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**RESEARCH PAPER**

# Socio-Economic and Technological Constraints for Implementation of 5G Technology

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| PAPER INFO | ABSTRACT |
|---|---|
| | The Fifth Generation wireless technology 5G development capabilities depend on 4G technology.5G is struggling to achieve its target of performance. In this paper we will throw light on the different existing generations (1G, 2G, 3G, 4G) and the upcoming one (5G). This paper throws light on the advantages and disadvantages of 5G technologies its need over the 4G technology. 5G mobile communication technology stands for 5th Generation mobile communication technology. The architecture of the Wireless World Wide Web (WWWW) is being investigated by 5G. 5G technology will have the increased bandwidth for all users. Major advantage of 5G network is giving unlimited facilities to all the users. This paper presents an overview of the 5G technology about its advantages disadvantages challenges and need for 5G and also discussing the previous generation. |

## Introduction

Wireless networking is one of the most effective systems of our day. Mobile communication has become essential component of present day life. In modern economy, it continuous to play an important role including customers, health, education and other major industries. Since the birth of the Mobile internet it linked the billions of people and rapidly increased day by day. Because of science and technology, the world has seen dramatic improvements in the telecommunication industry over the last few decades.

## Historical Background

We have numerous technologies for mobile and wireless communication we will discuss some which are as follow:

- 1G (First Generation)
- 2G (Second Generation)
- 3G (Third Generation)
- 4G  (Fourth Generation)
- 5G  (Fifth  Generation)



## First-Generation (1G)

1G is the first generation of the wireless mobile telecommunication .Voice transmission and bandwidth of 2kbps was given by 1G, and it was developed in 1980's.Mobile radio telephones and system such as the mobile telephone system will be replaced with 0G technology. Advanced mobile telephone systems and improved mobile telephones services make 1G network. Analog signals are used by 1G network. 1G will be used till 2G take place. The major dissimilarity between 1G and 2G is, 1G mobile network carries analog signals and 2G mobile network carry digital signals. The mobile radio telephone is the predecessor of 1G technology.

## Second-Generation (2G)

The second generation of the wireless mobile telecommunication is 2G. 2Gmobile telecommunication was commercially introduced in Finland by Radiolinja in 1991 on the GSM standard. Digital communication system is used in 2G mobile system. In many parts of the world, 2G is still used. Following were the advantages of 2G:

- The encryption process for phone conversations was digital.
- Radio frequency was used more effectively that permits more than one user per frequency band.
- Text messaging data services for mobile.
- The different services allowed by 2G to various networks are: Text, image and multimedia messages.

- All the messages are encrypted digitally that are sent on 2G. Analog signaling is used in 1G while digital signals are used in 2G.

**Third-Generation (3G)**

Third generation of the wireless mobile telecommunication is 3G. With internet protocol IP-based services, 3G replace 2G for faster data transfer. The transfer rate of 3G wireless mobile telecommunication is at least 144kbps. 3G permits network service providers to grant a variety of advanced services to their users with wide network capacity. Video calling, wireless mobile telephone and broadband wireless data services all are in the mobile network. Mobile television and video conferencing services are added in 3G technology. The classification of each generation is based on innovative frequency bands and increase data volumes. The first commercial 3G technology was developed in 2000.

**Fourth-Generation (4G)**

Fourth generation of the wireless mobile telecommunication is 4G. The successor of 2G and 3G is 4G. The capabilities provided by 4G are defined by ITU-T in MIT advanced. The following services are provided by 4G:

- Mobile web access.
- Video conferencing.
- Gamming services.
- 3D television.

