

# Future of 5G Wireless System

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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.

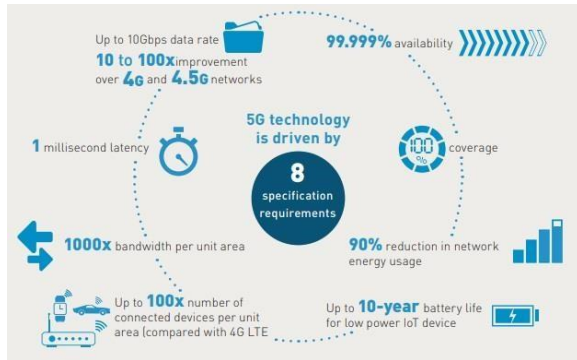
## I. INTRODUCTION

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. No one company or person owns 5G, but there are numerous companies in the mobile ecosystem that are causative to bringing 5G to life. Qualcomm has played a major role in originating the many introductory technologies that drive the industry forward and make up 5G, the next wireless standard.

South Korea is the country which arrayed the first 5G networks and the state is expected to stay in the lead as far as penetration of the technology goes, by 2025, nearly 60 percent of mobile contributions in South Korea are anticipated to be for 5G networks. Huawei Technology Co. owns the utmost copyrights on the next-generation of 5G technology, confirming the Chinese company will get paid despite Trump administration exertions to erase it from the supply chain, according to a new study. Wireless systems using Orthogonal Frequency Division Multiplexing (OFDM) with extensive area coverage, high amount at millimetre waves (10 mm to 1 mm) covering a frequency range of 30 GHz to 300 GHz, and permitting a 20 Mbps data rate to distances up to 2 km. The millimetre wave band is the most active solution to the current surge in wireless Internet usage. These provisions are capable of providing wireless world wide web (WWW) applications.

## II. WHAT IS 5G

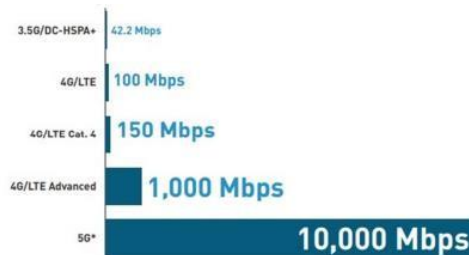
5G technology is a breakthrough. The next-generation of telecom networks (fifth generation or 5G) has started beating the market end of 2018 and will continue to increase worldwide. Elsewhere the speed of development, the technology is predictable to unleash a massive 5G IoT (Internet of Things) ecosystem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



- Up to 10Gbps data rate -10 to 100x speed development over 4G and 4.5G networks
- 1-millisecond latency
- 1000x bandwidth per unit area
- Up to 100x number of coupled devices per unit area (compared with 4G LTE)
- 99.999% availability
- 100% coverage
- 90% reduction in network energy usage

### III. How fast is 5G

5G speed max out at 10 gigabits per second (Gbps).



### IV. What makes 5G faster

The use of shorter frequencies (millimetre waves between 30GHz and 300GHz) for 5G networks is why 5G can be faster. This high band 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 2020 matter of Prosperity Magazine, average 5G speed travels done in Q3/Q4 2019 range from:

- 220 megabytes per second (Mbps) in Las Vegas
- 350 in New York
- 380 in Los Angeles
- 450 in Dallas, to 550 Chicago

V. A sequential summary of all the generations has

### 5.1 1G

1G (or 1-G) refers to the very first generation of wireless telephone technology (mobile telecommunication). The 1st generation was announced in initial 1980's. With data rate up to 2.4kbps. The subscribers were Advanced Mobile Phone System (AMPS), Nordic Mobile Telephone (NMT), and Total Access Communication System (TACS). The setbacks of first generation was below par capacity, reckless handoff, inferior accent associations, and with no safety measures, since audio calls were accumulated and played in radio towers due to which weakness of these calls from not so needed connections i.e. noises from the third party increases. The main difference between the two mobile network system (1G and 2G), is the medium of encoders i.e. The radio signals which 1G networks uses are basically analog, while 2G networks are digital. We are aware of the fact that both the systems use digital signaling to connect the radio towers (which pay attention to the handsets) to the rest of the telephonic networks, the tone of voice itself during a call is programmed to digital signals in 2G whereas when we are talking about 1G, its modulation is done and that to on higher frequency, classically 150 MHz and up. This inherited advantage of digital over that of analog resulted in the replacement of 1G over 2G.

