



## **A Comparative Study of Mobile Wireless Networks**

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### **ABSTRACT**

As the coming generation is going to be the mobile communication technology Generation. If we talk about the communication, at present we are fully equipped with 2G and have started using 3G. But time is not so far when we deal with 4G and it's beyond mobile communication technology. In this paper we have just tried to present the brief overview and limitations of existing systems and how generation next mobile communication technology is going to start new evolution. The G Next revolution, we call it 4G. In this I have discuss the overview, features of 4G, its future vision and scope. This paper will help the new scholars to enhance their knowledge about the different mobile communication existing and G Next systems.

**Key words:** FDMA, TDMA, CDMA, GSM, OFDM, WiMax.

### **INTRODUCTION**

We are in computer age; age which is making a revolution in every aspects. One of the factors that make most of the impact in this revolution is communication technology. The communication technology is the technology in which we share data between one or more computers. What we just require is a PC and an Internet connection. From our early days various technologies where used for communication, But as the time passes its approach has changed. The approach i.e. "way of performing things" .We categorized this approach as the generation of mobile communication. How we have started with 1G, 2G and currently using 3G. We will see how the future G i.e. 4G and its beyond is going to revolutionize the world.

As we are in third generation, which is not sufficient to stop the revolution of mobile communication technologies, so the need of next generation technology is required. In G Next we will see the data transfer at unbelievable speed. The speed which brings the world more closely, but the challenge of its development depends upon the evolution of different technologies, standards and deployment<sup>1-2</sup>.

In this paper we present the overview, features of 4G, its future vision and scopes. The paper is organized as follows. In the Section 2 provides all the related work of mobile communication technologies. Section 3 contains the classification of mobile communication generation. In section 4 the practical approach of G Next is discussed. Finally Section 5 contains the conclusion part.

### Related Work

Mobile communications networks are developing at an unbelievable speed, with evidences of significant growth in the areas of mobile subscribers and terminals, mobile and wireless access networks, and mobile services and applications<sup>3</sup>. The present time seem to be right to start the research of 4G mobile communications

because we are using the 3G standardization and the next generation of 4G is underway to add more capability and adaptability to the mobile communication technology. In 4G, most of the ongoing research such as distributed computing, mobile agents, multimedia services, or radio air interfaces, etc. The following table shows the mobile communications development starting from the first

**Table 1: Mobile Communication History and Status**

Property	1G	2G	2.5 G	3G	4G
Starting time	1985	1992	1995	2002	2010-2012
Driven Technique	Analog signal Processing	Digital signal Processing	Packet Switching	Intelligent signal processing	Intelligent software auto configuration
Representative standard	AMPS, TACS, NMT	GSM, TDMA	GRPS, I-Mode, HSCSD, EDGE	IMT - 2000 (UMTS, WCDMA, CDMA 2000)	OFDM, UWB
Radio frequency (Hz)	400 M - 800 M	800M-900M, 1800M-1900M	2G		3G-5G
Bandwidth	2.4 K -30 K	9.6K - 14.4 K	171K-384K	2M-5M	10M-20M
Multi-address technique	FDMA	TDMA, CDMA			FDMA, TDMA, CDMA
Cellular Core Networks	Large area Telecom networks	Medium area		Small area Telecom networks some IP networks	Mimi area All-IP networks
Service type	Voice, Mono-service, Person-to-person	Voice, SMS, person-to-person	Data service	Voice, Data, some multimedia, person-to-machine	Multimedia machine to-machine

generation mobile telephony to the up coming the fourth generation mobile telephony<sup>4</sup>.

### Classification of mobile communication generation

To study the practical approach of G Next mobile communication technology, it is necessary to have brief idea of all the generations. So let's start one by one from the beginning.

#### First Generation

This generation launched in early 1980s is just the beginning of the mobile communication technology. It was developed at AT & T Bells labs.

In this data is transmitted by analog signals (Fig.1), which is a form of wave. In this basically the voice data is send in form of wave. The technology that used during 1G is: AMPS (Advanced Mobile Phone System), NMT (Nordic mobile Telephone) and TACS (Total Access Communication System)<sup>5</sup>. The FDMA (Frequency Division Multiple Access) is used for transmission. In this each calling party is allocated a dedicated frequency channels: 3 users use three channels (Fig. 2)<sup>6</sup>. It has low capacity, limited local and regional coverage.

