Original Research Article

J. Computing & Int. Systems (2021) 229–232

Journal of Computing and Intelligent Systems

Journal homepage: www.shcpub.edu.in

ISSN: 2456-9496

Ultra-Modern Fifth Generation Wireless Technology

Saurabh G Katre#1, Muqueet UR Rehman#2

Received on 28th JUN 2021, Accepted on 30th JUN 2021

Abstract — It is the most recent generation of cellular technology, with advantages such as faster speeds, lower latency, ultra-reliable communications, and huge property, allowing for the simultaneous connection of several devices. This distinguishes this technology from all other mobile technologies now in use throughout the world. In the fifth generation, an analysis of the World Wide Wireless Web (WWWW) and the Real Wireless World is being developed. Fifth-generation refers to future mobile network technology that will be introduced in India by several main mobile carriers between 2020 and 2021. It has the potential to significantly improve wireless technologies. The purpose of this study is to give a brief overview of fifth-generation wireless technologies.

Keywords - Wireless technology, 1G to 5G development, network architecture.

I. INTRODUCTION

Wireless communication technology has advanced and improved greatly over the years as a result of study and development. The moment has come to link a variety of wireless technologies, networks, and applications all at once. 5G is the designation given to the most recent technology. Following generation of wireless communication systems is the fifth-generation wireless system. On the outskirts of the current 4G, it's following a key portion of mobile telecommunications standards. 5G moves the United States away from mobile-only networks and toward systems that connect at fast speeds.

High throughput, better spectrum potency, decreased latency, greater quality support, and high association density are some of the major features of fifth-generation. Multimedia, phone, video, Internet, and various broadband services are all supported. New spectrum has been given to fifth generation in the millimetre wave bands to accommodate the increased output demands of 5G. Multiple Input Multiple Output (MIMO) can be used in 5G to significantly enhance network capability [1].

The move to the 5G wireless communication standard is a logical response to the rise of the IoT and as a result, increase in demand for services [2]. The fifth-generation system is presently being funded by a growing number of companies, who are also developing 5G products. Intel, Qualcomm, Nokia, Xiomi, Realme, Verizon, and Samsung are leading the development of the next mobile wireless standard.

I. WIRELESS TECHNOLOGY GENERATIONS

From 1G to 2.5G and 3G to 5G, the telecommunications industry has seen significant transformations. When a significant advancement in wireless mobile technology is recognised, a new generation is named (typically retroactively). Previous generations, like as 3G, marked a watershed moment in communications. 1G was an analogue telecommunications standard for voice with a data-rate of 2.4 kbps in communications that was originally established in the 1970s. FM and FDMA were used, together with a thirty-kilocycle information measure. Poor speech quality, a short battery life, and a bulky phone are among the most prominent downsides of 1G.

Then there are 3G wireless networks, which employ a technique called Code Division Multiple Access (CDMA) (CDMA). It was the first to offer high-speed internet connection. W-CDMA and HSPA were among the technologies utilised (High-Speed-Packet-Access). It offered IP property services for both time-based and non-time-based. The need for data services via the internet fueled the development of 3G.

* *Corresponding author: E-mail:* [1]saurabhkatre2157@gmail.com

[2] mrrehman750@gmail.com

[1]Student, Dept. of Computer Sci & Engg., SGBAU, Amravati, Maharashtra, India.

[2]Student, Dept. of Computer Sci & Engg., SGBAU, Amravati, Maharashtra, India.

4G is similar to 3G and is considered a step forward from 3G, but with a quicker web connection, more capacity, and lower latency. 4G technologies such as WiMAX and LTE (Long-Term-Evolution) promise to be 5 times faster than 3G services. COFDM (Coded Orthogonal Frequency Division Multiplexing), MIMO (Multiple Input Multiple Output), and link adaptability technologies were used in the project. Spectrum scarcity and high energy use are two challenges that 4G cannot solve. The current focus is on 5G, which is capable of supporting IPv6. There are substantial advances from 1G, 2G, 3G, and 4G to 5G [3 to 5]. Fig 1 illustrates the evolution of wireless technologies from 1G to 5G.

