RESEARCH PAPER ON 5G NETWORK EVOLUTION

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Abstract:
Future 5G wireless networks will aspect new contests, as well as growing claim on network capacity to support a huge number of devices running application necessitating high data rates and always-on connectivity; hugely and supportive the emerging business models in the wireless network market demanding networks to be more open. New challenges initiative new resolutions and involve changed plans in the network positioning, management, and operation of future 5G wireless networks equated to those of current wireless networks. One of the key purposes of future 5G wireless networks is to compliantly provide service customized networks to a wide variety of services using integrated cloud reserve and wireless/wired network possessions, which may be presented by several infrastructure providers and/or operators.

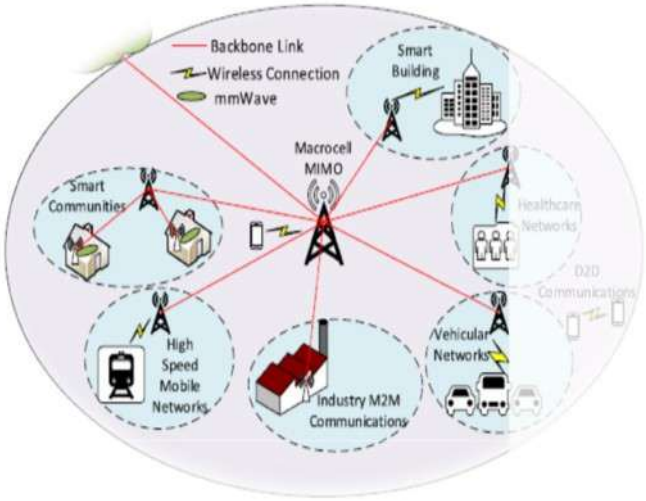
Introduction:

5G Technology stands for 5th generation mobile technology. 5G represent the next major phase of mobile telecommunication ethics beyond the upcoming 4G standards. 5G technology is contribution the service in Product Manufacturing, Documentation, supporting electronic communications, etc. As the purchaser become more and more aware of the mobile phone technology, he or She will look for a decent package all together including all the advanced features a cellular phone can have. Hence the search for new technology always the main motivation of the top cell phone colossuses to out innovate their competitors. The aim of a 5G based telecommunication network would perfectly answer the challenges that a 4G prototypical would present once it has entered ubiquitous use.

5G technology is a breakthrough. The next-generation of telecom networks (fifth generation or 5G) has started beating the market end of 2018 and will continue to increase worldwide. Elsewhere the speed of development, the technology is predictable to unleash a massive 5G IoT (Internet of Things) ecosystem where networks can assist communication wants for billions of 5G technology is driven by 8 specification connected devices, with the right trade between requirements:

- Speed
- Latency
- Cost.

Application Area of 5G Network



What makes 5G faster?

The use of shorter frequencies (millimeter waves between 30GHz and 300GHz) for 5G networks is why 5G can be faster. This highband 5G spectrum affords the predictable boost not only in speed but also in capacity, low latency, and quality. However, 5G download speed may vary widely by area.

According to the February 2021 matter of Prosperity Magazine, average 5G speed travels done in Q3/Q4 2020 range from:

220 megabytes per second (Mbps) in Las Vegas, 350 in New York, 380 in Los Angeles,450 in Dallas, to 550 Chicago, and over 950 in Minneapolis and Providence approximatively.

How secure will 5G Technology be?

4G networks use the USIM tender to achieve strong mutual authentication between the user and the connected devices and the networks. The entity introducing the USIM application can be a removable SIM card or an embedded UICC chip.

This strong mutual authentication is decisive to enable trusted services. Today, security solutions are already a mix of security at the device and security at the network. Profuse security frameworks may co-exist in the future, and 5G is likely to re-use remaining solutions used today for 4G networks and the cloud (SEs, HSM, certification, Over-The-Air provisioning, and KMS).

The standard for strong mutual authentication for 5G networks was settled in 2018.

The need for 5G security, privacy, and the trust will be as robust as for 4G, if not stronger, with the tender impact of IoT services. Local SEs in devices can secure network admittance and support secure service area such as emergency call management and virtual networks for IoT.

