

A Survey on Evolution of Mobile Communication from 1G to 7G

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ABSTRACT

The journey of development in mobile wireless communication is spread over few decades. This advancement in mobile communication consists of few generations and is still going on. Here we have analyzed the various generations of cellular systems from 1st generation to 7th generation. In this paper, it has been discussed to review various existing generations of mobile wireless technologies, this paper throws a light on the evolution and development of various generation of mobile wireless technology along with their significance and advantages of one another. There are various applications like Paging Service for 1G, Short Message Service (SMS), Multi Media Service (MMS) for 2G, Video calling for 3G, high speed video calling for 4G and for 5G spectrum free and very fast internet service with Wireless World Wide Web.

Keywords— Wireless Communication generations,1G, 2G, 3G, 4G,5G,6G,7G.

1 Introduction

A device which works in any environment either in static or dynamic mode is known as Mobility. Mobile communication technology is a wireless technology. In Wireless communication the information is transferred over a distance without the use of "wires". In the past few decades, the mobile wireless technologies have experience of various generations of technology revolution & evolution, namely from 1G to 7G. Here we describes about the generations of the mobile communication and its Technology, i.e study of several generations which are being used 1G, 2G, 3G, and 4G, and try to find some future generations which are under research like 5G, 6G, and 7G.Each generation have some standards, capacities, techniques and new features which differentiate it from previous generations. Due to these new features, the number of mobile phone subscribers is increasing day by day.

2 LITERATURE REVIEW

In literature review we will discuss mobile communication generations from 1G to 7G.

2.1 1G MOBILE COMMUNICATION SYSTEM

The 1G first generation mobile wireless communication system was introduced in 1980's, This 1G technology was a analog system which was based on a standard known as Advance Mobile



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Phone Service (AMPS). The AMPS system was frequency modulation radio system using frequency division multiple access (FDMA). The channel capacity of 1G is 30 KHz and frequency band was 800-900 MHz. The main service given is VOICE only.

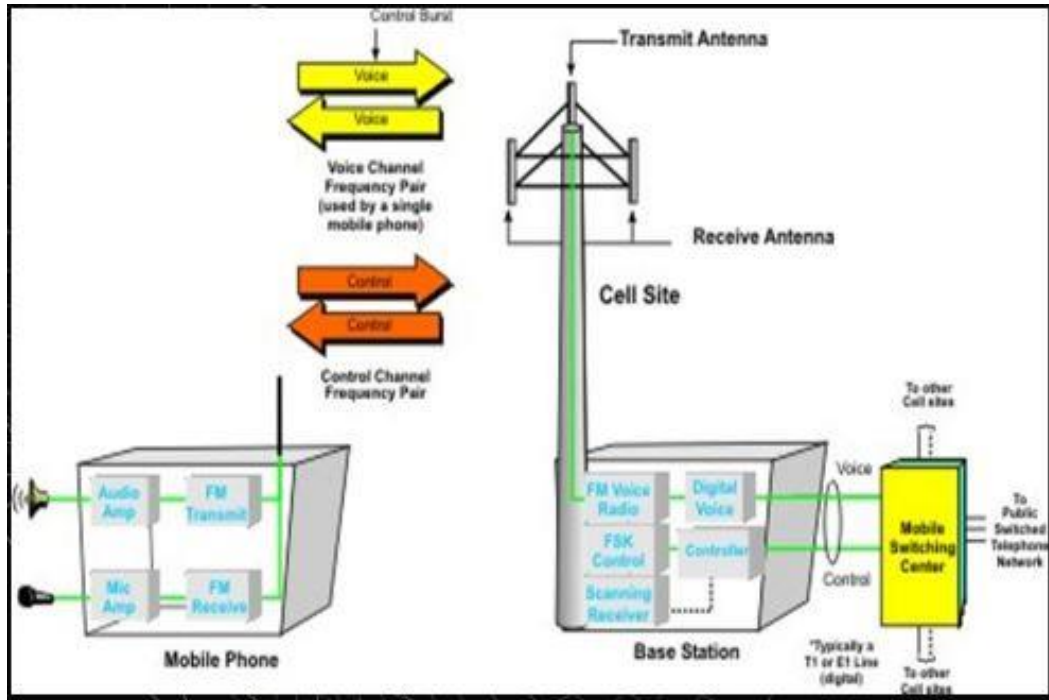


Fig 1: Analog cellular system

2.2 2G MOBILE COMMUNICATION SYSTEM

The drawbacks of the first-generation cellular systems are analog voice signal transmission and limited service performance. To overcome this the analog systems are upgraded to digital cellular systems. Second generation cellular systems are also called as Digital Cellular Systems. Compared with first generation the applications like Short Message Service (SMS), Multi Media Service (MMS) are developed in second generation. The frequency range upgraded to 850 MHz-1900 MHz. The maximum data rate for 2G technology is 10 Kbps to 473 Kbps only. The multiplexing method in 2G is replaced by TDMA/CDMA. The main service given by 2G is Voice, Data, and MMS.