Demanding requirement in terms of QOS is one common characteristics of the 4G technology. The successor of 4G is 5G.

| Generation | Time Period | Definition | Characteristics | Data Rates |
|---|---|---|---|---|
| 1G | 1980-1990 | Analog | Voice only | 2kbps |
| 2G | 1990-2006 | Digital narrowband circuit data/packet data | Data analog voice, Web browsing, MMS | 14.4-64kbps |
| 3G | 2006-2011 | Digital broadband packet data | Video calling universal access, portability, | 2Mbps |
| 4G | 2011-Present | Digital broadband packet data with high throughput | HD streaming, portability increased to worldwide roaming | 200Mbps-1Gbps |

**The evolution mobile networking technologies from 1G to 4G**

**Concept of Fifth Generation (5G)**

Mobile and wireless networks have increased in these days. The fifth generation network is currently under development and will be at the peak soon. Evaluation of 5G technologies with 4G LTE is targeting to surpass speed, low latency and low power. The 5G communication technology is capable of assisting wireless World Wide Web (WWWW).This records offer the idea of intelligent net telephone where, the smart phone decide on the finest connection. The function of 5G and its usability are plenty beyond the expectations.5G will unable new packages like as an example autonomous driving, faraway control of robots and tactile programs, but those additionally bring loads of modifications to the network. Biggest assignment for the 5G network might be that the services to cater for a numerous set of offerings and their requirement. To reap this, the intention of 5G network will be to improve the ability in the structure. It is predicated that a few of the problems will be release by the 5G in future.

**Advancement of Fifth Generation (5G)**

Fifth Generation technology gives extensive variety of features, that are well-being for all organizations of society which include college students, specialist, engineers, doctors, instructors, administrative bodies and even for a common man. If we're discussing about the advancement of 5G, 5th Generation may be a great deal equal to achievement of goals. It's integrated with past the restriction increase function in comparison to the previous technologies. Newly trending requests about this technology including tactile internet, high resolution video streaming, vehicular communications, avenue protection, real time manage location have stringent necessities on throughput, robustness, credibility and latency. It's clear that all the demands can't be provided by way of truly evolving the present day Fourth-Generation (4G) structure.

**Performance Evaluation for Fifth Generation (5G)**

5G age is a new advancement of cell communication technology that can be introduced in many countries. New researchers and superior mobile communication generation designer were dealing with the rising demand of the mobile clients. Maximum of advanced international locations have begun research on 5th generation mobile technology which is expected to release in 2020.

5G technology has drawn worldwide research interest inside the latest years via imaginative and prescient to have hundred million connections, approximately 0 latency that is low latency and hundred times throughput improvement. Fifth-Generation is excessive reliability and the throughput, boom scalability, low latency and energy efficient. As a substitute 5th generation is also up to date in connectivity simultaneous and at once, excessive speed to permit huge wide variety of devices, large information extent consistent with unit region, better reliability of the

