

5th Generation Wireless Communication Revolution

Shafiqul Abidin, Mohd Izhar, Vikas Rao Vadi

Abstract: *The entire world is moving with mobility with a ultra fast speed in utmost minimum time. This article is basically to highlight the features of future technology associated with 5G. The mobility of technology has experienced from 1 G to 4G. 5G technology is yet to come but debate has already started about its negative and positive aspects. 5 G is a complete wireless communication with almost no limitations. It supports WWW. People say 5 G is actually Real wireless world. But all these generation have their advantages over other. 5G represent a new way of thinking. Fifth generation can be called a wearable device equipped with artificial intelligence characteristics. mindset. 5G will enable everything to be securely plus automatically monitored. In this effort has been made o discuss aspects of 5G and associated feature*

Keywords : *Fifth Generation, 5G, Wireless World Wide Web, WWW, Voice Over Internet Protocol, VoIP, Wireless System for Dynamic Operating Mega Communication, WISDOM, Long Term Evolution, LTE, Machine to Machine, M2M.*

I. INTRODUCTION

5th generation Technology refers the short name of fifth generation which was started from late 2010s. It is a complete wireless communication with almost no limitations. It is highly supportable to WWW (Wireless World Wide Web). It can be called REAL wireless world. The concept of realizing next generation communication systems in the form of 5th Generation communication network based on Wireless System for Dynamic Operating Mega Communication (WISDOM) followed by other leading initiatives at research facilities in industry and academic. In mobile technology we have experienced generations 1G to 4G. 5 G is still underdeveloped technologies. In 5G technology, machine type communication will be one of the biggest change that going to be occur.

It has been long since the rollout of 4G based services by the cellular companies. Advent and possible utilization of 5 G based services in future is already picking up. 5 G based services are expected to commence from 2020. 5 G mobile wireless communications are expected to incorporate a large number of advanced technologies in order to increase the bandwidth further, Quality of Service (QoS), improve

Revised Manuscript Received on January 15, 2020

* Correspondence Author

Shafiqul Abidin*, Department of Information Technology, HMRITM (Affiliated with Guru Gobind Singh Indraprastha University), Delhi, India. Email: shafiqulabidin@yahoo.co.in

Mohd Izhar, Department of Computer Science & Engineering, HMRITM (Affiliated with Guru Gobind Singh Indraprastha University), Delhi, India. Email: mohd.izhar.delhi@gmail.com

Vikas Rao Vadi, Don Bosco Technical School (Affiliated with Guru Gobind Singh Indraprastha University), New Delhi, India. Email: vikasvadi@gmail.com

usability and security, decrease delays and cost of service. 5G platform is flexible, reliable and will bring benefit to billions of people, to many industries and benefit to society too.

II. EVOLUTION OF MOBILE WIRELESS COMMUNICATION INTRODUCTION

The evolution of mobile wireless communication from 1 G to 4 G has brought revolution in the communication among the people of the world. It is expected that 5 G brings another revolution by offering very high data speed. It incorporates many sophisticated technologies and uses important concepts like WISDOM for the better performance than their predecessors. This generation is expected to be rolled out by 2020 [1].

The first generation (1 G) was developed in 1980. 1G or we can say that it have emerged through analog based system so can be termed as “analog cellular”. No digital signals are used in this. It was time consuming and in this network we can only send text messages and can have voice calls .1G can also be termed as “cells”. No services of data were there in first generation of computer. If we compare it with 2G the basic or main difference is of the analog and digital protocol which have used in both the generations. It is the first protocol that took place in mobile technology in 1980. Its range of frequency is around 150MHZ and up. Different 1G protocol are used in different countries. It uses analog signal to connect the radio tower. Here phones are very large like a brick. Examples of 1G network are NMT (Nordic Mobile TELEPHONE) which were used in Europe and Russia and other example is AMPS (Advanced Mobile Phone System).

The second generation (2 G) was commercially launched on GSM .It is more efficient as compared with 1G as it is allowing greater penetration level . Here the introduction of data services for mobile is present. It starts with SMS text messages. 2G are based on digital protocol rather than an analog protocol. It has divided in two more technology the first one is 2.5G and the second one is 2.75G. 2G networks are used in more than 200 countries. The main advantage with 2G is that here requirement of battery in signals is very less. Another we can say that privacy is the major advantage in 2G network. Here the velocity to transfer and getting the information has increased. 2G technology can be viewed as two technology namely TDMA (Time Division Multiple Access) and second one is CDMA(Code division multiple access) it was introduced in 1990 with GSM technology.

