



## **R/W Protocol Specification**

### **Added batch function for Felica Card**

**DUALi Inc.**

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## 1. FeliCa Batch Commands

New FeliCa batch commands using RWSAM consist of Command code and additional Sub-command code to exchange command/response packet data between reader and RWSAM.

These commands are used to access data securely in FeliCa card using Secure Application Module for a Reader/Writer (RWSAM). The main purpose of RWSAM is to enhance security by concealing the data such as secure logic and keys. There are two types of RWSAM, RC-S251 and RC-S500.

The FeliCa batch commands can be used only for one FeliCa user card with RWSAM.

When the reader is in PCSC or CCID mode, APDU format shall be used.

### 1.1 RWSAM Mutual Authentication in DES (Command=0x5A, Sub-command=0x00)

This is an authentication between the FeliCa Driver in the reader and RWSAM based on a 3-way mutual authentication mechanism (3-key Triple DES) using shared symmetrical keys. User must submit this symmetrical a 24-byte DES key. There is a different mutual authentication key for Normal Mode and Admin Mode but only Normal Mode can be available with this command. The default CBC is all 0x00.

The communication between the FeliCa Driver and RWSAM after mutual authentication is encrypted with the session key created during the Mutual authentication and uses a transaction ID.

#### [Frame Format for vendor mode]

##### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1]	Data[2] ~ Data[25]
0x001B		0x5A	0x00	SAM Slot Num	ENC Mode	Default Key[24]

- ENC Mode: this mode is maintained until finish all transactions.  
0x00: authentication for unencrypted communication  
0x01: authentication for encrypted communication
- Default Key[24] : Authentication Key, symmetrical 24-byte TDES key

##### ■ Response frame

LEN-H	LEN-L	Resp	Data[0] ~ [7]
0x000B		OK	Serial No[8]

- Serial No[8] : RWSAM serial number

### [APDU Format for PCSC mode]

#### ■ Command frame for PCSC mode

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1]	Data[2] ~ Data[25]
0xFE	0x5A	0xFE	0xFE	0x1B	0x00	SAM Slot Num	ENC Mode	Default Key[24]

- ENC Mode: this mode is maintained until finish all transactions.  
0x00: authentication for unencrypted communication  
0x01: authentication for encrypted communication
- Default Key[24] : Authentication Key, symmetrical 24-byte TDES key

#### ■ Response frame for PCSC mode

Resp	Data[0] ~ [7]	SW1	SW2
OK	Serial No[8]	0x90	0x00

- Serial No[8] : RWSAM serial number

## 1.2 RWSAM Mutual Authentication in AES (Command=0x5A, Sub-command=0x01)

This is an authentication between the FeliCa Driver in the reader and RWSAM based on a 3-way mutual authentication mechanism using shared symmetrical keys. User must submit this symmetrical a 16-byte AES key. There is a different mutual authentication key for Normal Mode and Admin Mode but only Normal Mode can be available with this command. The default CBC is all 0x00.

### [Frame Format for vendor mode]

#### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1]	Data[2] ~ Data[17]
0x00	0x13	0x5A	0x01	SAM Slot Num	ENC Mode	Default Key[16]

- ENC Mode: this mode is maintained until finish all transactions.  
0x00: authentication for unencrypted communication (AES)  
0x01: authentication for encrypted communication (AES)
- Default Key[16] : Authentication Key, symmetrical 16-byte AES key

#### ■ Response frame

LEN-H	LEN-L	Resp	Data[0] ~ [7]
0x00	0x0B	OK	Serial No[8]

-Serial No[8] : RWSAM serial number

### [APDU Format for PCSC mode]

#### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1]	Data[2] ~ Data[17]
0xFE	0x5A	0xFE	0xFE	0x13	0x01	SAM Slot Num	ENC Mode	Default Key[16]

- ENC Mode: this mode is maintained until finish all transactions.  
0x00: authentication for unencrypted communication (AES)  
0x01: authentication for encrypted communication (AES)
- Default Key[16] : Authentication Key, symmetrical 16-byte AES key

#### ■ Response frame

Resp	Data[0] ~ [7]	SW1	SW2
OK	Serial No[8]	0x90	0x00

- Serial No[8] : RWSAM serial number

### 1.3 Mutual Authentication in DES (Command=0x5A, Sub-command=0x02)

This is an authentication between the FeliCa card and RWSAM. User must submit Group Service Key and User Service Key.

### [Frame Format for vendor mode]

#### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2m]	Data[ ]	Data[... ]	Data[ ...]	Data[ ...]
2m+2n+20		0x5A	0x02	NoA[1]	LoAC[2m]	NoS[1]	LoSC[2n]	GSK[8]	USK[8]

- NoA[1] : Number of Area(m),  $1 \leq m \leq 16$
- LoAC[2m] : List of Area Code, Little Endian
- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSC[2n] : List of Service Code, Little Endian
- GSK[8] : Group Service Key
- USK[8] : User Service Key

#### ■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x0011		OK	IDi[8]	PMi[8]

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

### [APDU Format for PCSC mode]

- Command frame : extended APDU format can be used when length is over 255bytes.

