



EVOLUTION OF WIRELESS MOBILE RADIO COMMUNICATION NETWORKS

Anamika Mani Tripathi¹, Ayushi Pandey², Anoop Kumar Verma³, Anurag Kumar Singh⁴, Mr. Mahesh Kumar Singh⁵, Mr. Narendra K. Chaurasia⁶

1, 2, 3, 4(E&C Deptt., BIT, GIDA, Gorakhpur, India)

5, 6(Asst. Prof., E&C Deptt., BIT, GIDA, Gorakhpur, India)

ABSTRACT

This paper presents an overview of current technology trends in the wireless technology market, a historical overview of the evolving 1G-4G technologies. In this paper, an attempt has been made to provide review of evolution of mobile generations by comparing existing generations of mobile wireless technology in terms of their features, performance, technology, data rate, advantages and disadvantages. We will also discuss the evolution and development of all different generations of mobile wireless technology along with their significance and advantages of one over the other. In this paper, comparison of 4G will also be done with all other generations from 1G to 4G including their important characteristics, advantages and disadvantages. Then later in this paper, requirement of 4G technology, 4G networks and Network Architecture will be discussed and shown in Fig5. In the end all the features of 4G technology, its advantages over other generations and applications will be included. 4G/LTE, which is the fastest growing mobile technology of all time, are delivering, and continue to increase the fast delivery of services and content while mobile. Wireless services offer enhancements to current applications, including greater data speeds, increased capacity for voice and data and the advent of packet data networks versus today's switched networks.

Keywords—1G-AMPS, 2G-GSM, 3G-CDMA 2000, 4G-LTE, Swiching Services

INTRODUCTION

In this paper we are discuss the evolution of wireless mobile radio communication networks, which have experience a huge change in field of cellular service field which support deploy in the nature of technology like data speed, frequency, signal strength. In each generation have some standard technique which have ability to differentiate the feature of previous one. With the creation of microprocessor and digitization of control links between Mobile phones and cell in the 1970s. The first handheld mobile cellular phone was developed by Motorola in 1973. The first generation of cellular standards was developed around analog technology.

In different countries various standards are used-The first multinational circular system was developed in Nordic countries (1981s) like Denmark, Finland, Norway and Sweden are followed by 1G standard NMT (Nordic Mobile Telephone) after October 12, 1983 the regional bell operating company Ameritech started the first American commercial cellular service in Chicago based on AMPS (Advance Mobile Phone System). This standard was 1G used FDMA technology for transferring information. The first generation (1G) wireless mobile communication network was analog used for voice call only. The second generation (2G) is a digital technology

sends data in the form of packet .its support text messaging. After this was (3G) third generation provided multimedia access along with the higher data bit transmission and also increased capacity. The fourth generation (4G) integrates third generation with fixed internet to support wireless mobile internet, which in an evolution to overcome the limitations of 3G and also raises QOS, increases the bandwidth and reduces the cost of resources.

II.FIRST GENERATION (ADVANCE MOBILE PHONE SYSTEM)

Fig 1 shows the layout of the 1G AMPS Network. 1G is stand for the first generation in the field of the wireless mobile communication based on analogue signals which grow up in 1980 (Japan and U.S, European nations).

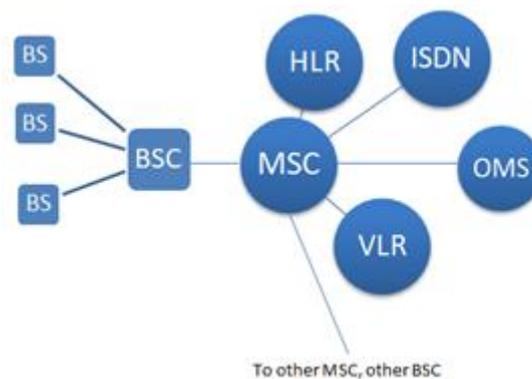


Fig1. Layout of the AMPS network

One of the very important things the cellular technology which differentiate the first generation (1G) from the previous technology. Its support the only voice signaling services based on the standard AMPS (Advance mobile phone system) and NMTSO4(Nordic Mobile Telephone System).the technology used by the AMPS is FDMA (Frequency Division Multiple Access) technique for the transferring message bit by using the analog frequency modulation. The technique FDMA is refers with the channel capacity 30KHZ and frequency band range lies between 823-893MHz and it is provided the speed of data rate is 2.4kbps with the bandwidth allocated by standard of first generation (AMPS) is 10MHz called expended spectrum.

Features: - 1) Based on analog system.

2) It supports data speed of up to 2.4kbps.

3) Cordless telephone.