5th Generation Wireless Communication Revolution



Fig. 1. Race to Innovation.

The third generation (3 G) in mobile network is designed to provide a very high speed of internet access. It not only improved the reliability but also provide a rapid access of internet. The downloading speed in this network is around 7.2 Mbps. Here the term “MOBILE BROADBAND” can be used as it introduced rapid access of internet whether you are in a bus, train or at your home. 3G services were introduced in 2003. Japan was the first country which has commercially launched 3G in 2001. Its main feature is that it support high data transmission at low rate and it also offer greater security as that of 2G. Another major advantages we can say talk of video calls and video conference. It has also improved the quality of music. The ITU (International Telecommunication) has developed 3G.

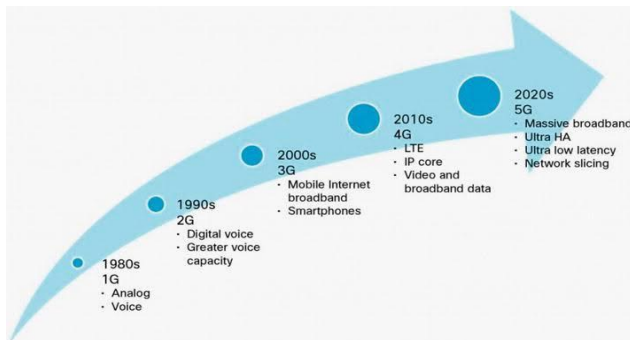


Fig. 2. Wireless Generations.

The fourth generation (4G) is a successor of 3G and predecessor of 5G. The term that can be attached with 4G is “LTE” (Long Term Evolution). We can say that it is a classification of this. LTE has an aim to provide faster and reliable mobile broadband for devices like tablets. It is studied that 4G is five times faster than 3G. Here to transmit a data different frequency has been used. In 2009 in SCANDINAVIA, the first LTE network was developed. It provide very high speed up to 100Mbps. We are saying that 4G is much faster than 3G ... yes because of OFDM. The name of the group that design the 4G network is “ITU” (International Telecommunications Union). 4G is just like a packed box or a switched packet in which IP is used for networking and to provide directions to various packets.

III. REVOLUTION OF 5G

5G supports wireless World Wide Web (WWW). Technocrats are having the opinion that 5 G is real time wireless communication. The concept of realizing next generation communication systems in the form of 5th Generation communication network based on Wireless

System for Dynamic Operating Mega Communication (WISDOM) followed by other leading initiatives at research facilities in industry and academic.

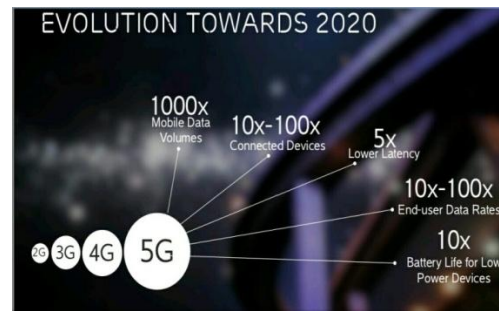


Fig. 3. Wireless Speed Revolution.

Some of the interesting services that users can experience are wearable or flexible mobile devices, Ultra High Display, video streaming, smart navigation, mobile cloud, real time interactive games. Spectrum remains a key challenges for 5 G high frequency bands are to be explored to achieve those higher data rates than any other currently emerging technology. Some sources specify that when 5 G arrives, it will have to handle billions of devices and myriad traffic types. It will offer improved reception and less network congestion, allowing for better connectivity and smoother roaming functionality [1].

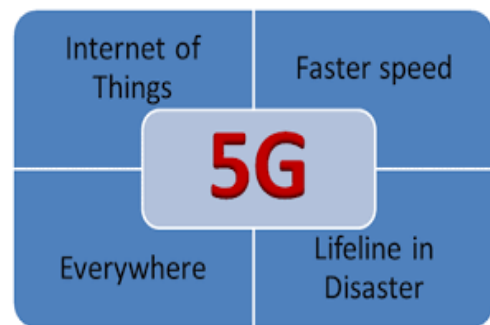


Fig. 4. 5G Major Application Areas.

IV. WIRELESS INNOVATION SYSTEM FOR DYNAMICALLY OPERATING MEGA COMMUNICATION (WISDOM)

WISDOM is a new terminology to define 5G. It is a unique concept towards a new wireless communication. 5G technology is capable to provide frequencies and bandwidth of the order of Tera Hertz and Tera bps respectively. 5G will be having the highest speed utmost suitable for present scenario.