conversation and very low battery reduction.5th generation includes all sorts of superior era which make this network greater improving in huge requests besides provides the cell phone customer more functions and new era. Fifth-Generation packet switches Wi-Fi with expanded location    coverage and excessive throughput.5G era may be used millimeter Wi-Fi and code department multiple get entry to that enable pace greater than I GB/s at low strength and higher than 100 mbps at complete mobility.5th Generation supplied excessive resolution for severe cellular customers, greater data rates. Fifth-Generation mobile communication technology can assisted the relationship for as a minimum hundred billion tool with very low latency and 10 GB/throughput.
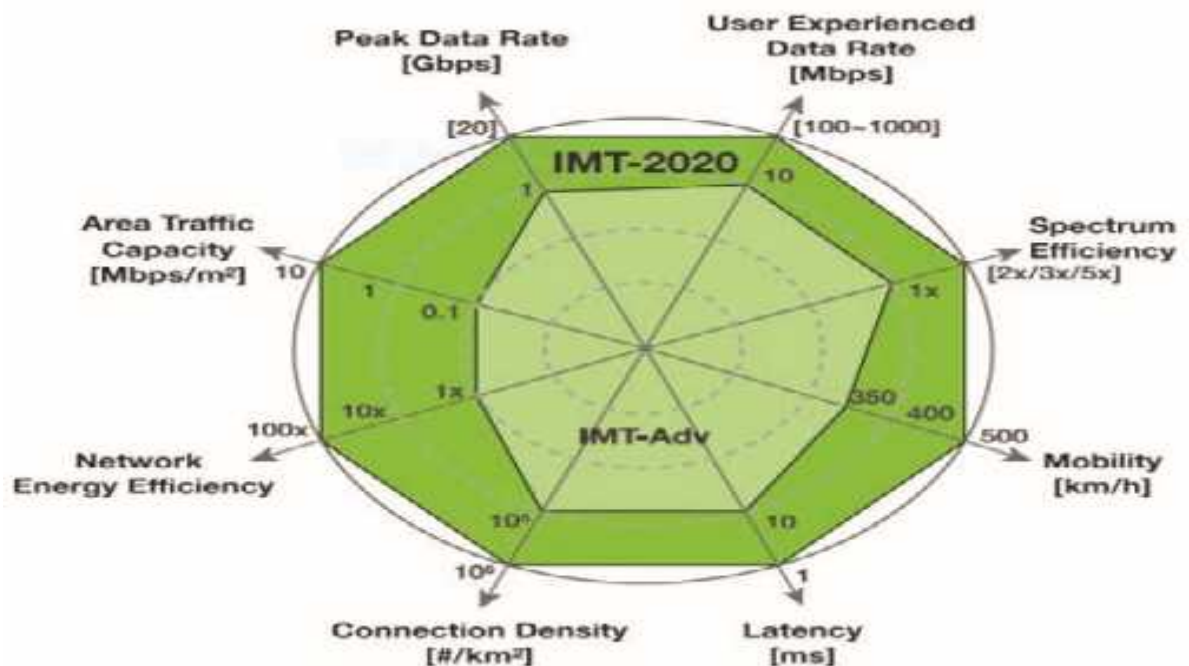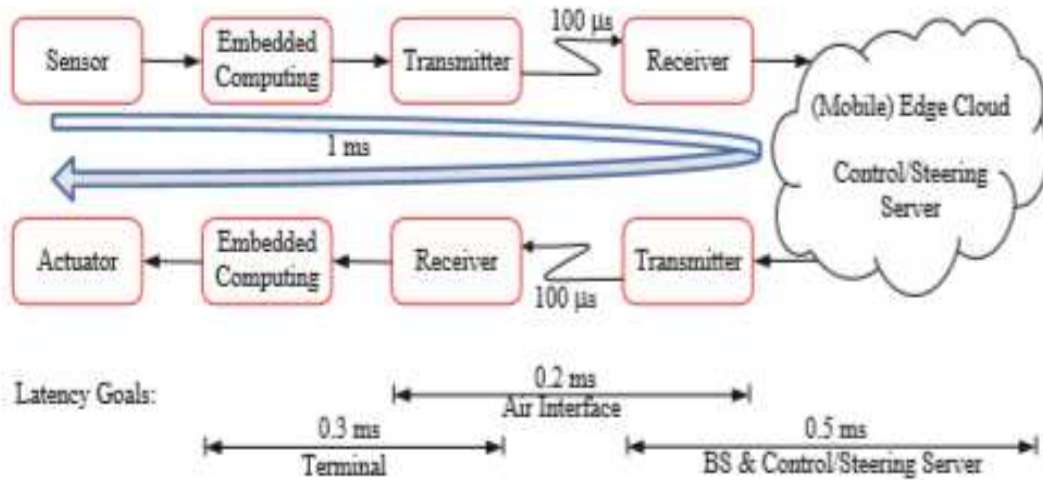


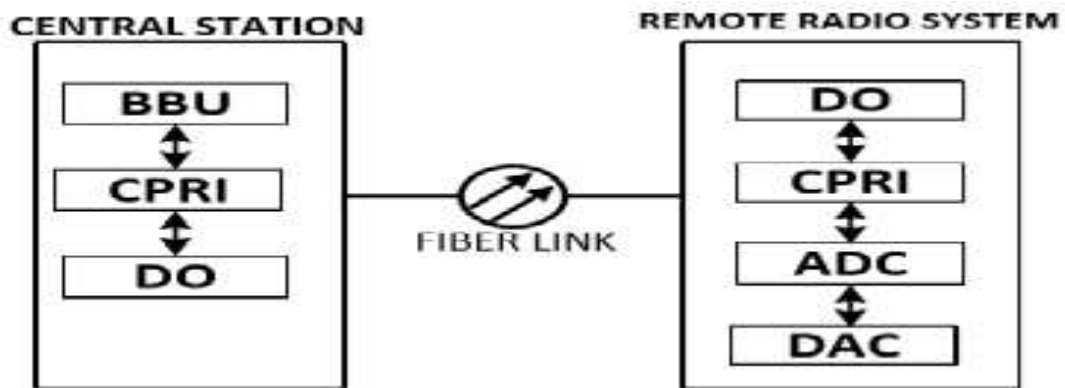Figure 3. The requirements of 5G mobile communication technology

