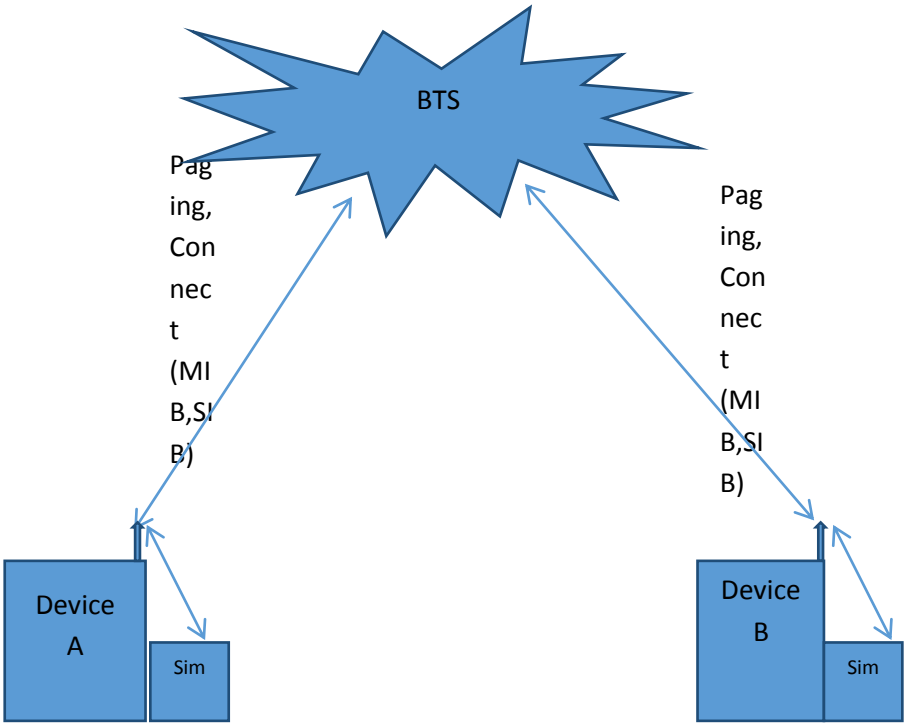


Fig- 3.1 Working Procedure

Normal Cellular Communication Flow



Proposed Communication Flow

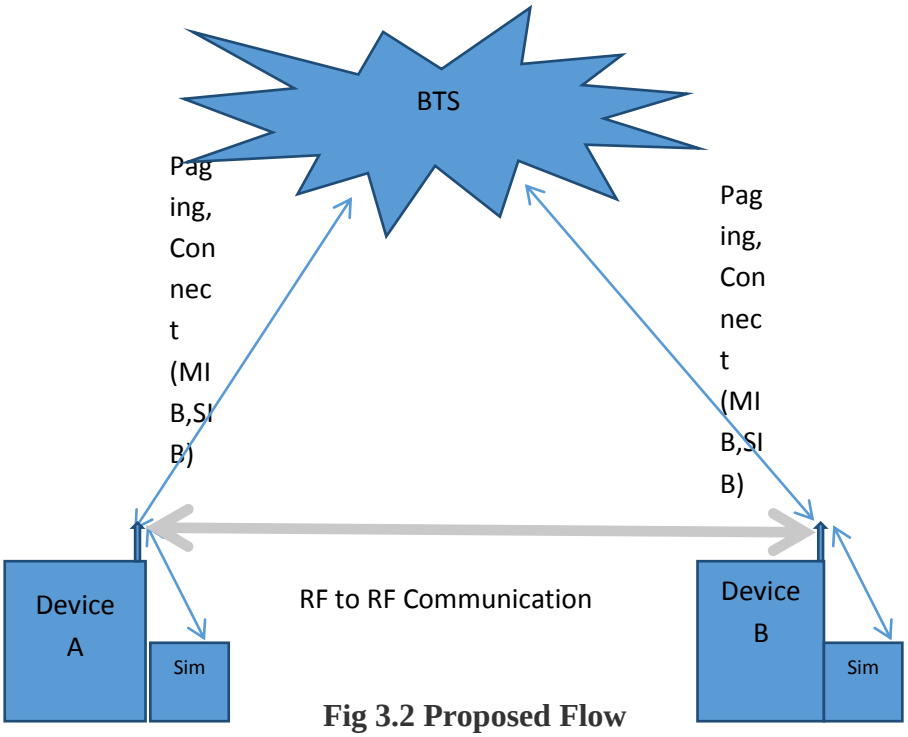


Fig 3.2 Proposed Flow

The LTE eNodeB always broadcasts theMaster Information Block (MIB), which is a verycrucial information,irrespective of the presence of any user. Among the system information blocks (SIBs), The MIB is the first blockto be broadcasted by the eNodeB.

Physical Broadcast Channel (PBCH) is the physical layer channel which transmits the MIB on downlink.

