



Programming Smart Cards

Part 2:

PC/SC Specifications

Open Card Framework

Java Smart Card I/O API

Sample codes in:

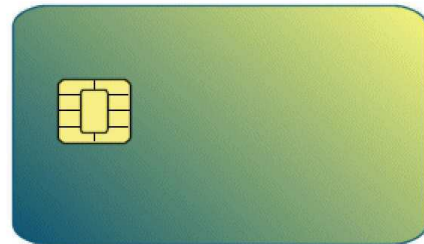
C/C++

C#

VB.NET

VB 6

Java



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- **VB 6**
- **C#**
- **VB.NET**
- **Java**

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Introduction

ISO 7816 specifications define the way to communicate with the smart card specifying in a formal and strict way all commands involved in interfacing a smart card. The proposed programming interface, which deals with hexadecimal commands, is however placed at a very low-level of abstraction. Also, ISO 7816 specifications don't provide any indications on interoperability between different vendors smart card readers, while all commands have to be sent to the smart card through a specific driver provided with the reader (on which applications rely on, evidently). To solve interoperability issue three programming models and APIs has been defined: PC/SC, Open Card Framework and, more recently, Java Smart Card I/O API.

A group of vendors such as Microsoft, Siemens, Hewlett Packard and a few other, proposed PC/SC specifications, nowadays became a *de-facto* standard, defining hardware and software architecture of a computing system resolving all issues related to interoperability amongst different model of readers and offering a highly abstracted programming interface.

PC/SC specifications hide the operating logic of particular smart card and smart card reader offering a unique consistent programming *framework*.

PC/SC specifications defines a set of API that allows to communicate with smart cards. Such API has been implemented in Windows Operation System and on Linux/Unix based Operating Systems and can be used for programming smart cards in C/C++, Visual Basic 6, C# and VB.NET.

In parallel to PC/SC specifications, *OpenCard Framework* (OCF) was developed as a joint initiative by IBM, Netscape, Sun and NCI which later also joined Siemens, Gemplus, Schlumberger, Bull, Visa and some other firms and proposed a generic object model, aimed to develop smart card-based applications.

OCF proposes a model that hides the complex operational logic of smart cards and reader terminals, offering a unified Java programming framework mapping low-level smart card's and reader terminal's native functionalities into a set of high-level abstracted Java classes.

Unlike PC/SC standard, specifically designed for Windows and Linux/Unix platforms, OCF has been designed to operate also with ATM, POS, embedded and handheld devices.

More recently, starting from the version 6.0 of JDK a new package has been introduced in the JDK to manage smart cards using Java programming language: Java Smart Card I/O API.

In this chapter we will describe the main features of PC/SC specifications highlighting specifically some architectural components such as the *Resource Manager* and the *Service Provider* showing how to send command to a smart card via PC/SC API in C/C++, VB6, C# and VB.NET, we will introduce all peculiar features of OCF and Java Smart Card I/O API showing how to program smart cards using Java..