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Generation Networks and Technical Aspects of the Different Technologies

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Abstract: Subscribers now a day's look for appropriate package including all the advance features as they are becoming aware of the mobile phone technology transformation. This drives the main intention of the cell phone giants to search for the new technology to outperform their competitors. The main purpose behind the fifth generation of wireless networks (5G) is planned to design the best network in the world which is beyond limitations and bug free than earlier generations, 5G technology will change the way most high bandwidth user access their Mobile Radio Communication (MRC), and this gives their users an edge over earlier generation networks. This paper represents the great evolution from 1G to 4G yield 5G, Introduction to 5G, The need for 5G,Advantages of 5G,Exceptional applications, Quality of services(QoS), 5G network architecture The Master Core as well as hardware/software for the 5G Master Core Technology

Keywords: 5G, All IP Network, Cloud Computing, 5G architecture The Master Core, Quality of Service (QoS)

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 systems were the 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[2]. 1G refers to analog cellular technologies; it became available in the 1980s. 2G denotes initial digital systems, introducing services such as short messaging and lower speed data.CDMA2000 1xRTT and GSM are the primary 2G technologies,althoughCDMA2000 1xRTT is sometimes called a 3Gtechnology because it meets the 144 kbps mobile throughput requirement. EDGE, however, also meets this requirement. 2G technologies became available in the 1990s. 3G requirements were specified by the ITU as part of the International Mobile Telephone 2000 (IMT2000) project, for which digital networks had to provide 144 kbps of throughput at mobile speeds, 384 kbps at pedestrian speeds, and 2 Mbps in indoor environments[3]. UMTS-HSPA and CDMA2000 EVDO are the primary 3G technologies, although recently WiMAX was also designated as an official 3G technology. The present time is just right to start the research of 4G mobile communications because of:

A). Possibility, according to the historical indication of a generation revolution once a decade, and now we are near the end of 3G standardization phase and the beginning of 3G deployment[4].

B). Necessity: according to 3G goals, 3G is necessary but not sufficient to the mobile communication strategy, in which many problems are only partly solved and there are still many problems left to be solved in the next generation, i.e. 4G[5]. Next generation mobile networks, commonly referred to as 4G, and are envisaged as a multitude of heterogeneous systems interacting through a horizontal IP centric architecture. The 5G core is to be a Re configurable, Multi Technology Core[6]. The core could be a convergence of new technologies such as Nanotechnology, Cloud Computing and Cognitive Radio, and based on All IP Platform[7].

II.EVOLUTION OF WIRELESS OLD TECHNOLOGIES

This section mentions in short the evolution of wireless and cellular systems based on the four main key aspects: radio access, data rates, bandwidth and switching schemes a. Review of Previous Fourth Generations Systems:

1) The 1st generation:
The 1st generation was pioneered for voice service in early 1980 where almost all of them were analog systems using the frequency modulation technique for radio transmission using frequency division multiple access (FDMA) with channel capacity of 30 KHz and frequency band was 824894 MHz, which was based on a technology known as Advance Mobile Phone Service (AMPS)[1].

2) Second Generation Systems :
The 2nd generation was accomplished in later 1990's. The 2G mobile communication system is a digital system; this system is still mostly used in different parts of the world. This generation mainly used for voice communication also offered additional services such as SMS and email. 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) [7] and frequency band is 850 - 1900 MHz. In2G, GSM technology uses eight channels per carrier with a gross data rate of 22.8 kbps (a net rate of 13 kbps) in the full rate channel and a frame of 4.6 milliseconds (ms duration[14]. The family of this generation includes of 2G, 2.5G and 2.75G.

3) Third Generation Systems (3G):
Third generation (3G) services combine high speed mobile access with Internet Protocol (IP) based services. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing. The 3G W CDMA air interface standard had been designed for always on packet based wireless service, so that computer, entertainment devices and telephones may all share the same wireless network and be connected internet anytime, anywhere. 3G systems offer high data rates up to 2 Mbps, over 5 MHz channel carrier width, depending on mobility/velocity, and high spectrum efficiency. The data rate supported by 3G networks depends also on the environment the call is being made in; 144 kbps in satellite and rural outdoor, 384 kbps in urban outdoor and 2Mbps in indoor and low range outdoor. The frequency band is 1.8_2.5 GHz [1]

