

GCR410 / GCR410-P

Application Note

Version 1.0

GEMPLUS

October 1999

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Printed in France.

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Document Reference: DPD14389A00

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PREFACE

This document describes the use of the GCR410 and GCR410-P in their environment. The major differences between the GCR410 and the GCR410-P are listed in the chapters about firmware, software and hardware.

Gemplus has developed its own Application Programming Interface (API) to support cards and card readers in the same way in multiple environments.

The lack of standards for interfacing PCs to smart card readers and a the absence of widely-accepted high-level programming interface for common ICC functionalities lead to the birth of the Portable Computer/Smart Card (PC/SC) workgroup in May 1996, a partnership between major PC and smart card companies.

This document provides information about Gemplus device handlers in the PC/SC context.

Audience

This document assumes that the reader is familiar with Gemplus Card Readers (GCRs) , PC/SC API and reader concepts and terminology.

FIRMWARE

There are two firmware versions, namely the GCR410 and the GCR410-P.

- The GCR410 is based on the GemCore V1.10 operating system.
- The GCR410-P is based on the GemCore V1.118, which is Windows Hardware Quality Laboratory (WHQL) certified.

In addition to the features of GemCore V1.10, GemCore V1.118 also provides :

- Plug and play,
- Transparent mode for the block protocol,
- Additional notification mode for the card extraction/insertion,
- Smart card communication parameter modification,
- IFSD transmission.

See “*Appendix A*” for additional information regarding these features.

HARDWARE

The Serial Port Connector

GCR410

The GCR410 is a universal PC/SC reader.

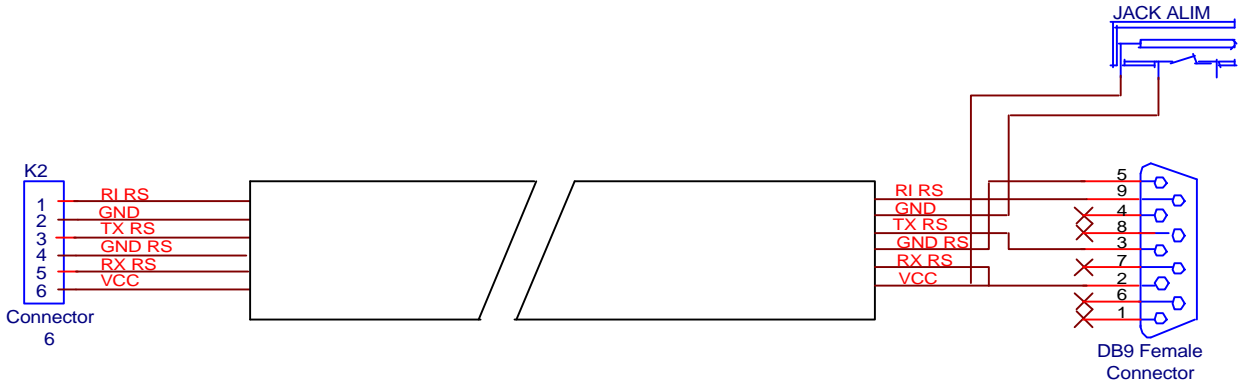


Figure 1. GCR410 Connectors

GCR410-P

The GCR410-P is a GCR410 reader with the plug & play feature.

When the Operating System (OS) detects the presence of a GCR410-P on a peripheral, the plug & play reader “introduces” itself to the OS in the following manner:

It provides a unique identifier,

It states the service it provides and the required resources,

It identifies the driver that supports it.

The OS recognizes the GCR410-P and links it to the corresponding driver.

