



The 4G Technology V/S other G Technologies

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Abstract-Wireless services have the highest demand in wireless and internet world. Mobile phones are rapidly becoming the preferred means of personal communication. Every generation technology has some platform for its development as a reason. 1G was based on analog signaling whereas 2G on low-band digital data signaling. The 3G technology was developed to overcome the faults of 1G & 2G technologies. 3G finds application in wireless voice telephony, mobile Internet access, fixed wireless internet access, video calls and mobile TV. The 4G system provides mobile ultra-broadband, internet access with very high speed data rate. This research paper presents an overview of 4G technology trends in the wireless technology market, a comparative overview of 4G v/s all other previous generation technologies and the major improvements which could be made to 4G technology.

Keywords: 1G, 2G, 3G, 4G, Mobile communication.

I. Introduction

Today we live in a fast changing world. The fast changing world has its own demands of communicating, connecting with people as fast as possible i.e. in minimum time possible without the consideration of location of the user. The continuous demands and requirements for wireless communication systems have led to the need for a better understanding of fundamental issues in communication theory and electromagnetic and the implications for the design of highly-capable wireless systems. The mobile communication systems and the wireless communication technologies have been improving very fast day by day. Devices continue to shrink in size while growing in processing power. Consumers are demanding more advanced and useful applications. Hence, there is need of capacity improvements in wireless communications. In addition; wireless communications is active areas of technology development of our time. Several major cellular wireless communication techniques have been proposed in order to meet these user expectations.

1G was basically analog cellular systems with circuit switched network architecture. The main challenge of the technology was basic voice telephony, low capacity and limited local and regional coverage. The increased demand for high frequency ranges in the telecommunications sector caused development in analog to digital transmission techniques. 2G arrived to meet the capacity demands of expansion of voice plus telephony, text messaging and limited circuit switched data services. The 3G system integrate voice and data applications. The 4G is a new generation of wireless that replaces the 3G systems. The key features of the 4G infrastructures are accessing information anywhere, anytime, with a seamless connection to a wide range of information and services, and receiving a large volume of information, data, pictures, video, and so on. The future 4G infrastructures integrate various networks using Internet protocol as a common protocol so that users are in control because they will be able to choose every application and environment. Based on the developing trends of mobile communications, the 4G focus on ensuring seamless service across a multitude of wireless systems and networks and have broader bandwidth, higher data rate, and smoother and quicker handoff. the International Telecommunications Union-Radio communications sector (ITU-R) specified a set of requirements for 4G standards, named the International Mobile Telecommunications Advanced (IMT-Advanced) specification, setting peak speed requirements for 4G service at 100 megabits per second (Mbit/s) for high mobility communication (such as from trains and cars) and 1 gigabit per second (Gbit/s) for low mobility communication (such as pedestrians and stationary users). Since the first-release versions of Mobile WiMAX and LTE support much less than 1 Gbit/s peak bit rate, they are not fully IMT-Advanced compliant, but are often branded 4G by service providers. ITU-R recognized that these two technologies, as well as other beyond-3G technologies that do not fulfill the IMT-Advanced requirements, could nevertheless be considered "4G", provided they represent forerunners to IMT-Advanced compliant versions and "a substantial level of improvement in performance and capabilities with respect to the initial third generation systems now deployed". Mobile Wi MAX Release 2 (also known as *Wireless MAN-Advanced* or *IEEE 802.16m'*) and LTE Advanced (LTE-A) are IMT-Advanced compliant backwards compatible versions of the above two systems, standardized during the spring 2011, and promising speeds in the order of 1 Gbit/s. As opposed to earlier generations, a 4G system does not support traditional circuit-switched telephony service, but all-Internet Protocol (IP) based communication such as IP telephony. As seen below, the spread spectrum radio technology used in 3G systems, is abandoned in all 4G candidate systems and replaced by OFDMA multi-carrier transmission and other frequency-domain equalization (FDE) schemes,

making it possible to transfer very high bit rates despite extensive multi-path radio propagation (echoes). The peak bit rate is further improved by smart antenna arrays for multiple-input multiple-output (MIMO) communications.

