It’s Time to Replace Your Wallet with Mobile Tizen Devices!

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TIZEN™ DEVELOPER CONFERENCE 2014 SAN FRANCISCO

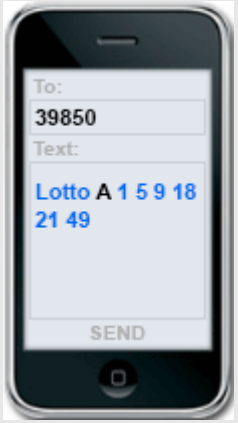
Payment Overview

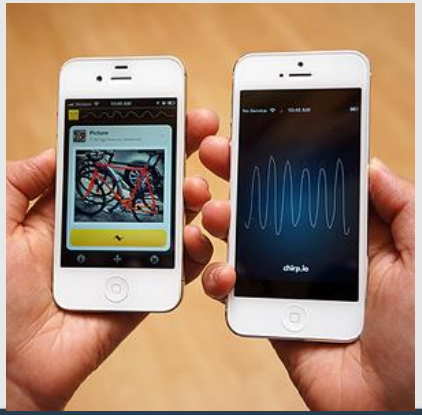
Traditional Payment

- Cash
- Paper Cheque
- Debit/Credit card
- Online transaction

Mobile Payment

- SMS based transaction
- Direct mobile billing
- QR code payment
- Audio signal-based payment
- Contactless NFC payment





Key Mobile Payment Characteristics

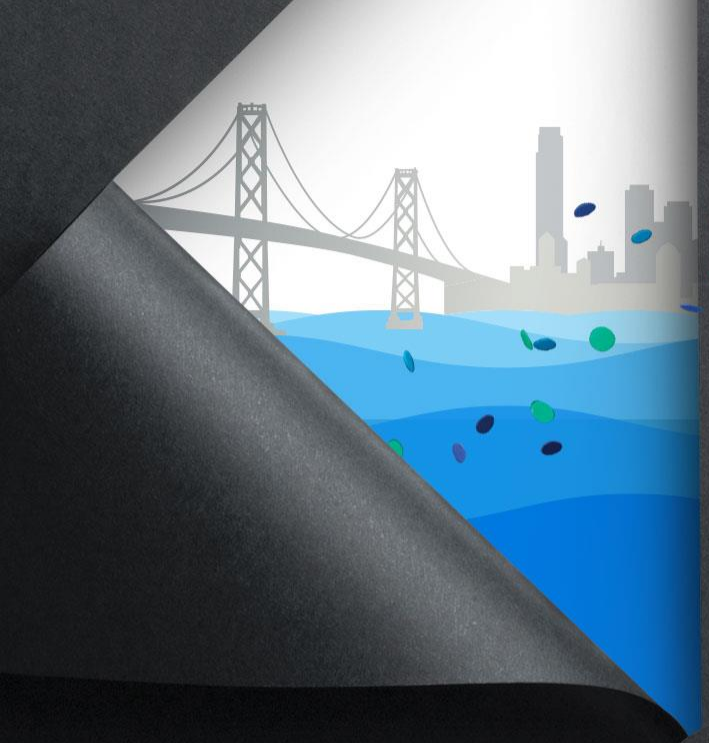
- **Security, privacy and trust**
- **Simplicity and usability**
- **Interoperability**
- **Universality**

Why NFC?

- **Security**(Based on Secure Element)
  1. SIM/UICC
  2. *Embedded secure element (eSE)*
  3. *Smart microSD*
- **Interoperability**(Industry Standards)
  - ETSI
  - GlobalPlatform
  - EMVCo
  - ISO/IEC
- **Universality**
- **Simplicity** (Tap & Pay)

