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An approach to Wireless Network: 6G Technology

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Abstract: *Wireless communications is the transferring of information between two or more points which are not physically connected. Wireless mobile communication is being used from many years, but day by day Need of facilities on mobile is increasing, so time to time next integrated Versions of network is introduced. Distances can be short, which is used for television remote control and even far distance which is used for deep-space radio communications. Latest version is 5G, but only some countries are using 5G wireless network. 5G network is strong and very fast wireless communication network, it is and it will fulfill most of the requirement of users. But it is not end of the desires, the paper deals with the evolutions of technologies and its advantages and meet desires of user next generation of mobile network also introduced 6G. This paper is about introduction and advancement of 6G & 7G for future.*

Keywords: 1G, 2G, 3G, 4G, 5G, 6G, Handover, TDMA, CDMA, GSM, smart antenna.

I. INTRODUCTION

A. Evolution From 1G TO 5G

Cell phones are used millions and billions of users worldwide. How many of us know the technology behind cell phones that is used for our communication? I have also intrigued about the type of technology used in my phone. What are 1G, 2G, and 3G and 4G technologies? 1G, 2G, 3G & 4G ("G" stands for "Generation") are the generations of wireless telecom connectivity. 1G (Time Division Multiple Access and Frequency Division Multiple Access) was the initial wireless telecom network system. It's outdated now. The analog "brick phones" and "bag phones" are under 1G technology. Cell phones era began with 1G. The next era, 2G has taken its place of 1G. Cell phones received their first major upgrade when they went from 1G to 2G. This leap effectively took cell phones from analog to digital. 2G and 2.5G were versions of the GSM and CDMA connections. And GSM is still the most popular technology, but with no internet. Fortunately, GPRS, an additional service, is provided over GSM for the purpose of internet access. GPRS has been developed and thus, EDGE was created. It's more secure and faster than GPRS. Then 3G came, the new Wireless CDMA technology. It is the first wireless telecom technology that provides broadband-speed internet connection on mobile phones. It has been specially made for the demand of internet on smart phones. Further development led to the creation of 3.5G, which provides blazing fast internet connection on phones, up to the speed of 7.2 MBPS. A smart phone can be connected to a PC to share its internet connection and 3G and 3.5G are ideal for this. But, as this WCDMA technology is not available in all regions, it's not as popular as GSM yet. Before making the major leap from 2G to 3G wireless networks, the lesser-known 2.5G was an interim standard that bridged the gap. Following 2.5G, 3G ushered in faster data transmission speeds so you could use your cell phone in more data-demanding ways. This has meant streaming video (i.e. movie trailers and television), audio and much more. Cell phone companies today are spending a lot of money to brand to you the importance of their 3G network. The above systems and radio interfaces are based on kindred spread spectrum radio transmission technology. While the GSM EDGE standard ("2.9G"), DECT cordless phones and Mobile Wi-MAX standards formally also fulfill the IMT-2000. requirements and are approved as 3G standards by ITU, these are typically not branded 3G, and are based on completely different technologies. 4G, which is also known as "beyond 3G" or "fourth generation" cell phone technology, refers to the entirely new evolution. Developers are now going for 4G (OFDMA), which will provide internet up to the speed of 1 GBPS! It is said to be able to overcome the problems of weak network strength and should provide a much wider network, making sure that the users get high-speed connectivity anytime anywhere. No doubt, 4G will open new doors of revolutionary internet technologies, but for now, 3G and 3.5G are the best. 4G will allow for speeds of up to 100Mbps. 4G promises voice, data and high-quality multimedia in real-time form all the time and anywhere. Today the whole world is aware of the revolutionary changes in cell phone communication field. Wireless communication has brought in the new innovation in this field. In the context of present scenario the 3G experienced better internet experience. Later on 3g has been improvised. It has been felt the urgency to have a better communication networks then 5g has come which can be a complete wireless communication without any hindrance and limitations. It is completely advanced in terms of wireless communication. In 5G system each and every cell phone will have a permanent home "IP address and care of address". Now

awaiting future will experience 6G. In present time cell phones have everything and are compact, with high memory and high speed with low power consumption. Today Bluetooth technology and other technology are just like a child's play. 6G wireless cell phone communication network shall meet world class standard covering the whole world under its communication just like Global covering system has been devised by some companies. The 6th generation (6G) wireless mobile communication networks shall integrate satellites to get global coverage. The global coverage systems have been developed by four countries. The global position system (GPS) is developed by USA. The COMPASS system is developed by China. The Galileo system is developed by EU, and the GLONASS system is developed by Russia [3]. These independent systems are difficulty for space roaming. The task of 7th generation (7G) wireless mobile communication networks are going to Unite.

