

# 5G Wireless Technology- A Review

Happy Singh<sup>1</sup>, Jasdeep Singh<sup>2</sup>, Jaskiran Kaur gope<sup>3</sup>, Dr. Raju Sharma<sup>4</sup>

<sup>1,2,3</sup>Student, BBSBEC, Fatehgarh Sahib

<sup>4</sup>Assistant professor, Department of ECE, BBSBEC, Fatehgarh Sahib

\*\*\*

**Abstract** - From first generation to 2.5 generation and from third generation to fifth generation of mobile telecommunication this world has seen a number of improvements along with improved performance with every passing day. This fast revolution in telecommunication world changes our daily life. This paper focuses on all the previous generations of mobile communication along with fifth generation. Fifth generation full fill all the requirements of customers who always wanted advance features in their phones. So, this paper reasons why we need 5G, applications of 5G etc.

**Key Words:** 5G, evolution from 1G to 5G, comparison, need of 5G, applications.

## 1. INTRODUCTION

Now a days, we are living in the world of technology. We are fully dependent on these technologies. Mobile phones become inseparable part of our life. We spend a lot of time on these smart gadgets. We can do many things on this smart phones like online payment of bills, online shopping etc. This is possible only due to interment. Now, we expect to have same speed on our tablets, PC and smart phones as we get at desktop at home [3]. The consumption of data increasing day by day and the present 4G technology will not be capable of carry burden of increasing data consumption. 5G is the solution for this problem. Till now, 5G does not exist in reality. But we can say that the upcoming network next to 4G, is 5G. All the data transfer and communication problems will be solve out by invention of 5G technology. 5G will provide us better communication and high data transfer speed and it is also capable of carry more data.

### Evolution of network technologies

#### 1.1 First Generation (1G)

It was introduced in early 1980's and it provided only voice call services [1].

- It contained analog system

- Analog radio signal having frequency 150MHz.
- Poor voice quality
- No security
- Low capacity
- Large size

#### 1.2 Second generation (2G)

It was introduced in late 1980's. It uses Digital signal system [7].

- 64 kbps data transmission speed
- security
- SMS (short message service )
- poor voice quality but better than 1G system
- large size
- More battery consumption

After 2G technology, **2.5G** was introduced which provides data transmission speed up to 144 kbps.

#### 1.3 Third generation (3G)

It was introduced in 1998's. 3G specifications and standards were developed in fifteen years. The technical specifications were made available to the public under the name IMT-2000.

- high speed internet
- Security greater than 2G
- Video Conferencing
- E-mail
- Multi-media service

### 1.4 Fourth Generation (4G)

4G is short for fourth generation technology. It is basically extension of 3G with more bandwidth and better service offers in 3G.

- High quality audio/ video streaming
- 10 times faster than 3G technology
- High bandwidth
- High data transfer rates

**4G LTE:** It means fourth generation long term evolution, it provides faster and more reliable mobile broadband internet for devices such as smartphones and laptops etc.

### 1.5 Fifth Generation (5G)

5G technology is the next generation of wireless communications. It is expected to provide Internet connections that are faster more than 4G LTE. 5G technology may use a variety of spectrum bands, including millimeter wave radio spectrum, which can carry very large amounts of data a short distance. The drawback of the higher frequencies is that they are more easily obstructed by the walls of buildings, trees and other foliage, and even inclement weather [4].

Table -1: Comparison Table [11]

Comparison					
Technology	1G	2G/2.5G	3G	4G	5G
Deployment	1970/1984	1980/1999	1990/2002	2000/2010	2014/2015
Bandwidth	2kbps	14-64kbps	2Mbps	200Mbps	>1Gbps
Technology	Analog cellular	Digital cellular	Broad bandwidth /CDMA / IP technology	Unified IP & seamless combo of LAN / WAN / WLAN / PAN	4G+WWW
Service	Mobile telephony	Digital voice, short messaging	Integrated high quality audio, video & data	Dynamic information access, variable devices	Dynamic information access, variable devices with AI capabilities
Multiplexing	FDMA	TDMA/CDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit/circuit for access network/air interface	Packet except for air interface	All packet	All packet
Core network	PSTN	PSTN	Packet network	Internet	Internet
Handoff	Horizontal	Horizontal	Horizontal	Horizontal Vertical	Horizontal Vertical

