Chapter XIV
Security, Privacy, and Trust for Pervasive Computing Applications

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ABSTRACT

Pervasive computing has progressed significantly during this decade due to the developments and advances in portable, low-cost, and light-weight devices along with the emergence of short range and low-power wireless communication networks. Pervasive computing focuses on combining computing and communications with the surrounding physical environment to make computing and communication transparent to the users in day-to-day activities. In pervasive computing, numerous, casually accessible, often invisible, frequently mobile or embedded devices form an ad-hoc network that occasionally connects to fixed networks structure too. These pervasive computing devices often collect information about the surrounding environment using various sensors. Pervasive computing has the inherent disadvantages of slow, expensive connections, frequent line disconnections, limited host bandwidth, location dependent data, and so forth. These challenges make pervasive computing applications more vulnerable to various security-related threats. However, traditional security measures do not fit well in pervasive computing applications. Since location and context are key attributes of pervasive computing applications, privacy issues need to be handled in a sophisticated manner. The devices in a pervasive computing network leave and join in an ad-hoc manner. This device behavior creates a need for new trust models for pervasive

computing applications. In this chapter, we address the challenges and requirements of security, privacy, and trust for pervasive applications. We also discuss the state-of-the-art of pervasive security, privacy, and trust along with some open issues.

INTRODUCTION

Pervasive computing embeds information communication and computation in an environment that overcomes the constraints of character, place, and time. Comparing virtual reality (VR), which builds an artificial world in the computer, to pervasive computing, which embeds computing in the real world, we observe two forms of computing on the opposite ends of the computing spectrum. Along with the forward march of wireless and sensor networks, the demand curve of PDAs, mobiles, smartphones, and other small handheld devices is showing an exponential growth. Given that, pervasive computing is showing its potential in almost every aspect of our life including hospitals, emergency and critical situations, industry, education, hostile battle field, and so forth. Pervasive computing contains varieties of diversified devices varying from PDAs to the tiny, nearly invisible chips in watches, cordless phones, and other day-to-day items. Because these devices can communicate with one another wirelessly, forming an ad-hoc mobile network, the utility of the combined capability of these small devices can be great. These pervasive computing devices

Figure 1. A typical ad-hoc network scenario in pervasive computing environment