

An Innovative and Revolutionary Step in Wireless Communication Field i.e. 4G wireless System

Prof.AbhinavV.Deshpande

Abstract: This paper presents the latest technique of wireless communication called as 4G wireless systems. The 4G system was originally envisioned by the Defense Advanced Research Projects Agency (DARPA). It includes the specification, mobile management, quality of service, wireless standard, objective and approach. The development in this field from first generation to third generation and by eliminating the weakness there in have forced to develop technology to provide broadband services which has resulted in the existence of 4G wireless system. This system is safe and secure for everyone.

Keywords: CDMA, FDM, IP, MCM, MC-CDMA, MIMO, Wi-Fi

Introduction:

Mainly wireless communication is widely used and depends upon generation designation. In early eighties in first generation system analog frequency is used for voice communication. In late eighties, in 2G system digital communication technique with Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM) or Code Division Multiple Access (CDMA) were used for voice transmission and reception. Then in 3G system are designed for voice and paging services which provide only WAN coverage ranging from 144 Kbps to 2Mbps.

In the next dimension of wireless communication i.e. 4G system uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB). It includes the support interactive multimedia, voice, and wireless internet, broad band services with a high speed, high capacity and low cost per bit. It also provides seamless switching, variety of services based on quality requirements, better scheduling and call admission control technique with service portability and global mobility.

Specification:

Multi Carrier Modulation (MCM) was earlier used in DSL modems and digital audio-video broadcast. It is a baseband process that uses parallel equal bandwidth channels to transmit information. MCM increases the Peak to Average Ratio (PAVR) of the signal and to overcome ISI a cyclic extension or guard band must be added to the data. In

CDM system the users are multiplexed with orthogonal codes whereas in MCCDMA each user can be allocated several codes and data is spread in time or frequency. In OFDM with TDMA the users are allocated time intervals to transmit and receive data. The allocation of the spreading codes or the time slots can be done to maintain certain amount of fairness while distributing the resources.

Mobile Management:

It includes location registration, paging and handover. The mobile terminal should be able to access the services at any place possible. The global roaming can be achieved with the help of multihop network which includes WLAN's or the Satellite Coverage in remote areas. The seamless service is also important. Each MT need not do location registration every time. In 4G, for congestion control basic approaches can be taken like avoidance and detection and recovery after congestion. The avoidance scheme will require the network to suitably implement and admission control, scheduling techniques. The detection and recovery would require flow control and feedback traffic management.

Quality of Service (QoS):

In 4G systems are expected to provide real time and internet like services.

Wireless Standards:

In 4G system, more thrust has been given in standards which include IP packet switched network, share and

utilize the network resources to support more. Simultaneous users per cell, scalable channel bandwidth between 5 to 20 Mhz, optionally up to 40 MHz, Peak link spectral efficiency from 15 bit/s/Hz in downlink to 6.75 bit/s/Hz in the uplink, system spectral efficiency smooth handover across heterogeneous network and ability to offer high quality of service.

Objective and Approach:

The 4G system is being developed to accommodate the quality of service (QoS) rate requirements set by further development of existing 3G applications like mobile broadband access, Multimedia Messaging Services (MMS), videos chat, mobile TV. 4G may allow roaming with wireless local area networks and may interact with digital video broadcasting system.

The transmission techniques in 4G system includes ultra high spectral efficiency, frequency domain equalization and turbo principle error correcting codes, channel dependant scheduling, link adaption etc.

In 4G system the circuit switched infrastructure is abandoned and only a packet-switched network is provided. It means that in 4G traditional voice calls are replaced by IP telephony. 4G allows seamless mobility with flexible inter-portability of the various kinds of existing wireless networks such as satellite, cellular, wireless, WLAN, PAN and system for accessing fixed wireless network.

Components:

As the wireless standard evolved, the access techniques used also exhibited increase in efficiency, capacity and scalability. After due study of the 1G to 3G and problem came across therein like system capacity and efficiency, data rate, admission control, spectral flexibility etc. new access scheme like Orthogonal FDMA (OFDMA), Multi-carrier CDMA (MC-CDMA) are gaining more importance in the 4G system. These are based on efficient algorithms and frequency domain equalization, resulting in lower number of multiplications per second. They also make to control the bandwidth and form the spectrum in a flexible way. The other important advantage of the access technique is that they require less complexity for equalization at the receiver. This is an added advantage

especially in MIMO environment since the spatial multiplexing transmission of MIMO system inherently requires high complexity equalization at the receiver.

In most fields, wireless system is very widely used. Currently a number of technology are used with high speed digital wireless, cellular phone have short range, low band width facility which is intend to use internet, long range high speed which of the purpose is called as 4G. (fourth generation)

The 4G wireless system will be having 2-8 GHz frequency band with 5-20 MHz bandwidth. The data rate in this system is up to 20 Mbps or more with multicarrier (CDMA) or OFDM (TDMA) with 200 kmph mobile top speed.

Advantages:

- 1.Support for interactive multimedia, voice streaming video, internet and other broad band services.
- 2.IP based mobile system.
- 3.High speed, high capacity and low cost per bit.
- 4.Seamless switching, variety of quality of services.
- 5.Global access, service portability and scalable mobile services.
- 6.Ad-Hoc and multihop network.
- 7.Better spectral efficiency and call admission control technique.

Disadvantages:

The 4G system have few disadvantages like expensive, battery uses is more, hard to implement, need complicated hardware.

Conclusion:

As the features of 4G system already described as above, shows that high usability, anytime, anywhere, any technology, support of multimedia and low transmission cost and integrated services are in 4G system.

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Prof. Abhinav V.Deshpande, Assistant Professor,
Department of Electronics & Telecommunication
Engineering, Prof. Ram Meghe Institute of Technology &
Research, Badnera, Amravati, PH-919370270054,
avd.a.deshpande@gmail.com

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