*COMPARISON STUDY ON 3G, 4G AND 5G: A Review*

*Akash Arvind Dalvi.*

*Department of M.Sc. IT*

*S.S. & L.S. Patkar Varde College*

*University of Mumbai*

*Mumbai, India*

[*akash.one0one@gmail.com*](mailto:akash.one0one@gmail.com)

*Darshak Sunil Jadhav*

*Department of M.Sc. CS*

*S.S. & L.S. Patkar Varde College*

*University of Mumbai*

*Mumbai, India*

[*darshakjadhav1426@gmail.com*](mailto:darshakjadhav1426@gmail.com)

***Abstract*— The 3G and the 4G wireless networks are base of the future that is 5G, in other words 5G is derived from 3G and 4G by enhancing the features. The Internet had brought a sudden change in a portable which is dynamical changes affecting the routine and lifestyle of humans adapting technology and communication system. A long approach has been achieved within the history of the wireless. The paper speaks about the connection and features of third Generation, fourth Generation and fifth Generation which is also known as in conman language as 3G, 4G and 5G technology because of various parameters that are its design, speed, switching style, frequency band, and error correction. This paper offers purpose by purpose specialized and additionally operating contrasts within the 3G and 4G.**

***Keywords— 3G, 4G, 5G, Network, Data, Speed WLAN***

1. INTRODUCTION

Wireless communication system development has been changing extremely, within so many years. The Wireless application services are developing very quickly, and it getting difficult for the service provider to manage the user-requested services. Nowadays the growth and the use of technology has been increasing dramatically. So the demand for the connection also has been increased. Thus to be in the rapidness of the growing world the wireless technology has also been updated and introduced the fifth-generation wireless technology.

By this, there are many improvements and there are high connectivity speeds and bigger bandwidth. In the future, several numbers of cell phones will have WiMAX connector, besides 4G, 3G, WLAN, and Bluetooth connectors. 5G is the fifth-generation wireless technology for mobile networks that has to proceed wide deployment in upcoming future. It is also the general technology for mobile networking, surpass the recent 4G.

1. THE 3G NETWORK

Third generation of wireless phone telecommunications technology. 3G given a good experience for the mobile user, it provided high-speed connection on behalf of the previous generations. The initial 3G networks were introduced in 2000. 3G remains for "the third generation", as it is the third type of access innovation that has been made generally usable for connection within cell phones. 3G networks supporting services that provide a data transmission rate of at least 144 kb/s. It can be used for SMS, calls, video calls, mobile Internet access, wireless Internet access, and mobile as well as Smart TV technologies.

* The 3G frequency band is 1.8GHz to 2.5GHz.
* The 3G bandwidth is 5-20 MHz
* 3G uses turbo codes for error correction.
* 3G Network Architecture is based on wide area cell
* The access used is wideband CDMA 2000
* 3G uses the circuit switch or packet switching technique for switching

Advantages of 3G:

* User will get wireless broadband connection.
* 3G is cheaper for services providers
* 3G is faster than previous wireless phone telecommunications technology

Disadvantages of 3G:

* Download speeds will generally be slower than expected transmission speed with the signal strength will be unsteady based on devices that are used.
* The radiation of magnetic waves that are generated with the massive usage of the wireless systems.

1. THE 4G NETWORK

Fourth generation of wireless phone telecommunications technology.4G innovation is the advancement in the 3G innovation with better transfer speed and enhanced administration that provided by the 3G. The first 4G networks were introduced in 2009.4G technologies is divide into two parts that are LTE and WiMAX. The fourth-generation 4G which has the ability to build interface with the help of wireline backbone fourth-generation 4G has the flexibility to interface with the wireline backbone network which will transmit varied multimedia systems. Network and that can transmit different types of multimedia. 4G is a framework that needs a high-speed wireless network to transfer data. 4G networks supporting services that provide an information transmission rate of 20 Mbps or more.

* The 4G frequency band is 2GHz to 8GHz
* The 4G bandwidth is similar to 3G 5-20 MHz
* 4G uses Concatenated codes for error correction
* The access used is multi-carrier – CDMA or OFDM(TDMA)
* 4G Network Architecture is based on the integration of wireless Local Area Network (LAN) and wide area.
* 4G uses packet switching, message switching technique for switching

Advantages of 4G:

* 4G is 10X faster than 3G.
* Fast download huge files over a wireless network
* High voice quality, easy to connect to the Internet, Social Networks, streaming media, video calling, etc.
* 4G networks offer complete privacy and security.
* No transport set-up delay as transport connection is on all the time which reduced latency.

Disadvantages of 4G:

* New frequencies which mean new components in cellular based station.
* The 4G network has higher data prices for the consumers.
* The consumer needs to buy a new devices which will be compatible with 4G network.
* Power usage is more.
* It is very expensive and hard to implement.

