Fifth Generation of Mobile Wireless Communication: 5G

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Abstract:

The mobile and wireless technology has evolved from 1G to 5G. Research on 5G is focused on World Wide Wireless Web (WWWW), and Real Wireless Communication. The important technologies for 5G technologies are 802.11 Wireless Local Area Networks (WLAN), Ad-hoc Wireless Personal Area Network (WPAN), and Wireless networks for digital communication. The 5G technology is made up of different advance features and provides higher bandwidth than previous generation. 5G completes the mobile technology with no limitation.

Keywords - *WLAN, 5G, WMAN, WWWW. WPAN*

I. INTRODUCTION

Wireless communication system was invented in 1970s. There is a tremendous development in wireless and mobile technology, generations of mobile and wireless technology are evolved from 1G to 5G. Now-a-days we are using 2G and 3G generations of mobile networks, which are WiFi stands for IEEE 802.11 wireless networks, Wi-MAX stands for IEEE 802.16 mobile & wireless networks, LTE stands for Long Term Evolution, UMTS stands for Universal Mobile Telecommunication System, cdma2000, personal area networks such as Zigbee, bluetooth. Mobile and wireless technology uses a Internet protocol (IP) for data and signal transmission which is on network layer. Mp3 recording, Video call, chatting, audio recording, skype call all are done in 3G mobile and wireless technology. But 3G network gives less bandwidth so the process is slow, but now world is so fast everyone needs speedy output therefore 5G technology is invented. 5G technology provides higher bandwidth for all such applications. The 5G wireless terminals can access different wireless technology at the same time. 5G wireless technology provides facilities like MP3 recording, video player, audio player etc. The user cannot imagine rocking fun for children using bluetooth technology and piconets. The 5G makes a perfect wireless real world - World Wide Wireless Web(WWWW), because 5G is completely mobile multimedia internet network, which provides higher bandwidth without any limitation. Fifth generation of mobile network is almost based on fourth generation. The 5th wireless mobile Internet networks are real wireless world which will be supported by LAS- CDMA (Large Area Synchronised Code-Division Multiple Access), OFDM(Orthogonal frequency-division multiplexing), MCCDMA (Multi-Carrier Code Division Multiple Access), UWB(Ultra-wideband), Network-LMDS(Local Multipoint Distribution Service), and Ipv6. 5G would be expected to release around 2020.

II. EVOLUTION OF MOBILE TECHNOLOGIES

A. 1G (1[st]generation of wireless networks)

1G technology invented in 1980s, which is totally based on analog system and popularly known as cell phones. 1G technology used frequency division multiple access (FDMA) for voice call modulation, used a radio frequency of 150MHz. It introduces Mobile Telephone System (MTS), Improved Mobile Telephone Service (IMTS), Advanced Mobile Telephone System (AMTS), Push to Talk (PTT). As this is a first generation, it has a poor capacity, unreliable handoff, poor voice links, and no security.

B. 2G (2ndGeneration of wireless Networks)

2G invented in 1980s. 2G uses digital signals for voice transmission works at speed of 64 kbps. Second generation of technology provides SMS (Short Message Service) and uses bandwidth of 30 to 200 KHz. 2G uses packet switched and circuit switched domain and data rate up to 144 kbps. e.g. GPRS, CDMA.

C. 3G (3rd Generation of wireless Networks)

To increase the clarity of network, 3G uses wideband wireless network. The data is sent in small packets such transmission is called as packet switching. But for voice calls interpretation it uses circuit switching. It operates at a range of 2100 MHz and has a bandwidth of 15-20 MHz used for high-speed internet service, video calling. 3G uses Wide Band Voice Channel that is by this the world has been contracted to a little village because a person can contact with another person by message anywhere in any part of the world.

D. 4G (4th Generation of wireless Networks)

4G provides same feature as 3G but additional services like multi-media newpapers, whatsapp, to watch TV programs with clarity and send data much faster than previous generations.[1]. LTE (Long Term Evolution) is considered as 4G technology. 4G technology used to improve or provide QoS for forthcoming applications like wireless broadband access, HDTV content, Digital video broadcasting (DVB), multimedia message service(MMS), video chat, mobile TV, minimal services like voice and data and services that utilizes bandwidth.

