

A Review of 4G and 5G in Context of Future of Wireless Communication

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ABSTRACT

This paper includes the proper discussion of why the 3G was not good enough for the wireless communication and why then 4G was evolved. There are many disadvantages of 3G due to which 4G came. Some of them are they require nearby base stations and they are very expensive, the cost of up gradation of cellular infrastructures are very costly which is a very big drawback for 3G, where 4G is really good for business purpose. After that the idea of 5G was proposed which provides complete wireless communication with almost no limitation which makes it the most powerful source of communication till the date.

Index Terms

SDR technology, VOIP, IPv6, OFDM, MIMO, TDMA, OFDM, UWB, GSM.

1. INTRODUCTION

The wireless communication history, every generation of computers get advanced with new frequency bands, high data rates and non backwards compatible transmission technology. Here as we know 4G is a successor of 3G, i.e. 4G provides internet broadband in computer devices and other mobile devices. Some of the other features you use now are days are parts of it like High definition Mobile TV, Video conferencing, video calling, accessing mobile internet, IP Telephony (Voice Over Internet Protocol [VOIP] it is the group of technologies which is used to deliver the voice communication through the internet protocol). 4G can be categorised in two types –LTE(Long Term Evolution[first used in Norway, Oslo in 2009]), Mobile WiMAX(firstly used in South Korea in 2006). WiMAX was established after 2008. Other companies eventually deployed it. In programming scenario the 4G has developed high level programming languages. Programming languages often improves Evolutionary development of commercial software business as well as prototyping (model of some product built to test a concept or process to act as a Replica). It also includes higher abstraction and Statement power.

2. WHAT IS WIRELESS COMMUNICATION

Wireless communication basically means a linkage between two destinations by the means of radio waves. Wireless communications has always been a major benefit because it permits long range communication with ease. It works in an

unguided medium, which means absence of wires and other physical conductors. The term wireless came in to existence with respect to a basic receiver or transceiver establishing its commonness among the users in the workplace. Today it is referred to as the Modern Wireless Communications with the different mediums.

Wireless communication is distinguished in two types:

- Cellular networks: setting a mobile communication through voice conversations and various tools issued for private and business use. The standards used in this kind of network are GSM, CDMA, and TDMA.
- Wireless Local Area Networks: with respect to the computer networks in workplace. The standardization of WLAN is IEEE 802.11

Wireless communications offers an advantageous approach such as simplicity and flexibility. It is much more reliable quicker, tends to get in higher data rates, better speed and its reach ability to the user. It is cost effective and always emerging with new technologies in the field. But wireless communications do have their Cons in existence with its practical disadvantages. There's a flaw of Security in the wireless communications, the data is unasserted. Apart from this, the other practical demerits are that wireless communications always has to uptight with the better technology. Also the waves that play a chief role in the wireless technology cause an impairment to the human bodies. But still wireless communications comes with a dominant importance in today's world.

The large-scale applications for wireless communication are

- Wi-Fi connectivity
- Bluetooth- for setting a short range connectivity.
- Infrared- connectivity through electromagnetic waves via remote systems or devices.
- Wireless communications acts as an essential use in the coming generations of mobile computing.

3. TECHNOLOGIES USED

Technologies used:

3.1 IPv6

IPv6 supports a large number of wireless enable devices. It removes the need of Network Address Translation (NAT) due to increase in number of ip addresses. It also enables multicast security and route optimisation capabilities and for a number of applications.

3.2 VOIP(Voice Over Internet Protocol)

VOIP can only transfer IP packets which eliminate two protocol complexities on a same circuit. It provides lower latency transmission of voice data because it is wrapped up in a packet. Due to greater data compression it increases battery life

3.3 OFDM (Orthogonal Frequency Division Multiplexing)

The design of the transmitter and the receiver is simplified. Transfer of data is more as compared to other forms of multiplexing .There is no gap in the frequency bandwidth but need to prevent interference .It sends multiples signal from the same antenna to one device at the same time .There is no cross talk between the signals.

3.4 SDR(Software Radio)Technology Defined

It is one of the types of open wireless architecture. It is a radio communication system in which those components are implemented by the software that is difficult to implement on hardware (e.g. mixers, filters, amplifiers, detectors etc).

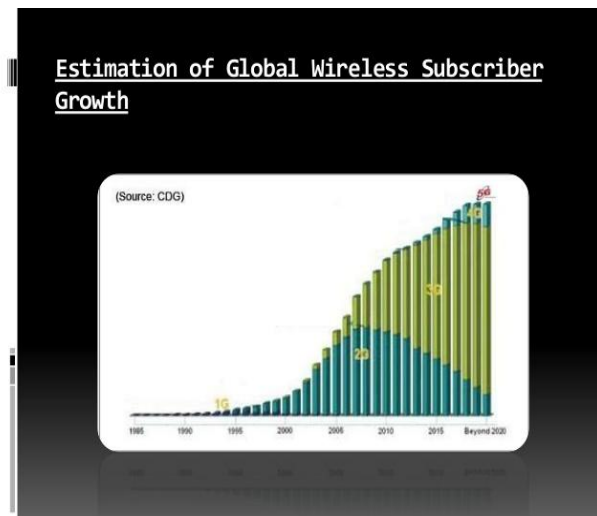


fig 1.1:estimate of global wireless growth

3.5 UWB (Ultra Wide Band)

It provides higher bandwidth with lower energy bands .This technology is used in both 4G and 5G ,also detected as noise in both 4G and5G .The radio frequency devices which are currently in use can use frequency spectrum(frequency use 3.1 to 10.6GHz).It transmits pulse instead of continuous signals .therefore it uses less power.

