"4G" – The Advanced Technology of 3G

Mr. Pradip Vaishnav
Assistant Professor
M. & N.Virani Science College
Saurashtra University

Mr. Chirag Jagani
Assistant Professor
M. & N.Virani Science College
Saurashtra University

Mr.Haresh Khachariya
Assistant Professor
M. & N.Virani Science College
Saurashtra University

ABSTRACT

Communication everywhere, with everybody and at any time. We have come much closer to this goal during the few years. Today, technologies are available, that enable the realization of high-performance and cost-effective communication systems for many application areas. Even as "third generation" mobile networks are being switched on around the world, a couple of years later than planned, attention are shifting to what comes next: a group of newer technologies that are, inevitably, being called 4G. Some 4G networks are operating already, with more on the way. This paper includes the generation of cellular system, limitations of 3G and 4G technologies.

Keywords

"4G" -The Advanced Technology of 3G.

1. INTRODUCTION

Not too long ago, communications meant voice and mobility meant cellular. But today we see that subscribers are increasingly relying upon diverse communications solutions for a complex array of voice, data, and multi-media needs, many of which are being addressed by Internet/Intranet connected networks, e.g. at offices, homes, shopping areas, transport facilities. As these forces converge, demand for new services, increasing bandwidth and ubiquitous connectivity continuously grows. In the early 90s analog cellular (AMPS) was beginning to take off in the U.S. Analog Cellular was known as AMPS in the America and TACS or ETACS in other parts of the world [3]. It is called 1G. Wireless service, due to the fact that analog was very spectrally inefficient, very costly. People did not leave their phones on because they feared that someone would actually call them. Receiving an unnecessary call was not good. Digital system arrived in the U.S in the early 90s with the first U.S TDMA system launching in 1993 and the first GSM systems in 1995. In 1996 the first CDMA system were launched. Even as "third generation" (3G) mobile networks are being switched on around the world, a couple of years later than planned, attention is shifting to what comes next: a group of newer technologies that are, inevitably, being called 4G. Some 4G networks are operating already, with more on the way. The remainder of this paper is organized as follows. Section 2 provides an overview of Mobile Generations. Section 3 provides information related to 3G Section 4 provides Limitations of 3G and drivers for 4G. Section 5 provides the introduction about 4G and Finally Section 5 provides the summary of the paper.

2. MOBILE GENERATIONS

In the last 10 years many countries introduced tele-communication services through liberalization and privatization to support competition in the telecommunications markets. Due to this com-petition the rates for telecommunication services decreased and the number of subscribers, in particular for mobile radio systems, increased much faster than expected.
A] First Generation First generation mobiles called 1G. Most of the devices, which came from this generation, had military\Defense as its origin and then moved to civilian services. Almost all of them are analog systems where voice was considered to be the main traffic. One standard is AMPS.
B] Second Generation After 1G second generations comes into picture called 2G. All the standard belonging to this generation are commercial centric and they are in digital form. Two main groups have evolved one from Europe and another from America. Some 2G standards are GSM, CDMA2000, PDC, and GPRS etc. The World's first public GSM call was made on 1st July 1991 in a city park of Helsinki.[1]GSM and CDMA are the two mobile technologies. Both technologies have the same goal: to divide the finite RF spectrum between multiple users. TDMA (Time Division Multiple Access) underlying technology used in GSM.CDMA (Code Division Multiple Access) on the other hand, uses special digital modulation i.e. Spread Spectrum which spread the voice over very wide channel in random fashion.
C] Third Generation The Third generations of mobile communication system 3G will be a significant step forward in the convergence of telecommunication and data communication industries. The first 3G networks was deployed in Japan in 2001.The main characteristics of 3G are to provide mobile multimedia service at a transmission rate of 144kbps at the high speed, 384kbps at the speed of walking and 2Mbps indoors. [2] 3G systems consist of the two main standard CDMA2000 and W-CDMA. The data speed of 3G is determined based on a combination of factors including the chip rate, channel structure, power control and synchronization. It is estimated that there are about 60 3G networks in 25 countries around the world. In Asia, Europe and the USA, telecommunication companies use WCDMA technology with the support of around 100 terminals designs to operate 3G mobile networks. The official 3G mobile networks are the system and services based on the ITU family of standards under the International Mobile Telecommunication Program, "IMT 2000".A boost was given to 3G mobile networks in Europe when the EU Council suggested that the 3G operators should cover 80% of the EU national population by the end of this current year. But the rapid growth in traffic volume and increase in new services has begun to change the configuration and structure of wireless network. Thus future mobile communication system will be distinguished by high integration of services, flexibility and higher throughput.

