

IJERT

ISSN : 2278-0181

International Journal of Engineering Research & Technology

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An Overview of 5G Technology

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Abstract:- 5G (5th generation mobile networks) stand for the next major phase of mobile telecommunications standards beyond the current 4G standards. 5G is 1000 time faster than 4g. From generation 1G to 2.5G and from 3G to 5G this world of telecommunication has seen a number of advancement along with improved performance with every passing day. This fast change in mobile networking gives us a change in our daily life routine to interact and learn etc. In this paper we highlight on all generation of mobile network along with 5G network. The development of 5G technologies is because of a cornerstone for realizing breakthroughs in the transformation of ICT network infrastructure. Because of Ultra- broadband and intelligent-pipe network features that achieve near- instantaneous, “zero distance” connectivity between people and connected machines – no matter where they are just the first step. In this paper also we also discuss about the architecture, waveform concept and requirements etc.

Keywords: 5G, zero distance, speed, IP.

I. INTRODUCTION:

A new mobile generation is upgraded in every 10 year, Telephone, was introduced in 1982. The first 2G system was came commercially in 1992, and the first 3G system came in 2001. 4G systems Advanced were first standardized in 2012. The development of the 2nd Generation (GSM) and 3rd generation (IMT-2000 and UMTS) standards took about 10 years from the official start of the R&D projects, and development of 4G systems began in 2001 or 2002. In April

- In 2008, NASA assists with Machine-to-Machine Intelligence (M2Mi) Corp to develop 5G communication technology. As the different generations of mobile network have evolved, each one has brought its own improvement. The same will be true of 5G technology.
- *First generation, 1G:* It is basically the first mobile phone and these phones were analogue .Because revolutionary in their time they provide very low levels of pectrum efficiency and security. Frequency typically 150MHz & above.
- *Second generation, 2G:* It is based on digital technology and provides much better spectrum efficiency, security.GSM provide vice and limited data services and uses digital modulation for improved audio quality.GSM operator also using CDMA2000 in the 450MHz frequency band.
- *Third generation, 3G:* The main goal of this technology was to provide high speed data to the users.

It will enhance to allow data up to 14Mbps and more. 3G find application in wireless voice telephony, mobile internet access, fixed wireless internet access, video calls and mobile TV.

- *Fourth generation, 4G:* It is an IP based technology capable of providing data rates up to 1Gbps. Application include in 4G is mobile web access, ip telephony, video conferencing, gaming services, HD mobile TV and 3D television. 5G cellular networking technology needs to provide significant benefits over previous systems to give an enough business.

5G gives the best facilities that might be seen with 5G technology include far better levels of connectivity and coverage. The term World Wide Wireless Web is being coined for this. For 5G technology is developed because a drawback with previous generation is lack of coverage, dropped calls and low performance at cell edges. 5G technology will need to address this.

A) 5G specifications

Typical parameters for a 5G standard may include:

II. 5G Mobile Network Architecture

Figure 1 is the network architecture of 5G mobile systems.

<i>Suggested 5g wireless performance</i>	
<i>Parameters</i>	<i>Suggested performance</i>
Network capacity	10 000 times capacity of current network
Peak data rate	10Gbps
Cell edge data rate	100mbps

Architecture of 5G is very highly advanced; its network and terminals are characteristically improved to allow a new situation. Likewise, service providers can implement the advance networking technology to accept the value-added services easily. It is Internet Protocol based model for wireless and for mobile networks interoperability. The internet protocol (IP) technology is designed exclusively to ensure sufficient control data for appropriate routing of IP packets associated to a certain application connections i.e. sessions between application of client and servers somewhere on the Internet. The system resides of a user terminal and a number of free terminals and also autonomous radio access technologies. Within each of the terminals and each of the radio access technologies is examine as the Internet protocol link to the outside Internet world.

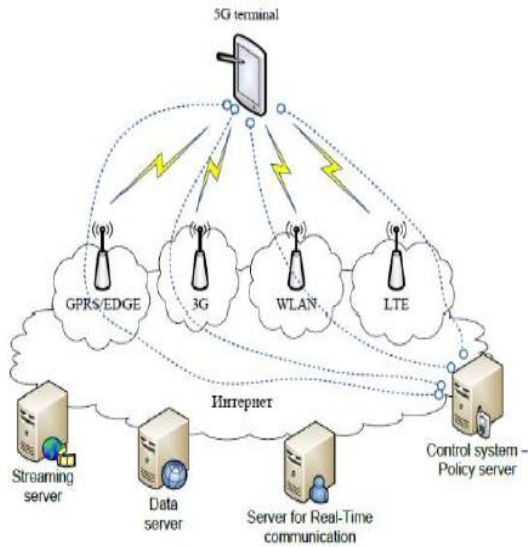


Figure 1 Functional Architecture for 5G Mobile Networks

III. 5G waveform background

Orthogonal frequency division multiplexing is an excellent waveform choice for 4G. It will give's superior spectrum efficiency, it can be processed and controlled with the processing levels achievable in current mobile handsets, and it operates better with high data rate stream covering wide bandwidths. It performs well in situations where there is selective fading.