4. GENERATION OF MOBILES

The generations in mobile communications have played a hefty role in emerging technologies. The various generations of mobiles have been discussed below.

4.1 1G (first generation)

The preliminary 1G phones technology was released during the 1980's in US. They were based on the analog radio signals, basically larger in size with a broad rigid structure. Their properties were Basic voice services and providing a speed of just 7 KBPS. E.g. AMPS (analog modulation physical system)

4.2 2G (second generation)

The 2G technology was released in Finland in 1991. They carried a digital technology which served utilities like text messaging and internet access. It also served a good data rate of 10 to 256 KBPS. 2G networks had an improved coverage and capacity. e.g. GSM, CDMA.

4.3 3G (third generation)

Japan released the 3G network in 2001. The devices with 3G were able to the browsing of Web at higher speeds and also enabling a simultaneous task like receiving phone calls while browsing. it provides video conferencing and mobile TV. 3G networks are said to be in International Mobile Telecommunication-2000 (IMT 2000). It provided an appreciable Data rate of 2MBPS. 3G is enabled with the first mobile broadband.

4.4 4G (fourth generation)

4G is introduced in for an appreciable browsing experience and drastic speeds reaching speeds up to 6MBPS. It is enabled with LTE an IP-based protocol and also with 802.16m standardized by the IEEE (i.e. WIMAX)



Fig:1.2:features of all the generations .

5. WHAT IS 4G

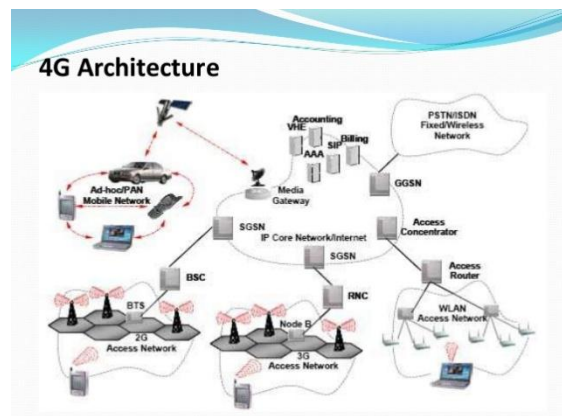


Fig 1.3:Architecture of 4G

In the year 2009 the technology of 4g was proposed to ITU .They basically propose two ideas:

- 1 .LTE Advanced standardised by the 3GPP.
- 2.802.16m standardized by the IEEE (i.e. WiMAX)
 - (WiMAX: Wireless Mobile Access, the standard designed to provide 30 to 40 mbps with 1Gbits/s update for fixed station.).see in fig 1.3.

There are various features of 4g like, Mobile multimedia; it can be used any time anywhere, Global mobility support, integrated wireless system, Customized Personal service. (MAGIC).It is also a source of entertainment. It has high speed data rate, the download speed is up to 400 mbps and 1 GB up to for stationary uses, It can ease to download movies in few minutes. It uses packet switching instead of circuit switching. Comprehensive ip solutions will be taken from this technology where voice and data and multimedia can be given to a user on an “Any time ,Anywhere “.It provide high mobile and TV resolution .Its bandwidth is almost about 100 MHz It is a combination of Wi-Fi and Wimax. Due to substantial growth in number of subscribers 4g is required. Massive demand of new services also leads to evolving of 4g technology. It offers to reduce the number of technologies to single global standard. It fulfils the goal of personal computing and communication. In 4g model with different access technologies combine on a common platform. It increases the position of ADSL and Optical fibre access system and office home LANs. It provides network services ALL –IP network. IMT Advanced requirements.

1. MERITS AND DEMERITS OF 4G

Merits: It has a lot of space then you need. It has higher bandwidth, better response time & better coverage. It uses the same tower where the sender and receiver and transmitter for 3g is. Less time to built the 4g ,its uses the same tower and same fibre optic cables as 3g.They just have to upgrade the tower with 4g components .Higher speed in the new mobile applications, with the help of LTE .LTE decrease the traffic of communication in terms of sending data.LTE separates frequencies into different channels in order to protect the disturbance of each channel, the solution is called “ORTHOGONAL”.LTE supports more data capacity because it focuses in VoIP(Voice Over Internet Protocol).LTE can also supports voice and SMS(Short Message Service)text messaging using existing network via generic access(VoLGA).

