

## 5G Wireless Technology

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**Abstract-** Today wireless services are the most preferred services of the world. The rapid increase in the service is due to the advancement of technology consecutively. As a subscriber becomes more aware of the mobile phone technology, he/she will seek for an appropriate package all together, and including all the advanced features of a cellular phone can have. Hence, the search for new technology is always the main intention of the prime cell phone giants to out innovate their competitors. In addition, the main purpose of the fifth generation wireless networks (5G Wireless networks) is planned to design the best wireless world that is free from limitations and hindrance of the previous generations. 5G technologies will change the way most high bandwidth users access their Mobile Radio Communication (MRC). So, this paper represents, great evolution of 1G (First Generation) to 4G yield 5G, introduction to 5G technologies, why there is a need for 5G, advantages of 5G networks technology, exceptional applications, Quality of Service (QoS), 5G network architecture.

**Key Point-** Evolution from 1G-5G, 5G, All IP Network, Cloud Computing , 5G architecture-The MasterCore, Quality of Service (QoS), 5G-IU, Parallel Multimode (PMM), 5GNetwork Architecture, Need of 5G

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### I. INTRODUCTION

Mobile wireless industry has started its technology creation, revolution and evolution since early 1970s. In the past few decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution. The telecommunication service in World had a great leap within last few years. 6 billion people own mobile phones so we are going to analyze the various generations of cellular systems as studied in the evolution of mobile communications from 1st generation to 5th generation. We can analyze that this could be due to increase in the telecom customers day by day. In the present time, there are four generations in the mobile industry. These are respectively 1G the first generation, 2G- the second generation, 3G- the third generation, and then the 4G- the fourth generation, 5G- the fifth second generation. Now days different wireless and mobile technologies are present such as third generation mobile networks (UMTS- Universal Mobile Telecommunication System, cdma2000), LTE (Long Term Evolution), Wi-Fi (IEEE 802.11 wireless networks), WiMAX (IEEE 802.16 wireless and mobile networks), as well as sensor networks, or personal area networks (e.g. Bluetooth, ZigBee). Mobile terminals include variety of interfaces like GSM which are based on circuit switching. All wireless and mobile networks implements all-IP principle, that means all data and signaling will be transferred via IP (Internet Protocol) on network layer. Fifth generation technology provide facilities like camera, MP3 recording, video player, large phone memory, audio player etc. that user never imagine and for children rocking fun with Bluetooth technology and Piconets. The fifth generation wireless mobile multimedia internet networks can be completely wireless communication without limitation, which makes perfect wireless real world – World Wide Wireless Web (WWW).

### II. EVOLUTION OF MOBILE TECHNOLOGIES

**1 First-Generation Systems (1G)** The 1st generation was pioneered for voice service in early 1980's, where almost all of them were analog systems using the frequency modulation technique for radio transmission using frequency division multiple access (FDMA) with channel capacity of 30 KHz and

frequency band was 824-894 MHz, which was based on a technology known as Advance Mobile Phone Service (AMPS).

**2 Second Generation Systems (2G)** The 2nd generation was accomplished in later 1990's. The 2G mobile communication system is a digital system; this system is still mostly used in different parts of the world. This generation mainly used for voice communication also offered additional services such as SMS and e-mail.

**3 Third Generation Systems (3G)** Third generation (3G) services combine high speed mobile access with Internet Protocol (IP)-based services. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing.

**2.1.4 Fourth Generation Systems (4G)** 4G usually refers to the successor of the 3G and 2G standards. In fact, the 3GPP is recently standardizing LTE Advanced as future 4G standard. A 4G system may upgrade existing communication networks and is expected to provide a comprehensive and secure IP based solution where facilities such as voice, streamed multimedia and data will be provided to users on an "Anytime, Anywhere" basis and at much higher data rates compared to previous generations.

Generation	Primary services	Key differentiator	Weakness (addressed by subsequent generation)
1G	Analogue phone calls	Mobility	Poor spectral efficiency, major security issues
2G	Digital phone calls and messaging	Secure, mass adoption	Limited data rates - difficult to support demand for internet/e-mail
3G	Phone calls, messaging, data	Better internet experience	Real performance failed to match hype, failure of WAP for internet access
3.5G	Phone calls, messaging, broadband data	Broadband internet, applications	Tied to legacy, mobile specific architecture and protocols
4G	All-IP services (including voice, messaging)	Faster broadband internet, lower latency	?