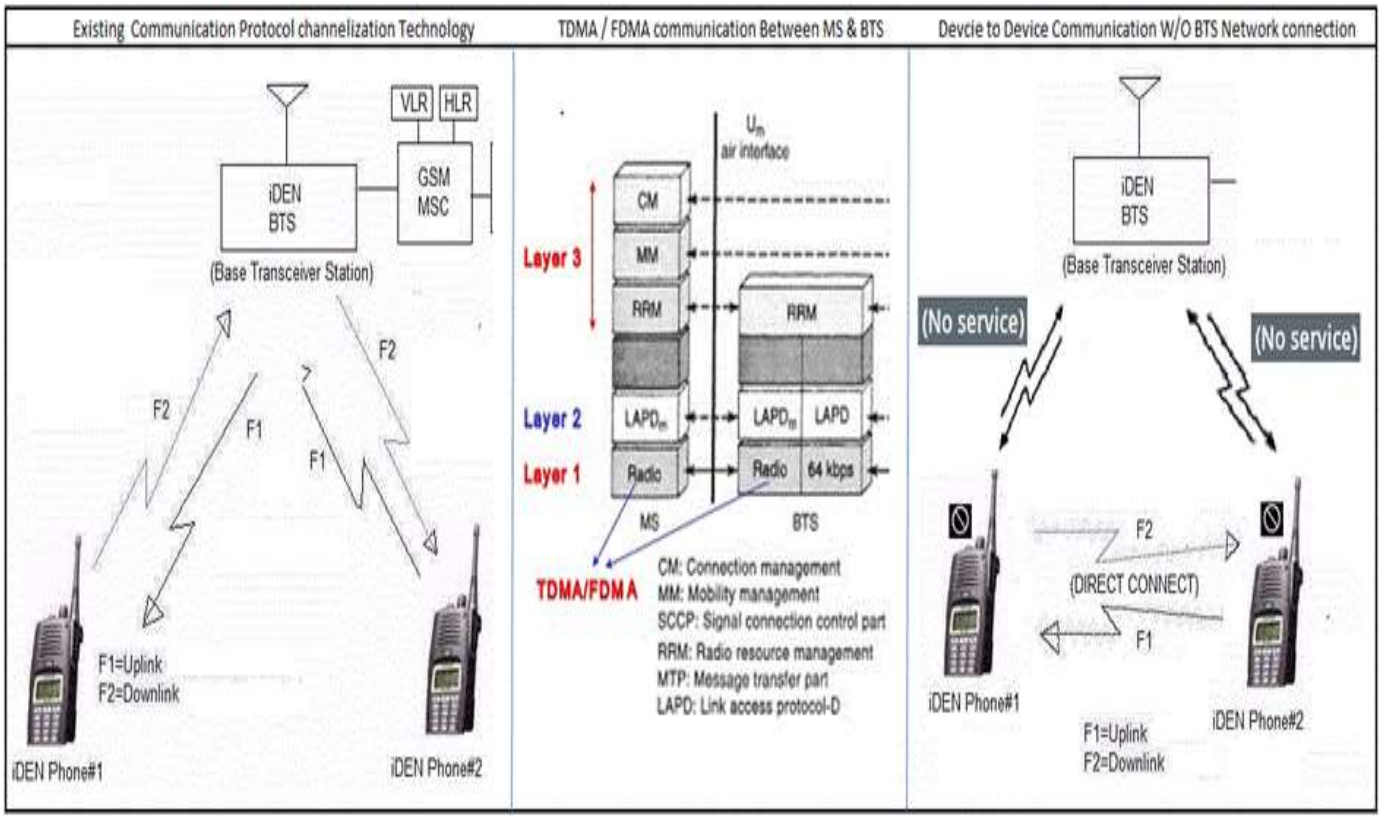


Fig 3.3 Proposed Solution

3.2 Module Architecture for Device to Device Communication

AP Modified structure

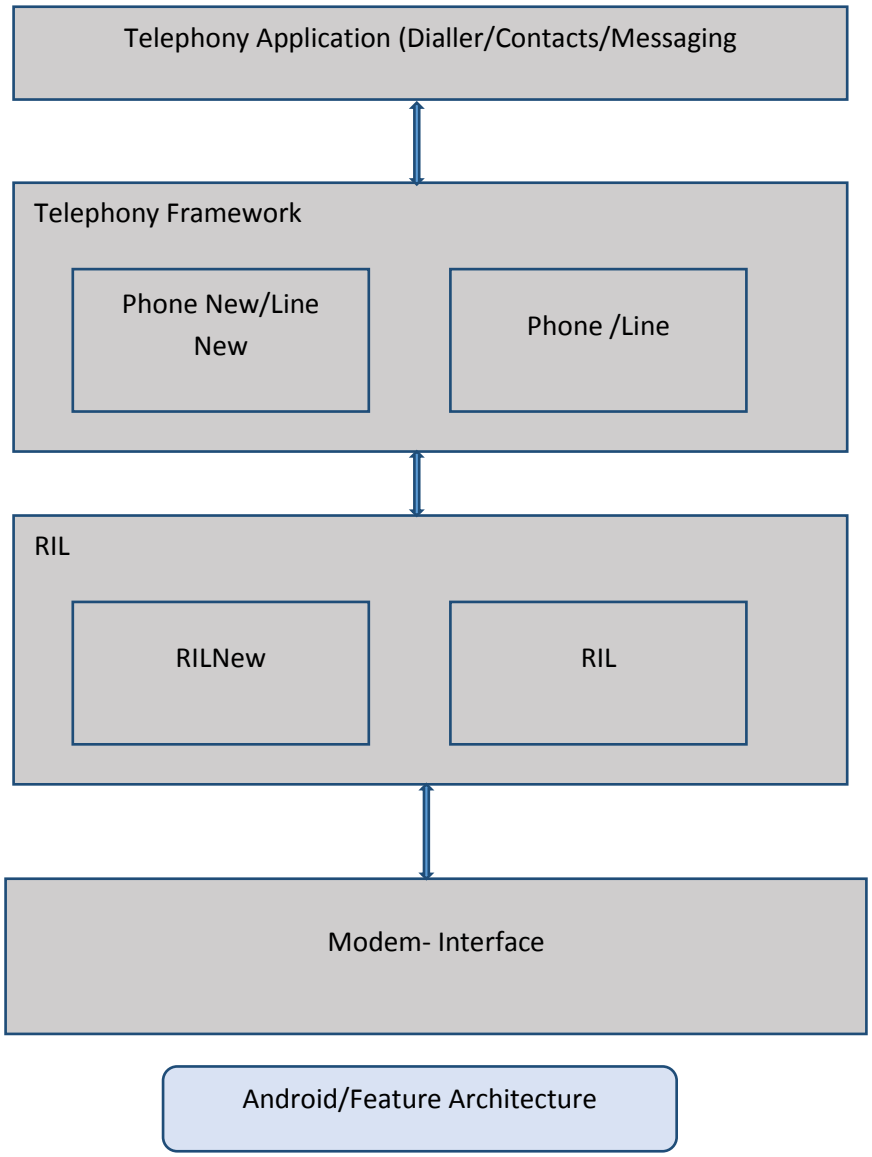


Fig 3.4 AP Architecture for Device to Device Communication

3.3 Module Details

RIL Daemon (RILD)

The RILD is to be introduced in the Android framework start up. Depending on which library must be used for Vendor RIL, it reads the framework property and provides the suitable requirement to merchant RIL and also calls RIL_Init function in Vendor RIL in order to delineate the functions to the higher layers. RIL_Init workis present in every Vendor RIL.

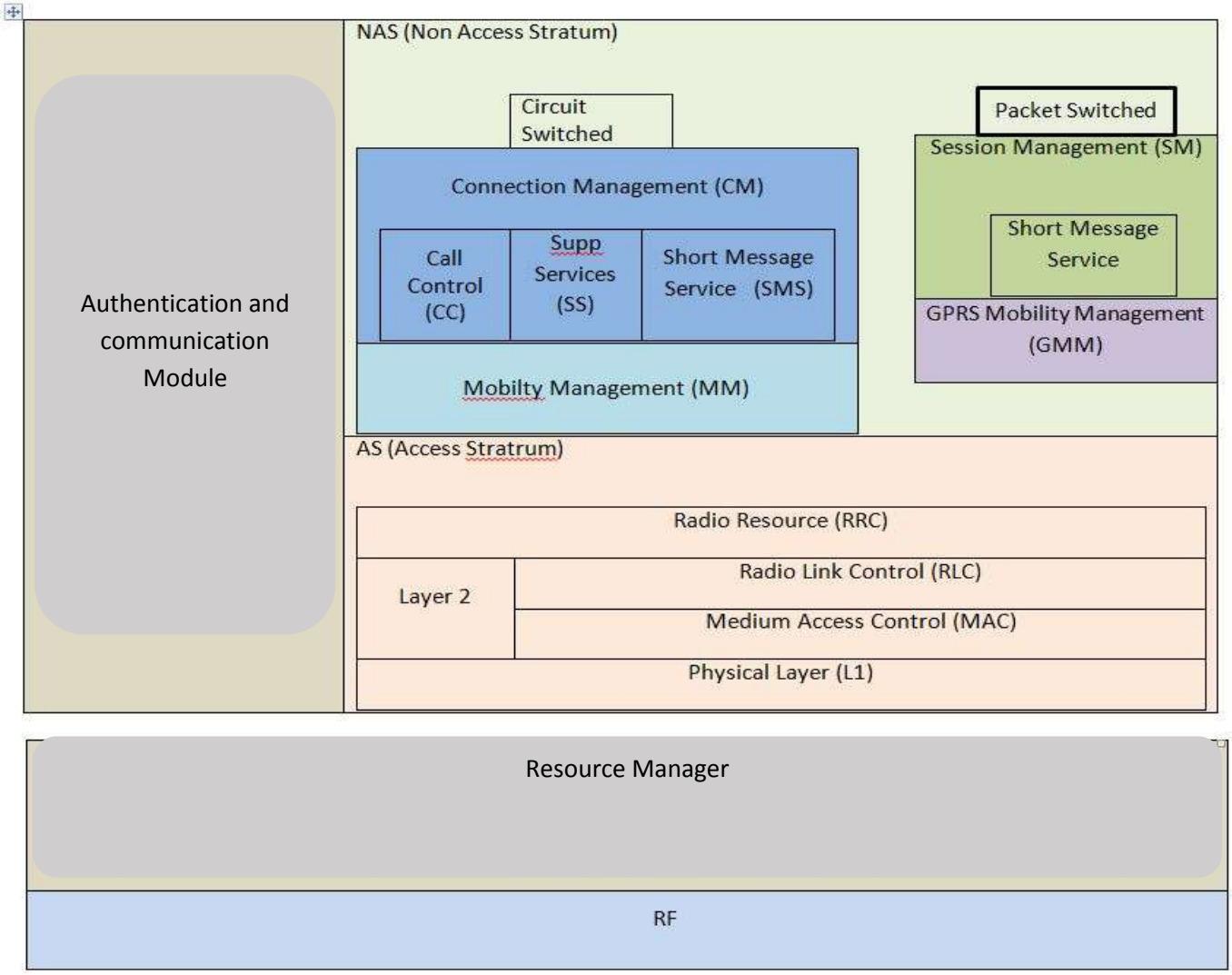
Vendor RIL

Every modem has a particular Vendor RIL. Thus, it can be looked upon as a driver required for the modem to function. The RIL daemon uses the gadget area andcalls the RIL_Init work, e.g., /dev/ttyS0. The modem will start by this process andthe handles of radio functionscontained in the RIL_RadioFunctions structure will be obtained.

Radio Interface Layer New (RILNew):

This is the new module that will be work amid device to device communication when no system is accessible, this module will take mind communication in no system conditions.

CP Modified structure



UMTS Protocol Architecture

Fig 3.5 UMTS Protocol Architecture

Connection Management:

The request for a new connection is made by a Connection Client Manager and this request, upon being received, is accepted by the Connection Server Manager.

Whenever a new connection for input/output is requested by a node, with no specification of the ID of the connection, any connection which is available on the required stream is given to therequesting node. In the case when connections are not available, and we have a client node, a separate and new connection is made. This connection is made only if we have not reached the maximum number of connections. Any connection which is available can be used by one node at an instance. Only when a node has finished using the connection,some other node can use it.

The node uses the host name and port which have been specified while requesting connections. If a particular configurable service has been specified, the values for the host name and port are obtained by the node from the predefined values in the configurable service. Additionally, these values can also be defined when we use a configurable service. The connection manager gets the remaining required values apart from the host name and the port from the default configurable service. In the case when the host name and port are used in another configurable service, thenthe values defined in that particular configurable service are considered for use.