## Literature Review

This paper is about the tactile internet Applications, Architectures, Requirements and emerging 5G systems (Simsek et al., 2016). Tactile mean with the sense of touch. The tactile internet will more attract the man's computer via using interactive systems in real time. Recently tactile internet activities add with the IEEE and ETSI. The 4G mobile communications do not meet the tactile internet specifications so 5th generation mobile communication enabled the tactile internet without wires edge. The important thing done in this paper is intersection between tactile internet and 5G. Tactile internet applications are self-driving cars, tele-medicine, industrial automations etc. when 5G internet introduce tactile internet has effective impact on business and industries.
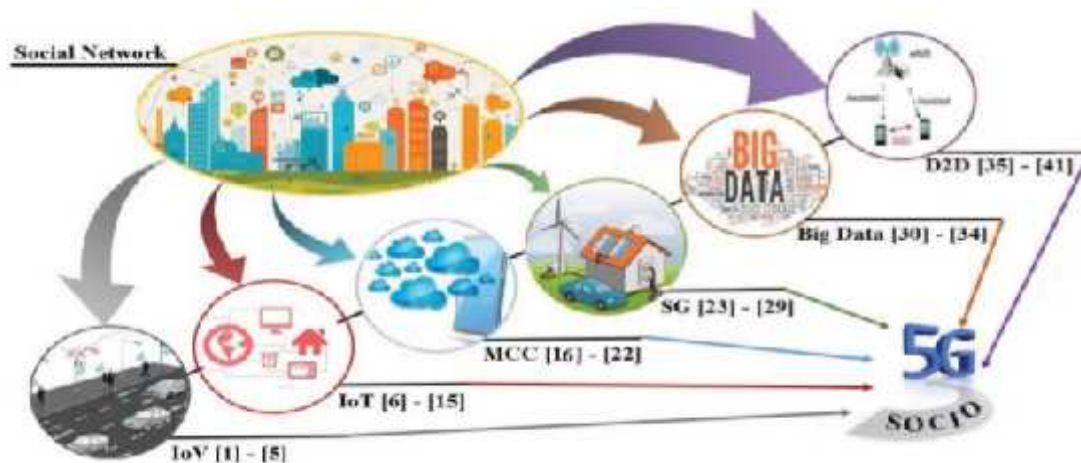
Example of latency objectives of tactile internet systems

This paper is about to clear the concept that combine front and back haul of 5th generation mobile network easy management is done with loyalty and using radio over fiber infrastructure for fifth generation font and back haul is future broadband communication (Kabonzo et al.,2017). They use co deign photonics using light and electronics to improve the 5G mobile network. Mobile front and back haul evolution is given in front haul the signals are transmitted via coaxial cable today 4G mobile network base band units over fiber transport but in 5G mobile network are virtualized base band units used in back haul connect base station to network. Then 5G network will send and receive information between users and base stations. Using Matab and VPI transmission maker method, they test the system by co-simulation technique. Their experiment gives a great improvement due to use of light and electronics components.