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2m]	Data[ ]	Data[... ]	Data[ ...]	Data[ ...]
0xFE	0x5A	0xFE	0xFE	2m+2n+20	0x02	NoA[1]	LoAC[2m]	NoS[1]	LoSC[2n]	GSK[8]	USK[8]

- NoA[1] : Number of Area(m),  $1 \leq m \leq 16$
- LoAC[2m] : List of Area Code, Little Endian
- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSC[2n] : List of Service Code, Little Endian
- GSK[8] : Group Service Key
- USK[8] : User Service Key

- Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDi[8]	PMi[8]	0x90	0x00

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

### 1.4 Mutual Authentication RWSAM in DES (Command=0x5A, Sub-command=0x03)

This command is used when the specified key type is GSK/USK. This is an authentication between the FeliCa card and RWSAM using the keys (GSK & USK) stored in SAM. User doesn't need to submit keys but need to submit key codes and versions for GSK & USK.

### [Frame Format for vendor mode]

- Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]	Data[2...3]	Data[4...5]	Data[6...7]	Data[8...9]
0x00	0x0B	0x5A	0x03	SC[2]	GSKC[2]	GSKV[2]	USKC[2]	USKV[2]

- SC[2] : System Code (2bytes)
- GSKC[2] : Group Service Key Code[2] , Little Endian
- GSKV[2] : Group Service Key Version[2] , Little Endian
- USKC[2] : User Service Key Code[2] , Little Endian
- USKV[2] : User Service Key Version[2] , Little Endian



■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x0011		OK	IDi[8]	PMi[8]

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

**[APDU Format for PCSC mode]**

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]	Data[2...3]	Data[4...5]	Data[6...7]	Data[8...9]
0xFE	0x5A	0xFE	0xFE	0x0B	0x03	SC[2]	GSKC[2]	GSKV[2]	USKC[2]	USKV[2]

- SC[2] : System Code (2bytes)
- GSKC[2] : Group Service Key Code[2] , Little Endian
- GSKV[2] : Group Service Key Version[2] , Little Endian
- USKC[2] : User Service Key Code[2] , Little Endian
- USKV[2] : User Service Key Version[2] , Little Endian

■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDi[8]	PMi[8]	0x90	0x00

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

## 1.5 Mutual Authentication RWSAM in DES (Command=0x5A, Sub-command=0x04)

This command is used when the specified key type is Area Key / Service Key. This is an authentication between the FeliCa card and RWSAM using the keys (Area Key & Service Key) stored in SAM. User doesn't need to submit keys but need to submit key codes and versions for Area Key & Service Key.

**[Frame Format for vendor mode]**

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]	Data[2...3]	Data[4]	Data[5...]	Data[...]	Data[...]
8+4m+4n		0x5A	0x04	SC[2]	SKV[2]	NoA[1]	LoACKV[4m]	NoS[1]	LoSCKV[4n]

- SC[2] : System Code (2bytes)
- SKV[2] : System Key Version, Little Endian
- NoA[1] : Number of Area(m), 1<=m<=16

- LoACKV[4m] : List of Area Code(2) / Key Version(2), Little Endian
- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSCKV[2n] : List of Service Code(2) / Key Version(2), Little Endian

■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x0011		OK	IDi[8]	PMi[8]

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK
- 

[APDU Format for PCSC mode]

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]	Data[2...3]	Data[4]	Data[5...]	Data[...]	Data[...]
0xFE	0x5A	0xFE	0xFE	8+4m+4n	0x04	SC[2]	SKV[2]	NoA[1]	LoACKV[4m]	NoS[1]	LoSCKV[4n]

- SC[2] : System Code (2bytes)
- SKV[2] : System Key Version, Little Endian
- NoA[1] : Number of Area(m),  $1 \leq m \leq 16$
- LoACKV[4m] : List of Area Code(2) / Key Version(2), Little Endian
- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSCKV[2n] : List of Service Code(2) / Key Version(2), Little Endian

■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDi[8]	PMi[8]	0x90	0x00

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

## 1.6 Mutual Authentication in AES (Command=0x5A, Sub-command=0x05)

This is an authentication between the FeliCa card and RWSAM. User must submit Group Key.