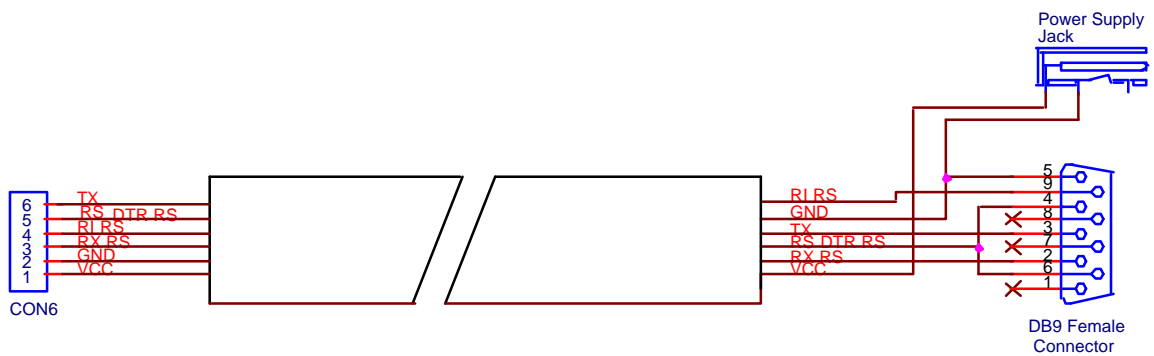


Figure 2. GCR410-P Connectors

The Power Supply Connector

The pin out of the power supply connector is provided in Figure 3 (this connector is part of the keyboard; the keyboard provides the power supply).

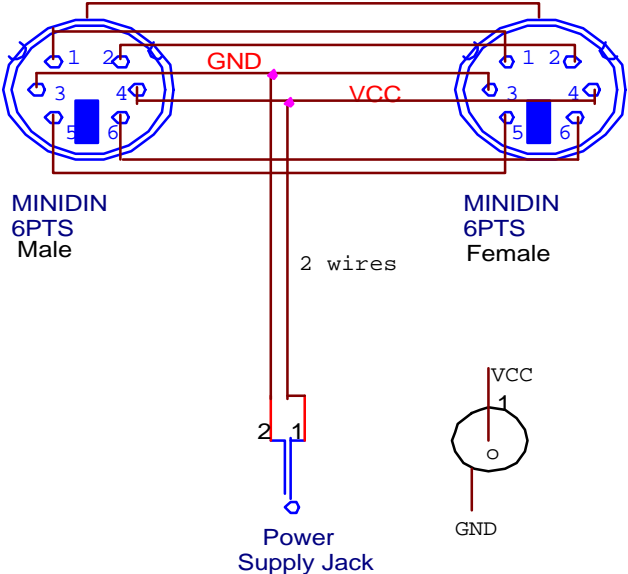


Figure 3. The Power Supply Connector

SOFTWARE

There is no difference between the GCR410 and the GC4410-P with respect to the API.

GCR API

The GCR API is a library of commands that interfaces with smart cards through Gemplus smart card readers. API library commands are called from applications (written in C or another programming languages) running under DOS, or environments such as Windows 3.xx or Windows 32 bits (Windows 95, Windows 98 and Windows NT).

