5G-The Wonder of Wireless Network

Ghankuntla rana ; Mr.Sarwesh swarnkar & Mr. Akash jain

Electronics&telecommunication ,kirodimal institute of techonology raigarh(C.G.)
Email-ranaghankuntla@gmail.com

➤ ABSTRACT:

In this paper, an attempt has been made to review various existing generations of mobile wireless technology in terms of their portals, performance, advantages and disadvantages. The paper throws light on the evolution and development of various. Generations of mobile wireless technology along with their significance and advantages of oneover the other. In the past few decades, mobile wireless technologies have experience 4 or 5 generations of technology revolution and evolution, namely from 1G to 4G.Current research in mobile wireless technology concentrates on advance implementation of 4G technology and 5G technology. Currently 5G term is not officially used. In 5G research is being made on development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World. In this paper we propose novel network architecture for next generation 5G mobile networks. In the proposed architecture the mobile terminal has the possibility to change the Radio Access Technology - RAT based on certain user criteria.

KEY CONCEPT:

Evolution from 1G-5G; 5G Network Architecture; Need of 5G

Introduction

Cellular generations differ, in general, in four main aspects: radio access, data rates, bandwidth and switching schemes. The 1G (First Generation) cellular systems, mainly analog system, had a bandwidth ranging from 10 to 30 KHz depending on system type and serviceOffered data rates were around 10 Kbps after analog to digital conversion The first phase of the 2G (Second Generation) GSM systems offered a data rate up to 9.6 Kbps. the 3G (Third Generation) systems, the peak data rate began of 2Mbps in the first phase and approached 50Mbps in consecutive phases at constant wide bandwidth of 5 MHz . The approved access scheme for the 3G was CDMA and switching continued to be circuit in addition to packet. Today we have different wireless and mobile technologies, which are mass deployed, such as 3G mobile networks (UMTS, cdma2000), LTE (Long Term Evolution), WiFi (IEEE 802.11 wireless networks), WiMAX (IEEE 802.16 wireless and mobile networks), as well as accompanying networks, such as sensor networks, or personal area networks (e.g., Bluetooth, ZigBee). . Key to the future generations of mobile communications are multimedia communications, wireless access to broadband fixed networks, and seamless roaming among different systems. In 4G mobile systems different access technologies, such as WLAN, WMAN and cellular, are combined on a common platform and interoperate to offer different service in different radio environments. The 4G term is related to available bit-rates in the access link, i.e. more than 1 Gbps is set as condition by ITU for a technology to be marked as 4G. Also, all-IP is the characteristic of 4G in the access and in the core network part, so there will be no circuit-switching as it existed in 3G systems, such as UMTS. , the 4G is already at the "front door" of the communication world, the next generation of mobile and wireless networks will be labeled 5G, if we continue the same pattern from the past two decades. We believe that the 5G approach will be user-centric approach [4], since the mobile terminals are becoming highly computationally capable devices which can support more complex functionalities for performing calculations, as well as bigger memory space and longer battery life in years will provide enough storage capability for control information. On the other hand, the 5G (Fifth Generation mobile and wireless networks) can be a completed wireless communication without limitation, which bring us perfect real world wireless – World Wide Wireless Web (WWWW). 5G is a name used in some research papers and projects to denote the next major phase of mobile telecommunications standards beyond the 4G/IMT-Advanced standards. At present, 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 [10], WiMAX Forum [11], or

pc

ITU-R [12]. The rest of the paper is organized as follows: Section 2 reviews in brief the evolution of wireless and cellular systems focusing on the four main key factors: radio access, data rates, bandwidth and switching schemes in addition to change in network architecture.   In this paper we provide complete functional architecture for 5G mobile networks.