[Frame Format for vendor mode]

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2n]	Data[2n+1...2n+16]
2n+19		0x5A	0x05	NoS[1]	LoSC[2n]	GK[16]

- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSC[2n] : List of Service Code, Little Endian
- GK[16] : Group Key

■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x0011		OK	IDi[8]	PMi[8]

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

### [APDU Format for PCSC mode]

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2n]	Data[ 2n+1...2n+16]
0xFE	0x5A	0xFE	0xFE	2n+19	0x05	NoS[1]	LoSC[2n]	GK[16]

- NoS[1] : Number of Service(n),  $1 \leq n \leq 16$
- LoSC[2n] : List of Service Code, Little Endian
- GK[16] : Group Key

■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDi[8]	PMi[8]	0x90	0x00

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

## 1.7 Mutual Authentication RWSAM in AES (Command=0x5A, Sub-command=0x06)

This command is used when the specified key type is “Node key, Diversification Code specified”. This is an authentication between the FeliCa card and RWSAM using the keys (Node Key) stored in SAM. User doesn't need to submit keys but need to submit service codes and key versions.

### [Frame Format for vendor mode]

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]	Data[2]	Data[3...]
4n+4		0x5A	0x06	SC[2]	NoS[1]	LoSCKV[4n]

- SC[2] : System Code (2bytes)
- NoS[1] : Number of Service,  $1 \leq n \leq 16$
- LoSCKV[4n] : List of Service Code[2] & Key Version[2] , Little Endian

■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x00	11	OK	IDi[8]	PMi[8]

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

**[APDU Format for PCSC mode]**

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]	Data[2]	Data[3...]
0xFE	0x5A	0xFE	0xFE	4n+4	0x06	SC[2]	NoS[1]	LoSCKV[4n]

- SC[2] : System Code (2bytes)
- NoS[1] : Number of Service,  $1 \leq n \leq 16$
- LoSCKV[4n] : List of Service Code[2] & Key Version[2] , Little Endian

■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDi[8]	PMi[8]	0x90	0x00

- IDi[8] : Issue ID Block if Resp is OK
- PMi[8] : Issue ID Block if Resp is OK

## 1.8 Mutual Authentication RWSAM in AES (Command=0x5A, Sub-command=0x07)

This command is used when the specified key type is “GK, Diversification Code specified”. This is an authentication between the FeliCa card and RWSAM using the keys (GK) stored in SAM. User doesn't need to submit keys but need to submit service codes and key versions.

**[Frame Format for vendor mode]**

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]	Data[2...3]	Data[4...5]
4n+4		0x5A	0x07	SC[2]	GKC[2]	GKV[2]

- SC[2] : System Code (2bytes)

- GKC[2] : GK Code, Little Endian
- GKV[2] : GK Version , Little Endian

■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x0011		OK	IDI[8]	PMI[8]

- IDI[8] : Issue ID Block if Resp is OK
- PMI[8] : Issue ID Block if Resp is OK

**[APDU Format for PCSC mode]**

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]	Data[2...3]	Data[4...5]
0xFE	0x5A	0xFE	0xFE	4n+4	0x07	SC[2]	GKC[2]	GKV[2]

- SC[2] : System Code (2bytes)
- GKC[2] : GK Code, Little Endian
- GKV[2] : GK Version , Little Endian

■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDI[8]	PMI[8]	0x90	0x00

- IDI[8] : Issue ID Block if Resp is OK
- PMI[8] : Issue ID Block if Resp is OK

## 1.9 Generate GSK/USK(Command=0x5A, Sub-command=0x08)

This command generates group Service Key and user Service Key instances of DES cards from System Key, Area Key, and Service Key.

**[Frame Format for vendor mode]**

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data1	Data2	Data3	Data2	Data3
17		0x5A	0x08	System key[8]	Number of Area Key instances [1]	List of Area Key [8n]	Number of Service Key [1]	List of Service Key[8n]

## ■ Response frame

LEN-H	LEN-L	Resp	Data[2...17]
0x0011		OK	GSK and USK[16]

**[APDU Format for PCSC mode]**

## ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data1	Data2	Data3	Data2	Data3
0xFE	0x5A	0xFE	0xFE	17	0x08	System key[8]	Number of Area Key instances [1]	List of Area Key [8n]	Number of Service Key [1]	List of Service Key[8n]

## ■ Response frame

Resp	Data[2...17]	SW1	SW2
OK	GSK and USK[16]	0x90	0x00

**1.10 Generate Group Key (Command=0x5A, Sub-command=0x09)**

This command generates Group Key instances of AES cards.