3. ABOUT 3G

3G is one of the latest technologies to be incorporated into mobile devices today. With 3G people are able to gain access to data and information at almost any time and from any place. 3G cellular phones were first launched in Japan in October 2001 and were introduced into South Africa in December 2004. This phone was designed so users would be able to surf the Internet, view pictures of the people they are talking to, watch movies and listen to music on their handsets (BBC News, 2001).

www.ijcait.com

International Journal of Computer Applications & Information Technology
Vol. I, Issue II, September 2012 (ISSN: 2278-7720)

What is 3G?

3G (Third Generation) is also known as UMTS (Universal Mobile Telecommunications System) and is said to be the next generation of mobile network. 3G is described by Cellular (2004) as being a generic name for a set of mobile technologies which comprise a host of high-tech infrastructure networks, handsets, base stations, switches and otherequipment. This technology enables cell phones to offer high-speed Internet access, data, and video and CD-quality music services. The difference between 3G & GPRS GPRS and 3G serve similar functions but 3G data services are the next step up from GPRS (Vodacom, 2004). The main difference between these two technologies is that 3G is able to achieve significantly faster data transfer rates and this enables one to work faster. 3G offers speeds of up to 384 kilobits per second – that is up to 7 times faster than a standard dial-up connection (Orange, 2005).

What are the benefits of 3G?

With 3G you can do everything you do now, but you can do it much better, a lot faster and from almost anywhere! Some of the main advantages are that3G allows for higher call volumes and supports Multimedia data applications such as video and photography (3GNewsroom.com).

The effects of 3G on society

Some of the latest features which have been brought about by this technology are mentioned by Orange (2005) and include:

- *Video calling*

With 3G you can now actually see the person on the other side! As long as both people have a 3G **phone you no** longer have to imagine what they look like and you can see them face-to-face via your cell phone's screen.

- *E-mail*

Should you have left your office and forgotten to send an important email, you are now able to quickly and efficiently `perform this function directly by using your cell phone. Alternatively, you can use your cell phone as a modem to be connected **to** your laptop or PDA (Personal Digital Assistant).

- *Games*

Since the invention of cell phones, games have always formed a part of mobile devices. As technology has developed, the games we are able to engage in have become far more interactive, exciting and entertaining. For those who play games over their mobile devices for recreation purposes or for those who simply play to pass the time, 3G now makes it possible to download these games at anytime and from almost anywhere.

- *Film*

The speed and quality of 3G really contributes to enhancing the quality of film over mobile devices. One is now able to view film trailers, reviews, and interviews, download ring tones, wall papers and enter competitions all by means of your cell phone.

- *Music*

It's now possible for you to download songs, music videos and interviews. You can even compose your own ringtone through your cell phone if you wish!

- *3G and its impact on websites*

The importance of having a web site in today's world is evident. Some have even gone so far as to say that if your company does not have a web site, you do not exist! With the introduction of 3G Technology, this statement will probably become more and more true as people from across the globe will soon be able to access the Internet at almost any time and from almost any place.

The future of 3G

A great deal of potential exists for new applications in the future as 3G packet based networks will allow users to be on line all the time. The capabilities of wireless networks in terms of bandwidth must still, however, be improved upon (3GNewsroom.com).

In Short,

3G is an exciting new technology that is being incorporated into mobile devices across the globe. Users are now able to make person-topersocalls, download data and do a variety of other tasks they never imagined possible all via their 3G cell phones.

4. LIMITATIONS OF 3G AND DRIVERS FOR 4G

3G performances may not be sufficient to meet needs of future high-performance applications like multi-media, full-motion video, wireless teleconferencing. We need a networktechnology that extends 3G capacities by an order of magnitude[4].

A] There are multiple standards for 3G making it difficult to roam and interoperate across networks. We need global mobility and service portability.

B] 3G are based on primarily a wide-area concept. We need hybrid networks that utilize both wireless LAN (hot-spot) concept and cell or base-station wide area network design.

C] We need wider bandwidth.

D] Researchers have come up with spectrally more efficient modulation schemes that cannot be retrofitted into 3G infrastructures.

E] We need all digital packet networks that utilizes IP in its fullest form with converged voice and data capability.

