

Convergence Technologies for Information, Communication and Entertainment (5G)

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Abstract -- This paper describe all generations of mobile communication ranges from zero to fifth generation technology. It mainly focuses on network architecture of fifth generation technology which provides sensible broadband wireless connectivity at very high speed. As 5G mobile technology is expected to be prepared by 2020 researches are being made on progress of World Wide Wireless Web, Dynamic Ad-hoc Wireless Networks and existing Wireless World. Fifth generation also focus on Voice over IP enabled devices that user will occurrence a high level of call volume and data transmission. So the main features in 5G mobile network is that user can at the same time connect to the many wireless technologies and can switch between them.

Keywords- 5G, MIMO, D2D, cloud, System defined ratio.

I. INTRODUCTION

Recent scenarios in mobile & wireless network have made remarkable development in the last few decades which increases the throughput over wireless channels and networks. Resulting, the reliability of wireless communication has been increased and the customers use wireless systems more often. The main supporting force behind wireless communication is the promise of portability, mobility, and accessibility. The Wireless communication is based on radio signal. Wireless and mobile network implements Internet Protocol (IP) principles and any data will be transferred over the Internet protocol in the network layer. The fifth generation wireless mobile multimedia internet networks can be completely wireless communication without limitation, which makes it a perfect world the real wireless – World Wide Wireless Web (WWW). In the next four decades, the technology of wireless phones has 0G to 5G generations. technology advances 5g display monochrome bandwidth huge trend, and many new features promoted a strong demand and significant in the features now wireless

technology and different phones for one day having such global system of mobile communication CDMA 2000(UMTS) used in iPhone 3g devices and the development of Long term evolution (LTE) Wi-Fi, Wi-max services network device and sensor as well as personal network.

The 5G terminals will have software defined radio (SDR) and modify the new system and plans to control the error can be downloaded from the internet. It is seen to enrich about consumer stations focus on the 5G mobile networks. The 5G mobile terminals have access the various wireless technologies at the same time [1]. The 5G mobile station able to integrate private flow of different technique. The network will be required 5G mobile station is able to integrate private flows of different techniques. The network will be relied upon to manage mobility users 5G plant will make the final choice between the various mobile access network providers for a specific service This paper gives an intelligent concept of the Internet [2] where the mobile phone can be preferably finest communications. [3] It is expected to be issued around 2020. 5G technology and the benefits of this generation , such as unhindered access to , convergence in entertainment and communications configurations of these opens a new dimension to our lives and change our lifestyle dramatically.

II. DEVELOPMENT OF WIRELESS TECHNOLOGY

The real inventor of wireless was Guglielmo Marconi (Italy), who unlocks the path of the wireless communications by communicating with the help of electromagnetic waves. Mobile communication has become more popular in last few years because of the rapid revolution in mobile technology [4]. As shown in Fig.1.the evolving generation of wireless technologies in term of data rate, coverage, mobility,

spectral efficiency. It is due to very large increase in communications revolution, these customers. This revolution is from 1G- the first generation to the 5G-fifth generation.

A. First Generation (1G)

1G emerged in the 1980s. It contains the peer system and popularly known as cell phones. And offers such as mobile phone technology system (MTS), Advanced Mobile Phone System (AMTS), and enhance the mobile telephone service (IMTS), and Push to talk (PTT). The first generation used analog radio signals that have a voice calls MHz frequency 150 is modified using a technique called Frequency Division Multiple Access (FDMA). Have low capability, handoff unreliable, links voice of the poor, and no security at all since voice calls and run in the radio towers, making these calls vulnerable to eavesdropping by third parties

B. Second Generation (2G)

2G emerged in the late 1980s. It uses digital signals for voice transmission and has a speed of 64 kilobytes per second. It provides ease of SMS (Short Message Service) and the use of the bandwidth of 30-200 KHz. Next to 2G, 2.5G tray system uses converter circuit and scope of the data rate and up to 144 kbps . For GPRS , CDMA , EDGE

C. Third Generation (3G)

The Third Generation so called 3G uses Wide Band Wireless Network with which clarity is improved. The data are sent through the technology called Packet Switching. Voice calls are interpreted through Circuit Switching. Along with verbal and includes data services, and access to a TV/video, new services such as Global Roaming. It works in the range of 2100MHz and has a bandwidth of 15-20MHz and used for High-speed internet service, video chatting.3G Wide Band uses the Voice Channel that is way the world has been contracted to a small village for someone who can connect with another person is in any part of the world, and can even send messages too.

D. Fourth Generation (4G)

4G offers downloading speed of 100Mbps. 4G provides same as the 3G feature with addition of

Multi-Media services, such as Newspapers, to watch programs T.V with more clarity and transmit Data much faster than previous generations. It is LTE (Long Term Evolution) is considered as 4G technology. It is developed 4G to accommodate the quality of requirements specified percentage before coming applications such as access to wireless broadband and rate requirements set by forthcoming applications like wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content, Digital Video Broadcasting (DVB), minimal services like voice and data, and other services that utilize bandwidth [5].

