

5G Technology Future of Mobile Communication

Abhi Tanwar, Karan Gogna & Akash Yadav

Dronacharya College of Engineering, Gurgaon, India

abhi11.1993@gmail.com

karangogna25@gmail.com

akashyadavdce@gmail.com

Abstract:

In this paper, an attempt of reviewing various existing generations of mobile technology according to their portals, performance, advantages and disadvantages. The paper tells about the evolution and development of various generations of mobile technology along with their significance and advantages of one over the other. In the past few decades, mobile technology has evolved from 0G to 4G. Current research in mobile technology concentrates on advancement of 4G technology and 5G technology. Currently 5G technology is not officially used. In 5G, researches are going on topic like development of World Wide Wireless Web (WWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World.

Keyword: 1G, 2G, 3G, 4G, 5G and Super Core.

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, namely from 0G to 4G. The cellular concept was introduced in 5G Technology stands for 5th Generation Mobile technology. 5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future.

Were a 5G family of standards to be implemented, it would likely be around the year 2020, according to some sources. A new mobile generation has appeared every 10th year since the first 1G system (NMT) was introduced in 1981, including the 2G (GSM) system that started to roll out in 1992, 3G (W-CDMA/FOMA), which appeared in 2001, and "real" 4G standards fulfilling the IMT-Advanced requirements, that were ratified in 2011 and products expected in 2012-2013. Predecessor technologies have occurred on the market a few years before the new mobile generation.

New mobile generations are typically assigned new frequency bands and wider spectral bandwidth per frequency channel (**1G up to 30 kHz, 2G up to 200 kHz, 3G up to 5 MHz, and 4G up to 40 MHz**), but the main issue that there is little room for new frequency bands or larger channel bandwidths. From end users point of view, previous mobile generations have implied substantial increase in peak bitrate (i.e. physical layer net bitrates for short-distance communication). However the major difference from a user point of view between 4G and 5G techniques must be something else than increased maximum throughput; for example lower battery consumption, lower outage probability (better coverage), high bit rates in larger portions of the coverage area, cheaper or no traffic fees due to low infrastructure deployment costs, or higher aggregate capacity for many simultaneous users.

II. The Evolution of “G from 1st to 5th Generation

The telecommunication service in World had a great leap within a last few year. 6 billion people own mobilephones so we are going to analyze the various generations of cellular systems as studied in the evolution of mobilecommunications from 1st generation to 5th generation. We can analyze that this could be due to increase in thetelecoms 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 forthgeneration,5G-the fifth second generation.

But its fail in some field such as in terms of overall connection quality, 1G compares unfavorably to its successors.

It has low capacity, unreliable handoff, poor voice links, and no security at all since voice calls were played back in radio towers, making these calls susceptible to unwanted eavesdropping by third parties.

b. 2G Generation: The second generation, 2G system, fielded in the late 1980s and finished in the late 1990s, was planned mainly for voice transmission with digital signal and the speeds up to **64kbps**. Second Generation (2G) wireless cellular mobile services was a step ahead of First Generation(1G) services by providing the facility of shortmessage service(SMS) unlike 1G that had its prime focus on verbal communication. The bandwidth of 2G is 30-200KHz. During the second generation, the mobile telecommunications industry experienced exponential growth in terms of both subscribers and value-added services.

c. 2.5G Generation: It is used to describe 2G-systems that have implemented a packet switched domain in addition to the circuit switched domain. 2.5 G can provide data rate, up to **144 kbps**. GPRS, EDGE and CDMA2000 were 2.5 technologies.

a. 1G Generation: The first generation of mobile phones was analog systems that emerged in the early 1980s. More popularly known as cell phones. 1G- technology replaced 0G technology, which featured mobile radiotelephones and such technologies as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT).

Its successor, 2G, which made use of digital signals, 1G wireless networks used analog radio signals. Through 1G, a voice call gets modulated to a higher frequency of about 150MHz and up as it is transmitted between radio towers. This is done using a technique called Frequency-Division Multiple Access (FDMA).

d. 3G Generation: In this 3G Wide Band Wireless Network is used with which the clarity increases and gives the perfection as like that of a real conversation. The data are sent through the technology called Packet Switching. Voice calls are interpreted through Circuit Switching. It is a highly sophisticated form of communication that has come up in the last decade. In addition to verbal communication it includes data services, access to television/video, categorizing it into triple play service. 3G operates at a range of 2100MHz and has a bandwidth of 15-20MHz. Highspeed internet service, video chatting are the assets of 3G.

