



All About 4G

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ABSTRACT

Mobile wireless industry has started its technology creation, revolution and evolution since early 1970s. In the past few decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution, namely from 0G to 4G. The cellular concept was introduced in the 1G technology which made the large scale mobile wireless communication possible. Digital communication has replaced the analog technology in the 2G which significantly improved the wireless communication quality. Data communication, in addition to the voice communication, has been the main focus in the 3G technologies and a converged network for both voice and data communication is emerging. With continued R&D, there are many killer application opportunities for the 4G as well as technological challenges.

KEYWORDS : GPRS, IPV6, LTE, VoIP, Wireless Technologies.

INTRODUCTION

Cellular communication has brought in an unparalleled revolution in the field of communication during the past two decades. The mobile communication industry growth has surpassed growth of all other fields. 3G system has been introduced in line with other countries. Talks have started about 4G/ 5G. The implementation of 4G /5G will most probably be the ultimate goal in the field of communication. 4G can be best described in one word "MAGIC", which stands for Mobile multimedia Anytime Anywhere Global mobility support, integrated wireless and personalized services 4G, short for fourth-generation wireless communication systems, has engaged the attention of wireless operators, equipment makers (OEMs), investors, and industry watchers around the world. 4G refers to the next generation of wireless technology that promises higher data rates and expanded multimedia services. The flexibility of 4G technologies to be used in combination with GSM and CDMA has provided it an edge over other technologies. The digital cameras attached in smart phones can be used to establish video blogs in scattered geographical regions. This gives the manufactures the opportunity to produce more affordable user friendly 4G compatible devices. Currently marketed technologies such as LTE (Long Term Evolution) and WiMAX have been around for a few years and are being marketed as 4G whilst not meeting the requirements set by the ITU. It was recently announced that these services could continue to be marketed as 4G as they are precursors to the IMT-Advanced. The ITU has recognised two standards that are planned to meet the 4G IMT-Advanced requirements put forward by the two groups, 3GPP and IEEE. Still 4G is not clearly defined or documented anywhere what are the basic requirements to build 4G wireless technology, like 3G is clearly defined in IMT-2000. IMT-Advanced is the closest where some of the 4G requirements can be found. For supporting **high data rate** and **high mobility** in fast moving car (60kilometers/hours) or fast moving trains (250 km/hr) and it is predicted that the new potential wireless system will support 100 Mbps on mobility and 1 Gbps approximately on without mobility at **lower cost**.

EVOLUTION OF 4G TECHNOLOGY

In order to make smooth transition from 3G to 4G the mobile communication companies are promoting Super 3G/LTE. The 3G provides packet and voice services separately where as Super 3G is based on ALL-IP network covering both packet and voice services. As from diagram we can infer that by the 2010 we would be able to achieve the 1 Gbps in motion at low speed and 100 Mbps at high speed. On December 25, 2006, **NTT DOCOMO** became the first in the world to achieve a packet signal speed of **5 Gbps** in an outdoor test in a low-speed environment (10 km/h). The test was undertaken to demonstrate the expected maximum transmission speed in an actual cell environment, taking into account interference from

peripheral cells. We are steadily approaching towards 4G wireless technologies by upgrading the current 3G technology by increasing the data rate speed and by reducing the cost of transmission which is the main objective of 4G wireless technology.

4G TECHNOLOGY FEATURES

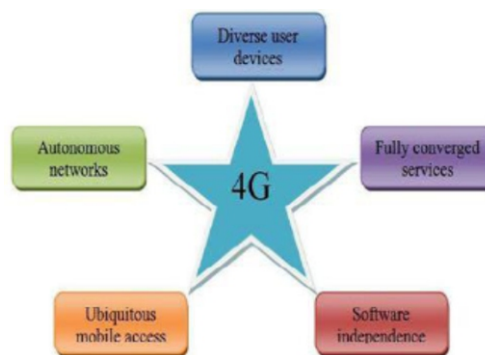


Fig-1: 4G services

Incomparable Speed: The majority of internet users choose a particular ISP over another because of the speed it offers. Even though I've used some slow and frustrating internet connections before I've also used a lot of super fast internet connections and I'm a great fan of the 3G technology. With all I've read so far the 4G mobile internet technology will be at least 10 times faster than the 3G mobile internet technology and that alone is enough speed than any individual will need.