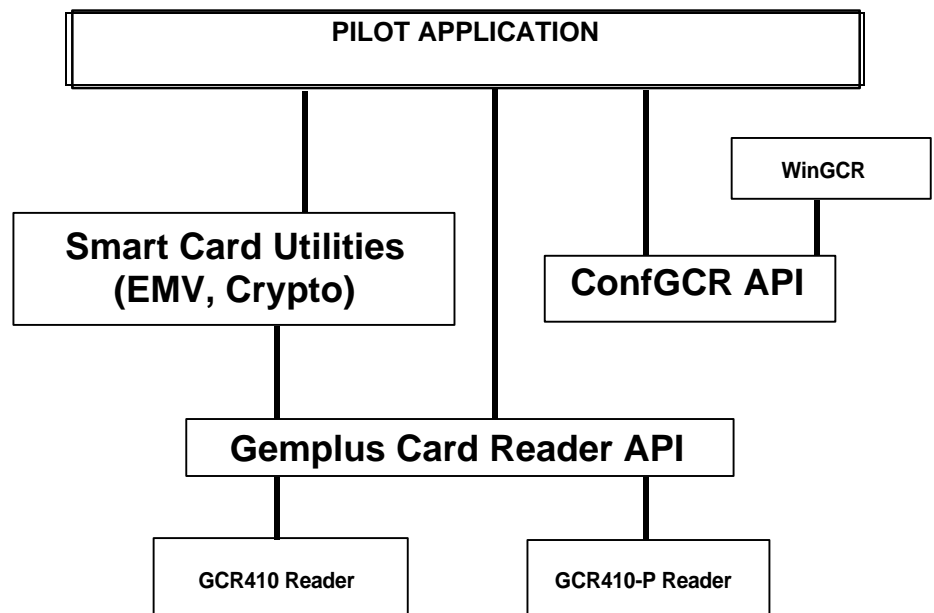


Figure 4. The GCR API

The GCR consists of two parts, namely a common interface and a reader module.

The Common Interface

The common interface includes:

- A channel management system,
- A session management system,
- A card exchange system,
- A card management system,
- A reader management system,
- A device management system.

Disks 1 and 2 contain all API installation items.

The Reader Module

The reader module name uses the IFD type (0x09 for the GCR410). Disk 3 enables the user to add the reader onto the system.

For the reader to be operational on a system, the relevant driver must be installed beforehand, using the “Smart Card Reader” tool located under the control panel. The drivers correspond to the GCR API’s disk 3 and they can be downloaded from the developer’s web site.

The ConfGCR tool is used to add reader drivers to the system. This tool registers the drivers into the registry base. Compatibility with Windows 16-bit applications can be also is specified, in which case the **gemplus.ini** file is updated.

The WinGCR tool shows users how to send commands to cards and readers, and how to view the returned status and data. With this information, users can develop their own applications. It also enables them to configure connected readers.

PC/SC Specifications

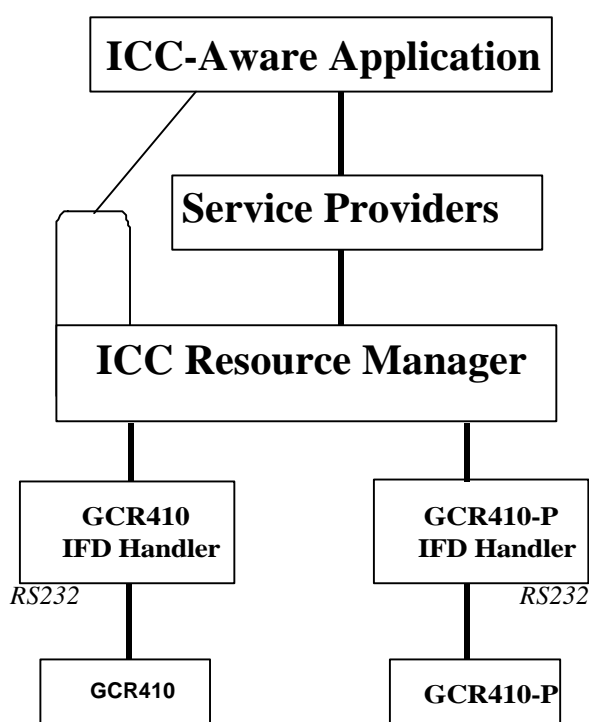


Figure 5. ICC Aware Application

PC/SC is a set of specifications to access smart cards from personal computers. It is written by the PC/SC workgroup, which was formed in 1996. The PC/SC architecture provides a framework for accessing ICCs from PCs.

PC/SC specifications:

- Define the interface with the readers,
- Define an abstract interface to gain access to cards,
- Must be independent from the applications,
- Must be independent from the IFD and the ICC,
- Allow for the evolution of the equipment,
- Allow for use of cryptography.

IFD Handlers define which readers are connected at start-up. The driver is activated the PC is booted. At this time, the resource manager detects the user's reader and the serial port is therefore engaged. It is not possible to use the API GCR GemCore.

