SDK for PC/SC – Readme First

Overview

PC/SC is the de-facto standard to interface Personal Computers (PC) with Smart Card (SC), and -of course- with Smart Card Readers & Writers.

PC/SC is available on Windows and most Unix systems, including Linux and Mac OS X (through the PCSC-Lite open source stack).

This SDK provides samples for the Windows platform.

Overview (cont.)

Most samples provided within this **SpringCard SDK for PC/SC** are also available as ready-to-use binaries.

Just visit **SpringCard QuickStart for PC/SC** to download, install and run these binaries in a nutshell

www.springcard.com/solutions/pcsc-quickstart.html

Content

Compatible products

Prox'N'Roll PCSC

CSB6 / CSB6-HSP

CrazyWriter / CrazyWriter HSP

NFC'Roll

H663/H512

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Reference documentation you'll need

- PC/SC on Windows:
  http://msdn.microsoft.com/
  (enter “winscard” or “ScardTransmit” in the search box)

- Java PC/SC API (javax.smartcardio):
  http://doc.java.sun.com/DocWeb/api/javax.smartcardio

- SpringCard's Simplified documentation of the PC/SC API
  http://www.springcard.com/en/download/find/file/pmdz061

Developer's Reference Manuals

- H663, CrazyWriter HSP, CSBHSB:
  http://www.springcard.com/en/download/find/file/pmd2271
- H512, NFC'Roll:
  http://www.springcard.com/en/download/find/file/pmd2176
- CSB6, Prox'N'Roll, CrazyWriter:
  http://www.springcard.com/en/download/find/file/pmd841p

How to install the PC/SC SDK

- To install the complete SpringCard PC/SC SDK :
  - Just unzip the archive on your hard drive
  - Recommended location is C:\DEV\SPRINGCARD\PCSC

License

SpringCard's SDK are available free of charge.

The license allows you to use the featured software (binary or source) freely, **provided that the software or any derivative works is used only in link with genuine SpringCard products**.

Please read **LICENSE.TXT** for details.

Directory structure

- **SAMPLES/C**
  - Sample programs written in ANSI C, and portable to virtually any OS supporting PC/SC
- **SAMPLES/DOTNET**
  - Sample programs written in C# and VB, targetting the .NET framework
- **SAMPLES/JAVA**
  - Sample programs written in Java, using the javax.smardcardio class available on some systems
- **SAMPLES/WIN32**
  - Samples programs written in either C or C++, that targets the Windows OS

Directory structure

- **BINARIES**
  - Pre-compiled binaries for Windows. Some binaries rely on the .NET framework (v4, client profile). Please install the framework beforehand
- **DOCS**
  - Contains the documentation of the libraries provided by SpringCard to ease working with some particular cards on top of PC/SC
- **LIBRARY/DOTNET**
  - Source code of the libraries provided by SpringCard to ease working with PC/SC, and with some particular cards on top of PC/SC, from C# or VB projects running in the .NET framework

Focus on the key examples

- ✓ Memory Card Tool
- ✓ PC/SC Scriptor
- ✓ NFC Tag Tool

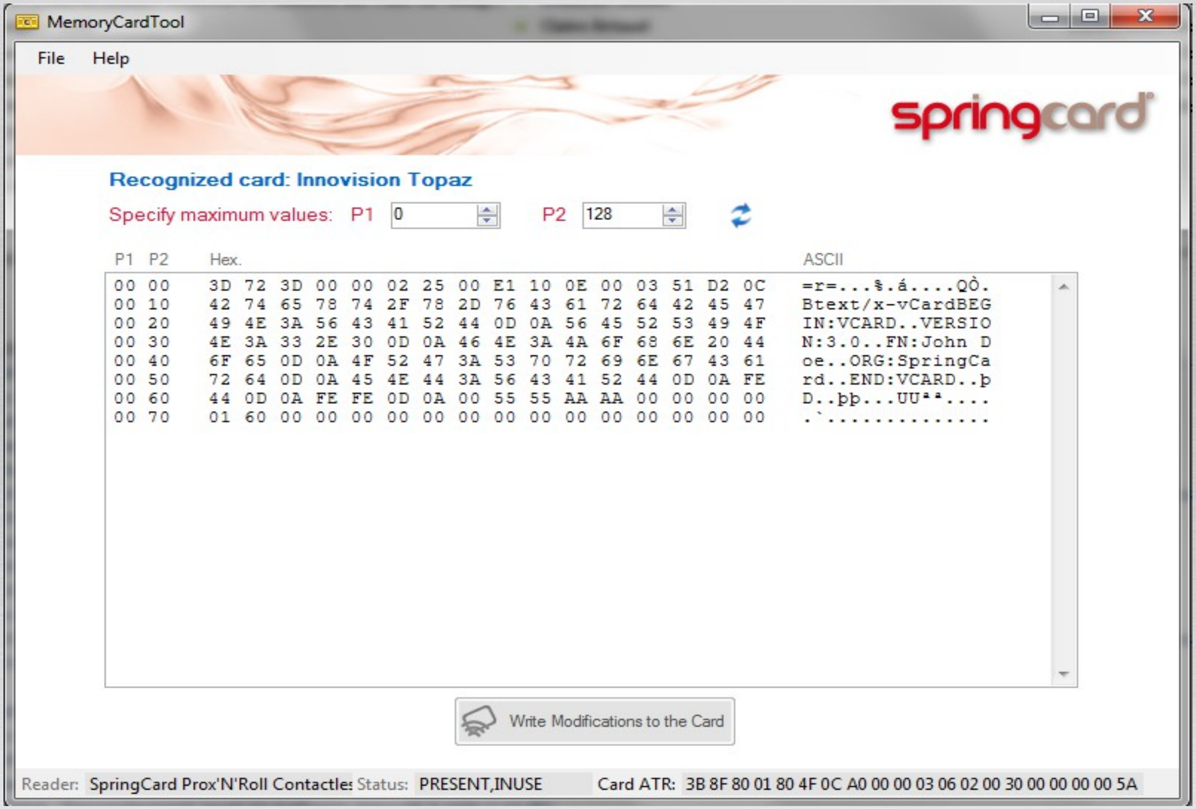
Memory Cards Tool

springcard®

Memory Card Tool

A unique tool that:

- ✔ displays the content of a memory card
- ✔ allows to write a card content



Recognized card: Innovision Topaz

Specify maximum values: P1 0 P2 128

```
P1 P2    Hex.                                                ASCII
00 00    3D 72 3D 00 00 02 25 00 E1 10 0E 00 03 51 D2 0C     =r=...%.á....QÒ.
00 10    42 74 65 78 74 2F 78 2D 76 43 61 72 64 42 45 47     Btext/x-vCardBEG
00 20    49 4E 3A 56 43 41 52 44 0D 0A 56 45 52 53 49 4F     IN:VCARD..VERSIO
00 30    4E 3A 33 2E 30 0D 0A 46 4E 3A 4A 6F 68 6E 20 44     N:3.0..FN:John D
00 40    6F 65 0D 0A 4F 52 47 3A 53 70 72 69 6E 67 43 61     oe..ORG:SpringCa
00 50    72 64 0D 0A 45 4E 44 3A 56 43 41 52 44 0D 0A FE     rd..END:VCARD..þ
00 60    44 0D 0A FE FE 0D 0A 00 55 55 AA AA 00 00 00 00     D..þþ...UUªª....
00 70    01 60 00 00 00 00 00 00 00 00 00 00 00 00 00 00     .`..............
```

Reader: SpringCard Prox'N'Roll Contactle: Status: PRESENT,INUSE Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 02 00 30 00 00 00 00 5A

