

The Next Generation of Mobile Technology “5G” services in India

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Abstract

5G Technology stands for fifth Generation Mobile technology. From generation 1G to 2.5G and from 3G to 5G this world of telecommunication has seen a number of improvements along with improved performance with every passing day. This fast revolution in mobile computing changes our day to day life that is way we work, interact, learn etc. This paper also focuses on all preceding generations of mobile communication along with fifth generation technology. Fifth generation network provide affordable broadband wireless connectivity (very high speed). The paper throws light on network architecture of fifth generation technology. Currently 5G term is not officially used. In fifth generation researches are being made on development of World Wide Wireless Web (WWWW), Dynamic Ad hoc Wireless Networks (DAWN) and Real Wireless World. Fifth generation focus on (Voice over IP) VOIP-enabled devices that user will experience a high level of call volume and data transmission. Fifth generation technology will fulfill all the requirements of customers who always want advanced features in cellular phones. The main features in 5G mobile network is that user can simultaneously connect to the multiple wireless technologies and can switch between them. This forthcoming mobile technology will support IPv6 and flat IP. Fifth generation technology will offer the services like Documentation, supporting electronic transactions (e-Payments, e-transactions) etc.

Keywords— 5 G, Evolution from 1G to 5G, Comparison of all Generations, Why 5G?

INTRODUCTION

Wireless communication has started in early 1970s. In next four decades, a mobile wireless technology has evolved from 1G to 5G generations. Fifth generation technology offer very high bandwidth that user never experienced before. The Fifth generation technologies offer various new advanced features which makes it most powerful and in huge demand in the future. 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), Wi MAX (IEEE 802.16 wireless and mobile networks), as well as sensor networks, or personal area networks (e.g. Bluetooth, Zig Bee). 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 Pico nets. 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). Fifth generation is based on 4G technologies. The 5th wireless mobile internet networks are real wireless world which shall be supported by LAS-CDMA (Large Area Synchronized Code-Division Multiple Access), OFDM (Orthogonal frequency-division multiplexing), MCCDMA (Multi-Carrier Code Division Multiple Access), UWB (Ultra-wideband), Network-LMDS (Local Multipoint Distribution Service), and IPv6. Fifth generation technologies offers tremendous data capabilities and unrestricted call volumes and infinite data broadcast together within latest mobile operating system. Fifth generation should make an important difference and add more services and benefits to the world over 4G. Fifth generation should be more intelligent technology that interconnects the entire world without limits. This generation is expected to be released around 2020. The world of universal, uninterrupted access to information, entertainment and communication will open new dimension to our lives and change our life style significantly.

Evolution of first generation to fifth generation

Mobile communication has become more popular in last few years due to fast revolution in mobile technology. This revolution is due to very high increase in telecoms customers. This revolution is from 1G- the first generation, 2G- the second generation, 3G- the third generation, and then the 4G-the forth generation,5G-the fifth second generation.

A. First Generation (1G)

1G emerged in 1980s. It contains Analog System and popularly known as cell phones. It introduces mobile technologies such as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT). It uses analog radio signal which have frequency 150 MHz, voice call modulation is done using a technique called Frequency-Division Multiple Access (FDMA).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. Second Generation (2G)

2G emerged in late 1980s. It uses digital signals for voice transmission and has speed of 64 kbps. It provides facility of SMS (Short Message Service) and use the bandwidth of 30 to 200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain and provide data rate up to 144 kbps. E.g. GPRS, CDMA and EDGE.

C. Third Generation (3G)

It uses Wide Band 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 television/video, new services like Global Roaming. It operates at a range of 2100MHz and has a bandwidth of 15-20MHz used for High-speed internet service, video chatting.3G uses 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[3].

D. Fourth Generation (4G)

4G offers a downloading speed of 100Mbps.4G provides same feature as 3G and additional services like Multi-Media Newspapers, to watch T.V programs with more clarity and send Data much faster than previous generations. LTE (Long Term Evolution) is considered as 4G technology. 4G is being developed to accommodate the QoS and rate requirements set by forthcoming applications like wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content, Digital Video Broadcasting (DVB), minimal services like voice and data, and other services that utilize bandwidth.

