Introduction & Features of 4G: A Review

Rishu Bhatia[1]
[1]Department of Electronics & Communication Engineering,
Ganga Institute of Technology and Management,
Kablana, Jhajjar, Haryana, India

Abstract: **4G Wireless Systems or Fourth generation wireless system is a packet switched wireless system with wide area coverage and high throughput. It is designed to be cost effective and to provide high spectral efficiency. Fourth generation (4G) technology will offer many advancement to the wireless market, including downlink data rates well over 100 Mbps, low latency, very efficient spectrum use and low-cost implementations. The move to 4G networks will allow service providers to offer the impressive applications that will drive users to upgrade to the new phones.**

I. INTRODUCTION

4G Wireless Systems or Fourth generation wireless system is a packet switched wireless system with wide area coverage and high throughput. It is designed to be cost effective and to provide high spectral efficiency. The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB), and Millimeter wireless. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr. The high performance is achieved by the use of long term channel prediction, in both time and frequency, scheduling among users and smart antennas combined with adaptive modulation and power control. Frequency band is 2-8 GHz. it gives the ability for world wide roaming to access cell anywhere. With impressive network capabilities, 4G enhancement promise to bring the wireless experience to an entirely new level with impressive user applications, such as sophisticated graphical user interfaces, high-end gaming, high-definition video and high-performance imaging. Consumer expectations for mobile handsets and similar products are becoming more and more sophisticated. Consumers are demanding a better user experience along with more advanced and useful applications on a more ergonomic device. The current 3G devices are good, but they will have to improve in areas like imaging and processing power to support future 4G applications like three dimensional (3D) and holographic gaming, 16 megapixel smart cameras and high-definition (HD) camcorders. Applications like these will demand more processing power than the current 3G handsets offer, requiring more efficient applications processors.

II. EVOLUTIONS OF WIRELESS TECHNOLOGIES

Wireless mobile communications systems are uniquely identified by "generation designations. Introduced in the early 1980s, first generation (1G) systems were marked by analog frequency modulation and used primarily for voice communications. Second generation (2G) wireless communications systems, which made their appearance in the late 1980s, were also used mainly for voice transmission and reception The wireless system in widespread use today goes by the name of 2.5G-an "in between " service that serves as a stepping stone to 3G. Whereby 2G communications is generally associated with Global System for Mobile (GSM) service, 2.5G is usually identified as being "fueled" by General Packet Radio Services (GPRS) along with GSM. In 3G systems, making their appearance in late 2002 and in 2003, are designed for

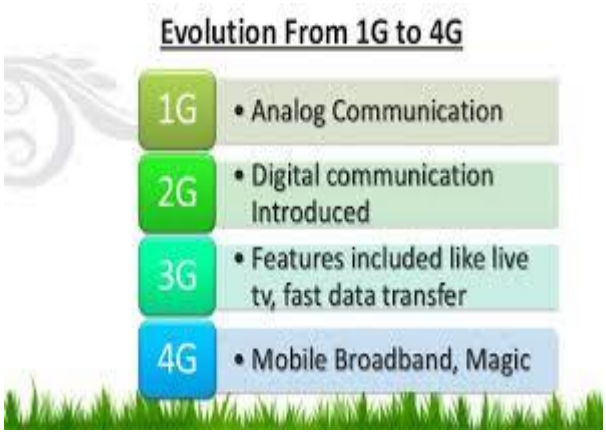

Figure 1: Evolution From 1G To 4G

voice and paging services, as well as interactive media use such as teleconferencing, Internet access, and other services. The problem with 3G wireless systems is bandwidth-these systems provide only WAN coverage ranging from 144 kbps (for vehicle mobility applications) to 2 Mbps (for indoor static applications). Segue to 4G, the "next dimension" of wireless communication. The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB), and Millimeter wireless and smart antenna. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr. Frequency band is 2 to 8 GHz. it gives the ability for world wide roaming to access cell anywhere.

III. LONG TERM EVOLUTION (LTE)

Long Term Evolution (LTE) technology is sometimes called 3.9G or Super 3G and has been developed by the Third Generation Partnership Project (3GPP) as an improvement to the current Universal Mobile Telecommunications System (UMTS). By using Orthogonal Frequency Division Multiple Access (OFDMA), LTE will be able to provide download rates of 150 Mbps for multi-antenna (2x2) multiple-input multiple output (MIMO) for the highest category terminals. For these terminals upload rates in the 50 Mbps range will

allow an efficient transfer of data. LTE makes very efficient use of the available spectrum with channel bandwidths from 1.25 Megahertz (MHz) to 20 MHz The flexible "slice" will allow LTE to be more easily implemented in countries where 5 MHz is a commonly allocated amount of spectrum. LTE will also co-exist with legacy systems already rolled out around the world.

