Fourth Generation Network

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Abstract— The higher peak data rates for mobile user are in demand. Mobile phones are rapidly becoming the preferred means of personal communication, creating the world's largest consumer electronics industry. Audio streaming, video streaming, social media services and online conferences are becoming the necessity of life. Hence, robust and efficient wireless technology is needed. 4th Generation Network (LTE-Advanced) is the solution for future mobile wireless networks. It is a promising technology for future wireless broadband network. This paper presents an overview of current technology trends in the wireless technology market and an examination of how the communications industry plans to implement 4G wireless technology to address the growing demand for wireless services.

Key words: LTE, OFDM, VoIP

I. INTRODUCTION

The past few years have witnessed a phenomenal growth in the wireless industry, both in terms of mobile technology and subscribers. The first generation mobile system were analogue or semi analogue systems, which came in the early 1980s – they were also called NMT (Nordic Mobile Telephone). They offered mainly speech and related services and were highly incompatible with each other. 1G refers to analogue cellular technologies; it became available in the 1980s. 2G denotes initial digital system, introducing services such as short messaging and lower speed data. CDMA 2000 1xRTT and GSM are the primary 2G technologies, although CDMA2000 1xRTT is sometimes called as a 3G technology because it meets the 144kbps mobile throughput requirement. EDGE, however, all meets this requirements. 2G technologies became available in the 1990s. 3G requirements were specified by the ITU as part of the International Mobile Telephone 2000 (IMT-2000) project, for which digital networks had to provide 144kbps of throughput at mobile speeds, 384kbps at pedestrian speeds, and 2mbps in indoor environments. Recently WiMAX was also designated as an official 3G technology. The present time is just right to start the research of 4G mobile communication.

The requirement for higher data speed is exponentially increasing, reason being the availability of smart phones at low cost and social networking sites. Consistent improvement in wireless data rata is in demand. 4th Generation network (LTE-A) in the solution for wireless Broadband Services. The 4G mobile services are the advanced version of the 3G mobile communication services. The 4G mobile communication services are expected to provide broadband, high speed data transmission, large capacity, providing users with high colour video images, 3D graphic games, etc.

4G is the term used to refer to the next wave of high speed mobile technologies that will be used to replace current 3G network. It is an IP- based and packet switched evolution of 3G technologies. It is a system that provides an end to end IP solutions were voice , data and streamed multimedia can be served to user on an "ANYTIME, ANYWHERE" basis on higher data rates than previous generations. 4G is adoption of packet switching instead of circuit in voice and video calls.

4G is not just one defined technology or standard, but it is a collection of technologies and protocols to enable the highest throughput, lowest cost wireless network possible. It supports interactive multimedia services. It has wide bandwidth, high bit rates, global mobility and service portability. The 4G systems will not only support the next generation of mobile service, but it will also support the fixed wireless networks. It will encompass all systems from various networks. The 4G systems will interoperate with 2G and 3G systems, as well as with digital broadcasting systems. In addition to it 4G systems will be fully IP-based wireless internet.

A. Objectives of the Study

The main objective of this Paper is to cater the quality and service and rate requirements set by the forthcoming applications like wireless broadband access, multimedia messaging service, video chat, mobile TV, HD TV content and minimal service like voice and data at anytime and anywhere. Also a High network capacity, Seamless connectivity and global roaming across multiple networks, a nominal data rate of at least 100Mbps between any two points in the world, smooth hand of across heterogeneous network.

B. 4G Features

– Support interactive multimedia, voice, video, wireless internet and other broadband services.
– High speed, high capacity and low cost per bit.
– Global mobility, service portability, scalable mobile networks.
– Seamless switching, variety of services based on Quality of Service requirements.
– Better scheduling and call admission control techniques.
– Ad hoc networks and multi-hop networks.

II. "4G WILL MAKE THE WORLD DYNAMIC, FAST, EASIER TO ACCESS"

4G will change the way we work, live and play. The key concept is integrating the 4G capabilities with all of the existing mobile technologies through advanced technologies. Application adaptability and being highly dynamic are the main features of 4G services of interest to users.

The future 4G infrastructures will consist of a set of various networks using IP (Internet protocol) as a common protocol so that users are in control because they will be able to choose every application and environment. Based on the developing trends of mobile communication, 4G will have broader bandwidth, higher data rate, and smoother and quicker handoff and will focus on ensuring seamless service across a multitude of wireless systems and networks.