Memory Card Tool

- ✓ In **SAMPLES/DOTNET/MEMORYCARDTOOL**
- ✓ Language = C#
- ✓ Target = .NET 4
- ✓ The project opens and builds using #Develop 4, the open-source IDE for .NET : http://www.icsharpcode.net/OpenSource/SD/Default.aspx
- ✓ Porting to Microsoft Visual C# Express 2010 is straightforward

Example: Mifare Classic

Recognized card

Change the number of sectors

Read card again, with specified number of sectors

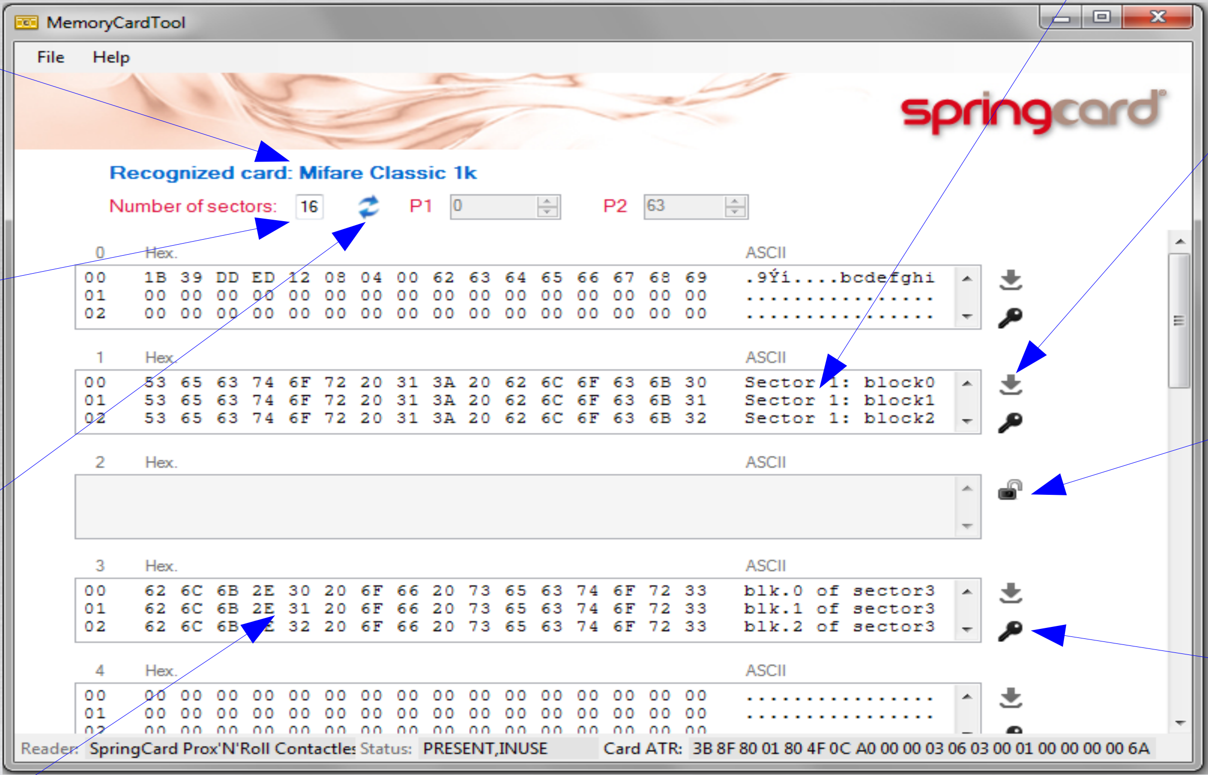
Hexadecimal content of each sector

ASCII translation of each sector

Update sector's content (if allowed)

Read sector with specified keys

Change sector's keys and access conditions



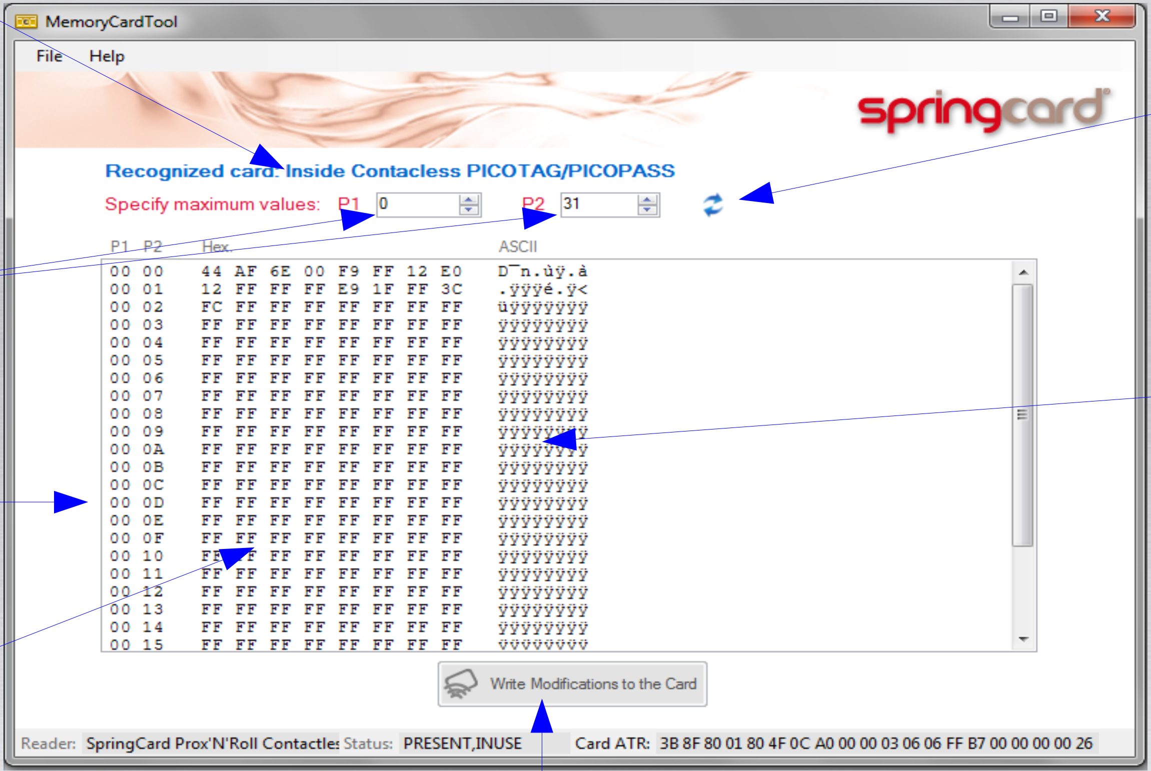
Recognized card: Mifare Classic 1k

Number of sectors: 16   P1 0   P2 63

```
0   Hex.                                                 ASCII
00  1B 39 DD ED 12 08 04 00 62 63 64 65 66 67 68 69     .9Ýí....bcdefghi
01  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
02  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

1   Hex.                                                 ASCII
00  53 65 63 74 6F 72 20 31 3A 20 62 6C 6F 63 6B 30     Sector 1: block0
01  53 65 63 74 6F 72 20 31 3A 20 62 6C 6F 63 6B 31     Sector 1: block1
02  53 65 63 74 6F 72 20 31 3A 20 62 6C 6F 63 6B 32     Sector 1: block2

2   Hex.                                                 ASCII

3   Hex.                                                 ASCII
00  62 6C 6B 2E 30 20 6F 66 20 73 65 63 74 6F 72 33     blk.0 of sector3
01  62 6C 6B 2E 31 20 6F 66 20 73 65 63 74 6F 72 33     blk.1 of sector3
02  62 6C 6B 2E 32 20 6F 66 20 73 65 63 74 6F 72 33     blk.2 of sector3

4   Hex.                                                 ASCII
00  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
01  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
02  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Reader: SpringCard Prox'N'Roll Contactle: Status: PRESENT,INUSE   Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 01 00 00 00 00 6A

Example: Inside Contactless PicoTAG



Recognized card: Inside Contacless PICOTAG/PICOPASS

Specify maximum values: P1 0 P2 31