➢ **1G Mobile communication system**

 The   1G   first   generation   mobile   wireless communication system was analog system, which was

based on a technology known as Advance Mobile Phone Service (AMPS). The AMPS system was frequency modulation radio system using frequency division multiple access (FDMA) with channel capacity of 30 KHz and frequency band was 824-894 MHz [3]. In 1988 10MHz additional bandwidth was allocated to AMPS which was developed in Chicago, with coverage area of 2100 square miles [4]. The first generation has some specifications which are as following.

| Generation	Start from	Data capacity	Techonology	standard	multiplexing	switing	service	Main network	frequency
1G	1970-84	2kbps	Analog wireless	AMPS	FDMA	circuit	Voice only	PSTN	800-900MHZ

➢ **2G Mobile communication system**

The 2G second generation mobile communication system is digital system. This system was commercially launched in Finland in 1991. This system is still mostly used in different parts of the world. This generation is for data and voice services. In this generation two digital modulation schemes are used; one is time division multiple access (TDMA)

and the 2nd is code division multiple access (CDMA) [5]. The first digital system was introduced in 1991 in United States. Three types of developments took place in 2nd generation wireless communication system, IS-54 (TDMA) in 1991, IS-95 (CDMA) in 1993, and IS-136 in 1996 [6].The family of this generation consists of 2G, 2.5G and 2.75G. The specifications of this ftamily are shown in the table below.

Generation	Starts from	Data capacity	Technology	Stander	Multiplexing	Switching	Service	Main network	frequency
2G-2.75G	1990-2003	10-473kbps	Digital wirelwess,GPRS, EDGE	CDMA,TDMA. GSM	TDMA,CDMA	Circuit packet,paket switch	Voice data mms internet	PSTM,GSM,TDMA,WCDMA	850-1900MHZ

➢ **3G Mobile communication system**

pc

pc
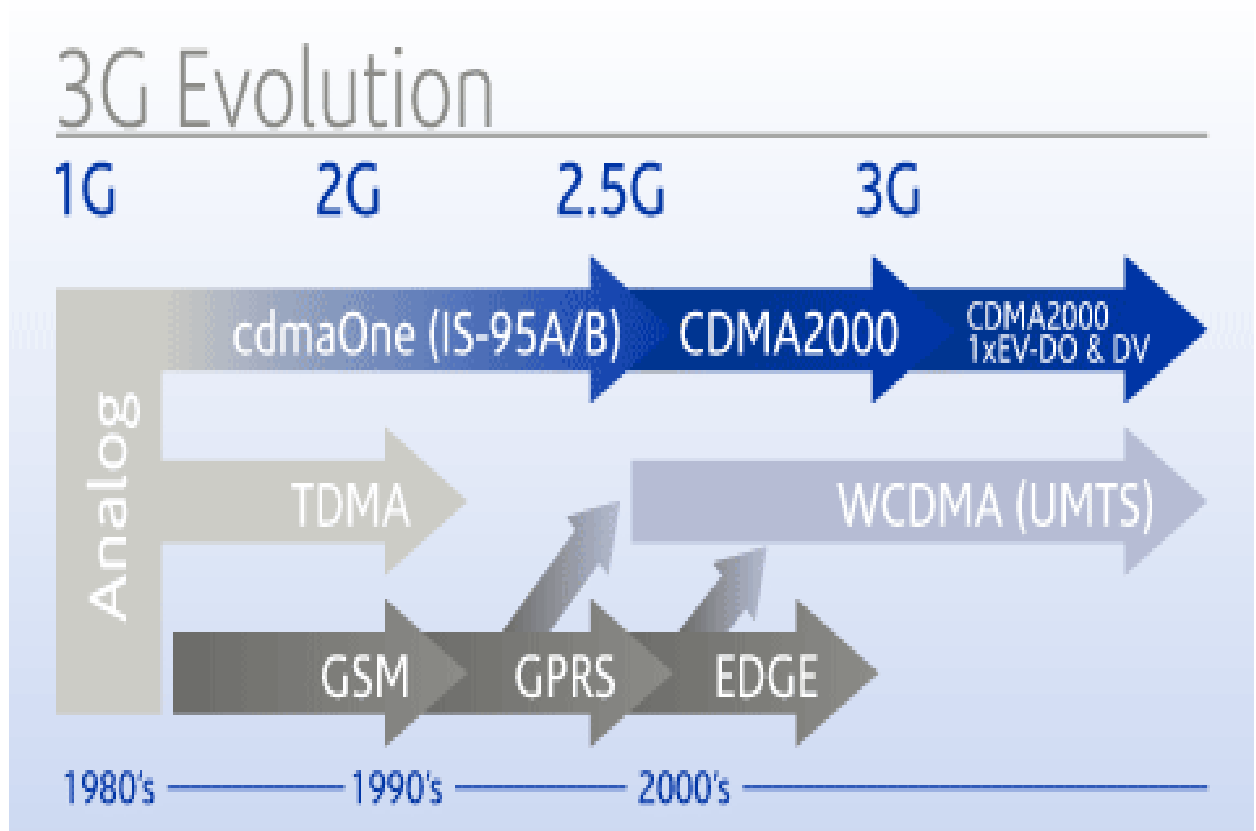
The evolution of GSM to 3G is about gradually adding more functionality, possibilities and value to the existing GSM network and business. In search of high speed, fast data rate capacity and good QoS, the evolution of mobile generation reached to 3rd generation mobile communication system. This system was adopted by Japan and South Korea in 2001 for the first time. 3G UMTSTM (universal mobile telephone service) is developed by ETSITM with in ITU's IMT-2000 framework. 3G mobile system is equally available with all cellular standards like CDMA, GSM, and TDMA under one umbrella. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing.