IV. RE-CONFIGURABLE TECHNOLOGY

In order to use the large variety of services and wireless networks, multimode user terminals are essential as they can adapt to different wireless networks by reconfiguring themselves. This eliminates the need to use multiple terminals (or multiple hardware components in a terminal).

The most promising way of implementing multimode user terminals is to adopt the software radio approach.

Challenges:

- Regulatory and Standardization issues
- Business models
- User preference profiles
- Inter-system handoff mechanisms and criteria
- Software download mechanisms
- Flexible spectrum allocation and sharing between Operators

Benefits for

- Users
  - Select network depending on service requirements and cost.
  - Connect to any network– Worldwide roaming.
  - Access to new services.
- Operators
  - Respond to variations in traffic demand (load balancing).
  - Incorporate service enhancements and improvements.
  - Correction of software bugs and upgrade of terminals.
  - Rapid development of new personalized and customized services.
- Manufacturers
  - Single platform for all markets.
  - Increased flexible and efficient production.

V. FEATURES OF 4G

- Support for interactive multimedia, voice, streaming video, Internet, and other broadband services
- IP based mobile system
- High speed, high capacity, and low cost per bit
- Global access, service portability, and scalable mobile services
- Seamless switching, and a variety of Quality of Service driven services
- Better scheduling and call admission control techniques
- Ad hoc and multi hop networks (the strict delay requirements of voice make multi hop network service a difficult problem)
- Better spectral efficiency
- Seamless network of multiple protocols and air interfaces (since 4G will be all •]IP, look for 4G systems to be compatible with all common network technologies, including802.11, WCDMA, Blue tooth, and Hyper LAN).
- An infrastructure to handle pre existing 3G systems along with other wireless technologies, some of which are currently under development.

VI. APPLICATIONS OF 4G

Applications could include:

• 4G Ultra high speed internet access - E-mail or general web browsing is available.

• 4G Data intensive interactive user services - Services such as online satellite mapping will load instantly.

•4G Multiple User Video conferencing subscribers can see as well as talk to more than one person.

•4G Location-based services - a provider sends wide spread, real time weather or traffic

conditions to the computer or phone, or allows the subscriber to find and view nearby businesses or friends whilst communicating with them.

• 4G Tele-medicine - a medical provider monitors or provides advice to the potentially

CONCLUSION

This paper presented a brief description of 4G and their features. Fourth generation (4G) technology will offer many advancement to the wireless market, including downlink data rates well over 100 Mbps, low latency, very efficient spectrum use and low-cost implementations. The move to 4G networks will allow service providers to offer the impressive applications that will drive users to upgrade to the new phones. 4G seems to be a very promising generation of wireless communication that will change the people's life in the wireless world.

REFERENCES

[1] B.G. Evans and K. Baughan, "Visions of 4G,"Electronics & Communication Engineering Journal, Vol. 12, No. 6, pp. 293–303, Dec. 2000.
[2] C. R. Casal, F. Schoute, and R. Prasald, "A novel concept for fourth generation mobile multimedia Communication," in 50th Proc. IEEE Vehicular Technology Conference, Amsterdam, Netherlands, Sep.1999, Vol. 1, pp. 381–385.
[3] Y. Yamao, H. Suda, N. Umeda, and N. Nakajima, "Radio access network design concept for the fourth generation mobile

communication system," in 51st Proc. IEEE Vehicular Technology Conference, Tokyo, Japan, 2000, Vol. 3, pp. 2285–2298.

[4] J. M. Pereira, "Fourth generation: now, it is personal," in Proc.11th IEEE Int.Symp.Personal, Indoor and Mobile Radio communications, London, UK, Sep. 2000, Vol. 2, pp. 1009–1016.

[5] K. Murota, NTT DoCoMo, "Mobile communications trends in Japan and NTT DoCoMo's activities towards 21st century," in ACTS Mobile Summit99, Sorrento, Italy, June 1999.

[6] J. Silva, European Commission, "Beyond IMT-2000," in ITU-R WP8F workshop, Geneva, Mar. 2000.

[7] F. Williams, Ericsson, "Fourth generation mobile," in ACTS Mobile Summit99, Sorrento, Italy, June 1999.

[8] H. Huomo, Nokia, "Fourth generation mobile," in ACTS Mobile Summit99, Sorrento, Italy, June 1999.