The ICC Resource Manager is provided by the OS vendor as a component of the OS. Its controls access to the IFDs. All requests for smart card access go through the resource manager, which routes them to the reader that contains the targeted card. It is responsible for identifying and tracking available resources:

The ICC vendor provides two separate categories:

- ICC Service Provider (SP) for file and authentication services, cardholder verification, ICC authentication,
- Cryptographic Service Provider for cryptographic services.

Two distinct SPs were necessary due to existing import/export restrictions on cryptographic technology imposed by some governments.

MS-Dos Environment

The MS-DOS Environment refers to a static library in a large memory model.

GCR API

The standard V4.30.003 API can be used for the common interface and V4.30.004 can be used for the reader module. The new package will consist of V4.31 and will support both the GCR410 and the GCR410-P.

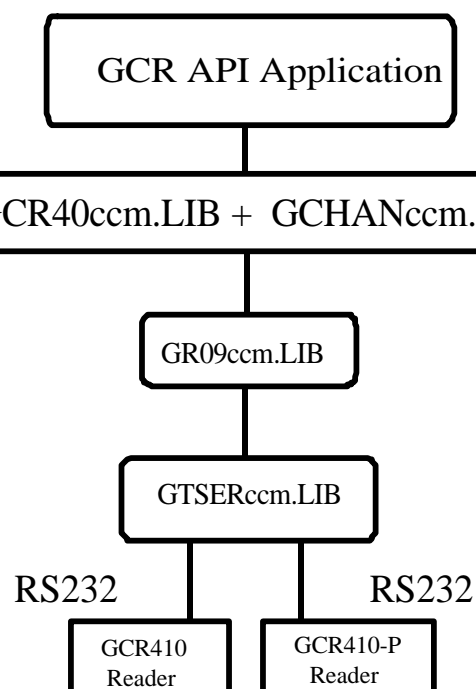


Figure 6. The GCR API in the MS-DOS Environment

CC = Compiler type (M7 =Microsoft C7 and higher,
B4 = Borland C4 and higher).

M = Memory model (L = Large memory model).

PC/SC

Note: PC / SC is not supported in this environment.

Windows 3.1 Environment (16-bit DLL)

GCR API

The standard V4.30.003 API can be used for the common interface and the V4.30.004 can be used for the reader module. The new package will consist of V4.31 and will support both the GCR410 and the GCR410-P.

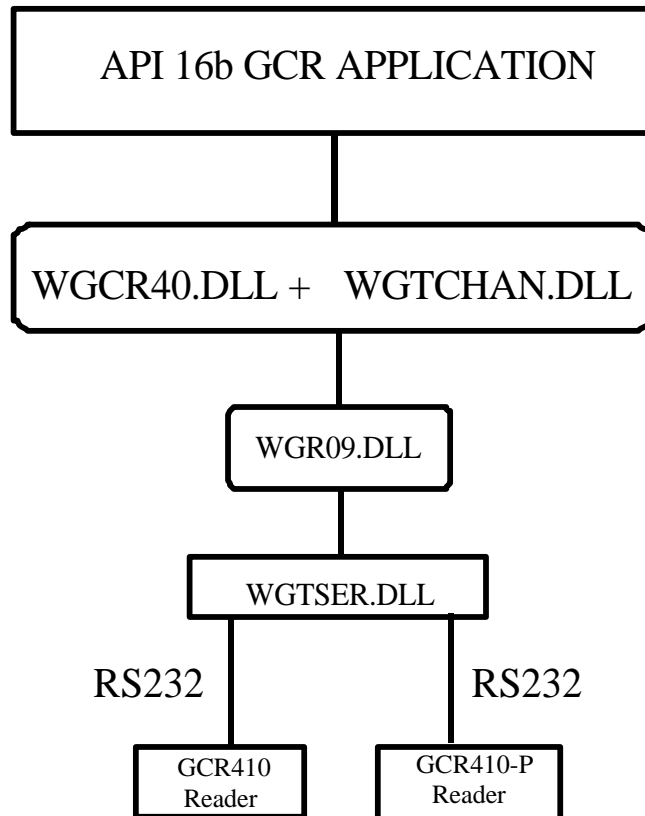


Figure 7. GCR API in the Windows 3.1 Environment

PC/SC

Note: PC / SC is not supported in this environment.