Generation	Starts from	Data capacity	Technology	Stander	Multiplexing	Switching	Service	Main network	*frequency*
3G-3.75G	2001-2003	384kbps-30Mbps	Broudband/IP Techonology FDD TDD GSM/3GPP	CDMA/UMTS/CDMA2000/HSDPA/HSUPA/1XEVDO	CDMA	Circuit & packet	High speed Voice /data /video /mms/ internet/ multi media	GSM,TDMA, paket network	1.6-2,5GHZ

pc

- ▪ UPCOMING
- ▪ 3.5 G
    - – Evolved radio Interface
    - – IP based core network
- ▪ 4G
    - – New Air Interface
    - – Very high bit rate services
    - – Convergence of Wire line, Wireless, and IP worlds
- ➢ **4G Mobile communication system**

A huge increment in the mobile subscription has made the attention of researchers and industries to move the next generation of mobile wireless technology. The main aim of 4G technology is

4G wireless technology should put together different presently existing and prospect wireless network technologies (e.g. OFDM, MC-CDMA, LAS-CDMA and Network- LMDS) to make sure that free movement and faultless roaming from one technology to another is achieved [8]. The technologies under the 4G umbrella are; one is LTE (Long term evolution) and second is Wi-MAX (Worldwide Interoperability for Microwave Access)

4G wireless technology should put together different presently existing and prospect wireless

to provide high speed, high quality, high capacity and low cost services for example voice, multimedia and internet over IP. 4G is totally IP based technology with the capability of 100Mbps and 1Gbps speed for both indoor and outdoor. This generation is in the under development stage. A term MAGIC is used to explain the 4G technology.

M= mobile multimedia

A= any time any where

G= global mobility support

I=intergreted wireless solution C= customized personal service

network technologies (e.g. OFDM, MC-CDMA, LAS-CDMA and Network- LMDS) to make sure that free movement and faultless roaming from one technology to another is achieved [8]. The technologies under the 4G umbrella are; one is LTE (Long term evolution) and second is Wi-MAX (Worldwide Interoperability for Microwave Access)

The technologies under the 4G umbrella are; one is LTE (Long term evolution) and second is Wi-MAX (Worldwide Interoperability for Microwave Access)

