

# 5G Technology Evolutions

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## ABSTRACT

5G technology has number of existing generations of wireless technologies in terms of their portal, efficiency, effectiveness, and cost-benefit analysis. The paper puts a focus on the evolution and development of various generations of mobile wireless technology along with their significance and advantages of one over the other. From past several decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution, namely from 1G to 4G. The Current research in mobile wireless technology concentrates on promoting the implementation of LTE technology and 5G technology. At present, the term is not officially used. In 5G, the research on the development of World Wide Wireless internet access (WWW), Dynamic adhoc Wireless Networks (DAWN) and Real Wireless World. In this paper, we focus a new network architecture for the next-generation of mobile networks, 5G. In this architecture, the mobile device will have the ability to get to the Radio Access Technology - RAT based on certain user-defined criteria.

**Keywords:** MIMO Based Millimeter waves, Service Based Architecture (SBA)

## 1 Introduction

In the mobile wireless industry has started its technology creation, revolution and evolution since the beginning of the 1970-ies.& none of the company's own 5g , but there are lot of companies that will help bring 5g Technology to life. We have played a very important role in the thinking of many of the fundamental technologies that drive the industry forward, and make-up for 5g, the next standard in wireless networks. From past few decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution. The telecommunication networks in the World, and it has been a huge leap in the last couple of years. Out of the 6 billion people own mobile phones, so we are going to analyze the various generations of cellular systems is studied in the development of mobile communications, We are able to analyze that it may be due to the increase in the number of telecom customers on a day-to-day basis. At the present time, we have four generations of mobile communications. These are the 1G - the first generation, or 2G, the second generation, or 3G-the third generation of 4G, the fourth generation, or 5G, the fifth generation to the next. Recently, various types of wireless and mobile technologies, such as third-generation mobile networks (UMTS, Universal Mobile Telecommunications System), cdma2000), LTE (Long Term Evolution), a Wi-Fi wireless lan(wlan), WiMAX, wi-fi and mobile network), also sensor networks, personal area networks (e.g. Bluetooth, ZigBee).

## 2 Why 5g Better Than 4g?

5G is a specific platform that is more capable than 4G. With 4G LTE, it is aimed to deliver much faster speed than 3G, 5G is designed to be more integrated, more viable platform that will not only lift the mobile user experience, but it also supports new types of services, such as: mission-critical communications, and it is a huge Thing. 5G could also have built-in support for all spectrum types and bands (low, mid, high), and a wide range of deployment models, from the traditional macro-cell-to-day), and a new way to get in contact with one another (for example, the device-to-device and multi-hop mesh).



5G uses a spectrum of GHz Frequencies which is better than a 4G phone. 5G has been designed in such way to make the most of each piece in the range to be used in a wide range of the spectrum, and the regulatory paradigm, in which the low bands below 1 GHz, and in the middle of all of the bands from 1 to 6 GHz, GHz, high band is well-known as the millimeter wave (mmWave). 5G is faster than 4G. 5G might be faster than 4G, delivering up to 20 Gigabits per second (Gbit / s peak data rates to 100 Megabits per second (Mbit / s) average data rates may apply. 5G has more capacity than 4G. 5G Technology is designed to support a 100x increase in traffic capacity and network efficiency.

### 3 Network Architecture of 5g

#### A Core Network

In this part, we are going to provide an 5G-core architecture overview and description of the 5G core components. We are going to see how to make the 5G architecture is related to the current LTE architecture.

The 5G core network, which enables advanced features of the 5G network, which is one of the most important parts of the 5G System, which is also known as the 5GS (source). The two parts are the 5G access network (5G-AN) and User Equipment (UE). The 5G core Technology makes use of a cloud-based line of a service-based architecture (SBA), in order to support user authentication, security, session management, and the overall flow of the connected devices, all of which are necessary for the complex coupling of the network, as shown in the 5G core is on the cards.