II. Comparisons

A. Comparison between 1G & 4G

<u>1G</u>	<u>4G</u>
<ol style="list-style-type: none"> 1. 1G is the first generation that existed in 1980s. 2. It is based on analog signals. 3. It supports data band width in kbps. 4. Poor carrier aggregation. 5. No MIMO technology. 6. Very large cells may range from 2- 20 km. 7. Peak speed up to 1.9 kbps. 8. Poor or no security. 9. Time consuming. 	<ol style="list-style-type: none"> 1. 4G is the fourth generation that evolved in late 1990 and early 00s. 2. It is based on wireless communication which is IP based. 3. It supports data band width in Mbps. 4. Multiple carrier aggregation. 5. Advanced MIMO technology. 6. Extremely dense and small cells. 7. Peak speed up to 150 Mbps. 8. High security. 9. Very fast in connecting.

B. Comparison between 2G & 4G

<u>2G</u>	<u>4G</u>
<ol style="list-style-type: none"> 1. 2G was present in 1990. 2. It is wireless telephone technology launched on GSM standards 3. Based on digital voice. 4. It is based on CODEC. 5. It is mainly used for mobile communication. 6. It has core network as PSTN. 7. Peak speed may be up to 14.4 kbps. 8. TDMA, CDMA technologies are part of 2G. 9. Carrier bit rate is 270.8 kbps & speech coding bit rate is 13kbps 10. Channel Bandwidth 200 k Hz in GSM . 11. Safe for consumers to use. 12. Handsets are provided with text messaging. 13. No QoS (quality of service). 14. Cannot take multiple parties simultaneously. 	<ol style="list-style-type: none"> 1. 4G is present since 2000. 2. 4G is the fourth generation of mobile phone mobile communication technology standards. 3. Based on Internet Protocol. 4. It is based on MAGIC. 5. It is for mobile communication as well as wireless internet. 6. It has core network as Internet. 7. Peak speed may be up to 150 Mbps. 8. WiMAX, Lte technologies are part of 4G. 9. Bit rate between 20- 200 mbps. 10. Flexible channel band width. 11. Safer for user than 2G. 12. Handsets are provided with Wi-Fi, Bluetooth, internet etc. 13. High QoS (quality of service). 14. Very much capable in taking multiple parties simultaneously.

C. Comparison between 3G & 4G

<u>3G</u>	<u>4G</u>
1. 3rd generation of mobile telecommunications technology also called Tri-Band 3G.	1. 4G is the fourth generation of mobile phone mobile communication technology standards.
2. It is the successor to 2G technology.	2. It is the successor to 3G technology.
3. It has various release versions like 3.5G, 3.75G.	3. It do not have its own release versions whereas it has release versions of technologies under it.
4. The technologies under it are CDMA 2000, UMTS, EDGE, 1XRTT, EVDO.	4. The technologies under it are WiMAX, Lte.
5. It based on high capacity broadband data.	5. It is completely based on Internet Protocol.
6. It has data bandwidth of 2Mbps.	6. It has data bandwidth of 200Mbps.
7. It has bandwidth of 5-10 Mbps.	7. Flexible bandwidth.
8. The spectral efficiency ranges from 1-5 Mhz.	8. The spectral efficiency could be 20 Mhz.
9. Costly in implementation.	9. Low cost than 3G.
10. The data throughput is up to 3.1Mbps.	10. The data throughput practically is 3-5Mbps and potentially it is 100-300 Mbps.
11. It has a peak upload rate of 5 Mbps.	11. It has a peak upload rate of 500 Mbps.
12. The peak download rate is 100 Mbps.	12. The peak download rate is 1 Gbps.
13. It supports packet switching.	13. It supports packet as well as message switching.
14. Its network architecture is wide area cell based.	14. Its network architecture is integration of wireless LAN and wide area network.
15. It uses turbo codes for error correction.	15. It uses concatenated codes for error correction.
16. It has frequency band of 1.8-2.5 GHz.	16. It has frequency band of 2-8 GHz.
17. It provides video access to the user.	17. It provides HD video access to the users.
18. No virtual presence.	18. Virtual presence is also possible.
19. It provides digital navigation.	19. It provides virtual navigation.