When 5g is comes then the advances in processing capabilities that will be available by 2020 when 5G is conventional to have its first launch means that other waveforms can be considered.

A. 5G waveform requirements

The potential applications for 5G containing high speed video downloads, gaming, car-to-car / car-to infrastructure communications, general cellular communications, Internet of things/ M2M communications and the like, all place requirements on the form of 5G waveform scheme that could support the required performance.

Overall waveform includes:

- It's Capable for handling high data rate wide bandwidth signals.
- It's Capable to provide low latency transmissions for long and short data bursts, i.e. very short Transmission Time Intervals, TTIs, are required.
- By the 5g waveform, it will gives fast switching between uplink and downlink for TDD systems that are likely to be used.

These are a few of the necessity that are needed for 5Generation waveforms to support the facilities that are needed.

IV. Other 5G concepts

There are many new concepts and methods that are being examined and developed for the new 5th generation mobile system. Some of these involve:

Pervasive networks: This technique being considered for 5G cellular network systems is where a user can together

be connected to many wireless networking access technologies.

Group co-operative relay: (Device to Device communicate) It is the technology that is being considered to make the high data rate available at wider area of the cell. Interference levels are higher and signal levels lower where data rates decreasing towards the cell edge.

Cognitive radio technology: It is an intelligent radio and network technology that can automatically detect available channels in a wireless spectrum and change transmission parameters enabling more communications to improve the behaviors of radio technology.

Dynamic adhoc networking: wireless mobile ad-hoc network are self configuring, dynamic network in which nodes are free to move.ad-hoc wireless networks for much speedier data flows.

Smart antennas: Next major element of any 5G cellular networking system will be that of smart antennas. Using these smart antennas it will be available to alter the beam direction to allow more direct communications and limit interference and increase overall cell capacity.

5G technology requirements

In current years there have been several aspects about the ultimate form that 5th Generation wireless technology should take. There have been two aspect of what 5th generation wireless technology should be:

- **Hyper connected view:** The requirements for 5G wireless systems taking the existence of cellular networking technologies including 2G, 3G, 4G, Wi-Fi and other relevant wireless systems to serve higher coverage or bandwidth and availability, along with more dense networks. Apart from having requirements to give traditional services, a key differentiator would be able to new services like Machine to Machine (M2M) applications along with added Internet of Things, IoT applications. This set of 5th Generation requirements could require a new radio technology to allow low power, low throughput and field devices with long battery lifetimes of ten years or more.
- **Next generation radio-access technology:** This aspect of the 5G requirements is to take the more technology driven views and set specifications for data rates, latency and other key specification. These requirements for 5th Generation would able to clear a demarcation to be made between 4G or other services and the new 5G wireless system.

A) 5G requirements summary :

By accounting the majority of requirements, the following set of 5G services is gaining industry acceptance.

- 1-10 gigabits per second connections to deadline points in the field.
- 1 millisecond end-to-end round trip delay.
- 1000 x bandwidth per unit area
- 10-100 x number of connected devices
- Perception of) 99.999% availability
- Perception of 100% coverage
- 90% decrease in network energy usage
- machine-type devices

One of the key concerns with the 5G requirements is that there are many different interested parties involved, each having their own requirements to be met by the new 5G wireless system. None of the networking technology is going to be able to meet all the needs together. As a result of these widely varying needs for 5G, many anticipate that the new wireless system will be a umbrella that authorize a number of different radio access networks to work together. A very high data download and ultra low latency about concerns do not easily sit with low data rate and long battery life times.

B) WHY NEED OF 5G?

- It will provide a very high speed data rate, high capacity, and low cost per bit.
- It supports the interactive multimedia, voice, video, Internet and other broadband services, greater effective and more attractive, and has Bi-directional, accurate traffic statistics.
- It supports large broadcasting capacity up to Gigabit which deals almost 65,000 connections at a time.
- 5th Generation technology offers remote management that user can get better and fast solution of the problems.

- It provides the high quality services because of the high error tolerance.

V. CONCLUSION:

5G technology will give the base for building smart cities, which will push mobile network performance and capability requirements to their existence. supports interactive multimedia, voice and video Internet and other broadband services, it is more effective and more attractive. It has Bi-directional and accurate traffic statistics. It will give unbelievably fast broadband data speeds, but more importantly it will have enough capacity wherever you go to achieve. Each function you want it to without a decrease in speed or connection of the data rate, no matter how many people are connected at the same time.

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