Windows NT4 Environment (32-bit DLL)

GCR API

- **GCR410**
The standard V4.30.003 API can be used for the common interface and the V4.30.004 can be used for the reader module. The new package will include V4.31. **Gemcore.430.1**, **Gemcore.430.2** and **Gemcore.430.3.zip** files are required to perform the installation.
- **GCR410-P**
Plug and Play is not integrated in windows NT4. See above for the installation.

PC/SC

- **GCR410**
The V1.1.0.11 PC /SC driver can be used. Installation takes place using the **I-GCR410-NT4.zip** file or the **GRSerial_NT4.zip** driver (for the driver version).
The driver is based on the old smclib version. There is no need to install the **smclib.exe** updating file because the old smclib is installed with the **scbase.exe** kernel.
- **GCR410-P**
Plug and Play is not integrated in windows NT4. The PC/SC driver V1.1.0.0 can be used instead. Installation takes place using the **W-GCR410P-NT4.zip** file. The driver is based on the old smclib version. There is no need to install the **smclib.exe** updating file because the old smclib is installed with the **scbase.exe** kernel.

The Windows 95/98/2000 Environment (32-bit DLL)

GCR API

The GCR API is not qualified for the Windows 98 environment.

For other 32-bit environments, the standard V4.30.003 API can be used for the common interface and the V4.30.004 can be used for the reader module. The new package will include V4.31. **Gemcore.430.1**, **Gemcore.430.2** and **Gemcore.430.3.zip** files are required to perform the installation for both the GCR410 and the GCR410-P.