III. Conclusion

There are many complex and interdependent moving parts that must work together before a standard definition of 4G is solidified. The benefits to service providers and end users drive the adoption of 3G services that, in turn, lead to the demand for even more advanced services. The realization of 4G minimizes the distance between wireless and wire line services, a challenging endeavor. At last it can be said that constant need of technology was the cause of 4G technology birth and development but 4G can be improved by providing it gigabyte speed and using its backhauling networks as backhauling backbone networks for upcoming generation technology.

Cellular Generations

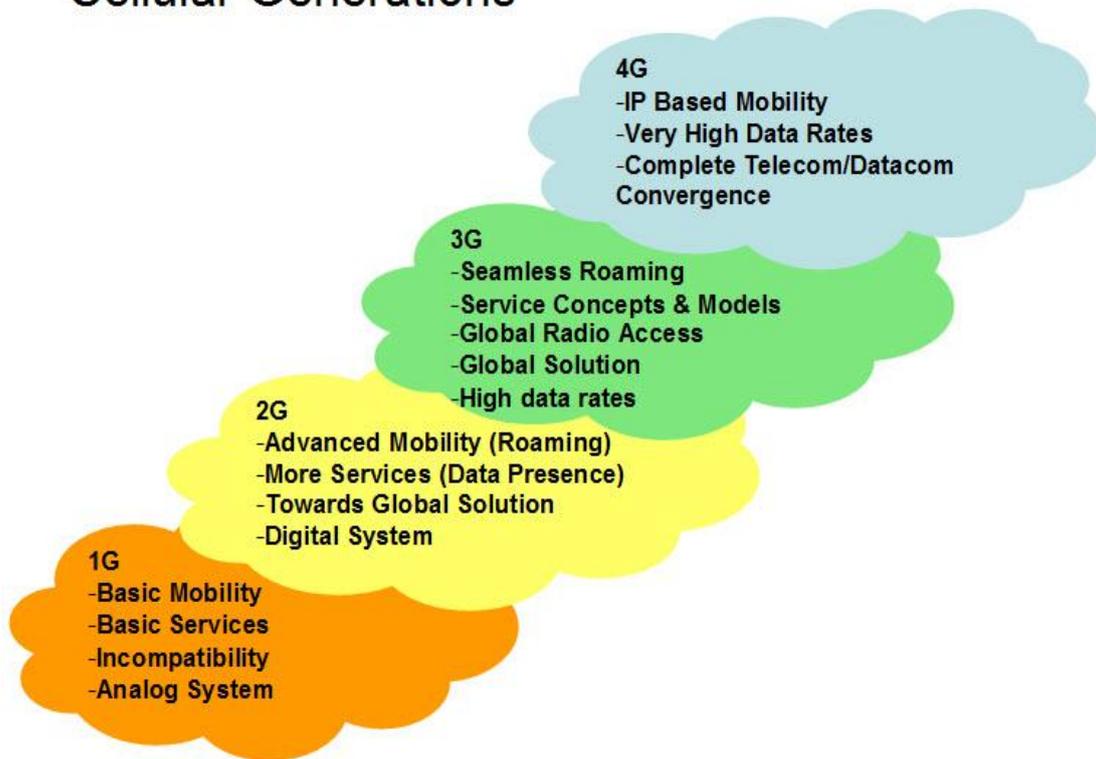


Fig.1. Cellular Generations

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