II. 5G TECHNOLOGY

A. What is 5G technology?

5G Technology stands for 5th Generation Mobile technology. 5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future. The gigantic array of innovative technology being built into new cell phones is stunning. 5G technologies which are on hand held phone offering more power and features than at least 1000 lunar modules. A user can also hook their 5G technology cell phone with their Laptop to get broadband internet access. 5G technology including camera, MP3 recording, video player, large phone memory, dialling speed, audio player and much more you never imagine. For children rocking fun Bluetooth technology and Pico nets has become in market.

B. What 5G Technology Offers?

5G technology going to be a new mobile revolution in mobile market. Through 5G technology now you can use worldwide cellular phones and this technology also strike the china mobile market and a user being proficient to get access to Germany phone as a local phone. With the coming out of cell phone alike to PDA now your whole office in your finger tips or in your phone. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system. 5G technology has a bright future because it can handle best technologies and offer priceless handset to their customers. May be in coming days 5G technology takes over the world market. 5G Technologies have an extraordinary capability to support Software and Consultancy. The Router and switch technology used in 5G network providing high connectivity. The 5G technology distributes internet access to nodes within the building and can be deployed with union of wired or wireless network connections. The current trend of 5G technology has a glowing future.

III. CONCEPTS FOR 5G MOBILE NETWORKS

The 5G terminals will have software defined radios and modulation schemes as well as new error-control schemes that can be downloaded from the Internet. The development is seen towards the user terminals as a focus of the 5G mobile networks. The terminals will have access to different wireless technologies at the same time and the terminal should be able to combine different flows from different technologies. The vertical handovers should be avoided, because they are not feasible in a case when there are many technologies and many operators and service providers. In 5G, each network will be responsible for handling user-mobility, while the terminal will make the final choice among different wireless/mobile access network providers for a given service. Such choice will be based on open intelligent middleware in the mobile phone.

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- A. *Physical/MAC layers Physical and Medium Access Control layers i.e. OSI layer 1 and OSI layer 2, define the wireless technology. For these two layers the 5G mobile networks is likely to be based on Open Wireless Architecture.*
- B. *Network layer The network layer will be IP (Internet Protocol), because there is no competition today on this level. The IPv4 (version 4) is worldwide spread and it has several problems such as limited address space and has no real possibility for*

TABLE 1: Layers in 5G Architecture

OSI Layer	5G Network Layer
Application Layer	Application (Services)
Presentation Layer	
Session layer	Open Transport Protocol
Transport Layer	
Network layer	Upper network layer
	Lower network Layer
Data link Layer	Open Wireless Architecture
Physical Layer	

QoS support per flow. These issues are solved in IPv6, but traded with significantly bigger packet header. Then, mobility still remains a problem. There is Mobile IP standard on one side as well as many micro-mobility solutions (e.g., Cellular IP, HAWAII etc.). All mobile networks will use Mobile IP in 5G, and each mobile terminal will be FA (Foreign Agent), keeping the CoA (Care of Address) mapping between its fixed IPv6 address and CoA address for the current wireless network. However, a mobile can be attached to several mobile or wireless networks at the same time. In such case, it will maintain different IP addresses for each of the radio interfaces, While each of these IP addresses will be CoA address for the FA placed in the mobile Phone. The fixed IPv6 will be implemented in the mobile phone by 5G phone manufactures. The 5G mobile phone shall maintain virtual multi-wireless network environment. For this purpose there should be separation of network layer into two sub-layers in 5G mobiles (TABLE. 1) i.e.: Lower network layer (for each interface) and Upper network layer (for the mobile terminal). This is due to the initial design of the Internet, where all the routing is based on IP addresses which should be different in each IP network world wide. The middleware between the Upper and Lower network layers (TABLE 1) shall maintain address translation from Upper network address (IPv6) to different Lower network IP addresses (IPv4 or IPv6), and vice versa.