Call Control:

A software within the telephone which defines the central function of a telephone is called a call control software. This software is responsible for the decoding of theinformation related to addressing and routing the calls from one end point to another end point. The standard switch operation can also be modified according to the needs of users by call control. These additional services are known as the supplementary services. A vertical service code is used to invoke these services. E.g., "Call Foreword on Busy", "Call Waiting" etc.

The central place in the operation of the telephone network is occupied by the call control software. This is justified by both complexity and reliability of the software. Thousands of person work for years for the development of Call control systems. Millions of lines of high level code is contained in the call control software. The reliability requirements have to be met by all

such call control software. A switch down time of only a few minutes in forty years is defined by theserequirements.

The major hurdle in the Voice over IP (VoIP) systems is the reliability and functionality of call control. This problem arises because such systems are based technology standards which have not been put to use in satisfying complex requirements, like in the case of call control systems.

One of three major categories of communications traffic in a VoIP network is call control,and the other two are media communications and call signalling.Q.931 is a connection protocol which is used by call control systems especially for VoIP systems (digital networks). The messages which are to be sent are transmitted as octets according to the ITU H.245, which defines in detail the different type of call media that can be put to use, e.g.,videoconferencing, VoIP, conventional call.It is also responsible for managing the connection once it is established. The Call control functions have a wide variety of uses which includeviewing the status of the endpoints involved in the connection along with thedetermination of master/slave status for endpoints, can also be used in modifying the parameters of a particular connection, ending a connection, and to restartthe connection if it has ended or failed.

Mobility Management:

One of the mostimportant function of a GSM or a UMTS network is Mobility Management. It is the function that allows a phone to work. The main task in mobility management is to keep track of the location of the users, providing call facility, messaging facility (SMS) and various other services to be delivered to the mobile phone users.

Like all cellular networks, a GSM or UMTS network is combination of individual cells which form a radio network. These cells are also known as base stations. Every small geographical area is covered by a base station and this area must also be uniquely identified. So by combining the coverage of these base stations, a cellular network gives coverage of network over a large area. A location area is also called arouting area and can consist of multiple base stations.

Whenever a mobile device moves from one location area to the next, a location update procedure allows the device to inform the cellular network of the change in area. This is done by detecting

the corresponding Location Area Codes (LAC). Whenever the current Location Access Code differs from the previous LAC, the device sends an update to the cellular network. This update isa request for location update, which contains information about the previous location along with the Temporary Mobile Subscriber Identity (TMSI).

The current LAC is stored in the SIM card by the mobile device. It is added to a list of recently used LACs which is maintained in the SIM. This process is necessary in order to avoid theIMSI attachment procedure which is not useful in caseswhere the mobile is switched off by force (removalof battery, for example) without providing the network any notificationof an IMSI detach and thenswitched on immediatelyjust after it wasswitched off. Since the mobile will still be associated with the Visitor Location Register (MSC/VLR)/Mobile Switching Center of the present location area in which it was switched off, there exists no need for any IMSI attachment procedure to be done by the mobile device.

A wide variety of reasons exist for the mobile to provide updated location information to the network. The cellular network usually requires the mobile device to do an IMSI attach or detach location update procedure whenever it is switched on or off. Each mobile device needs to report the location of the device repeatedly at a fixedtime period using a*periodic location update* procedure. Whenever a mobile device which is not on a call moves from one location area to the next location area, a *random location* update is needed. This procedure of random location update is also neededwhenever a stationary mobile reselects base station from a cell in a different location area owing to low signal. In this way, reliable cellular network is provided to the userswhich can be used to call, along with the freedom of mobility in the entire coverage area of the cellular network.

If a subscriber does not reply to page in which the attempt to deliver a call or SMS is made, the subscriber will then be marked not present in the MSC/VLR and the Home Location Register (HLR). The mobile not reachable flag MNRF also shows that the device is absent as this flag is set. Whenever the mobile performs an update in the location area, the Home Location Register is also updated and the MNRF flag which was previously set is reset.

Authentication and communication Module and Resource Manager- This is the recent module that is crucial in device to device communication between devices in close range. Thedetails and the usefulness of this module is clarified beneath.

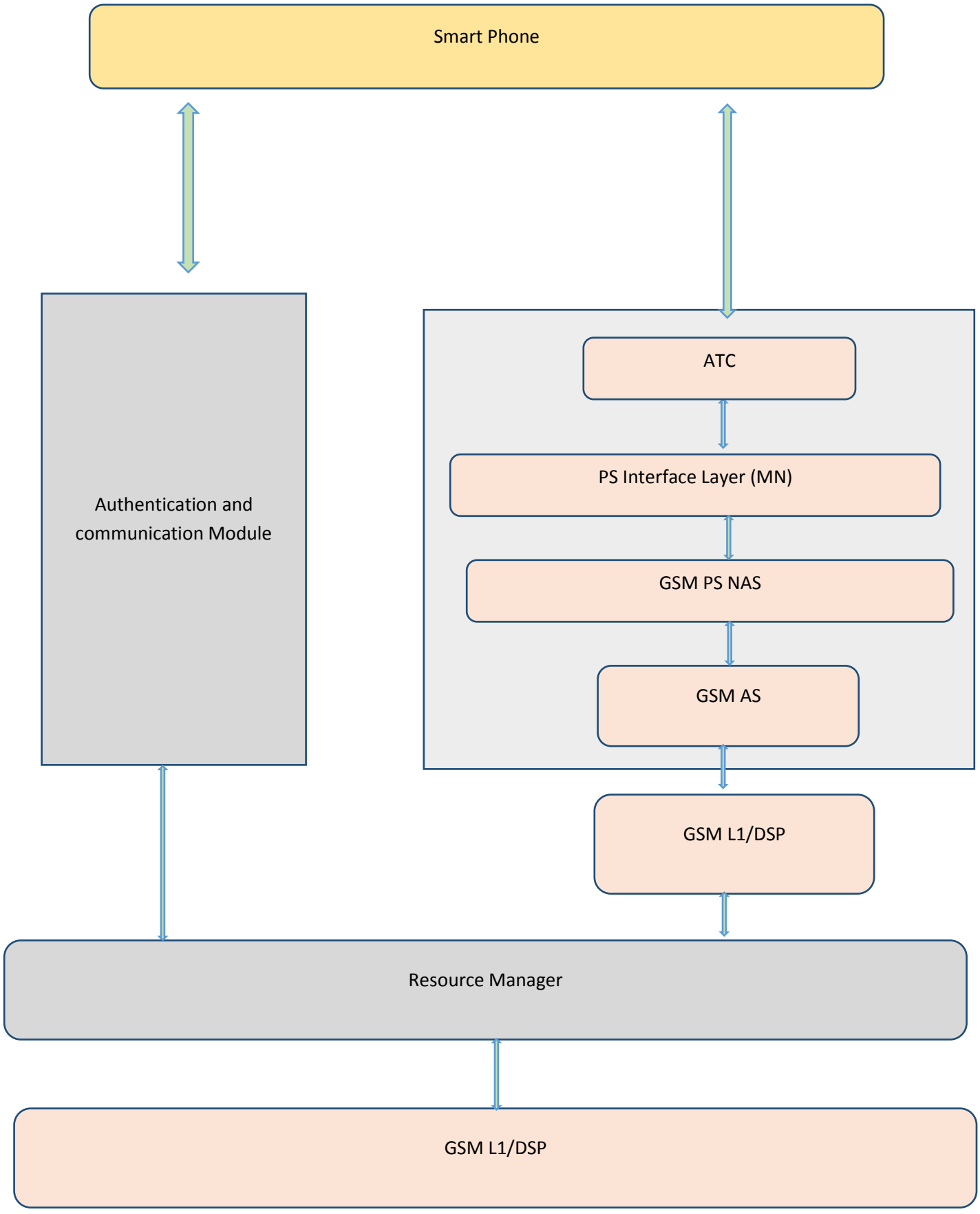


Fig 3.6 GSM Architecture

Authentication and Communication Module

Description

1. Empower Subscribers to have one more membership (S-Mobile membership) with single baseband/RF
2. Having call / Message using either subscription.

High-Level Feature

1. Mobile connectivity via Resource Manager Module
2. Subscriber can originate and receive pages/calls on either subscription
3. WCDMA/GSM/GPRS and CDMA (1x/DO) accessible on SIM
   (Including Inter-RAT); the versatile will be restricted to communicate inside some specific range.
4. When one membership is in information exchange the other membership can get voice incoming call

AP side:

In existing engineering, we have Telephony Application (Dialler/Contact/Messaging), RIL and Phone Module.

In purposed Solution we will have 2 more modules: RIL New, Phone New.

