

Insights into the development trends in 7G mobile wireless networks

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ABSTRACT

From past year wireless technology has made enormous development. The development of wireless technology is reached at 7.5G. Wireless technology FG (Future generation) portable communications will have higher information transmission rates in 6G and 7G. Over the past decade, wireless technology has experienced enormous development. Surveys have shown that another wireless subscriber signs up every 2.5 seconds. Be that as it may, wireless is not an ongoing technology. Several wireless technologies are accessible with their own advantages and disadvantages. Current times are just the start of sending 5G versatile correspondence systems. At present we have numerous technologies each fit for performing functions like supporting voice traffic using voice over IP (VoIP), broadband information access in versatile condition and so forth., however, there is an incredible need of sending such technologies that can incorporate every one of these systems into a single brought together system. In this paper we present the study of several generations that are being used 0G, 1G, 2G, 3G, 4G, and 5G and attempt to locate some people in the future which are under research like 6G, and 7G. Comparison is made among all the generations and every generation's functions, execution, and usage of technology are clarified in the paper

Keywords: *Wireless Communication generations; 7G Communication; Space Roaming; Artificial General Intell; Nanocore; CDMA; TDMA; FDMA; GSM; Broad band; Generations; OFDMA; WiMAX; SDR; MIMO; STBC*

INTRODUCTION

The mobile communication systems and wireless communication technologies have been experiencing extremely fast growth step by step [3]. Wireless communication is the transfer of data over a distance without the use of improved electrical conductors or "wires", the term is along these lines shortened to "wireless"[16]. In the past not many decades, mobile wireless technologies have encountered various generations of technology upheaval and advancement, specifically from 0G to 5G which is as of now being conveyed universally[20][22].

Every generation has some standards, capacities, techniques, and new features that separate it from previous generations. Because of these new features, the quantity of mobile telephone subscribers is increasing step by step. The new generation called 5G is used in some of the countries like South Korea, Sweden, Estonia, Turkey, Japan and China started to use these generations in their countries. Now the 5G has also has arrived now the entire world is first trying to use 5G and then they are waiting for the next generations like 6G and 7G. Since in every generation, higher bandwidth is allocated with some new features added, we can assure that the upcoming generations will serve a better feature than the late generations appeared. This development leads to an increase in the use of mobile users and mobile phone [1] developers and company manufacturing phones. Because of this growth the market value of phones and other devices is at an increasing rate.

EVOLUTION OF WIRELESS COMMUNICATION SERVICE.

Looking back at the evolution of mobile communication, it takes about one decade from the initial concept research to the commercial deployment (Fig. 1), whereas its subsequent usage lasts for a minimum of another 10 years [2]. That is, once the previous generation mobile network enters the commercial phase, the next generation begins concept analysis as shown in Table 1 [24].

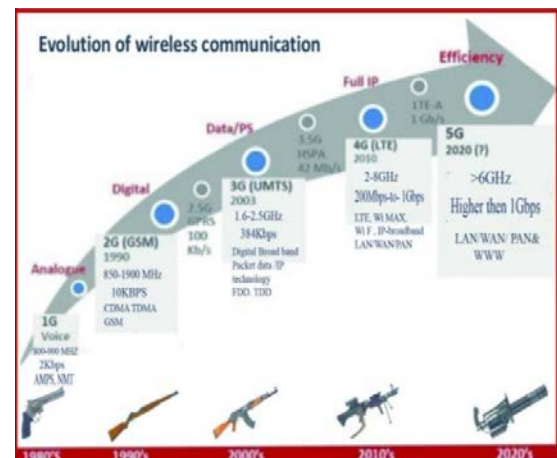


Figure 1. Evolution of Wireless Communication Service

(1G-5G)

Table1. Evolution of Wireless Communication Service

| Generation | Speed | Technology | Time Period | Features |
|------------|----------------|-----------------|-------------|--|
| 1G | 14.4 Kbps | AMPS, NMT, TACS | 1970-1980 | During 1G Wireless, phones are used for voice only. |
| 2G | 9.6/ 14.4 Kbps | TDMA, CDMA | 1990-2000 | 2G capabilities are achieved by allowing multiple users on a single channel via multiplexing. During 2G Cellular phones are used for |