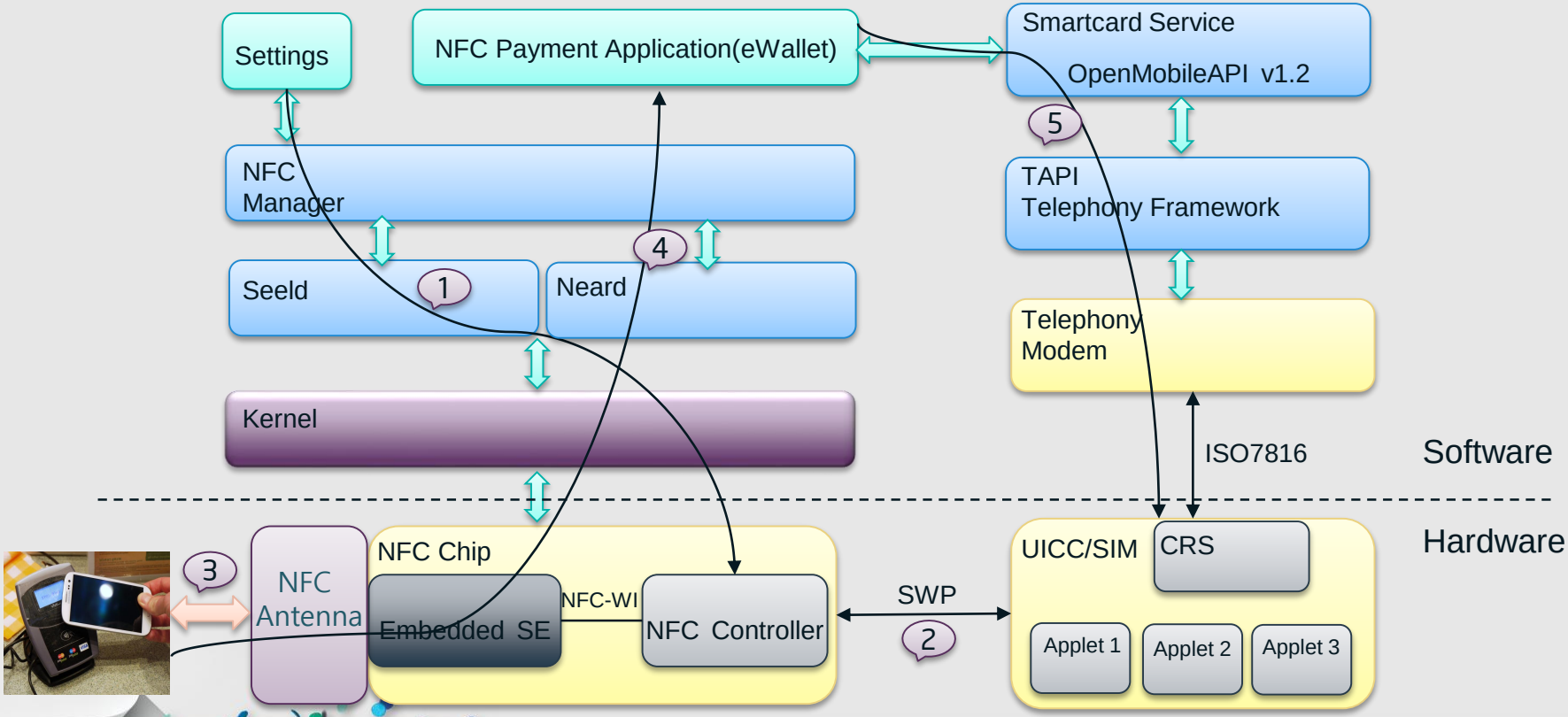
Key Communication Protocols for NFC Payment

- **SE and the mobile processor**
  - UICC: ISO7816
  - smart microSD: SD protocol
  - eSE: By default NFC CLF will export the API for user
- **SE and the NFC controller**
  - UICC: SWP/HCI
  - smart microSD: SWP/HCI
  - eSE: NFC-WI，SWP/HCI, I2C, SPI, DCLB
- **POS reader and the NFC controller**
  - NFC as a carrier
  - EMV Contactless