New S-RIL module and S-Phone will cooperate with new verification and communication module and will give client more administrations like communication through RF without utilizing cell Network.

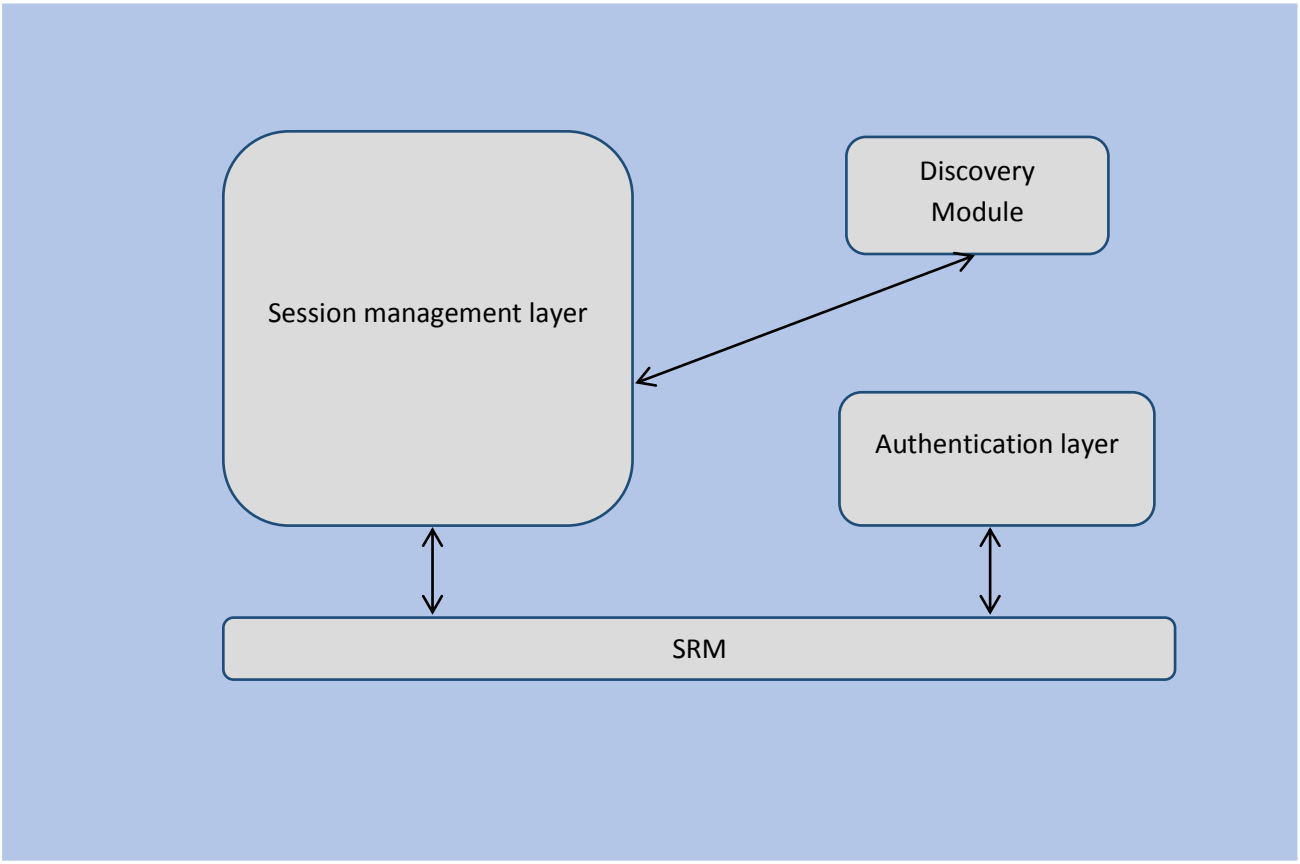


Fig 3.7 Authentication and communication Module

Authentication Layer (AL):

- Responsible for link setup and control between devices
- Used for security : authentication and encryption
- AL messages have higher priority than user data and acknowledgement for such messages is not provided (logical channel provides a link reliable enough)

Session Management layer (SML):

- Provides higher level protocol multiplexing
- Provides packet segmentation and reassembly
- Provides QoS (quality of service)

Discovery Module (DM):

In discovery Module, Following information will be stored.

- ➔ Discovery Module will fetch below information from the server based on location.
- ➔ Based on below information call/sms can be done in case of no service.

Device ID (DIi)	NearbyGPS Coordinate (Dxi, Dyi)	Potential Channel (PCi)	State(Connected/ Not Connected) (Si)	Final Allocated Channel (FCi)	Threashold Value (Thi)	Threshhold Limit (T/F) (TL)
DI1	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th1**	**TL**
DI2	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th2**	**TL**
DI3	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th3**	**TL**
DI4	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th4**	**TL**
DI5	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck**	**Th5**	**TL**

				|| El)		
DI6	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th6**	**TL**
DI7	**(xi, yi)**	**Ci,Cj,Ck, El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th7**	**TL**

Table 3.1 Discovery Module

3.5 Detail Explanation for Device to Device Communication:

Table for polling Channel Area wise range this table will keep on updating on the basic of machine learning

Area Wise coordinate (Axi,Ayi)	Channel (Ci)
(Ax1, Ay1)	C1,C2,C3,C4
(Ax2, Ay2)	C5,C6,C7,C8
(Ax3, Ay3)	C10,C11,C12,C13
(Ax4, Ay4)	C14,C15,C16,C17

Table 3.2 Area Polling Table

Table for Emergency Channel Area wise range 50km

Area Wise coordinate (Exi, Eyi)	Channel (Ei)
(Ex1, Ey1)	E1,E2,E3,E4
(Ex2, Ey2)	E5,E6,E7,E8
(Ex3, Ey3)	E10,E11,E12,E13
(Ex4, Ey4)	E14,E15,E16,E17

Table 3.3 Emergency Polling Table

Table 3- Complete Device for Device to Device communication this table will keep on updating on the basic of machine learning

Device ID (DIi)	Near Channel (FChEi)	GPS Coordinate (Dxi, Dyi)	Potential Channel (PCi)	State(Connected/ Not Connected) (Si)	Final Allocated Channel (FCi)	Threashold Value (Thi)	Threshhold Limit (T/F) (TL)
DI1	C1, C2, C4, C3, C5	(xi, yi)	Ci,Cj,Ck, El,	Si	FCi = (Ci||Cj || Ck || El)	Th1	TL
DI2	C6, C7, C4, C3, C5	(xi, yi)	Ci,Cj,Ck, El,	Si	FCi = (Ci||Cj || Ck || El)	Th2	TL
DI3	C1, C2, C4, C3, C8	(xi, yi)	Ci,Cj,Ck, El,	Si	FCi = (Ci||Cj || Ck || El)	Th3	TL
DI4	C11, C21, C4, C3, C5	(xi, yi)	Ci,Cj,Ck, El,	Si	FCi = (Ci||Cj || Ck || El)	Th4	TL
DI5	C1, C2, C4, C31, C5	(xi, yi)	Ci,Cj,Ck, El,	Si	FCi = (Ci||Cj || Ck || El)	Th5	TL
DI6	C1, C2, C4, C3,	(xi, yi)	Ci,Cj,Ck	Si	FCi = (Ci||Cj ||	Th6	TL

	C5		**, El,**		**Ck || El)**		
DI7	**C1, C2, C4, C3, C5**	**(xi, yi)**	**Ci,Cj,Ck , El,**	**Si**	**FCi = (Ci||Cj || Ck || El)**	**Th7**	**TL**

Table 3.4 Communication Main Table

Description of elements:

1. **Device id**: Every user registered on server will get his unique user id, user can add name and friends also.
2. **Nearby Channels**: After Booting up, UE already scan all nearby available frequencies. In our solution this information will be saved in discover module. Once connected to server this information will be updated on server along with GPS coordinates.
3. **GPS Coordinates**: UE will update GPS its present GPS Coordinate. In discovery module on UE side if it get changed Discovery module will update it on server.
4. **Potential Channels**: Potential channels are channels which UE can use in case of emergency. Will be fetched from table 1.1.
5. **State :**State of device will be maintained by checking if device is connected to server or not (By pinging to UE at regular interval of time)
6. **Final Allocated Channel**: Allocated Channel on which the device will communicate.
7. **Threshold Value** : Value at which device will signal strength become weak
8. **Threshold Limit**- Boolean value when threshold value will update

To Calculate Potential Channel PCi

1- **Calculate the available Pool (P)**

P = Select (Axi ,Ayi) from Table 1 where |Dxi –Axi||Dyi<=Ayi| > threshold range*- **eq1**