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|------|--|-----------------------------------|--------------|--|
| | | | | data also along with voice. |
| 2.5G | 171.2Kbps 20-40 Kbps | GPRS | 2001-2004 | 2.5G the internet becomes popular and data becomes more relevant. 2.5G Multimedia services and streaming starts to show growth. Phones start supporting web browsing though limited and very few phones have that. |
| 3G | 3.1 Mbps 500- 700 Kbps | CDMA 200 (1xRTT, EVDO) UMTS, EDGE | 2004-2005 | 3G has Multimedia services support along with streaming are more popular. In 3G, Universal access and portability across different device types are made possible. (Telephones, PDA's, etc.) |
| 3.5G | 14.4 Mbps 1-3 Mbps | HSPA | 2006-2010 | 3.5G supports higher throughput and speeds to support higher data needs of the consumers |
| 4G | 100-300 Mbps. 3-5 Mbps 100 Mbps (WiFi) | WiMax LTE Wi-Fi | 2009-present | Speeds for 4G are further increased to keep up with data access demand used by various services [9]. High definition streaming is now supported in 4G. New phones with HD capabilities surface. It gets pretty cool. In 4G, Portability is increased further. World-wide roaming is not a distant dream. |

| | | | | |
|----|-------|---------------------------|--------------|---|
| 5G | 1Gbps | GPRS/E DGE, LTE, 3G, WLAN | 1 April 2020 | The 5G provides 10 times more capacity than other existing systems [6]. It expected speed will be up to 1Gbps. It is completely wireless communication with almost no limits supporting Wireless World Wide Web (WWW). It is more reliable and faster in lower cost. It provides high capacity, large phone memory, faster data transmission, supports interactive multimedia, etc. |
|----|-------|---------------------------|--------------|---|

SIXTH GENERATION (6G)

6G is proposed to integrate 5G with satellite networks for global coverage. It is considered to be a cheap and Fast Internet Technology to provide unbelievably high data rates or very fast Internet speed access on-air through wireless and mobile devices possibly up to 11 Gbps, while traveling or in a remote location. The satellite communication network may consist of telecommunication satellite networks, earth imaging satellite networks, and navigation satellite networks. The goal of 6G is to integrate these kinds of satellite networks to provide network position identifiers, multimedia and internet connectivity, and weather information services to mobile users. Specially designed Nano Antennas will be implemented at different geographical locations or positions along roadsides, villages, malls, airports, hospitals, etc to broadcast such high-speed electromagnetic signals. The globe will be decorated by fly sensors with the help of 6G technology. These fly sensors will provide information to their remote observer stations; further these stations will check any activity upon a special area such as the activity of terrorists, intruders, etc. The point to point wireless communication networks that transmit super- fast broadband signals through the air will be assisted by high-speed optical fibres lines to broadcast much-secured information from transmitters to destinations.

Features / Advantages of 6G Technology

- Ultra-fast access to the Internet.
- Data rates will be up to 10-11 Gbps.
- Home automation and other related applications.
- Smart Homes, Cities, and Villages.
- May be used in the production of energy from the galactic world.
- Space technology, Defense applications will be modified with 6G networks.
- Home-based ATM systems.
- Satellite to Satellite Communication for the development of mankind.
- Natural Calamities will be controlled with 6G networks.
- Sea to Space Communication.

- Mind to Mind Communication may be possible\
- Standards:- The Global Position System(GPS) by the USA, the Galileo by Europe, the COMPASS by China, and the GLONASS by Russia. If 6G integrates with 5G with these satellite networks [7][8], it would have four different standards. So handoff and roaming will be can be a big issue in 6G

- AI-powered network management
- Virtual space environment with realistic sensations
- Internet cognition
- Continuous computing
- Remote access for diagnosis, learning, education, etc
- Internet of Everything(IOE)
- 7G is proposed to integrate with satellite networks for global coverage

OVERVIEW OF 7G NETWORK TECHNOLOGIES

The 7G of mobile wireless networks which aims to acquire space roaming. The world is trying to become completely wireless, demanding uninterrupted access to information anytime and anywhere with better quality, high speed, increased bandwidth and reduction in cost. The 7G will be the most progressive generation in the mobile communication arrange. It resembles the 6G for worldwide inclusion yet it will also characterize the satellite functions for mobile communication.

Be that as it may, in 7G, there will be some research on requesting issues like the use of the mobile telephone during moving condition starting with one nation then onto the next nation, because the satellite is also moving in a constant speed and in specific circle, the standards and protocols for cell to the satellite system and for the satellite to the satellite communication system. The fantasy of 7G must be genuine when all standards and protocols are characterized. Perhaps this is possible in cutting edge after 7G and can be named as 7.5G. There is another way, is immediate HD video broadcasting for newsgathering likewise. This can be the best solution for cost on lower level user X.