With the help of 3G, we can access many new services too. One such service is the GLOBAL ROAMING. Another thing to be noted in case of 3G is that Wide Band Voice Channel that is by this the world has been contracted to a little village because a person can contact with other person located in any part of the world and can even send messages too.

There is also a concern that in many countries 3G will never be deployed due to its cost and poor performance. Although it is possible that some of the weaknesses at physical layer will still exist in 4G systems, an integration of services at the upper layer is expected.

e. 4G Generation: When It is still to estimate as to how many number of people have moved on from

2G to 3G, technology has come up with the latest of its type namely 4G. A successor of 2G and 3G, 4G promises downloading speed of 100Mbps. Then with the case of Fourth Generation that is 4G in addition to that of the services of 3G some additional features such as Multi-Media Newspapers, also to watch T.V programs with the clarity as to that of an ordinary T.V. In addition, we can send Data much faster than that of the previous generations.

III. Comparison between these technologies

A look at the **definition, throughput and technology** used for various generations of telecom technology. The comparison between **1g, 2g, 3g, 4g, 5g** helps analyze capabilities of each of the technologies and features that can be supported by each of them [11].

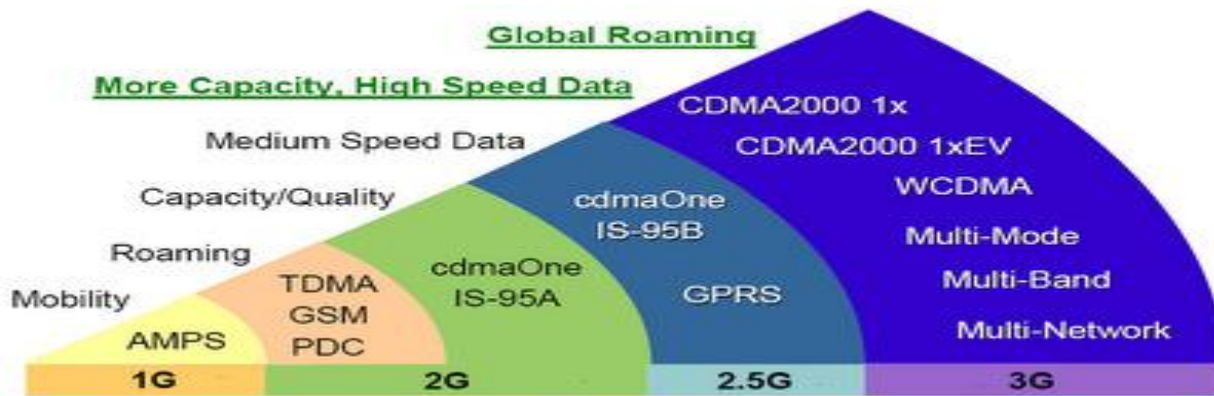


Fig1: Evolution of “G”

IV. 5G Technology

5G Technology stands for 5th Generation Mobile technology. 5G mobile technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features which makes 5G mobile technology most powerful and in huge demand in near future.

A user can also hook their 5G technology cell phone with their Laptop to get broadband internet access. 5G technology including camera, MP3 recording,

video player, large phone memory, dialing speed, audio player and much more you never imagine. For children rocking fun Bluetooth technology and Piconets has become in market.

a. The Fifth Generation (5G)-Real Wireless World System: The 5th wireless mobile multimedia internet networks can be completed wireless communication without limitation, which bring us perfect real world wireless—

Generation (1G,2G,3G,4 G,5G)	Definition	Throughput Speed	Technology	Time period	Features
1G	Analog	14.4 Kbps (peak)	AMPS,NMT,TACS	1970 – 1980	During 1G Wireless phones are used for voice only.
2G	Digital Narrow band circuit data	9.6/14.4 Kbps	TDMA,CDMA	1990 to 2000	2G capabilities are achieved by allowing multiple users on a single channel via multiplexing.During 2G Cellular phones are used for data also along with voice.
2.5G	Packet Data	171.2 Kbps(peak) 20-40 Kbps	GPRS	2001-2004	In 2.5G the internet becomes popular and data becomes more relevant.2.5G Multimedia services and streaming starts to show growth.Phones start supporting web browsing though limited and very few phones have that.
3G	Digital Broadband Packet Data	3.1 Mbps (peak) 500-700 Kbps	CDMA 2000 (1xRTT, EVDO) UMTS, EDGE	2004-2005	3G has Multimedia services support along with streaming are more popular.In 3G, Universal access and portability across different device types

