

5G - Upcoming of Mobile Wireless Communication

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Abstract: Development in wireless technologies after every ten years revolutionized the way people communicate. User becomes more acquainted of the wireless communication technology, he/she will always search for excited packages all together, and including high bit rates, cheap, efficient user services with low power consumption or all the advanced features of a cellular phone can have. Therefore, the main focus of fifth generation wireless networks is to provide best wireless world to the subscribers without the drawbacks of previous generations. Paper briefly describes the 5G features and comparison of different generations.

Keywords: 5G, Cellular Technology, Generation, Mobile Wireless Technology, Wireless Communication.

I. INTRODUCTION

From last few years evolution of wireless technology shows rapid enhancement in communication. Wireless communication started from early 1970's and regularly upgraded to smart mobile communication technology 5G. Starting from 1G, the mobile wireless technology reached to 5G. In recent years the world shows tremendous growth in the evolution of cellular communication technologies from GSM (Global system for Mobile) to LTE-A (Long Term Evolution-advanced) system. User requires mobility, high bandwidth and low latency etc. All these features are offered by the fifth generation wireless mobile communication systems and makes this technology a most powerful and smarter technology [1]. After every ten span, the cellular wireless generation refers a change in the basic nature of the service, transmission technology and in frequency bands. Starting from 1G to 2G both are analog networks used in 1981 to 1995. After that third generation supports multimedia, spread spectrum transmission, increase quality and capacity of the systems i.e. UMTS (Universal Mobile Telecommunication System with CDMA 2000). Whereas fourth generation mobile technology supports IP switched networks, LTE as well as sensors and PAN. The wireless industry exhibit a phenomenal growth in last few years both in the field of mobile technology and its subscribers. The future generation of mobile wireless communication, commonly referred to as 5G which will be smarter, reconfigurable and expected as interconnection of heterogeneous systems through a horizontal IP-centric architecture [2]. 5G technologies covers some new technologies such as nanotechnology,

cloud computing and cognitive radio and interconnect the whole world without limits.

II. FEATURES AND COMPARISON

5G technology is receiving lots of attention in the media even through the official definition is not defined yet. 5G is the next generation of mobile technology that supports broadband as well as networking of number of devices. Infrastructure of 5G will be flexible and easily accommodate the increasing demand for mobile data as well as provide connectivity for multiple technologies such as nanotechnology, cloud computing, Internet of things (IOT). The main focus of introducing of 5G will be on developing intelligent systems that work together on unlimited data with faster network system and with greater energy efficiency [3]. 5G provide more facilities to a user like:-

- Low battery consumption
- Better coverage and high data rates available at cells
- More secure; SDR security
- Energy efficient
- Cost effective
- Improved data coding and modulation technology
- Smart beam antenna system
- Cover outage probability
- Addition radio spectrum
- Not harmful to human health
- Ultra low latency
- Reliable
- On demand services
- Ability to support the new services
- Easily support previous generations

5G is to be a new technology that will provide all the possible applications. 5G terminals are cognitive radio enabled and interconnect most of the existing communication infrastructure. The advancement of wireless and cellular systems based on different aspects which is depicted in the table. Table 1 shows the comparison of all generations of mobile technologies [4].

Table I. Comparison of Generations of Mobile Technologies

Feature	Technologies				
	1G	2G	3G	4G	5G

Year	1985	1995	2001	Today	2020(approx)
Bandwidth	2kbps	64kbps	2Mbps	1Gbps	>1Gbps
Service	Mobile	Digital Voice, SMS, Higher Packetized Data	Integrated High Quality Audio, Video and Data	Dynamic Information Access, Global Roaming, Wearable Devices	HD Streaming, Dynamic Information Access, Global Roaming, Wearable Devices with AI
Core Network	PSTN	PSTN	Packet Network	Internet	Internet and 5G network interfacing
Technology	AMPS	AMPS	CDMA 2000, UMTS, EDGE	Wi-Max LTE, LTE Advanced, Wi-Fi	WWWW(coming)
Switching	Circuit	Circuit, Packet	Packet	All Packet	All Packet
Multiplexing	FDMA	TDMA, CDMA	CDMA	CDMA	CDMA, BDMA

III. EVOLUTION

A. First Generation (1G):

It was first used in 1980s. It used analog communication of speech signal services. Nippon Telephone and Telegraph first used cellular system in the world in 1979. Nordic Mobile Telephones (NMT) and Total Access Communication Systems (TACS) were one of the popular analog systems used at that time. The main disadvantages of 1G were all of those systems offered handover and roaming capabilities but cellular networks were unable to interoperate between the countries. Advanced Mobile Phone System (AMPS) was launched in 1982. AMPS and TACS use the Frequency Modulation (FM) technique and frequency division duplex (FDD) for radio transmission. 1G uses Frequency Division Multiple Access (FDMA), channel bandwidth up to 30 KHz [5].