```
P1 P2   Hex.                       ASCII
00 00   44 AF 6E 00 F9 FF 12 E0    D¯n.ùÿ.à
00 01   12 FF FF FF E9 1F FF 3C    .ÿÿÿé.ÿ<
00 02   FC FF FF FF FF FF FF FF    üÿÿÿÿÿÿÿ
00 03   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 04   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 05   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 06   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 07   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 08   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 09   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0A   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0B   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0C   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0D   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0E   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 0F   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 10   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 11   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 12   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 13   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 14   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
00 15   FF FF FF FF FF FF FF FF    ÿÿÿÿÿÿÿÿ
```

Reader: SpringCard Prox'N'Roll Contactle: Status: PRESENT,INUSE Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 06 FF B7 00 00 00 00 26

Recognized card

Read card again, with specified P1 and P2

Specify Max values for P1 and P2

ASCII translation

Address of each page or block

Hexadecimal content

Update card's content (if allowed)

How to read / write a Memory Card

APDUs for a Mifare Classic

- To Read: FF F3 00 P2 Le, where P2 is the address of the block and Le is the number of bytes to read
- To Write: FF F4 00 P2 Lc Data, where Lc is the length of data to write and Data is the data itself
- Please refer to the Developer's guide to specify the keys, if the default keys don't work

APDUs for another Memory Card

- To Read : FF B0 P1 P2 Le, where P1 and P2 are the two address bytes (Most Significant Byte First), and Le the number of bytes to read
- To Write : FF D6 P1 P2 Lc Data, where P1 and P2 are the two address bytes (Most Significant Byte First), Lc is the number of bytes to write, and Data is the data to write
- Please refer to the Developer's guide to know the different allowed values for P1, P2, Le and Lc, for each supported Memory Card

Source code for reading

The SpringCardPCSC.cs class is used.

First, create an ScardChannel object (“channel”), from the reader name :

- ✓ ScardReader reader = new ScardReader(readerName);
- ✓ ScardChannel channel = new SCardChannel(reader);

Then, to read “length” bytes at address “address”:

- ✓ CAPDU capdu = new CAPDU(0xFF, 0xB0, (byte) (address / 0x0100), (byte) (address % 0x0100), length);
- ✓ RAPDU rapdu = channel.Transmit(capdu);
- ✓ byte[] bytes_read = rapdu.data.GetBytes();

Source code for reading

The SpringCardPCSC.cs class is used.

First, create an ScardChannel object ("channel"), from the reader name :

- ✓ ScardReader reader = new ScardReader(readerName);
- ✓ ScardChannel channel = new SCardChannel(reader);

Then, to read "length" bytes at address "address":

- ✓ CAPDU capdu = new CAPDU(0xFF, 0xB0, (byte) (address / 0x0100), (byte) (address % 0x0100), length);
- ✓ RAPDU rapdu = channel.Transmit(capdu);
- ✓ byte[] bytes_read = rapdu.data.GetBytes();

Source code for writing

Once the channel is created, we only need to send the writing APDU to write “data” at address “address”:

- CAPDU capdu = new CAPDU(0xFF, 0xD6, (byte) (address / 0x0100), (byte) (address % 0x0100), data);
- RAPDU rapdu = channel.Transmit(capdu);
- if (rapdu.SW != 0x9000)
  - → Error !

How to recognize the card ?

- The ATR is used to recognize the card and differentiate between cards with sectors (Mifare Classic) and cards without sectors.
  - Check http://smartcard-atr.appspot.com/ for information about ATRs

- The ATR is further analyzed with cards without sectors, to identify precisely the card and deduce the number of pages or blocks, and the number of bytes per page or block.

- For some ATRs (those from the Mifare UltraLight family), further identification is performed in reading the pages until we find a duplication (same data again) or until an error occurs.

- To obtain the ATR, use the previously defined channel :
  - string atr = channel.CardAtr.AsString("");

How to detect when a card is inserted ?

We have already created an ScardReader object, from the reader's name :

- ScardReader reader = new ScardReader(readerName);

Once it is created, we can track all the changes on this reader, via the StartMonitor() method, in a background thread:

- reader.StartMonitor(new ScardReader.StatusChangeCallback (ReaderStatusChanged));

ReaderStatusChanged is the callback, ie: the method called each time the background thread detects any change on the reader. This method analyses the reader state and the ATR of the card.

- void ReaderStatusChanged(uint ReaderState, CardBuffer CardAtr) { … }

If a card is effectively inserted in the reader, it will then be read.

Advanced: reading in a background thread

- When a card is read, the main screen might freeze during the process.

- To avoid this behavior, reading is performed in a background thread.
  - Thread cardthread = new Thread(card_read_proc);
  - Or: Thread cardthread = new Thread(read_card_again);
  - cardthread.Start();

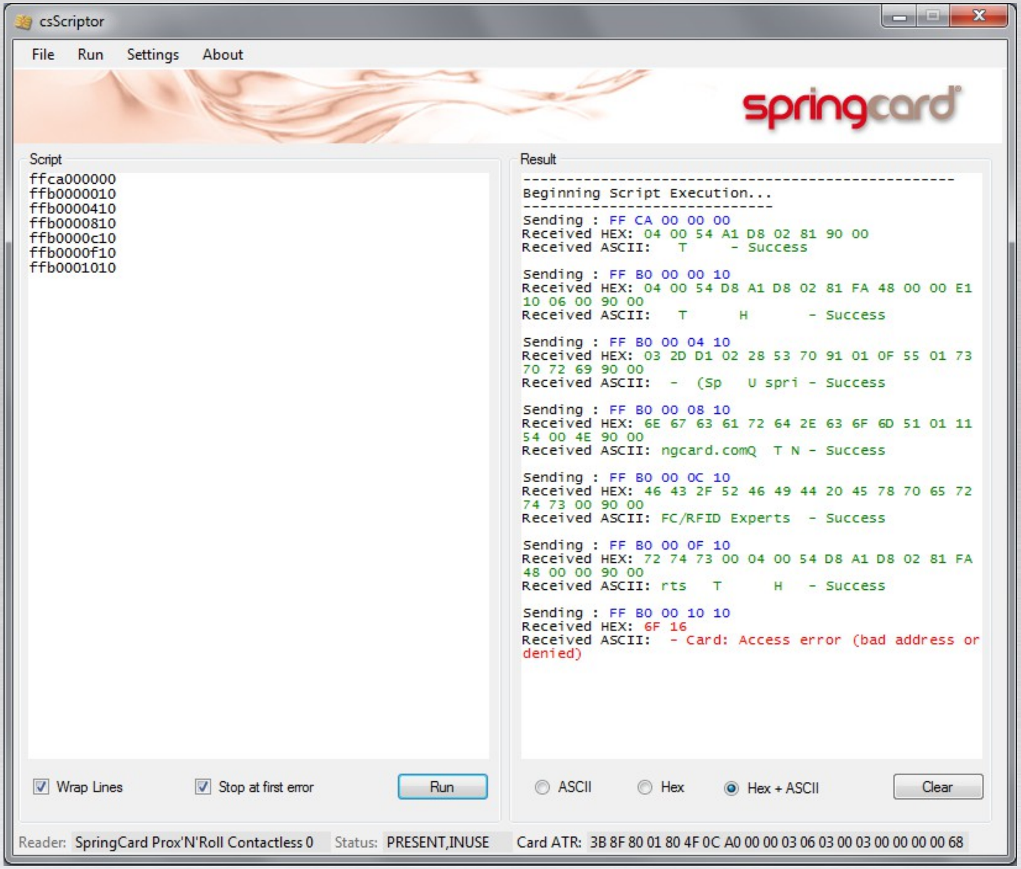
- Once the card is read, the thread exits in the onError(), or in the onCardRead() callback method.

PC/SC Scriptor

(csScriptor)

csScriptor

- This tool allows to send several APDUs to a card in a row.
- For example, first ask the serial number and then read the card
- It is ideal to work with SmartCards, where several APDUs are needed to first select an application and then read is content



Script:

