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3G, 4G AND 5G: A Comparative Study

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Abstract - *The 3G and the 4G wireless networks have been studied and with the reference of the upcoming 5G network and other reference material, to create a near talk among the 3 systems. The Internet upheaval in a portable is changing our lives as far as the way we work, learn and the interact. A long way has been achieved in the history of the wireless. The paper speaks to the connection between 3G and 4G and 5g in view of various parameters i.e., its architecture, speed, switching design basis, frequency band, and forward error correction. This paper chooses the typically expected changes in the remote progressions. A perfect 5G model to suit the difficulties and deficits of 3G and 4G arrangements are talked about and additionally the noteworthy framework enhancements on the prior remote advancements This paper gives point by point specialized and in addition working contrasts in the vicinity of 3G and 4G.*

Keywords:3G, 4G, 5G, Datarates,Interfacing,Mobile communications, Packet switching mode, Remote servers, Wireless network

1. INTRODUCTION:

Wireless and remote systems have made gigantic development over the most recent fifteen years. These days numerous cell phones are outfitted with a WLAN connector. In the recent times the growth of the use of the technology has been increased dramatically. So the number of devices which need the connection also has been increased. Therefore to be in the pace of the growing world the wireless technology has also been increased and introduced the 5G. By this there are many benefits and there is high connectivity speed and bigger bandwidth .In the closest future, numerous cell phones will have WiMAX connector, other than their 4G, 3G, WLAN, and Bluetooth connectors. The 5G is the fifth generation of the standards of telecommunication hardware. It is also the general technology for mobile networking, passing the recent 4G.

2. OVERVIEW OF 3G, 4G AND 5G

2.1.1 The 3G network:

3G really remains for "the third generation", as it is the third kind of access innovation that has been made generally economically accessible for associating cell phones. They were supplanted by the second era in the 1990s, which now utilized a more solid computerized flag, and empowered the utilization of content informing, or SMS (Short Message Service) benefit permits download rates of up to 7.2Mbps

- The frequency band of 3G is 1.8-2.5GHz
- 802.11a uses a modulation techniques includes BPSK,QPSK
- 3G uses Turbo codes for error correction
- The access used is wide band CDMA
- 3G uses circuit or packet switching

Advantages of 3G:

- Wireless broadband
- 3G is cheaper for providers
- Extremely faster than previous networks.

Disadvantages of 3G:

- Download speeds can sometimes be slower than expected with the signal strength very variable depending on your device.
- The radiation of magnetic waves

2.1.2. The 4G network:

4G remains for Fourth era remote system. 4G Innovation is fundamentally the expansion in the 3G innovation with more transfer speed and administrations offers in the 3G. The fourth generation 4G which has the ability to interface with wireline backbone network and that can transmit various multimedia and data across the world just started in 2002. 4G is a conceptual framework which needs high speed wireless network to transfer data.

The frequency band range of 4G is 2-8 GHz

- The bandwidth is as same as of 3G 5-20 MHz
- The data rate is more than 20 Mbps

- It uses the multi-carrier – CDMA or OFDM(TDMA)
- to 5 mbps but potential estimated at a range of 10 to 300 mbps
- The switching technique used is packet switching, message switching
- Integration of wireless LAN and wide area.

Advantages of 4G:

- Quickly download files over a wireless network
- Extremely high voice quality
- Easily access Internet, IM, Social Networks, streaming media, video calling, etc.
- Higher bandwidth
- WiMAX, LTE, and HSPA+ are all versions of 4G, WiMAX is used by Sprint, LTE is used by Verizon and AT&T, HSPA+ is used by AT&T and TMobile
- 4G is 10 times faster than 3G

Disadvantages of 4G:

- New frequencies means new components in cell towers.
- Higher data prices for consumers
- Consumer is forced to buy a new device to support the 4G
- It is impossible to make your current equipment compatible with the 4G network

2.1.1 The 5G:

The 5G wireless technology will be having various software which can be downloaded from the internet like the new error control schemes and the radio and modulation schemes. This development in the past years is the step towards the user terminals. The improvement is seen towards the client terminals as a focal point of the 5G versatile systems. 5G guarantees ultra-dependable, quick speeds and high data transmission portable availability, which gives crest paces of 20 times, contrasted and 4G. It is required to give 10 or more Gbps speeds, which enable access to high-transmission capacity mixed media and information administrations for different industrial applications. 5G is planned to help mission-basic applications, for example, money related exchanges and human services, and inactivity and rapid will be accomplished using Fiber optic links.

