Chapter 64
Exploring the Growth of Wireless Communications Systems and Challenges Facing 4G Networks

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ABSTRACT

Mobile communication and its many applications have been fueling the rapid growth and adoption of wireless communications for years. This growth has been marked by significant network development and advanced techniques evolving in all the fields of mobile and wireless communications. The transition from 3G communications to 4G communications has extremely boosted the way and speed at which companies and their customer are able to operate in the global economy. The purpose of this chapter is to describe some of the significant impacts of 4G wireless communication systems on the telecommunications industry. Topics describing 4G to include a brief history of mobile communications, what are the major characteristics of 4G networks and its users, advantages of 4G, challenges that 4G faces, wireless in the field/IT component, future directions of 4G, and some of the potential plans for growth.

INTRODUCTION

Wireless and Mobile Communications

In a traditional sense, wireless systems were considered as an auxiliary approach used in regions where it was difficult to build a connection by using typical wires and cables (Alderete & Gutiérrez, 2014). Firms operating in a competitive and global marketplace are relying more and more on the data that flows throughout their organization. As a means of enhancing supply chain management (SCM), firms

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are working to improve the integration level with suppliers and clients, materials and inventory regarding the production costs, influence of raw material prices, and the active request for changes by the client (Dharni, 2014; Gupta & Naqvi, 2014; Qrunfleh, Tarafdar, & Ragu-Nathan, 2012; Soon, Mahmood, Yin, Wan, Yuen, & Heng, 2015). Many organizations are seemingly more concerned with the identification of logistic issues as new opportunities arise. Even though changes in commercial activity are an important part of B2B (business-to-business) operations; for the most part, managers today do not comprehend insightful ways to deal with them. Many of the smaller firms that are integrated into a supply chain, lack the technological capacity to implement electronic operations of data processing, transmission of data, and reception of data (Qrunfleh, et al., 2012).

Originally, 1G-networks were introduced in the 1980s and were generally based on analog techniques. It built the basic structure of mobile communications and solved many fundamental problems. Some of these problems included cellular architecture adopting, multiplexing frequency band, roaming across domain, and non-interrupted communication. The only service of 1G was Speech Chat. Then, once implemented, 2G gained popular acceptance during the 1990s. It was based on digital signal processing techniques and regarded as a bridge from analog to digital technology. It introduced a new option of communication called text messaging, multimedia messaging or picture messaging, General Packet Radio Service, Wireless Application Protocol, Enhanced Data Rates for GSM Evolution, and Internet services. 2G's main contributions were the utilization of SIM (Subscriber Identity Module) cards and support capabilities for a large number of users (e.g., 2.5G was regarded as 3G services for 2G networks). This network extended the 2G network with data service and packet switching methods. 2.5G brought the Internet into mobile personal communications under the same networks with 2G, which was an important concept leading to different kinds and combinations of communications.

The 3G network, known as "the third generation mobile broadband data services", came with several incremental improvements in radio technology and command-and-control software. Radio advancements of the 3G network are referred to as antenna techniques or coding/modulation schemes. According to Akintoye (2013, p. 43), "Several new radio techniques are employed to achieve high rates and low latencies." These new radio techniques included Space Division Multiplexing (SDM) via Multiple Input/Multiple Output (MIMO), Space Time Coding (STC) using higher order of modulation, and encoding schemes, beam forming, beam directional control, and inter-cell interference techniques. These growths in wireless data services have placed higher demands on mobile wireless networks, and in response, wireless carriers are upgrading their networks to offer faster data rates (Latha & Suganthi, 2015; Sundarambal, Dhivya, & Anbalagan, 2010).

BACKGROUND

Mobile Systems and 4G

The use of mobile wireless data services continues to increase worldwide. Mobile systems focus on effortlessly integrating the current wireless technologies including global system for mobile communication, wireless local area networks, and Bluetooth. Ultimately, 4G systems support comprehensive and personalized services. These factors are essential in providing stable system performance and quality service. According to Akintoye (2013), the 4G platform as a mobile multimedia, universally available, global mobility support, integrated wireless, and e-customized service network system. It was designed