Digital radio for LET applications over fiber

This paper tells the 5G network effect on the Internet Of Vehicle, Smart Grids, Mobile Cloud Computing, Internet Of Things, Device to Device Connectivity and Big Data (Singh et al., 2017). 5G network hold together all the Social aspects in future. When all these social aspects are together in one network this may affect the quality of service so 5G network have to work intelligently to avoid this problem in future. Researchers in this paper also discuss the problem linked with the 5G-soico such as collision, resource allocation, and huge amount of diverse smart device support. The future 5G network technologies include all these Social aspects. Still gap in this paper is to solve the problems that occur when the 5G network is introduced.
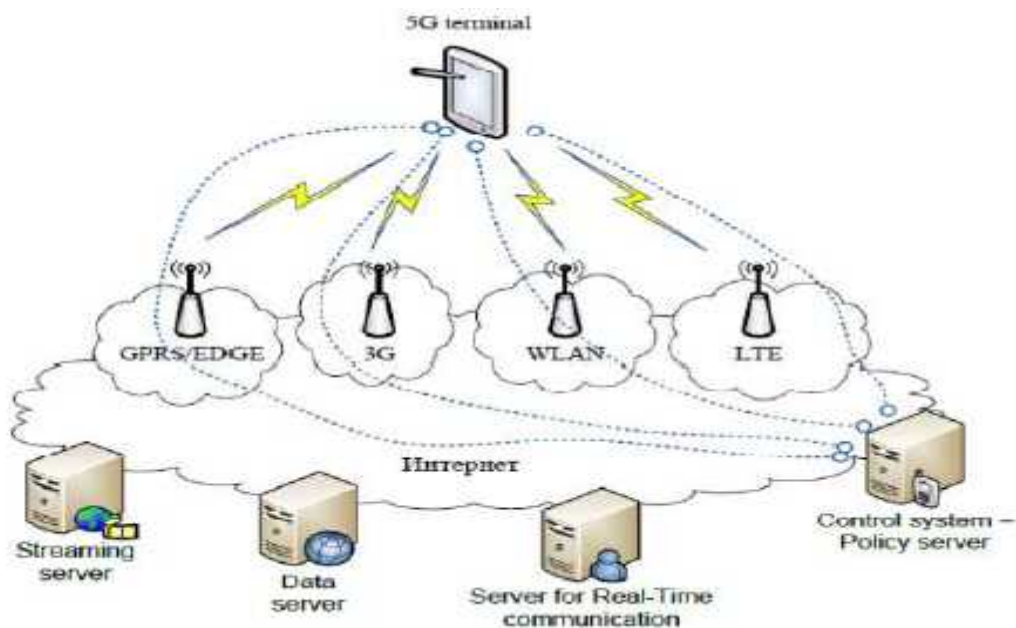


Overview of future technology for networks (5G) from a social viewpoint

In this paper 5G network visions in 2020. Today 4G networks is in deployment but 5G deployments is stated around 2020. In 5G network user can at a time connect with many technologies. 5G network supports IPV6 and flat IP. Today more people use mobile network but in around 2020 traffic is double on mobile network 4G is not capable of handling this traffic so 5G is introduced. 5G addresses the issue of problems of management frequency licensing. 5G have software radios and error handling techniques. Support IPV6 means each mobile have permanent IP address that shows the location of phone. Support flat IP means that 5G is capable of accepting data from all technologies. All things are sending and receive through packet switching instead of circuit switching. This paper is all about the features and mobile technology that they want to introduce in future (Patel et al., 2012).

This paper is about the evolution and development of 5G mobile network advantages over the 4G mobile networks and made the network architecture for future 5G network. When 5G generation of mobile network is introduced the world is virtualized all world is connect without limit. 5G changes our lifestyle completely. 1G, 2G, 3G, 4G and 5G evolution in mobile technology. There is no difference between PC and mobile when 5G is launched. 5G is more fast than 4G in 5G network is developed by World Wide Web, low battery is consume, more than one data path

is available to transfer data, AI is used and data is more secure than 4G. In 4G when we download something from internet it may take more to download but in 5G network it will be downloaded in nanoseconds. 5G is fast, reliable and efficient when launched (Kachhavay et al., 2014).