#### Second Generation

First time digital signal processing (Fig. 3)

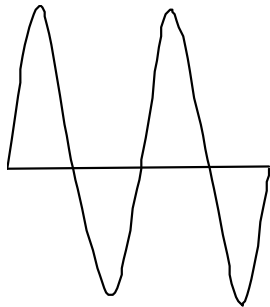


Fig. 1: Analog Signals

Fig. 3: Digital Signals



Fig. 2: Frequency Division Multiple Access

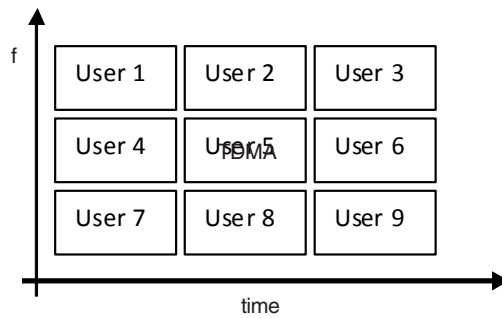


Fig. 4: Time Division Multiplexing Access

is started with the beginning of 2G. It has great advantage over previous generation mobile communication technology. It has increased sound quality and reduced noise level. The technology that used during 2G is: CDMA (Code Division Multiple Access), GSM (Global System for Mobile Communications), PCS. The TDMA (Time Division Multiple Access) (see fig. 4) is used for transmission. This shows the beginning of two important services i.e. SMS (Short Message Services) and E-Mail.

Now, before we jump to 3G, there was 2.5G introduced to overcome the speed limitations of 2G. It offered a high speed as compare to 2G. This mainly introduced latest bandwidth technology in addition to the existing 2G. This brought Internet to the mobile communication with introduction of packet switching. The new technology i.e. GPRS (general packet radio service) come into existence.

As we are approaching towards the end of 2G, a new generation has come. We call it 2.75G. In this a new technology i.e. EDGE (enhance data rates for GSM evolution) came into existence. It works on our GSM network. In this faster and clear

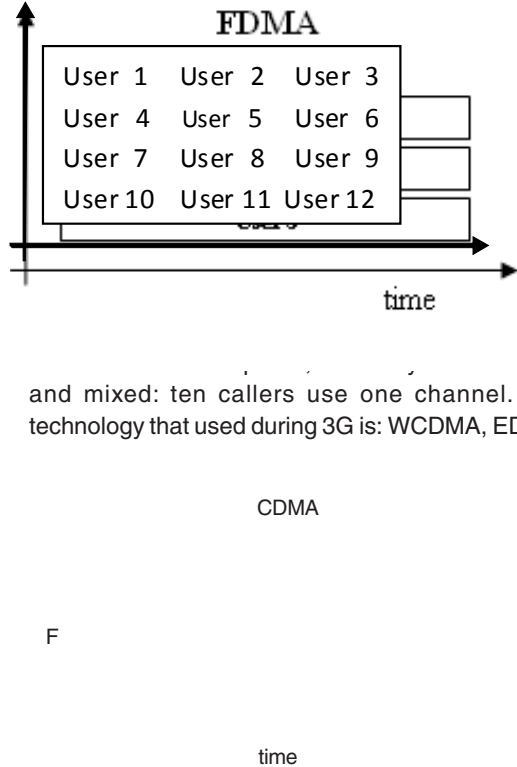


Fig. 5: Code Division Multiplexing Access

and mixed: ten callers use one channel. The technology that used during 3G is: WCDMA, EDGE,

CDMA

F

time

and TD-SCDMA, CDMA2000 (Fig. 5), WiMax<sup>6</sup>. It supports both packet switched and circuit switched. It has higher range of bandwidth and frequency and support speed up to 2 Mbps.

**Fourth Generation**

The time is not so far when we see the next generation mobile technology and its use. Just imagine the unbelievable speed with high range of available bandwidth and frequency. In this we will see much improved multimedia, video streaming and wider global access. It will support data rates at 20Mbps to 100 Mbps. The technology that used during 3G is: OFDM, OFDMA, and Wimax. It supports packet switching.

