

# An Overview on Fifth Generation (5G) Technology

Vijay Kumar <sup>[1]</sup>, Sonam Gour <sup>[2]</sup>

<sup>[1]</sup> B.Tech Student, Department of Computer Science Engineering,

<sup>[2]</sup> Assisatnt Professor, Arya College of Engineering and Research Centre,  
Kukas, Jaipur, Rajasthan - India

## ABSTRACT

In modern days, we are using wireless modern communication systems, which require high data rates and more band width efficiencies. The most well-known 4G technology of wireless standard is Long Term Evolution (LTE) which espoused OFDMA (Orthogonal Frequency Division Multiple Access) and MIMO (Multi Input Multi Output) techniques. The 5G technology is basically stands for 5th generation technology. We have seen as vast and rapid development and improvements of telecommunication in our daily life. This paper is focusing of all the previous introduced generations and the upcoming 5G generation in India. Presently the term 5G is not used as an official term by any organisation. The fifth-generation technology focuses voice over internet protocol (VOIP) enabled devices which enables the user to experience high quality of calling and transmission of data at high speed. The fifth generation can offer various features such as cloud gaming, internet of things, electronic transactions etc.

**Keywords:** 5G Technology, LTE-A, Very High Speed data Rate, VOIP

## I. INTRODUCTION TO THE 5G TECHNOLOGY

The start of wireless communications dates returned to the past due 19th century, while M.G. Marconi did the pioneering paintings of setting up the primary a success radio hyperlink among a floor station and a tugboat. Since then, wireless communication structures have advanced and advanced at a splendid rate. The wide variety of cellular subscribers has multiplied dramatically over the last decades. The wide variety of cellular subscribers global has grown from some thousand on begin of the 20th century to around 1.5 billion in 2004 [1].

Wireless communications is an unexpectedly developing section of the communications industry, with the ability to offer high-quality, high-speed data trade among transportable gadgets placed everywhere with within the world. It has been the concern of research for the reason that 1960s, the high-quality improvement of wireless conversation era is because of the confluence of numerous factors. First, the call for wireless connectivity is

exploding. Second, the dramatic advances in VISL generation have enabled the implementation in small, low energy regions of a complicated signal processing and coding algorithm. Third, the second one era wireless a conversation standard, which includes CDMA, GSM, TDMA, permit the transmission of virtual voice and information at low volume. In addition, the third generation of wireless communications can provide customers an extra superior provider that achieves better potential via advanced spectral efficiency [2].

Modern wireless communication systems drive for prime knowledge rates, reliable communications, improved coverage and lower power necessities. Multiple input and output (MIMO) will be known as a candidate to satisfy these challenges. MIMO technology provides higher spectral potency and improves the reliableness of communication systems [3-4]. Communication through the cooperative sequence improves speed and expands the coverage space [5].