4. Fourth generation systems (4G)
The evolution of mobile service from the 1G (first generation) to 4G (fourth generation) are discussed in this section. This process began with the designs in the 1970s that have become

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known as1G. The earliest systems were implemented based on analog technology and the basic cellular structure of mobile communication. Many fundamental problems were solved by these early systems. Numerous incompatible analog systems were placed in service around the world during the 1980s.The 2G (second generation) systems designed in the 1980s were still used mainly for voice applications but were based on digital technology, including digital signal processing techniques[9]. These 2G systems provided circuit switched data communication services at a low speed. The competitive rush to design and implement digital systems led again to a variety of different and incompatible standards such as GSM (global system mobile), mainly in Europe; TDMA (time division multiple access) (IS-54/IS136) in the U.S.; PDC(personal digital cellular) in Japan; and CDMA (code division multiple access) (IS95), another U.S. system. These systems operate nationwide or internationally and are today's mainstream systems, although the data rate for users in these system is very limited. During the 1990s, two organizations worked to define the next, or 3G, mobile system, which would eliminate previous incompatibilities and become a truly global system[10]. The 3G system would have higher quality voice channels, as well as broadband data capabilities, up to 2 Mbps. Unfortunately, the two groups could not reconcile their differences, and this decade will see the introduction of two mobile standards for 3G[11]. In addition, China is on the verge of implementing a third 3G systems. An interim step is being taken between 2G and 3G, the 2.5G. It is basically an enhancement of the two major 2G technologies to provide increased capacity on the 2G RF (radio frequency) channels and to introduce higher throughput for data service, up to 384 kbps. A very important aspect of 2.5G is that the data channels are optimized for packet data, which introduces access to the Internet from mobile devices, whether telephone, PDA (personal digital assistant), or laptop. However, the demand for higher access speed multimedia communication in today's society, which greatly depends on computer communication in digital format, seems unlimited. According to the historical indication of a generation revolution occurring once a decade, the present appears to be the right time to begin the research on a 4G mobile communication system.A.Technologies of 4G

1)OFDMA: Orthogonal Frequency Division Multiplexing (OFDM) provides clear advantages for physical layer performance and also a framework for improving layers performance by proposing an additional degree of freedom. Using OFDM, it is possible to exploit the time domain, the space domain, the frequency domain and even the code domain to exploit radio channel usage[12]. It ensures very robust transmission in multipath environments with reduced receiver complexity. OFDM also provides a frequency diversity gain, improving the physical layer performance .It is also compatible with other enhancement Technologies, such as smart antennas and MIMO.OFDM modulation can also be employed as a multiple access technology (Orthogonal Frequency Division Multiple Access; OFDMA). Here, each OFDM symbol can transmit information to and from several users using a different set of sub carriers (i.e. sub channels). This provides additional flexibility for resource allocation (increasing the capacity) and also enables cross layer optimization of radio link usage.

2) WiMax World Interoperability for Microwave Access: IEEE 802.16 Standards: The current WiMax revision is based upon IEEE 802.16e 2005, approved in December 2005. It is a enhancement to the IEEE Std 802.16-2004, and so the actual standard is 802.16 2004 as amended by 802.16e 2005. Thus, these specifications need to b considered
together.IEEE 802.16e 2005 improves upon IEEE 802.162004 by:
a)Adding support for mobility (soft and hard handover between base stations).
b) Scaling of the Fast Fourier transform (FFT) to the channel bandwidth in order to keep the carrier spacing constant across different channel bandwidths (i.e 1.25 MHz, 5 MHz, 10 MHz or 20 MHz).
c) Denser sub channelization, thereby improving indoor Penetration Introducing Turbo Coding and Low Density Parity Check (LDPC).
d) Introducing downlink sub channelization, allowing administrators to trade coverage for capacity or vice versa.
e) Adding an extra QoS class for applications.Application of WiMax

There are two major applications of WiMax:

I.Fixed WiMax (IEEE 802.16 2004): Fixed WiMax applications are point to multipoint enabling the delivery of last mile wireless broadband access as an substitute to cable and DSL for homes and businesses. Fixed WiMax Adoption is currently available however the adoption rate is impacted by the high cost of equipment in comparison to cable or DSL. It provides greater benefits for developing countries that do not already have physical infrastructure to support wired broadband access.