- 1) *Open Transport Protocol (OTA) layer:* The mobile and wireless networks differ from wired networks regarding the transport layer. In all TCP versions the assumption is that lost segments are due to network congestion, while in wireless networks losses may occur due to higher bit error ratio in the radio interface. Therefore, TCP modifications and adaptation are proposed for the mobile and wireless networks, which retransmit the lost or damaged TCP segments over the wireless link only. For 5G mobile terminals will be suitable to have transport layer that is possible to be downloaded and installed. Such mobiles shall have the possibility to download (e.g., TCP, RTP etc. or new transport protocol) version which is targeted to a specific wireless technology installed at the base stations. This is called here Open Transport Protocol - OTP.
- 2) *Application layer:* Regarding the applications, the ultimate request from the 5G mobile terminal is to provide intelligent QoS management over variety of networks. Today, in mobile phones the users manually select the wireless interface for particular Internet service without having the possibility to use QoS history to select the best wireless connection for a given service. The 5G phone shall provide possibility for service quality testing and storage of measurement information in information databases in the mobile terminal. The QoS parameters, such as delay, jitter, losses, bandwidth, reliability, will be stored in a database in the 5G mobile phone with aim to be used by intelligent algorithms running in the mobile terminal as system processes, which at the end shall provide the best wireless connection upon required QoS and personal cost constraints. With 4G, a range of new services and models will be available. These services and models need to be further examined for their interface with the design of 4G systems. The process of IPv4 address exhaustion is expected to be in its final stages by the time that 4G is deployed.

Therefore, IPv6 support for 4G is essential in order to support a large no. of wireless-enabled devices. IPv6 removes the need for NAT (Network Address Translation) by increasing the no. of IP addresses. With the available address space and number of addressing bits in IPv6, many innovative coding schemes can be developed for 4g devices and applications that could help in the deployment of 4G network and services. The fourth generation promises to fulfill the goal of PCC (personal computing and communication)—a vision that affordably provides high data rates everywhere over a wireless network. In the future wireless networks there must be a low complexity of implementation and an efficient means of negotiation between the end users and the wireless infrastructure. The Internet is the driving force for higher data rates and high speed access for mobile wireless users. This will be the motivation for an all mobile IP based core network evolution.

IV. 5G MOBILE NETWORK ARCHITECTURE

The system model that proposes design of network architecture for 5G mobile systems, which is all IP based model for wireless and mobile networks interoperability. The system consists of a user terminal (which has a crucial role in the new architecture) and a number of independent, autonomous radio access technologies. Within each of the terminals, each of the radio access technologies is seen as the IP link to the outside Internet world. However, there should be different radio interface for each Radio Access Technology (RAT) in the mobile terminal. For an example, if we want to have access to four different RATs, we need to have four different accesses - specific interfaces in the mobile terminal, and to have all of them active at the same time, with aim to have this architecture to be functional.

V. 6G TECHNOLOGIES

A. Cutting edge Technology

6G internets use a combination of the latest in radio and fiber optics technology. We deliver through line of sight. Which means we don't have to rely on the copper cable or base our speed on how far your business is away from the exchange.

B. How does 6G compare with traditional broadband?

6G has the benefit of the blooding a brand a new network in compassing the latest state of the art technology .so we do not suffer the any of the legacy essay the other provide do 6G air fiber id deferent future reroof wireless solution id using technology pioneer by the military to communicate with unmanned Arial vehicle for critical matter during sever condition. Now refuse and available for bushiness 6g offer faster moor secure and cost effective and brood band.

C. Wisdom

Wireless innovative System for Dynamic Operating Mega communications concept, 6th generation (with very high data rates Quality of Service (Quos) and service applications) and 7th generation (with space roaming). This paper is focused on the specifications of future generations and latest technologies to be used in future wireless mobile communication networks. However keeping in view the general poor masses of India, some of the future generation technologies will be embedded with 2and 2.5G so that general masses may get the advantage of internet, multimedia services and the operators may get proper revenues with little extra expenditure in the existing mobile communication networks.