**Table 1: Evolution of technology generations in terms of services and performance**

2G		2.5G		3G		4G	
Name	Name	Download	Name	Download	Name	Download	Download
TDMA	GPRS	115 Kbit/s	<i>WCDMA (UMTS)</i>	<i>384 Kbp/s</i>	<i>LTE</i>	<i>100 Mbp/s</i>	
	EDGE	236 Kbp/s	<i>HSPA (UMTS)</i>	<i>14 Mbit/s</i>	WIMAX	50 Mbp/s	
					HSPA+	56 Mbit/s	
<i>CDMA2000</i>			EVDO (CDMA2000)	3.1 Mbit/s			

**Table 2 : Mobile Technologies with their downloading speed**

### III. 5<sup>th</sup> GENERATION SYSTEMS

5G network is very fast and reliable. The concept of hand held devices is going to be revolutionized with the advent of 5G. Now all the services and applications are going to be accessed by single IP as telephony, gaming and many other multimedia applications. As it is not a new thing in market and there are millions of users all over the world who have experienced the wireless services wireless technology. It is not easy for them to shrink from using this new 5G network technology. There is only need to make it accessible so that a common man can easily afford the profitable packs offered by the companies so that 5G network could hold the authentic place. There is need to win the customer trust to build fair long term relation to make a reliable position in the telecommunication field. To complete with the preceding wireless technologies in the market 5G network has to tender something reliable something more pioneering. All the features like telephony, camera, mp3 player, are coming in new mobile phone models. 4G is providing all these utility in mobile phone. By seeing the features of 4G one can gets a rough idea about what 5G Networks could offer. There is messenger, photo gallery, and multimedia applications that are also going to be the part of 5G. There would be no difference between a PC and a mobile phone rather both would act vice versa.

#### IV. 5G MOBILE NETWORK ARCHITECTURE

Terminals and network components are dynamically upgraded (and adapted) to new situation. Network operators use the upgradeability to introduce value-added services more easily. Upgradeability is based on cognitive radio. Cognitive radio technologies include the ability of devices to determine their location and location's information (i.e. temperature, weather etc.), sense spectrum used by neighboring devices, change frequency, adjust output power and even alter transmission parameters and characteristics. A cognitive radio is a transceiver (beam) that is able to understand and respond to its operating environment. Thus cognitive radio concerns mobile devices and networks which are computationally intelligent about radio resources and related communications to explore user communication needs and provide wireless services, be appropriate to those needs. Hence, the radio is aware and cognitive about changes in its environment and responds to these changes by adapting operating characteristics in some way to improve its performance.

##### *The Master Core Technologies (MCT)*

The 5G Master Core is a convergence of below mention technologies. These technologies have their own impact on exiting wireless network which makes them in to 5G. The different segments of the Master Core Technology (MCT) are displayed below in figure.

##### *Parallel Multimode (PMM)*

In 5G Wireless Communication Systems, The MasterCore can be operated into parallel multimode such as All IP Network Mode, 5G Network Mode, where in All IP Network Mode controls all network technologies of RAN and DAT (Different Access Networks) up to 5G new deployments. 5G Network Mode manages all new deployments based on 5G as a result 5G network systems will be more efficiency, powerful and less complicated.

##### *All IP Network*

The All-IP Network (AIPN) is an evolution of the 3GPP system to fulfill the increasing demands of the cellular communications market. It is a common platform valid for all sorts of radio access technologies. AIPN focused primarily on the enhancements of packet switched technology but now it provides a continued evolution and optimization in terms of both performance and cost. The key benefits of AIPN architecture includes a variety of different access systems' provision, lower costs, universal seamless access, and increased user-satisfaction and reduced system latency.

##### **Nanotechnology**

Nanotechnology is the application of nanoscience to control process on nanometer scale between 0.1

to 100nm. The field is also known as Molecular Nanotechnology (MNT) where MNT deals with control of the structure of matter based on atom-by-atom and molecule-by-molecule engineering. Nanotechnology is considered as the next industrial revolution, and the telecommunications industry will be radically transformed by it in a few years.