Advanced Security: One thing about most forms of broadband internet technology despite their great speed is their security weakness. A lot of them have one or two features that make them highly vulnerable and even though the 4G internet technology is not perfect when it comes to security it has been designed in a way that makes it cover the weakness of other technologies. If you're an internet user concerned a lot about security, with 4G, you really have no need to worry.

Reliability and Effectiveness Irrespective of the Weather Condition: The final thing I love the most about the 4G mobile internet technology is how reliable it is and also the fact that it isn't affected by the weather. It can be really frustrating to be enjoying your broadband internet connection only to start experiencing problems due to harsh weather conditions. The 4G technology addresses all these and it won't in any way be affected by the weather.

Transfer Rate: One of the things that changes from each generation of computers to the next is the speed at which they can transfer and process data. For instance, a third generation computer and computer network could transfer data up to 2 megabits per second. Fourth generation computers improved on that speed, with the ability to transfer data at up to 100 megabits per second. This higher bandwidth sets these two generations apart from previous ones, which could barely transfer data fast enough for streaming video.

Wireless Technology: 3G and 4G computers and computer networks are some of the first to offer truly wireless capabilities. Wireless Internet works off of radio signals, the same kind used by cell phones. 3G computers have the ability to use and receive these wireless signals and thus you can make calls over a 3G computer or you can use wireless Internet. 4G computers and their networks take this further, adding power to the amount of data that can be transferred and the additional reception that 4G systems can provide.

APPLICATIONS OF 4G

Enhanced Mobile Gaming Experience enhanced wireless capabilities that deliver mobile gaming interaction with latency less than five milliseconds. Play online multiplayer games while traveling at high speeds or sitting outside. Personal Media Repository Create a personal media repository that can be accessed from home and on the road to view photos, watch movies and listen to your personal music collection. Virtual Presence Use hologram-generating virtual reality programs that provide an artificial presence just about anywhere. For example, decide if you want to personally respond when someone rings your front door while you are away from home. Broadband Access in Remote Locations 4G networks will provide a wireless alternative for broadband access to residential and business customers. In addition, 4G will provide the first opportunity for broadband access in remote locations without an infrastructure to support cable or DSL access.

higher rate as compare to the 2.5G. As data traffic has tremendous growth potential, under 4G existing voice centric telecom hierarchies will be moving flat IP architecture where, base stations will be directly connected to media gateways. 5G will offer even more flat architecture by using advanced semiconductor technologies as 22mN CMOS. 5G will promote concept of super core, where all the network operators will be connected one single core and have one single infrastructure, regard less of their technologies.

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Table-1: Comparative Study of 3G and 4G

Requirement : Architecture	3G(Including 2.5)	4G
Data Elements	voice driven.	Converged data and voice over IP
Network Arch	Wide area cell-based	Hybrid: Integration of wireless LAN
Speed	384 Kbps to 2 Mbps	20 to 100 Mbps in mobile mode.
Frequency	1800-2400 MHz	2-8 GHz
Bandwidth	5-20 MHz	100 MHz (or more)
Switching	Circuit and Packet	Digitally packetized voice
Access Tech.	WCDMA, 1xRTT	OFDM and MC-CDMA
Forward Error Correction	Convolution rate 1/2, 1/3	Concatenated coding scheme
Component Design	Optimized antenna design, multi-band adapters	Smarter Antennas, Software, multiband and wideband radios
IP	A number of air link protocols, IP 5.0	All IP (IPv6)

CONCLUSION

There has been constant development in the cellular as we have seen in 2G technology to 3G technology which includes GSM, GPRS, EDGE, CDMA, CDMA200, HSPDA, WiMAX etc. 2G only supports the voice communicate and 2.5G supports voice and data communication and 3G supports voice and data communication but at