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A Review on growth of 4g technology

[1]Priyanka girdhar, Research Scholar, Department of ECE, IIET
[2]Kapil Sachdeva, Assistant professor , Department of ECE, IIET

ABSTRACT : 4G means **fourth generation**. It is fourth generation of mobile telecommunications technology, succeeding 3G. A 4G system must provide capabilities defined by ITU in IMT Advanced. Potential & current applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, 3D television, & cloud computing.Two 4G candidate systems are commercially deployed: Mobile WiMAX standard first used in South Korea in 2007, & first-release Long Term Evolution (LTE) standard . This has however been debated if these first-release versions should be considered to be 4G or not, as discussed in technical definition section below.In United States, Sprint (previously Clearwire) has deployed Mobile WiMAX networks since 2008, while MetroPCS became first operator to offer LTE service in 2010. USB wireless modems were among first devices able to access these networks, with WiMAX smartphones becoming available during 2010, & LTE smartphones arriving in 2011. 3G & 4G equipment made for other continents are not always compatible because of different frequency bands. Mobile WiMAX is not available for European market as of April 2012.

1. INTRODUCTION TO WIRELESS COMMUNICATION

Wireless communication is transfer of information between two or more points that are not connected by an electrical conductor. most common wireless technologies use radio. With radio waves distances may be short, such as a few meters for television or as far as thousands or even millions of kilometers for deep-space radio communications. This encompasses various types of fixed, mobile, & portable applications, including two-way radios, cellular telephones, personal digital assistants (PDAs), & wireless networking. Other examples of applications of radio *wireless technology* include GPS units, garage door openers, wireless computer mice, keyboards & headsets, headphones, radio receivers, satellite television, broadcast television & cordless telephones. Somewhat less common methods of achieving wireless communications include use of other electromagnetic wireless technologies, such as light, magnetic, or electric fields or use of sound.

The term *wireless* has been used twice in communications history, with slightly different meaning. This was initially used from about 1890 for first radio transmitting & receiving technology, as in *wireless telegraphy*, until new word *radio* replaced This around 1920. Term was revived in 1980s & 1990s mainly to distinguish digital devices that communicate without wires, such as examples listed in previous paragraph, from those that require wires. This is its primary usage today.

LTE, LTE-Advanced, Wi-Fi, Bluetooth are some of most common modern wireless technologies.

All modern techniques such as 802.11ac, LTE & 60GHz rely on combining multiple channels across frequencies & spatial paths & processing multiple channels at once is an ideal task for today's massively-parallel giga-transistor chip architectures.

G stands for Generation, as in next generation of wireless technologies. Each generation is supposedly faster, more secure & more reliable. Reliability factor is hardest obstacle to overcome.

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1G was not used to identify wireless technology until 2G, or second generation, was released. That was a major jump in technology when wireless networks went from analog to digital. It's all uphill from there. 3G came along & offered faster data transfer speeds, at least 200 kilobits per second, for multi-media use & was a long time standard for wireless transmissions regardless of what you heard on all those commercials.

Meaning of G

Each of Generations has standards that must be met to officially use G terminology. Those standards are set by, you know, those people that set standards. Standards themselves are quite confusing but advertisers sure know how to manipulate them.

1G – A term never widely used until 2G was available. This was first generation of cell phone technology. Simple phone calls were all This was able to do.

2G – second generation of cell phone transmission. A few more features were added to menu such as simple text messaging.

3G – This generation set standards for most of wireless technology we have come to know. Web browsing, email, video downloading, picture sharing & other Smartphone technology were introduced in third generation. 3G should be capable of handling around 2Mbps.

4G – speed & standards of this technology of wireless needs to be at least 100 Megabits per second & up to 1 Gigabit per second to pass as 4G. This also needs to share network resources to support more simultaneous connections on cell. As This develops, 4G could surpass speed of average wireless broadband home Internet connection. Few devices were capable of full throttle when technology was first released. Coverage of true 4G was limited to large metropolitan areas. Outside of covered areas, 4G phones regressed to 3G standards. When 4G first became available, This was simply a little faster than 3G. 4G is not same as 4G LTE which is very close to meeting criteria of standards.

The major wireless networks were not actually lying to anyone when 4G first rolled out, they simply stretched truth a bit. A 4G phone had to comply with standards but finding network resources to fulfill true standard was difficult. You were buying 4G capable devices before networks were capable of delivering true 4G to device. Your brain knows that 4G is faster than 3G so you pay price for extra speed. Marketing 101. same will probably be true when 5G hits markets.