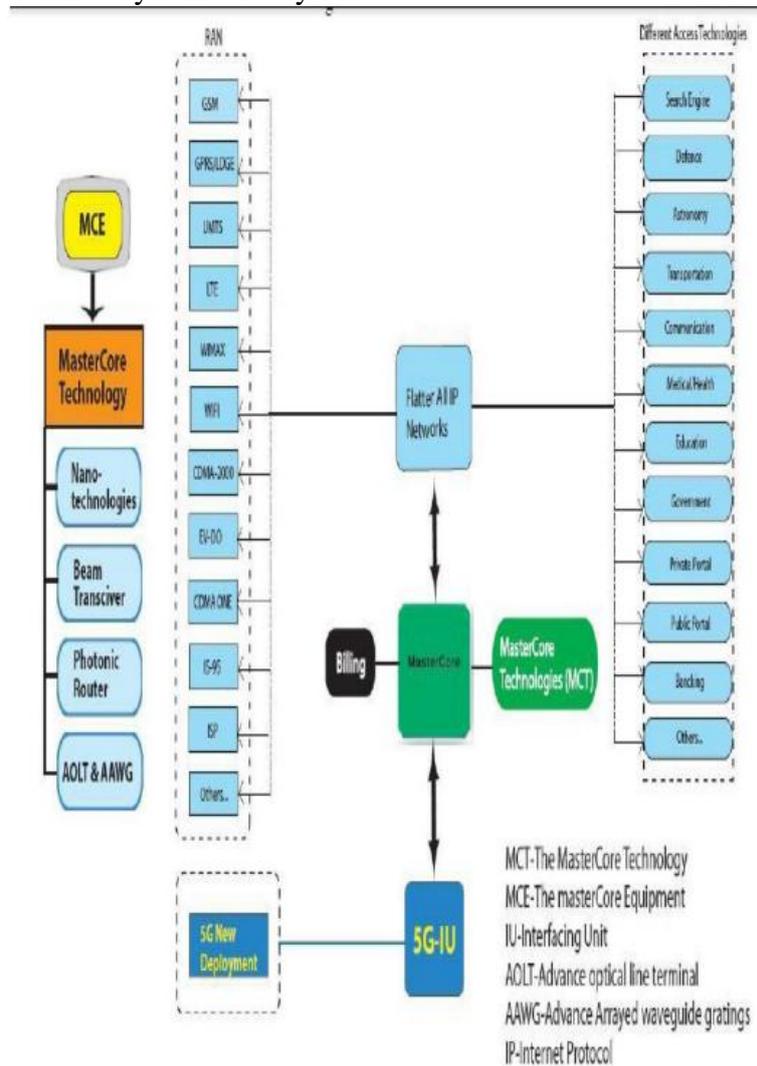


Fig 1: The MasterCore Architecture

### Cloud computing

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction... ”.

### 5G-IU

5G-IU (5G Interfacing Unit) acts to make the most powerful of 5G wireless communication system. Because, all sorts of radio access technologies are combined in a common platform is complex form of aggregation. It will be more complex in future when added new radio access technologies. This is why, 5G-IU is used between new deployments and core network so that 5G wireless communication system is easily manageable.

## V. CHARACTERISTICS OF 5G TECHNOLOGY

- The technology 5G presents the high resolution for sharp, passionate cell phone every day and give consumers well shape and fast Internet access.
- The 5G technology provides billing limits in advance that the more beautiful and successful of the modern era.
- The 5G technology also allows users of mobile phones, cell phone records for printing operations. The 5G technology for large volume data distribution in Gigabit, which also maintains close ties to almost 65,000.
- The technology gives you 5G carrier distribution gateways to unprecedented maximum stability without delay. The information from the data transfer technology 5G organize a more accurate and reliable results.
- Using remote control technology to get the consumer can also get a 5G comfort and relax by having a better speed and clarity in less time alone.
- The 5G technology also support virtual private network.
- The uploading and downloading speed of 5G technology touching the peak.
- The 5G technology network offering enhanced and available connectivity just about the world.
- 5G network is very fast and reliable.

## VI. CONCLUSION

The new coming 5G technology is available in the market to fulfill user demands in affordable rates, bright and high peak future also much reliability as well as exceptional applications. Fifth generation is based on 4G technologies. Fifth generation technologies offers tremendous data capabilities and unrestricted call volumes. Fifth generation should be more intelligent technology that interconnects the entire world without limits.

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