Demerits: Up gradation of equipments are high, we equipments will be needed to install. Need to use additional antennas at network base stations for data transmissions. So, network upgrades need to use new cell phones to make use of new network infrastructures. Carriers and providers have to plan carefully to make sure that the expenses are kept realistic. In case of advanced mobile data applications, it's not possible to offer full internet due to limited speed and bandwidth. It has to improve its user interfaces.

6. WHAT IS 5G

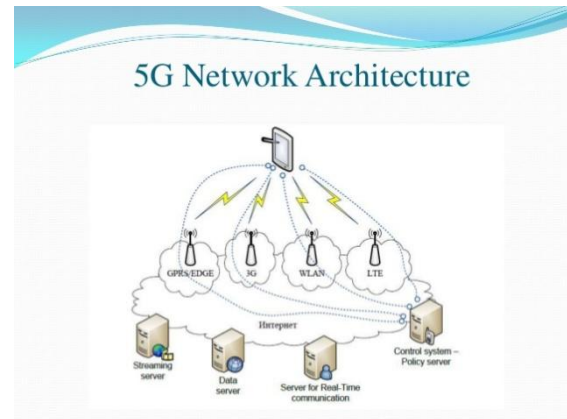


Fig:1.4 : architecture of 5G.

Its concept is only theory not real .It is going to be the new revolution in mobile market. It's just the real wireless world with almost no limitation related to access & zone issues. It has wearable devices with AI capabilities. It is the unified global standard it has unparalleled consistency transporter class gateway. It usually support virtual private network. It provides very high bi-directional bandwidth shaping and very high resolution for cell phone. For fast action it provide subscriber supervision tools. It covers wide coverage with high throughput & uses a packet switched wireless system. Data transfer rate is about 1gbps between two points in the world. Interactive multimedia, voice, streaming video, internet, &other broadband services, more effective & more attractive, bi-directional, accurate traffic statics supported by 5G technology. It provides global access, service portability & scalable mobile services. Flexible platform can serve by 5G technology. IT has more capacity than others about 10 times high. It almost provides connectivity speed of 25 mbps. New concept of multi-path data path introduced in this technology. It' s vision is to make real wireless world .integration of networks required in5G.It usually support CDMA, OFDM, MCCDMA, UWB & IPv6.It has an extraordinary capability to support software & consultancy. It has a great feature called remote diagnostics. It has ubiquitous computing provided by pervasive networks .It is a stratospheric platform station (HAPS) system with high altitude.

1. MERITS AND DEMERITS OF 5G

Merits: It has high speed, capacity and low cost per bit. It can give global access, service portability and scalable mobile services, less traffic and high resolutions for crazy cell phone users, uploading and downloading speed is up to 1Gbps.It can serve flexible platform.

Demerits: This technology is not yet developed, that is why no demerits have been discovered yet.

7. APPLICATION OF 4G & 5G

7.1 E-commerce- helps E-commerce engine, online payment, and courier system integrated in one site.

7.2 Business /Work-extend your office works to your phone, your car or to your belt.

7.3 Private life - Movies download, various search engines.

7.4 Vehical- 8.2 4G and public safety, Intelligence transportation system (ITS) helps technologies information process, control and electronics, will mitigate future collaborations.

7.5 Public places- Providing guide lines to certain places, showroom nearby, Provide anywhere anytime police security connection thorough 4g.

7.6 Education and Entertainment- Smart classes-learning, online gaming.

7.7 Ringing your mobile according to your mood, as well as hold you're mobile as u desire.

7.8 Visualize planets and universe live.

7.9 Get alert from your mobile when someone is trying to open your intelligent car illegally.

7.10 It is media independent handover. Manages radio resource.

8. FUTURE WORK

Telemedicine-rapidly developing new application in clinical medicines in which we may transfers prescriptions ,remote medicine procedure, and other networks for consulting purpose, or remote medical examination .To make it easy to understand we give an example like two doctors discussing a case through satellite communication ,these new techniques have helped the modern telecommunication .Pervasive networks have wireless sensor networks ,and ubiquitous computers ,because of this the user can connect to any of these networks and move according to requirement among them. Also added multi homing applications .Massive Dense Networks/Massive Distributed MIMO .Use of millimetre wave frequency has also been used for wireless backhaul and access. Cognitive radio technology also known as smart radio allows same spectrum to be used by different radios technologies. Here Radio resource management has been used in distributed form which in result release software defined radio. (Wireless Regional Area Networks).

South Koreans Ministry of Science Education &Technology (MEST) has declared to spend millions for 5g network to develop which would be faster that 4g LTE. Trails of service would be developed through 2017 and commercially this generation of network would be available till 2020.

One of the known companies Samsung performed the 5g test on may in 2013, when it said it had 1gbps signals.

9. CONCLUSION

The number of generations developed one by one and some of the features enhanced in them eventually, in every next generation which has lead to the growth and development of the society. Coming back to 4G it provides usual voice and transfer of other services in 3G and then it included internet broadband service along with every other service as a development in 4G.Then 5G totally is by its own a future scope technology and does not defines the number of services it would provide in future .

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