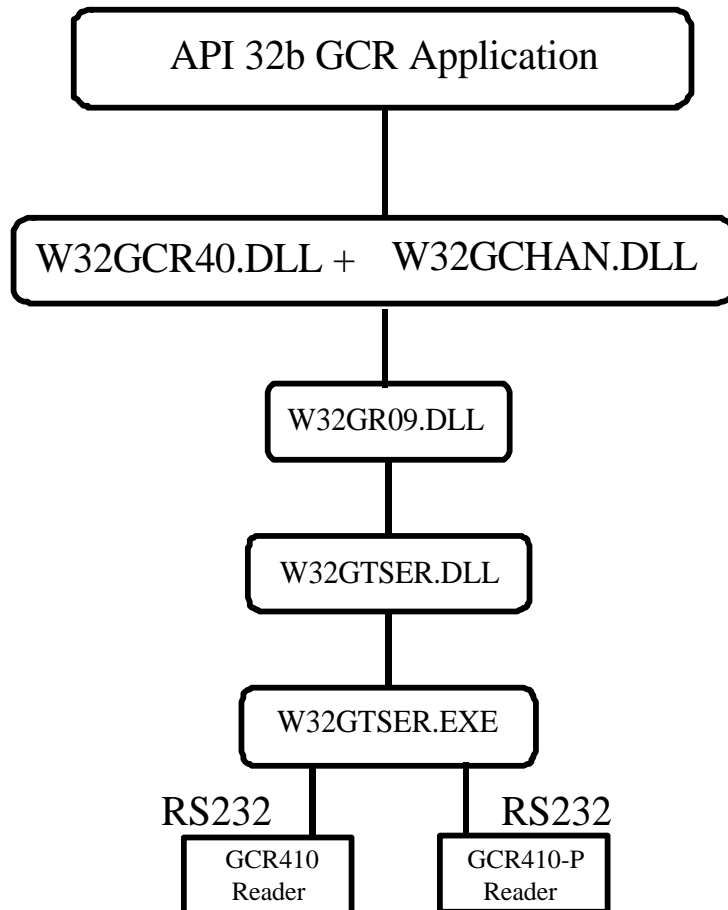


Figure 8. GCR API in the Windows 95/98/2000 Environment

PC/SC

- **GCR410**

Installation takes place using the *I-GCR410-W95W98.zip* file for the Windows 95 and Windows 98 environments or with the *GRSerial_9x.zip* driver (for the driver version). The installation process for the Windows 2000 environment is in progress.

The driver is based on the old smclib version. There is no need to install the *smclib.exe* updating file because the old smclib is installed with the *scbase.exe* kernel.

- **GCR410-P**

The PC/SC driver V1.1.0.0 can be used. Installation takes place using the *W-GCR410P-W9598.zip* file for the Windows 95 and Windows 98 environments. Installation for Windows 2000 takes place using the *GCR410P-2000.zip* file.

The driver is based on the old smclib version. There is no need to install the *smclib.exe* updating file because the old smclib is installed with the *scbase.exe* kernel.

PC/SC Installation

When the GCR410-P reader is connected to the system for the first time, the environment asks the user to install the manufacturer floppy disk.

There are two possibilities at this point:

- The classic method relies on the GCR API. In this case, the user cancels the system's installation, and requests not to be questioned in the future.
- Otherwise, it is possible to install the appropriate PC/SC driver.