5G is single station multi operating system. User can access unlimited data using 5G technology. According to varinder and vipin 5G system can automatically switch and provide bandwidth according to the requirement of the services. They say that to satisfy requirement of new increased technology, bandwidth is required which should be greater than 4G network bandwidth. They say that larger cells will be used in future with broad coverage; they will make the signals stabilized. According to them 5G technology is built on different layers from physical to application as an open platform. 5G technologies provide high resolution for the use of network to the mobile phone consumer (SARKAR et al., 2018).
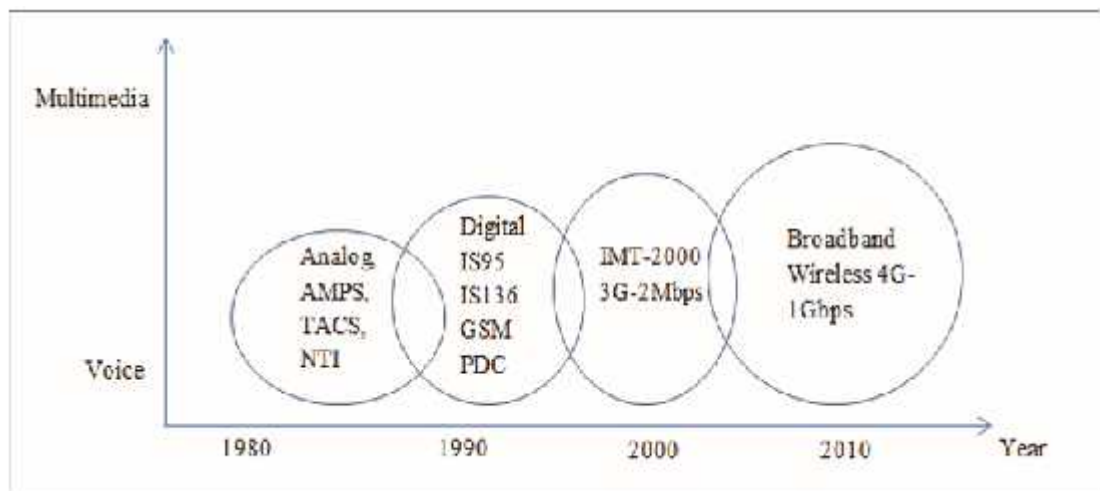


5G IP-Based Architecture

In this paper they mainly work on two questions. Firs one is, how far will 5G be viable? And another question is, will it be the technology of some developed countries or developing countries also get benefit of this. Challenges of 5G technology are categorized into two types that are Technological challenges & common challenges. But the question is still remaining that the previous technologies are still under process and what will be the future of 5G? They suggest various advantages of 5G in which government can use this technology for good governance, the next generation technology (Cheruku et al., 2017).

Goal of this paper is to shed a few mild on the present day fame of 5G structure definition and traits on the generation. They offer in-depth reviewing the

latest characteristics recognizing the critical results and ideas for the future fifth generation communication network. They review the needs for 5G recognized by unlike initiatives, variation and similarities. They take some time to recognize the latest ideas that required being conceive, constructing at the enablers, to meet the preferred needs (Bega et al., 2017).

In this article, they construct a prototype of the internet of the medical stuff. Version that they proposed provide particular design for mobile device. This prototype contains a representative and manager component. A representative was constructing on top of microcontroller board and supervisor was constructed utilizing a tiny laptop. They debate some issues associated with future improvement of IMEDT system has been presenting consisting of smart analysis, functionality as well as protection troubles to emerging 5G cell network (Jusak et al.,2016).

In this paper they review the evolution of mobile communication technology. Various networking communication technologies categorized into generations (Ibrahim et al., 2017).
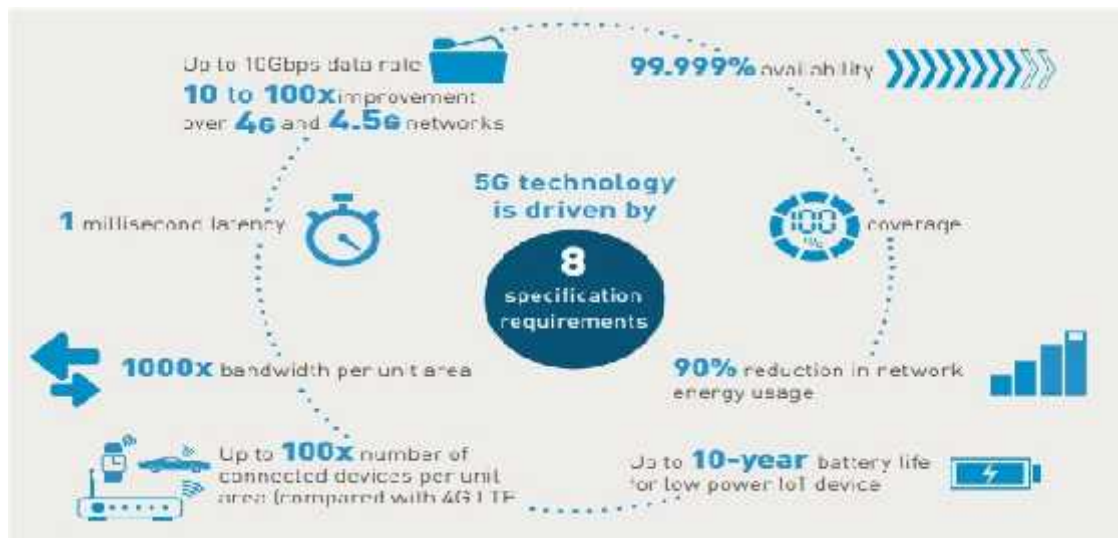


