Chapter 1.14
Basics of Ubiquitous Networking

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ABSTRACT

Networking is no longer a luxury but rather has reached a stage where it could be regarded as a commodity, if not a necessity. Improvements in networking technologies and devices have resulted in many services and facilities that were considered a dream just a decade ago. The demands of users and organisations are driving networks to provide four "A's" networking, or the "anytime, anywhere, by anything and anyone" networking, referred to as "ubiquitous networking". This chapter provides an overview of ubiquitous networking, commencing with a discussion on how ubiquitous networking environments will change our lives, followed by a section on the importance of networking infrastructure, along with the applications and services necessary to maximise the benefits of a ubiquitous networking environment. Furthermore, this chapter addresses the global evolution of ubiquitous networking including some of New Zealand's attempts in this increasingly important field.

INTRODUCTION

The exponential growth of the Internet has diminished the difficulties associated with communication between distant places, allowing people to participate in the digital economy regardless of their geographical limitations. Additionally, developments in wireless technologies are freeing people from using wires for communicating. For example, the conveniences of wireless connections have converted mobile phones in a commodity, rather than a luxury item (Weatherall & Jones, 2002). The worldwide penetration of handheld devices through 2005 is the more than 511 million, with 310 million of those in Asia, as reported in the *Statistics for Mobile Commerce* (Retrieved April

26, 2006 from: http://www.epaynews.com/statistics/mcommstats.html#7). A report by McKinsey cited in the same Web site forecasts a mobile phone penetration in Europe of 85% for the year 2005. Technological advances of wireless technologies are truly leading us to a world that is capable of delivering "anytime, anywhere, by anything and anyone" networks (Ministry of Internal Affairs and Communications, Japan, 2005a).

The idea of "anywhere, anytime, by anything and anyone" (or 4As) networking is at the core of a new emerging networking technology, referred to as a "ubiquitous networking". The origin of the term "ubiquitous" is Latin, meaning "being everywhere, especially at the same time" (Phobe.com, 2003). The concept of ubiquitous networking originated from the concept of ubiquitous computing, which was aimed to "make many computers available throughout the physical environment, while making them effectively invisible to the user" (Weiser, 1993; Wikipedia, 2005). Yuhan (2003) distinguishes the term "ubiquitous computing" from "ubiquitous networking" by stating "*ubiquitous computing requires good network connections, but not necessarily ubiquitous networking*". Additionally, Weiser (1993) highlights four important "networking" issues when focusing on ubiquitous computing, namely: wireless media access, wide-bandwidth range, real-time capabilities for multimedia over standard networks, and packet routing.

In the Tokyo Ubiquitous Network Conference, four main objectives of ubiquitous networking were stated, indicating that ubiquitous networking should be: (1) freed from networking constraints concerning capacity, location, and different link ups; (2) freed from the constraints of terminal limitation; (3) freed from the constraints of limited service and contents; and (4) freed from the constraints of network risk (Ministry of Interal Affairs and Communications, Japan, 2005b).

The world of ubiquitous networking creates new business opportunities, from the development of services and applications that maximise these earlier-mentioned objectives of ubiquitous networking. Evolving networking technologies will change our daily lives, both in social and economical terms. For example, according to Kitamura (2002), the potential demand that can be generated in Japan with ubiquitous networking environments exceeds 10 trillion yen (Kitamura, 2002). The potential demand includes, but is not limited to services such as ubiquitous health/concierge systems, ubiquitous automobile systems and ubiquitous education/learning systems.

In the following sections of this chapter the concept of ubiquitous networking will be explained in detail. The next section addresses the importance of networking infrastructure in ubiquitous networking, followed by the section, which provides an overview of business models and proposed applications and services. The fourth and fifth sections covers some approaches to ubiquitous networking around the world, including New Zealand. The sixth section addresses the underlying issues in achieving a ubiquitous networking environment, while the last section concludes the chapter.

NETWORK INFRASTRUCTURE FOR UBIQUITOUS NETWORKING

The core of a ubiquitous networking environment is the underlying networking infrastructure that is capable of meeting the requirements of users. In general, networking technologies can be divided into two broad categories: (1) wired networks and (2) wireless networks. The key functional distinction between the two types of networks is the speed, where wired networking technologies are capable of providing much higher speed communications compared to wireless networking technologies. The technologies supporting wireless networks will always be "resource-poor" when compared with those supporting wired networks (Satyanarayanan, 1996). The following