E. 5G (5th Generation of wireless Networks):-

5G mobile systems model is all-IP based model for wireless and mobile networks interoperability. The All-IP Network (AIPN) is capable to fulfill increasing demands of the cellular communications market. It gives a common platform for all radio access technologies. The AIPN uses packet switching and its continuous evolution provides optimized performance and cost. In 5G Network Architecture all IP based mobile applications and services such as Mobile portals, Mobile commerce, Mobile healthcare, Mobile government, Mobile banking and others, are offered via Cloud Computing Resources (CCR). Cloud computing is a model for convenient on-demand network access to configurable computing resources (e.g., networks, servers, storage, applications, and services). Cloud computing allows consumers to use applications without installation and access their personal data at any computer with internet access.

III. CHALLENGES IN SWITCHING FROM 4G

A. Multi Mode User Terminal

4G uses single user terminal. The single user terminal operates in different wireless networks. This approach solved various design problems like for example limitation of device size, cost of the device, and it's power consumption. The software radio approach can solve these limitations. The user terminal can be made more adaptable so that it can confirm to the wireless interfaces of the network.

B. Choice Among Various Wireless System

Every wireless system has different characteristics and roles. Selecting wireless technology for a service at a particular time and place is complicate because of the rapid increase in the number of wireless technologies availability of choices. The selection must always be based on user's QoS requirements and available network resources.

C. Security:-

Providing security under heterogeneous types of

5G uses IPv6 instead of IPv4, where mobile IP address is assigned according to location and connected network.

IV. PROTOCOL STACK OF 5G TECHNOLOGY

Which should be different in each IP network worldwide. The middle ware between the Upper and Lower network layers (Fig. 3) is used to maintain address translation from Upper network address (IPv6) to different Lower network IP addresses (IPv4 or IPv6), and vice versa.

Application layer	Application (services)
presentation layer	
Session layer	Open transport protocol(OTP)
Transport layer	
Network layer	Upper Network layer
	Lower Network layer
Data Link Layer (MAC)	Open wireless Architecture(OWA)
Physical layer	

Fig.2 : Protocol Stack of 5G

A. Physical Layer

Physical and medium Access control layers i.e. layer 1 and layer 2 defines the wireless technology. For these two layers 5G mobile network is based on open wireless architecture.

B. Network Layer

The network layer will be IP (Internet Protocol), because there would not have competition today on this level. Even though, IPv4 (version 4) is used worldwide, it has several problems such as limited IP address space (only 4,294,967,296 possible IP addresses), also lacks in providing QoS. All these problems are solved in IPv6, but traded with significantly bigger packet header. But 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.). In 5G Mobile IP will be used for all mobile networks, 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. Mobile can be attached to several mobile or wireless network at a 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 use to maintain virtual multi-wireless network environment. For this purpose network layer separated in two sub-layers in 5G (Fig. 2) 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
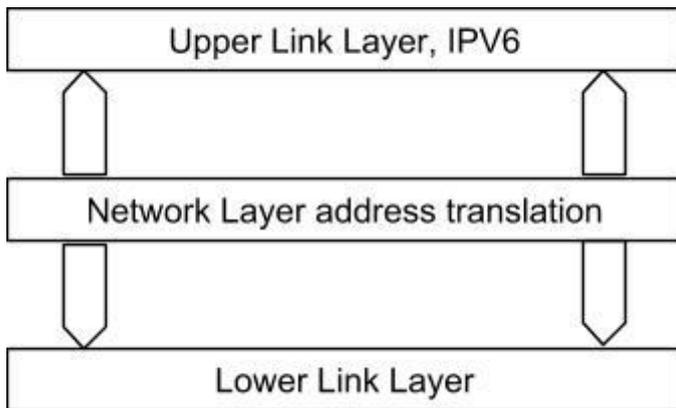

Fig. 3 : 5G Mobile Terminal Network

C. Open Transport Protocol Layer:

The mobile and wireless networks differ from wired networks regarding the transport layer. Lost segments are due to network congestion in all TCP, while in wireless network losses may occur due to higher bit error ratio in the radio interface. So, TCP should retransmit the lost damaged segments over wireless link only for the sake of modification and adaptation. For 5G mobile terminals will be suitable to have transport layer that is possible to be downloaded and installed. Such mobiles will have the possibility to download (e.g., TCP, RTP etc. Or new transport protocol) version which is marked to a specific wireless technology installed at the base stations. This is known as Open Transport Protocol (OTP).