D. 6G Mobile Communication System

The 6G mobile system for the global coverage will integrate 5G wireless mobile system and satellite network. These satellite networks consist of telecommunication satellite network, Earth imaging satellite network and navigation satellite network. The telecommunication satellite is used for voice, data, internet, and video broadcasting; the earth imaging satellite networks is for weather and environmental information collection; and the navigational satellite network is for global positional system (GPS). The four different countries which developed these satellite systems are; the GPS by USA, the COMPASS system developed by China. The Galileo system by EU, and the GLONASS system developed by Russia. In 6G handoff and roaming will be the big issue because these satellite systems are different networks and 6G has four different standards. So the handoff and roaming must take place between these 4 networks but how it will occur is still a question.

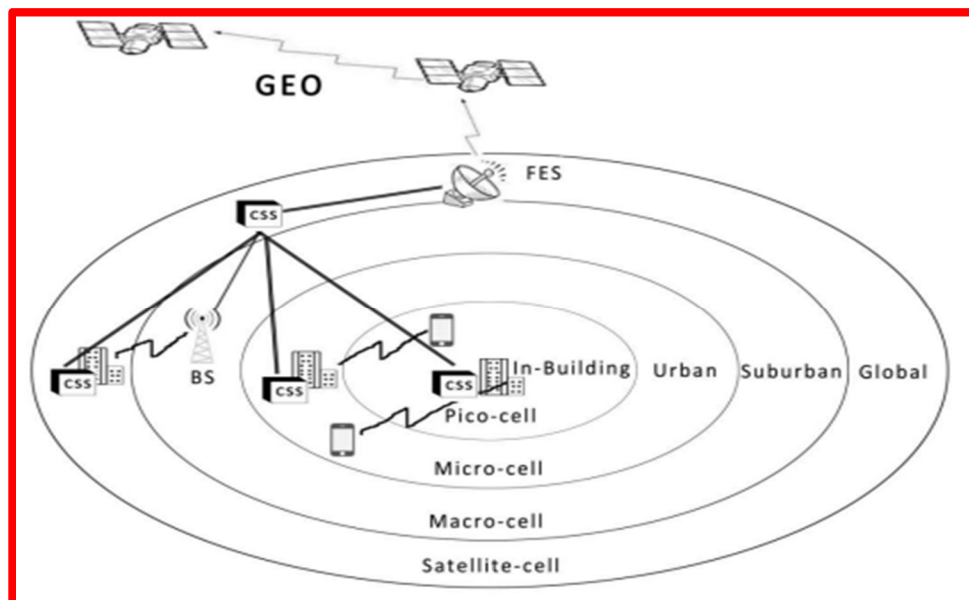


Fig (1) 6G Technology with Satellite Network

Handover (handoff) - When a mobile user travels from one area of coverage or cell to another cell within a call's duration the call should be transferred to the new cell's base station. Handoffs are expensive to execute, so unnecessary handoffs should be avoided. Unreliable and inefficient handoff procedures will reduce the quality and reliability of the system.

Generation	Started At	Technology	Data Rates	Main Network	Handover	Sub Generation
1G	1980	Analog Wireless	2kbps	PSTN	Horizontal	1G Only
2G	1991	Digital Wireless, GPRS, EDGE	10kbps to 500 kbps	PSTN, GSM, CDMA	Horizontal	2.5G, 2.75G
3G	2001	Broad Band IP	400kbps to 30Mbps	Packet, GSM, WCDMA	Horizontal And Vertical	3.5G, 3.75G
4G	2008	LTE, Wi-max	200kbps To 1Gbps	Internet	Horizontal & Vertical	4G only
5G	Will Start by 2020	IPv4	Higher than 1Gbps	Internet	Horizontal & Vertical	5G till now

VI. COMPARISON BETWEEN 5G AND 6G TECHNOLOGES

Features	5G	6G
Year	2015	After 5G Onwords
Speed	1Gbps and Higher	10 to 11 Gbps
Technology	4G + WWW	5G + Satellite
Standards	Wi-max LAS, WCDMA, OFDM, UWB, Network-LMDS, IPv6	GPS, COMPASS, GLONASS, Galileo System
Core Network	Internet	Internet
Handwork	Horizontal & Vertical	Horizontal & Vertical

A. 6G Technology

6G technology refers to the sixth generation technology. It is proposed to integrate 5G technology for a global coverage. For resource monitoring and weather information multimedia video and high-speed Internet connectivity and the Earth imaging satellite networks are used. To integrate these three kinds of satellite like telecommunication, navigation, multimedia networks which provide global positions, internet connectivity with high speed and for mobile user's weather information services are major three objectives for 6g technology.