Bandwidth: -15MHZ

Frequency: - 30KHZ

Technology:-FDMA, Analog cellular

Year: - 1981-1990

III.SECOND GENERATION (GLOBAL SYSTEM FOR MOBILE COMMUNICATION)

To overcome the limitation of 1G technology like the security of the data .first generation this is based on the analog signaling.2nd generation is providing huge change in the step of the evaluation of wireless mobile communication. All the processing of the second generation is based on the digital signaling introduced around 1980s.

Features: -



1. Enhanced spectrum efficiency.
2. Provides data rate of up to 64kbps.
3. Improved system capacity, and network area.
4. Roaming facility.
5. Voice and data services.
6. Enhanced security.

Bandwidth: -150KHZ

Frequency: -200KHZ

Technology: -Digital Cellular, TDMA, CDMA

Year: - 1991-2000

The second generation cellular phones were commercially proposed on the GSM standards in Finland. The bandwidth required for the second generation is 30-200kHz. All the data services provided the second generation (2G) is SMS (Short Message Services) and MMS (Multimedia Message Services), images and data text message are sent over 2G are digitally encrypted means only the intended receiver antenna can receive and read it here it is overcome the limitation of 1G. The technologies are used in second generation for digital modulation are TDMA (Time division multiple access) and CDMA (Code division multiple access). TDMA is refers the division of signals into time slot. Data is transfer in their allotted slot only and CDMA provides each user with the special code to communication over a multiple physical channels. GSM (Global system for mobile communication) and CDMA technologies are based on IS-95 system. GSM is combination of TDMA and FDMA.

TABLE NO.1

For The Architecture of 2G Map Interfacing

CONNECTION FOR NETWORK	BLOCK MAP	MAP
MSC	VLR MAP	B
MSC	HLR MAP	C
HLR	VLR MAP	D
MSC	MSC MAP	E
MSC	EIR MAP	F
VLR	VLR MAP	G
AUC	HLR MAP	H

IV.2.5G (SECOND AND HALF GENERATION)

2.5G which is stands for Second and half generation in the field of cellular wireless technology its lies between 2G and 3G technology. 2.5G upgraded must be compatible with 2G technology. HSCSD (High Speed Circuit Switched Data) are also upgraded path for the GSM in 2.5G technology. The services associated with 2.5G

technology is GPRS(General Packet Radio Service) which is used for transmitting encrypted data in GSM network in the form of packets wireless mobile phones technologylike EDGE(Enhanced Data rate for GSM Evolution)or EGPRS(Enhanced General Packet Radio Services) are provided the transmission speed of data rate with 144kbps. Ranging of the data rate provided by the 2.5Gtechnology lies from 56kbps to 115kbps. Its ability totransfer and receive PHOTO,VIDEO, SOUND,SMS,viaMMS on the multimedia messaging services and also provide the connection of internet for transferring multimedia content from the one phone to another one.2.5Gtechnology much improves and enhances the wireless mobile communication services.

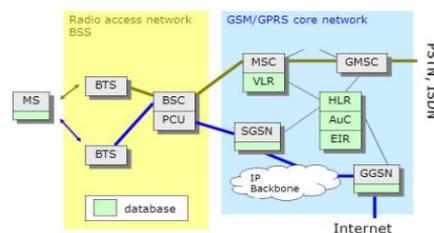


Fig2. GSM/GPRS network architecture

V. THIRD GENERATION (CODE DIVISION MULTIPLE ACCESS)

In the cellular network system third generation was introduced in year 2000.The international telecommunication union defined the 3G (Third Generation)of mobile communication standards.

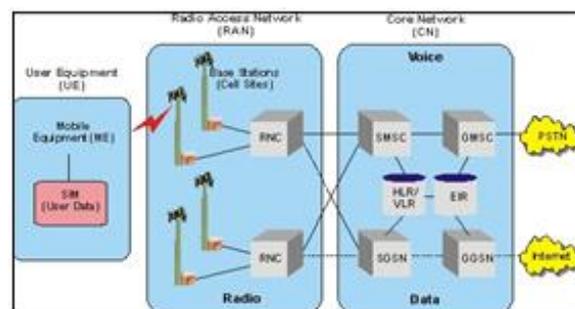


Fig3. Evolution of the 3G wireless Technology [4]

3G System provide the higher data transfer from 144kbps to 390kbps in wide coverage area and 2MBPS in LAN(Local Area Network).The applications which are finding third generation are wireless voice telephonecall, mobile internet access, fixed internet access, video call and mobile television.

Bandwidth:-15MHZ

Frequency: - 30MHZ

Technology: -Multicarrier CDMA (MC-CDMA)

Year:- 2001-2010

3G CDMA2000 providesseamless and evolutionary upgrade path for second generation and second and half generation code division technology. Third generation technology support the multiple users can access. The channel CDMA2000 are center on the original 1.25MHZradio channel and support the data rate speed up to



307kbps in packet domain. The most significant feature of third generation that its provided greater numbers of voice and data users and higher data rate at lower incremental cost than 2G (Second Generation).