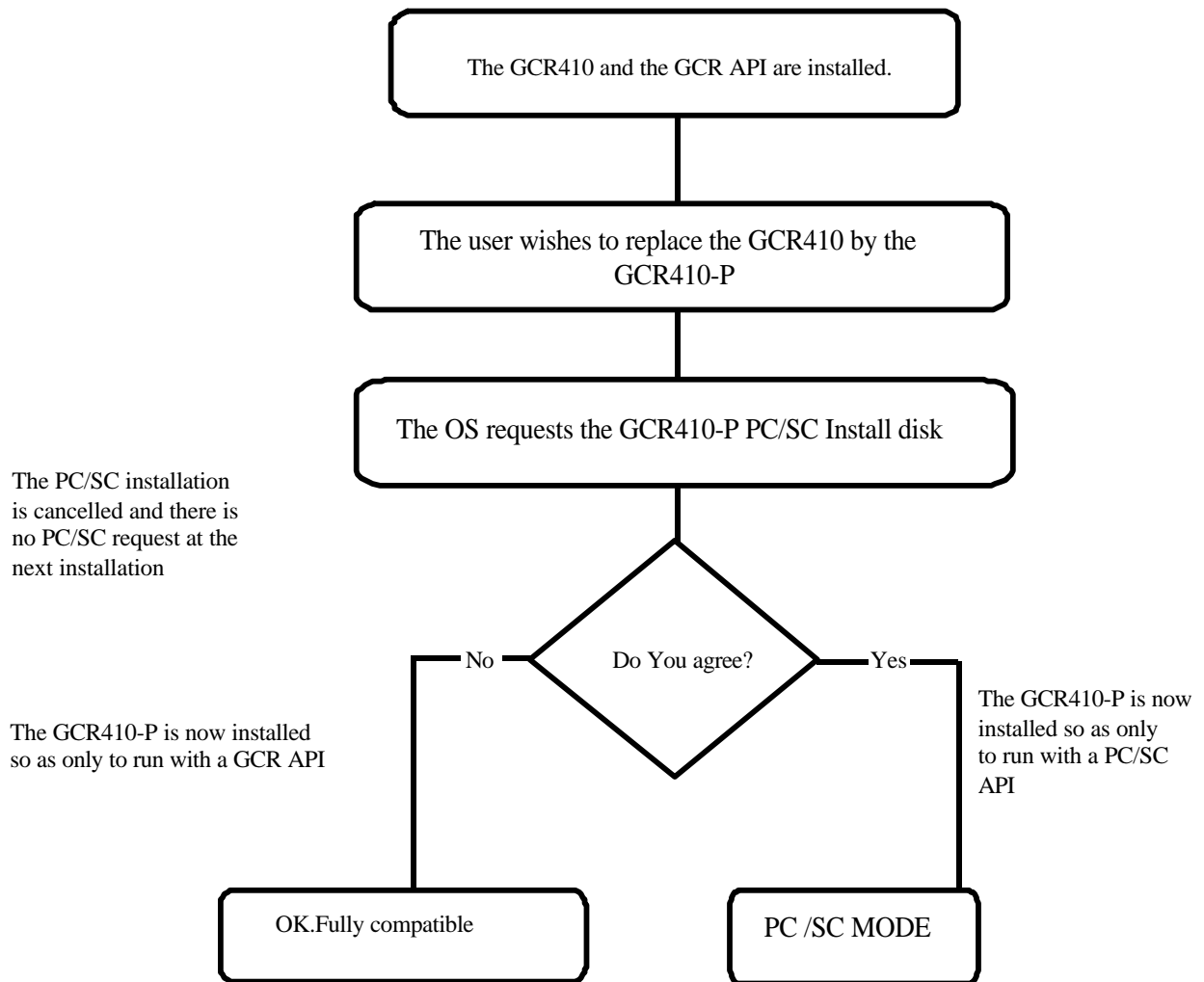


Figure 9. PC/SC Installation Flow Chart

The PC/SC Bridge

If the user decides to install the PC/SC driver for the GCR410-P, this driver starts up during system booting and prevents the GCR API from running (the serial port is used by the PC/SC driver, therefore the serial port cannot be reached).

However, a GCR API / PCSC bridge has been designed which enables the use of a reader under Windows 95/98/NT4, specifically for the 32-bit application. It runs with its PC/SC driver in GCR API mode.

For example, Win GCR 32 bits, which use the GCR API, can run with a GCR410-P, which is normally on a PC/SC mode.

This bridge is available in the 4.31 version for the GCR API. For 16-bit applications, Gemplus does not provide a solution that allows use of PC/SC.

For additional information, refer to “*Appendix B - PC/SC – GCR API Bridge*”.

The Vendor PC/SC Function

PC/SC makes it possible to have proprietary functions for the reader driver. Gemplus proposes three such functions for this entire reader range:

- ***IFD_Exchange*** is designed to send a command to the reader and to receive the response. This is comparable to the GCR API's **G4_IFDExchange**. This function can be used to pilot the peripheral.
- ***Get_Attribute*** is designed to read reader attributes (defined below).
- ***Set_Attribute*** is designed to update reader attributes.

These attributes are:

- **APDU_Timeout :** Timeout on the T=0 and T=1 exchange,
- **CMD_Timeout:** Timeout for the other exchange which are not T=0 or T=1,
- **POWER_Timeout:** Space between the power down and the power up in order to perform a cold reset.

APPENDIX A - GEMCORE 1.118

Microsoft¹ Plug & Play

A modified serial cable and a specific command, 0x5A, let the user enable or disable Plug & Play enumerator detection. There is no parameter; this command is a toggle.

Transparent Mode for Block Protocol¹

In transparent mode, the application software can configure the communication line with the card or the security module. Consequently, processing of asynchronous cards with a protocol incompatible with T=0 and T=1 is possible. The Exchange APDU (0x15) command sends data without analyzing blocks.

Additional Notification Mode for Card Insertion/Extraction¹

A new command, 0x17 TYPE [0x00 [PRESENCE]], is designed to enable the card presence indicator and set its behavior. This is a pulse on either the SDA, SCL or TxD line.

Parameters between brackets are optional. If the PRESENCE parameter is absent in the command, card presence detection is enabled for the GCR410 and disabled for all other Gemplus readers.

