INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 2 (2018) PAGES 2811 - 2818
RECEIVED : 25.02.2018 PUBLISHED : 21.03.2018
March 21, 2018

# 4G MOBILE COMMUNICATION SYSTEM – A SURVEY

[1] Ms. J.Elakkia [2]Ms. R.Jothimeena,[3]Prof. M. Saravanan,
[1,2] Second Year M. C.A. Student, [3]Associate Professor
Department of Computer Applications
Ganadipathy Tulsi's Jain Engineering College, Vellore, INDIA.

**ABSTRACT**

The abbreviated form of 4G is Fourth Generation. There is no formal definition for 4G mobile communication. Therefore 4G mobile communications are fully IP-Based integrated system. The 4G technology are fully IP-based integrated system. The 4G Mobile communication is projected here in order to solve a pitfall of 3G Systems. And 4G technology is proving a variety of services like voice, high-definition video, high data rate etc., The International telecommunication regulatory and standardization bodies was started in 2012-2015 time of scale to control the commercial deployment of 4G networks. This 4G mobile communication provides a secured IP-Based communication on WIMAX, modem, smart phones etc., OFDMA, SDR and MIMO are the main key points to work 4G Technology.

**Keywords:** IP, WIMAX, OFDMA, SDR, MIMO

## 1. INTRODUCTION

The 4G mobile communications are used not only in WIMAX communication systems also on cellular telephone systems. To satisfy the increase on user demand, the 4G technology are integrated with terminals, networks and other application channels. The 4G mobile communication provides capabilities which are defined by ITU in advance. The current applications need minor changes on web access, IP telephony, services like gaming, mobile TV, video conferencing and 3D television. In order to use a 4G mobile communication, the terminals have to select the particular wireless system. In GSM, the base stations will broadcast the messages from time to time for service subscription to the mobile station. The growth of mobile communication and wireless networks shows the evidence in the area of mobile subscriber, WIMAX network access, mobile services, and applications.

INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 2 (2018) PAGES 2811 - 2818
RECEIVED : 25.02.2018 PUBLISHED : 21.03.2018
March 21, 2018

| Generation | Requirements | Comments |
|---|---|---|
| 1G | No official requirements.<br>Analog technology. | Deployed in the 1980s. |
| 2G | No official requirements.<br>Digital Technology. | First digital systems.<br>Deployed in the 1990s.<br>New services such as SMS and low-rate data.<br>Primary technologies include IS-95 CDMA and GSM. |
| 3G | ITU's IMT-2000 required 144 kbps mobile, 384 kbps pedestrian, 2 Mbps indoors | Primary technologies include CDMA2000 1X/EV-DO and UMTS-HSPA.<br>WiMAX now an official 3G technology. |
| 4G | ITU's IMT-Advanced requirements include ability to operate in up to 40 MHz radio channels and with very high spectral efficiency. | No technology meets requirements today.<br>IEEE 802.16m and LTE-Advanced being designed to meet requirements. |

Table 1: Millimeter Wave Mobile Communications

Targets in the framework include users, terminals, networks, and applications, which imposes the entire related domain and operating system and environment of 4G mobile communication. The main features of 4G mobile communication are explained in the range of different and the quality to adjust the new conditions of the targets which leads to integration without any interruptions. The feature of range of different includes both external range of changes and internal range of changes, in which quality is caused by external range of changes which is solved by internal range of changes.