```
ffca000000
ffb0000010
ffb0000410
ffb0000810
ffb0000c10
ffb0000f10
ffb0001010
```

Result:

```
---------------------------------------------------
Beginning Script Execution...
-----------------------------
Sending : FF CA 00 00 00
Received HEX: 04 00 54 A1 D8 02 81 90 00
Received ASCII:   T     - Success

Sending : FF B0 00 00 10
Received HEX: 04 00 54 D8 A1 D8 02 81 FA 48 00 00 E1
10 06 00 90 00
Received ASCII:   T      H        - Success

Sending : FF B0 00 04 10
Received HEX: 03 2D D1 02 28 53 70 91 01 0F 55 01 73
70 72 69 90 00
Received ASCII:  -  (Sp   U spri - Success

Sending : FF B0 00 08 10
Received HEX: 6E 67 63 61 72 64 2E 63 6F 6D 51 01 11
54 00 4E 90 00
Received ASCII: ngcard.comQ  T N - Success

Sending : FF B0 00 0C 10
Received HEX: 46 43 2F 52 46 49 44 20 45 78 70 65 72
74 73 00 90 00
Received ASCII: FC/RFID Experts  - Success

Sending : FF B0 00 0F 10
Received HEX: 72 74 73 00 04 00 54 D8 A1 D8 02 81 FA
48 00 00 90 00
Received ASCII: rts   T      H   - Success

Sending : FF B0 00 10 10
Received HEX: 6F 16
Received ASCII:  - Card: Access error (bad address or
denied)
```

[✓] Wrap Lines [✓] Stop at first error

ASCII Hex [✓ Hex + ASCII]

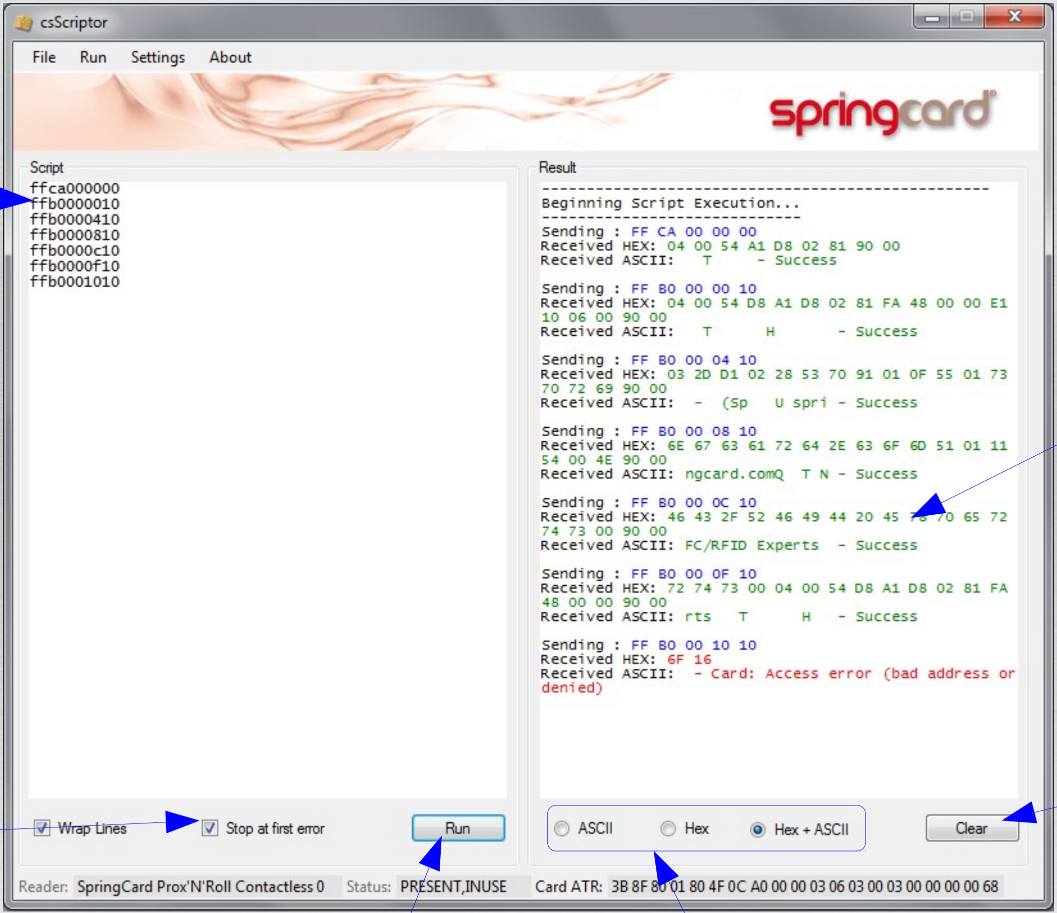
Reader: SpringCard Prox'N'Roll Contactless 0 Status: PRESENT,INUSE Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 03 00 00 00 00 68

csScriptor

- In **SAMPLES/DOTNET/CSCRIPTOR**
- Language = C#
- Target = .NET 4
- The project opens and builds using #Develop 4, the open-source IDE for .NET : http://www.icsharpcode.net/OpenSource/SD/Default.aspx
- Porting to Microsoft Visual C# Express 2010 is straightforward

Overview

Write all the APDUs in this box



```
ffca000000
ffb0000010
ffb0000410
ffb0000810
ffb0000c10
ffb0000f10
ffb0001010
```

```
------------------------------------------------------
Beginning Script Execution...
------------------------------
Sending : FF CA 00 00 00
Received HEX: 04 00 54 A1 D8 02 81 90 00
Received ASCII:   T     - Success

Sending : FF B0 00 00 10
Received HEX: 04 00 54 D8 A1 D8 02 81 FA 48 00 00 E1
10 06 00 90 00
Received ASCII:   T      H       - Success

Sending : FF B0 00 04 10
Received HEX: 03 2D D1 02 28 53 70 91 01 0F 55 01 73
70 72 69 90 00
Received ASCII:  -  (Sp   U spri - Success

Sending : FF B0 00 08 10
Received HEX: 6E 67 63 61 72 64 2E 63 6F 6D 51 01 11
54 00 4E 90 00
Received ASCII: ngcard.comQ  T N - Success

Sending : FF B0 00 0C 10
Received HEX: 46 43 2F 52 46 49 44 20 45 78 70 65 72
74 73 00 90 00
Received ASCII: FC/RFID Experts  - Success

Sending : FF B0 00 0F 10
Received HEX: 72 74 73 00 04 00 54 D8 A1 D8 02 81 FA
48 00 00 90 00
Received ASCII: rts   T      H   - Success