E. Fifth Generation (5G)

5G stands for the fifth generation technology Mobile. 5G officially no mention of mobile technology for by any institution or have not been accurately identified by any unified institution. Research carried out so far their search for 5G based on IEEE 802.xx standard. Most important technologies, including 802.11 wireless local area network (WLAN), 802.16, DC wireless network (WMAN) and assigned a personal wireless network for (WPAN) [6].

With a huge increase in demand from users, now 4G easily replace with 5G with Access to advanced technology called Beam Division Multiple Access (BDMA) and Non-quasi orthogonal or Filter Bank Multi- carrier (FBMC) multiple access. Concept behind the BDMA technique demonstrated in the case of to communicate with mobile terminals base station. In this communication , and allocated to orthogonal beam Each mobile station and BDMA technique that divides Antenna beam according to location of the mobile station for giving Multiple access to the mobile station , which increase the capacity of the system [7] . idea that the shift towards 5G current drifts, usually assumed to 5G cellular networks must address six challenges that are not addressed effectively by 4G Higher capacity , higher data rate , lower latency end -to-end , mass communication device , low cost and quality , including experience consistent presentation [8] , [9].

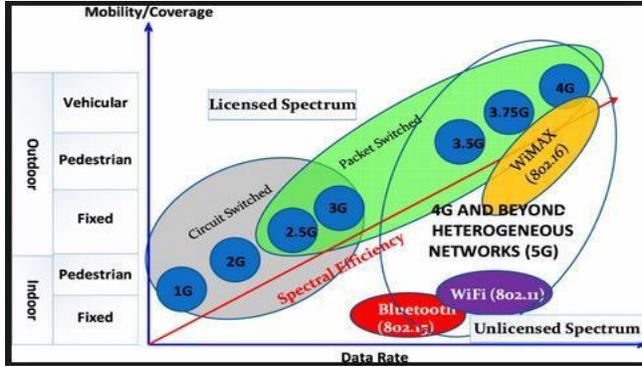


Figure 1: Progress of wireless technologies

III. COMPARISON OF 1G TO 5G

Table.1 Development OF Wireless Technology

Technology	1G	2G	3G	4G	5G
Features					
Start/Deployment	1970 – 1980	1990 – 2004	2004 - 2010	Now	Probably 2020
Data Bandwidth	2Kbps	64Kbps	2Mbps	1Gbps	>1Gbps
Technology	Analog cellular Technology	Digital cellular Technology	CDMA 2000 (1X, EVDO), UMTS, EDGE	WiMax, LTE, Wi-Fi	WWW(coming soon)
Service	Mobile Telephony (voice)	Digital voice, SMS, Higher Capacity, Packetized data	Integrated high Quality audio Video and data	Dynamic information access, Wearable devices	Dynamic information access, Wearable devices with AI capabilities
Multiplexing	FDMA	TDMA, CDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit, packet	packet	All Packet	All Packet
Core Network	PSTN	PSTN	Packet N/W	Internet	Internet

IV. NEED OF FIFTH GENERATION (5G)

A. multi- user stations in 4G mode, there will be the need to design a single user station that can operate in different wireless networks and get the best of design problems such as restrictions on the device size, cost, and energy use. These problems can be solved using radio program approach.

B. chooses between all the different wireless systems for the wireless system has the characteristics and distinctive roles to them. Choosing the most appropriate technology for a particular service in a particular place at a specific time. It will be applied to this by making the selection according to the best possible fit of consumer quality of service (QoS) requirements.

C. Security - Reconfigurable, and it should be designed with protection mechanisms to adapt and lightweight.

D. network infrastructure and quality of service support - the current integration of existing systems to IP internet protocol and is providing guaranteed quality of service for the end -to-end services that connect different systems is a challenge.

E. Charging and Billing - It is difficult to accumulate, and to deal with and build consumers' account information from many service providers. In the same way consumers' bills it is also a difficult task.

F. Jamming and Spoofing - A sign identifying counterfeit sites that are sent out to deceive the system, in this case the GPS receiver is that the signals received from a satellite and calculates the wrong coordinates. Criminals can take advantage of these technologies. Jamming occurs when the sender sends signals in the same frequency converts the GPS signal.

G. Data Encryption - if the GPS receiver and communication with the transmitter and then the communication link between the two is not tough to break down and the consumer must use encrypted data. [5]

V. 5G MOBILE NETWORK ARCHITECTURE

5G cellular architecture is a heterogeneous, so it must include, microcells, small cells, and the relay. Mobile concept of small cells is an integral part of the 5G wireless cellular network and partly consists of a mobile relay and concepts small cell [10]. It provides the high mobility of users, which is within the automotive and high-speed trains. They are placed mobile small cells inside vehicles to communicate with users inside the vehicles, while the MIMO Technology consists of a large antenna arrays outside of the vehicles to communicate with the external base station. According to the opinion of the user, achieved a small cell mobile base station regularly, and spotted all allied with the user as a single unit to the base station, which proves the above idea of the division of internal and external devices [11] And it achieved a small cell mobile station a regular basis, and observed all allied with the user as a single unit to the base station, which proves the above idea of the division of internal and external devices. Small cell mobile users have a high data rate of the data rate services with reduced overhead signals, as shown in [12].