## 2. Why there is need for 5G?

This paper mainly focuses on how 5G network can provide

more facilities approach to common man to utilize his available possessions in enormous way to make him feel the real progress. As per users point of view, the major difference between current generations and expected 5G techniques must be something else than increased maximum throughput; other requirements include [2];

- Faster than 4G
- Lower latency
- Lower battery consumption
- Lower outage probability
- Higher data transfer rates
- More security; SDR security/ better cognitive radio
- Full multimedia capability beyond 4G speeds
- More application combined with artificial intelligent (AI)
- Smart beam antenna system

So, 5G is next generation technology that will provide all the possible applications, by using only one universal device and interconnecting most of already existing communication infrastructures.

## 3. Applications of 5G

### 3.1. High speed mobile networks

5g support up to 10 to 20 GBPS of data download speed. This speed is equivalent to fiber optic internet connection accessed wirelessly [6]. Compared to present technologies, voice and high speed data can be simultaneously transferred efficiently in 5G.

Fifth generation will be using new radio millimeter waves for transmission. It has much higher bandwidth compared to lower LTE bands and capable of huge data rates.



Fig-1: Speed comparison [12]



Fig-3: Internet of Things [14]

### 3.2. Entertainment and Multimedia

According to survey 55 percent of mobile internet traffic has been used for video downloads globally in 2015. This will increase in future and high definition video streaming will be common in future. 5G will offer a high downloading speed on your mobiles and provide crystal clear audio and video clarity.

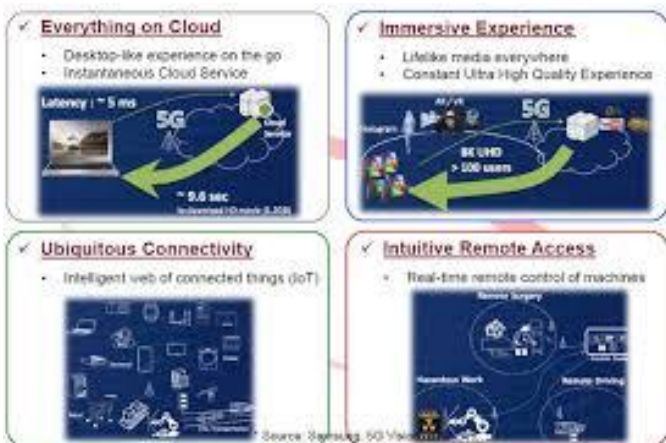


Fig -2: Entertainment and Multimedia [13]

### 3.3. Internet of things- connecting everything

Internet of Things (IoT) will connect every object, appliances, devices, sensors into the internet. Internet of Thing applications will collect huge amount of data from millions of devices. It requires an efficient network for data connections, processing, transmission control and real time analytics etc.

5 G technology is most efficient technology for IoT due to its flexibility, low cost, and unused spectrum availability.

IoT can benefit from 5G technology in many areas. For example:

#### 3.3.1 Smart Homes

We can make our home smart by connecting all home appliances and devices to internet. One can control his/her home appliances from anywhere which helps to decrease energy wasting. Standard of living will increase [8].



Fig -4: Smart Home [15]

#### 3.3.2. Smart city

Smart city applications like instant weather update, local area broadcasting, traffic management, smart power grid, energy management, water supply management etc... can use reliable 5g technology for its functioning [9].



**Fig- 5:** smart city [16]



**Fig-7:** Health care using 5G [18]

### 3.3.3 Industrial IoT

In future industries will fully depend on smart technologies like 5G for efficient automation of equipment, safety, process tracking, shipping, smart packing and energy management.

### 3.3.4 Smart farming

In future, 5g will used for agriculture purposes. By using smart RFID sensors and GPS, farmers can track location of livestock and manage them easily. Sensors can be used for irrigation control, access control and energy management.



**Fig-6:** Smart Farming [17]

### 3.3.5 Healthcare

People with medical problems will benefit from these smart technologies and real time monitoring. Doctors can connect with patients from anywhere anytime and guide them. Scientist are working on smart medical devices which help in performing remote surgery [10].