II.Mobile WiMax (IEEE 802.162005): Mobile WiMax offers the full mobility of cellular networks at true broadband speeds. Mobile WiMax Adoption Mobile WiMax equipment will arrive to carriers towar the end of 2007. However, mobile equipment testing typically takes between 12 to 18 months before the equipment is introduced to the consumer market

5) Fifth generation systems (5G)

5G Wireless Communication System is not deployed yet. The big challenge for the design and deployment of 5G wireless system can be faced easily as proposed features and architecture (Mentioned below) that will increase system capacity and quality within the limited available frequency spectrum, whose frequency band and Data Bandwidth _3 _300GHz and 1Gbps & higher (as demand) successively. The remarkable issue, there don‘t have any limitation in 5G as respect to user demands in the next 200 years[13].The 5G also implies the whole wireless world interconnection (WISDOM—Wireless Innovative System for Dynamic Operating Mega communications concept), together with very high data rate of the Quality of Service (QoS) applications

GSM (Global System for Mobile Communication)

GSM or global system for mobile communication is a digital cellular system. It was originated in Finland Europe .however now it is throughout the world. GSM (Global System for Mobile Communication) accounts for 80% of total mobile phone technologies market. There are over more than3 billion users of GSM (Global System for Mobile Communication) now. GSM technology got its popularity, when people used it

to talk to their friends and relatives. The use of GSM (Global System for Mobile Communication) is possible due to the SIM(subscribers identity module) GSM (Global System for Mobile Communication) is easy to use, affordable and helps you carry your cell phone everywhere. GSM (Global System for Mobile Communication) is a 2G technology. There are many frequency ranges for GSM (Global System for Mobile Communication) however 2G is the most used frequency. GSM (Global System for Mobile Communication) offers moderate security. It allows for encryption between the end user and the service base station. The use of various forms of cryptographic modules is part of GSM technology.

EDGE Technology (Enhanced Data Rates for GSM Evolution Technology)

EDGE technology is an extended version of GSM. It allows the clear and fast transmission of data and information. EDGE is also termed as IMT-SC or single carrier. EDGE technology was invented and introduced by Cingular, which is now known as AT& T. EDGE is radio technology and is a part of third generation technologies. EDGE technology is preferred over GSM due to its flexibility to carry packet switch data and circuit switch data. EDGE is termed as backward compatible technology; backward compatible technology is that technology which allows the input generation of older devices. EDGE technology is supported by third generation partnership projects; this association helps and supports the up gradation of GSM, EDGE technology and other related technologies. The frequency, capability and performance of EDGE technology is more than the 2G GSM Technology.

EDGE technology holds more sophisticated coding and transmission of data. EDGE technology can help you connect to the internet. This technology supports the packet switching system. EDGE develops a broadband internet connection for its users. EDGE technology helps its users to exploit the multimedia services .EDGE technology do not involve the expense of additional hardware and software technologies. It only requires the base station to install EDGE technology transceiver. EDGE technology is an improved technology which almost supports all the network vendors.All they have to do is to upgrade their stations. EDGE technology has its edge because it can make use of both switch circuit technology and packet circuit technology. EDGE technology is also believed to support EGPRS or in other words enhanced general packet radio service. It is important to have GPRS network if one wants to use EDGE technology because EDGE can not work without GSM Technology. Therefore it is an extended version of GSM Technology.

Future Prospective of 5G Technology:

5G mobile phones have bright future in the era of development and technology. At present, each desktop or laptop has assigned an individual IP address to track the flow of data traffic but in future 5G mobile phones will have permanent care of address and "Home" IP address associated which tells actual location without any error. Once a computer is connected to internet, then it can easily connect with mobile phone as computer sends a data packet to IP address of mobile set and as a result, server present on IP address send acknowledge ment packet to real location through message forwarding mechanism [8]. 5G will use cloud computing mechanism in their mobile phones i.e. it is a technology that uses central data repository and internet connection to maintain applications. At present, operators are going through training of clod computing technology and in future they implied tremendous opportunities of cloud in 5G wireless networks. The most effective and attractive feature of 5G will be its advanced billing interfaces.

III CONCLUSION

This paper gives brief of individual cellular generation of mobile wireless technology. This revolution had started from 1G and emerging up to 5G. 5G will prove to be the reason for India considered to be developed. It will encourage the idea of Super Core that will connect all operators globally under same framework or core and same infrastructure regardless of their access methods. At last I want to conclude that advance technology make things good and can be bad. So it is all up to users that take charge of using these wirelesses generation of mobile technology.

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