D. Application Layer:

As bandwidth is higher in 5G, regarding the applications, the ultimate request from the 5G mobile terminal is to provide intelligent QoS management over a 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 will provide a possibility for service quality testing and storage of measurement information in information databases in the mobile terminal. The QoS parameters, such as losses, delay, jitter, bandwidth, reliability will be stored in a database in the 5G mobile phone with the 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.

V. 5G ARCHITECTURE

5G is developed to accommodate the QOS and rate necessities set by upcoming applications like wireless broadband access, mobile T.V., multimedia messaging services, video chat, digital video broadcasting (DVB) and other services that utilize bandwidth. The 5G is used to provide acceptable RF coverage, to interconnect all wireless networks to provide seamless experience the users.

VI. FEATURES OF 5G

1. The 5G technology offers high speed for uploading and downloading of data.
2. 5G technology offers high resolution for cell phone user and also provides large bandwidth shaping bi-directionally.
3. 5G Provides high QoS.
4. The 5G technology has connectivity speed up to 25 Mbps.
5. The QoS is based on to remove or avoid error.
6. The traffic statistics makes 5G more accurate.
7. Virtual Private Network (VPN) is supported in 5G.
8. It reduces network energy consumption by 90%.
9. It offers speed upto 1 to 10 Gbps.
10. Life of battery is much more longer.

VII. APPLICATIONS OF 5G

1. 5G makes merging of global standard for all.

2. Application of 5G makes world real Wi Fi zone.
3. As the Network availability everywhere, so people can access their computers and mobile devices anywhere anytime.
4. It uses cognitive radio technology, which facilitates different use of various versions of radio technologies to efficiently share the same spectrum.
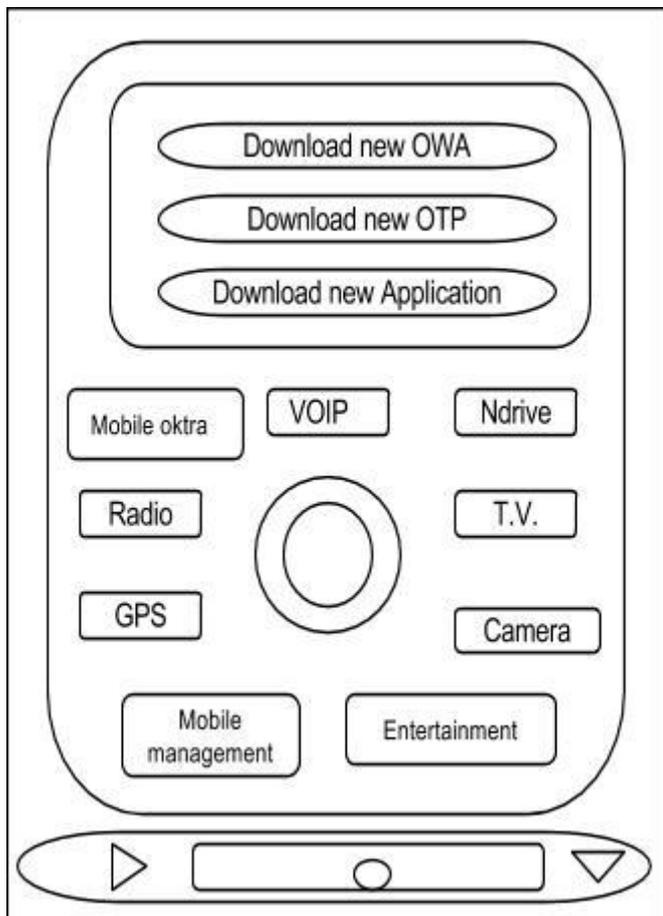5. Makes real world real wifi zone.

Fig. 4 5G Mobile Design

VIII. CONCLUSION AND FUTURE SCOPE

In this paper discussed about 5G technology for mobile communication. 5G is the evolution of mobile communication. There were lots of developments happened in the different generation, but every generation has some limitation which was overcome in next generation of mobile communication. 5G designed as open platform for different layers physical layer up to the application. At the moment, the modules are being developed to that offer the best Operating System and lowest cost for a specified service using various wireless technologies at the same time from the 5G mobile. The expectations from 5G network technology is it should be less expensive, much reliability than its foregoing technologies. As it provides high bandwidth we can watch HDTV channel in our mobile phones without any disturbance.

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