

“5G Technology-A Future Aspect”

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ABSTRACT

5G Technology is a revolutionary in the field of wireless telecommunications implementing the latest networking architecture which provides high quality services. 5G Technology stands for fifth Generation mobile technology, this upcoming technology will support IPv6 and flat IP. Hence the search for new technology is always the main motive of the leading cell phone giants to other innovate their competitors. It has a wide range of applications including Smart housing, Effective Networking, Military and Cooperate Companies etc. Currently, 5G is not a term officially used for any particular specification in India. It is said that is 5G network is properly developed properly we won't require a network like 6G. The term is alternatively used for 5G will be World Wide Wireless Web, which act as platform enables us to connect to any kind of services at any instant of time. Other researches on Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World.

Index terms: 5G , 5G Architecture, Evolution of 5G, 5G design.

I. INTRODUCTION

The world has seen a great deal of changes in the domain of Communication. Over the previous decade, wireless services and technologies have drastically developed while forming our economy and society. We've moved from simple to computerized, from voice only services to wireless broadband from 2G to 4G and beyond. Technological innovation both supports and stretches the boundaries of flexible use policies, permitting a lot of uses and users to be. This can be true just in case of 5G technologies that allows higher-spectrum bands for quality than previously thought potential.^[1]

5G (5th generation mobile networks or 5th generation wireless systems) denotes the proposed next major phase of mobile telecommunication standards beyond the current 4G/IMT Advanced standards. 5G planning incorporates Internet connection speeds faster than 4G, and other improvement. The fifth generation wireless mobile multimedia internet network can be completely wireless communication without limitation which makes perfect wireless real world- World Wide Wireless Web (WWWW). It is based on 4G technologies. The 5G wireless mobile internet networks are real wireless world supported by LAS-CDMA (Large Area Synchronized Code-Division Multiple Access), UWB (Ultra Wide-band) and IPv6. It is ought to have a critical effect and add more administration and advantages to the world more than 4G and it will offers gigantic information capabilities and unlimited call volumes and infinite data within latest mobile operating systems. This generation is expected to release around 2020. The world of universal and uninterrupted access to information, entertainment and communication will open new dimension to our lives and change our lives significantly.^[2]



II. EVOLUTION FROM 1G TO 5G

i) First Generation (1G)

1G was developed in the 1980's. It contains analog system which supported the 1st generation of analog cell phones with speed up to 2.4 kbps. It introduces mobile technologies such as mobile telephone system (MTS), advanced mobile telephone system (AMTS), Improved Mobile Telephone System (IMTS) and push to talk (PTT). It allows user to make voice call in only one country but it had low capacity, unreliable handoff, poor voice links and no security at once as these calls played back at Radio Towers susceptible to unwanted eavesdropping by third parties.

ii) Second Generation (2G)

2G emerged in late 1990s. Commercially launched on the GSM standard in Finland (1991). It uses digital signals for voice transmission and has a speed of 64 kbps with a high penetration power intensity and provide services such as text messages(SMS), Picture Messages-Multimedia Messages(MMS) which uses bandwidth of 30-200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain which provide speed upto 144 kbps. E.g. GPRS, CDMA and EDGE.

iii) Third Generation (3G)

It uses Wideband Wireless Network with which clarity is increased. The data are sent through the technology called Packet Switching. Voice Calls are interpreted through Circuit Switching. Along with verbal communication it includes data services, access to TV/Video. Transmission speed ranges from 25 kbps to 2 mbps and operates in the range of 2 MHz used for High-Speed internet service, video-chatting etc.

Fig.1 Comparison of all generation

Technology Features	1G	2G	3G	4G	5G
Start/Deployment	1970-1980	1990-2004	2004-2010	At present	Soon(probably 2020)
Data Bandwidth	2 kbps	64 kbps	2 Mbps	1 gbps	Higher than 1 Gbps
Technology	Analog cellular computer	Digital cellular Technology	CDMA 2000(EVDO),EDGE	WiMax LTE, Wi-Fi	WWWW (future possibility)
Service	Mobile Telephony(voice)	SMS, Digital voice	Integrated high quality audio, video and data	Dynamic information access, Wearable devices	Dynamic information access, Wearable Devices (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) Fourth Generation (4G)

4G offers both cellular and broadband multimedia services everywhere. It offers a downloading speed of 100 Mbps. 4G provides same features as 3G and additional services like Multi-Media Newspaper and to watch T.V. programs with more clarity and send data much data than the previous generations. LTE (Long Term