Advantages of 5G-

- Increased bandwidth for all users
- High resolution
- Bi – directional large bandwidth
- More efficient and easily manageable
- uninterrupted uniform connectivity

Disadvantages of 5G –

- the research is still in progress
- it might be available in some places as there is no required facilities.
- Old devices cannot support this
- Required infrastructure has to be developed

2.1.4 Comparative study between 3G and 4G

The basic difference between 3G and 4G is in terms of speed through which data transmission occurs from the sources to the device and also the signal quality to transmit the information. 4G is currently the world's best network connection method when

it comes to mobile phones, and especially mobile internet. 4G stands for the 4^{th} generation as it is just in terms of the evolutionary path of the mobile phone industry. 4G is the successor of 3G network. And in the future there will be a successor for the 4G network also. 3G technologies are in widespread use while 4G compliant technologies are still in the horizon. The 4G network is much faster than the 3G network. Another interesting difference is that the 3G network uses the hybrid version of both packet switching and circuit switching but the 4G network uses only packet switching and it abandonment of the circuit switching. Although some cell phone companies claim to use the 4G technology while in fact they are not, they do this by clouting it as pre 4G or 3.9G.The main difference in 3G and 4G technologies is that 4G systems are completely IP based with capacities of 100Mbps to 1 Gbps.

2.1.5 Comparative examination in the vicinity of 4G and 5G:

The 4G is the long term evolution of the 3G network that marks an audacious shift from the hybrid data and voice networks to only data IP networks. The LTE-A is the bridge between the 4G and 5G networks. Nowadays the 4G networks is undergoing rapid deployment whereas the industry is targeting the 202 for the widespread deployment of the 5G network. Till now the 4G networks

were focused on the availability of the raw bandwidth which causes low connectivity speed so to overcome this problem the 5G is aiming for the pervasive connectivity to lay grounds, which provides fast access to the internet users. Unlike 4G, the 5G wireless networks provides the internet users the ability to handle a wide range of connected devices and various varieties of traffic types. 5G will also allow the internet users to stream and download HD video streaming and low data usage.

3. COMPARISION BETWEEN 3G, 4G AND 5G

	3G	4G	5G
Start/development	1990/2002	2000/2010	2010/2015
Frequency band	1.8-2.5 MHz	2-8 MHz	Around 10-15 meters
Data bandwidth	2 mbps	2000 mbps-1 gbps	1Gbps
technology	IP technology, broad bandwidth CDMA	LAN/WAN/PAN and WLAN, Unified IP and scam less combination of broadband	LAN/WAN/PAN,WLAN and wwww, Unified IP and scamless combination of broadband
Switching	Packet except circuit for air interface.	All packet	All packet.
Peak download rate	1000Mbit/s	1Gbit/s	3.6 Gbit/s
Forward error correction	3G uses Turbo codes for error correction	Concatenated codes are used for error corrections is 4G.	c-ran are used for error corections in 5G
Multiplexing	CDMA	CDMA	CDMA
Standards	WCDMA,CDMA-2000	Single unified standard	Single unified standard

4. CONCLUSION:

In this comparative review we conclude that each of these wireless network have their unique importance in a particular field. Nowadays, Mobile has turned out to be a very important part of the everyone's life. In this paper we have discussed about evolution of 3g 4g and 5g technologies and their advantages, disadvantages and the performance of different generations. This area still has a vast area of research opportunities. The arrival of 4G has made a great revolution in the field of telecommunication. We have understood that there are many unending problems such as the bad connectivity, poor coverage, less quality of the service and flexibility. The arrival and implementation of 5G in the upcoming years will take the wireless and telecommunication to a completely newer level. It is going to provide various new features and services. All-IP framework and high data rates have been the basic advancements in the newer mobile network generations.

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