The 4G systems will interoperate with 2G and 3G systems, as well as with digital (broadband) broadcasting of

- Diminishing spectrum availability
- Doesn't require increase power or additional frequency
- Fix number of beams that can be selected to follow devices as it moves about.

IPv6 systems. In addition, 4G systems will be fully IP-based wireless Internet.

Technologies Used in 4G

- Smart Antennas for Multiple- input and multiple-output
- IPv6
- VoIP
- OFDM
- Software Defined Radio System

A. *Smart Antennas*

- Transmitting and Receiving antennas

B. *Resolve Problem*

Unlike the 3G network which are a jumble of circuit switched and packet switched networks, 4G will be based on packed switching only, which will require low latency data transmission. It is believed that 4th generation wireless networks would support a great numbers of wireless devices that are addressable and routable.

Therefore in the context of 4G IPv6 is an important network layer technology and standard that can support great number of wireless devices. IPv6 removes the need for Network Address Translation (NAT).

It also enables number of applications with better multicast, security and route optimization capabilities.

C. *VoIP Technology*

"Voice Over Internet Protocol"

- Allows only packets (IP) to be transferred eliminating complexity of 2 protocols over the same circuit.
- All voice data will be wrapped up in a packet.
- Lower latency data transmission (faster transmission) Samples voice between 8,000 & 64,000 times per second and creates stream of bits which is then compressed and put into a packet. Increases battery life due to greater data compression.

D. *OFDM Technology*

Orthogonal Frequency Division Multiplexing

- Allows for transfer of more data than other forms of multiplexing (time, frequency, code, etc)
- Simplifies the design of the transmitter & receiver.
- Allows for use of almost the entire frequency band.
- No gaps to prevent interference needed.
- Currently used in WiMax and WiFi .
- The Frequencies are spaced so that the signals do not interfere with each other (no cross talk)
- Parallel Data transmission
- Allows for the sending of multiple signals simultaneously from the same antenna to one device .

E. *Software Defined Radio (SDR)*

It is the form of Open Wireless Architecture (OWA). Since 4G is the collection of wireless standards, the final form of the 4G device will constitute of all standards. This can be realized using SDR technology.

III. CHALLENGES

A. *Security and Privacy*

In the development of 4G networks, security measures must be established that enable data transmission to be as safe as possible. To overcome the security and privacy issues, two approaches can be followed. First to modify the existing security and privacy methods, and second to develop new dynamic reconfigurable, adaptive and lightweight mechanisms.

B. Quality of Service

Many telecommunication providers are promising that there will be enhanced connectivity and the quality of data that is transmitted will be of the highest possible quality. It is important for providers to develop an effective approach to the 4G network that will enhance quality, provide effective security measures and ensure that all users are provided with extensive alternatives.

IV. CONCLUSION

4G system offers the promise of a standard that can be embraced worldwide through its key concept of integration. There must be low complexity of implementation and an efficient means of negotiation between the end users and the wireless infrastructure. The 4th generation network promises to fulfil the goals of personal computing and communication (PCC)-a vision that affordably provides high data rates everywhere over a wireless network. 4G network theoretically will have a higher data transfer rate. With the appropriate amount of spectrum and good network engineering.

4G wireless is a breakthrough technology in internet connections. With higher speeds, mobility and security, and flexible packages, it is fast becoming the most reliable solution for communication and internet needs. The 4G mobile communications have high intelligence, not only on the performance of4G mobile terminals in design and operation, but also on the menu and scroll operation which are greatly reduced.

What's more, 4G phones could achieve many unimaginable functions. 4G phones could remind the owners the schedule, when to do something or not do something. And it help users to see all the ticket selling status and order tickets online, and it shows the position of seats. The users could watch live sports games online anytime via 4G phone.

4G communication can provide a kinds of the flexibility very high system operation, therefore, relative to other technologies, 4G communication deploy them easily much more rapidly. With the gradual introduction of the method, it can effectively reduce the cost of running and users.

4G communication is not evolution through the simple upgrade from 3G communication, it would have a new integration technologies such as the OFDM / CDMA, digital audio broadcast. It is a combination of the two technologies.

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