| Technology / Features | 1G | 2G | 2.5G | 3G | 4G |
|---|---|---|---|---|---|
| Start/ Deployment | 1970/ 1984 | 1980/ 1991 | 1985/ 1999 | 1990/ 2002 | 2000/ 2006 |
| Data Bandwidth | 1.9 kbps | 14.4 kbps | 14.4 kbps | 2 Mbps | 200 Mbps |
| Standards | AMPS | TDMA, CDMA, GSM | GPRS, EDGE, 1xRTT | WCDMA, CDMA-2000 | Single unified standard |
| Technology | Analog cellular technology | Digital cellular technology | Digital cellular technology | Broad bandwidth CDMA, IP technology | Unified IP and seamless combination of broadband, LAN/WAN/PAN and WLAN |
| Service | Mobile telephony (voice) | Digital voice, short messaging | Higher capacity, packetized data | Integrated high quality audio, video and data | Dynamic information access, wearable devices |
| Multiplexing | FDMA | TDMA, CDMA | TDMA, CDMA | CDMA | CDMA |
| Switching | Circuit | Circuit | Circuit for access network & air interface; Packet for core network and data | Packet except circuit for air interface | All packet |
| Core Network | PSTN | PSTN | PSTN and Packet network | Packet network | Internet |
| Handoff | Horizontal | Horizontal | Horizontal | Horizontal | Horizontal and Vertical |

Table 2: History of Mobile Telephone Technology

**A.SYMBOLS**

1xRTT = 2.5G CDMA data service up to 384 kbps
AMPS = Advanced Mobile Phone Service
CDMA = Code Division Multiple Access
EDGE = Enhanced Data for Global Evolution
FDMA = Frequency Division Multiple Access
GPRS = General Packet Radio System
GSM = Global System for Mobile
NMT = Nordic Mobile Telephone
PDC = Personal Digital Cellular
PSTN = Public Switched Telephone Network
TACS = Total Access Communications System
TDMA = Time Division Multiple Access
WCDMA = Wideband CDMA

## 2. VISION OF 4G

This generation of WIMAX is intended to complement and replace the 3G systems, perhaps in 5 to 10 years. The main keys of the 4G mobile communication to access a data anywhere and anytime with integration connection without any interruptions in a wide range of data and services and also receive a large amount of data, pictures, audio, and video and so on. The future 4G technology will use the IP as a common protocol in order to make the users in control, so that each and every application and environment to choose the same protocol.

Based on the developing area on mobile communication, 4G technology uses high bandwidth with high data rate and uses a smoother and quicker handoff which will focus on integration services without any interruptions on WIMAX systems and networks. The concept is integrating the 4G technology with the older mobile communication to achieve a advanced technology for the society by means of speed and less cost. This will make high potential and interest to the end users.

The features on 4G services will be delivered to different users and supports the traffic of users, interface on air, radio environment and QoS. The levels are correct and efficient while transfer the network applications into various forms. The dominant methods of access to this small area of data will be mobile, telephones, PDA etc to integrate without interruption through voice communication. The 4G technology will internally operate with 2G and 3G and also with digital computing.

Additionally, 4G mobile communication is fully IP-Based WiFi internet. The integration of 4G technology from Satellite broadband to 3G cellular and 3G systems to WLL(WIMAX local loop) and FWA(Fixed WIMAX Access) to WLAN.

INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 2 (2018) PAGES 2811 - 2818
RECEIVED : 25.02.2018 PUBLISHED : 21.03.2018
March 21, 2018

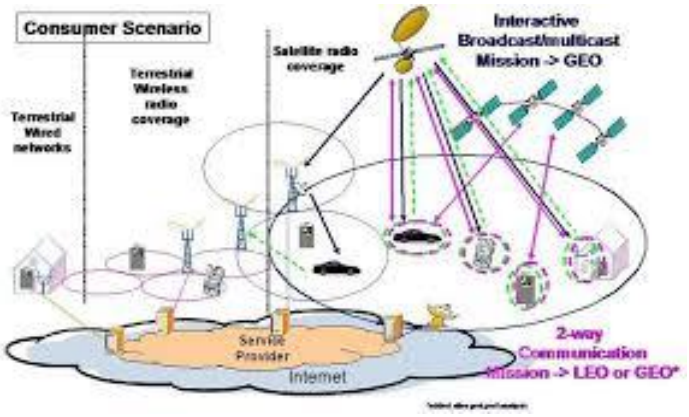


Fig.1. Statlite role of 4G Mobile Communication Systems.

**A.BENEFITS**

1.Higher capacity bandwidths
2.Chepier Networks and Equipment.
3.No need on Licence
4.High capacity and QoS enhancement.
5. High revenue.

