IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A REVIEW ON EVOLUTION OF WIRELESS NETWORK – 5G NETWORK

Krutika Shambharkar[1] Chanchal Ghritlahare[2]

Teena Yadav[3] Priyanka Das[4]

Mr. Pawan Kumar
Assistant Professor
Department of IT, Kalinga University
Kalinga University, Naya Raipur,C.G. India

Abstract

Fifth Generation (5G) Technology is a more recent generation of mobile networks in wireless communication. Evaluations in the area of mobile communication technologies are offered in this article. With the aid of next-generation mobile networks, numerous obstacles that were encountered during each phase were documented. The fifth generation (5G) of mobile networks offers everyone access to high-speed internet whenever they want, wherever they are. Due to its innovative characteristics, such linking people and controlling gadgets, machines, and objects, 5G is a little different. Different degrees of performance and capabilities offered by the 5G mobile technology will create new user experiences and link new businesses. Therefore, understanding this is crucial where the benefits of 5G can be used by businesses. In this study, it was found that in-depth investigation and analysis are revealed in a variety of areas, including millimetre wave (mmWave), massive multiple-input and multiple-output (Massive-MIMO), tiny cells, mobile edge computing (MEC), beamforming, various antenna technologies, etc. The primary goals of this article are to explore future research goals for the 5G mobile system and to highlight some of the most recent improvements made to the technology.

keywords

5G, wireless technology,small cell, machine learning, milimeter wave(mmWave), Mobile networks.

Introduction

The largest search engine, Google, has already acknowledged that smartphone users now outnumber desktop users. A few years ago, a smartphone's maximum RAM size was a few MB, but today, even smartphone setups compete with desktop computers. It is clear that the usage of smartphones without access to the internet is quite limited. Internet speed is essential given the growing reliance on IoT. The term "5G" merely designates the most recent and up-to-date mobile wireless standard, which is based on the IEEE 802.11ac broadband technology standard. Instead than focusing on faster Internet connection speeds, 5G aspires to be more capable than current 4G LTE, supporting more mobile broadband users per area unit and data consumption in gigabytes per second. This would enable a significant section of the population It is clear that using a smartphone without an internet connection entails watching hours of high-quality streaming media every day, even when no wifi hotspots are around. The Internet of Things, also known as machine-to-machine (M2M) communication, is supported more efficiently by 5G research and development, with the goal of reducing costs, battery consumption, and latency while boosting connection and security across a wide population.

EVOLUTION OF WIRELESS TECHNOLOGIES

Due to the rapid advancement of mobile technology in recent years, mobile communication has increased in popularity. Due to a significant growth in telecom consumers, this revolution has occurred. This revolution started with the first generation, then moved on to the second generation, the third generation, the fourth generation, and finally the fifth generation.

First Generation (1G): 1G first appeared in the 1980s. It has an analogue system and is commonly used in cell phones. It introduces mobile technologies as Push to Talk (PTT), Improved Mobile Telephone Service (IMTS), Advanced Mobile Telephone System (MTS), and Mobile Telephone System (MTS). It makes use of analogue radio signals with a 150 MHz frequency, and voice calls are modulated using a process known as frequency-division multiple access (FDMA).Since voice calls were played back in radio towers, making them vulnerable to uninvited third-party eavesdropping, it had a low capacity, unstable handoff, bad voice connectivity, and no security at all.

Second Generation(2G):

The second generation was completed at the end of the 1990s. A digital system, the 2G mobile communication system is still widely utilised throughout the world. This generation, which mostly relied on voice communication, also provided other services like SMS and e-mail. Time division multiple access (TDMA) and code division multiple access (CDMA), both of which operate in the 850–1900 MHz frequency range, are the two digital modulation techniques utilised in this generation. Eight channels per carrier are used by GSM technology in 2G, with a frame lasting 4.6 milliseconds and a gross data rate of 22.8 kbps (a net rate of 13 kbps) in the full rate channel. This generation's family consists of the 2G, 2.5G, and 2.75G.