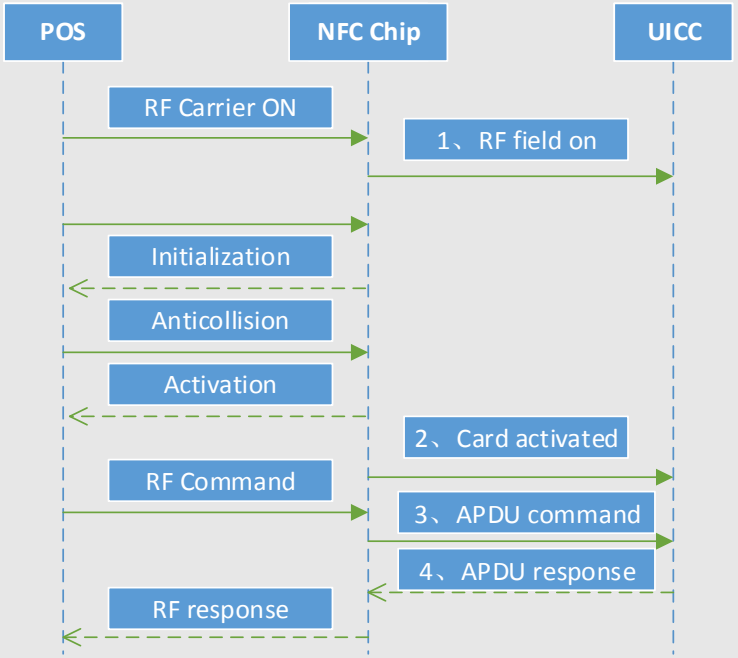


Tizen NFC Based Mobile Payment Architecture

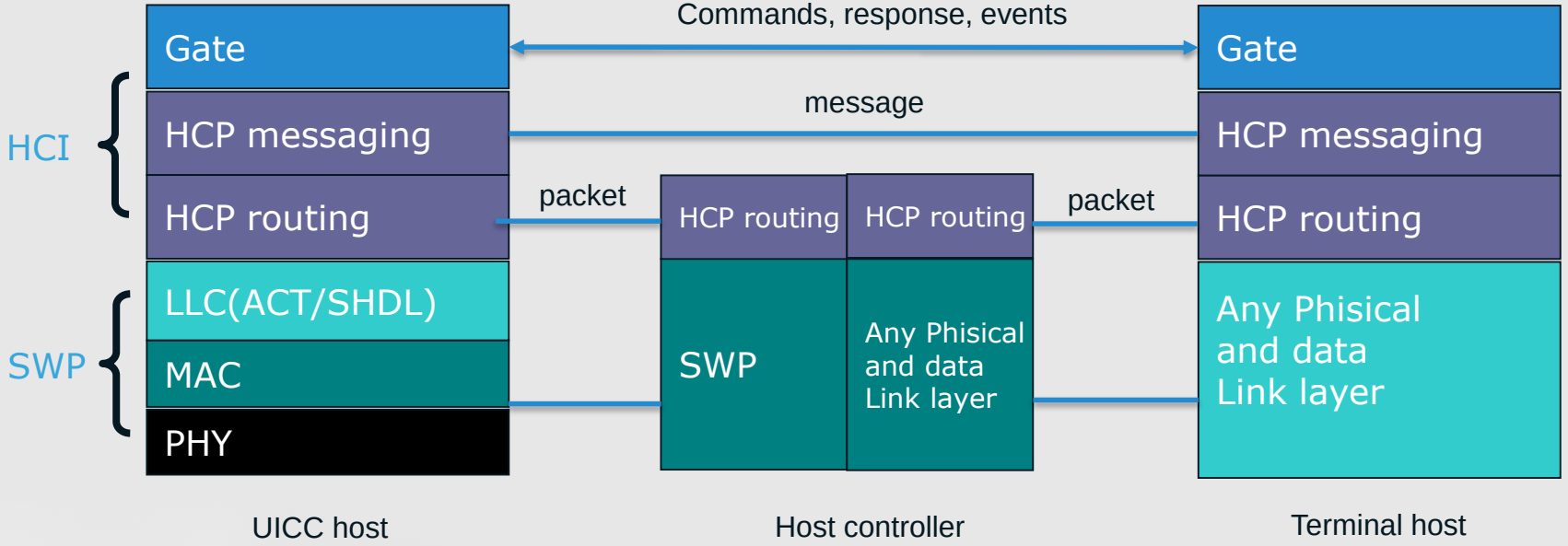
Tizen NFC Payment Architecture



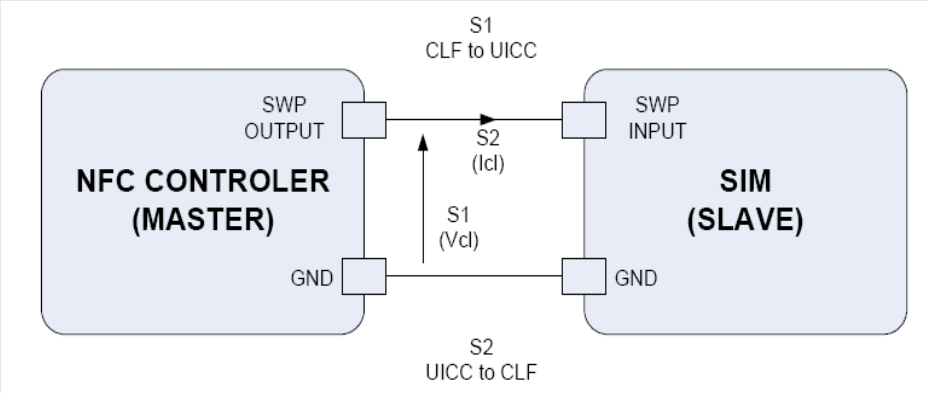
Transaction Procedure

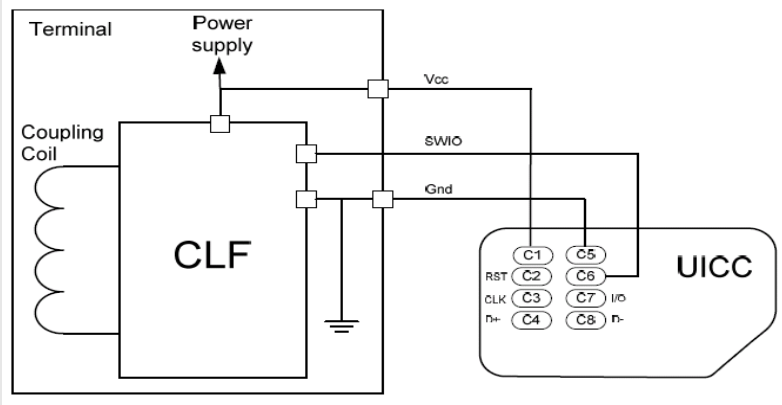


HCI(Host Control Interface) Architecture



Contact between NFC & SIM





SWP

Enablement Tips

Checklist for NFC payment

- **NFC Chip**
  - Chip hardware test
    - *NXP_SELF_TEST_ANTENNA*
    - *NXP_SELF_TEST_SWP*
  - Chip secure element configuration
    - *NXP_SE_DEFAULTMODE*
    - *NXP_SWP_DEFAULTMODE*
    - *NXP_EVT_SWP_SWITCH_MODE*
    - *UICC_GateList*
  - HCI configuration for host controller administration gate
    - WHITELIST
    - SESSION_IDENTITY
  - Implemented in the kernel driver or the library from NFC vendor

Checklist for NFC payment(cont)

- **Secure Element Contactless Management (SECM)**
  - Contactless activation states
  - The priority of each application