Fig 1: Wireless network generations [1G to 5G]

II. NETWORK ARCHITECTURE DESIGN AND LAYERS

The system model in the fig-2 shows a proposes network architecture design for a fifth-generation system, which is primarily an IP-based model for wireless and mobile network capability. This system consists of a user terminal and a variety of independent, autonomous radio access methods. Every radio access method is seen by each terminal as an IP link to the internet-using world. Each Radio Access Technology (RAT) in the mobile terminal, on the other hand, has its own radio interface. If we want access to four different RATs, for example, we'll need four unique access points - specific interfaces within the mobile terminal - and we'll want all of them active at the same time, with the objective of making this design purposeful.

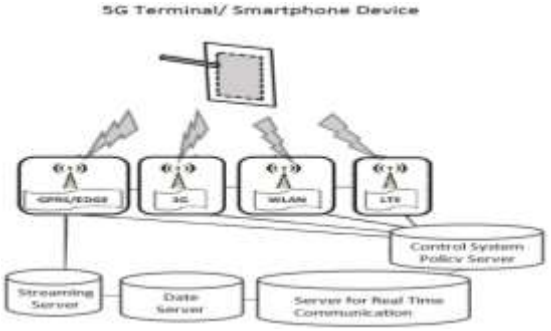

Fig 2: Network Architecture

Fifth Generation Technology Model
Application
Open Transport Protocol (OTP)
Upper Network Layer
Lower Network Layer
Open Wireless Architecture

Table 1: Network Layers

III. WORKING

5G networks, like previous cellular networks, can have cells separated into sectors and transfer data through radio waves. A wired or wireless connection connects each cell to the network backbone. 5G may provide data across unlicensed frequencies that are now utilised for Wi-Fi. It ensures a more reliable, quicker, and cost-effective network. The objective of 5G is to provide significantly faster speeds, more capabilities per sector, and lower latency than 4G. The cell is split into small and pico cells to increase network potency [6].

WWWW can support applications and services, and they can link the entire world. Included are the most modern technologies, such as radio, the Internet of Things, and cloud computing. The following sophisticated features are seen in fifth-generation technology [7]:

- Device-centric, distributed, programmable, and cloud-based architectural designs are used.
- Data rates are quite high.
- Each endpoint has a connection speed of one to 10 gigabits per second.
- End-to-end round-trip latency of one millisecond
- Battery usage is low.
- No matter where you are, you have higher importance.
- A wider range of devices are supported.
- Infrastructure development at a lower cost.

IV. KEY ENABLERS

The creation of 5G will not start from scratch, but rather rely on 4G LTE in stages. The following are some of the major 5G technologies:

• Device-to-Device (D2D) communication: This technology allows for direct communication. D2D millimetre wave communication technology can be used in a 5G cellular network to provide high-speed rates, increase network coverage, and provide peer-to-peer applications. Characterizing D to D connections as part of LTE has taken a lot of time and effort [8].

• Machine-to-machine (M2M) Communication: Whereas D3D communication focuses on mobile radios, M2M communication broadens the scope and facilitates the omnipresent property among mobile devices. It is estimated that over a hundred billion linked devices would use M2M communications in the 5G backbone [9].

• MIMO: MIMO (multiple-input-multiple-output) technology is crucial in 4G and is expected to be even more significant in 5G. Huge MIMO further extends the benefits of MIMO to a larger scale by improving throughput and spectrum potency.

Millimetre wave communication, ultra-dense network (UDN), all-spectrum access (ASA), OFDM (orthogonal frequency division multiplexing), and IoT are some of the other 5G facultative technologies.

V. APPLICATIONS

The following are just a few of the many uses for 5G wireless technologies:

• Augmented reality/virtual reality/tactile web

• Connected cars/autonomous driving

• Multi-person videoconferencing using a cloud-based wireless office

• A uniform worldwide standard that applies to everyone

• Network connectivity from anywhere, at any time

• Blockchain

• Videos in 3D and Ultra High Definition (UHD)

• Remote medical check-ups and smart surgery

• Safety on the go. Furthermore, 5G can allow a person to pay all of his or her expenses in one transaction and vote from his or her phone.

VI. ADVANTAGES

The benefits of 5G wireless technology are expected to be threefold:

• Faster Response: Data transfer speeds with 5G are expected to be around 10 times faster than with 4G, implying far faster transmission of images and videos.