### 3.3.6 Autonomous driving

In future, due new technologies, vehicles can communicate with smart traffic signs, surrounding vehicles and objects on the road. This will reduce traffic problems, accidents etc.



**Fig-8:** Autonomous cars [19]

These are some applications of fifth generation but The application area of 5g technology is very wide. These are some applications of 5G technology which make our lives easy and increase standard of living.

## 4. CONCLUSIONS

In this paper we have surveyed 5G technology of mobile communication. Fifth generation of mobile communication has more features as compared to previous generation. This mobile technology will offer high data rates, efficient and reliable communication at affordable rates. It will help to increase the standard of living of people and make our lives easy and also help to save our time. Fifth generation will definitely change the whole world.

**REFERENCE**

- [1] Hossain, Saddam. "5G wireless communication systems." *American Journal of Engineering Research (AJER)* 2.10 (2013): 344-353.
- [2] Sapakal, Reshma S., and Ms Sonali S. Kadam. "5G mobile technology." *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)* 2.2 (2013): 568-571.
- [3] Patel, Saurabh, Malhar Chauhan, and Kinjal Kapadiya. "5G: Future mobile technology-vision 2020." *International Journal of Computer Applications* 54.17 (2012).
- [4] Gohil, Asvin, Hardik Modi, and Shobhit K. Patel. "5G technology of mobile communication: A survey." *2013 international conference on intelligent systems and signal processing (ISSP)*. IEEE, 2013.
- [5] Singh, Sapana, and Pratap Singh. "Key concepts and network architecture for 5G mobile technology." *International Journal of Scientific Research Engineering & Technology (IJSRET), IIMT Engineering College, Meerut, India* 1.5 (2012): 165-170.
- [6] Hong, Steven, et al. "Applications of self-interference cancellation in 5G and beyond." *IEEE Communications Magazine* 52.2 (2014): 114-121.
- [7] Bhushan, Naga, et al. "Network densification: the dominant theme for wireless evolution into 5G." *IEEE Communications Magazine* 52.2 (2014): 82-89.
- [8] Skouby, Knud Erik, and Per Lynggaard. "Smart home and smart city solutions enabled by 5G, IoT, AAI and CoT services." *2014 International Conference on Contemporary Computing and Informatics (IC3I)*. IEEE, 2014.
- [9] Santos, José, et al. "Fog computing: Enabling the management and orchestration of smart city applications in 5g networks." *Entropy* 20.1 (2017): 4.
- [10] de Mattos, Willian D., and Paulo RL Gondim. "M-health solutions using 5G networks and M2M communications." *IT Professional* 18.3 (2016): 24-29.
- [11] <http://image.slidesharecdn.com/telecomseminar-150818145637-lva1-app6891/95/telecom-seminar-0g-5g-eng-hasan-shamroukh-32-638.jpg?cb=1439909885>
- [12] <http://itinfozone.com/wp-content/uploads/2018/08/1g-2g-3g-4g-5g-660x291.png>
- [13] [https://www.rfpag.com/wp-content/uploads/2016/06/5G\\_Vision-1.jpg](https://www.rfpag.com/wp-content/uploads/2016/06/5G_Vision-1.jpg)
- [14] <https://www.rfpag.com/wp-content/uploads/2016/06/IOT-1-e1477851237715.jpg>
- [15] <https://www.rfpag.com/wp-content/uploads/2016/10/smart-home2.jpg>
- [16] [https://www.sageautomation.com/hs-fs/hubs/blog\\_images/5G%20Networks/Blog%20Hero%20Image.jpg?width=1920&name=Blog%20Hero%20Image.jpg](https://www.sageautomation.com/hs-fs/hubs/blog_images/5G%20Networks/Blog%20Hero%20Image.jpg?width=1920&name=Blog%20Hero%20Image.jpg)
- [17] <https://previews.123rf.com/images/akaratphasura/akaratphasura1701/akaratphasura170100019/71979868-smart-farming-hi-tech-agriculture-concept.jpg>
- [18] <https://www.rfpag.com/wp-content/uploads/2016/10/smart-watch3.jpg>
- [19] <https://www.rfpag.com/wp-content/uploads/2017/10/conneced-car.jpg>