1. THE 5G NETWORK

Fifth generation of wireless phone telecommunications technology, it will perform a much important role than previous generations. 5G is told to be 20X faster to compare to 4G.5G, also being called the real world wireless which, allows complete wireless communication with nearly no restrictions. It’s the mix of 4G, 3G, Wi-Fi, and new radio access to building an integrated and dynamic radio access network. The fifth-generation be going to more advanced technology that can connect the every part of the world without any limitations. The 5G networks are the real wireless network which shall be supported by LAS-CDMA, UWB and MC-CDMA, Network-LMDS, and IPv6.The 5G technology achieves mobile phone users more features and efficiency.

* The 5G frequency band is 24 GHz and 100 GHz.
* The 5G bandwidth is 5-100 MHz
* 5G uses Cloud RAN codes for error correction
* The access used is Code Division Multiple Access, Beam-division multiple-access.
* 5G Network Architecture is based on Network Function Virtualization (NFV) and Software Defined Network (SDN)

Advantages of 5G:

* Increased bandwidth for all consumers.
* Virtually there is 0 latency.
* 5G technology provides high resolution for all cell phone users and prepares bi-directional large bandwidth.
* The network traffic statistics by 5G technology make it precise.
* The 5G also support virtual private network (VPN).
* 5G is more efficient and easy to manage.

Disadvantages of 5G:

* The 5G technology is under research and process is not completed
* The 5G technology privacy and security issue not yet fixed.
* The consumer needs to buy a new device to support the 5G network.
* Developing infrastructure is very expensive.

1. COMPARISION OF 3G AND 4G

The distinction between the third-generation (3G) and fourth-generation (4G) is in terms of speed in data transmission in 3G maximum upload rate is up to five Mbps, and in 4G upload rate is up to eight Mbps3G download speeds is to be between one and four Mbps and in 4G download speeds is to be between eight and ten Mbps. 4G also known as the successor of its previous network 3G, within the future there'll be successor for 4G. Currently, the best network connection for cell phone and mobile internet is 4G.3G technologies square measure in widespread use whereas 4G compliant technologies square measure still within the horizon4G the fourth generation as it is just in terms of the path of development in the wireless phone telecommunications technology. The 4G network is far quicker than the 3G network. Another distinction is that the 3G network uses the hybrid version of both packet switching and circuit switching, however, the 4G network uses only packet switching and abandonment of the circuit switching. Although some telephone firms claim to use the 4G technology whereas actually, they're not, they are doing this by clouting it as pre 4G or three.9G. The 4G technologies are entirely based on IP capacities of 100Mbps to 1 GB/s.

1. COMPARISION OF 4G AND 5G

The 4G is that the long-run evolution of the 3G network that took a risky shift from the hybrid data and voice networks to only data IP networks. The LTE-Advanced is the bridge between the 4G and 5G networks. Wireless networks until 4G mostly targeted the supply of raw whereas 5G is aiming at providing connectivity for quick and flexible access to the net users.5G is designed to support a range of applications like the IoT, connected wearables, augmented reality and gaming with low data usage. The 5G is told to be 20X faster compared to 4G. The 5G Network Architecture is based on Software Defined Network (SDN) and Network Function Virtualization (NFV) for more security and reduce latency. Unlike 4G, the 5G wireless networks provide the web users the flexibility to handle a good vary of connected devices and varied forms of traffic types.

1. COMPARISION OF 3G, 4G AND 5G

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| --- | --- | --- | --- |
|  | 3G | 4G | 5G |
| Start/  Development | 1990/2002 | 2000/2010 | 2010/2018 |
| Frequency  Band | 1.8 to 2.5 MHz | 2 to 8  MHz | 25 to 100  MHz |
| Data  Bandwidth | 5-20  MHz | 5-20  MHz | 5-100  MHz |
| Switching | Packet except circuit for air interface | All packet | All packet |
| Core Network | Packet Network | Internet | Internet |
| Network  Architecture | Wide Area Cell | WLAN and wide area | SDN,NFV |
| Forward error correction | Turbo Code | Concatenated Codes | Cloud RAN codes |
| Standards | WCDMA,  CDMA-2000 | Single unified standard | Single unified standard |

Table 1

1. CONCLUSTION

In this comparative review, we have concluded that each of those wireless networks has its distinctive importance in a very specific field. Nowadays mobile phones are very valuable in our day – to – day life. In this paper, we have discussed 3g 4g and 5g technologies and their positive and negative impacts and the performance of different from each other generations. 4G have created an excellent revolution within the field of tele-communication. We’ve now understood that there are various endless issues like poor connectivity, poor coverage, less quality of the service and adaptability. The arrival of 5G within the forthcoming years can take the wireless and telecommunication to a newer level, it’s going to offer varieties of new features and services. All-IP framework and high data rates have been the basic development in the newer mobile network generations

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