5th generation technology is highly suitable for rapid transfer and sharing data over a single IP. Hand held devices are equipped to deal such technical complexities and robustness. It is possible only if 5G technology provides excellent speed and real life mobility. In this context WISDOM is anticipated to be having perfect architecture capable of handling and dealing revolutionary wireless communication [2].

5G in terms of WISDOM may be expressed as :

$$\begin{aligned} 4G + WISDOM &\equiv 5G \\ 5G &= 4G \times 65000 \end{aligned}$$

The combination of 4th generation and WISDOM perception is the foundation of wireless technology. It is the reality of genuine 5G system. The main motivation for the development of the WISDOM concept for 5G is the needs of the society 2020 and beyond. These days, there is an exponential increase in wireless access bandwidth that is commercially available to the end user. It is evolved network rather than a revolution. 5G is much more than all the other generations. 5G will provide multi domain performance. 5G will provide foundation for efficient industries and society. 5G provide global standard. It is that one platform or that one common platform with dynamic and secure network slices. It will provide long ranges and small data volumes. It provide mass market personalized TV [3].

V. IMMENSE NEED FOR 5TH GENERATION

5th generation technology is flexible and will have robustness. It will definitely reduce latency and maximize customer experiences in both indoor plus outdoor connectivity. 5G technology can be incorporated we can sensors in roads or in railways to communicate each other or for communication with smart vehicle. We can get a idea of 5G through 4G. It is just a successor of 4G with some more advanced technology. 5G is shift in mindset. Now if we talk about 2020 then there will be 9 billion users and thousands of things will be connected but with varying needs like some want low cost connectivity and other want very high speed to transfer data. Transformation in things is everywhere [4]. Even music and film are now often consumed data streams through a network by removing the need of packaging and shipping. What we are watching is that people in a city can commute more efficiently by using apps that bind multiple information into a unit. But we can say that a real or drastic benefit will come when everything like people, cars, trucks, buses and such more are connected and that will help to build a seamless infrastructure of transportation. If such network will come than it will help vehicles as cars and buses will notify emergency services in the event of an incident by their location. Secondly it will play a great role with animals as their safety and health can be monitored and maintained by tracked them. In other words we can say that 5G is a platform which uses such equipment which we cannot even imagine today. It will build an end to end machine to machine communication [5].

5G is a conception and conception where personalization meets connectivity and networking technologies innovation by integrating under one interoperable umbrella leading technologies such as security and privacy protection technologies, cognitive radio and networking technologies M2M (Machine to Machine) communication technologies, cloud computing technologies, data mining, decision-making technologies, and advanced sensing and actuating technologies [1].

VI. KEY FEATURES AND FUTURE TRENDS

5th Generation wireless system is considered as beyond 2020 mobile communication. It means that the 5G will be introduced in early 2020s. At present we have technology LTE advanced. This LTE advanced technology supports 1Gbps and 512 Mbps peak down load speed and upload speed respectively [6].

5G has been introduced to fulfill the requirements of interconnected society of 2020 and beyond. The ideas of 5G have been taken from current 4G / LTE and HSPA. 5G equippers multi-radio, multi-band air interference to support portability and nomadicity in ultra-high data rate communication using unique concept. The basic aim is to supersede the present propagation of core mobile networks with single worldwide core network. Few of the characteristics of 5G are:-

- Global Network
- Wearable device with Artificial Intelligence capabilities
- Media independent handover
- Radio resource management
- VoIP (Voice over IP) enabled device
- With 6th sense technology.

Future mobile technology will comprise the features like:-

- CR
- Beam Division Multiple Access
- Flat IP support
- Support IPv6
- Pervasive network
- Multi homing
- Group Cooperative Relay Technique
- Mobile Cloud Computing Support.

VII. CONCLUSION

This should clearly explain the main conclusions of the work highlighting its importance and relevance.

Today, there are more than 5 billion wireless mobiles connected worldwide. There is a tremendous increase in overall mobile traffic on the wireless communication systems fuelled primarily by the uptake in the mobile-broadband. It is expected and estimated that by 2020 and beyond 7 trillion devices will share the wireless communication system. Traffic will increase exponentially if compared with current scenario.

In this paper we have studied about all the different generations of network. From 1G follow 2G then 3G to 4G and lastly we have studied some of the facts related to 5G. At present we have technology LTE advanced. This LTE advanced technology supports 1Gbps and 512 Mbps peak down load speed and upload speed respectively. So this paper give a conclusion that upcoming 5G will be important and will bring a beneficial change in mobile technology and by watching all of its application and some of its advantages it will definitely make the life of people easy and happy.