**[Frame Format for vendor mode]**

## ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1]	Data[2....]
17		0x5A	0x09	Function type[1]	Number of Service Key[1]	List of Service Key [16n]

- Function type [1] : 0x00
- Number of Service Key [1] :
- List of Service Key [16n] :

## ■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1]	Data[2...17]
0x0011		OK	Function type[1]	Result[1]	Group Key[16]

- Function type [1] :
- Result[1] :
- Group Key[16] :

**[APDU Format for PCSC mode]**

## ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1]	Data[2....]
0xFE	0x5A	0xFE	0xFE	17	0x09	Function type[1]	Number of Service Key[1]	List of Service Key [16n]

- Function type [1] : 0x00
- Number of Service Key [1] :
- List of Service Key [16n] :

## ■ Response frame

Resp	Data[0]	Data[1]	Data[2...17]	SW1	SW2
OK	Function type[1]	Result[1]	Group Key[16]	0x90	0x00

- Function type [1] :
- Result[1] :
- Group Key[16] :

**1.11 Polling Command (Command=0x5A, Sub-Command = 0x10)**

This command is used to exchange polling commands with the FeliCa card after authentication. Only one FeliCa card can be handled using this command because Time slot is fixed at 00h internally.

**[Frame Format for vendor mode]**

## ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]
4		0x5A	0x10	SC[2]

- SC[2] : System Code

## ■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]
0x11		OK	IDm[8]	PMm[8]

- Response: OK(0x00), Err(pls refer to the response code).
- IDm[8]
- PMm[8]

**[APDU Format for PCSC mode]**

## ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]
0xFE	0x5A	0xFE	0xFE	4	0x10	SC[2]

- SC[2] : System Code

## ■ Response frame

Resp	Data[0...7]	Data[8...15]	SW1	SW2
OK	IDm[8]	PMm[8]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- IDm[8]
- PMm[8]

**1.12 Read Block Command (Command=0x5A, Sub-Command = 0x11)**

This command is used to exchange read commands with the FeliCa card after authentication.

**[Frame Format for vendor mode]**

## ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2n]
2n+3		0x5A	0x11	NoB[1]	BL[2n]

- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[2n] : Block List

## ■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1...16n]
16n+2		OK	NoB[1]	BD[16n]

- Response: OK(0x00), Err(pls refer to the response code).
- NoB[1] : Number of Block(n), only when Resp is OK.
- BD[16n] : Block Data(16n) only when Resp is OK.

**[APDU Format for PCSC mode]**

## ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2n]
0xFE	0x5A	0xFE	0xFE	2n+3	0x11	NoB[1]	BL[2n]



- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[2n] : Block List

■ Response frame

Resp	Data[0]	Data[1...16n]	SW1	SW2
OK	NoB[1]	BD[16n]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- NoB[1] : Number of Block(n), only when Resp is OK.
- BD[16n] : Block Data(16n) only when Resp is OK.

### 1.13 Write Block Command (Command=0x5A, Sub-command=0x12)

This command is used to exchange write commands with the FeliCa card after authentication.

#### [Frame Format for vendor mode]

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2n]	Data[n+1...]
2n+3+16n		0x5A	0x12	NoB[1]	BL[2n]	BD[16n]

- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[n] : Block List(2n), not supporting 3bytes Block List
- BD[16n] : Block Data(16n)

■ Response frame

LEN-H	LEN-L	Resp
1		OK

- Response: OK(0x00), Err(pls refer to the response code).

#### [APDU Format for PCSC mode]

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2n]	Data[n+1...]
0xFE	0x5A	0xFE	0xFE	2n+3+16n	0x12	NoB[1]	BL[2n]	BD[16n]

- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[n] : Block List(2n), not supporting 3bytes Block List
- BD[16n] : Block Data(16n)

■ Response frame

Resp	SW1	SW2
OK	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).

## 1.14 Read Block Command without Encryption (Command=0x5A, Sub-command=0x13)

This command is used to exchange read command with the FeliCa card without mutual authentication.

### [Frame Format for vendor mode]

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[2m+2...]
2m+2n+4		0x5A	0x13	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]

- NoS[1] : Number of Service(m),  $1 \leq m \leq 16$
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[2n] : List of Block Number, not supporting 3bytes Block List

■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1...16n]
16n+2		OK	NoB[1]	BD[16n]

- Response: OK(0x00), Err(pls refer to the response code).
- NoB[1] : Number of Block(n), only when Resp is OK.
- BD[16n] : Block Data(16n) only when Resp is OK.

### [APDU Format for PCSC mode]

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[2m+2...]
0xFE	0x5A	0xFE	0xFE	2m+2n+4	0x13	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]

- NoS[1] : Number of Service(m),  $1 \leq m \leq 16$
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- BL[2n] : List of Block Number, not supporting 3bytes Block List

■ Response frame

Resp	Data[0]	Data[1...16n]	SW1	SW2
OK	NoB[1]	BD[16n]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- NoB[1] : Number of Block(n), only when Resp is OK.
- BD[16n] : Block Data(16n) only when Resp is OK.

### 1.15 Write Block Command without Encryption (Command=0x5A, Sub-command=0x14)

This command is used to exchange write commands with the FeliCa card without authentication.