5G Network Requirements:

A unique objective for 5G networks is to support the appreciation in mobile data consumption, with users craving higher data speeds and traffic volumes expected to increase by hundreds. It is likely that 5G networks will have to transport reference point data speeds of 100Mbit/s and peak speeds of up to 10Gbit/s. Not only will there be a need to cope with the total volume of traffic, but the meditation of traffic in some

locations, such as business districts and commuter

hubs, will require new approaches. With wireless technologies already impending the Shannon limit for bits/Hz on individual radio links, the focus must turn to packing in more base stations in a given area, to achieve considerable rises in bits/Hz/km2.

Network Spectrum

As the demands on mobile communication networks rise, the purchase and resourceful use of spectrum will become more important than ever. Satisfying the forthcoming demands will involve better use of the spectrum that is already available to mobile networks, access to additional bandwidth at similar frequencies and the manipulation of higher frequencies in the centimeter-wave and millimetrewave bands.

Advantages of 5G Technology

• High determination and bi-directional large bandwidth shaping.

• Technology to wrinkle all networks on one platform.

• More active and effective.

• Technology to simplify subscriber administration tools for the quick action.

• Most likely, will provide a vast broadcasting data (in Gigabit), which will support more than 60,000 connections.

Disadvantages of 5G Technology

However, 5G technology is examined and abstracted to solve all radio signal problems and hardship of mobile world, but because of some security reason and lack of technological development in most of the geographic sections, it has following limitations:

• Technology is silent under process and research on its possibility is going on.

• The speed, this technology is pleasing seems tough to achieve (in future, it might be) because of the useless technological support in most parts of the world.

• Many of the old devices would not be able to 5G, hence, all of them need to be swapped with a new one expensive deal.

• Developing infrastructure needs high cost.

• Security and privacy problems yet to be solved.

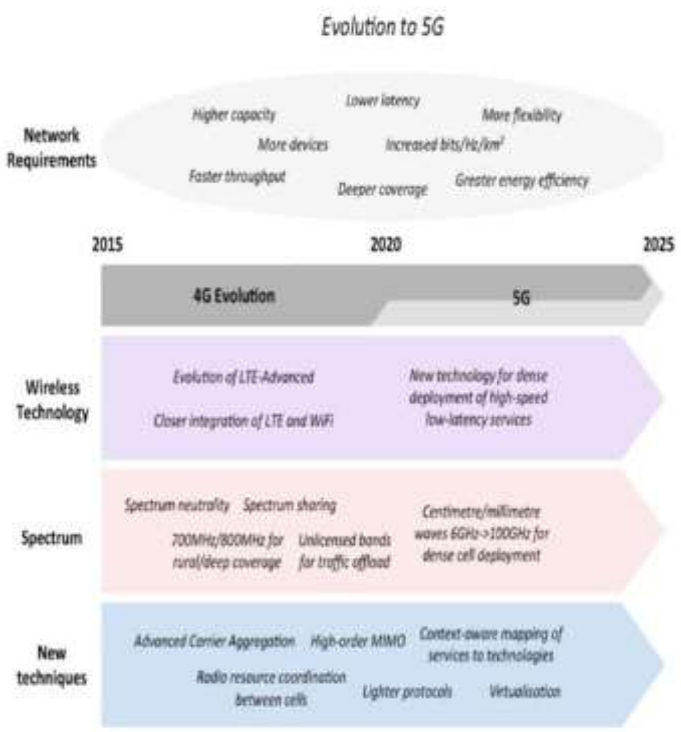
Future scope:

In the upcoming, 5G will offer higher qualities of services, lower latency, and higher bandwidth, which will help improve user experiences both in the consumer and business space, from cloud gaming, to telehealth use cases.

By Sergey Seletskyi, IoT Practice Leader and Senior Solution Architect at Intellias. 5G networks will reform the Internet of Things (IoT). But it will take some years for the technology to cover most of the planet.

For most people, 5G will handle the wide area wireless connection, and Wi-Fi will handle the local wireless connection. Ultimately, however, there could certainly come a time when only one of them will be essential. It may seem irrational to think that Wi-Fi could go away, especially given how pervasive it is today. Improved Spectrum - greater capacity, more users and faster speed. In many countries the original frequency bands for 5G are below 6 GHz and similar frequencies to remaining mobile and Wi-Fi networks.

