Chapter 16
Mobile and Handheld Security

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ABSTRACT

Mobile and handheld devices are becoming an integral part of people's work, life and entertainment. These lightweight pocket-sized devices offer great mobility, acceptable computation power and friendly user interfaces. As people are making business transactions and managing their online bank accounts via handheld devices, they are concerned with the security level that mobile devices and systems provide. In this chapter we will discuss whether these devices, equipped with very limited computation power compared to full-sized computers, can make equivalent security services available to users. We focus on the security designs and technologies of hardware, operating systems and applications for mobile and handheld devices.

INTRODUCTION

As mobile and handheld devices are becoming indispensable in this modern world, people are concerned with whether these lightweight and downsized computer systems and mobile networks can achieve the same level of security as in conventional computer and network systems. The purpose of this chapter is to provide readers a perspective of the current mobile and handheld systems through the review of the security designs and technologies of mobile hardware, operating systems (O.S.), and applications. The chapter starts with the background information of handheld devices in the above three areas in Section 2. In Section 3 we discuss the security risks when using mobile devices. Section 4 talks about mobile hardware security. Mobile operating system security and application security are reviewed in Section 5 and 6 respectively. We examine the standards, technologies and tools for layered mobile security in Section 7. The future

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of mobile security is discussed in Section 8 and conclusion is drawn in the last section.

BACKGROUND

A mobile or handheld device is a pocket-sized computing device installed with a mobile operating system supporting various mobile applications. Such devices consist of three main parts: hardware, operating system, and applications. Smartphones and Personal Digital Assistants (PDAs) are the most popular mobile devices which also include Enterprise Digital Assistants (EDAs), ultra-mobile PCs, handheld game consoles, multimedia players and recorders in a broader definition. In this chapter, we will focus our discussion on smartphones, since they correspond to the major market of mobile and handheld devices.

Evolved from a mating of the mobile phone and PDA (Charlesworth, 2009), the smartphone provides not only essential phone features such as calling and receiving calls, but also additional PC-like information accessing services (CEVA, 2009). There is no industrial standard for the definition of a smartphone. "We have between 56 and 85 percent global market share depending on what you say is a smartphone," said Jerry Panagrossi, vice president of U.S. operations for Symbian, the leading provider of mobile operating systems for smartphones. Rick Roesler, vice president of handhelds for Hewlett Packard (HP), considers "Smartphones are computers you talk to," while Jason Langridge, UK mobility business manager at Microsoft says: "For us, smartphones combine traditional communication devices and provide rich data applications." (Needle 2005) Nowadays, smartphones are installed with operating systems that allow users to add applications, such as Word, Excel and games, and hardware, such as Wi-Fi card, GPS card and Secure Digital (SD) card, to enhance connectivity, storage and data processing. Most smartphones support features such as email, Internet browsing, build-in camera, document viewing and editing, media playback and editing, etc. However, compared to conventional desktop applications, mobile applications are often designed and implemented with limited functionality due to the relatively less computation power and low storage space.

The hardware manufacturers of smartphones include Nokia, Research In Motion Limited (RIM), Samsung, Palm, etc. The newly released Nokia N97 (Nokia-N97 2009), as an example, has a 3.5-inch 24-bit colorful screen with resolution of 640 by 360 pixels. N97 runs over the S60 (a software platform runs over Symbian OS) 5th edition platform and supports a wide range of connectivity such as Bluetooth 2.0 Enhanced Data Rate (EDR), USB 2.0, Wi-Fi, GPRS and WCDMA, and applications such as Microsoft Outlook and Lotus Notes. The recent BlackBerry 9000 series runs over Intel XScale 624MHz CPU and supports sending and receiving e-mails wherever it connects a wireless network of certain cellular phone carriers.

Popular mobile operating systems include Symbian OS, iPhone OS, BlackBerry, Windows Mobile, Linux, Palm WebOS and Android (market share shown in Figure 1). Symbian OS, the most popular mobile OS from Symbian Ltd counting for almost half of the world market, is a proprietary operating system that runs exclusively on the Advanced RISC Machine (ARM) architecture which is a 32-bit Reduced Instruction Set Computer, or RISC, processor architecture developed by ARM Limited. These processors are used and equipped in about 98 percent of the mobile phones sold each year. Although Symbian OS has the largest share in the worldwide markets, it falls behind other companies in the North American market. The latest version of Symbian OS 9.5 supports mobile digital television broadcasts, Wi-Fi, Mobile Web Server and lots of open source software.

Users with a smartphone running Windows Mobile operating System will not only be able to use proprietary software such as Microsoft Office Mobile but also a large variety of third-party software. iPhone OS is a close source (with