Advantages of 7G Technology

In generations beyond 5G, network operators will be connected to one single core—a nanocore. Combined with artificial intelligence, this nanocore will transform the mobile and wireless service that we know today [6]. Already, 7G has lofty goals, such as space roaming (with support from the global navigation satellite system, the telecommunication satellite system, the earth-image satellite system, and the 6G cellular system). The telecommunication satellite will be used for voice and multimedia communications; the navigational satellite will obviously be used for global positioning systems (GPS); and the earth-image satellites will provide us with closely up-to-the-minute weather updates and help with things like natural disaster preparedness.

7G aims to provide space roaming at very high data speeds using satellites that are already in existence such as those for global navigation, earth imaging, telecommunication, etc. The telecommunication satellite will be used for voice and multimedia communications; the navigational satellite will be used for global positioning systems (GPS); and the earth-image satellites will provide us with up-to-the-minute weather updates and help with things like natural disaster preparedness. Needless to say, 7G should have absolutely no issue with data capacity coverage or bandwidth (no matter what tasks one throws at it). Needless to say, 7G will form the framework of a fully-connected world of cheap, fast Internet service with wireless speeds of faster orders of magnitude up to 11Gbps and the ability to tap satellite communication networks using specially designed nanoantennas.

Expected features of 7G

- High speed signal transmission
- AGI core networking
- Non-existent latency

Expected 7G Critical Issues in Public Safety solution

- Threat detection
- Crime control
- Mind reading
- Health monitoring
- Facial recognition/expressions
- 3D Image synthesis
- Air quality measurements
- Disaster preparedness
- Gas and toxicity sensing
- IOT device management

The seventh generation of cellular wireless communications will integrate & converge a set of previously disparate technologies, including Deep learning, AGI, Mind reading, Big data analytics, etc. In addition the core communications network fabric will also transform as many new technologies converge with 7G. Most notably, AGI will take center stage with 6G. There is a potential for a so-called “nano-core” to emerge as a common computing core that encompasses elements of both HPC and AI [15]. Assuming this potential vision is realized, the nano-core will be a logical collection comprised of a web of computational resources, shared by many networks and systems. In generations beyond 5G, network operators will be connected to one single core — a nanocore. Combined with artificial intelligence, this nanocore will transform the mobile and wireless service that exists today.

Remote diagnostics from doctors to patients (living in rural areas) would get significantly easier, and so the state of remote business conferencing, remote learning, and education via mobile devices. Similarly, because 7th generation wireless mobile-communication networks would integrate satellites for global coverage, there would be very little (if any) mobile network uncovered area. So, if one is living in a mountain range or in some remote village, he would still have medical care and excellent mobile coverage, thus closing the digital divide.

EXTENDED SEVENTH GENERATION (7.5G)

We will be able to get a very high peak download as well as upload data rates with 7.5G. For video broadcasting in high definition mode, space-time block codes will be used. In just a second, we will be able to download five films of 20GB size as well as 15 GB file upload also. Satellite network techniques will also be navigated through this, and through OFDM and FEC technology, we will see high-speed communication. It can be made possible only by having high bandwidth with satellite cell sensitivity improvement along with its signal fidelity. 7.5G will make it possible for devices to communicate even when they are in the center of the sea. Table 1 shows a comparative study of different mobile technologies starting from 1G to 5G.

CONCLUSION

In this paper, we analyzed how different mobile wireless technologies varies with each other, but with these growing

technologies, we are moving towards a wireless world with endless benefits. We can see that our world is fastly approaching to the wireless environment, with a great need for uninterrupted information access anytime and wherever it is required. As with the growing wireless technology, we see high bandwidth with less cost and better quality. Our mobile potential is enormous: Smart cities, connected infrastructure, Wearable computers, Autonomous driving, Virtual and Augmented reality, Internet of Things, and much more are still yet to be made good use of. Only by looking ahead to 7G with space roaming potential, we get a glimpse of what may be possible in the next few years. Certainly 7G will appear sooner than we think as human progress moves faster and faster with time and we humans are becoming more machine integrated. So, maybe direct person to computer information exchange is possible by means of a rudimentary thinking interface with the technology universe i.e. think about a cup of tea, and it is produced for you.

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