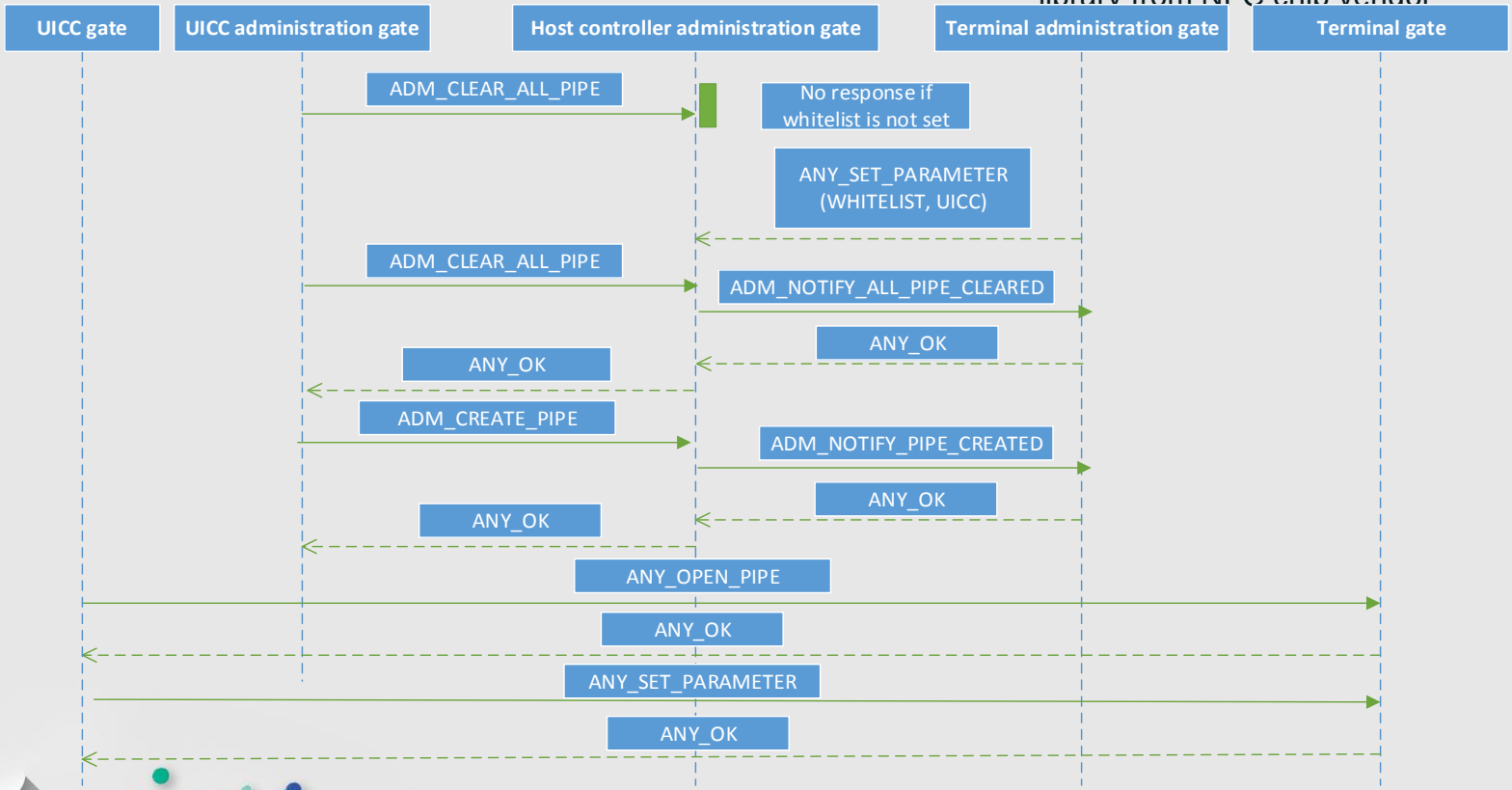
- **Contactless Registry Service(CRS)**
  - An SECM entity for UICC
  - CRS application provide the user to active/deactive, change priority of applications on the contactless interface