Sending : FF B0 00 10 10
Received HEX: 6F 16
Received ASCII:  - Card: Access error (bad address or
denied)
```

[✓] Wrap Lines   [✓] Stop at first error   ASCII   Hex   [✓ Hex + ASCII]

Reader: SpringCard Prox'N'Roll Contactless 0   Status: PRESENT,INUSE   Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 03 00 00 00 00 68

The card answers are given in this box

Uncheck this box if you want the script to continue even if errors are encountered

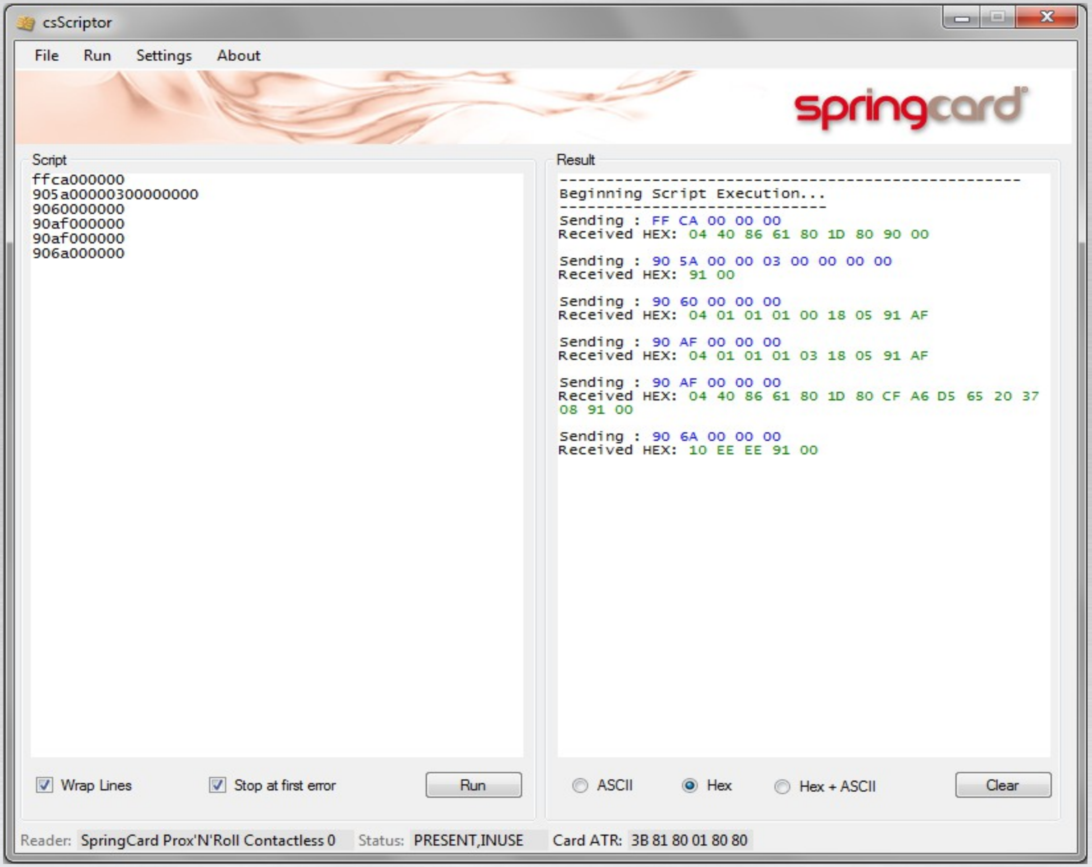
Click on “Clear” to clear the result screen

Click on “Run” to send the APDUs to the card

Choose output format

Example: a DESFire card

- ✓ Get Serial Number
- ✓ Select Application '00 00 00'
- ✓ GetVersion (3 APDUs)
- ✓ GetApplicationIDs



```
ffca000000
905a00000300000000
9060000000
90af000000
90af000000
906a000000
```

```
--------------------------------------------------------------
Beginning Script Execution...
------------------------------------
Sending : FF CA 00 00 00
Received HEX: 04 40 86 61 80 1D 80 90 00

Sending : 90 5A 00 00 03 00 00 00 00
Received HEX: 91 00

Sending : 90 60 00 00 00
Received HEX: 04 01 01 01 00 18 05 91 AF

Sending : 90 AF 00 00 00
Received HEX: 04 01 01 01 03 18 05 91 AF

Sending : 90 AF 00 00 00
Received HEX: 04 40 86 61 80 1D 80 CF A6 D5 65 20 37
08 91 00

Sending : 90 6A 00 00 00
Received HEX: 10 EE EE 91 00
```

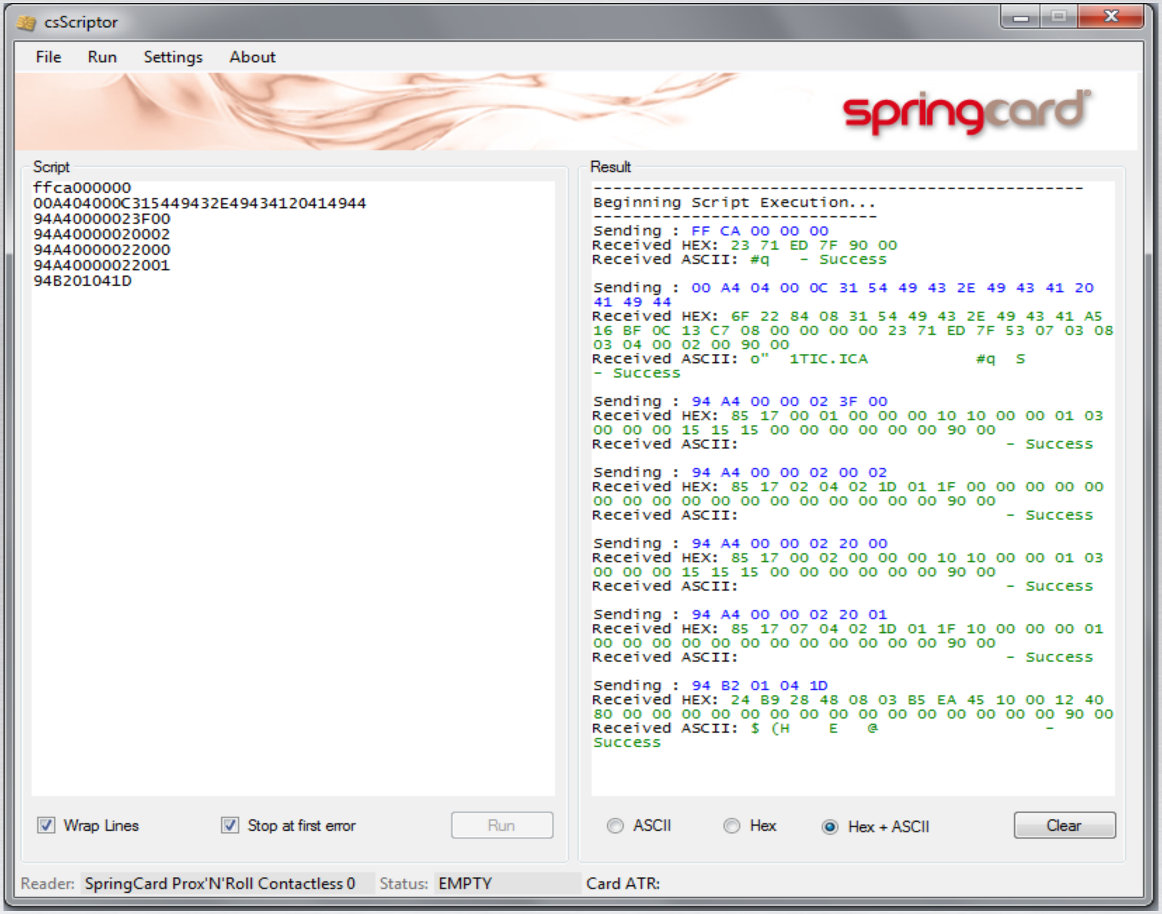
[✓] Wrap Lines [✓] Stop at first error

ASCII [✓ Hex] Hex + ASCII

Reader: SpringCard Prox'N'Roll Contactless 0 Status: PRESENT,INUSE Card ATR: 3B 81 80 01 80 80

Example: a Calypso card

- ✓ Get Serial Number
- ✓ Select 1TIC.ICA Application
- ✓ Select MF
- ✓ Select EF_ICC
- ✓ Select DF_Calypso
- ✓ Select EF_Enr
- ✓ Read ENR, Record#1



Script

