

Review Paper on 5G Technology

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Abstract— the objective of this paper is to comprehensively study the 5G technology of mobile communication. 5G stands for 5th generation mobile technology as it uses a very high bandwidth it likely to include all advanced features at it will become most dominant technology in year future in 2020. So this is the basic objective which gives the brief in sight of 5G technology.

Key words: 5G Evolution of Mobile Technology, 5G Architecture Nanotech Cloud Computing

I. INTRODUCTION

Mobile communication has seen a lot of changes in recent years. Cell phones today have everything in them. Ranging from largest phone memory to camera with the development of Piconet and Bluetooth technology data sharing has become a child play.

Most recognized benefit of 5G technology over 4G will be the latency and not the speed of delivery – which repeatedly could be between 10 GBPS and 100 GBPS. 4G provides latency between 40MS-60ms which is 10w but not enough to provide real time response on the other hand it is also predicted that 5G will provide ultra -10w latency that could have between 1ms -10ms.

- 5G introduces a whole new concept of multipath data path scheme for a real wireless world a complete www.
- It will promote concept of super core where all the network operators will be connected one single core and have one single infrastructure regardless of their access technologies.

- Voice only
 - Band width used was analog
 - Operating frequency 800 MHZ.
 - Career Frequency
 - 30 KHz
 - Simpler
- 2) *Limitations of 1G*
- Limited capacity
 - Low calling capacity
 - No room for spectrum growth
 - Minimum privacy

B. 2G

2G was technologies which used digital signals and are based on GSM. The main difference between 1G and 2 G is that former uses analogy signals were letter uses digital signals the 2G used TDMA, CDMA access the data speed up to 64 KBPS.

1) Features of 2G

- Made use of CODEC (compression and multiplex algorithm) to compress and multiplex digital voice data.
- It can handle more calls per amount of bandwidth.
- Safer for consumer to use.
- The battery life of handset last longer.
- SMS, Emails, Error Checking has improved sound quality

2) Limitations of 2G

- Demands strong digital signals to assist connection of mobile phones
- Unable to hold complex data such as videos

II. EVOLUTION OF MOBILE TECHNOLOGY

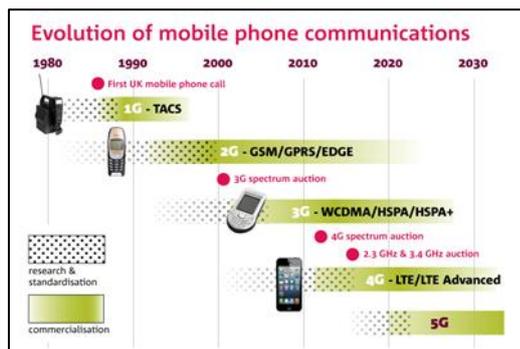


Fig. 1: Evolution of Mobile Technology

A. 1G

It refers to first generation mobile telecom and was first introduced in 1980's and continued till 1990. These networks used analog system for communication. These were simple voice only cellular phones; speed was up to 2.4 KBPS.

Technology which it used was AMPS, mobile phone system, NMT, TACS,

1) Features of 1G

- First wireless communication

III. 3G

It was established in 2000. As compared to 1G and 2G it provides highest speed of 144Kbps 2Mbps also non as mobile telecommunication of 2000.

1) Features of 3G

- Enhanced multimedia (Voice, data video and remote control)
- Usability on all popular models (cellular phone, e-mail, pagers, fax, video conferencing and web browsing)
- High speeds (upwards of 2Mbps)
- Bandwidth 5-20 Mbps
- Access WCDMA/CDMA 2000
- Frequency band 16-25 GHz
- Routing flexibility (Repeater, Satellite and LAN)
- Excellent quality of voice.

2) Limitation of 3G

- Expensive fees for 3G license services
- Big Size of Mobile Phone
- Expensive in nature
- Higher bandwidth requirements

IV. 4G

It is a packed switched wireless system with wide area coverage and high though put. It is designed to be cost effective and to provide high spectral efficiency. It provides data rate of 20Mbps. Mobiles speed will be up to 200 Km. the frequency band is 2-8GHz.