Threshold range- is the range which define channel in particular Area

2- **Generate structure Array of Available Pool**

Availble Pool (Pi)	Channel (PCi)	Threshold bit (Ti)(T/F)
P1	PC1	Ti
P2	PC2	Ti
P3	PC3	Ti
P4	PC4	Ti
P5	PC5	Ti
P6	PC6	Ti
P7	PC7	Ti

Table 3.5 Available Polling Table

i- Is the number of channel

3- **Generate structure Array of Emergency Channel**

Availble Pool (Ej)	Channel (ECi)	Threshold bit (Ti)(T/F)
E1	EC1	Ti
E2	EC2	Ti
E2	EC3	Ti
E4	EC4	Ti
E5	EC5	Ti
E6	EC6	Ti
E7	EC7	Ti

j- Is the number of emergency channel

Table 3.6 Available Polling Table

4- Calculate 3 Potential channels for particular device(PCi)

PCi=(Deviceid*Randno)%i

Final PCi for normal channel

PCi= Pi[PCi]– **eq2**

Sort Column PCi and Ti of Table Pi based on threshold bit in descending order

5- Calculate 3 Potential channels for particular device(PCi)

PCi=(Deviceid*Randno)%j

Final PCi for emergency channel

PCi= Ej[PCi]**– eq3**

Sort Column ECi and Ti of Table Ej based on threshold bit in descending order

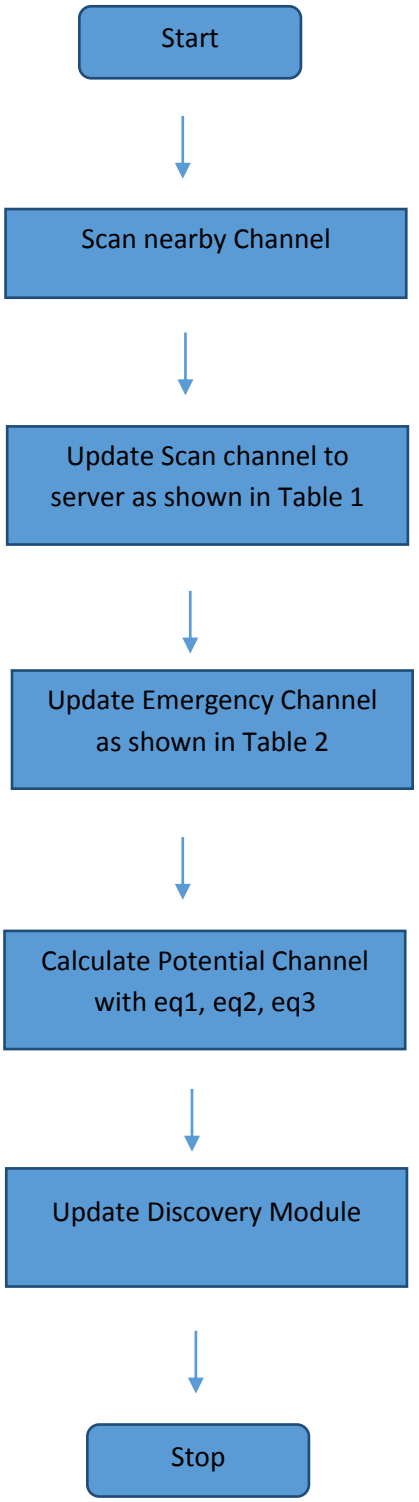
Algorithm for Allocation of Potential Channel

1- Start
2- On device boot complete device will scan all nearby channel and update to the server with area as shown in Table 1.
3- Emergency channel will also be maintained as shown in Table 2.
4- Potential channel will be calculated as shown by eq1, eq2, eq 3.
5- Update potential channel at column PotentialChannel in Table 3.
6- Update Discovery Module in Authentication and communication module with Potential Channel of self and neighbouring device with GPS location and threshold value.
7- Update Table 3 and Discovery module at certain interval with a change in GPS locationto get updated potential channel and nearby device.
8- Stop

Algorithm for Device to Device Communication

1- Start
2- Check for Device Network Availability
3- If Network available
    a. check for threshold limit
    b. if Threshold limit reach
        i. update potential channel with threshold bit
    c. Else
        i. update threshold bit to server and discovery module and track other devices whose status is “Not Connected”
4- Else
5- Get Potential channel from Discovery Module
6- Check connectivity of Potential channel from Discovery Module
7- Start Communicating
8- Stop

Block Diagram for Allocation of Potential Channel


Start
Scan nearby Channel
Update Scan channel to server as shown in Table 1
Update Emergency Channel as shown in Table 2
Calculate Potential Channel with eq1, eq2, eq3
Update Discovery Module
Stop

CHAPTER 4IMPLEMENTATION, RESULT, USECASE

4.1 Implementation

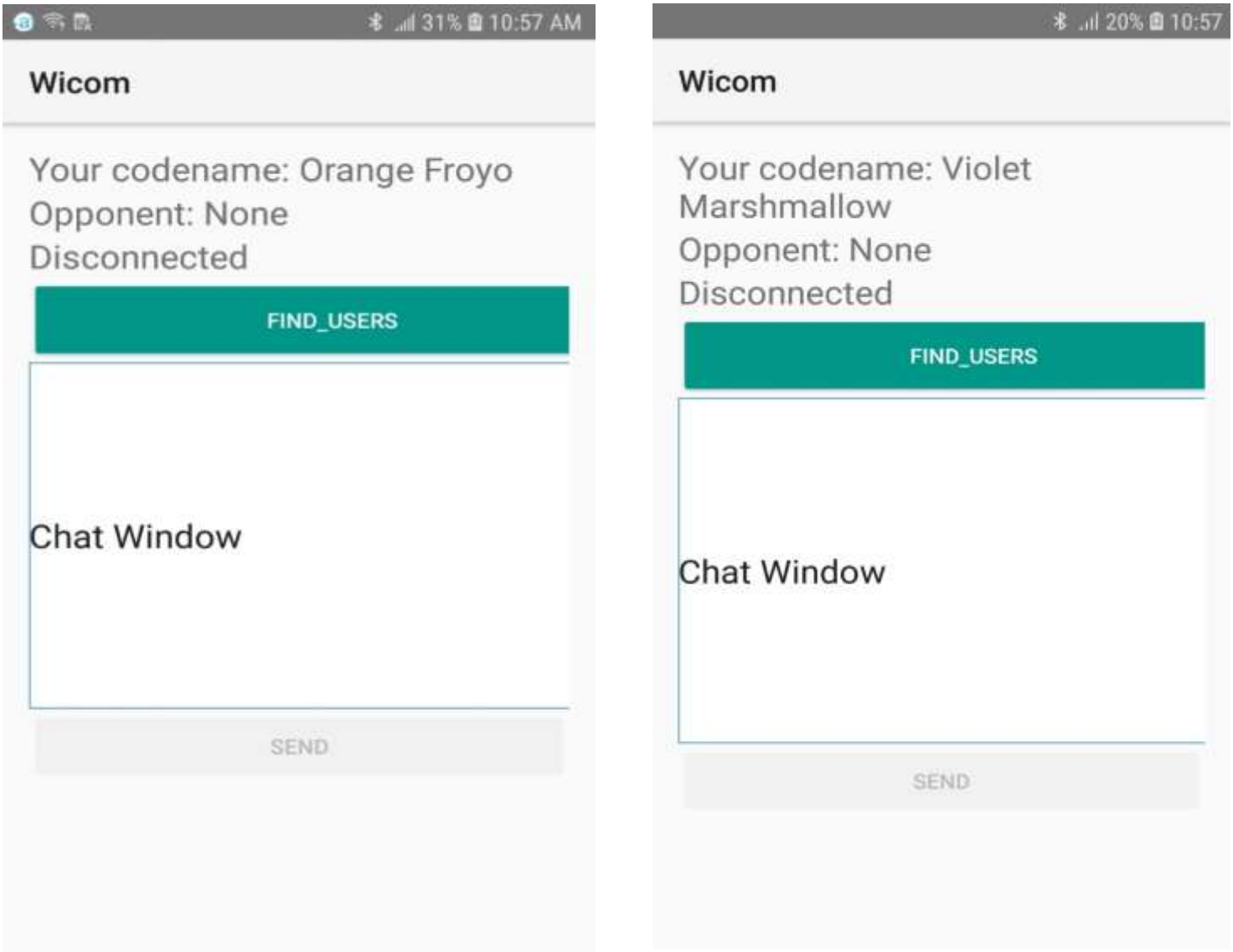


Fig 4.1 Sample Application

- DISCONNECTED STATE
- CODENAME DISPLAYED(USERNAME)
- NO OPPONENT IS CONNECTED(NONE)
- FIND_USERS BUTTON TO START ESTABLISHING CONNECTION
- SEND BUTTON IS DISABLED AS NO USER IS CONNECTED