Third Generation(3G):

High speed mobile access and Internet Protocol (IP)-based services are combined in third generation (3G) services.Packet switching technology is used to send the data. Circuit Switching is used to understand voice communications. It also includes data services, access to television and video, and new services like global roaming 3G systems, which depending on mobility and speed give high data speeds up to 2 Mbps, over 5 MHz channel carrier width, and great spectrum efficiency. The data rate that 3G networks can provide varies depending on the location of the call; it is 144 kbps for satellite and remote outdoor, 384 kbps for urban outdoor, and 2 Mbps for interior and low range outdoor. The range of frequencies is 1.8 to 2.5 GHz [2].

Fourth Generation(4G):

100Mbps download speeds are available on 4G. In addition to offering the same features as 3G, 4G also offers extra services like Multi-Media Newspapers, enhanced TV viewing, and far quicker data transmission than earlier generations. Long Term Evolution (LTE) is a type of 4G technology. A 4G system could improve current communication networks and is anticipated to offer a complete and secure IP-based solution where users can access voice, streamed multimedia, and data "Anytime, Anywhere" at much faster data rates than in previous generations.In order to support upcoming applications including wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content, and Digital Video Broadcasting (DVB), 4G is currently being developed, services that only use a little amount of bandwidth include phone and data.

III. COMPARISION OF 1G TO 5G

CONTENT	1G	2G	3G	4G	5G
START	1970	1990	2004	NOW	SOON (2020)
DATA BW	2kbps	64kbps	2mbps	1gbps	>1gbps
MULTIPLEX	FDMA	TDMA	CDMA	CDMA	CDMA
SWITCHING	CIRCUIT	CIRCUIT	PACKETALL	PACKETALL	PACKET
CORE NETWORK	PSTN	PSTN	PACKETN/W	INTERNET	INTERNET

5G Architecture

The interoperability of wireless and mobile networks is based entirely on the fifth generation mobile systems model. The All-IP Network (AIPN) is equipped to meet the cellular communications market's rising demands. All radio access technologies use it as their common platform. With its ongoing evolution, the AIPN's packet switching technology offers optimal performance and affordability. A user terminal (which is key to the new architecture) and several independent, autonomous radio access technologies (RAT) make up the fifth generation network architecture. All IP-based mobile services and applications, including mobile portals, mobile commerce, mobile health care, mobile government, mobile banking, and others, are provided via Cloud Computing Resources (CCR) in the 5G Network Architecture. A convenient on-demand network access approach for configurable computer resources, such as networks, servers, storage, applications, and services, is called cloud computing. Customers can access their personal data from any computer with an internet connection and utilise applications without installing them thanks to cloud computing. CCR connects remote reconfiguration data from RRD linked to Reconfiguration Data models (RDM) to the ReconfigurableMulti Technology Core (RMTC). Dealing with the proliferation of different radio access technologies is an RMTC's principal problem. The foundation is an All IP Platform-based convergence of radio, cloud computing, and nanotechnology. Based on network conditions and/or user needs, Core alters its communication functionalities. In addition to 802.11x WLAN and 802.16x WMAN, RMTC is connected to a variety of radio access technologies, ranging from 2G/GERAN through 3G/UTRAN and 4G/EUTRAN. Other standards, like IS/95, EV-DO, CDMA2000, etc., are also supported. Both the terminal and the RMTC can choose from a variety of access systems thanks to interoperability process-criteria and processes.

How 5G works?

The only difference is that 5G uses higher, less congested radio frequencies. This makes it possible for it to transmit more data much more quickly. 'Millimetre waves' (mmwaves) are the name given to these higher bands. Previously unutilized, they have now been made available for licencing by the authorities. Due to the difficulty in using them and the high cost of the necessary equipment, they have mostly gone unexplored by the general population.