					are made possible. (Telephones, PDA's, etc.)
3.5G	Packet Data	14.4 Mbps (peak) 1-3 Mbps	HSPA	2006 – 2010	3.5G supports higher throughput and speeds to support higher data needs of the consumers.
4G	Digital Broadband Packet All IP Very high throughput	100-300 Mbps (peak) 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax LTE Wi-Fi	Now (Read more on Transitioning to 4G)	Speeds for 4G are further increased to keep up with data access demand used by various services.High definition streaming is now supported in 4G. New phones with HD capabilities surface. It gets pretty cool.In 4G, Portability is increased further. World-wide roaming is not a distant dream.
5G	Not Yet	Probably gigabits	Not Yet	Soon (probably 2020)	Currently there is no 5G technology deployed. When this becomes available it will provide very high speeds to the consumers. It would also provide efficient use of available bandwidth as has been seen through development of each new technology.

Table 1: Comparison of generations of mobile comm..

World Wide Wireless Web (WWWW). 5G is based on 4G technologies, which is to be revolution to 5G. The 5th wireless mobile internet networks are real wireless world which shall be supported by LAS-CDMA, OFDM, MCCDMA, UWB, Network-LMDS and IPv6.

Currently 5G is not a term officially used for any particular specification or in any official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum or ITU-R. New 3GPP standard releases beyond 4G and LTE Advanced are in progress, but not considered as new mobile generations.

5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology.

The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future. The gigantic array of innovative technology being built into new cell phones is stunning. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system. 5G technology has a bright future because it can handle best technologies and offer priceless handset to their customers. May be in coming days 5G technology takes over the world market.

The Router and switch technology used in 5G network providing high connectivity. The 5G technology distributes internet access to nodes within the building and can be deployed with union of wired or wireless network connections. A new revolution of 5G technology is about to begin because 5G technology going to give tough completion to normal computer and laptops whose marketplace value will be effected. The new coming 5G technology is available in the market in affordable rates, high peak future and much reliability than its preceding technologies.

b. What 5G Technology offers:

5G technology is going to be a new mobile revolution in mobile market. Through 5G

technology now you can use worldwide cellular phones and this technology also strike the china mobile market and a user being proficient to get access to Germany phone as a local phone. With the coming out of cell phone alike to PDA now your whole office in your finger tips or in your phone. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system. It can handle best technologies and offer priceless handset to their customers. 5G Technologies have an extraordinary capability to support Software and Consultancy. The Router and switch technology used in **5G network** providing high connectivity. The 5G technology distributes internet access to nodes within the building and can be deployed with union of wired or wireless network connections.

c. KEY CONCEPTS OF 5G:

Real wireless world with no more limitation with access and zone issues [15].

Wearable devices with AI capabilities.

Internet protocol version 6 (IPv6), where a visiting care-of mobile IP address is assigned according to location and connected network.

One unified global standard.

Pervasive networks providing ubiquitous computing: The user can simultaneously be connected to several wireless access technologies and seamlessly move between them (See Media independent handover or vertical handover, IEEE 802.21, also expected to be provided by future 4G releases). These access technologies can be a 2.5G, 3G, 4G or 5G mobile networks, Wi-Fi, WPAN or any other future access technology. In 5G, the concept may be further developed into multiple concurrent data transfer paths [15].

Cognitive radio technology, also known as smart-radio: allowing different radio technologies to share the same spectrum efficiently by adaptively finding unused spectrum and adapting the transmission scheme to the requirements of the technologies currently sharing the spectrum. This dynamic radio resource management is achieved in a distributed fashion, and relies on software defined radio [15].

High altitude stratospheric platform station (HAPS)

d. Features of 5G Technology:

5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping[15].The advanced billing interfaces of 5G technology makes it more attractive and effective.

5G technology also providing subscriber supervision tools for fast action.

The high quality services of 5G technology based on Policy to avoid error.

5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000connections [15].

5G technology offer transporter class gateway with unparalleled consistency.

The traffic statistics by 5G technology makes it more accurate.

Through remote management offered by 5G technology a user can get better and fast solution.

The remote diagnostics also a great feature of 5G technology.

The 5G technology is providing up to 25 Mbps connectivity speed.

The 5G technology also support virtual private network.

The new 5G technology will take all delivery service out of business prospect

The uploading and downloading speed of 5G technology touching the peak.

The 5G technology network offering enhanced and available connectivity just about the world [15].

e. Key challenges:

Integration of various standards: Each engineering practice has their own standard (Feks

systems.

Telecom has 3GPP,3GPP2, ITU, IETF, etc). To integrate these various standards, requires systematic and time consuming approach [8].