#### [Frame Format for vendor mode]

##### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[...]	Data[...]
2m+2n+16n+4	0x5A	0x14	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]	BD[16n]	

- NoS[1] : Number of Service(m),  $1 \leq m \leq 16$
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- LoBN[2n] : List of Block Number(2n), not supporting 3bytes Block List
- BD[16n] : Block Data(16n)

##### ■ Response frame

LEN-H	LEN-L	Resp
N+1		OK

- Response: OK(0x00), Err(pls refer to the response code).

#### [APDU Format for PCSC mode]

##### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[...]	Data[...]
0xFE	0x5A	0xFE	0xFE	2m+2n+16n+4	0x14	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]	BD[16n]

- NoS[1] : Number of Service(m),  $1 \leq m \leq 16$
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Number of Block(n), maximum number of blocks depends on the card product
- LoBN[2n] : List of Block Number(2n), not supporting 3bytes Block List
- BD[16n] : Block Data(16n)

■ Response frame

Resp	SW1	SW2
OK	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).

### 1.16 Request Service Command (Command=0x5A, Sub-command=0x15)

This command is used to identify a specific card by means of IDm obtained in the Polling process and requests the required area and service. The card replies if it has the requested area and service and sends Area/Service key version data.

#### [Frame Format for vendor mode]

■ Command frame

LEN-H	LEN-L	SCMD	Data[0]	Data[0]	Data[1...2m]
2m+3		0x15	PDT[1]	NoAS[1]	LoSC[2m]

- PDT[1] : Packet Data type
  - 0 : DES
  - 1 : AES
- NoAS[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoSC[2m] : List of Area Code/Service Code, Little Endian

■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1...2m]
2m+2		OK	NoAS[1]	LoASKV[2m]

- Response: OK(0x00), Err(pls refer to the response code).
- NoAS[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoASKV[2m] : List of Area/Service Key Version, Little Endian

#### [APDU Format for PCSC mode]

■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[0]	Data[1...2m]
0xFE	0x5A	0xFE	0xFE	2m+3	0x15	PDT[1]	NoAS[1]	LoSC[2m]

- PDT[1] : Packet Data type

0 : DES

1 : AES

- NoAS[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoSC[2m] : List of Area Code/Service Code, Little Endian

■ Response frame

Resp	Data[0]	Data[1...2m]	SW1	SW2
OK	NoAS[1]	LoASKV[2m]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- NoAS[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoASKV[2m] : List of Area/Service Key Version, Little Endian

### 1.17 Request Service v2 Command (Command=0x5A, Sub-command=0x16)

This command is used to identify a specific card by means of IDm obtained in the Polling process and requests the required area and service. The card replies if it has the requested area and service and sends Node(AES/DES) key version data.

**[Frame Format for vendor mode]**

■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1]	Data[2...2m]
2m+3		0x5A	0x16	PDT[1]	NoN[1]	LoNC[2m]

- PDT[1] : Packet Data type
  - 0 : DES
  - 1 : AES
- NoN[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoNC[2m] : List of Node Code, Little Endian

■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1]	Data[2]	Data[3]	Data[4...2m]
4m+2		OK	NoN[1]	Status1[1]	Status2[1]	El[1]	LoNKVA[2m]

- Response: OK(0x00), Err(pls refer to the response code).
- NoN[1] : Number of Node(m),  $1 \leq m \leq 32$
- Status1[1] : Status Flag1
- Status1[2] : Status Flag2

- EI[1] : Encryption Identifier
- LoNKVA [2m] : List of Node Key Version(AES), Little Endian or  
List of Node Key Version(DES), Little Endian

### [APDU Format for PCSC mode]

#### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1]	Data[2...2m]
0xFE	0x5A	0xFE	0xFE	2m+3	0x16	PDT[1]	NoN[1]	LoNC[2m]

- PDT[1] : Packet Data type  
0 : DES  
1 : AES
- NoN[1] : Number of Area/Service(m),  $1 \leq m \leq 32$
- LoNC[2m] : List of Node Code, Little Endian

#### ■ Response frame

Resp	Data[0]	Data[1]	Data[2]	Data[3]	Data[4...2m]	SW1	SW2
OK	NoN[1]	Status1[1]	Status2[1]	EI[1]	LoNKVA[2m]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- NoN[1] : Number of Node(m),  $1 \leq m \leq 32$
- Status1[1] : Status Flag1
- Status1[2] : Status Flag2
- EI[1] : Encryption Identifier
- LoNKVA [2m] : List of Node Key Version(AES), Little Endian or  
List of Node Key Version(DES), Little Endian