4G LTE– Long Term Evolution – LTE sounds better. This buzzword is a version of 4G that is fast becoming latest advertised technology & is getting very close to speeds needed as standards are set. When you start hearing about LTE Advanced, then we will be talking about true fourth generation wireless technologies because they are only two formats realized by International Telecommunications Union as True 4G at this time. But forget about that because 5G is coming soon to a phone near you. Then there is XLTE which is a bandwidth charger with a minimum of double bandwidth of 4G LTE & is available anywhere AWS spectrum is initiated.

Verizon, T-Mobile & Sprint have all advanced to LTE technology with each carrier adding their own combination of wireless technologies to enhance spectrum

2. HISTORICAL EVOLUTION

History of G

The first cell phones could barely keep a call connected let alone send a text message & now we are streaming content across wireless spectrum while cruising web & talking to friends. A long way indeed. Where does it go from here & will

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wireless spectrum stand up to test? We will soon find out.

2G Rises to Challenge

When smart phones were first introduced, there was no texting as well as undoubtedly horrible connections. Then came 2G or 2nd Generation networks as well as by having them came capability to transfer & get information, although velocities were actually sluggish - 9.6 kb|s - slower than old, screechy, modems that we used to utilize in early days of Internet. Slowly technological innovation strengthened & information rates were raised, by having latter types of 2G getting to speeds of about 56kb|s & we thought that was fast!

3G is Introduced

3G or 3rd Generation of mobile technology innovations took us by storm with speeds of about 4 times quicker than old 2G standards. With initial speeds of around 200kb|s & steady transformation of technological innovations saw maximum speeds of up to 7.2 Mb|s & we were awed by things that could be accomplished. latter speeds were just numbers because highest rates were not achievable unless you were in right spot at right time. Still quite an improvement.

Currently 4th Generation technologies are being presented around world & devices are being made available that may enjoy this brand-new mobile advancement in speeds & reliability.

However exactly what is 4G?

4G or 4th Generation Mobile standards is a series of measures that defines demands of a 4G network & also standards that must be met. existing common standard specifies a 4G network as one that offers 100Mb|s for individuals on move as well as which supplies 1Gb|s to an immobile location or one shifting at a slow-moving speed, or standing still in that perfect spot for instance. There are many variable involved that profusely degenerates speed that you will actually be capable of utilizing.

Yes there are 4G devices available that may take advantage of high speed networks being built but that network has a long way to go before most of us realize true potential. term 4G is being thrown around a lot but true 4G is not widely recognized. 4G is faster than 3G but it has to meet specifications of standards to be called true 4G. LTE is closest we have come to using a True Fourth Generation mobile technology.

The 4G system was originally envisioned by the Defense Advanced Research Projects Agency (DARPA). The DARPA selected the distributed architecture & end-to-end Internet protocol (IP), & believed at an early stage in peer-to-peer networking in which every mobile device would be both a transceiver & a router for other devices in the network, eliminating the spoke-and-hub weakness of 2G & 3G cellular systems. Since the 2.5G GPRS system, cellular systems have provided dual infrastructures: packet switched nodes for data services, & circuit switched nodes for voice calls. In 4G systems, the circuit-switched infrastructure is abandoned & only a packet-switched network is provided, while 2.5G & 3G systems require both packet-switched & circuit-switched network nodes, i.e. two infrastructures in parallel. This means that in 4G, traditional voice calls are replaced by IP telephony.

1. In 2002, the strategic vision for 4G — which ITU designated as IMT Advanced— was laid out.
2. In 2005, OFDMA transmission technology is chosen as candidate for the HSOPA downlink, later renamed 3GPP Long Term Evolution (LTE) air interface E-UTRA.
3. In November 2005, KT demonstrated mobile WiMAX service in Busan, South Korea.