1) Features of 4G

- Support for Interactive multimedia
- Support for voice
- Support for streaming video
- High Speed
- High Capacity
- Low cost per bit
- Global Access
- Better spectral efficiency
- Service driver service

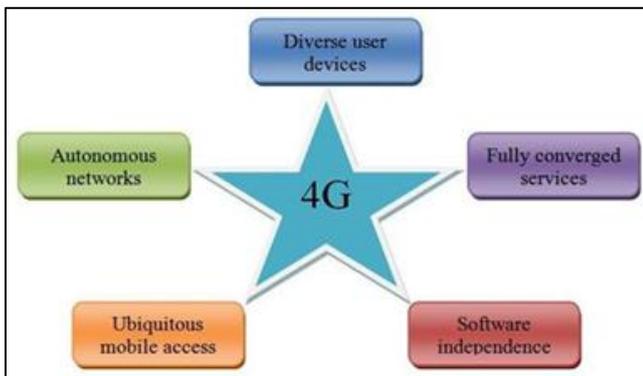


Fig. 2: 4G

2) Limitation of 4G

- Expensive and hard to implement
- Battery usage is more
- Needs complex hardware

V. 5G

5G refers to 5th generation of wireless mobile network which began in late 2010. It has almost no lamentations. This communication technology merges all enhanced benefits of mobile phone like dialing speed, MP3 recording, cloud storage, HD downloading in instant of second and much more that you had never imagined.

A. 5G Architecture

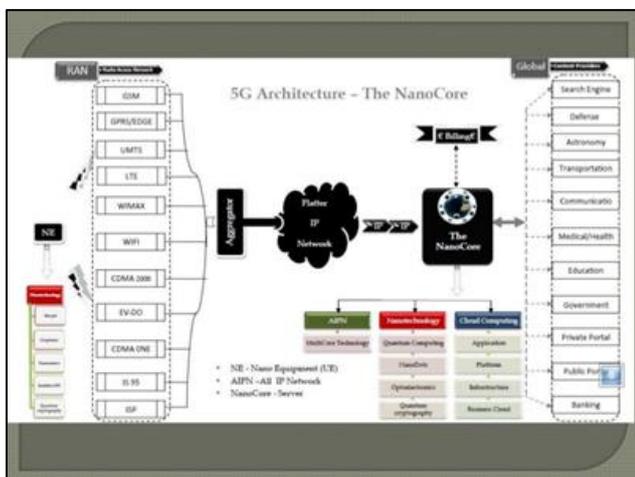


Fig. 3: 5G Architecture

Globalization is the latest offerings in today's world. Convergence in the technology is the main agenda of network systems for making it possible in the case of performing similar tasks. The simple explanation of the digitization of all media content. The words, sounds, image, etc will get transformed into digital information and we will be able to expand the potential relationships between them and thereby enabling them to flow across the platforms available and newly introduced ones.



Fig. 4: 5G

The 5G Noncore is a convergence of below mention technologies. These technologies have their own impact on exiting wireless network, which makes them in to 5G.

- Nanotechnology.
- Big size of Mobile phones
- Expensive in nature
- Higher bandwidth requirements
- cloud computing

1) Nanotechnology

The term nanotechnology was introduced in 1974 by norio taniguchi at the Tokyo International conference on production engineering. Nanotechnology is the next industrial revolution and the telecommunications industry will be radically transformed by it in a few years. Impact of nanotechnology has been on both mobile and on core network. Perfection in security and the better impact on the sensor makes the nanotechnology the most significant in its row. This is considered to be most significant in telecommunication.

Nanotechnology is the application of nano science to make the control process to a nano meter scale, which will be in between 0.1 and 100mm. this particular field is known as Molecular nano Technology (MNT). Atom-by-atom and molecule -by-molecule based control of the structure of matter. The telecommunication industry will radically get changed into the latest Nanotechnology in little year time.

2) Cloud Computing

Cloud computing uses the internet and central remote server to maintain data and application. In 5G networks this central

remote server will be our content provider. Cloud computing allows consumers and business to use application without installation and access. The same concept is going to be used in Nano core where the user tries to access his private account form a global content provider through Nanocore in form of cloud.

This could make our user to obtain much more real – time application to utilize his 5G network efficiently. 5G will add on the real time application through the Nanocore clouding.

Could computing have three segments as follows?