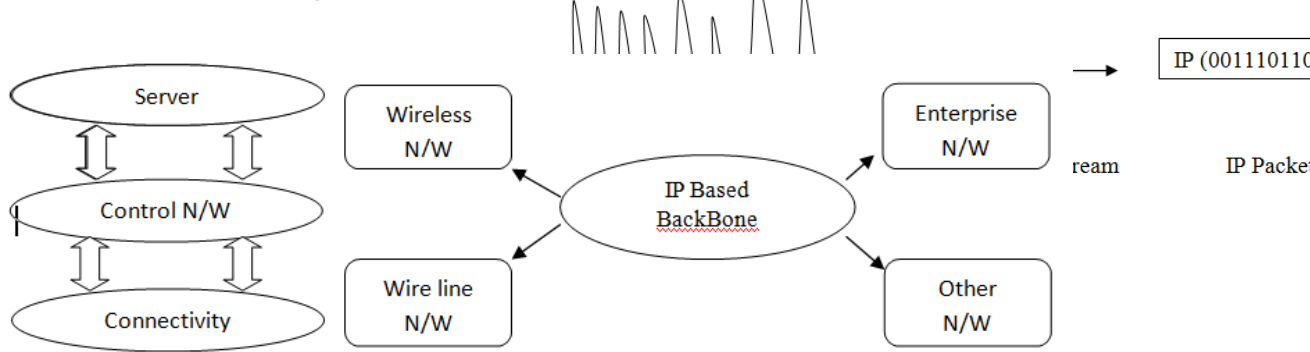
**Proposed Research**

We are moving towards the next generation mobile communication technology. So we must know how the improved as well as new technology of 4G and its beyond is going to work. 4G will have IP based core network. This system is expected to provide a comprehensive and secure all-IP based solution where facilities such as IP telephony, ultra-broadband Internet access, gaming services and HDTV streamed multimedia may be provided to users.

**IP Based Core Network**

In this voice is transmitted over the IP. All voice data is stored inside the packets. This leads to faster transmission over network<sup>5</sup>.

**Fig. 6: Transformation of voice to IP packets**



**Fig. 7: IP Packet BackBone**

All the voice data is compressed and converted into Bit Stream and then stored inside the packets i.e. IP packets (Fig 6-7) .

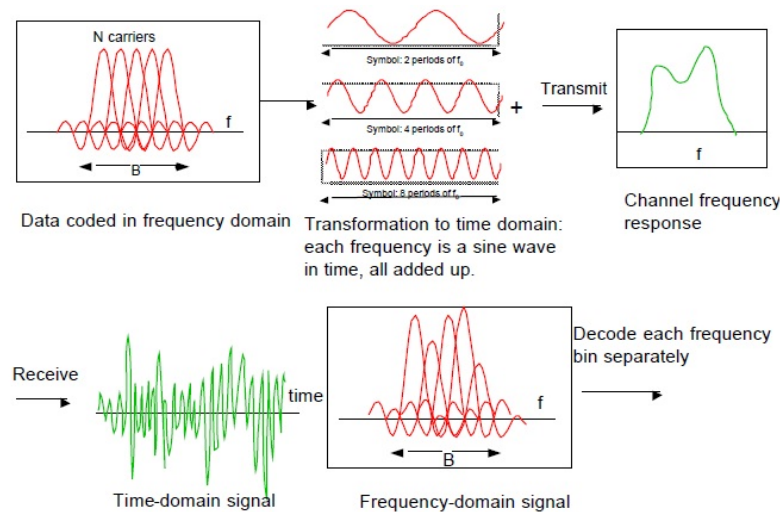
**OFDM (Orthogonal Frequency Division Modulation)**

This is the one of the latest mobile communication technology. More than that we can say it a upcoming mobile communication technology.

OFDM is a multi carrier system, uses discrete Fourier Transform/Fast Fourier Transform (DFT/FFT). The bandwidth used for this technology is divided into many small narrow bands, and then data is transferred on these parallel bands. When we talk about the early mobile communication technology, it generally uses multipath transmission (More than one transmission path between sender and receiver). It creates a lot of problem during

transmission when data is large. So overcome this problem OFDM is used. It resolves the multipath problem by transmitting data parallel (see fig. 8). It

uses longer symbol period, e.g. for N parallel streams, symbols period is N times as long<sup>9</sup>.



**Fig. 8: OFDM Transmission**

**WiMax (Worldwide Interoperability for Microwave Access)**

It is a type of wireless mobile telecommunication technology. It is based on point to multi point (PMP) and IP wireless access technology. With this technology the wireless access up to 30 miles is possible. It uses radio frequency for access. This is especially useful in those areas that were not served by cable or DSL or in areas where the local telephone company may need a long time to deploy broadband service. When we talk about its architecture, it consists of a Network Management System (NMS), some nodes, and a database. BS and SS managed nodes collect and store the managed objects in an 802.16 MIB format. Managed objects are made available to NMS' using the Simple Network Management Protocol (SNMP).

**CONCLUSION**

As currently we are in 3G, and in coming time we are approaching towards the Next G. One thing we can say that, the coming mobile communication technology is going to be lot more promising. Large data, complex networks and transmission at very high speed are the G Next. At the same time we will see large distance wireless communication. In this paper I have discussed the existing system, its overview and the upcoming mobile communication overview and its features. Once the Next G will reach, it's going to be very handful for us. But every thing has is good as well as bad size. So various problem may come. We have to ready for its both side and always pray the god to avoid the bad one.

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