Generation	Starts from	Data capacity	Technology	Stander	Multiplexing	Switching	Hand off	Main network	*frequency*
4G	2010	200MBps-1GBps	LTE WIMAX	IP broadband/ LAN /WAN /PAN	MC-CDMA OFAM	packet	Horizontal &vertical	internet	2-8 GHZ

IMT-Advanced and 4G Wireless Standards

☐☐ IMT-Advanced Requirements

☐☐ Based on an all-IP packet switched network

☐☐ Peak data rates of up to approximately 100 Mbit/s and up to approximately 1 Gbit/s for low mobility

☐☐ Scalable channel bandwidth, between 5 and 20 MHz, optionally up to 40 MHz

☐☐ Peaklink spectral efficiency of 15 bit/s/Hz in the downlink, and 6.75 bit/s/Hz in the uplink

☐☐ System spectral efficiency of up to 3 bit/s/Hz/cell in the downlink and 2.25 20bit/s/Hz/cell for indoor usage

☐☐ Smooth handovers across heterogeneous networks.

pc

 Ability to offer high quality of service for next generation multimedia support.

 Typically, IMT-Advanced and 4G are used synonymously

 IMT-Advanced Technologies are

 LTE-Advanced (specified by 3GPP)

 WiMax– 802.16m (specified by IEEE)

 WirelessMAN-Advanced, Mobile WiMax Release 2

WIMAX

- ○ World Interoperability for Microwave Access
- ○ There are two main applications of WiMAX:

➢ Visualized virtual navigation
  Telegeoprocessing: GIS, GPS

➢ Life- saving: Telemedicine

1) **Fixed WiMAX** (IEEE 802.16-2004) - Fixed WiMAX applications are point-to-multipoint enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL for homes and businesses.

2) **Mobile WiMAX** (IEEE 802.16e-2005) - Mobile WiMAX offers the full mobility of cellular networks at true broadband speeds.

➢ **"Killer" Applications of 4G**

➢ Voice over Internet Protocol (VoIP) for IPv6
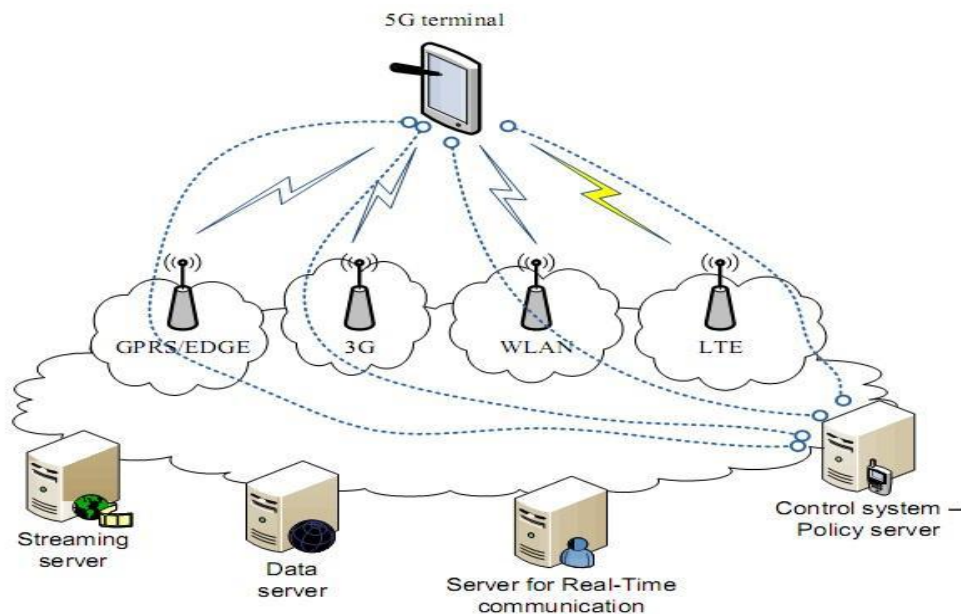
➢ **Future Generations of Mobile communication**

pc

Generation	Starts from	Data capacity	Technology	Stander	Multiplexing	Switching	Service	Main network	*frequency*
5G	2015	Higher than 1GB	IP V6	IP Broadband LAN/WAN/PAN&WWWW	CDMA	All packet	Dynamic information access,veriable device for all capability	Internet	