B. Second Generation (2G):

2G provides the services like text messages, picture messages and Multimedia messages (MMS) for mobile phone networks. In 1991, 2G telecommunication networks were commercially launched for GSM standard. In second generation network phone conversations were digitally encrypted; 2G systems were significantly more efficient on the spectrum allowing for far greater mobile phone penetration levels; and it introduced data services for mobile, starting with SMS text messages. 2G uses two standards based multiple access, TDMA based and CDMA based. 2.5G was GPRS which could enable much faster communications uses packet switching and circuit switching domain to provide data rate up to 144kbps. In less populous areas, the weaker digital signal may not be sufficient to reach a cell tower. This tends to be a particular problem on 2G systems deployed on higher

frequencies, but is mostly not a problem on 2G systems deployed on lower frequencies [6].

C. Third Generation (3G):

Third generation technology is carried out by the International Telecommunication Union (ITU) in the year 1980. 3G communication frequency spectrum between 400 MHz to 3GHz. 3G technology approved by both the government and communication companies unanimously. It represents the convergence of various 2G wireless telecommunications systems into a single global system that includes both terrestrial and satellite components. One of the most important aspects of 3G wireless technologies is its ability to unify existing cellular standards, such as CDMA, GSM, and TDMA, less than one umbrella. The following three air interface modes accomplish this result: wideband CDMA, CDMA2000 and the Universal Wireless Communication (UWC-136) interfaces [7].

D. Fourth Generation (4G):

4G is the fourth generation of cellular wireless standards. It is a successor to the 3G and 2G families of standards. In 2008, the ITU-R organization specified the IMT-Advanced (International Mobile Telecommunications Advanced) requirements for 4G standards, setting peak speed requirements for 4G service at 100 Mbps for high mobility 1G :-Basic mobility, Incompatibility , Analog system 2G:-Roaming , Towards global solutions, Digital systems 3G:-Seamless Roaming, Global Radio Access, High data rates 4G:-IP based mobility, very High Data rates, complete Telecom convergence communication (such as from trains and cars) and 1Gbps for low mobility communication (such as pedestrians and stationary users) 4G system is expected to provide a comprehensive and secure all-IP based mobile broadband solution to laptop computer wireless

modems, smart phones , and other mobile devices. Facilities such as ultra-broadband Internet access, IP telephony, gaming services and streamed multimedia may be provided to users [8].

E. Fifth Generation (5G):

5G is a name used in some research papers and projects to denote the next major phase of mobile telecommunications standards beyond the 4G standards. Currently, 5G is not a term officially used for any particular specification or in any official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum or ITU-R. New 3GPP standard releases beyond 4G and LTE Advanced are in progress, but not considered as new mobile generations [9]. The implementation of standards under a 5G umbrella would likely be around the year of 2020. 5G will be a completed wireless communication with almost no limitation; somehow people will call it REAL wireless world.

All these generations are differentiated from each other by the means of their capacity, user mobility, device portability, compatibility, connectivity and many more features. Mobile Cellular Network evolution has been categorized into generations as shows in the figure. Figure 1 shows the evolution of wireless mobile technologies [10].

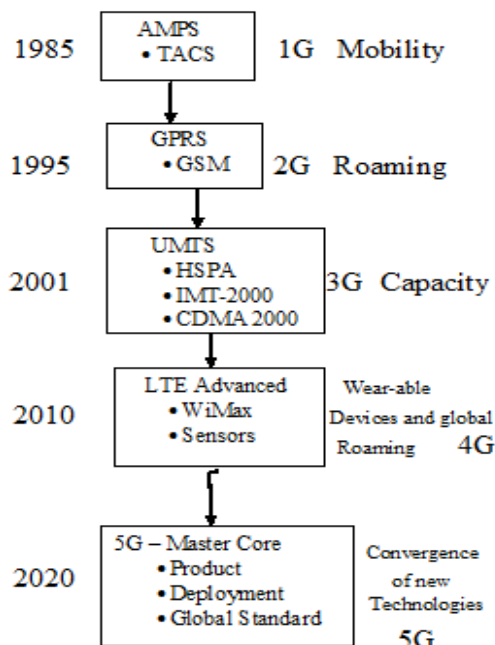


Figure 1: Evolution of Wireless Mobile Technologies.

IV. CONCLUSIONS

In this paper, we have discussed about the new era mobile communication technologies. The key factors of 5G network technology uplifts the mobile

communication market to a new revolution in mobile wireless market. 5G technology will be implemented at the end of this decade and has a bright future because it can support all technologies and offer priceless handsets to their customers. This next generation global standard technology is available in the market around 2020 to fulfill the user demand of best rates as well as an exceptional application.

V. REFERENCES

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