### 5.2 2G

2G (or 2-G) is short-term for second-generation wireless telephone technology. The three key benefits of 2G networks over their predecessors' generations were that:

Phone conversations were digitally encrypted; 2G systems were considerably more competent on the spectrum allowing greater mobile phone penetration levels. 2G introduced data services, and gave rise to SMS text messages. 2G technologies enabled the various mobile phone networks with the services such as picture messages, text messages, and MMS (multimedia messages) All text messages sent over 2G are digitally encrypted as said above, allowing for the transfer of data in such a way that only the intended receiver can receive and read it i.e. more advanced than the 1G in terms of privacy. C. 2.5G It is generally a 2nd generation cellular system subscription combined with General Packet Radio Services i.e. GPRS and other amenities which doesn't

commonly endow in 2G or 1G network. It can get high with data rate up to 144kbps system frameworks, but it applies both packet switching and circuit switching. GPRS, Enhanced Data Rate for GSM Evolution mainly known as EDGE, and Code Division Multiple Access i.e. CDMA 2000 were the main 2.5G technologies. D. 3G Then, came the introduction of 3rd generation which was established in late 2000. It imparts the world with transmission rate up to 2Mbps. The main purpose of Third generation (3G) system was to merge high speed mobile access to services based on Internet Protocol (IP) and it was successfully accomplished. Aside from transmission rate, avant-garde improvement was made for maintaining QoS. Supplementary facilities like global roaming and improved audio quality made 3G as a noteworthy and qualitative generation. The major annoyance for 3G handsets is that, they grab more power than most 2G models. Looking from the market point of view, 3G network plans are more expensive than 2G. 3G involves the utilization of Wideband Code Division Multiple Access i.e. WCDMA, Universal Mobile Telecommunications Systems (UMTS) and Code Division Multiple Access (CDMA) 2000 technologies, along with the introduction of the evolving technologies like High Speed Uplink/Downlink Packet Access (HSUPA/HSDPA) and Evolution-Data Optimized (EVDO) which has made an intermediate wireless. 3G telecommunication networks prop up services that offer an information transfer rate of at least 200 kb/sec .Generation between 3G and 4G named as 3.5G provides an improved data rate of 5-30 Mbps.

### 5.3 3.75G

Long-Term Evolution technology (LTE) and Fixed Worldwide Interoperability for Microwave Access (WiMAX) is the outlook of mobile data services. LTE and Fixed WiMAX have the potential to complement the capability of the network. It also provides a substantial number of users, the facility to access a broad range of high speed services approximating on stipulate video, peer to peer file sharing and fused Web services.

### 5.4 4G

4G is the fourth generation (4th) of wireless mobile telecommunication technology, succeeding 3G and even more fascinating. A 4G system must provide

capabilities defined by ITU in IMT. Advance 4G is generally referred as the progeny of the 3G and 2G standards. Presently, the standardization of Long Term Evolution (LTE) advanced as forthcoming 4G standards along with Mobile Worldwide Interoperability for Microwave Access commonly called WiMAX is done by 3rd generation partnership project (3GPP). A 4G system improves the customary communication networks by imparting complete and reliable solution based on IP. Facilities like voice, data and multimedia will be given to the users every time and everywhere basis and at quite elevated data charge as related to earlier generations. Applications which use a 4G network are Multimedia Messaging Service (MMS), Digital Video Broadcasting (DVB), and video chat, High Definition TV content and mobile TV.