Evolution of mobile networks

In this figure they discussed about the generation and about the years in which 1G, 2G, 3G, 4G introduced. it is predicted that in future by using 5G technology, consumer can download 1080p HD movie in just a second in their cell phones and they can also download 50Gb games in just one minute. They discussed that technology called filter bank multicarrier (FBMC) is a new technique and have much more advantages over the technique called Orthogonal frequency division multiplexing (OFDM). Their work expand that few changes in (FBMC) caused replacement of (OFDM). They include that (OFDM) is much more sensitive than (FBMC), with the growth of mobile customers, it works better.

**Why 5G Is Required**

The key difference between the current 4G technology and the planned 5G technology from consumer perspective must be anything other than improved top output; other criteria include:

- 5G technology transmits data more efficiently and faster than the 4G technology. Low latency rate.
- Less battery consumption.
- Wireless World Wide Web (WWWW).
- Around 1 Gbps data rate in mobility.
- 5G technology will have more transmission capacity and bandwidth.
- More secure than the 4G.
- Multiple data transfer paths and these data transfer paths are concurrent.



**Challenges for 5G**

**Internet of things**

Internet of things will resume daily part of our life connecting everyone by 24/7. IOT applications need several requirements foe good performance such as high speed, low latency and in case of maintaining high quality service minimum down time. At the other hand, while working on the next generation of cellular system (5G) with its individual features makes it an effective solution for IoT communication requirements to maintain its efficiency and effectiveness.

**D2D Communication**

Device to device communication refer to direct communication without any infrastructure. D2D communication exposes some advantages for improving spectrum efficiency, but it still has some disadvantages such as security issues
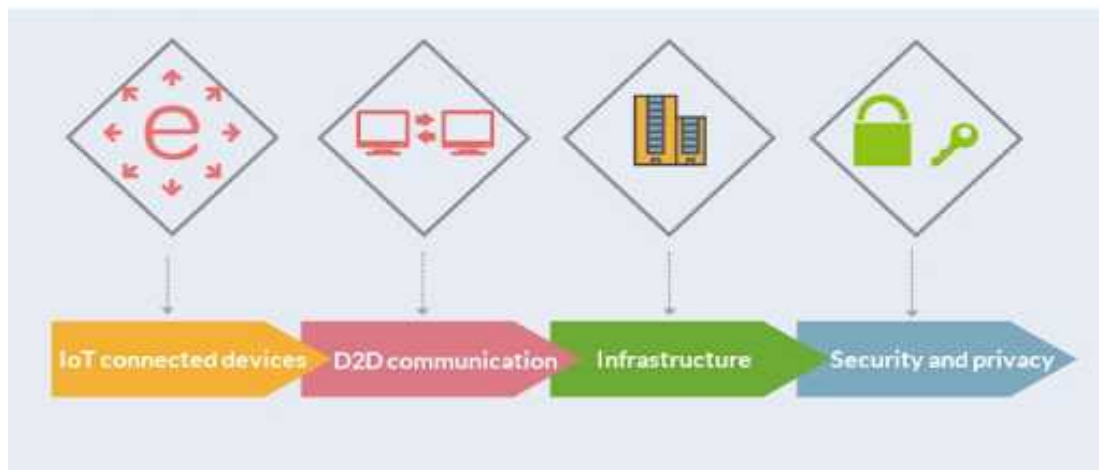
**Infrastructure**

There are two Infrastructure options for 5G technology. These are standalone and non-standalone infrastructure. A non-standalone infrastructure depends in part on existing 4G LTE technology and carries new 5G technology with it. The standalone infrastructure refers to 5G network which do not rely on LTE networks and have their own network.