**B.APPLICATIONS**

1.No Physical Presence
2.No Physical Navigation
3.Geoprocessing Application will be done through telecommunications.
4.Medicine And Education will be done through telecommunications.
5. Crisis Management

## 3.KEY TECHNOLOGIES

### A. OFDMA

**Orthogonal frequency-division multiple access (OFDMA)** is a signal modulation which will divide the high data rate to many slow modulated narrowband. It is used on many WIMAX and communication standards.

**ADVANTAGES**

1. Pulsed carrier will be avoided.
2. Low-data-rate users is provided with Lower maximal transmission power
3. Delay on Shorter and constant .

**DISADVANTAGES**

1.Higher sensitivity to frequency offsets and phase noise.
2.The fast channel feedback data and adaptive sub-carrier assignment is more difficult than CDMA fast power control.
3.Dealing with co-channel interference from nearby cells is more difficult in OFDM than in CDMA

INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 2 (2018) PAGES 2811 - 2818
RECEIVED : 25.02.2018 PUBLISHED : 21.03.2018
March 21, 2018

**B. SOFTWARE DEFINED RADIO**

Software-defined radio (SDR) is a radio communication system. The components have been implemented in hardware but it is implemented in software using PC or Embedded system. The concept of SDR is old but the rapidly evolving capabilities of digital electronics render practical many processes to be use theoretically only.

**ADVANTAGES**

1. The ability to alter the functionality by downloading an running new software at will.

2. The possibility of adaptively choosing an operating frequency and a mode best suited for prevailing conditions.

3. The chance for new experimentation.

**DISADVANTAGES**

1. Writing a software is difficult.
2. Digital signals and algorithms interface is required.
3. Lacking on understanding among designers (what is required).

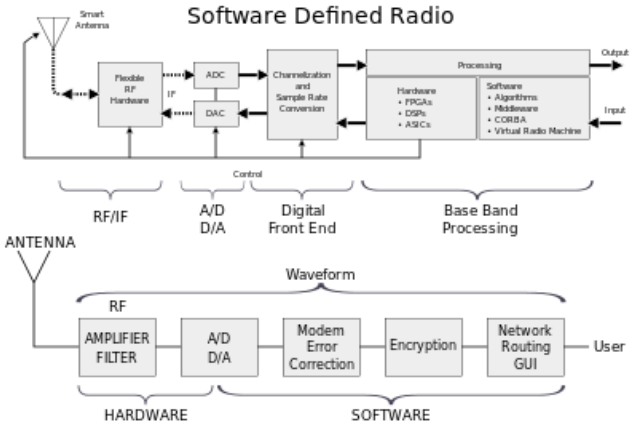


Fig.2. Software Defined Radio

**C. MULTIPLE INPUT AND MULTIPLE OUTPUT**

MIMO will connect WiFi hotspots with each and every devices and also to the internet 802.11n. It also connects to cable and DSL for access WIMAX. It provides high-speed data transfer and communications services on 4G technology and also to Long Term Evaluation (LTE). MIMO is using a transmission techniques and receiver techniques which uses multiple antenna in both transmitter and receiver side. The basic parameter to describe the QoS in wireless is speed, range and reliability. These parameters are used as strict tools to implement a MIMO.

INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 2 (2018) PAGES 2811 - 2818
RECEIVED : 25.02.2018 PUBLISHED : 21.03.2018
March 21, 2018

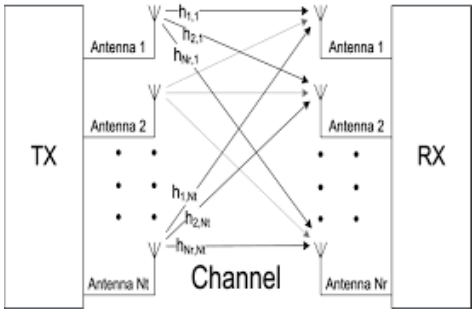


Fig 3 – Multiple Input Multiple Output

**ADVANTAGES**

1. High QoS (Quality of Service) with increased spectral efficiency and data rates.

2. The wide coverage area supported by MIMO system helps in supporting large number of customers per cell.

3. The MIMO based system is widely adopted in latest WIMAX standards viz.

**DISADVANTAGES**

1. The resource requirements and hardware complexity is higher compare to single antenna based system.
2. The hardware resources utilize power requirements.
3. MIMO based systems is not cheaper while compare to single antenna based system because of more number of hardware and advanced software requirements.