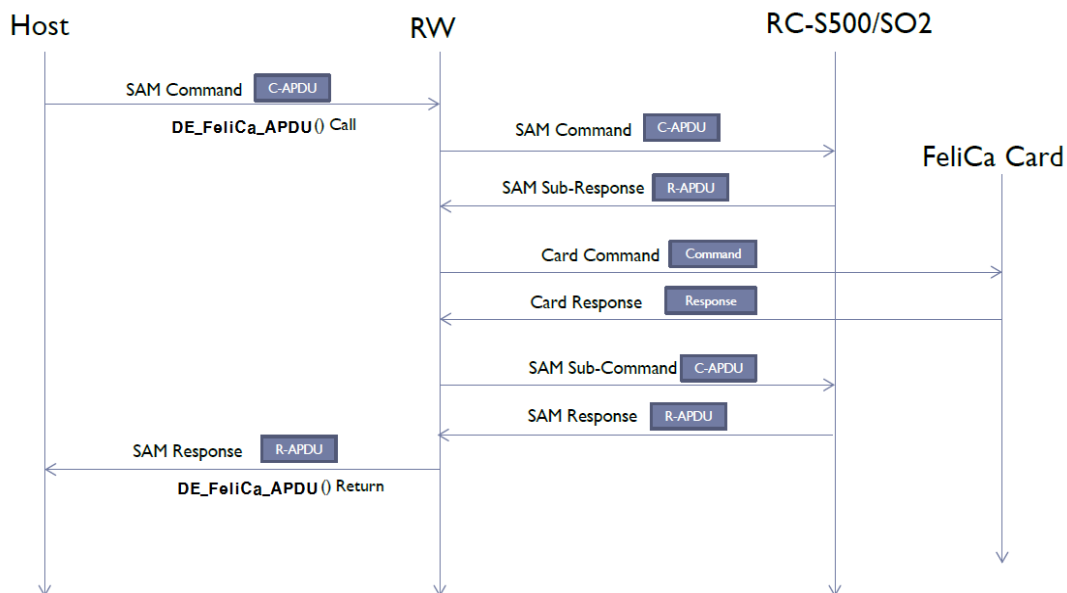
### 1.18 FeliCa Transparent - SubCmd Command (Command=0x5A, Sub-command=0x18)

This command is used to reduce the number of communications between host and reader, and also reduce the total processing time because host doesn't involve communications with RWSAM.

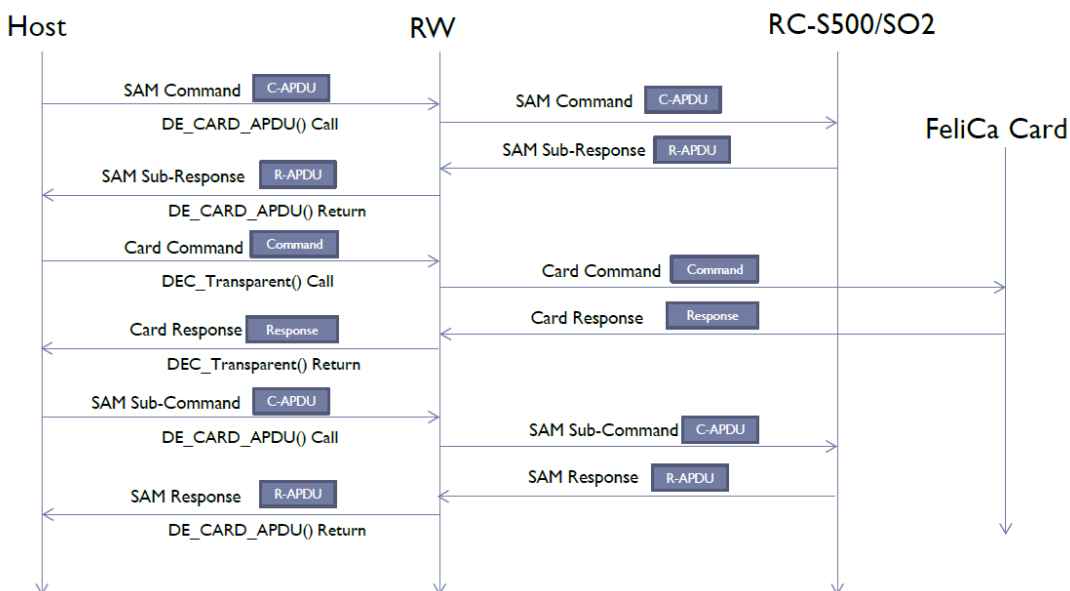
The reader sends APDU-format commands from host to RWSAM. After getting response data from RWSAM, the reader automatically selects Card Command from the response data and sends it to the FeliCa card. Then RWSAM Sub-command is selected after getting Card Response from the card. The reader gets RWSAM Response and sends it to the host.

**(Please, Don't use this command for polling command)**

When this command is used, total processing time is reduced because reader handles Card Commands and Card Responses internally.



