

5G Technology-Next major phase of mobile telecommunication

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Abstract— Nowadays the mobile is changing our lifestyle in term of the way we work and learn. In this paper we discuss and review various accessible generations of mobile wireless technology in terms of their performance. The paper throws light on the evolution and progress of various generations of mobile wireless technology with their advantages of one over the other. In the past few years, mobile wireless technologies have experience 4 or 5 generations of technology namely from 0G to 4G. In this mobile wireless technology the current research concentrates on advance implementation of 4G and 5G technology. But the currently 5G term is not officially used. In 5G researches are being made on development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World.

Index Terms—1G; 2G; 3G; 4G; 5G

I. INTRODUCTION

5G Technology stands for fifth Generation Mobile technology. This world of telecommunication has seen a number of improvements.

This paper focuses on all previous generations of mobile communication with 5th generation technology. Fifth generation network provide affordable broadband wireless connectivity at very high speed. Currently 5G term is not officially used. In fifth generation

researches are being made on development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World. Fifth generation focus on VOIP(Voice Over IP) VOIP-enabled devices that user can experience a high level of call volume and data transmission. This technology will fulfill all the requirements of customers who always want advanced features in their mobile phones. The main features in 5G mobile network is that user can simultaneously connect to the multiple wireless technologies and can switch between them. It provides the facilities like camera, MP3 recording, video player, large phone memory and audio player etc that user never imagine. It offers tremendous data capabilities and unrestricted call volumes. This generation is expected to be released in 2020.

Manuscript received Sep 23, 2014

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II. EVOLUTION

This revolution is due to very high increase in telecoms customers. This revolution is from 1G- the first generation, 2G- the second generation, 3G- the third generation, and then the 4G- the fourth generation, 5G- the fifth second generation.

A. 1st GENERATION

The First generation is basically known as 1G which was introduced in 1980. The First generation of wireless technology used analog transmission techniques which were basically used for transmitting voice signals. It also consist of various standards among which most popular were Advance Mobile Phone Service (AMPS), and Total Access Communication System (TACS) etc. Data transmission between the wire part of connection and PSTN (Packet Switched Telephone Network) was done using packet-switched network.

1. Use of Analog signals for data (in this case voice) transmission led to many problems:-
 1. Analog Signals does not allow advance encryption methods hence there is no security of data.
 2. Analog signals can easily be affected by interference and the call quality decreases.



Fig 1 Nokia 650 1G mobile phone

B. 2nd GENERATION

The short form of second-generation is 2G. Three main benefits of 2G networks were- phone conversations were digitally encrypted; 2G systems were significantly more efficient on the spectrum allowing for far greater mobile phone penetration levels; and 2G introduced data services for mobile, starting with SMS text messages. 2G technologies provide the services such as text messages, picture messages and MMS (multi media messages). All text messages sent over 2G are digitally encrypted, allowing for the transfer of data in such a way that only the intended receiver can receive and read it.

1G networks are analog, radio signals on 2G networks are digital. Both systems use digital signaling to connect the radio towers to the rest of the telephone system. 2G has been

outdated by newer technologies such as 2.5G, 2.75G, 3G, and 4G

C. 2.5 GENERATION

2.5 G usually associated with General Packet Radio Services (GPRS) - that is, between the second and third generations of wireless technology. The second generation or 2G- level of Wireless is usually identified as Global System for Mobile (GSM) service. GPRS offers data speeds at 28 Kbps (and possibly higher) and is expected to be introduced in the 2001 through 2003 timeframe.



Fig 2 Siemens S57 2.5G GPRS phone

D. 3rd GENERATION

3G, short form of third Generation of mobile telecommunications technology. 3G finds application in wireless voice telephony, mobile Internet access, fixed wireless Internet access, video calls and mobile TV.

3G telecommunication networks support services that provide an information transfer rate of at least 200 kbit/s. Later 3G releases often denoted 3.5G and 3.75 G also provide mobile broadband access of several Mbit/s to smartphones and mobile modems in laptop computers. This ensures it can be applied to wireless voice telephony, mobile Internet access, fixed wireless Internet access, video calls and mobile TV technologies.

Each generation is characterized by new frequency bands, higher data rates and non-backward-compatible transmission technology. The first release of the 3GPP Long Term Evolution (LTE) standard does not completely fulfill the ITU 4G requirements called IMT-Advanced. First release LTE is not backward-compatible with 3G, but is a pre-4G or 3.9G technology, however sometimes branded 4G by the service providers. Its evolution LTE Advanced is a 4G technology. WiMAX is another technology verging on or marketed as 4G.

E. 4TH GENERATION

The Fourth generation is basically known as 4G. A 4G system, in addition to the usual voice and other services of 3G, provides mobile ultra-broadband Internet access, for example to laptops with USB wireless modems, to smartphones, and to other mobile devices. Imaginable applications include IP telephony, gaming services, high-definition mobile TV, video conferencing, 3D television, and cloud computing.

4G wireless is supposed to be anywhere from four to ten times faster than today's 3G networks. Sprint says its 4G WiMax network can offer download speeds that are ten times faster than a 3G connection, with speeds that top out at 10 megabits per second. Verizon's LTE network, meanwhile, can deliver speeds between 5 mbps and 12 mbps.