```
ffca000000
00A404000C315449432E49434120414944
94A40000023F00
94A40000020002
94A40000022000
94A40000022001
94B201041D
```

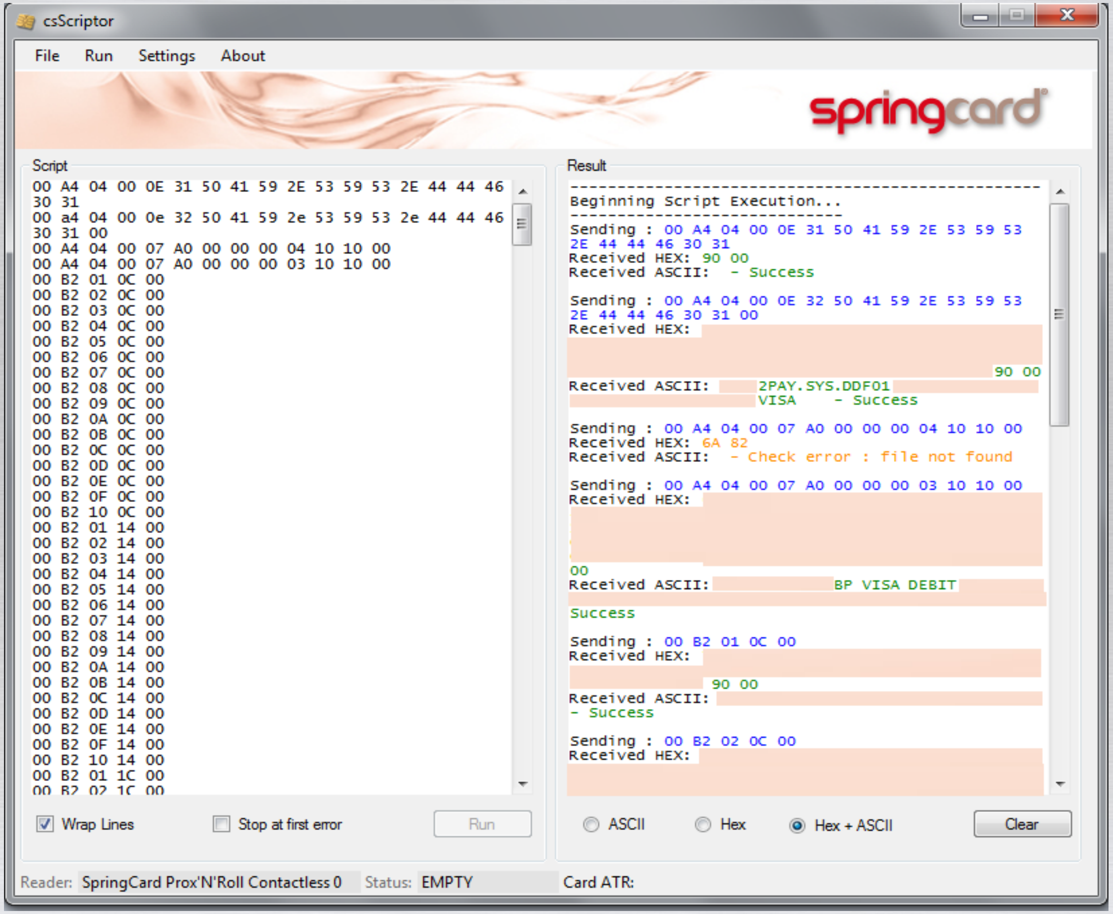
Result

```
----------------------------------------------------------
Beginning Script Execution...
-----------------------------
Sending : FF CA 00 00 00
Received HEX: 23 71 ED 7F 90 00
Received ASCII: #q   - Success

Sending : 00 A4 04 00 0C 31 54 49 43 2E 49 43 41 20
41 49 44
Received HEX: 6F 22 84 08 31 54 49 43 2E 49 43 41 A5
16 BF 0C 13 C7 08 00 00 00 00 23 71 ED 7F 53 07 03 08
03 04 00 02 00 90 00
Received ASCII: o"  1TIC.ICA           #q  S
- Success

Sending : 94 A4 00 00 02 3F 00
Received HEX: 85 17 00 01 00 00 00 10 10 00 00 01 03
00 00 00 15 15 15 00 00 00 00 00 00 90 00
Received ASCII:                              - Success

Sending : 94 A4 00 00 02 00 02
Received HEX: 85 17 02 04 02 1D 01 1F 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 90 00
Received ASCII:                              - Success

Sending : 94 A4 00 00 02 20 00
Received HEX: 85 17 00 02 00 00 00 10 10 00 00 01 03
00 00 00 15 15 15 00 00 00 00 00 00 90 00
Received ASCII:                              - Success

Sending : 94 A4 00 00 02 20 01
Received HEX: 85 17 07 04 02 1D 01 1F 10 00 00 00 01
00 00 00 00 00 00 00 00 00 00 00 00 90 00
Received ASCII:                              - Success

Sending : 94 B2 01 04 1D
Received HEX: 24 B9 28 48 08 03 B5 EA 45 10 00 12 40
80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 90 00
Received ASCII: $ (H    E   @                    -
Success
```

Reader: SpringCard Prox'N'Roll Contactless 0 Status: EMPTY Card ATR:

Example: a payment card

- Select Payment Applications
  - Try MasterCard and Visa
- Read all potential records



```
00 A4 04 00 0E 31 50 41 59 2E 53 59 53 2E 44 44 46
30 31
00 a4 04 00 0e 32 50 41 59 2e 53 59 53 2e 44 44 46
30 31 00
00 A4 04 00 07 A0 00 00 00 04 10 10 00
00 A4 04 00 07 A0 00 00 00 03 10 10 00
00 B2 01 0C 00
00 B2 02 0C 00
00 B2 03 0C 00
00 B2 04 0C 00
00 B2 05 0C 00
00 B2 06 0C 00
00 B2 07 0C 00
00 B2 08 0C 00
00 B2 09 0C 00
00 B2 0A 0C 00
00 B2 0B 0C 00
00 B2 0C 0C 00
00 B2 0D 0C 00
00 B2 0E 0C 00
00 B2 0F 0C 00
00 B2 10 0C 00
00 B2 01 14 00
00 B2 02 14 00
00 B2 03 14 00
00 B2 04 14 00
00 B2 05 14 00
00 B2 06 14 00
00 B2 07 14 00
00 B2 08 14 00
00 B2 09 14 00
00 B2 0A 14 00
00 B2 0B 14 00
00 B2 0C 14 00
00 B2 0D 14 00
00 B2 0E 14 00
00 B2 0F 14 00
00 B2 10 14 00
00 B2 01 1C 00
00 B2 02 1C 00
```

```
------------------------------------------------------
Beginning Script Execution...
-------------------------------
Sending : 00 A4 04 00 0E 31 50 41 59 2E 53 59 53
2E 44 44 46 30 31
Received HEX: 90 00
Received ASCII:  - Success

Sending : 00 A4 04 00 0E 32 50 41 59 2E 53 59 53
2E 44 44 46 30 31 00
Received HEX: [redacted]
                                               90 00
Received ASCII: [redacted] 2PAY.SYS.DDF01 [redacted]
[redacted] VISA    - Success

Sending : 00 A4 04 00 07 A0 00 00 00 04 10 10 00
Received HEX: 6A 82
Received ASCII:  - Check error : file not found

Sending : 00 A4 04 00 07 A0 00 00 00 03 10 10 00
Received HEX: [redacted]
00
Received ASCII: [redacted] BP VISA DEBIT [redacted]
Success

Sending : 00 B2 01 0C 00
Received HEX: [redacted]
[redacted] 90 00
Received ASCII: [redacted]
- Success