• Reduced latency: 5G is expected to reduce latency (the time between causes and effects). This might make it possible to watch high-speed video game footage without any delays, for example.

• Increased connectivity: 5G technology would provide consumers with faster and more dependable connections than 4G/LTE. This implies that a large number of people and gadgets may communicate at the same time.

Aside from these benefits, 5G offers the amazing capacity to assist any computer code or practise. It's due to the high rate at the cell's apex and the increased coverage area. It uses a small amount of battery power. It is beneficial to the government because it will make governance easier, and it is beneficial to the general public since it will provide online property at any time and from any location.

VII. CHALLENGES

The shift from 4G to 5G offers several transformative issues that must be addressed in order for the 5G vision to be fully realised. The sanctimonies of 5G confront problems when it comes to new technology. The use of this technology to provide services in a variety of applications poses certain problems. Some criticise 5G because of its high expected value, arguing that it would be incompatible with previous generations. 3G and 4G phones will be unable to connect to a 5G network, just as 2G phones were unable to connect to 3G or 4G networks. A new phone must be purchased, which will almost probably be more expensive than 4G/LTE service. We require a substantial modification in the cellular design style to overcome these challenges. We'll also have to meet 5G system criteria like Mfento-cells, low latency, network quantifiability, long battery life, and inexperienced communications. It's challenging to satisfy these standards while still cutting expenses [10].

VIII. CONCLUSION

We conclude in this study that a fifth-generation rk is extremely fast and dependable.

Based on 4G technology, fifth-generation wireless technology might be a valuable wireless network for

mobile, fixed, and business wireless applications. It has a wide range of sophisticated features, making it powerful and in high demand in the near future. Before 5G can be implemented, numerous testing and experiments must be done. This technology is still in its early stages of development. It has a promising future and the potential to revolutionise the mobile market.

IX. FUTURE SCOPE

Since it integrates artificial intelligence with nano-core, the fifth generation increases the future of nano-core and will be inconceivable (AI). A smart gadget will be able to control one's intelligent robot mechanism. The message will be automatically typed by your phone based on what your brain believes. We'd get at a stage where no spectrum is required for communication. According to Google hot trends, the phrase 6G is the seventeenth most searched word. Despite the fact that 6G technology has yet to be fully discovered, search phrases such as what is 6G mobile technology, 6G technology, 6G mobile, 6G network, 6G wiki, and 6G technology ppt are growing more popular.

ACKNOWLEDGMENT

The Originality of the work has been warranted by our team and is not been published or in review elsewhere.

REFERENCES

[1] "5G" Information from Wikipedia - https://en.wikipedia.org/wiki/5G

[2] "5G Development with MATLAB", https://www.mathworks.com/content/dam/mathworks/ebook/gated/5G_ebook.pdf

[3] G. Mishra, A. Agarwal and K. Agarwal, "The 5th generation mobile Wireless networks - Key concepts, network architecture and challenges", http://pubs.sciepub.com/ajeee/3/2/1

[4] R. Nordin and M. H. Alsharif, "Evolution towards 5G wireless networks: Current trends and difficulties in the deployment of millimetre wave, massive MIMO, and tiny cells," Telecommunication Systems, vol. 64, 2017, pp. 617-637.

[5] A. V. Bhalla and M. R. Bhalla, "Mobile Wireless Technology Generations: A Survey,", IJCA, vol. 5, no. 4, August 2010, pp. 26-32.

[6] "How 5G technology works", https://www.rfpage.com/how-5g-technology-works

7] D. H. Lathe et al., "A research on 5th generation mobile technology and future network service", IJCS, vol. 5(6), 2014, pp. 8309-8313.

[8] S. Andreev, "Delivering uniform connectively and service experience to convergent 5G wireless networks", Proceedings of the IEEE World Forum on Internet of Things, 2014, pp. 323-324.

[9] "5G Understanding: Perspectives on future technological advancements"

[10] Wang et al. (2014). 5G Wireless Communication Networks Architecture of Cellular and Key Technologies, *IEEE Communications Magazine*, vol. 52(2), pp. 122-130.