LONG TERM EVOLUTION(4G) - A Generation Gallop Technology

Earlier, downloading a large file used to take 30 minutes to a couple of hours depending on the broadband speed. Now the same task is possible in few minutes time even while on travel! The LTE (Long Term Evolution or 4G) has made this possible with its lightning fast Internet capabilities.

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4G is the fourth generation of cell phone mobile communication standards. A successor of the third generation (3G) standards, 4G system provides mobile ultra-broadband Internet access to laptops with USB wireless modems, smart phones and to other latest mobile devices. Applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing and 3D television.

The Mobile WiMAX standard and the first-release of Long Term Evolution (LTE) standard (since 2009 in Scandinavia) have launched products in their respective countries. In the U.S., Sprint Nextel has deployed Mobile WiMAX networks since 2008 and Metro PCS was the first operator to offer LTE service in 2010. USB wireless modems have been available since the start, while WiMAX smart phones have been available since 2010 and LTE smart phones since 2011. Equipments made for different continents are not always compatible because of different frequency bands. At present, Mobile WiMAX and LTE smart phones are not available in the European market.

The generations refers to a change in the fundamental nature of the service, non-backwards-compatible transmission technology, higher peak bit rates, new frequency bands, wider channel frequency bandwidth in Hertz, and higher capacity for many simultaneous data transfers (higher system spectral efficiency in bit/second/hertz/site).

In every ten years, new mobile generations have appeared since the first move from analog (1G) in 1981 to digital (2G) transmission in 1992. This was followed in 2001 by 3G multi-media support, spread spectrum transmission with at least 200 kbit/s peak bit rate in 2011/2012, expected to be followed by "real" 4G. Real 4G refers to all Internet Protocol (IP) packet-switched networks giving mobile ultra-broadband (gigabit speed) access.

In 2G, the Second Generation of communication technology, telephones moved from fixed to wireless. In India, within a few years of its launch, mobile phones became the standard device of communication. Currently, India has 94.3 crore mobile subscribers, while the number of landline phone subscribers is around 3.23 crores. Voice and text messages are the primary services offered in 2G, with a limited Internet surfing. While the International Telecommunications Union has adopted recommendations for technologies that would be used for future global communications, they do not actually perform the standardization or development work themselves and rely on the work of other standards bodies such as IEEE, The WiMAX Forum and 3G.

In mid 1990s, ITU-R standardization organization asked for IMT-2000 requirements as a framework, considered 3G systems, requiring 200 kbit/s peak bit rate. In 2008, International Mobile Telecommunications Advanced requirements for 4G systems were specified by ITU-R. The fastest

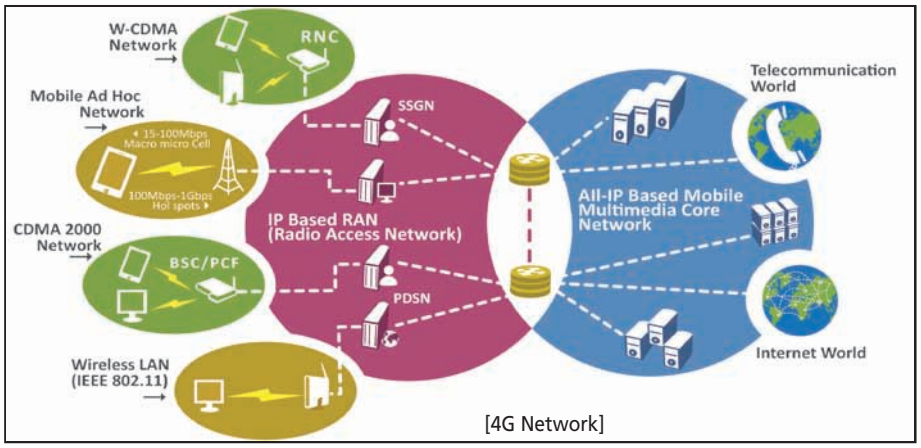
3G-based standard in the UMTS family is the HSPA+ standard, which was commercially available in 2009 and offers 28 Mbit/s downstream (22 Mbit/s upstream) accelerated up to 42 Mbit/s peak bit rate downstream. In theory, 672 Mbit/s is possible, but still not deployed. The fastest 3G-based standard in the CDMA2000 family was available in 2010 offering 15.67 Mbit/s downstream.

Then came 3G or Third Generation, where data transfer became the primary service. It offers data download at greater speed along with services such as mobile payment, mobile banking and video-on-demand. While 2G offers a data transfer speed of 128 Kbps, in 3G it is up to 10 Mbps.

The concerns of 3G spectra getting crowded with increasing data traffic led to the formation of a new technology. Thus, the Fourth Generation of communication had been conceptualized and in March 2008, a standard definition of 4G was formed. The International Telecommunications Union-Radio Communications Sector (ITU-R) defined Internet speed to be considered for 4G as 100 Mbps for high mobility, such as train or car, and 1 Gbps for static users.

LTE had been developed over a long time, hence the name. It is now the fastest and most advanced wireless technology available. LTE enables access to rich content services like high definition video streaming and HD video conferencing.

India, which has 1.35 crore broadband subscribers and 94 crore mobile subscribers has huge potential for super fast mobile broadband. According to industry estimates, by 2016, about 6 percent of all mobiles will have 4G connection, which will account for 36 percent of the total mobile data traffic.



[4G Network]

DATA SPEED OF LTE

Peak download	**100 Mbit/s**
Peak upload	**50 Mbit/s**

The migration to 4G standards incorporates elements of many early technologies and often you will read about solutions that use Code (a cipher), frequency or time as the basis of multiplexing the spectrum more efficiently. While spectrum is considered finite, Cooper's Law has shown that we have developed more efficient ways of using spectrum.

IPV6 SUPPORT

Unlike 3G, which is based on two parallel infrastructures consisting of circuit switched and packet switched network nodes respectively, 4G will be based on packet switching only. This will require low-latency data transmission. By the time that 4G was deployed, the process of IPv4 address exhaustion was expected to be in its final stages. Therefore, in the context of 4G, IPv6 support is essential to support a large number of wireless-enabled devices. By increasing the number of IP addresses, IPv6 removes the need for NAT, a method of sharing a limited number of addresses among a larger group of devices, although NAT will still be required to communicate with devices that are on existing IPv4 networks.

4G MOBILE SYSTEMS

4G mobile systems dictate entirely new approaches and novel infrastructure solutions to seamlessly integrate the existing wireless technologies including wireless broadband, 802.16e, CDMA, wireless LAN, Bluetooth etc.

KEY FEATURES OF 4G MOBILE

- All IP based heterogeneous networks that allow users to use any system at anytime and anywhere.
- Provide end-users with high-speed, large volume, good quality, global coverage, and flexibility to roam between different types of technologies.
- Provide high-data-rate services to accommodate numerous multimedia applications such as video conferencing, online games etc.

CHALLENGES IN MIGRATION TO 4G

- Seamless Mobility
- Vertical Handoff
- QoS Support
- Multimode User Terminals
- Wireless System Discovery/Selection

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