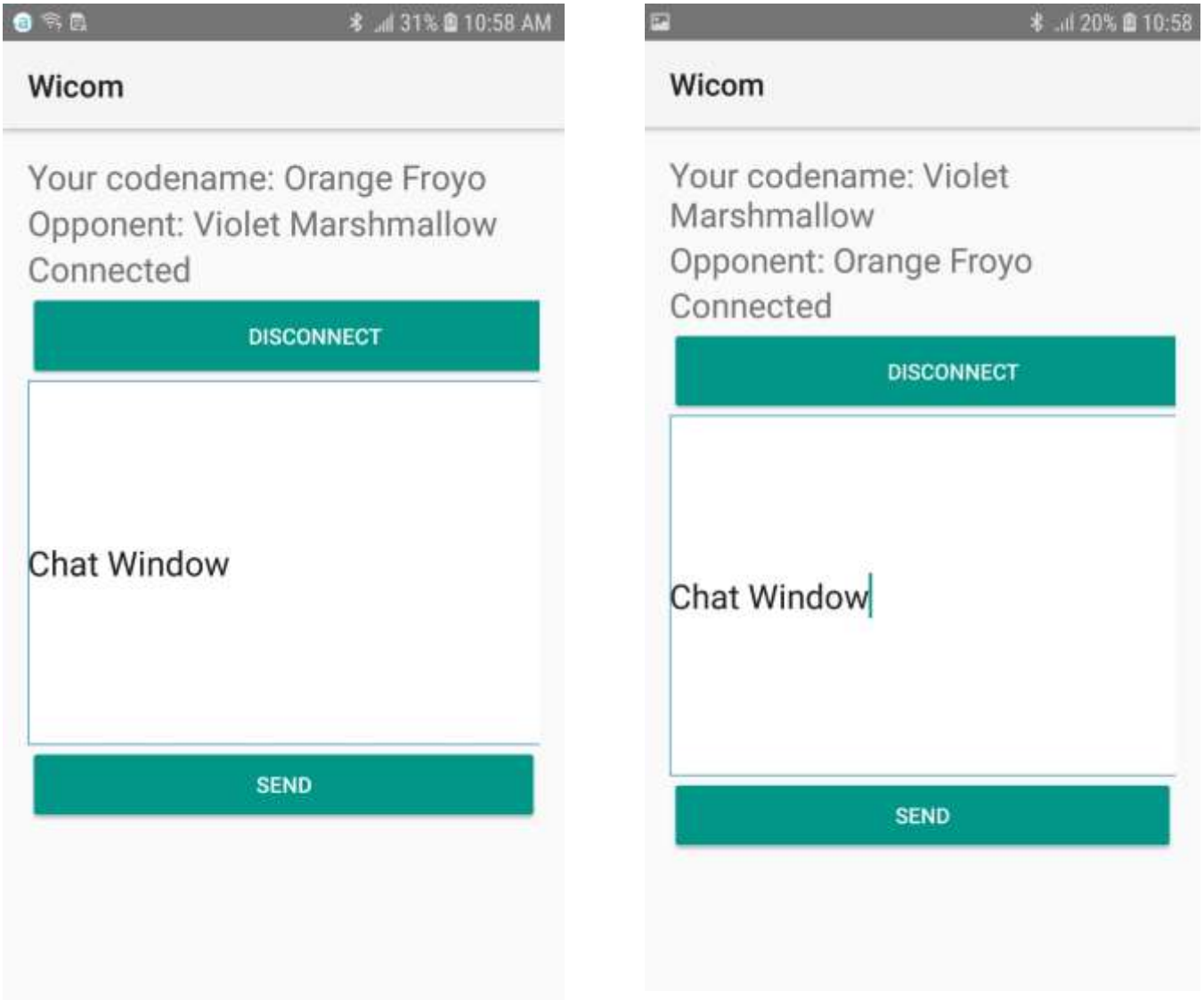


Fig 4.2 Sample Application Connected

- CONNECTED STATE
- CODENAME DISPLAYED(USERNAME)
- OPPONENT NAME DISPLAYED(DEVICE CONNECTED)
- DISCONNECT BUTTON TO STOP CONNECTION
- MESSAGE TO BE SENT CAN BE TYPED IN CHAT WINDOW
- SEND BUTTON IS ENABLED AND MESSAGE CAN BE SENT TO THE CONNECTED DEVICE

CURRENT STATUS

1. The initial connection phase takes some time
2. Connection can be successfully established between two devices
3. User authentication is not required to establish connection
4. Once connected, the message can be sent and the messages are received as a toast of duration 3.5 seconds
5. Tested between two devices Samsung S7 and Samsung J7

API USED

- NEARBY CONNECTIONS API

  Nearby Connections API enables peer-to-peer networking in mobile devices. It can be used in apps to facilitate easy discovery, connection, and transfer of data amongdevices that are in close range in real-time, irrespective of the network availability. The location of the API is com.google.android.gms.nearby.connection package.

- Strategy used in the API is p2p_cluster.

  P2P_CLUSTER is a strategy whichenables devices to establish an M-to-N, i.e., cluster-shaped network topology. This enables interconnection of clusters of devices which are within the radio range (~100m).Each device in the cluster can initiate outgoing connections to M devices and can also accept inbound connections from N other devices simultaneously.