Evolutions) is considered as 4G Technology. It is developed to accommodate applications like mobile TV, HDTV content, MMS, Video chat, Digital Video Broadcasting (DVB) and other services.

v) Fifth Generation (5G)

5G systems are still some years away (perhaps 2020) but likely 5G technologies are an area of active research. By 2020, the large amount of data traffic generated by tablets and smartphones within very high bandwidth. It possess all types of advanced features. 5G technologies which are on hand held phone offering more power and features than at least 1000 lunar modules. 5G technology has a bright future because it can handle best technologies and offer priceless handset to other customers.^[4]

III. SALIENT FEATURES OF 5G

- The 5G technology presents the high resolution for sharp, passionate cell phone every day and give consumer well shape and well shape and 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 phone, cell phones records for printing options.
- The 5G technology for large volumes distribution in Gigabyte which also maintains close ties to almost 65,000.
- Using remote control technology to get a consumer can also get a 5G comfort and relax by having a better speed and clarity in less time alone.
- The 5G Technology is fast and reliable.
- The uploading and downloading speed of 5G technology touching the peak.^[3]

IV. 5G DESIGN AND ARCHITECTURE

Design of 5G Technology-

5G would be “ubiquitous computing”. Human life will be surrounded by intelligent sensors will bring radical change to human’s life. Existing telecom networks are fashioned in hierarchical way, when subscriber traffic is aggregated at aggregation point Base Station Controller/Radio Network Controller (BSC/RNC) and then routed to the gateways. All networks operators can be connected to one supercore with massive capacity. Flat IP architecture used as “normal” IP addresses

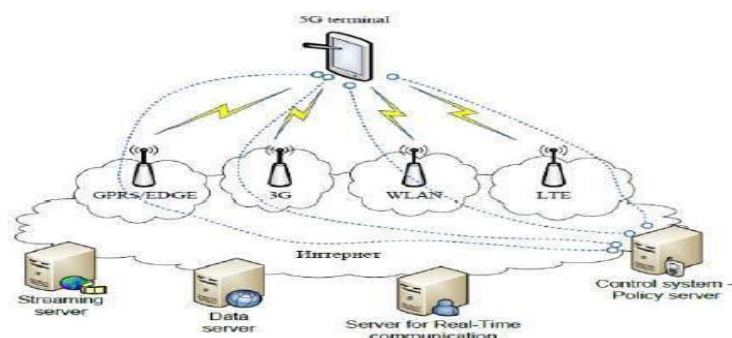


Fig.2 IP based system model of 5G designed for the wireless and mobile networks.



The system consists of user terminal (which has a crucial role in the new architecture) and a number of independent, autonomous radio access technologies. Within each of terminals, each of Radio Access Technology (RAT) in the mobile terminal. For an example, if we want to have access to four different RATs, we need to have 4 different access-specific interfaces in mobile-terminal, and to have all of them active at the same time, with aim to have this architecture to be functional.

Architecture- The Nanocore

The 5G Nanocore is a convergence of below mentioned technologies. These technologies have their own impact on existing wireless network which makes them into 5G.

- Nanotechnology
- Cloud Computing
- All IP Platform.

1) Nanotechnology

It is the application of Nano-science to control process of making products on nano-scale between 0.1 and 100 nm. In 5G mobiles are referred as Nano equipment as they are geared up with nanotechnology. Mobile devices together with the intelligence that will be embedded in human environments- home, office, public places will create a new platform that enable ubiquitous sensing, computing and communication.

Specs of Nano-technology as follows-

- Self-Cleaning –the phone clean by itself
- Self-powered- the phone derives its energy from renewable sources of energy such as Solar-energy etc.
- Flexible
- Transparent
- Sense the environment- The phone will tell you about amount of air pollution and constituents of air.

2) Cloud Computing

Cloud Computing is technology uses the internet and central remote server to maintain data and applications. Cloud computing allows consumers and businessman to uses applications without installations and access their personal files from the computer. In 5G network this central remote server will be our content provider. Operators can enter the cloud computing market and create new value-added services and create services integrating industry content and applications in the digital super-market model.