**Security and Privacy**

From (Mehta et al.,2014)security is a big challenge for 5G technology for which rearrange, compatible and light weight protection mechanism should be designed. Location data privacy is frightening concern with 5G technology. 5G is the smaller extent area to which something deals with something else. Therefore many cellular towers placed together with a smaller radius



**Advantages of 5G Technology**

From (Fagbohun, 2014)5G aims to provide consumers with a range of services at high speed. Main advantage of 5G is greater speed in transmission. There are many advantages of the 5G technology but here we have to discuss only those which are more important. Some of the advantages of the 5G technology are as follow:

**Increased all-user Bandwidth**

Bandwidth is the amount of user space available to download files and access web pages   etc. One of the benefits of 5G technology is that companies like Sprint and T-Mobiles etc. have improved capacity on the data network. Many users have 3G memories when they view internet page or download file it will take more time on loading and watch the progress bar load their page. On 5G this will be a worry of past. That means 5G provide more bandwidth through which people don't feel like they're fighting for knowledge in crowded places like airports and sports areas etc. To use more bandwidth people will change their devices to do things that never done before.

**Interoperability**

4G technologies limit users to ability to move and interoperability across various networks. 5G technology will be able to provide global unified standard to facilitate the users. By using the same mobile device, a user can accept the various services from various service providers.

**High Performance**

4G provides less transfer data rates to users when downloading content. In contract, 5G technologies provide higher data transfer rates 1-20 GB/s. 5G technology will allow the users to download the content more quickly. 5G technology will give users to experience less delay. 5G much lower the latency. 5G increased the capacity of the network as the network expands.

**Lower Power Consumption**

4G technology used more power consumption mean battery can be reduce very fast by using 4G. 5G is lower power consumption and battery cannot be reducing fast like 4G technology. 3G devices need one battery and two batteries are required for 4G devices. Reducing the battery of the wireless devices is the big problem but 5G technology will have to break this rule of reducing the battery. Battery runs out very fast by using 5G technology.

**Disadvantages of 5G Technology**

The expected disadvantages of the 5G technology are as follow:

- 5G technology needs more expenditure in infrastructure as it has a higher frequency than 4G technology so the coverage will decrease unusually so that more number of towers will required by the 5G.
- Increased bandwidth for all users mean less coverage.
- Third parties act as a masquerader as legal users resulting in service theft and billing fraud can easily occur.

- Eavesdropping and catching of private or important communication can be done easily through the 5G technology.
- 5G mobile devices are expensive so that it takes time for common man to make use of 5G technology.
- Security and privacy issue of personal data is still not solved by the 5G technology.
  - Some open issues in the 5G technology from social perspective are as follow:



## Future Scope and Future Direction

5 Gmobile wireless technology will be new change in a world of mobile communication technology. Different wireless technologies will be approach by the 5G mobile technology. We can control any place of the world with the help of 5G technology from any part of the world. We can watch HD video without any buffering; we can communicate with friends and family without any interruption. Message will be automatically typed whatever your brain thinks. From (Singh et al.,2012)the 5G cell phone can have approach to various wireless technologies

simultaneously and the end must be able to integrate unlike flows from various technologies.

**Conclusion**

In this paper, we have studied contrasting wireless mobile communication technology and the technology bands of 1G, 2G, 3G, 4G, and 5G. 5G mobile communication network will be brought by the end of decade. We anticipate that this paper will assist different human beings from distinctive fields working on the future mobile technology. A brand new uprising of the fifth-generation mobile communication technology is ready to begin because 5G era will provide us hard of completion to an ordinary PC and laptops whose marketplace could be attain. Future 5G mobile communication technology can be accessible at market in sensible rates, excessive top future and even more reliability than the previous technologies. As a result, user centric networks are given more priority nowadays providing the available services which the user may not have experienced before.

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