PERMISSIONS REQUIRED

<!-- Required for Nearby Connections -->

<"android.permission.BLUETOOTH" />

<"android.permission.BLUETOOTH_ADMIN" />

<"android.permission.ACCESS_WIFI_STATE" />

<"android.permission.CHANGE_WIFI_STATE" />

<"android.permission.ACCESS_COARSE_LOCATION" />

ACTIVITY FLOWCHART

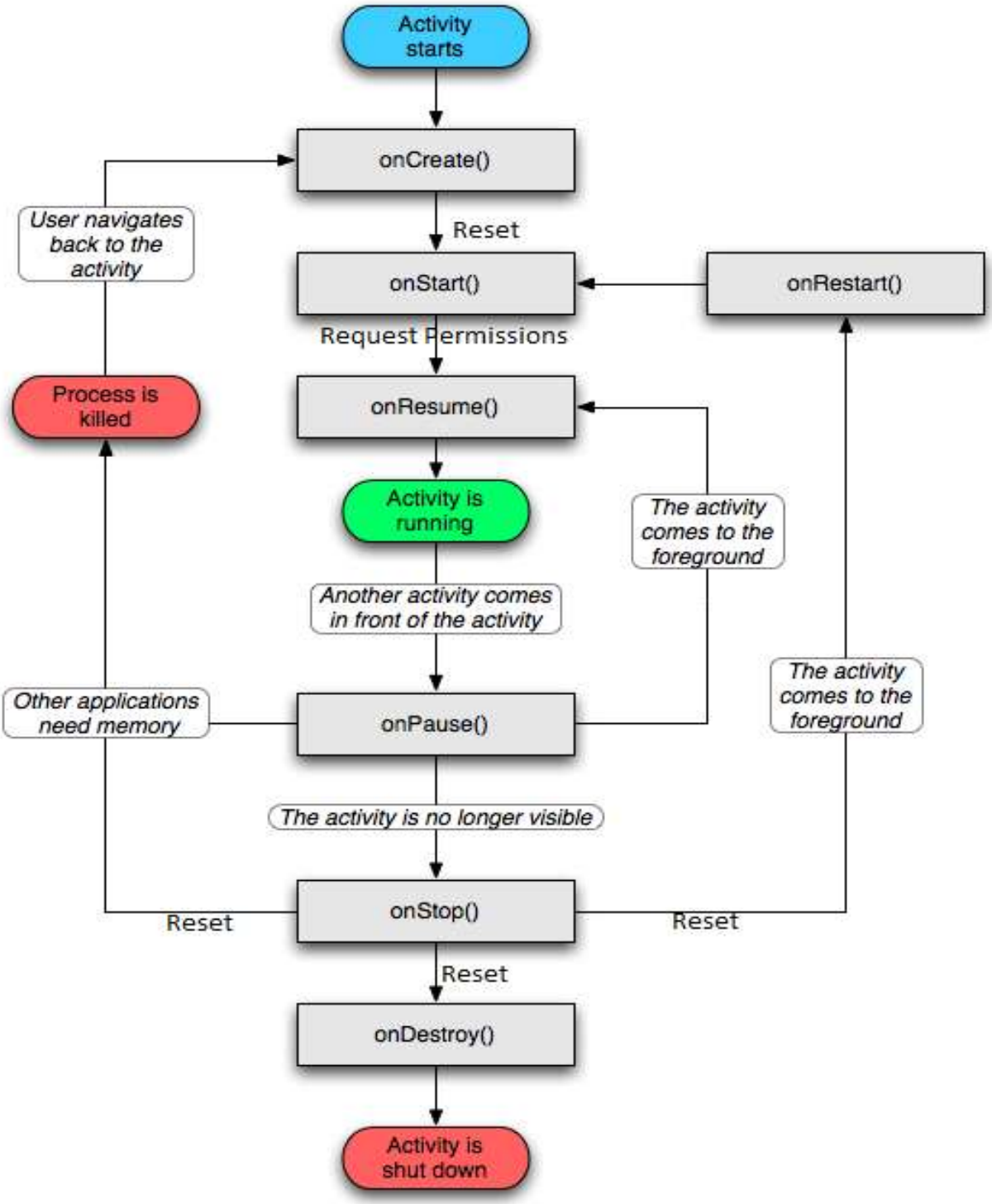


Fig 4.3 Code Flow Activity

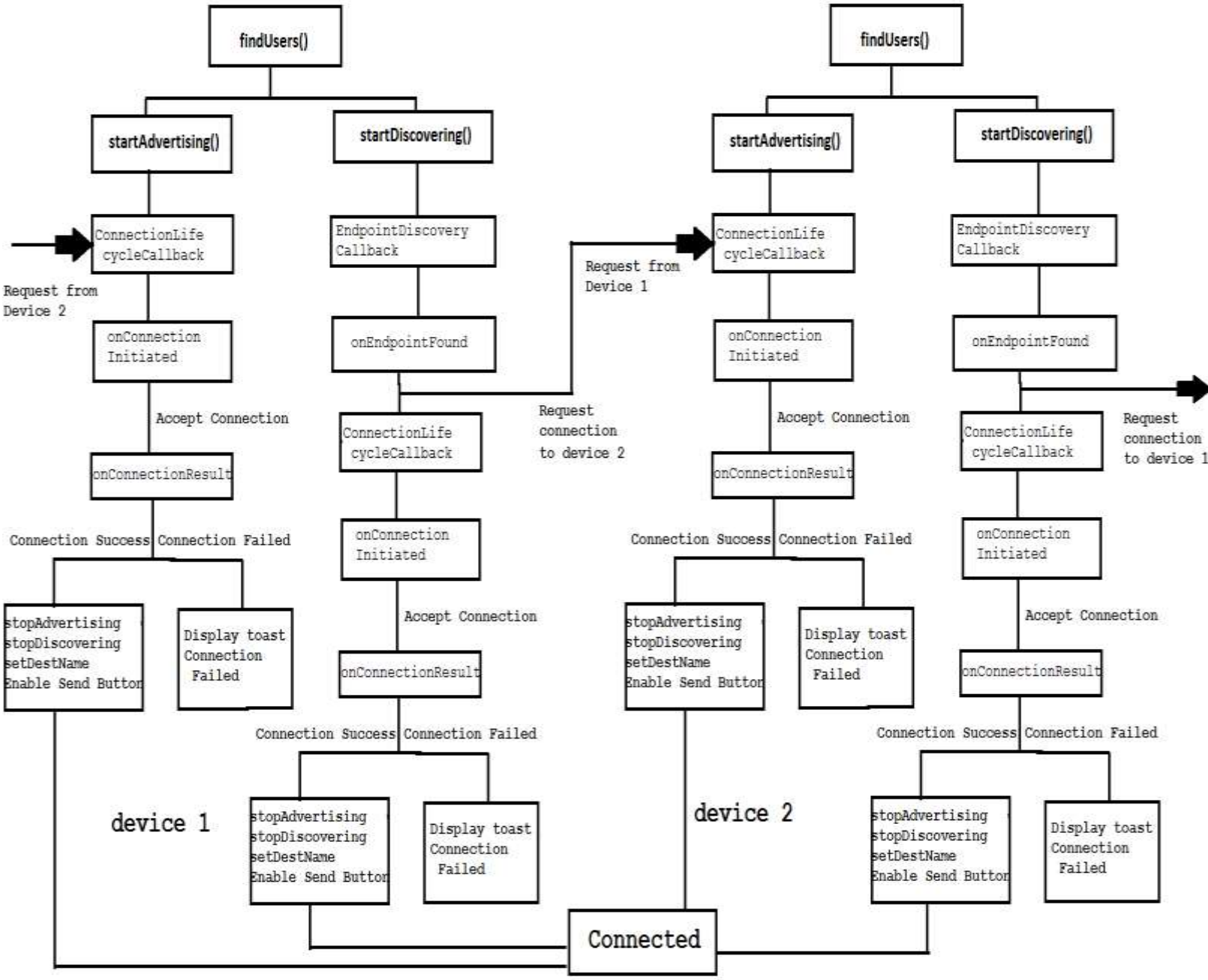


Fig 4.4 APP FLOW ACTIVITY

CHAPTER 5RESULTSCONCLUSION AND FUTURE WORK

5.1 Results

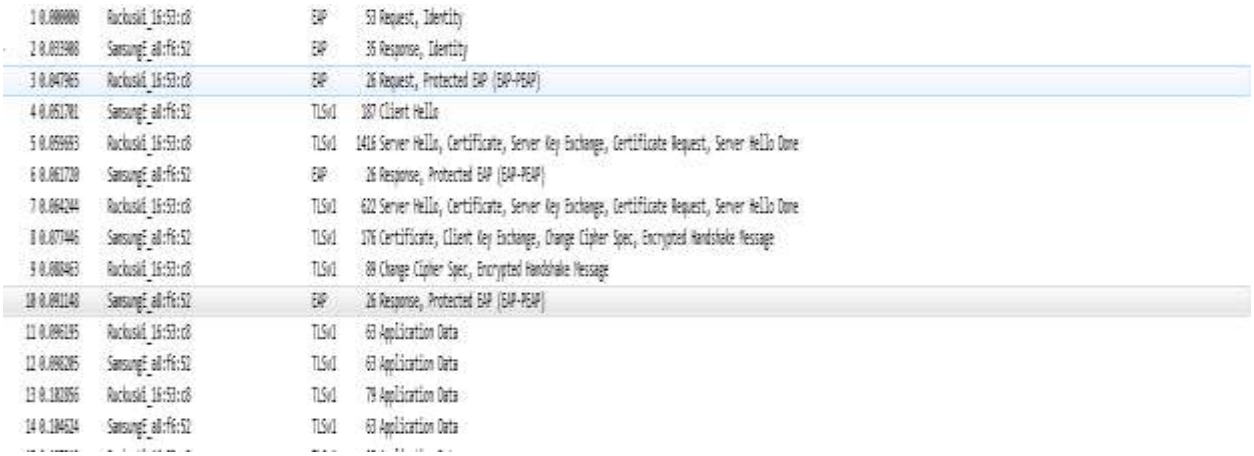


Fig 5.1 Results

Above is the result for the demo prototype

1- The Request is being made via Request, Protected

2- Request is received at other side and connection is established

3- Requester get the response from other side via, Response Protected

4- Successful connected

Application starts transferring data

5.2 Conclusion and Future Work

Conclusion

With the proposed Device to Device Communication we present the idea to communicate between devices even in not network cases, this will be helpful during the emergency situation and natural disaster,

In current scenarios in case of no network and emergency situation user has no option to communicate, even in urgent situation, by this method user has the method to communicate easily with proper authentication

Future Scope

Our proposed system provide method to communicate between two device in no network , this can further be extended to provide support at operator level in order to remove dependency on OEM and manage frequency level , and operator can take care .

1-Tracking other user with network condition while travelling:

Problem: When two or more person are travelling on same location there is no way to check the location of other user with network condition in order to have successful communication.

Solution: Our solution will tell user the location of other user in google maps that will include network condition as well, which will help user to communicate in deciding with and without network.

Fig 5.2 Tracking User A

- : No Network
- : Network is here.

