ABSTRACT

The current growth of mobile data usage and emergence of new applications have greatly motivated the Third Generation Partnership Project (3GPP) to work on Long Term Evolution (LTE). LTE is the most recent standard in the mobile network technology to be developed based on GSM/EDGE and UMTS/HSPA network technologies with the aim of optimizing the capacity and speed of 3G mobile communication networks. In this chapter, the structures and features of fourth generation (4G) LTE are investigated at the early stages of telemedical research. The chapter also provides a comparison of WiMAX and LTE standards on various aspects, as well as the potential of technology in healthcare applications. Issues and challenges of wireless technologies in healthcare applications and services are finally presented.

INTRODUCTION

The total number of mobile subscribers has grown enormously over the last few years. Similar to conventional voice traffic communication, the traffic volume of data usage has grown, in some cases even overstepped that of voice traffic. Mobile subscribers anticipate a wider variety of services and faster upload and download speeds. Service providers need more data capacity with lower data delivery costs the rising communication industry. These demands and expectations have encouraged the development of wireless communication systems. Two promising technologies, the Institute of Electrical and Electronics Engineers (IEEE)
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802.16 Worldwide Interoperability for Microwave Access (WiMAX) and Third Generation Partnership Project (3GPP) Long Term Evolution (LTE) have been configured to cope with those targets. The LTE standard ensures much higher peak rates along with much lower packet latencies, and mobile communications services can move forward to fit the demands for the growth of cellular technology.

The emergence of new standards has also affected the current mobile market. The present mobile market is highly competitive. From the third generation to the fourth, telecommunication companies and organizations that previously vied in distinct markets are now competing in only one market. In the third generation scenario, mobile device manufacturers competed with other mobile phone manufacturers and service providers to stay and win users’ hearts. In the fourth generation environment, however, the trend is expected to be different. Competition is moving towards challenging demands. Companies are expanding their services and diversifying their areas of coverage. Instead of only offering devices, they’ve begun to target the best services that can be provided in order to stay competitive in the market. Devices and technologies go well together. New standards mean that new devices must be implemented, and trends will continue to grow as long as there are demands for a certain product.

The Global Mobile Suppliers Association (GSA, 2011) recently reported that 248 operators in 87 countries now use LTE, including 35 networks that have been commercially launched in 21 countries. The number of operators entrusted with LTE network preparations has increased by 64% in the past year. The WiMAX Forum presently tracks nearly 600 WiMAX deployments in 150 countries (WiMAX Forum, 2011), and the deployment frequencies vary from 2.3 GHz to 5 GHz. Many WiMAX devices have been developed and deployed, and many more applications will available as fourth generation technologies evolve. These applications could be classified into categories, such as communications, which includes voice call, chatting, messaging, and Internet access services, mobility or traffic, which includes location-based positioning, path search, maps and navigation, commerce applications, which include Internet banking, financing, and mobile shopping, entertainment with rich multimedia services, such as broadcasting, games, and music, and telemedicine and emergency response aid. With the deployment of mobile and wireless networks, many current and emerging healthcare applications can be supported. Efforts to supplement the need to provide electronic services with impeccable quality of service (QoS) could one day realize the dream of providing wide-scale healthcare services.

Electronic healthcare or telemedicine had been proposed and implemented in certain countries several years ago. Different applications and services are available to serve patients and medical experts. Telemedical applications are based on two types of technologies: Store and Forward (SAF) and Two-way InterActive TeleVision (IATV) (Devaraj & Ezra, 2011). SAF technology can be used on common facilities with relatively low costs, such as computers with Internet access or even smart phones. The concept works with still images of the patient taken and sent to medical experts for review. This technology can be used in non-critical situations. IATV technology requires video conferencing between patients and doctors, allowing its application in both critical and non-critical situations. With this technology, equipment with better quality is usually necessary to provide smooth interaction between patients and professional. Both technologies have been adopted in many telemedical applications.

In the present chapter, the structures and features of 4G LTE and WiMAX are investigated for application in the early stages of research for healthcare applications, such as telemedicine. The most common targets for 4G LTE are discussed and reviewed. The existing structure of 3GPP will be used as a basis for network planning.