VI.FOURTH GENERATION (LONG TERM EVOLUTION)

4G technology is introduce in the field of wireless mobile communication is 2000s. In the simplest form 4G consist of an evolution beyond the third generation (3G) cellular communication system now at or near deployment worldwide. 4G wireless mobile communication is the IP based network system. The main purpose of the 4G technology are enhance the feature of the previous technology like provide,high quality, high speed, high capacity, security and low cost service for voice and data service and fulfill the requirement of the user. Standards used for the fourth generation is LTE (Long Term Evolution).

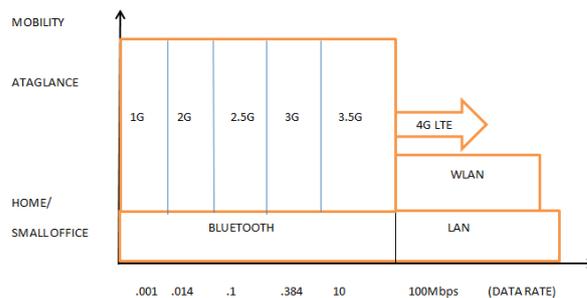


Fig4.Classification among mobility Vs. Data ratenetworks [2]

It has to be capability 100mbps and 1Gbps of Data rate. To use of the LTE network, multimode user terminals should be able to select the target wireless mobile system.

The key factor of fourth generation technology is terminal mobility and it provides the wireless servicing anywhere, anytime, which is shown in Fig4. The key factor the LTE system is implies automatic roaming between different wirelessnetworking.

The fourth generation technology also integrates the future wireless mobile phone technology(e.g OFDM, LAS-CDMA and MC-CDMA,network-LMDS) to give freedom of motion and uninterrupted roaming form one phone technology to another technology.Technologies which are considered are as 4G generation techonology are LTE(Long term evolution) and WiMAX(Wireless interoperability For Microwave Access).The first successful field trial for the 4G was conducted in Japan in 2005.



Fig5.Architecture of 4G network [4]



Bandwidth:-150MHZ

Frequency: -300 MHZ

Technology: -OFDMA, MIMO

Year:-2011-2020

VII.SWITCHING SERVICES

Switching techniques and switching services of all generation are varied by changing of technology and development of different standards by the ITU. These changes are shown in terms of 1G TO 4G by demanding the different user's requirement like high quality video and audio with multimedia services. In 1G circuit switching techniques used for voice services only. Due to lower bandwidth we got the poor quality voice services in wireless mobile communication therefore in 2G we increase the data rate for digitalization. After the digitalization we employed the circuit switching services with Packet Switching Services. Packet switching services are utilized for digital voice, short messaging and acquired the huge data for the communication among the different user one at a time when we move 2G to 3G-4G we introduce huge bandwidth which gives a high data speed 2MBPS in this scenario switching techniques are reward from Packet Switching to Data Gram Packet Switching.

VIII.CONCLUSION

Wireless mobile radio communication network developing very quickly in term of capacity and capability of mobile networks. In the last few decades we have experienced a very remarkable growth in cellular industry. During the survey of the these technology create a new infrastructure of the cellular network are provide a new localization, personalization, etc. While technologies are continue to establish themselves in all field, research is also already moving toward the next generation of communication services. The next generation mobile phones are expected to introduce a wide variety of cellular system, from high-quality voice to high-definition video, through high data-rate wireless channels. Upcoming future communication system introduce about multimedia, wireless access to broad-band fixed networks system. In my survey paper I briefly introduce the history of generation form 1G - 4G, features, differences, and how to 4G becomes powerful in field of the communication increase speed and reduction in cost.

REFERENCES

- [1] Ajay K. Mishra, (2004), "Fundamentals of Cellular Network Planning and Optimization, 2G/2.5G/3G... Evolution Of 4G", John Wiley and Sons.
 - [2] T. S. Rappaport "Wireless Communication: Principles and Practice", 2nd Edition, Pages 1-40.
 - [3] Amit Kumar, Dr. Yunfei Liu, Dr. Jyotsna Sengupta, (2010) "Evolution of Mobile Wireless communication Networks; 1G to 4G", IJECT Volume : 1 Issue: 1.
 - [4] Ms. A. U. Gawas, (May 2015) "An Overview on Evolution of Mobile Wireless communication Networks: 1G to 6G", IJRITCC Volume : 3 Issue: 5.
- Website Link:
- [5] http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf.
 - [6] http://www.itu.int/ITU-D/ict/statistics/2010/material/graphs/2010/Global_ICT_Dev_00-10.jpg.