### 5.5 . 5G

Huge consortiums of major global telecoms are already working to create worldwide values around 5G. Although most of those standards don't get solidified, experts yet expect it to be more compatible (with 4G and 3G) in addition to having some interoperability across the world. With an increment, in the demand of the users exponentially, 4G can now be easily replaced with 5G with a new advanced access technology named as Beam Division Multiple Access i.e. BDMA and or Filter Bank multi carrier abbr. as FBMC multiple access. The concept behind BDMA techniques can be explained by considering the case of the base station communicating with the mobile stations. An orthogonal beam is owed to each mobile station and by BDMA technique we can split that antenna beam according to locations of the mobile stations for openhanded multiple accesses to the mobile stations, which likewise increase the competency of the system and thus is the main process of this communication. An idea to swing towards 5G is based on present drifts; it is commonly assumed that 5G cellular networks can tackle six obstacles that are not well addressed by 4G i.e.

1. Higher capacity,
2. data rate higher,
3. End to End latency has been lowered,
4. connectivity to massive device,
5. reduced cost
6. consistent Quality

## VI. Advantages of 5G

Fifth generation objective is at providing countless of utility to the consumer at high speed. The applications developed to use these utilities are highly customer companionable; curtail the intercommunication among the application and the customer. For example, unification of speech recognition technology in the user interfaces would ease the use of the applications for each user [9].

1. 5G targets at providing a unified global standard which will facilitate global mobility and service portability.
2. 5G stations and networks will provide common services independent of their capabilities. This is also called as service personalization.
3. It is expected to provide wireless download speeds of above 1Gbps in local area network (LAN) and 500 Mbps in wide area network (WAN), about 40 times greater than the 4G wireless networks.
4. Its focus at lower power consumption.
5. It would provide users access to large repository of data and services where he would have flexibility to filter these data and services as per his preferences by configuring the operational mode of their devices.
6. Better Network Convergence
7. Provide Higher Bandwidth
8. More effective and efficient
9. Most likely, will provide a huge broadcasting data (in Gigabit), which will support more than 60,000 connections.
10. You can control your PCs by handsets.

## VII. Disadvantages of 5G

The fifth generation (5G) of mobile technology is emerging as a superior communication network, delivering increased speeds, coverage and reliability. This innovative network is bringing about the reality of Internet of Things (IoT) as it is able-to handle significantly more devices. However, as with any new technology, there are some disadvantages to be considered as follows [10].

1. **OBSTRUCTIONS CAN IMPACT CONNECTIVITY:** The range of 5G connectivity is not great as the frequency waves are only able to travel a short distance. Added to this setback is the fact that 5G frequency is interrupted by physical obstructions such as trees, towers, walls and buildings. The obtrusions will either block, disrupt or absorb the high-frequency signals. To counter this

setback, the telecom industry is extending existing cell towers to increase the broadcast distance.

2. **INITIAL COSTS FOR ROLLOUT ARE HIGH:** The costs related to the development of 5G infrastructure or adaptations to existing cellular infrastructure will be high. This amount will be further compounded by the ongoing maintenance costs needed to ensure the high-speed connectivity, and it's likely the customers will bare the brunt of these big price tags. Cellular operators are looking to minimise these costs by exploring alternative options in the form of network sharing.
3. **LIMITATIONS OF RURAL ACCESS:** While 5G might bring about real connectivity for the predominantly urban areas, those living in the rural settings will not necessarily benefit from the connection. As it stands, many remote areas countrywide are not able to access any form of cellular connectivity. The 5G carriers are going to target big cities with larger populations, eventually working their way into the outer areas, but it's not likely this will be happening any time soon. As a result, only some of the population will benefit from 5G communication.
4. **BATTERY DRAIN ON DEVICES:** When it comes to cellular devices connected to 5G, it seems the batteries are not able to operate for a significant period-of time. The battery technology needs to advance to allow for this enhanced connectivity, where a single charge will power a cell-phone for a full day. Alongside depleted batteries, users are reporting that cell-phones are getting increasingly hot when operating on 5G.
5. **UPLOAD SPEEDS DON'T MATCH DOWNLOAD SPEEDS:** The download speeds of 5G technology are incredibly high, in some cases up to 1.9Gbps. However, the upload speeds are rarely more than 100Mbps, which is not quite as incredible as initially touted. In relation to existing mobile connectivity, however, the upload speeds are higher than being seen with 4G LTE.
6. **DETRACTING FROM THE AESTHETICS:** The erection of more cell-phone towers, or extension of existing cell-phone towers, is not welcomed by most communities because they are seen to diminish the overall look and feel of an area. With 5G, there is going to be a need for increased infrastructure development, which won't necessarily see as a good thing for local resident.