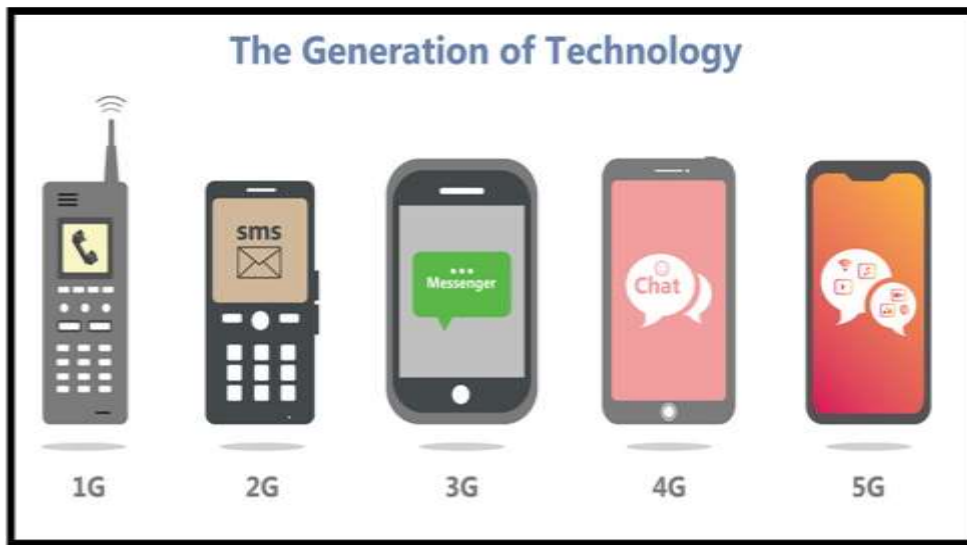


Fig 1 : Different Generation of Mobile Cellular Generation

When considering the today's world scenario, we all experience that the way of communication is developing very rapidly every day. Now a days everyone has its own mobile phone or we can say a mobile computing device which can perform most of the task that are used to be performed only on the desktop computers. Now nobody uses a landline phone. A modern mobile phone can perform several tasks and also keeps us connected to the network all the time using internet. When we talk about 5G technology it will take a long jump then the previous generations [6].

We have experienced the previous versions of generations such as 1G, 2G, 3G and 4G technologies all the generations are better than the previous versions and have many improvements then the previous versions and now the next generation is on the way that will change the way we communicate with each other. 5G can not only connect only peoples but can also connect the machines and internet on things enabled devices[7-8].

5G technology can wholly modify the value of how the data is priced over the world. In the small devices such as smart wearables devices various features are embedded nowadays a mobile phone have 4 to 5 cameras and the 5G technology can make it possible to offer these smart devices at affordable rates also.



Fig. 2: 5G Technology Overview

## II. HOW 5G TECHNOLOGY WORKS

Like 4G LTE, 5G is also dependent on OFDM and will work according to the same principles as the mobile network. However, the new 5G NR (New Radio) radio interface will improve OFDM to provide a greater degree of flexibility and scalability. For more details on the 5G waveform and multiple access technologies, please see this white paper on the 5G waveform [10-11].

5G will not only provide faster and better mobile broadband services compared to 4G LTE, but it will also expand into new service areas, such as important communications and mega internet connection. This is made possible by many new 5G NR radio interfacing technologies, such as the new independent TDD sub frame design; for more detailed information on 5G and an understanding of the specific components of the 5G NR design, please refer to this technical document 5G.

