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Chapter XVI

Internet-Enabled Smart Card Agent Environment and Applications

Teoh Kok Poh and Sheng-Uei Guan
National University of Singapore

INTRODUCTION

The introduction of smart card technology offers an alternative for user authentication and storage medium for data that require both high security as well as location transparency. With a considerably large storage that can be protected from unauthorized access and tampering, and the ability to compute custom software routines including cryptographic algorithms, smart card represents a trusted medium for self-identification and secured information storage that we can carry around with us (Effing and Rankl, 1996).

On the other hand, intelligent software agents represent a new software methodology that starts to gain wide acceptance. While they are possibly the best candidates as an end user's personal assistant in the computer world, they usually are not designed with high security and location transparency in mind. This has greatly limited their ability to function as 'personal representatives' in the world of the Internet.

The proposed smart card agent environment is an effort to bridge these two technologies to produce a viable solution for personalized Internet-based services and solutions. Introduction of software agent technology into traditional smart card applications will bring in new intelligence to make it smarter. The level of security and location transparency in the smart card technology will greatly enhance the usability of agents in the Internet world. With the combination of these two technologies, many Internet-based applications can provide a personalized services with minimum user interactions. This will promote the utilization of Internet-based services and solutions.

BACKGROUND

Smart Card

Since the introduction of smart card in the 1970s, it has been used in many applications, including pay phone, access control, loyalty program, mobile phone, e-commerce and many

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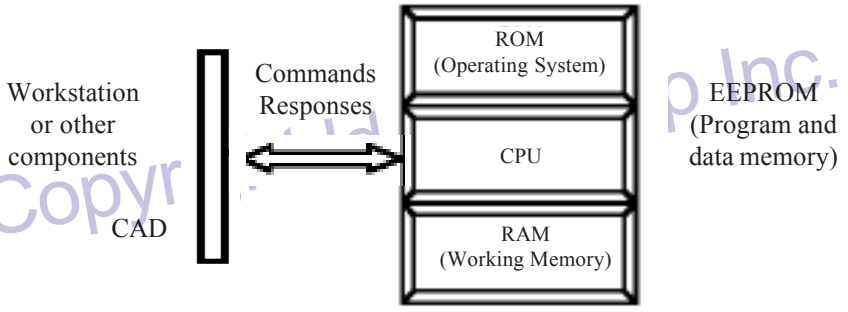
Figure 1: Typical Smart Card Architecture and System View



others. The possible applications are growing with the increasing computing power and storage capacity. In a broader scope, smart cards include memory cards with secured and non-secured memory as well as microprocessor cards. However, in the scope of this chapter, we only consider the microprocessor cards in the smart card family.

The basic smart card architecture consists of a communication interface, memory, and a CPU for data processing and calculations. In order to be useful, a smart card needs to interact with a Card Acceptance Device (CAD) or reader through a communication interface. The Card Acceptance Device serves as a conduit for information into and out of the card (Sun Microsystems, 1998). Figure 1 shows a typical smart card architecture and system view.

a) Communication Interface

A smart card is a 'passive' microprocessor that has no power supply and other peripherals like keyboard connected. The only external interface it has is the eight electrical contact points. In order to be useful, a Card Acceptance Device (CAD) is required to provide the power supply and serial communication link.

b) Card Acceptance Device (CAD)

A Card Acceptance Device is required to activate the smart card and perform useful tasks with the smart card. It can be a stand-alone device or link up with other computers in various ways like serial communication port, PCMCIA slot, floppy disk drive, and ISA bus.

c) Smart Card Microprocessor

Smart card microprocessor has limited computation power and memory resources due to the cost and physical constraint. Generally, there are 8, 16 or 32 bit processors operating at a speed of below 5 MHz, with user memory range from 1Kbytes to 64 Kbytes and RAM of 1Kbytes or less.

d) Smart Card Memory

Generally, there are three main types of memory for its respective purpose:

- ROM—Contains code and data that cannot be modified once burnt in. Mainly for the operating system with general-purpose software routine.
- RAM—Fast and volatile memory used as working memory and temporary storage.
- EEPROM—Non-volatile memory that allows both read and write actions at a slower speed compared to RAM. It can be used as application and data memory.