

# Chapter XI

## Review of Wireless Technologies and Generations

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### ABSTRACT

*The concept of wireless communication i.e. exchange of any type of electronic content (audio, video, data, etc.) without the use of any physical medium like cables, wires etc, is not new. It started almost a century back with “radio and telegraphs” and has made rapid progress over the period of time. Looking at the present trend, it is obvious that the field of wireless communication will continue to move far ahead than one could imagine. To encourage adoption and advancement in technology, a standardization process was required. Different standards have evolved, over the period of time, to accommodate the new technologies as they emerged. The era during which technologies are popular and are used by businesses is generally termed as Generations. This chapter presents a brief history of wireless communication and different phases of technologies and standards involved in it. A discussion of the communication technology generations not only provides an understanding of the past history of these technologies, but also creates basis for understanding their future. This chapter provides brief introduction and description of all generations, starting from the first generation mobile communications to future generation mobile communications.*

## **INTRODUCTION**

In this age of information and communications technology (ICT), there is an ever-increasing demand for almost constant delivery of information, anytime, anywhere. Knowledge is enormous and ever increasing exponentially. Both the public and business class people have become “tech-savvy.” They rely more and more on technology to overcome the barriers of distance and time, and wish to access the information instantly at any time and from anywhere. A business man wants access to urgent information while he is “on the road”, a boss wants to be in contact with his people working at remote sites, a salesperson wants continuous updates on the information related to his product, and nowadays even children demand mobile gadgets to communicate with their parents or friends. How to fulfill the dreams of such a wide range of people? The technology strives to provide solutions through development and innovations in the field of wireless communication.

Communication is a very important aspect of human life. All living beings communicate with each other in one way or another. Humans, being an intelligent, social, and restless creature, strive to find better and better ways of communicating with each other. In olden days, people were sent to far-off places as messengers. Later on, pigeons were trained as messengers for fast communication. Then fast-moving vehicles were invented and used for communication. But the dream of very fast communication became a reality only after the invention of electricity. However, humans always had a fantasy of communicating instantly, anywhere, anytime, as mentioned in many holy books. This fantasy was transformed into reality with the discovery of electromagnetic waves (Shea, 2000), which revolutionized the communication world in a holy way. Researchers are

constantly pursuing various ways to make this technical breakthrough achieve mobile communications through wireless means. As a result, in the last few decades, various standards have emerged for mobile communications (known as *generations*)—starting from the first generation (1G) with analog technology, passing through digital revolution with 2G, 3G, 4G, and so on. The standards also exist for technology in between two generations such as 2.5G technology (The Mobile Phone Directory, 2005c). As wireless technology advances, giving rise to new opportunities, customer needs increase and hence the new standards are being proposed. Now it is right time for the business community to grab this opportunity and make mobile communication an affordable luxury for everyone in the near future.

The content of the chapter is organized into different sections as follows. The first section gives a brief account of the history of wireless communications. The next section describes the development of wireless communications through wireless generations; this section covers the different technologies and main features of the 1G, 2G, 2.5G, and 3G standards, and gives a brief description of the 4G technology, including the promise it holds, requirements, and challenges. The last section concludes the chapter.

## **HISTORY OF WIRELESS COMMUNICATIONS**

In 1867, the foundation of wireless communication was laid, when Maxwell predicted the existence of electromagnetic (EM) waves. Later in 1887, Hertz proved the same. However in 1898, a significant breakthrough came, when Marconi demonstrated the wireless telegraph by establishing wireless communication between England and France. In 1902, suc-

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