While information can be transmitted more quickly on higher bands, sending over great distances can present challenges. Physical items like trees and buildings can easily block them. Multiple input and output antennae will be used by 5G to increase signals and network capacity in order to get over this problem. Additionally, the technology will employ smaller transmitters. instead of using a single, standalone mast, mount them on buildings and street furniture. According to current projections, 5G will have 1,000 more device-supporting capabilities per metre than 4G. A physical network can be "sliced" into several virtual networks using 5G technology. As a result, operators will be better able to manage their networks by delivering the appropriate portion of the network based on how it is being used. For instance, this means that an operator will be able to use various slice capacities based on relevance. Therefore, a single user streaming video would use a different portion of a business, and simpler devices might be separated from more demanding and complex applications, like driving driverless vehicles.

Why 5G?

High capacity, very high speed, and cheap bit cost. It supports voice, video, Internet, and other broadband services that are more efficient and appealing, and it has precise, bi-directional traffic data. Global service portability and access are provided by 5G technology. Due to its great error tolerance, it provides high-quality services. It is offering robust broadcasting capabilities, up to

Gigabit, which can handle about 65,000 simultaneous connections. More artificial intelligence (AI) applications will be developed as artificial sensors that might communicate with mobile phones would surround human life. • Remote management is used in 5G technology so that users can receive better and faster solutions. • The 5G technology has a very high upload and download speed. • 5G technology offers bi-directional massive bandwidth shaping and excellent resolution for frantic cell phone users.

Challenges

Challenges To fully realise the 5G vision, a number of transformative issues related to the switch from 4G to 5G must be overcome. The new technologies that enable 5G have some limitations. The integration of this technology to offer services in many application situations is not without its difficulties. The high planned cost of 5G and the fact that it is incompatible with earlier generations have drawn criticism from some quarters. 3G and 4G phones cannot connect to a 5G network, just as 2G phones could not connect to 3G or 4G networks. One is compelled to get a new phone, which will probably cost more than 4G/LTE subscription.

We need to fundamentally alter the way cellular architecture is created in order to overcome these issues. Additionally, we must meet the performance criteria for the 5G system, which include Mfentocells, strict latency, network scalability, extremely long battery life, and green communications. The difficult part is balancing these demands with cost-cutting efforts.

Conclusion

Higher data rates and the all-IP principle are on the horizon for wireless and mobile networks. For the same applications, mobile terminals get better every year in terms of processing power, onboard memory, and battery life. The latest technologies, including cognitive radio, SDR, nanotechnology, cloud computing, and All IP Platform, are included in 5G. In the upcoming generation of mobile networks, referred to as 5G, it is anticipated that the original Internet philosophy of keeping the network as simple as possible and offering additional features to the end nodes will become reality.

Reference

1. Introduction About 5G Mobile Technology by Asst. Prof. Bhavika Patel, Mr. Mehul Patel, International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 6, Issue 06, June – 2017

2. 5G WIRELESS TECHNOLOGY by Ganesh R. Patil et al, International Journal of Computer Science and Mobile

3. Introduction About 5G Mobile Technology by Asst. Prof. Bhavika Patel, Mr. Mehul Patel, International Journal of

4. Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 6, Issue 06, June – 2017

5. Need and Advantages of 5G wireless Communication Systems by Menal Dahiya in International Journal of Advance Research in Computer Science and Management Studies, ISSN: 2321-7782 (Online), e-ISJN: A4372-3114, Impact Factor: 6.047, Volume 5, Issue 6, June 2017

6. Chataut R., Akl R. Massive MIMO systems for 5G and beyond networks—Overview, recent trends, challenges, and future research direction. Sensors. 2020;20:2753. doi: 10.3390/s20102753.

7.https://doi.org/10.22214/ijraset.2022.40930

8.https://www.researchgate.net/profile/Pawan-Kumar-356/publication/366848008_Hashtag_Emotional_Study_using_Hidden_Linguistic_Extraction_for_Textual_Characterization_of_Internet_Abusive_Behaviour/links/63b51ccec3c99660ebc8c18c/Hashtag-Emotional-Study-using-Hidden-Linguistic-Extraction-for-Textual-Characterization-of-Internet-Abusive-Behaviour.pdf

9.https://scholar.google.com/citations?view_op=view_citation&hl=en&user=wG6abC4AAAAJ&citation_for_view=wG6abC4AAAAJ:IjCSPb-OGe4C