EVOLUTION OF WIRELESS TECHNOLOGIES



Evolution Of Wireless Technologies (1_{st} to 4_{th} Generation)

1. First Generation Networks (1 G): First Generation (1G) of wireless networks was standardized in initial 1981 for voice communication. It was able to handle data transfer speed up-to 2.4kbps. The most popular 1G-access technologies were Advanced Mobile Phone System (AMPS), Nordic Mobile Phone System (NMTS), Total Access Communication System (TACS) etc. Analog signals were responsible to carry out voice in 1G.

2. Second Generation Networks (2G): Second Generation (2G) of wireless networks was standardized in 1990. It was primarily used for voice communication and able to handle data transfer speed up-to 64kbps. It was also able to data communication with limited speed. The most popular 2G-access technologies were Global Systems for Mobile communications (GSM), Code Division Multiple Access (CDMA) and IS-95. 2G technology was also able to send text messages, picture messages, and MMS Multimedia Messaging Services (MMS). It is also able to provide secure point-to-point communication i.e. only intended receiver could receive and read the message.

2G was suffering from some of the critical issues such as low data rate, limited capacity of cells, higher handover latency, limited mobility etc. also the 2G enabled phones have limited facilities.

3. Extension to Second Generation Networks (2.5G): It was an extension of second-generation wireless systems. It introduces packet-based switching technique known as General Packet Radio Services (GPRS).

Furthermore, it is able to provide better communication by use of packet switching and circuit switching techniques along with services provided by 2G. It is able to handle data transfer speed up to 144kbps. The most popular 2.5G-access technologies were GPRS, Code Division Multiple Access-2000 (CDMA2000) and Enhanced Data Rate for GSM Evolution (EDGE).

4. Third Generation Networks (3G): Third Generation (3G) of wireless networks was standardized in 2000. The basic objective to design 2G was voice communication and high-speed data transfer up to 2Mbps. The most popular 3G-access technologies were Wideband Code Division Multiple Access (WCDMA), CDMA2000 and Universal Mobile Telecommunications Systems (UMTS) technologies. To utilize benefit of 3G smart phone based specific applications were developed to handle video calling, online games, email service, social media services such as Facebook and Orkut etc.

5. Extension to Third Generation Networks (3.5G): It was an extension of 3G wireless networks and standardized in 2008. It was primarily designed to improve data rate of present 3G networks and able to handle data transfer speed up to 3.6Mbps. The most popular 3G-access technologies were HSDPA (High Speed Downlink Packet Access) and HSUPA (High Speed Uplink Packet Access). 3.75G system was proposed as an improved version of 3G network. The technology used in it was, High Speed Packet Access Plus (HSPA+). The technology used in it was known as Long-Term Evolution technology (LTE) and Fixed Worldwide Interoperability for Microwave Access (WIMAX). These technologies are able to provide high-speed services such as on demand videos, composite web services, social media services etc. to multiple users simultaneously.

6. Fourth Generation Networks (4G): Fourth Generation (4G) of wireless networks was standardized in 2010. 4G has designed to handle data transfer speed up to 300Mbps along with Quality of Service (QoS). In 4G, the user can watch online High Definition (HD) video and can play online games. The most popular 4G-access technologies are Voice over LTE network VoLTE (use IP packets for voice). 3G Partnership Project (3GPP) is presently standardizing Long Term Evolution (LTE). It reduces latency for critical applications and provides secure mobility. It also supports IoT enabled devices to interact in an efficient manner.

Conclusion.

5G Technology stands for 5th Generation Mobile technology. 5G mobile technology has altered the means to use cell phones within very high bandwidth. Users never experienced continually before such a high value technology. Nowadays mobile users have much awareness of the cell phones (mobile) technology. The 5G technologies include all the types of innovative structures which makes 5G mobile technology most

powerful and in a huge demand in near future. A user can also catch their 5G technology cell phone with their Laptop to get broadband internet access. 5G technology with camera, MP3, video play-actor, large phone memory, audio player and much more you never imagine. For children astounding fun Bluetooth technology and Piconets has become in market.

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