

# 6G - A Study of Wireless Network

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**Abstract :-** Transmission of data between two or more points without physical connections is called wireless data transmission. Wireless mobile communication has been around for several years, but the demand for mobile devices is constantly increasing. As a result, new integrated versions of networks are released regularly. These networks can span short distances, such as for remote control of television, or even long distances, such as deep space radio communication. The latest version is 5G, although it is currently only used in a few countries. The 5G network is a robust and highly efficient wireless network that meets most user requirements. However, this does not mean the end of technological pursuits. This study looks at the development of technologies, their benefits and how they meet the needs of users. The 6G concept of the next generation of mobile communication networks will also be presented. The article discusses the development and growth of both 6G and 7G, paving the way to the future.

**Key Words:** 1G, 2G, 3G, 4G, 5G, 6G, Transmission, TDMA, CDMA, GSM, Smart Antenna.

## 1. INTRODUCTION

Today, the whole world is well aware of pioneering advances in mobile communications. The introduction of wireless communication ushered in a new era of innovation in this field. In the current situation, 3G technology has provided a great internet experience. However, it was soon improved, leading to the birth of 5G, which revolutionized wireless communication by offering seamless and unlimited connectivity. 5G is a very advanced system that assigns a permanent home "IP address and maintenance address" to each mobile phone. The future holds the promise of 6G, where mobile phones have everything in a compact form, large memory, high speed and low energy consumption. Technologies like Bluetooth have become child's play in comparison. The goal of 6G wireless mobile network is to create a world-class standard that provides global coverage, similar to the Global Positioning System (GPS) developed by the United States, the COMPASS system developed by China, the Galileo system developed by the EU. and the GLONASS system developed by Russia. These autonomous systems present challenges for smooth roaming in space. Seventh generation (7G) wireless

cellular networks are tasked with connecting these systems.

## 2. BACKGROUND AND HISTORY

Presently, there is little records approximately the standards of 6G. However, it's miles anticipated that the world-wide standardization our bodies will type out the standards for 6G with the aid of the year 2030 [4]. The work at some of the research facilities has proven that 6G can be capable of transmitting a signal at a human computational capability by means of the 12 months 2035 [5]. Whilst the rollout of 5G continues to be underway, the researchers the world over have started running to deliver a brand new technology of Wi-Fi networks. A tentative timeline for the implementation of 5G, B5G, and 6G standards by means of worldwide standardization bodies is shown in Fig. 1 with admire to the vision of 6G wireless networks. Global Telecommunication Union Radio communication zone (ITU-R) issued the necessities of international mobile Telecommunications-2020 (IMT-2020 preferred) in 2015 for the 5G network requirements. at the same time, 3GPP issued R13 for 5G standards. it is expected that ITU will whole the standardization of 6G (ITU-R IMT-2030) with the aid of the quit of the 12 months 2030, while 3GPP will finalize its standardization of 6G in R23 [5]. ITU has hooked up a focus workgroup for exploring the system technology for B5G/6G systems in July 2018 [7]. The Academy of Finland has founded, 6Genesis, flagship software that specialize in 6G technology, in 2018 [8]. similarly, China, the united states of the united states, South Korea, Japan, Russia have additionally started out the research for B5G/6G communique technology [4, 5, 9,10,11].

The vision of 5G technology is extended for the 6G networks via speculating the visionary technology for subsequent-era wi-fi systems in [5]. distinctive networking scenarios are provided in [12,13,14,15]. The authors in [12] and [13] deliver a predictive technical framework for industries in future generations of conversation structures in particular focusing at the specs of future generations of the communique system. cell-less architecture, decentralized networking, and resource allocation, and three-dimensional radio connectivity which include the vertical path are anticipated in next-era conversation systems. The

evolution of wi-fi structures from 1G to 6G is printed in [14].

The authors in [15] presented the role of wise surfaces within the structure of 6G networks. The authors in [16, 17, 18, 19] offers the anticipated technology, possible applications of 6G. The articles [20, 21, 22, 23, 24] present the system-degree angle of the 6G scenario with use instances, vision, and technology. The authors in [25] analyze the application of block chain for the safety and privacy measures in upcoming 6G networks. The capacity function of optical communicate in 5G/B5G and 6G conversation networks is defined in [5]. the object [26] gives the feasibility of the application of mm Wave verbal exchange in satellite tv for pc communication as an enabler of 6G networks. the article [27] gives an evaluation of potential applications of tool-to-tool conversation in 6G. The authors in [9, 28, 29, 30] difficult at the multiple challenges in integrating synthetic intelligence (AI) and its capability function in destiny communication networks.