Example of using CRS application

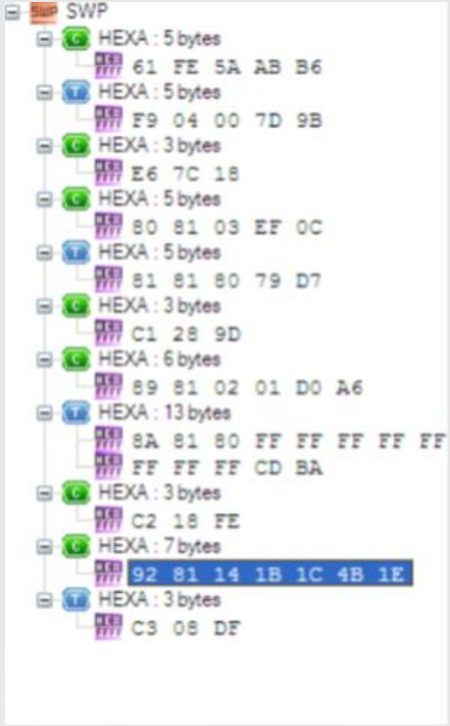
```
1、Select the CRS application
sh-4.1# ./send-apdu /org/seeld/se/nfc0_uicc_se0/channel0 00:A4:04:00:09:A0:00:00:01:51:43:52:53:00
Response APDU [0x6f 0x16 0x84 0x9 0xa0 0x0 0x0 0x1 0x51 0x43 0x52 0x53 0x0 //CRS CRS Application AID TLV
                  0xa5 0x9 // FCI Proprietary Template, length
                        0x9f 0x8 0x2 0x1 0x0 //version
                        0x80 0x2 0x0 0x11 //Global Update Counter
                  0x90 0x0 ]
2、Get the status of the contactless application on the card
sh-4.1# ./send-apdu /org/seeld/se/nfc0_uicc_se0/channel0 80:F2:40:00:02:4F:00:00
Response APDU [0x61 0x1f // Application Template
            0x4f 0xe 0x32 0x50 0x41 0x59 0x2e 0x53 0x59 0x53 0x2e 0x44 0x44 0x46 0x30 0x31 // Application AID
            0x9f 0x70 0x2 0x7 0x0 // Application Lifecycle State, Activation State is encoded on the second byte，00 is deactived
            0x80 0x2 0x0 0x8 // Application Update Counter
            0x81 0x1 0x0 // Selection Priority
            0x88 0x1 0x0 // Display Required Indicator
3、Update the status of selected application
sh-4.1# ./send-apdu /org/seeld/se/nfc0_uicc_se0/channel0
            80:F0://SET STATUS
            01://Status type: Availability State over the Contactless Interface
            01://Status value: Actived
            10:4F:0E:32:50:41:59:2E:53:59:53:2E:44:44:46:30:31:00
Response APDU [0x90 0x0 ]//operation successfuly
```

HCI Procedures

Need implement in kernel or library from NFC chip vendor



Runtime monitor SWP data between host and SE



1、CLF active SWP link, UICC return **ACT_SYNC** command, return the SYNC_ID of the card to CLF module

2、CLF send U-Frame: **RSET** command F9, provide: endpoint window size and capability. window size=04

3、UICC return response U-Frame：**UA**, acknowledge received RSET command and accept RSET command

4、UICC send I-Frame: cmd=03=**ANY_OPEN_PIPE**, notifiy CLF to open pipeId=01.

5、CLF send response I-Frame: response=00=ANY_OK, notify UICC open pipeId=01success

6、UICC return S-Frame: Type=RR=Receive Ready.

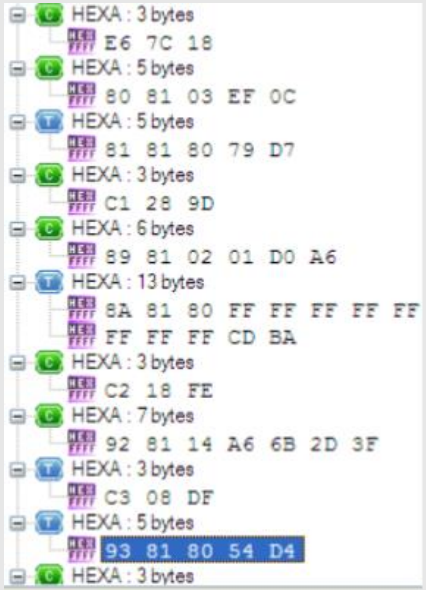
7、UICC send I-Frame: cmd=02=**ANY_GET_PARAMETER**, and registry=01, means get the argument is 8 byte SESSION_IDENTITY, default value all FF.

8、CLF return response I-Frame: response=00=ANY_OK, and return SESSION_IDENTITY=FFFFFFFFFFFFFFFF.

9、CLF return S-Frame: Type=RR=Receive Ready.

10、UICC send I-Frame: cmd=14=**ADM_CLEAR_ALL_PIPE**
CLF should return response=00=ANY_OK but no response after that ☹

11、CLF return S-Frame: Type=RR=Receive Ready.




Demo Videos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