The components of the 5G core architecture:

- The user plane Function (UPF)
- The Data network (DN), e.g. operator services, Internet access or 3rd party services
- Mobility Management Function (AMF) &The core Access
- The authentication Server Function (AUSF)
- Session Management Function (SMF)
- Network Slice Selection Function (NSSF)
- Network function (NEF)
- NF Repository Function (NRF)
- Policy Control function (PCF)
- A Unified data management (UDM)
- The use of this Function is set to OFF.

#### 3.1 5G Architecture

In fig no.1, 5G has been designed from the ground up, and the network features of the site are broken down by service. That's the reason why this structure is also well-known as 5G-core, service-based Architecture (SBA). Figure 1 explains the 5G network topology diagram shows the main components of the 5G core network:

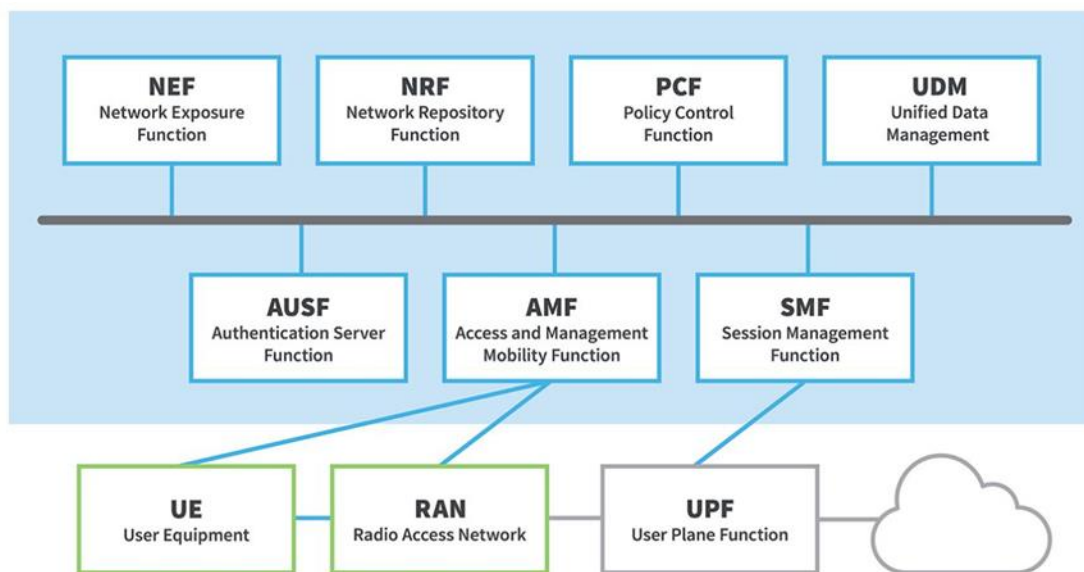


Figure 1: 5G core network

### 3.2 5G Design and Planning Considerations

The design for a 5G network architecture, which provides support for the most demanding applications is a complex one. For Example, there is no "one-size-fits-all approach, the range of applications, it is necessary to provide information on the distance traveled, the large amounts of data, or a combination of the two. Hence, the 5G architecture will need to support the low and medium and high-band spectrum from the copyright licensing, both private and public resources to a full 5G vision for the future. This is the reason, 5G is designed not to turn on the radio frequencies that range from sub-1 gigahertz (GHz) up to very high frequencies, the so-called "millimeter-wave (or the mm-Wave). The lower the frequency, the faster the signal can travel. The higher the frequency, the more data it can do.