The authors in [31, 32], have focused at the vision for the following era of wireless verbal exchange structures. Block chain and AI are the potential technologies for the next technology communicate systems. Block chain can be used for efficient useful resource sharing and AI may be applied for the sturdy, self-organizing, self-restoration, and self-optimizing wireless network [33]. by using the usage of millimeter-wave (mm Wave) and terahertz (THz) frequency bands, massive bandwidth, and particularly directive antennas could be available to the 6G cell devices to permit new applications and seamless coverage [33]. Federal Communications fee (FCC) has commercialized these frequency bands in 2019 [34]. extremely-high-precise positioning turns into available with 6G due to excessive-stop imaging and direction-finding sensors, much like human eyes and ears. 6G mobile telephones will be ready with successful robots and sensible algorithms [5].

The latency of the network in 6G could be minimized by way of using exquisite-rapid and excessive computational strength processors both at the community and stop gadgets. The mobile phone of the destiny network might be sensible sufficient to sense the environment and deliver the precautionary and preventive measures. for instance, those cellular phones could be successful to stumble on the air pollutants degree, poisonous meals substances, and explosive substances round us. these phones will update the wallet, difficult coins, and wristwatches by way of providing virtual currencies, and smart watches, respectively. further, smart goggles will update glasses and smart phones. it is expected that 6G cell phones, coupled with the fantastically excessive directive and beam-guidance antennas, could be capable enough to look via the walls by using reconstructing the pics by

receiving the indicators from more than one tiers of density of the environment within the region [9]. this option could be useful for extracting minerals and factors from rocks, exploring underground natural reserves, and detecting arms. other than this, 6G cellular phones will have notable features of imparting position, area, and range with very high accuracy. this can be useful for maritime and underwater communicate and positioning.

Self-driving cars, which are already being evolved within the preliminary section these days, could make human lifestyles more secure and greater at ease [5]. Holographic technology and VR/augmented fact (AR) will spoil the barrier of distances. The digital revolution has converted the way we play, communicate, or work. inside the current technology of the digital revolution, 5G has come to be the middle of interest for all and sundry. soon the cell gadgets in our wallet gets the wi-fi pace approaching the fiber optic transmission speed, bringing 3-d imagery, tv, on line games, and many other packages that we by no means imagined into our tablets or mobiles.

Special attention is paid to the development of the visitor's prediction in [35]. Following the 6G imaginative and prescient and provider necessities, a few use case eventualities for the 6G, including independent cars, smart cities, flying networks, holographic, telemedicine, and Tactile internet, are mentioned in [36]. moreover, the reliability of the future wireless network is forecasted to be on the identical or better level as that of today's wired verbal exchange networks.

Some potential key permitting technology encompassing block chain-aided decentralization of the community and gadget getting to know (ML)-primarily based intelligent conversation system for the 6G are discussed in [37]. A comparative evaluation among the important thing performance signs (KPIs) for 5G and 6G is achieved in [31]. realistic programs together with holography, ML, VR, net-of-things, visible light communicate (VLC), automatic using is discussed in [38].

### 3. 6G TECHNOLOGIES

Advanced technology: 6G internet uses the latest radio and optical technology. We transmit data through the line of sight, so there is no need for copper cables and the speed does not depend on the distance of your business from the exchange point. How is 6G different from traditional broadband? The advantage of 6G is a completely new network that includes the latest cutting-edge technology. This means we have no legacy issues from other providers. 6G over-the-air fiber is a clear future wireless solution that uses the military's pioneering technology to communicate with unmanned aerial vehicles in critical situations. 6G, now available to

businesses, offers faster, more secure and more cost-effective broadband services.

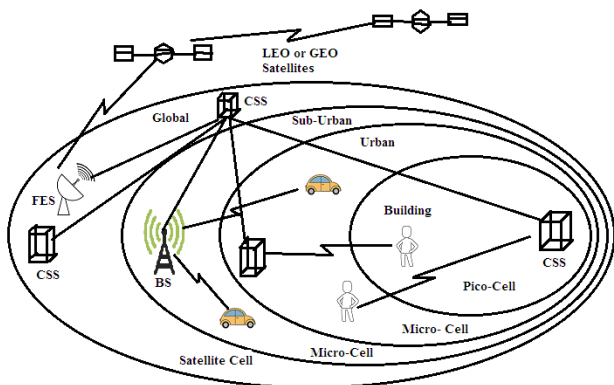


Fig -1: 6G Technology Satellite Network

### 3.1 WISDOM -

Innovative wireless system for dynamic operation Mega communication concept, 6th generation (very high data quality of service (QoS) and service applications) and 7th generation (with space travel). This article focuses on future generation specifications and the latest technologies that can be used in future cellular networks. Considering India's population, some of the next-generation technologies include 2G and 2.5G networks so that the masses can benefit from Internet and multimedia services, while operators can earn decent revenue from existing mobile networks with little additional cost.