Common Platform: There is no common architecture for interconnecting various engineering practices. One commongoverning body is required, which creates a common platform for all engineering practices to regularize theinterconnectivity issues as well as knowledge sharing.

V. 5G Super Core Concept

Existing telecom networks are fashioned in hierarchical way, where subscriber traffic is aggregated at aggregation point(BSC/RNC) and thenrouted to gateways.(As shown in figure). Flat IP architecture will lessen burden on aggregation pointand traffic will directly move from Basestation to Media gateways. When transition from legacy (TDM,ATM) platforms to IP will be concluded (Flat Network concept, describedimpervious section) a common ALL IP platform will be emerged. Vision of Super Core is based on IP platform. All network operators(GSM,CDMA, Wimax, Wireline) can be connected to one Super core with massive capacity. This is realization of single networkinfrastructure. The concept of super core will eliminate all interconnecting charges and complexities, which is right now network operator isfacing. It will also reduce number of network entities in end to end connection, thus reducing latency considerably[1].

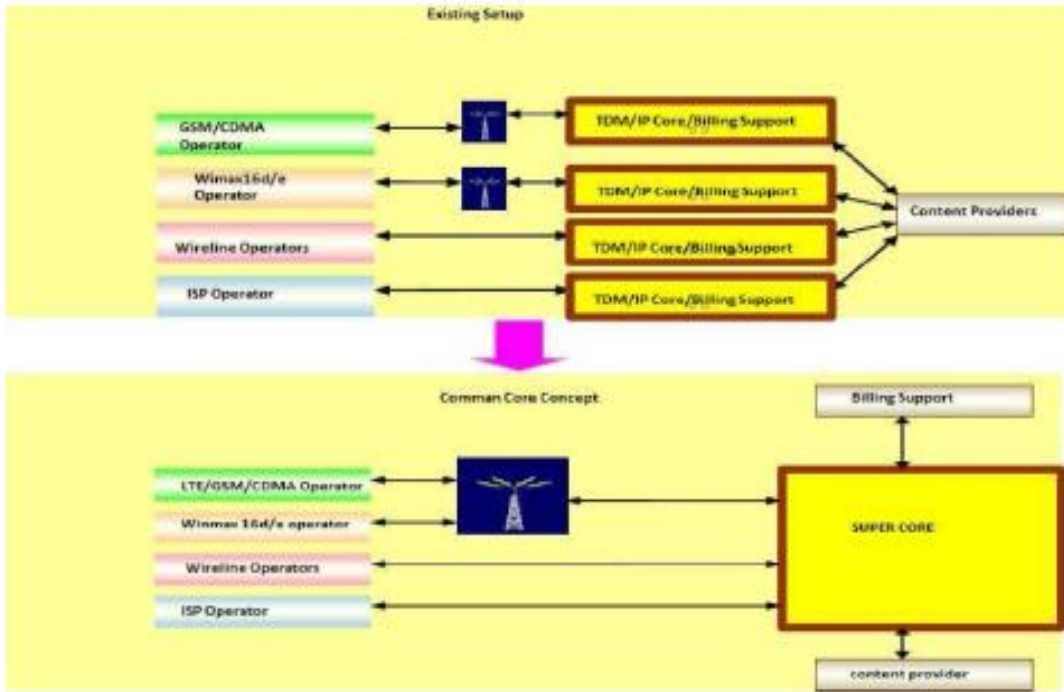


Fig 2: Supercore Architecture

Researches going on to be implemented in 5G:

1. Researchers are working so that the user can simultaneously be connected to several wireless access technologies and can switch between them.
2. Instead of Internet Protocol version 4 (IPv4) it will use IPv6.
3. It would have user centric network concept [14].

VI. CONCLUSION:

5G technology going to be a new mobile revolution in mobile market. Through 5G technology now you can use worldwide cellular phones and this technology also strike the china mobile market and a user being proficient to get access to Germany phone as a local phone [13]. With the coming out of cell phone alike to PDA now your whole office in your finger tips or in your phone. 5G technology has a bright future because it can handle best technologies and offer priceless handset to their customers.

As data traffic has tremendous growth potential, under 4G existing voice centric telecom hierarchies will be moving flat IP architecture where, base stations will be directly connected to media gateways. 5G will promote concept of Super Core,

where all the network operators will be connected one single core and have one single infrastructure, regardless of their access technologies. 5G will bring evaluation of active infra sharing and managed services and eventually all existing network operators will be MVNOs (Mobile virtual network operators).

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