Sending : 00 B2 02 0C 00
Received HEX: [redacted]
```

[✓] Wrap Lines   [ ] Stop at first error

ASCII   Hex   [✓ Hex + ASCII]

Reader: SpringCard Prox'N'Roll Contactless 0   Status: EMPTY   Card ATR:

NFC Tags Tool

(NFCTool)

What is an NFC Forum tag ?

- An NFC Forum tag is a card, which content is valid in relation to the requirements of the NFC Forum

- 4 “types” are described :
  - NFC Forum Type 1
  - NFC Forum Type 2
  - NFC Forum Type 3
  - NFC Forum Type 4

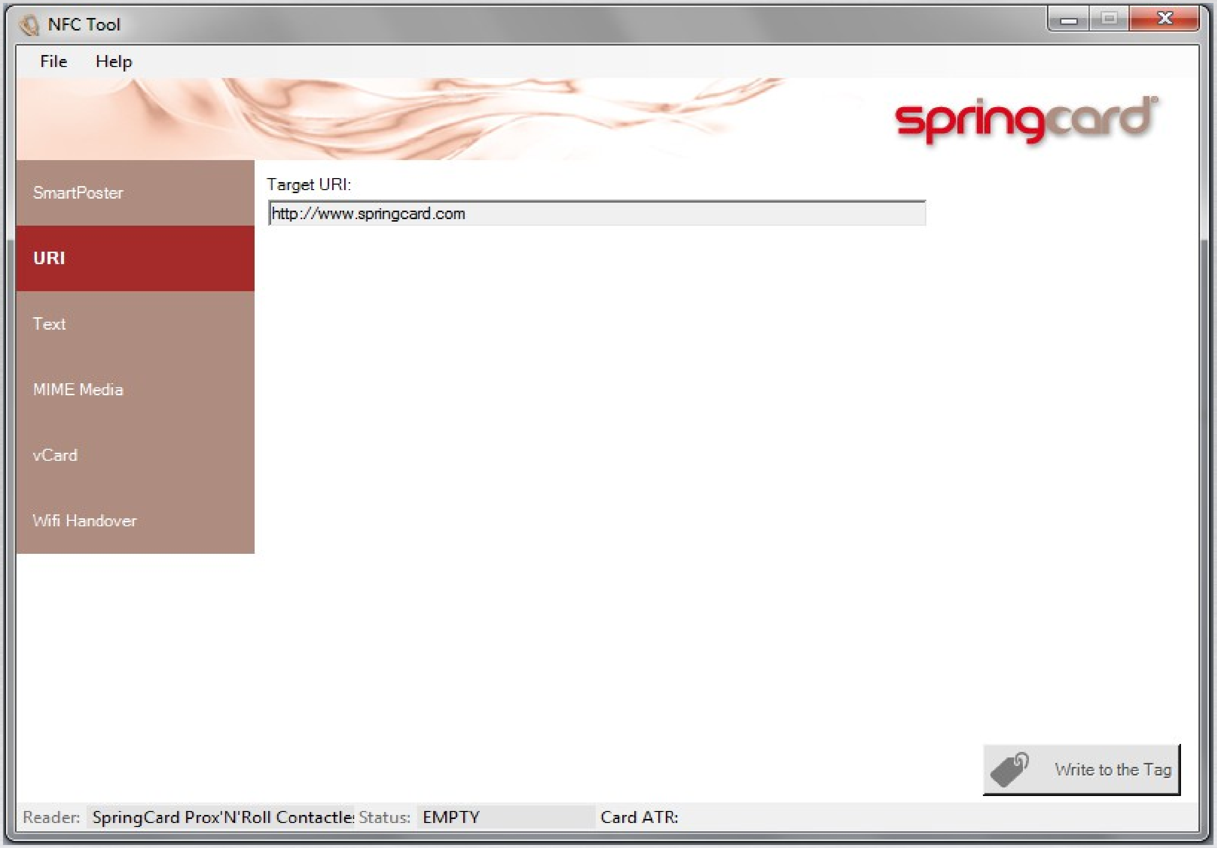
- For more information :
  - http://www.nfc-forum.org/home/

NfcTool

- Nfc Tool enables to:
  - create NFC tags
  - write their content
  - read their content

- Supported contents:
  - SmartPoster
  - URI
  - Text
  - MIME Media
  - vCard
  - Wifi Handover

- Supported tags:
  - Type 2
  - Type 4



Target URI: http://www.springcard.com

Reader: SpringCard Prox'N'Roll Contactle Status: EMPTY Card ATR:

NDEF ? RTD ?

NDEF stands for “NFC Data Exchange Format”

- ✓ It contains a Type and a Payload
- ✓ The type defines the NDEF
- ✓ The payload contains the data

RTD stands for “Record Type Definition”.

An RTD is an NDEF, that has an NFC-specific type, which can be an:

- NFC Forum Well Known Type
- NFC External Type

NDEFs supported by NfcTool

Here is the list of all the NDEFS supported by NfcTool:

- ✓ RtdAlternativeCarrier
- ✓ RtdHandoverSelector
- ✓ RtdMedia
- ✓ RtdSmartPoster
- ✓ RtdText
- ✓ RtdUri
- ✓ RtdVCard

For more information on those objects, please visit our website, where online information is available:

RAJOUTER URL

NfcTool

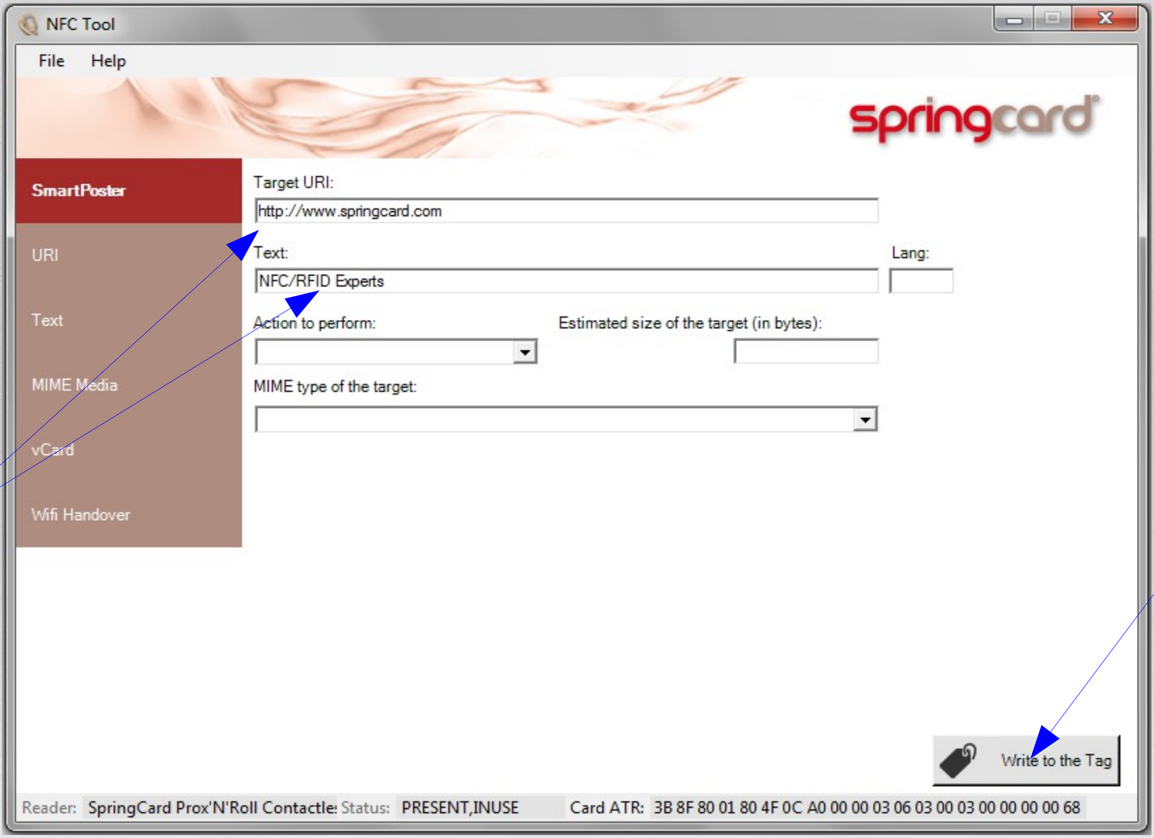
- ✓ In **SAMPLES/DOTNET/NFCTOOL**
- ✓ Language = C#
- ✓ Target = .NET 4
- ✓ The project opens and builds using #Develop4, the open-source IDE for .NET : http://www.icsharpcode.net/OpenSource/SD/Default.aspx
- ✓ Porting to Microsoft Visual C# Express 2010 is straightforward

How to create a Smartposter ?

1. Place a tag on your selected reader

2. Fill in the fields

3. Click on "Write to the Tag"



Target URI: http://www.springcard.com

Text: NFC/RFID Experts

Lang:

Action to perform:

Estimated size of the target (in bytes):

MIME type of the target:

Reader: SpringCard Prox'N'Roll Contactle: Status: PRESENT,INUSE Card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 03 00 00 00 00 68

Writing a Type 2 Tag

A Type 2 Tag is memory card.

To write, the APDU is “FF D6 P1 P2 Lc Data”, where P1 and P2 are the two address bytes (Most Significant Byte First), Lc is the number of bytes to write, and Data is the data to write.

The NfcTagType2.WriteBinary() method is used, where the APDU is transmitted to the card through the ScardChannel object (the same as in MemoryCardTool):

- ScardReader reader = new ScardReader(readerName);
- ScardChannel cardchannel = new SCardChannel(reader)
- CAPDU capdu = new CAPDU(0xFF, 0xD6, (byte) (address / 0x0100), (byte) (address % 0x0100), data)
- RAPDU rapdu = channel.Transmit(capdu);
- if (rapdu.SW != 0x9000)
    - → Error !

Writing a Type 4 Tag

Assuming an already formatted Type 4 Tag, we first need to select the NDEF File: APDU=00 A4 00 0C 02 E1 04 .

We use the NfcTagType4.SelectFile(ushort file_id) method, where file_id=0xE104:

- CAPDU capdu = new CAPDU(0x00, 0xA4, 0x00, 0x0C, (new CardBuffer(file_id)).GetBytes());
- RAPDU rapdu = channel.Transmit(capdu);
- if (rapdu.SW != 0x9000)
  - → Error !

Then, use the APDU "FF D6 P1 P2 Lc Data", where P1 and P2 are the two address bytes (Most Significant Byte First), Lc is the number of bytes to write, and Data is the data to write.

We use the NfcTagType4.WriteBinary(SCardChannel channel, ushort offset, byte[] buffer) method:

- CAPDU capdu = new CAPDU(0x00, 0xD6, (byte) (offset / 0x0100), (byte) (offset % 0x0100), buffer);
- RAPDU rapdu = channel.Transmit(capdu);
- if (rapdu.SW != 0x9000)
  - → Error !

Formatting a DESFire EV1 into a Type 4 Tag

We use a Command Line Application to format a DESFire EV1 into a Type 4 tag : NfcDesfire.exe

This application is launched twice from the “DesfireFormatForm” form.

- ProcessStartInfo info = new ProcessStartInfo("NFCDesfire.exe", parameters);
  - The first call erases the card, provided the given keys are correct
  - The second call creates the CC File and the NDEF File