VIII. Compare 1G to 5G

5G technology offers higher data rates, lower latency, more energy efficiency, higher system capacity and

more connected devices than previous generations. The method offers new, different technologies and improved versions of existing ones, as well as new features.

Generation	Speed	Technology	Key Features
1G (1970 –1980s)	14.4 Kbps	AMPS,NMT, TACS	Voice only services
2G (1990 to 2000)	9.6/ 14.4 Kbps	TDMA,CDMA	Voice and Data services
2.5G to 2.75G (2001-2004 )	171.2 Kbps 20-40 Kbps	GPRS	Voice, Data and web mobile internet, low speed streaming services and email services.
3G (2004-2005)	3.1 Mbps 500- 700 Kbps	CDMA2000 (1xRTT, EVDO) UMTS and EDGE	Voice, Data, Multimedia, support for smart phone applications, faster web browsing, video calling and TV streaming.
3.5G (2006-2010)	14.4 Mbps 1-3 Mbps	HSPA	All the services from 3G network with enhanced speed and more mobility.
4G (2010 onwards)	100-300 Mbps, 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax, LTE and Wi-Fi	High speed, high quality voice over IP, HD multimedia streaming, 3D gaming, HD video conferencing and worldwide roaming.
5G (Expecting at the end of 2019)	1 to 10 Gbps	LTE advanced schemes, OMA and NOMA	Super fast mobile internet, low latency network for mission critical applications, Internet of Things, security and surveillance, HD multimedia streaming, autonomous driving, smart healthcare applications.

IX. FUTURE SCOPE

5G network technology will reveal a new era in mobile communication technology. The 5G mobile phones will have access to different wireless technologies at the same time and the terminal should be able to combine different flows from different technologies. 5G technology offer high resolution for crazy cell phone user. 5G technology will provide super and perfect utilization of cellular communication in future. The future enhancement of Nano-core will be incredible as it combines with artificial intelligent (AI).One can able to control his intelligent Robot using his mobile phone. Your Mobile can automatically type the message what your brain thinks. We might get a circumstance where we don't require any spectrum for communication. 5G technology will provide super and perfect utilization of cellular communication in future. We can monitor any place of the world from anywhere, observe space and watch TV channels at HD clarity in our mobile phones without any interruption. There will be exciting amusement unbelievable services. The 5G

mobile phones will be a tablet PC and amazing. Many mobile embedded technologies will evolve.

X. CONCLUSION

In this paper we have discussed the existing and future wireless mobile communication generations and cellular systems focusing on four main key factors:

I. switching schemes, bandwidth, data rates, and radio access, also 5G main development challenges and explained the necessity for 5G. We conclude that 5G network is very fast and reliable. Fifth generation is based on 4G technologies. The 5th wireless mobile internet networks are real wireless world which shall be supported by LAS-CDMA (Large Area Synchronized Code-Division Multiple Access), OFDM (Orthogonal frequency-division multiplexing), MCCDMA(Multi-Carrier Code Division Multiple Access), UWB(Ultrawideband), Network-LMDS (Local Multipoint Distribution Service), and IPv6. Fifth generation technologies offers tremendous data capabilities and unrestricted call volumes and infinite data broadcast together

within latest mobile operating system. Fifth generation should make an important difference and add more services and benefits to the world over 4G. Fifth generation should be more intelligent technology that interconnects the entire world without limits. The 5G mobile technology is expected to be implemented at the end of the current decade. The world of universal, uninterrupted access to information, entertainment and communication will open new dimension to our lives and change our life style significantly. The new coming 5G technology will be available in the market to full fill user demands in affordable rates, bright and high peak future also much reliability as well as exceptional applications.

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