The card type parameter is described in *the GemCore Reference Manual*. 0x00 is the Vpp level parameter.

Smart Card Communication Parameter Modification

The parameter used by the reader to communicate with asynchronous cards can be modified dynamically by the smart card command 0x12 PRT CNF₁ CNF₂ CNF₃ CNF₄². This command does not power up or reset, and it is only accepted when the card is powered on. The command parameter enables the user to modify the protocol, the communication speed, the extra guard time number, inter blocks and inter characters' timeout, as well as the size of blocks accepted by the card.

IFSD Transmission (T=1 Protocol)

The reader indicates to the smart card the length of the blocks supported by GemCore. A new command, 0x12 CFG PTS₀ PTS₁ PTS₂ PTS₃ PCK³, notifies the IFSD value to the card, automatically (IFSD = 0xFE) or manually (any IFSD within ISO⁴ limits).

If CFG = 0x08, there is no card reset, no PTS exchange, nor is there manual notification with PTS₀ = IFSD value.

In all other cases, notification takes place after the reset; it is an automatic sequence.

¹ Mandatory for WHQL

² 0x1A PRT CNF₁ CNF₂ CNF₃ CNF₄ for the SAM

³ 0x1A CFG PTS₀ PTS₁ PTS₂ PTS₃ PCK for the SAM

⁴ The standard value is 32 bytes

APPENDIX B - PC/SC – GCR API BRIDGE

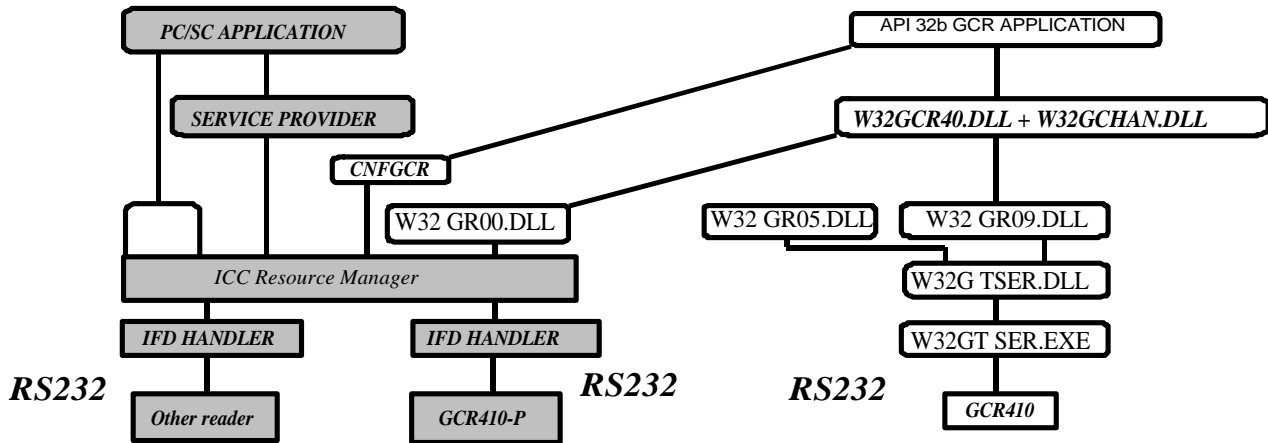


Figure 10. PC/SC – GCR API Bridge

TERMINOLOGY

Abbreviations

API	Application Programming Interface
GCR	Gemplus Card Reader
ICC	Integrated Circuit Chip
IFD	InterFace Device
IFSD	Information File Size for Interface Device
OS	Operating System
PC/SC	Portable Computer/Smart Card
PTS	Protocol Type Selection
SP	Service Provider
WHQL	Windows Hardware Quality Laboratory

Glossary

API	Application Programming Interface; a language and message format used by an application program to communicate with the operating system. APIs are implemented by writing function calls in the program, which provide the linkage to a specific subroutine for execution.
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