Conventionally commands are sent like below for getting data from a FeliCa card using RWSAM. All commands processing shall be done separately in Host side. These procedures will cause longer transaction time.



### [Frame Format for vendor mode]

- Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1]	Data[n]
n+3		0x5A	0x18	SAM Slot Num [1]	RETRY[1]	Data[n]

- SAM Slot Num [1] : slot number of SAM
- RETRY[1] : Retry count when the reader can't get Cad Response data from the FeliCa card. The reader will send retry SAM Command to RWSAM to get Card Command again.
  - Please use from "1".
  - If you set "0" as this value, the reader doesn't send command to the FeliCa card.
- Data[n] : Data to send the card

#### ■ Response frame

LEN-H	LEN-L	Resp	Data[n]
n+1		OK	Response Data[n]

- Response: OK(0x00), Err(pls refer to the response code).
- Data [n] : Response Data from the card

### [APDU Format for PCSC mode]

#### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1]	Data[n]
0xFE	0x5A	0xFE	0xFE	n+3	0x18	SAM Slot Num [1]	RETRY[1]	Data[n]

- SAM Slot Num [1] : slot number of SAM
- RETRY[1] : Retry count when the reader can't get Cad Response data from the FeliCa card. The reader will send retry SAM Command to RWSAM to get Card Command again.
  - Please use from "1".
  - If you set "0" as this value, the reader doesn't send command to the FeliCa card.
- Data[n] : Data to send the card

#### ■ Response frame

Resp	Data[n]	SW1	SW2
OK	Response Data[n]	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).
- Data [n] : Response Data from the card



## 2. FeliCa Card Commands without RWSAM

These are FeliCa Card commands to handle FeliCa card without RWSAM.

### 2.1 Polling (Command=0x5B, Sub-command=0x00)

This command is used to send Polling command to FeliCa card without data encryption.

#### [Frame Format for vendor mode]

##### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0...1]	Data[2]	Data[3]
0x00	0x06	0x5B	0x00	System Code[2]	Time Slot[1]	Request Code[1]

- System Code[2] : System Code. 0xffff indicate all system code.
- Time Slot[1] : Time Slot. (0x00, 0x01, 0x03, 0x07, 0x0f)
- Request Code[1] : 0x01(system code is requested) Others(system code is not requested)

##### ■ Response frame

LEN-H	LEN-L	Resp	Data[0...7]	Data[8...15]	Data[16...17]
17 or 19		OK	IDm[8]	PMm[8]	SysCode[2]

- IDm[8] : IDm of FeliCa card.
- PMm[8] : PMm of FeliCa card.
- SysCode[2] : System code(when the system code is requested)
- Response: OK(0x00), Err(pls refer to the response code).

#### [APDU Format for PCSC mode]

##### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0...1]	Data[2]	Data[3]
0xFE	0x5B	0xFE	0xFE	0x06	0x00	System Code[2]	Time Slot[1]	Request Code[1]

- System Code[2] : System Code. 0xffff indicate all system code.
- Time Slot[1] : Time Slot. (0x00, 0x01, 0x03, 0x07, 0x0f)
- Request Code[1] : 0x01(system code is requested) Others(system code is not requested)

##### ■ Response frame

Resp	Data[0...7]	Data[8...15]	Data[16...17]	SW1	SW2
OK	IDm[8]	PMm[8]	SysCode[2]	0x90	0x00

- IDm[8] : IDm of FeliCa card.
- PMm[8] : PMm of FeliCa card.

- SysCode[2] : System code(when the system code is requested)
- Response: OK(0x00), Err(pls refer to the response code).

## 2.2 Read without Encryption (Command=0x5B, Sub-command=0x01)

This command is used to send Read command to FeliCa card without mutual authentication.

### [Frame Format for vendor mode]

#### ■ Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[ 2m+2...]
2m+2n+4		0x5B	0x01	NoS[1]	LoSC(2m)	NoB[1]	LoBN(2n)

- NoS[1] : Number of Services(m)
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Total Number of Blocks to be accessed(n)
- LoBN[2n] : List of block number, Service Code Order[1] | Block Number[1]

To read data from Block 0, 1 of Service Code 0009h and Block 2,3 of Service Code 000Bh,  
-> 52 02 09 00 0B 00 04 00 00 00 01 01 02 01 03 should be sent to the reader

#### ■ Response frame

LEN-H	LEN-L	Resp	Data[0]	Data[1...16n]
16n+2		OK	NoB	BD (16n)

- Data[0] : NB, Number of Blocks (n)
- Data[1...N-1] : Block Data, 16 x n bytes
- Response: OK(0x00), Err(pls refer to the response code).