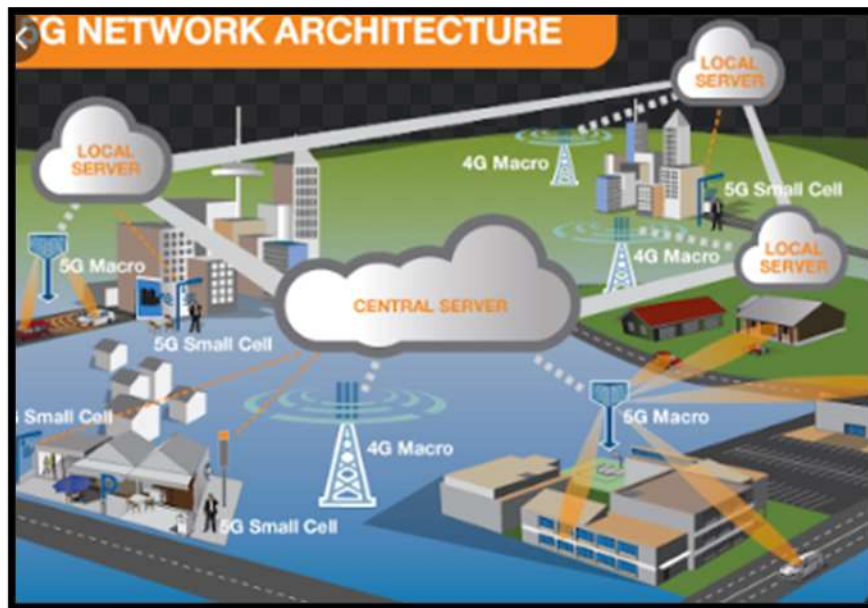


Fig.3: Working of 5G

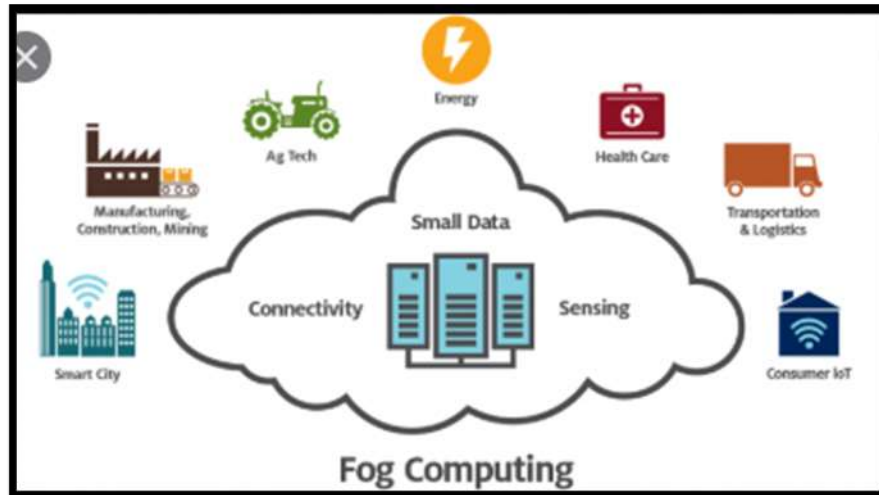
## III. WHAT ARE THE KEY DIFFERENTIATING 5G TECHNOLOGIES?

5G is bringing a wide range of technology inventions in both the 5G NR (New Radio) air interface design as well as the 5G NextGen core network. The new 5G NR air interface introduces many foundational wireless inventions, and in our opinion, the top five are:

- Scalable OFDM numerology with 2n scaling of subcarrier spacing
- Flexible, dynamic, self-contained TDD subframe design
- Advanced, flexible LDPC channel coding
- Advanced massive MIMO antenna technologies
- Advanced spectrum sharing techniques

## IV. APPLICATION OF 5G TECHNOLOGY

- Autonomous Vehicle
- Industrial automation
- Cloud Computing and gaming
- Health Care
- Smart Homes
- Under water communication
- Self-driving car
- Smart Cities
- Mobile connectivity
- IOT Devices



➤ Fig.4. Applications of 5G

## V. THE BENEFIT OF 5G TECHNOLOGY

5G is a new type of network: a platform for innovations that will not only improve mobile broadband services today, but will also expand mobile networks to support a wide range of devices and services and connect new industries with improved performance, efficiency and costs. 5G will redefine a wide range of industries with connected services, from retail to education, transportation to entertainment, and everything in between. We consider 5G technology as transformational like cars and electricity.

Through a historical study on the 5G economy, we have found that the full economic impact of 5G will be achieved worldwide by 2035, supporting a wide range of industries and potentially producing up to \$ 12 trillion. goods and services [12].

The study also found that the 5G value chain (OEM, operators, content creators, application developers, and consumers) alone could achieve up to \$ 3.5 trillion in global revenue by 2035 and support up to 22 million jobs, and more than one job per person in Beijing, China. Of course, there are many new and emerging applications that are not fully defined or even known today. That is why only time will tell us about the Full 5G Effect.

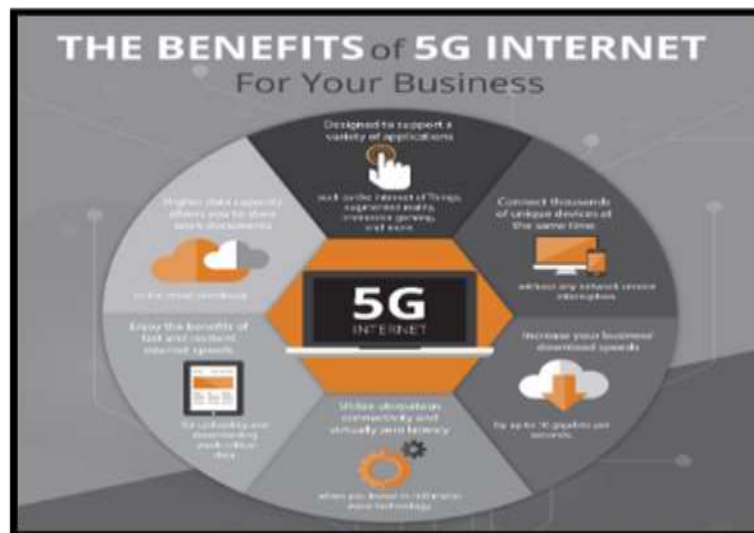


Fig.5. Advantages of 5G

## VI. DISADVANTAGES OF 5G



Fig.6. Disadvantages of 5G

The 5G technology consists various disadvantages some of them given below →

- 5G is not yet fully developed i.e. its viability is still running.
- Infrastructure- this technology needs a whole new infrastructure to be implemented.
- Costly- the hardware requirements for this technology are costlier.
- Security- the security issues are yet to be removed