**4.QUALITY OF SERVICE**

In the Mobile, Video applications are used widely using 4G mobile communications. It offers real-time videos for IoT (homes, offices, etc.,) with pre-recorded /live stream videos. Here Qos is a main key by providing guaranteed and differentiated QoS support. The main components to achieve a Qos are Enabling QoS , media based server and network to network gateway and media applications. Also we can measure to evaluate the performance to achieve QoS.

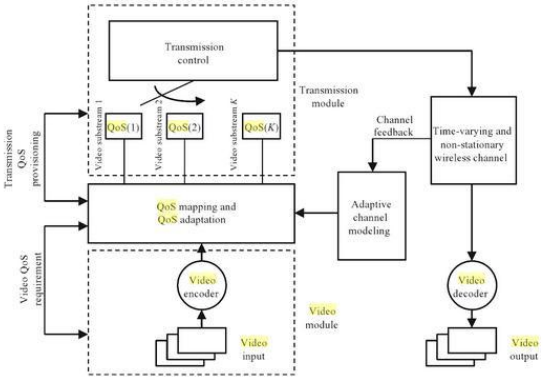


Fig 4: QoS Management Architecture

## 5. SECURITY

Security is a major issue in today's convergence communication world what securities does 4G provide to us they are as follows:-

1. The different types WIMAX networks complicate the security issue.
2. Dynamic reconfigurable, adaptive, and lightweight security mechanisms should be developed.
3. Security in WIMAX networks mainly involves authentication, confidentiality, integrity and authorization for the access of network connectivity and QoS resources for the mobile nodes flow.
4. AAA (Authentication Authorization Auditing) protocols provide a framework for such suffered especially for control plane functions and installing security policies in the mobile node such as encryption, decryption and filtering.

## 6.CONCLUSION

In mobile communication, there are many attempts were made to minimize a technology into single global standard communication. The main concept to project a 4G is to offer a standard role through its key concept of integration. Amongst WIMAX networks are supporting IP multimedia applications to allow resource sharing on multiple users. There will be an implementation with low complexity and negotiation with efficient manner between users and WIMAX infrastructure. The goal of PCC ( Personal computing and communication) is fulfilled in 4G technology. Therefore the main vision of 4G mobile communication is to provide high speed data throughout the wired and WIMAX network.

## 7. REFERENCES

[1] Bill Krenik “4G Wireless Technology:When will it happen? What does it offer?” IEEE Asian Solid-State Circuits Conference November 3-5, 2008.

[2]. Ahmet AKAN, C¸agatay EDEMEN “Path to 4G Wireless Networks” 2010 IEEE 21st International Symposium on Personal.

[3]. Augustine C. Odinma, Lawrence I. Oborkhale and Muhammadou M.O. Kah, “The Trends in Broadband Wireless Networks Technologies “,The Pacific Journal of Science and Technology, Volume 8. Number 1. May 2007.

[4] **J. Ibrahim**. 4G Features. *Bechtel Telecommunications and Technical Journal*, Volume 1, Number.1, December
2002, Page(s): 11-14.

[5] **Frattasi, S.; Fathi, H.; Fitzek, F.H.P.; Katz, M.D.;Prasad, R.** Defining 4G Technology from the User’s Perspective. IEEE Volume 20, Issue 1, Jan.-Feb. 2006,
Page(s):35 – 41.

[6] **Santhi, K.R.; Srivastava, V.K. ; SenthilKumaran, G.; Butare, A.** Goals of True Broad band's Wireless Next Wave (4G-5G). *Vehicular Technology Conference, 2003.VTC 2003-Fall. 2003 IEEE 58th*, Volume 4, Oct.2003, Pages(s): 2317-2321.