The main functions used by NfcDesfire.exe come from the pcsc_desfire.dll dll:

- FormatPICC
- CreateIsoApplication
- SelectApplication
- CreateIsoStdDataFile

How to read an NFC Tag

First thing to do: recognize the type of card

- This is done in the NfcTag.Recognize(...) method
  - Check the ATR of the card to determine if it can be a Type 2
  - If not, check if it is a Type 4
  - If not, check if it is a DESFire EV1 that can be formatted

Once the ATR is analyzed, the NfcTag object is created

- It is entirely read (override method "Read()" in NfcTagType2 and NfcTagType4)
- Then, the content is parsed to determine the different NDEFs
  - For Type2 tags, the ParseUserData(...) method parses the content into TLVs
  - Then, the Ndef.Parse(byte[] buffer) static method parses the content into Ndef objects

At the end, the first valid Ndef object found is printed in the corresponding screen (SmartPoster, Vcard, URI, etc...)

Other examples provided in the SDK

Unit. tests

- **SAMPLES/C/REFERENCE**
  - Various utilities, written in ANSI C, to perform the unitary tests of our products / libraries
  - Use Microsoft Visual C++ 6 (Visual Studio 98) to build them

NFC Tags in command line

- **SAMPLES/C/NFCTOOLS**
  - Creates NFC Forum Tags (only type 2 and type 4 on Desfire EV1 supported) from the command line
  - Use Microsoft Visual C++ Express 2010 to open and build the project

PC/SC Monitor

- **SAMPLES/C/PCSCMON**
  - **pcscmon** tracks every PC/SC reader connected to the computer, and traces the insertion/removal of cards
  - This is a derivative work from pcsc_scan
    http://ludovic.rousseau.free.fr/softwares/pcsc-tools/
    and as though distributed under the GPL license. **SpringCard has no link with the writer of this project. Please observe the specific license policy.**

SmartCard APDU from the command line

- **SAMPLES/C/SMACADU**
  - Same idea as csScriptor but in pure C
  - This is an open-source project, provided for convenience only. **SpringCard has no link with the writer of this project. Please observe the specific license policy.**

PC/SC Diagnostic for .NET

- **SAMPLES/DOTNET/PCSCDIAG2**
  - Handy tool to check the installation of the readers, and to perform 'quick and dirty' tests in no time: send APDUs to a card, send Control commands to a reader.
  - Use #Develop 4 to open and build the project

Get UID

- **SAMPLES/DOTNET/VBGETUID**
  - Show how to communicate with PC/SC readers and cards from VB.NET
  - Use Microsoft Visual Basic Express 2010 to open and build the project

vCard printing and encoding

- **SAMPLES/DOTNET/ZENIUSVCARD**
  - Creates your electronic business cards (vCard on NFC Forum Tags) using an Evolis Zenius printer and the integrated SpringCard CrazyWriter or CrazyWriter HSP
  - Demonstrates how to synchronize the contactless encoding with the printing and the moves of the card in the printer's path
  - Use #Develop 4 to open and build the project

PC/SC Diagnostic for Win32

- **SAMPLES/WIN32/PCSCDIAG**
  - Handy tool to check the installation of the readers, and to perform 'quick and dirty' tests in no time: send APDUs to a card, send Control commands to a reader.
  - Use Microsoft Visual C++ 6 (Visual Studio 98) to open and build the project (needs MFC and VS 6 runtime)

Java PC/SC applet

- **SAMPLES/JAVA/JPCSCAPPLET**
  - This applet acts as a 'bridge' between JavaScript and PC/SC. This makes it possible for a web page to communicate with the readers and cards (see www.nfcwizard.com for a live demo of an advanced version of this applet!)
  - No IDE – use java compiler from the command line
  - The applet must be signed to be allowed to access the readers from a web page running in the browser (loop for *Verisign Code Signing Certificate for Java* on the web)

Java PC/SC monitor

- **SAMPLES/JAVA/JPCSCMON**
  - Same as PC/SC Monitor but in Java
  - No IDE – use java compiler from the command line

Going further

Interesting articles on CodeProjects

http://www.codeproject.com/Articles/23018/How-to-access-SmartCards-simply-and-effectively

http://www.codeproject.com/Articles/16653/A-Smart-Card-Framework-for-NET

http://www.codeproject.com/Articles/17013/Smart-Card-Framework-for-NET

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