2.5G - In the Second generation the data rate speed (Internet speed) is limited and very slow. So to increase the data rate without changing the instruments which has supported for 2G voice transmission the 2.5G technology is developed. Here sending and receiving of EMAIL is developed and made browsing possible. BUT the major drawback in 2G or 2.5G is it cannot handle complex data such as videos and it requires strong digital signal.

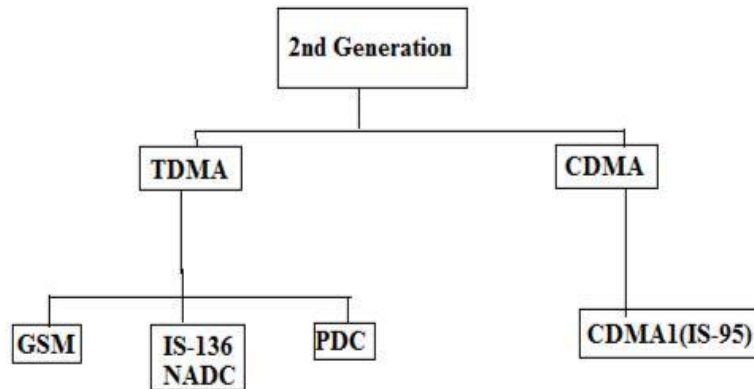


Fig 2: 2G Multiplexing

2.3 3G MOBILE COMMUNICATION SYSTEM

The 3G technology was introduced in year 2000’s. In the 3G technology Video calling facility is employed, that means for establishing the video call the data rate of EDGE is not finite. The Aim is to increase the data rate. In this generation the maximum data rates are increased. 3.5G – HSDPA (High-Speed Downlink Packet Access): High-Speed Downlink Packet Access(HSDPA) is a packetbased data service in W-CDMA downlink with data transmission up to 8-10 Mbit/s (and 20 Mbit/s for MIMO systems) over a 5MHz bandwidth in WCDMA downlink. Its implementations includes Adaptive Modulation and Coding (AMC), Multiple-Input Multiple-Output (MIMO), Hybrid Automatic Request (HARQ), fast cell search, and advanced receiver design.

3.75G – HSUPA (High-Speed Uplink Packet Access): High Speed Uplink Packet Access (HSUPA) is a UMTS / WCDMA uplink evolution technology, directly related to HSDPA and the two are complimentary to one another. HSUPA will enhance advanced person-to-person data applications with higher and symmetric data rates.

The data capacity in 3G is 384Kbps to 30Mbps the technology used here is GSM/3GPP, the major service provided in this generation is high speed internet and multimedia.

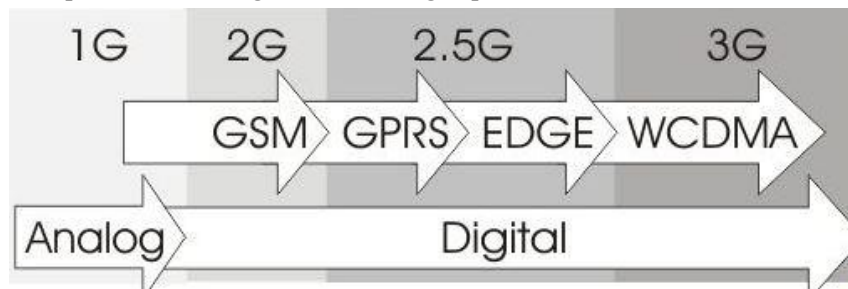


Fig 3: Technology and standard

2.4 4G MOBILE COMMUNICATION SYSTEM

This 4G was developed in the year 2010, The main aim of 4G technology is to provide high speed, high quality, high capacity and low cost services for example voice, multimedia and internet over IP. 4G is totally IP based technology. It majorly works on two things LTE and WIMAX, LTE is a standard for wireless communications of high speed data for mobile phones and data transmission. Wi-MAX - WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide 30 to 40 megabit-per-second data rates, with the update providing up to 1 Gbit/s for fixed stations. The major service provided by this 4G is VOLTE ,high speed data access along with high Qos and security.