- Application
- Platform
- Infrastructure

a) Beam Division Multiple Access (BDMA) for 5G technology

BDMA (Beam Division Multiple Access) is the latest allocation technique in which an orthogonal beam is allocated to each mobile station. In this technique, an antenna beam will get divided and allocated into the locations of the mobile stations to provided multiple accesses and thereby increasing the capacity of the system. Science mobile stations and the base stations are in line of sight state, they can transmit beams, which directed to each other’s position for proper communication without making any kind of interference with cell edge mobile stations. When the mobile station, the base station will transmit the beams in such a way that different angles will be taken care. The working is like one mobile stations positioned at similar angles will keep on sharing the one beam to communicate with the base station; Mobile stations that are sharing the same beam will divide the same frequency or time resources and will use the orthogonal resources.

According to the mobile communication environment, a base station can change the direction, number and respective widths of the beams adaptively with most easiness. Three –dimensional mode of division will happen in the case of beams and hence a spatial reuse of frequency or time resources can be maximized. The first slot of communication is the base station and the mobile station does not know each other’s position. The mobile station will detect their positions and the moving speeds and will transmit the entire information to the base station. The second stage is taken care by the base station. The base station will calculate the direction along with the width of a downlink beam, which is based on the position and moving spend information received from the mobile station.

b) Important Advantage

There are several advantages of 5G technology, some of the advantages have been shown in the above ercsson image, and many other are described below-

- High resolution and bi-directional large bandwidth shaping.
- Technology to gather all networks on one platform.
- More effective and efficient.
- Technology to facilitate subscriber supervision tools for the quick action.
- Most likely, will provide a huge broadcasting data (In Gigabit), which will support more than 60,000 connections.
- Easily manageable with the previous generations.

- Technological sound to support heterogeneous service (including private network).
- Possible to provide uniform, uninterrupted, and consistent connectivity across the world.

Some other Advantages for the common people parallel multiple services, such as you can know weather and location while talking with other person.

You can control your PCs by handsets.

- Education will become easier- A student sitting in any part of world can attend the class.
- Medical Treatment will become easier & frugal- A doctor can treat the patient located in remote in part of the world.
- Monitoring will be easier- A governmental organization and investigating offers can monitor any part of the world. Possible to reduce the crime rate.
- Visualizing universe, galaxies, an planets will be possible.
- Possible to locate and search the missing person.
- Possible, natural disaster including tsunami, earthquake etc. can be detected faster.

B. Disadvantages of 5G Technology

Tough, 5G technology is researched and conceptualized to solve all radio signal problems and hardship of mobile world, but because of some security reason and lack of technological advancement in most of the geographic regions, it has following shortcomings-

- Technology is still under process and research on its viability is going on.
- The speed, this technology is claiming seems difficult to achieve (in future, it might be) because of the incompetent technological support in most parts of the world.

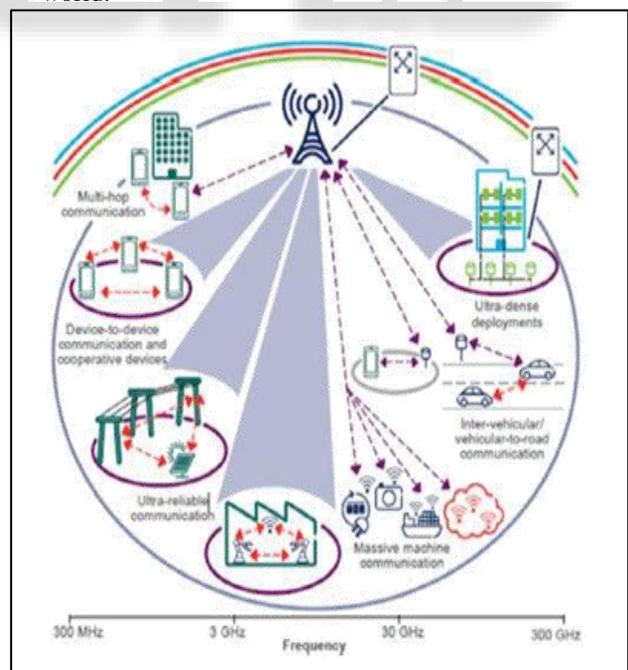


Fig. 5: Disadvantages of 5G Technology

- Many of the old devices would not be competent to 5G; hence, all of them need to be replaced with new one – expensive deal.
- Developing infrastructure needs high cost.
- Security and privacy issue yet to be solved.

VI. CONCLUSION

- 5G technology is going to be a new revolution in wireless system market
- As data traffic has tremendous growth potential under 4G existing voice centric telecom Hiererchies will be moving flat if architecture where base stations will be directly connected to media to gateways .

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