### [APDU Format for PCSC mode]

#### ■ Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[ 2m+2...]
0xFE	0x5B	0xFE	0xFE	2m+2n+4	0x01	NoS[1]	LoSC(2m)	NoB[1]	LoBN(2n)

- NoS[1] : Number of Services(m)
- LoSC[2m] : List of Service Code, Little Endian
- NoB[1] : Total Number of Blocks to be accessed(n)
- LoBN[2n] : List of block number, Service Code Order[1] | Block Number[1]

To read data from Block 0, 1 of Service Code 0009h and Block 2,3 of Service Code 000Bh,  
-> 52 02 09 00 0B 00 04 00 00 00 01 01 02 01 03 should be sent to the reader

- Response frame

Resp	Data[0]	Data[1...16n]	SW1	SW2
OK	NoB	BD (16n)	0x90	0x00

- Data[0] : NB, Number of Blocks (n)
- Data[1...N-1] : Block Data, 16 x n bytes
- Response: OK(0x00), Err(pls refer to the response code).

### 2.3 Write without Encryption (Command=0x5B, Sub-command=0x02)

This command is used to send Write command to FeliCa card without mutual authentication.

### [Frame Format for vendor mode]

- Command frame

LEN-H	LEN-L	CMD	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[ 2m+2]	Data[ 2m+3...]
2m+2n+16n+4		0x5B	0x02	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]	BD[16n]

- NoS[1] : Number of Services (m)
- LoSC[2m] : List of Service Code(little endian, Lower Byte | Higher Byte), 2m bytes
- NoB[1] : Total Number of Blocks (n)
- LoBN[2n] : List of block number, Service Code Order[1] | Block Number[1]
- BD[16n] : Data to be written to the card, 16n bytes

To write data to Block 0 of Service Code 0009h and Block 2 of Service Code 000Bh,

-> 53 02 09 00 0B 00 02 00 00 01 02 xx xx xx xx xx xx xx xx xx xx xx xx yy yy yy yy yy yy  
yy yy yy yy yy yy yy yy yy yy yy should be sent to the reader

- Response frame

LEN-H	LEN-L	Resp
0x0001		OK

- Response: OK(0x00), Err(pls refer to the response code).

### [APDU Format for PCSC mode]

- Command frame

CLA	INS	P1	P2	Lc	SCMD	Data[0]	Data[1...2m]	Data[2m+1]	Data[ 2m+2]	Data[ 2m+3...]
0xFE	0x5B	0xFE	0xFE	2m+2n+16n+4	0x02	NoS[1]	LoSC[2m]	NoB[1]	LoBN[2n]	BD[16n]

- NoS[1] : Number of Services (m)
- LoSC[2m] : List of Service Code(little endian, Lower Byte | Higher Byte), 2m bytes
- NoB[1] : Total Number of Blocks (n)
- LoBN[2n] : List of block number, Service Code Order[1] | Block Number[1]
- BD[16n] : Data to be written to the card, 16n bytes

To write data to Block 0 of Service Code 0009h and Block 2 of Service Code 000Bh,

-> 53 02 09 00 0B 00 02 00 00 01 02 xx xx xx xx xx xx xx xx xx xx xx yy yy yy yy yy yy  
yy yy yy yy yy yy yy yy yy yy   should be sent to the reader

- Response frame

Resp	SW1	SW2
OK	0x90	0x00

- Response: OK(0x00), Err(pls refer to the response code).

### 3. How to use batch commands in PCSC mode

#### 3.1 Format of Conversion

This is the rule how to convert vendor commands into APDU-format commands in PCSC mode. All FeliCa-related vendor commands including FeliCa batch commands can be sent.

Vendor Protocol(Command Frame)

Name	STX	LEN-H	LEN-L	CMD	Data	LRC
Values	0x02	0xHH	0xHH	0xHH	Data[N-1]	0xHH
Length.	1-byte	N		1-byte	n-byte	1-byte

APDU command format in PCSC

CLASS	INS	P1	P2	LC	DATA IN	Le(option)
0xFE	0xHH	0xFE	0xFE	N-1	Data[N-1]	0x00

Vendor Protocol(Response Frame)

Name	STX	LEN-H	LEN-L	Resp	Data	LRC
Values	0x02	0xHH	0xHH	0xHH	Data[N-1]	0xHH
Length.	1-byte	N		1-byte	n-byte	1-byte

APDU response format in PCSC

Resp	DATA IN	SW
0xHH	Data[0..n]	0x9000

Extended APDU format also can be used when Lc is larger than 255bytes. Lc shall be written in 3-byte format as specified in ISO7816 standards. For example, Lc should be 0x00012C if data size is 300bytes

#### 3.2 Example

[Command for changing mode to Vendor mode]

- Frame data in vendor mode : 0003150100
- Frame data in PCSC mode : FE15FEFE02010000 or FE15FEFE000002010000(Extended length)