A Wireless cellular network architecture 5G is made up of two layers: radio network and the network cloud. Different types of components performing different functions form a radio network. The cloud and virtual network function of the user plane entity and control plane entity that each form of higher layer functions related to user and control plane, respectively. Functions for the network as a service will offer the service according to need, and the pooling of resources are one of the examples. Functions for the network as a service is the relationship between the radio network and the network cloud [13].

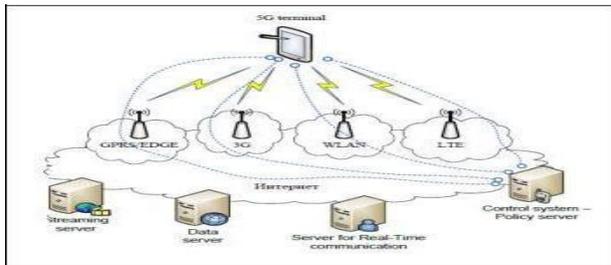


Figure 2. 5G Mobile Network Architecture

In cellular network architecture in 5G [8] and [12]. It has equal importance in terms of front-end and network backhaul respectively. In this paper, it has been suggested in 5G cellular network architecture as shown in the figure. 3. It describes the interdependence between the various emerging technologies, such as MIMO, Cognitive Radio, and small cell mobile and fixed networks. This proposed structure also explains the role and function in the virtualization cloud network architecture 5G cellular networks. The concept was also included device to device (D2D) communications, and small cell access points and the Internet of things in this proposed 5G cellular network architecture. In general, it proposed to 5G cellular networks provide a good platform to unite the 5G network in the future.

VI. KEY CONCEPTS AND FEATURES OF 5G

The key concepts discussing 5G and beyond 4G wireless communications are:

- 1) One unified global standard.
- 2) Wearable devices with AI capabilities.
- 3) Real wireless world with no more limitation with access and zone issues.
- 4) Internet protocol version 6(IPv6), where a visiting care-of mobile IP address is assigned according to location and connected network.
- 5) Deployed networks provide computing everywhere: the user can simultaneously be connected to many of the technologies and wireless access and easily navigate between them these techniques and access can be 2.5G, 3G, 4G or 5G mobile networks , Wi-Fi , WPAN or any access technology in the future . In 5G, and the concept can be further developed to several tracks of simultaneous data transfer.
- 6) Cognitive radio technology, also known as Smart Radio: Allow different radio technologies to share the same spectrum efficiency through the creation of adaptation unused spectrum transmitter -conditioning system to the requirements of the technologies currently sharing the spectrum. This dynamic radio resource management is achieved in a manner distributed, and depends on software.

Following are the features of 5G:-

- 1) 5G technology provides high precision for crazy cell phone user and large bandwidth.
- 2) Interfaces bills advanced technology 5G makes them more attractive and effective.
- 3) 5G technology also provides the joint supervision of the work tools quickly.
- 4) High quality services 5G technology on the basis of a policy to avoid the error.
- 5) 5G technology is to provide a large transmission of data at Gigabit which supports nearly 65,000 communications [10].
- 6) 5G offers technology transfer gate category with consistency unmatched.
- 7) Traffic statistics through 5G technology makes them more accurate.
- 8) Through remote management offered by 5G technology that the user can get a better and faster solution.
- 9) Remote diagnostics is also a great advantage for the technology 5G.
- 10) 5G technology is to provide up to 25 Mbps connection speed.

TABLE 2. Technical comparison between recent 802.11 standards.

Technical Specification	802.11an	802.11ac	802.11ad	802.11af
Frequency	2.4,4.9GHz	5GHz	60 GHz	0.41-0.71
Modulation Scheme	OFDM	OFDM	OFDM, Single Carrier	OFDM
Data rate,	150Mbps	433Mbps	4.6Gbps	54Mbps
Data rate,	600 Mbps	1.73Gbps	7Gbps	54Mbps
Channel Bandwidth	20,40MHz	20,40MHz,80M	2GHz	5,10,20,40MHz
Spectral Efficiency	15bps/Hz	21.66 bps/Hz	1bps	NA
Range	12-70m Indoor	12-35 m Indoor	60m Indoor,10	<100m Indoor,
Worldwide availability	Y	Y(Limited in	Y	Y

VII. CONCLUSION

The paper gives a comprehensive study of the current innovative and flexible toward the green, and most leading 5G mobile communications standard. These papers discuss 5G wireless communication system architecture, challenges and benefits. Also review in brief of the evolution of the wireless and focusing on some technical specification: data rate, bandwidth, efficiency, frequency and switching scheme in addition to change in network architecture as shown in Table 2.the new coming 5G is going to fulfill user demands in affordable rates, much reliability as well as exceptional application.

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