It has 3 main segments which are as follows-

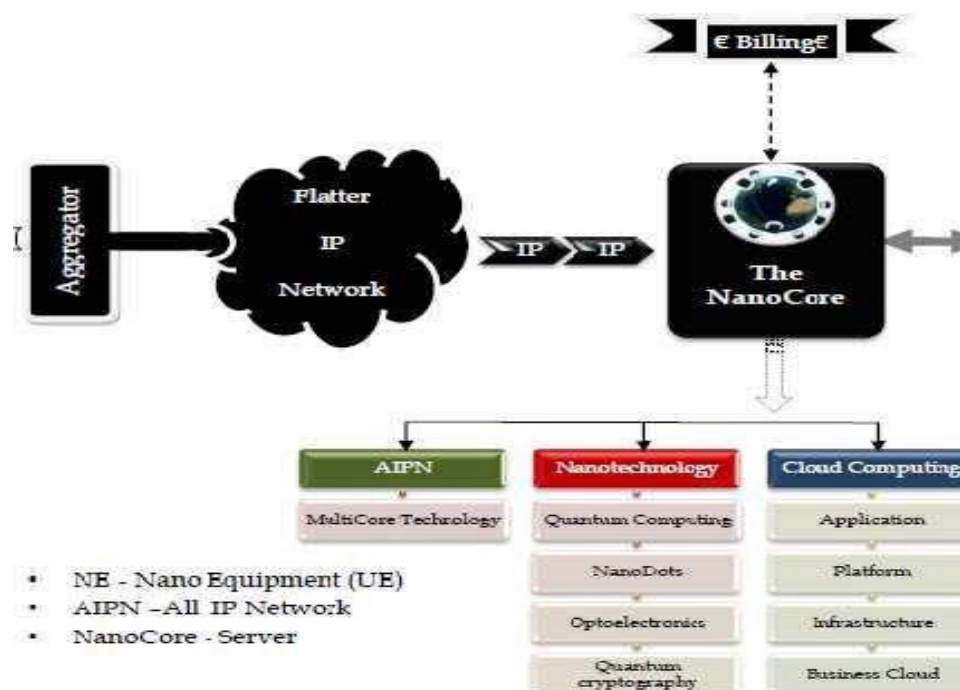
- i) Applications- It is based on, on demand software services. On demand software services vary in their pricing scheme and how software is delivered to users.
- ii) Platform- The platform segment refers to products that are used to deploy internet. NetSuite, Amazon, Google and Microsoft have also developed platforms that allow users to access applications from centralized servers.
- iii) Infrastructure- The third segment in cloud computing, known as infrastructure and it is the “Back-bone” of entire concept. Infrastructure vendor’s environments such as Google gears allow users to build applications.



3) All IP Network

For converging of different technologies to form a single 5G Nanocore, we require a common platform to interact. To meet customer demand for real-time data applications delivered over mobile broadband networks, wireless operators are turning to flat IP network architecture.

Fig.3 Architecture of 5G Technology



V. ADVANTAGES AND DISADVANTAGES OF 5G WIRELESS TECHNOLOGY

5th Generation technology offers a wide a range of applications, features which are beneficial for the all group of people including students, professionals (doctors, engineers, teachers, administrative bodies etc.) and even a common man.

Advantages

- High resolution and bi-directional large band-width shipping.
- More effective and efficient.
- Easily Manageable with previous generations.
- Possible to provide uniform, uninterrupted and consistent connectivity across world.
- Technology to facilitate subscriber supervision tools for quick action.
- Technological sound to support more than 60,000 connections.

Disadvantages

Though, 5G technology is reached and conceptualized to solve all radio signals problems and hardship of mobile world, but because of some security reason and lack of technological advancement in most of geographic regions, it has following shortcomings.

- Technology is still under process and research on its viability is going on.



- The speed of this technology is claiming seems difficult to achieve in future because of incompetent technological support.
- Security and Privacy issue yet to be solved.
- Many of the old devices are not enough competent to 5G, hence all of them need to be replaced with new expensive deal.
- Developing Infrastructure needs high cost.

VI. CONCLUSION

The future enhancement of Nano-core will be incredible as it combines with artificial intelligent (AI). One can able to control his intelligent Robot using his mobile phone. The development of the mobile and wireless networks is going towards high data rates and all-IP principle. It is expected that initial internet philosophy of keeping the network simple as possible, and giving more functionalities to end nodes, will become reality in the future generation of mobile networks, here referred to as 5G. A strong 5th Generation advancement can solve majority of these problems, thus it's essential that we invent good chunk of research resources in order to be developed nation.

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