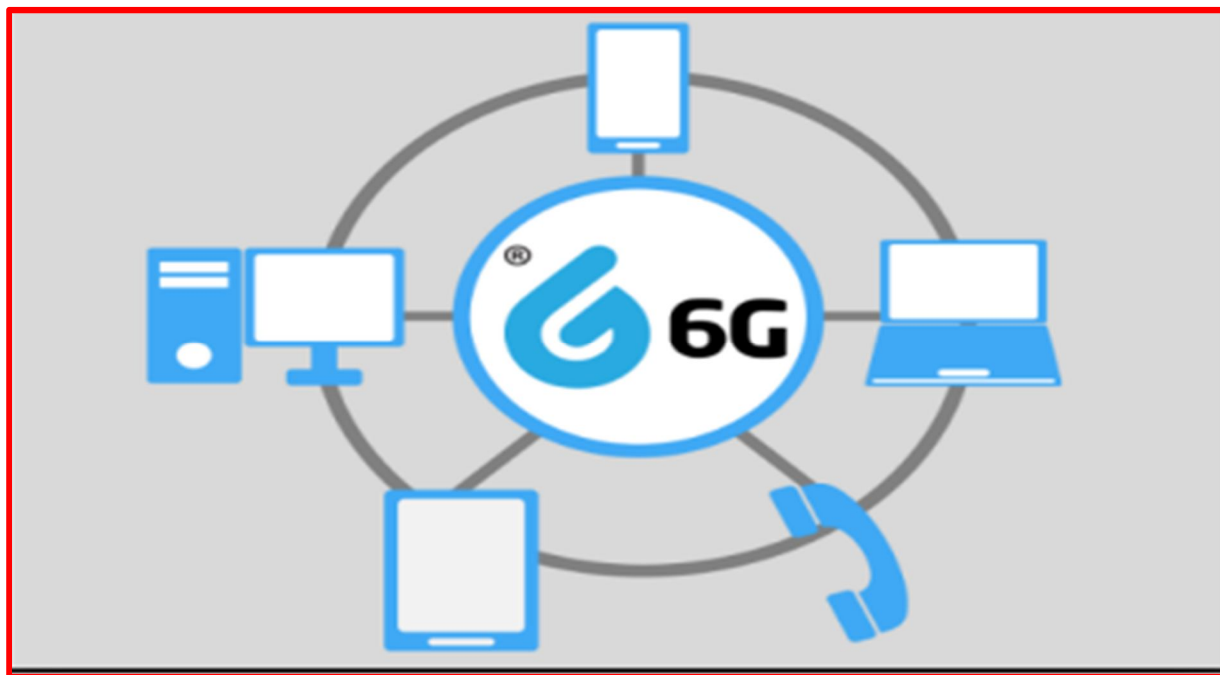


Fig (2) 6G Technology Illustration

B. Advantages

- 1) *Ultra-fast to access Internet.*
- 2) *Data rates up to 10-11 Gbps.*
- 3) *Home automation and other related applications.*
- 4) *Smart Homes, Cities and Villages.*
- 5) *Used in the production of Energy from galactic world.*
- 6) *Space technology and Defense applications will be modified with 6G networks.*
- 7) *Home based ATM systems.*
- 8) *Satellite to Satellite Communication for the development of mankind.*
- 9) *Natural Calamities will be controlled with 6G networks.*
- 10) *Sea to Space Communication*

VII. CONCLUSION AND FUTURE WORK

We can say that, present wireless technology (1G to 4G) is meeting all the requirements of users. But present generation wants everything should be fast that's why we are thinking about broad and fast across all the boundary of requirement and efficiency. That's why we are thinking about next generation of wireless network 6G. 6G will fulfil most of the demand of the present and next generation user. The 7G will be the most advance generation in mobile communication but there will be some research on demanding issues like the use of mobile phone during moving condition from one country to another country, because satellite is also moving in constant speed and in specific orbit, the standards and protocols for cellular to satellite system and for satellite to satellite communication system. The dream of 7G can only be true when all standards and protocols are defined. May be this is possible in next generation after 7G and can be named as 7.5G.



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