The 6G cellular system aims to provide global coverage by integrating the existing 5G wireless cellular system with satellite networks. These satellite networks include telecommunications, Earth imaging and navigation satellites. Communications satellites are used for voice, data, Internet and video transmission, while Earth imaging satellites collect weather and environmental data. Navigation satellites are responsible for the Global Positioning System (GPS). Behind those satellite systems are the US for GPS, China for COMPASS, the EU for Galileo and Russia for GLONASS.

Table -1:

Features	1G	2G	3G	4G	5G
Started at	1980	1990	2000	2010	2020
Technology	Analog Signal, AMP S, NMT	Digital Wireless, GPRS, EDGE, GSM,	WCDMA, Broad Band IP Tech	LTE, Wi-Max, Single Standard	MIMO, mm waves, IPv4

Services	Analog Voice Calling	Digital Voice, SMS	High Capacity Packet data, Internet	Internet of Applications, Complete IP Multimedia	Massive, Broadband and Internet Of Things
Core Network	PSTN Circuit	PSTN Circuit, GSM	Packets, WCDMA	Internet	Internet
Data Rates	2.4 Kbps	64 Kbps	2 Mbps	100-1000 Mbps	1-10 Gbps
Sub Generation	1G	2.5G, 2.75G	3.5 G, 3.75 G	4G Only	5 G Until now

### 3.2 HANDOFF:-

In 6G, handover and roaming are major challenges due to different networks and standards. A smooth transition between these four networks is still an issue that needs to be addressed. Handover - If a mobile phone user moves from one coverage area or cell to another during a call, the call must be routed to the new cell's base station. Making a waiver can be costly, so it's important to minimize unnecessary waivers. Inefficient and unreliable transmission processes can cause a deterioration of the system quality and reliability.

### 4. 5G AND 6G TECHNOLOGY COMPARISON

1. The difference between 5G and 6G is due to the use of different parts of the wireless spectrum. Although both technologies use higher frequencies for faster data transmission, 5G operates in the frequency range below 6 gigahertz (GHz) and above 24.25 GHz, which are called low and high frequencies, respectively. On the other hand, 6G works in the 95 GHz to 3 Terahertz (THz) range. At these wavelengths, 6G offers speeds 1,000 times faster than 5G, which itself is only four to five times faster than 4G.

2. The importance of 5G lies in its potential to make the Internet of Things (IoT) a practical reality. The limited bandwidth of 4G prevented the transmission of data at the speeds necessary for the optimal operation of smart devices, thus hindering the widespread adoption of the Internet of Things. However, this is expected to change with 5G, and the subsequent launch of 6G is likely to further increase the speed and efficiency of IoT.

3. It is important to note that 5G will not replace 4G, and neither will 6G replace 5G. Each generation represents a distinct advance in wireless connectivity.

While 4G was essentially an improved version of 3G, 5G and 6G refer to separate iterations of wireless technology. 6G is expected to primarily serve limited consumer applications such as immersive entertainment for enterprise, military and industrial applications. However, future developments may change this scenario.

4. Unlike 5G, which faced challenges with infrastructure requirements, 6G leverages existing infrastructure built for 5G and extends connectivity to new frontiers. It spans land, underwater and even space, opening up unprecedented possibilities for connectivity.

5. Both 5G and 6G have remarkably low latency. Latency refers to the time it takes to send information packets at a certain frequency. Compared to the 4G latency of about 50 milliseconds, the latency of 5G reaches 5 milliseconds, which is about 10 times less. In addition, 6G achieves an estimated latency of 1 millisecond, five times less than 5G. This near-instant speed makes handling huge amounts of data much easier.

## 5. CONCLUSION AND FUTURE WORK

We can confirm that the current wireless technology (1G-4G) meets the needs of users. However, the current generation needs speed in everything, which is why we consider a wider and faster approach in all requirements and performance limits. That is why we are considering the development of the next generation of wireless networks, 6G. 6G is expected to meet most of the demands of current and future generations of users. 7G will be the most advanced generation of mobile communication, but challenges must be solved, such as the use of mobile phones in transitions between countries, because satellites also move at a constant speed in certain orbits. Research is needed to develop standards and protocols for mobile communication systems and satellite-to-satellite communication systems. Realizing the 7G dream is only possible if all standards and protocols are clearly defined. Perhaps this can be achieved in the next generation after 7G, which could be called 7.5G.

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