COMPARISON OF ALL GENERATIONS OF MOBILE TECHNOLOGIES

Technology Features ⇒ ↓	1G	2G	3G	4G	5G
Start/ Deployment	1970 – 1980	1990 - 2004	2004-2010	Now	Soon (probably 2020)
Data Bandwidth	2kbps	64kbps	2Mbps	1 Gbps	Higher than 1Gbps
Service	Mobile Telephony (Voice)	Digital voice, SMS, Higher capacity packetized data	Integrated high quality audio, video and data	Dynamic Information access, Wearable devices	Dynamic Information access, Wearable devices with 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
Technology	Analog Cellular Technology	Digital Cellular Technology	CDMA 2000 (1xRTT, EVDO) UMTS, EDGE	WiMax LTE Wi-Fi	WWWW(coming soon)

5G in India

The government has started tuning spectrum for 5G services as part of its roadmap to become early adopter of the next generation services, which is expected to provide download speed over 1000Mbps on mobile devices.

"On spectrum we are already more or less aligned with global position in 5G. Those bands we are harmonizing in line with global community," Telecom secretary Aruna Sundararajan told PTI in an interview. She was in Barcelona to attend global telecom event Mobile World Congress and held meeting with key players in the sector, including Bharti Airtel, Vodafone, Nokia, Ericsson, Huawei, Qualcomm, Media Tek, NTT, Intel, etc.

The Department of Telecom has started harmonizing spectrum in 3500MHz band and 26GHz band along with E and V band. At present 4G services are provided in spectrum band below 2600 Mhz. With increase in frequency band count, the signal coverage area reduces, but as per technology trend, speed of transmitting data has been increasing. The government has already harmonized spectrum in 700MHz band which can be used for 5G services.

Telecom players are running trials to use 5G in automated cars, robotic surgery from remote locations, education, etc. Telecom Minister Manoj Sinha has asked technology companies to look for using 5G services in agriculture sector as well, she said. "All the players are positioning themselves for India as a big 5G market. One of the leading chipset companies in a meeting told us that India will have one of the biggest IoT (Internet of things) user base and the company is keen to partner with C-DoT for developing various IoT solutions. India is a forerunner and will be an early adopter of 5G,"

According to Bharti Airtel Chairman Sunil Bharti Mittal, 5G services in India will start once standards for the technology will be finalized by global telecom body International Telecommunications Union next year.

Sundararajan said before finalization of standards telecom gear makers - Huawei, Ericsson, Nokia, ZTE, NTT and Samsung have started deepening their work on 5G in India.

"Ericsson has plans to scale up manufacturing facility. They are also going to set up 5G test bed in IIT Delhi. Huawei is going to set up their test lab for 5G,"

Chinese telecom gear maker ZTE, which has recently won major 4G contract from BSNL, is planning to start capacity building around new technology in India, the telecom secretary said.

Finnish telecom firm Nokia will start smart village pilot in which they will showcase health and education using 5G.

Nokia will set up 400-500 centers and in third phase pan India rollout will take place, Sundararajan said. "Another significant message that came out here was that a lot of Indian software companies are behind of lot of the technologies in 5G. The corresponding software has to be made. Indian companies are developing software for that. Already C-DoT has developed standard M2M platform". When asked about timing for spectrum auction, she said that the government will decide on it only after the Telecom Regulatory Authority of India submits recommendations to the government.

Why need of 5g?

- ❖ Very High speed, high capacity, and low cost per bit
- ❖ It supports interactive multimedia, voice, video, Internet, and other broadband services, more effective and more attractive, and have Bi-directional, accurate traffic statistics
- ❖ 5G technology offers Global access and service portability.
- ❖ It offers the high quality services due to high error tolerance.
- ❖ It is providing large broadcasting capacity up to Gigabit which supporting almost 65,000 connections at a time.
- ❖ More applications combined with artificial intelligent (AI) as human life will be surrounded by artificial sensors which could be communicating with mobile phones.
- ❖ 5G technology use remote management that user can get better and fast solution.
- ❖ The uploading and downloading speed of 5G technology is very high.

- ❖ 5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping
- ❖ 5G technology offer transporter class gateway with unparalleled consistency

Conclusion

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications. 5g include latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and based on All IP Platforms. It is expected that the initial Internet philosophy of keeping the network simple as possible, and giving more functionalities to the end nodes, will become reality in the future generation of mobile networks, here referred to as 5G.

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