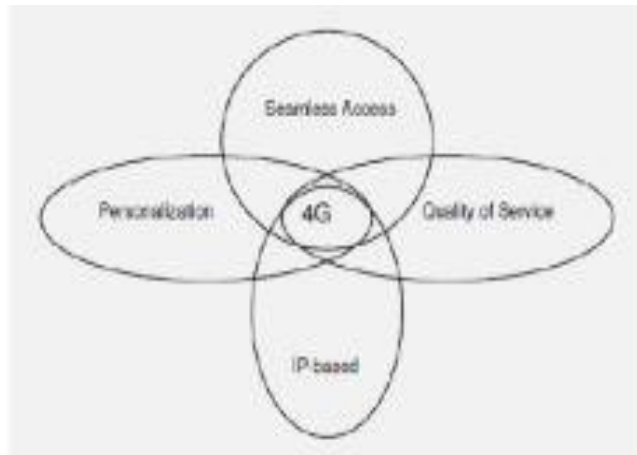


Fig 4: features of 4G

2.5 5G MOBILE COMMUNICATION SYSTEM

The 5G technology started to develop from the year 2015.the data capacity in the 5G network is higher than 1Gbps.5G is to be a new technology that will provide all the possible applications, by using only one universal device, and interconnecting most of the already existing communication infrastructures. This 5G technology have the bandwidth up to 40MHz it is a complete wireless technology with very less limitation ,it is highly supportable to www(wireless world wide web). This 5G provides high speed in data transmission with higher capacity. The major services are dynamic information access, wearable, devices with artificial intelligence capabilities.

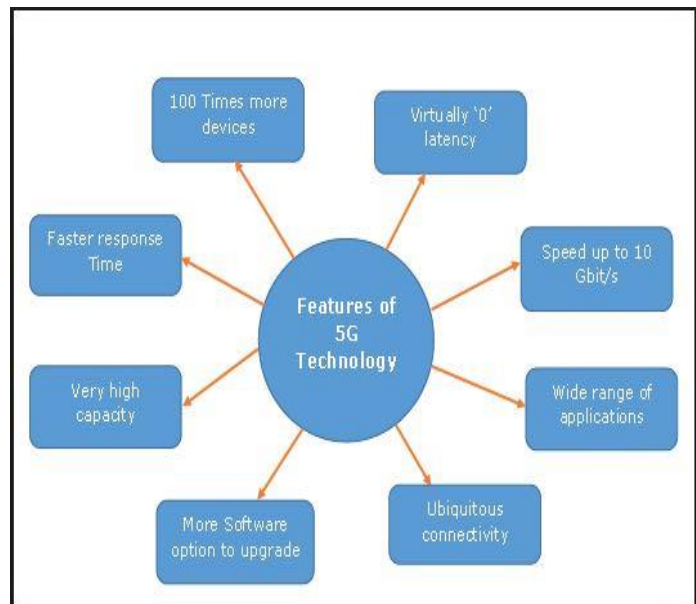


Fig 5: features of 5G

2.6 6G MOBILE COMMUNICATION SYSTEM

The 6G mobile system for the global coverage will integrate 5G wireless mobile system and satellite network. The telecommunication satellite is used for voice, data, internet, and video broadcasting; the earth imaging satellite networks is for weather and environmental information collection; and the navigational satellite network is for global positional system (GPS).