➤ **What India wants from 5G.**_

India's Requirements from 5G5G must factor in the Indian requirement for DSL-like connectivity: Always ON, low latency, affordable cost To minimize cost, 5G must avoid using many more BTS sites, or much more spectrum, and focus on spectral efficiency5G

➤ **Why is there a need for 5G?**
The major difference, from a user point of view, between current generations and expected 5G techniques must be something else than increased maximum throughput; other requirements
include:
▢ ▢ Lower battery consumption.
▢ ▢ Lower outage probability; better coverage and high data rates available at cell edge.
▢ ▢ Multiple concurrent data transfer paths.
▢ ▢ Around 1Gbps data rate in mobility.
▢ ▢ More secure; better cognitive radio/SDR Security.
▢ ▢ Higher system level spectral efficiency.
▢ ▢ Worldwide wireless web (WWWW), wireless-based web applications that include full multimedia capability beyond 4G speeds.
▢ ▢ More applications combined with artificial intelligent (AI) as human life will be
surrounded by artificial sensors which could be communicating with mobile phones.
▢ ▢ Not harmful to human health.
▢ ▢ Cheaper traffic fees due to low infrastructure deployment costs.

should allow virtual network operations enabling multiple operators to use the same physical network infrastructure5G infrastructure must be green—not just the CPEs or handsets—since we lack good grid connectivity5G must work well in Indian propagation characteristics—dense, concrete buildingsWe want TV on our mobiles to watch cricket at work!
5G Architecture Design Principles

1. Water-filing applied to equipment placement and its choice.
2. Aggressive spatial re-use due to ultranarrow beams at BS
3. Aggressive joint design of wireless access and backhaul
4. Aggressive use of licensed and licenseexempt Technologies

• 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

pc

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

5G

> **FUTURE SCOPE Beyond 5g:** 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. Your Mobile can automatically type the message what your brain thinks. We might get a circumstance where we don't require any spectrum for communication. The Google hot trends have rated the term 6G as the 17th most searched word in the search engines. The iPod 6G comes in seven different colors and has an aluminum body which makes the body strong to with stand constant daily usage. It has a clip on design like iPod shuffle and it attached to shirt firmly. 6G technology haven't been fully revealed yet but search phrases like what is 6G mobile technology, 6G technology, 6G mobile, 6G network, 6G wiki, 6G technology ppt. are getting

more familiar with new mobile technology getting evolved
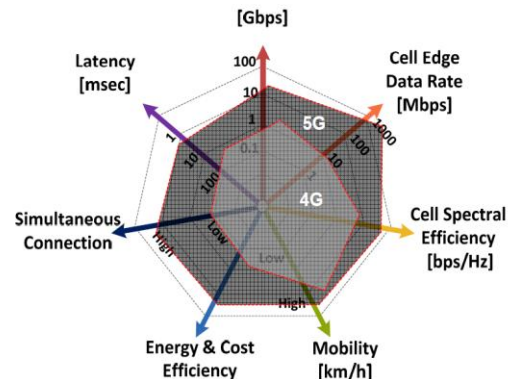
Currently 5G term is not officially used. In 5G research is being made on
development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks

> **Conclusion**

In this paper we have discussed the existing and future wireless mobile communication generations. Edge will contribute to a bright future for 3G and onwards generations, a vision shared by major analyst and industry groups.

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Currently, there are many available radio access technologies, which provide possibility for IP-based communication on the network layer, as well as there is migration of all services in IP environment, including the traditional telephony and even television, besides the traditional Internet services, such as web and electronic mail as most used among the others. On the other side, mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications (services). 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.