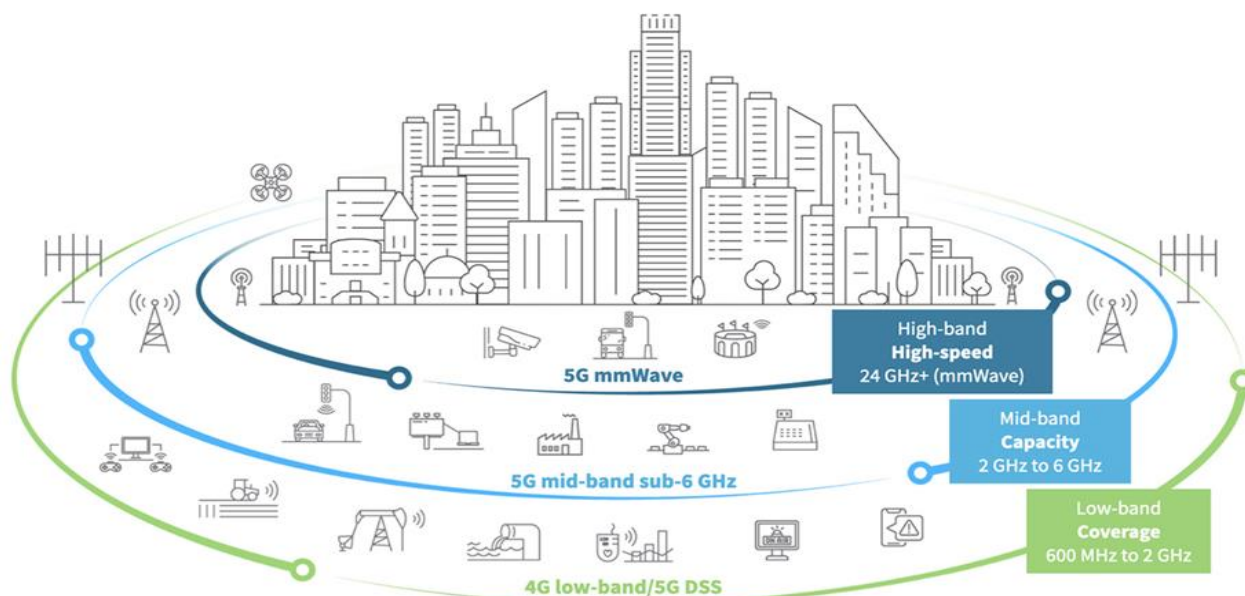


Figure 2: 5G Network Architecture

There are total three bands that are at the core of 5G networks:

- In Fig no.2 ,(5G high-band mmWave) technology to provide the highest frequencies of 5G. They are ranging from 24 GHz to approximately 100 GHz. Considering the higher frequencies will not be an easy one to go through obstacles and high-band 5G, is in the short distance through the province. In addition

to that, the millimeterWave coverage is restricted, and will require a new infrastructure. In Fig no.3 The 5G mid-band is in the 2 to 6 GHz frequency range and has a seating capacity of both the urban and suburban areas. In this frequency band, the peak rates are hundreds of MBPS.

5G low-band operation, according to the 2-GHz band and provides a wide coverage. This is the band which makes use of the spectrum, and the use of Technology to offer a wide range of features that are useful to all of group of peoples.

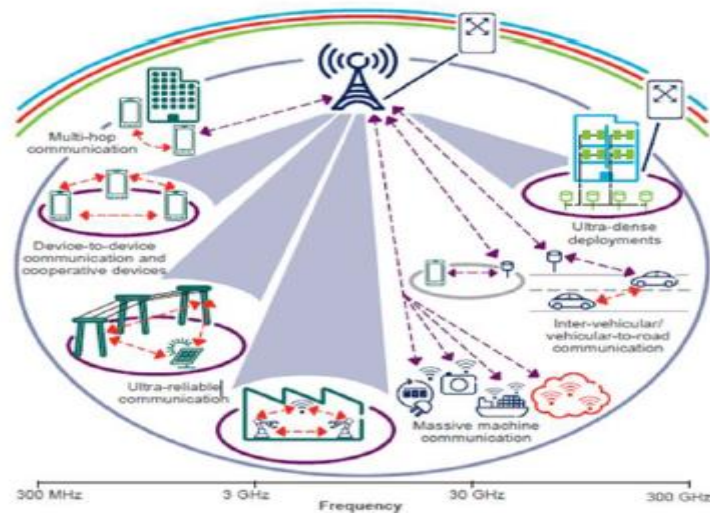


Figure 3: Telecom wireless Testing of 5G Network

#### 4 Difference Between the previous generations

The current generations of mobile cellular networks 1G,2G,3G and 4G. The first-generation 1G(1980-1990): supplied analog voice. The second-generation 2G: At the starting of the 1990's: 2G introduced digital answering system.(g) CDMA-code division multiple access). The third-generation 3G:At the starting of the 2000's, 3G, and brought it to mobile data (e.g., CDMA2000). The fourth generation of the various wireless 4G LTE. In the 2010's, 4G LTE, ushered in the era of mobile broadband internet access.