## VII. DIFFERENCES BETWEEN 4G AND 5G

There are several differences between 4G vs 5G:

- 5G is a unified platform that is more capable than 4G
- 5G uses spectrum better than 4G
- 5G is faster than 4G
- 5G has more capacity than 4G
- 5G has lower latency than 4G

## VIII. CONCLUSION

Nowadays when we experience the rapid change in the way of communication it is very important to accelerate the change of technologies. 5G technology will make a long jump in the way of communication and this technology not only improve our way of communication but it will be linked with our daily life with the internet on things enabled devices. Through this paper our aim is to encourage the relation between the peoples who are making their efforts for creating the future of technology of communication, services, nanotechnology and cloud computing. The 5G technology have many benefits that can meet the increasing demand of future generations.



## REFERENCES

- [1]. S. M. Alamouti, "Simple Transmit Diversity Technique for Wireless Communications," *IEEE Journal on Select Areas in Communications*, vol. 16, pp- 1451- 1458, 1998.
- [2]. R. W. Chang, "Synthesis of band-limited orthogonal signals for multichannel data transmission," *Bell Systems Technical Journal*, pp. 1775–1796, 1966.
- [3]. D. Jangir, G. Shankar, B. B. Jain and G. K. Soni, "Performance Analysis of LTE system for 2x2 Rayleigh and Rician Fading Channel," 2020 International Conference on Smart Electronics and Communication (ICOSEC), pp. 961-966, 2020.
- [4]. Jangir, Dimple & Shankar, Gori & Jain, Bharat, "Data Rate Analysis of LTE System for  $2 \times 2$  MIMO Fading Channel in Different Modulation Scheme", *Springer Computational Methods and Data Engineering*, pp.-469-479, 2021.
- [5]. H. Singh, G. K. Soni, P. Suryawanshi and G. Shankar, "Performance Analysis and BER Comparison of OFDM System for 4x4 MIMO Fading Channel in Different Modulation Scheme," 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT), pp. 255-259, 2020.
- [6]. Abdullah Gani, Xichun Li, Lina Yang, Omar Zakaria, Nor BadrulAnuar, Multi-Bandwidth Data Path Design for 5G Wireless Mobile Internets, *WSEAS Transactions on Information Science and Applications archive*, Volume 6, Issue 2, February 2009. ISSN: 1790-0832.
- [7]. Tomorrow's 5g cell phone; Cognitive radio, a 5g device, could forever alter the power balance from wireless service provider to user, *InfoWorld Newsletters / Networking*, February 28, 2003.
- [8]. Toni Janevski, 5G Mobile Phone Concept, *Consumer Communications and Networking Conference*, 2009 6th IEEE [1-4244-2308-2].
- [9]. The Korean IT R&D program of MKE/IITA: 2008-F-004-01 "5G mobile communication systems based on beam-division multiple access and relays with group cooperation".
- [10]. Ganesh R. Patil and Prof. Prashant S.Wankhade, "5G WIRELESS TECHNOLOGY", *International Journal of Computer Science and Mobile Computing*, Vol. 3, Issue. 10, PP-203 – 207, October 2014.
- [11]. Nam Tuan Le, Mohammad Arif Hossain, Amirul Islam, Do-yun Kim, Young-June Choi, and Yeong Min Jang, "Survey of Promising Technologies for 5G Networks", *Hindawi Publishing Corporation, Mobile Information Systems*, 2016.
- [12]. J. G. Andrews, S. Buzzi, W. Choi, S. V. Hanly, A. Lozano, A. C. K. Soong, and J. C. Zhang, "What will 5G be?" *IEEE J. Sel. Areas Commun.*, vol. 32, pp. 1065–1082, Jun. 2014.