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4. In April 2006, KT started the world's first commercial mobile WiMAX service in Seoul, South Korea.
5. In mid-2006, Sprint announced that it would invest about US$5 billion in a WiMAX technology buildout over the next few years ($5.87 billion in real terms). Since that time Sprint has faced many setbacks that have resulted in steep quarterly losses. On 7 May 2008, Sprint, Imagine, Google, Intel, Comcast, Bright House, & Time Warner announced a pooling of an average of 120 MHz of spectrum; Sprint merged its Xohm WiMAX division with Clearwire to form a company which will take the name "Clear".
6. In February 2007, the Japanese company NTT DoCoMo tested a 4G communication system prototype with 4×4 MIMO called VSF-OFCDM at 100 Mbit/s while moving, & 1 Gbit/s while stationary. NTT DoCoMo completed a trial in which they reached a maximum packet transmission rate of approximately 5 Gbit/s in the downlink with 12×12 MIMO using a 100 MHz frequency bandwidth while moving at 10 km/h, & is planning on releasing the first commercial network in 2010.
7. In September 2007, NTT Docomo demonstrated e-UTRA data rates of 200 Mbit/s with power consumption below 100 mW during the test.
8. In January 2008, a U.S. Federal Communications Commission (FCC) spectrum auction for the 700 MHz former analog TV frequencies began. As a result, the biggest share of the spectrum went to Verizon Wireless & the next biggest to AT&T. Both of these companies have stated their intention of supporting LTE.
9. In January 2008, EU commissioner Viviane Reding suggested re-allocation of 500–800 MHz spectrum for wireless communication, including WiMAX.
10. On 15 February 2008, Skyworks Solutions released a front-end module for e-UTRAN.
11. In November 2008, ITU-R established the detailed performance requirements of IMT-Advanced, by issuing a Circular Letter calling for candidate Radio Access Technologies (RATs) for IMT-Advanced.
12. In April 2008, just after receiving the circular letter, the 3GPP organized a workshop on IMT-Advanced where it was decided that LTE Advanced, an evolution of current LTE standard, will meet or even exceed IMT-Advanced requirements following the ITU-R agenda.
13. In April 2008, LG & Nortel demonstrated e-UTRA data rates of 50 Mbit/s while travelling at 110 km/h.
14. On 3 March 2009, Lithuania's LRTC announcing the first operational "4G" mobile WiMAX network in Baltic states.
15. In December 2009, Sprint began advertising "4G" service in selected cities in the United States, despite average download speeds of only 3–6 Mbit/s with peak speeds of 10 Mbit/s (not available in all markets)

3. Wireless services

1. Infrared & ultrasonic remote control devices
2. Professional Land Mobile Radio & Specialized Mobile Radio typically used by business, industrial & Public Safety entities.

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3. Consumer Two-way radio including FRS Family Radio Service, General Mobile Radio Service & Citizens band radios.
4. The Amateur Radio Service (Ham radio).
5. Consumer & professional Marine VHF radios.
6. Airband & radio navigation equipment used by aviators & air traffic control
7. Cellular telephones & pagers: provide connectivity for portable & mobile applications, both personal & business.
8. Global Positioning System (GPS): allows drivers of cars & trucks, captains of boats & ships, & pilots of aircraft to ascertain their location anywhere on earth.
9. Cordless computer peripherals: cordless mouse is a common example; wireless headphones, keyboards, & printers may also be linked to a computer via wireless using technology such as Wireless USB or Bluetooth
10. Cordless telephone sets: these are limited-range devices, not to be confused with cell phones.
11. Satellite television: Is broadcast from satellites in geostationary orbit. Typical services use direct broadcast satellite to provide multiple television channels to viewers.

4. APPLICATIONS OF WIRELESS TECHNOLOGY

Mobile telephones

One of best-known examples of wireless technology is mobile phone, also known as a cellular phone, with more than 4.6 billion mobile cellular subscriptions worldwide as of end of 2010. These wireless phones use radio waves from signal-transmission towers to enable their users to make phone calls from many locations worldwide. They may be used within range of mobile telephone site used to house equipment required to transmit & receive radio signals from these instruments.

Wireless data communications

Wireless data communications are an essential component of mobile computing. various available technologies differ in local availability, coverage range & performance, & in some circumstances, users must be able to employ multiple connection types & switch between them. To simplify experience for user, connection manager software may be used, or a mobile VPN deployed to handle multiple connections as a secure, single virtual network. Supporting technologies include:

Wi-Fi is a wireless local area network that enables portable computing devices to connect easily to Internet. Standardized as IEEE 802.11 a,b,g,n, Wi-Fi approaches speeds of some types of wired Ethernet. Wi-Fi has become de facto standard for access in private homes, within offices, & at public hotspots. Some businesses charge customers a monthly fee for service, while others have begun offering it for free in an effort to increase sales of their goods.

Cellular data service offers coverage within a range of 10-15 miles from nearest cell site. Speeds have increased as technologies have evolved, from earlier technologies such as GSM, CDMA & GPRS, to 3G networks such as W-CDMA, EDGE or CDMA2000.

Mobile Satellite Communications may be used where other wireless connections are unavailable, such as in largely rural areas or remote locations. Satellite communications are especially important

for transportation, aviation, maritime & military use.

Wireless Sensor Networks are responsible for sensing noise, interference, & activity in data collection networks. This allows us to detect relevant quantities, monitor & collect data, formulate clear user displays, & to perform decision-making functions.

5. OBJECTIVE OF RESEARCH

The main objective of research is as follow:

1. Highlighting the role of 4G in recent communication Technology
2. Studying existing wireless communication technology
3. Comparison of data transmission speed in case of of 2G,3G,4GTechnologies
4. Analyzing the limitation & benefits of 4G.

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