1G, 2G, 3G, 4G, and all of it led to 5G, which has been designed to be more connected than it has ever been. In the high-speed performance, superior reliability, and it is a very small latency, 5G will expand the mobile ecosystem and the people. 5G is going to affect every industry, creating a safer and more secure transportation, telecommunications, precision agriculture, and digitized, supply chain management, and more of a reality.5G is designed to deliver peak data rates up to 20 Gbit / s based on the IMT-2020 requirements. Qualcomm Technologies ' flagship 5G solutions for the Qualcomm Snapdragon X65 it is designed to reach up to 10 gbit / s in the downlink peak data rates may apply. But 5G is more than just a matter of how fast it is. In addition to the higher peak data rates, 5G is designed not to have a lot more capacity, due to the development of the new series, such as mmWave.

5G can provide a lower latency, faster response, and can be used for a more consistent user experience, so that the dates of the rates to be consistently high, even when the user is moving around. The new 5G NR mobile networks are supported, the Gigabit LTE coverage of your foundation, which can provide a ubiquitous Gigabit-class connectivity.

##### 4.1 Advantages of 5G

There are a number of advantages of 5G technology, some of the features are presented in the above-Ericsson, photos, images, and many, many others, are discussed below –

- Lwa is a high-resolution, bi-directional large bandwidth shaping.

- The investment in the technology for the collection of all networks on a single platform.
- The classes are going to be more efficient and effective
- Lwa, easy-to-use, the previous generation
- Investment in technology in order to support heterogeneous services
- The potential to provide consistent coverage throughout the world.
- The Potential to find and the search for the missing person.

#### 4.2 Disadvantages of 5G Technology

- The technology is still in the research process, and the profitability of your hand.
- The speed of this technology is claimed to be, it seems to be very difficult to achieve in the future, it would be due to the negligence of technology in most parts of the world.
- Many of the devices that do not have the power of 5G, which is why they all need to be replaced with a new one — an expensive proposition.
- The development of infrastructure is the high cost.
- Safety, security and privacy, and the problem is still not solved.

#### 5 Conclusions

A comprehensive study of the future of the fifth generation of wireless technology that has been made. We have introduced the fifth generation of the web, the challenges, the supervisor, and the design of the basic network architecture of 5G spectrum, the ultra-dense radio access networks, and the dissipation of traffic coming from mobile, and cognitive-fe unit cell , Wi-Fi, and White-Fi internet access, an alternative option is defined, the cognitive radio, software defined radio, software defined networking, 5G's impact on society, this document. In this paper, this is the one that you can be a better platform to ask questions of representatives from industry, academia, & scientists to better results in the various kinds of problems and challenges in the future, and the fifth (5G) generation wireless networks

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#### References

- [1] KhushneetKour , "A Review Paper on 5G Wireless Networks", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org V-IMPACT - 2016.
- [2] Meenal G. Kachhavay[1] Ajay P.Thakare[2], "5G Technology-Evolution and Revolution", International Journal of Computer Science and Mobile Computing ISSN 2320-088X Available Online at www.ijcsmc.com IJCSMC, Vol. 3, Issue. 3, March 2014, pg.1080 – 1087
- [3] Nam Tuan Le, I Mohammad ArifHossain, "Survey of Promising Technologies for 5G Networks", Hindawi Publishing Corporation Mobile Information Systems Volume 2016, Article ID 2676589, 25 pages <http://dx.doi.org/10.1155/2016/2676589>
- [4] Saddam Hossain, "5G Wireless Communication Systems", American Journal of Engineering Research (AJER) 2013 e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-10, pp-344-353 [www.ajer.org](http://www.ajer.org)
- [5] Websearches on 5G Technology Related.