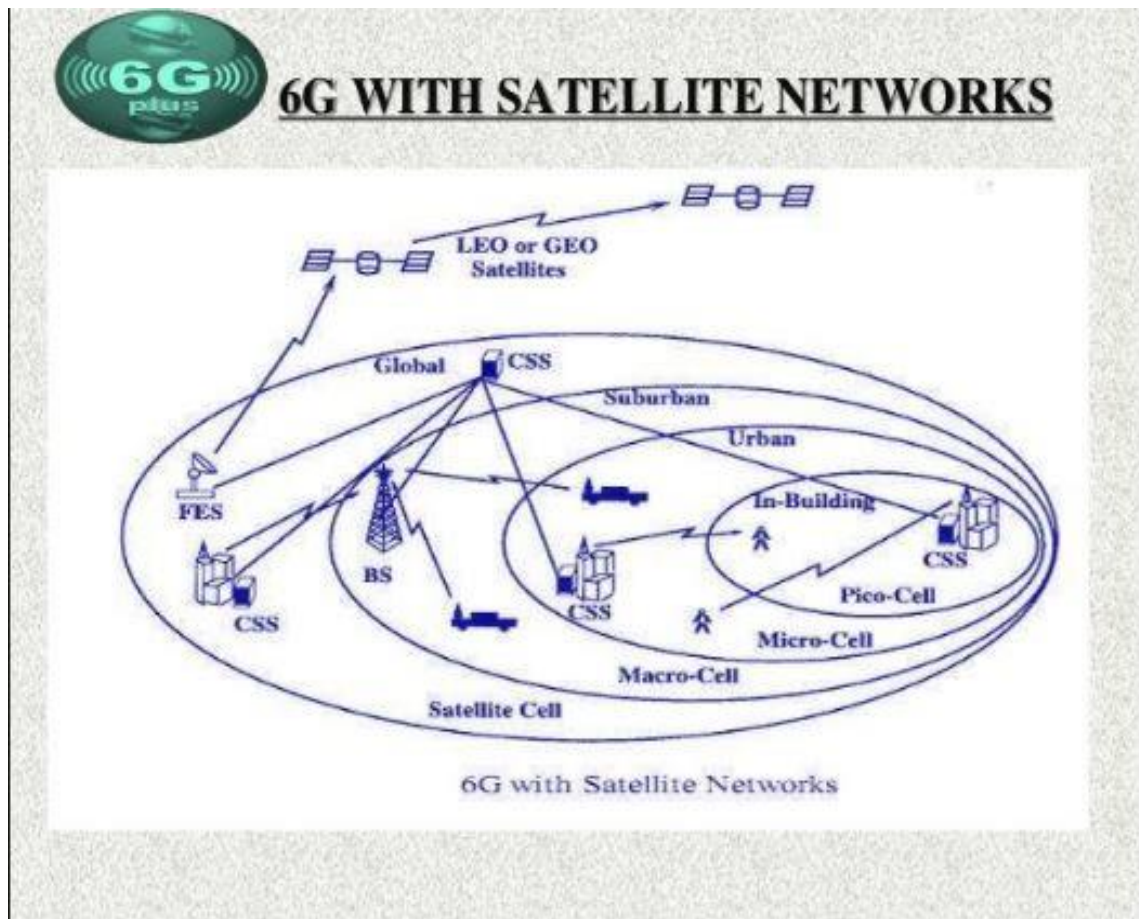


Fig 6: 6G with satellite network

In 6G very fast internet speed access on air through wireless devices possibly upto 11Gbps. specially designed nano antennas will be implemented at different geographical locations.

2.7 7G MOBILE COMMUNICATION SYSTEM

The 7G will be the most advance generation in mobile communication network. It is like the 6G for global coverage but it will also define the satellite functions for mobile communication. But in 7G, there will be some research on demanding issues like the use of mobile phone during moving condition from one country to another country, because satellite is also moving in constant speed and in specific orbit, the standards and protocols for cellular to satellite system and for satellite to satellite communication system. The dream of 7G can only be true when all standards and protocols are defined. The main aim of this 7G technology is to acquire space roaming. This 7G system can be supported by the global navigation satellite system.

Generations	1G	2G	3G	4G	5G
Starts from	1970-84	1990-2003	2000-03	2010	2015
Data capacity	2kbps	10-473kbps	384kbps-30mbps	200mbps-1gbps	Higher than 1gbps
Technology	Analog	Digital,GPRS,EDGE	GSM,3GPP	LTE	IPV6
Multiplexing	FDMA	TDMA/CDMA	CDMA	MC-CDMA	CDMA
Switching	Circuit	Packet	Packet	Packet	ALL Packets
Service	Voice only	Voice,data,MMS	High speed internet	VOLTE, video calling	Dynamic information Access
Frequency	800-900Mhz	850-1900 MHz	1.6-2.5Ghz	2-8Ghz	Higher Than 4G

Fig 7: comparison from 1G to 7G

3 CONCLUSION

The last few years have witnessed a phenomenal growth in the wireless industry. Their current development is the outcome of various generations. In this paper we reviewed various generations of mobile communications including future generations 6G and 7G. The main aim of this generations is to create fastest and reliability mobile network. The first generation (1G) has fulfilled the basic mobile voice, while the second generation (2G) has introduced capacity and coverage. The datarates are increased in 3G and 4G with broadband experience. Satellite network will be used from 6G mobile communication systems and onwards.

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