In this paper we have defined completely novel network architecture for such 5G mobile

pc

networks. The architecture includes introduction of software agents in the mobile terminal, which will be used for communication with newly defined nodes called Policy Routers, which shall be placed in the core network. The Policy Router creates IP tunnels with the mobile terminal via each of the interfaces to different RATs available to the terminal. Based on the given policies, the change of the RAT, i.e., vertical handover, is executed via tunnel change by the Policy Router, and such change is based on the given policies regarding the Quality of Service and user preferences, as well as performance measurement obtained by the user equipment via new defined procedure for that purpose in this paper, called Quality of Service Policy based Routing (QoSPRO). Finally, the proposed RAT selector algorithm, based on genetic algorithms and particle-swarm optimization, provides highest probability of satisfied users regarding their requirements from the access network.

The proposed architecture for future 5G mobile networks can be implemented using components of the shelf (existing and standardized Internet technologies) and its implementation is transparent to the radio access technologies, which makes it very likeable solution for the next generation mobile and wireless network.sAutomobile and the television changed our lives but EDGE will change our lives by providing 3G, 4G, 5G, 6G, 7G services for the masses.

➢ **Refrence**

[1] International Journal of Electronics and Computer Science Engineering 1265
Available Online at www.ijecse.org ISSN-2277-1956
ISSN 2277-1956/V2N4-1265-1275
5G Technology of Mobile Communication

[2] SysteMultimedia Wireless Sensor Networks: Perspectives S j 1 K D
and Future Directions
Sajal K. Das
National Science Foundation
Center for Research in Wireless Mobility and Networking

[3]Spectrum Trading in India and 5G
Purnendu S. M. Tripathi and Ramjee Prasad

[4] Global ICT Standardisation Forum for India (GISFI) and 5G Standardization
Prasad, Ramjee

[5]Generations of Mobile Wireless Technology: A Survey

[6] Future broadband
mobile communication technology

[7] 5G WIRELESS TECHNOLOGIES-Still 4G auction not over, but time to start talking 5G

[8] Future Generations of Mobile Communication Networks Engr. Muhammad Farooq, Engr. Muhammad Ishtiaq Ahmed, Engr. Usman M Al

[9] What India wants from 5G
Kumar N Sivarajan
Chief Technology Officer

[10] ITU/BDT Arab Regional Workshop on "4G Wireless Systems"
LTE Technology

[11] The FP7 RAS cluster in the ignition phase of 5G research

[12] © 2014, IJCSMC All Rights Reserved 1080
Available Online at www.ijcsmc.com
International Journal of Computer Science and Mobile Computing
A Monthly Journal of Computer Science and Information Technology
ISSN 2320–088X
IJCSMC, Vol. 3, Issue. 3, March 2014, pg.1080 – 1087
RESEARCH ARTICLE
5G Technology-Evolution and Revolution
Meenal G. Kachhavay[1] Ajay P.Thakare[2]
1M.E. [I st year] C.S.E. Sipna College of Engineering, Amravati
2Head of Department, Electronics and Telecommunication, Sipna College of Engineering, Amravati

pc

[13] 5G Ultra-High Capacity Network Design With Rates 10x LTE-A

[14] Protocols and Algorithms for the Next Generation 5G Mobile Systems
Aleksandar Tudzarov
T-Mobile Macedonia, Orce Nikolov bb, 1000 Skopje, Republic of Macedonia

[15] 5G Carrier Grade Wi-Fi: Requirements and Technologies

[16] Prospective of Fifth Generation Mobile Communications
Dr. Anwar M. Mousa
University of Palestine,Gaza- Palestine

[17] 5G - The Future of Mobile Wireless Communication Networks
Sanskar Jain1, NehaAgrawal1 and Mayank Awasthi2
1IET, Mangalayatan University
2ECE Department, IET, Mangalayatan University

[18] Functional Architecture for 5G Mobile Networks

pc