2. Notifying other user in case of emergency while travelling:

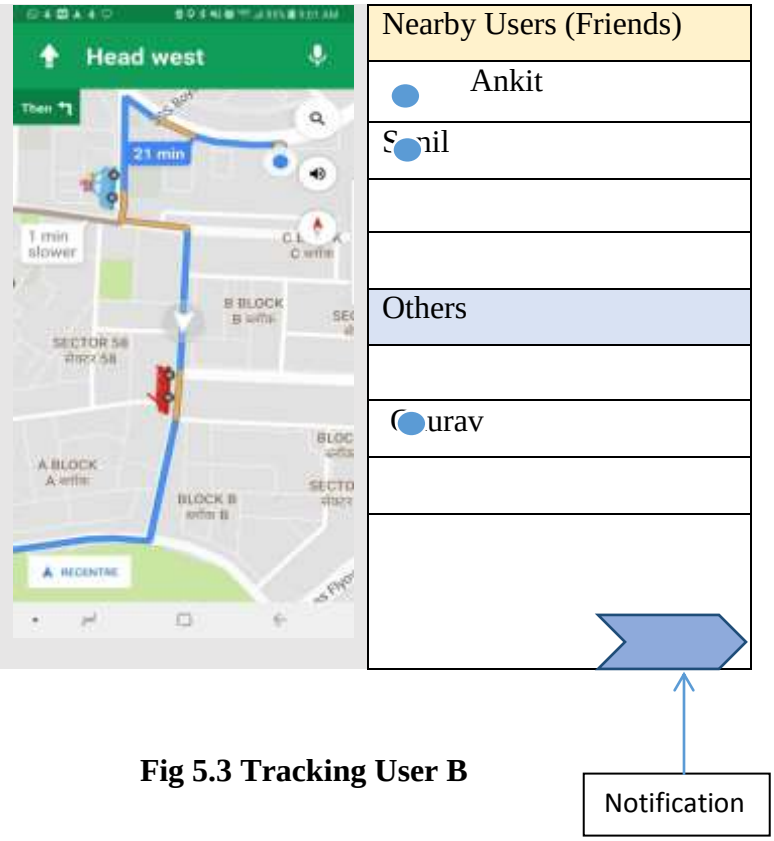


Fig 5.3 Tracking User B

Problem: In case of emergency when or network disaster when there is no network, there is no way to communicate and get in touch with the missing person

Solution: Our Solution Device to Device communication will provide user a method to communicate in no network case and during emergency.

3. Automatically detecting of networking RAT with change in location:

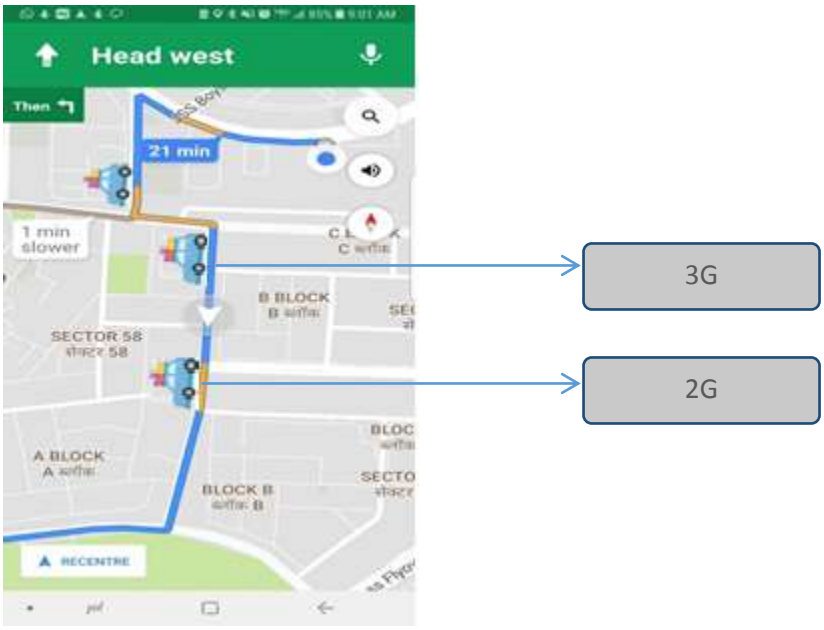


Fig 5.4 Tracking RAT

Problem: When user travelling from one place to other there are no of times device search for 2G,3G and spent lot of time I camping

Solution: Our solution will have predefined camping information that will save camping time.

4- Communication in Emergency Mode, Disaster, when no network available:

Problem: In case of emergency when or network disaster when there is no network, there is no way to communicate and get in touch with the missing person

Solution: Our Solution Device to Device communication will provide user a method to communicate in no network case and during emergency.

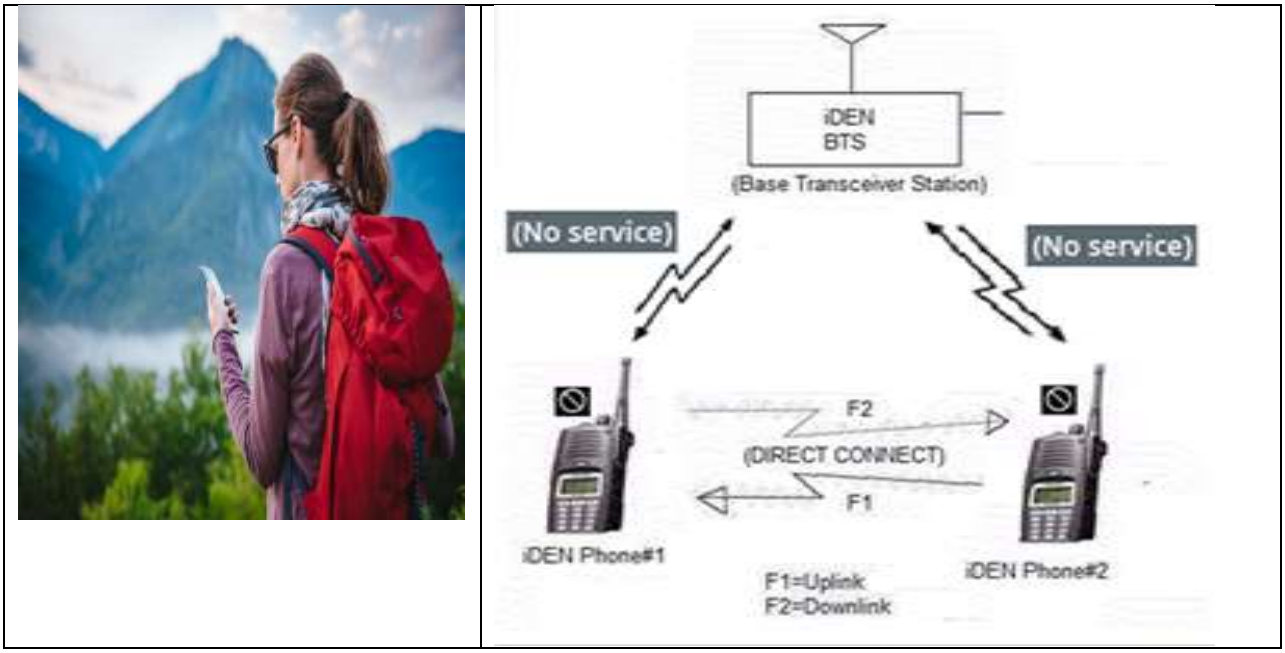


Fig 5.5 Communication in Emergency Mode

Connectivity during Travel based on available mode.

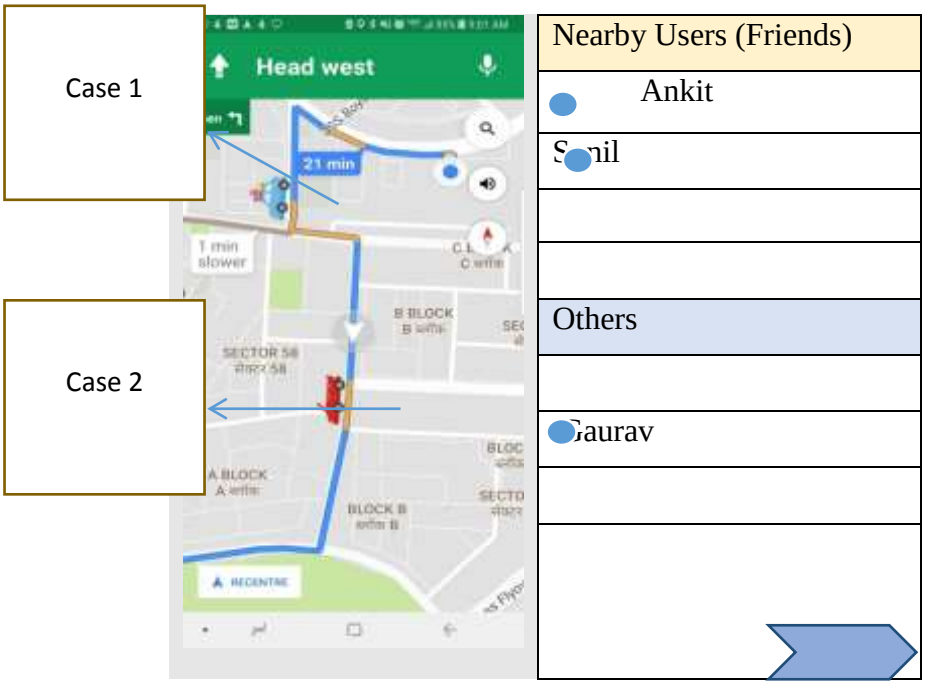


Fig 5.6 Communication in available Mode

Communication can be initiated from map based on available mode,

Case 1: Network is available

a) **Call**
b) **Message**
c) **Video call**
d) **Lost Phone**

Case 2: Network not available

a) **Emergency call**
b) **Device to Device call**

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