5G technologies will play a vital role in our lives by enabling unlimited access to information and data sharing to anyone, anywhere at any time. The Terabit communication system will support 5G technologies along with Integrated Radio Access Technology (RAT), enhanced versions of LTE and other advanced, reliable and robust technologies.

Head of Department(Computer Applications) at Kalka Institute for Research and Advanced Studies, an affiliated college of Guru Gobind Singh Indraprastha University. He is Sr. Life Member of ISTE and Sr. Life Member of Computer Society of India, He has authored four books, reviewed one book on Cloud Computing (Publisher: Jones & Bartlett Learning) and published several papers in international and national journals. He is in Editorial Board of Global Journal of Enterprise Information System.His areas of research are Data Analytics, Big Data, Soft Computing, Network Security etc.

REFERENCES

1. Ramjee Prasad, "5G:2020 and Beyond", River Publishers, Aalborg, Denmark. 2014.
2. Ramjee Prasad , (2008, February) , Keynote Speech- Wireless Innovative System Dynamic Mega Communication (WISDOM), in IEEE CogART 08:First IEEE International Workshop on Cognitive Radio and Advanced Spectrum.
3. Ramjee Prasad "Global ICT Standardization Forum for India (GISFI) and 5G Standardization ", Journal of SICT Standardization , Volume 1 No. 2, pp 123-136, November 2013.
4. Ramjee Prasad , Human – Bond Wireless Communication, Wireless World Research Forum, May 20, 2014, Marrakech , Morocco.
5. Saurabh Patel, Malhar Chauhan , Kinjal Kapadiya " 5G: Future Mobile Technology – Vision 2020", International Journal of Computer Applications, Volume 54- No. 17, September 2012.
6. Shafiqul Abidin, " A Novel Construction of Secure RFID Authentication Protocol", International Journal of Security, Computer Science Journal, Malaysia, Vol. 8, Issue 8, pp 33-36, October 2014.
7. Ericson White Paper, "5G Radio Access", 2014.
8. Cheng-Xiang et al, " Cellular Architecture and Key Technologies for 5G Wireless Communication Networks", Communication Magazine,IEEE Volume 52, No. 2, pp 122-130,February 2014.

AUTHORS PROFILE



Dr. Shafiqul Abidin - M Tech (IT), Ph. D (IT), possesses more than 22 year experience in academic, research and administration. Dr. Abidin has published more than 50 research papers in national / international journals of repute and conferences. He is associated with various national / international journals as

reviewer and advisory board member such as WASET Italy; IJOART, USA; International Union of Engineering & Technology, USA; Inderscience; IEEE and Springer. He has visited various countries for teaching and research purpose in their institutions for a period of more than five years. Dr. Abidin has successfully completed two international certification programmes ICDL from Dubai, UAE and Project Assessment from Cambridge University, London, United Kingdom. He is life member of Indian Society for Technical Education (ISTE), Computer Society of India (CSI), International Association of Computer Science and Information Technology (IACSIT), Singapore and International Association of Engineers (IAENG), Hong Kong. He has evaluated number of Ph. D thesis and dissertations. Two of his research scholars have submitted their Ph. D thesis for final examination. His research areas include – WSN, RFID, Network Security and e-learning etc.



Dr. Mohd Izhar M. Tech (CSE), Ph. D (CS) has more than 15 year experience in teaching and system administration. Dr. Izhar has published many research papers in national / international journals of repute. He has organized number of FDPs and technical events. Dr. Izhar has participated in various programmes

sponsored by AICTE, IEEE and ICT. Dr. Izhar has published a book on network security. His research areas include wireless network security, e-learning, high speed data processing etc.



Prof. (Dr.) Vikas Rao Vadi having around 20 years of experience, is currently working as Director at Bosco Technical Training Society, Don Bosco Technical School, an affiliated institution of Guru Gobind Singh Indraprastha University, New Delhi, India. Earlier he had worked as Professor and Director at Trinity Institute of

Professional Studies, affiliated to Guru Gobind Singh Indraprastha University, Dwarka, New Delhi, India. As Faculty at Saudi Electronic University in Dammam, Kingdom of Saudi Arabia, As Professor and Principal at Comm-IT an affiliated College of Guru Gobind Singh Indraprastha University, As Dean Academics at Satya College of Engineering and Technology, an affiliated college of MDU, Rohatak.As