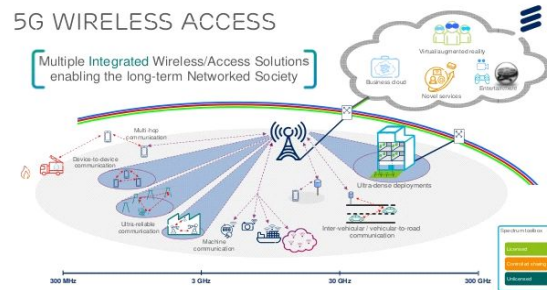


Fig 3 HTC-EVO 4G

III. 5TH GENERATION

5G (5th generation mobile networks or 5th generation wireless systems) denotes the next major phase of mobile telecommunications standards beyond the current 4G/IMT-Advanced standards. This generation is expected to be released in 2020.

5G does not describe any particular specification in any official document published by any telecommunication standardization body.



A. Advantages of 5G

1. Wearable devices with artificial intelligence (AI)
2. Internet Protocol version 6 where the IP address is assigned according to location and the connected network.
3. The ability to connect the user to different wireless access technologies, like 2.5G, 3G, 4G or 5G mobile networks, as well as Wi-Fi and WPAN (wireless personal area network)— or even any other technology to be developed in the future. This is basically a concurrent data transfer path technique.
4. Smart radio. In order to share the same spectrum efficiently during a wireless transmission scheme, the system will adaptively find (search) unused spectrum.
5. High altitude stratospheric platform station (HAPS) system. This is based on beam division multiple access (BDMA) and group relay techniques.

B. NEED OF 5G

1. 5G technology offer high resolution for crazy cell phone user and bi- directional large bandwidth shaping.

2. The advanced billing interfaces of 5G technology makes it more attractive and effective.
3. 5G technology also providing subscriber supervision tools for fast action.
4. The high quality services of 5G technology is used to avoid large numbers of error.
5. 5G technology is providing large broadcasting of data in Gigabit.
6. The traffic statistics by 5G technology makes it more accurate.
7. Through remote management offered by 5G technology a user can get better and fast solution.
8. The remote diagnostics also a great feature of 5G technology.
9. The 5G technology is providing up to 25 Mbps connectivity speed.
10. The 5G technology also support virtual private network.
11. The new 5G technology will take all delivery service out of business prospect
12. The uploading and downloading speed of 5G technology touching the peak.

which makes 5G technology most powerful and in huge demand in near future. Introduction of 5g Wireless System 5G technology going to be a new mobile revolution in mobile market. Through 5G technology now you can use worldwide cellular phones and this technology also strike the china mobile market and a user being proficient to get access to Germany phone as a local phone. With the coming out of cell phone alike to PDA now your whole office in your finger tips or in your phone. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system. 5G technology has a bright future because it can handle best technologies and offer priceless handset to their customers

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IV. COMPARISON BETWEEN THESE TECHNOLOGIES

Generations (1G,2G,3G, 4G,5G)	Definition	Throughput Speed	Technology	Time period	Features
1G	Analog	144 Mbps (peak)	AMPS,NMT, TACS	1970-1980	During 1G Wireless phones are used for voice only
2G	Digital Narrow Band circuit data	2.8144 Mbps	ISMA,CD MA	1990 to 2000	2G capabilities are achieved by allowing multiple users on a single channel via multiplexing. During 2G Cellular phones are used for data also along with voice.
2.5G	Packet Data	171.2 Mbps (peak) 20-24 kbps	GPRS	2000-2004	In 2.5G the internet becomes popular and data becomes more relevant. 2.5G Multimedia services and streaming starts to show growth. Phones start supporting web browsing though limited and very few phones have that.
3G	Digital Broadband Packet Data	3.1 Mbps (peak) 500-700 Kbps	CDMA 2000 (1x,RTT, EVDO), UMTS, EDGE	2004-2005	3G has Multimedia services support along with streaming are more popular. In 3G, Universal access and portability across different device types are made possible. (Telephones, PDA's, etc.)
3.5G	Packet Data	144 Mbps (peak) 1-3 Mbps	HSPA	2006-2010	3.5G supports higher throughput and speeds to support higher data needs of the consumer.
4G	Digital Broadband Packet All IP Very high throughput	100-300 Mbps (peak) 3-5 Mbps 100 Mbps (Wi-Fi)	4G/LTE Wi-Fi	New (Kind more on Transmission as 4G)	Speeds for 4G are further increased to keep up with data access demand used by various services. High definition streaming is now supported in 4G. New phones with HD capabilities surface. It gets pretty cool. In 4G, Portability is increased further. World-wide roaming is not a distant dream.
5G	Not yet	Probably gigabit	Not Yet	Seen (probably 2020)	Currently there is no 5G technology deployed. When this becomes available it will provide very high speeds to the consumer. It would also provide efficient use of available bandwidth as has been seen through development of such new technology.

Table 1 Comparison

CONCLUSION

5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features