5. 4G MOBILE TECHNOLOGIES

This new generation of wireless is intended to complement and replaces the 3G systems, perhaps in 5 to 10 years. Accessing information anywhere, anytime, with a seamless connection to a wide range of information and services, and receiving a large volume of information, data, pictures, video, and so on, are the keys of the 4G infrastructures. 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 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. These features mean services can be delivered and be available to the personal preference of different users and support the users' traffic, air interfaces, radio

environment, and quality of service. Connection with the network applications can be transferred into various forms and levels correctly and efficiently. The dominant methods of access to this pool of information will be the mobile telephone, PDA, and laptop to seamlessly access the voice communication, high-speed information services, and entertainment broadcast services. Figure 1 illustrates elements and techniques to support the adaptability of the 4G domains. The fourth generation will encompass all systems from various networks, public to private; operatordriven broadband networks to personal areas and ad hoc networks. The 4G systems will interoperate with 2G and 3G systems, as well as with digital (broadband) broadcasting systems. In addition, 4G systems will be fully Ipbased wireless Internet. This all-encompassing integrated perspective shows the broad range of systems that the four th generation intends to integrate, from satellite

www.ijcait.com

International Journal of Computer Applications & Information Technology
Vol. I, Issue II, September 2012 (ISSN: 2278-7720)

broadband to high altitude platform to cellular 3G and 3G systems to WLL (wirelesslocal loop) and FWA (fixed wireless access) to WLAN (wireless local area network) and PAN (personal area net-work), all with IP as the integrating mechanism. With 4G, a range of new services and models will be available. These services and models need tobe further examined for their interface with thedesign of 4G systems. Figures 2 and 3 demonstrate the key elements and the seamless connectivity of the networks.
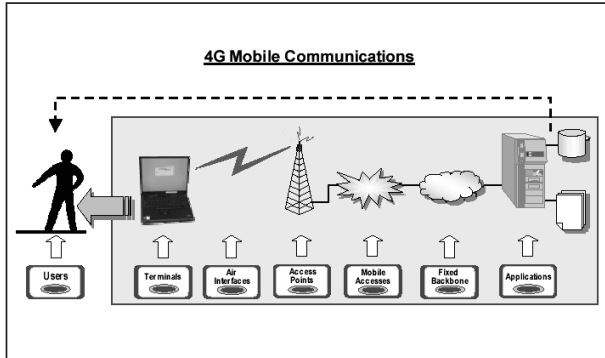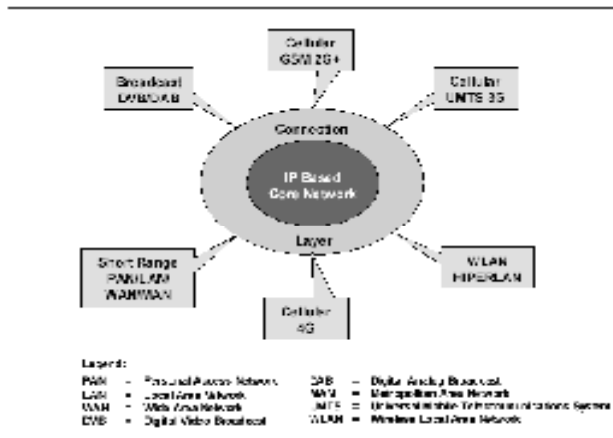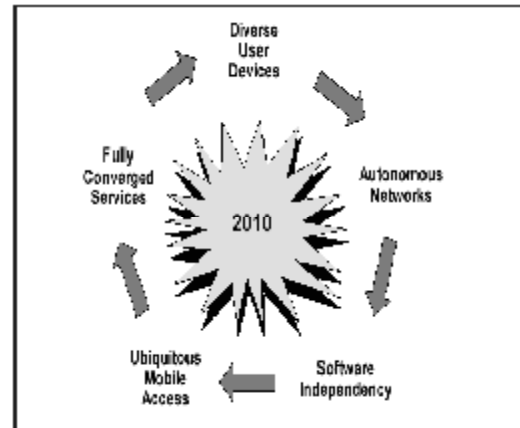

Figure 1:4G vision

Figure 2: Seamless connections of networks

6. CONCLUSION

Nowadays, wireless technology is getting popular and important in the network and the Internet field. In this paper, we briefly introduced the history background of 1G to 4G, drivers for 4G, and illustrated how 4G may work for more convenient and powerful in the future. There are many standards and technologies, which are still in developing process. Therefore, no one can really sure what the future 4G will look like and what services it will offer to people. However, we can get the general idea about 4G from academic research; 4G is the evolution based on 3G's limitation and it will fulfill the idea of WWW (World Wide Wireless Web) offering more services and smooth global roaming with inexpensive cost.

7. REFERENCES

[1] Firmanto, W. T. and Gulliver.T. A., Code Combining of Reed–Muller Codes in An Indoor Wireless Environment, Wireless Personal Communications 6: 359–371,1997, Kluwer Academic Publishers, Netherlands.

[2] Beach M., Propagation and System Aspects, University of Bristol, Future Communication Systems course, April 1994.

[3] Classen, F, Meyr, H, Sehier, P, Maximum likelihood open loop carriersynchronizer for digital radio, Proceeding ICC'93, pages 493-497, 1993

[4]WSANs: I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, Wireless sensor networks: A survey, Computer Networks.