Application Interface Document

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# Document History

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| --- | --- | --- |
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# Purpose

This document describes the interface and communication protocols between the Development board and SDK Samples.

# BLE Role Definitions

The communication interface between the device (referred to in this document as ‘device’) and the mobile application (referred to in this document as ‘app’ or ‘application’) shall be BLE. The device shall be a connectable BLE peripheral device. The mobile application shall be a BLE central device.

# Interface Description

This section describes the interface capabilities between the device and the application. The device shall advertise a total of 3 services used to facilitate communication. All data transfer while the application is connected to the device is encrypted through the BLE protocol.

1. Device advertisement
   1. When the device is enabled by the user the device will begin advertising as a connectable peripheral with the name “E-Ink”. At this point the application can connect to the device.
2. Device Information Service

The device shall advertise an information service. This service shall contain 4 read-only characteristics containing the following information.

1. Battery level as a percentage
2. Device Command Service

The device shall advertise a command service. This service shall contain 2 write-only characteristics and 1 read-only characteristic containing the following.

1. Command value set by the application to tell the device which command to execute
2. A command data value set by the application to provide any supporting command data
3. A result value set by the device to notify the application of a success or error executing the command

The following commands shall be recognizable by the device:

1. Display a particular card immediately
2. The device shall update the screen to display the front image of a specific card
3. Remove a particular card
4. The device shall remove the specified card and its associated back if applicable
5. Remove all cards
6. The device shall remove all cards
7. Device Card Transfer Service

The device shall advertise a card transfer service. This service shall contain 4 write-only characteristics and 1 read/write/notify characteristic containing the following.

1. A memory index (1-25) set by the application to indicate which card to update,
2. A flag to indicate whether an image is compressed. Only the uncompressed images are supported on this hardware.
3. Card image data set by the application
4. Write done indication set by the application and cleared by the device. Will allow for notifications.
5. A flag to indicate whether the image is the front or back of a card

This service shall operate as follows. The application will check the ‘write done’ field. If 0x00 the application may start writing a new card. The application will set the memory index of the card to write, set the card back flag to indicate whether this is the front or back image of the card, and set whether or not the image is compressed. The application will then write the card image data in chunks, waiting for a write success notification after each write command indicated by ‘write done’ set to 0x01 by the device. When the application is finished writing all the card data, it will set the ‘write done’ to 0xBB. The application will then wait for the device to clear the ‘write done’ value to 0x00 indicating it is ready to receive another card. It is recommended the application monitor ‘write done’ for notifications if planning on writing multiple cards.

Some additional considerations are as follows:

1. The application shall use the maximum MTU size available on that phone to increase data transfer speed. The device shall support BLE 4.2 and higher.
2. Cards can be added /edited in any order.
3. The device can only accept image data that is not compressed.

# Protocol Description

This section describes the protocol details between the device and application.

1. Advertising packet

|  |  |  |  |
| --- | --- | --- | --- |
| **Advertising Data NORMAL OPERATION** | | | |
| **bytes** | **description** | **value** | **notes** |
| 1 | Length of item in bytes | 0x02 |  |
| 2 | Data type value | 0x01 | Flags |
| 3 | Flag value | 0xXX |  |
| 4 | Length of item in bytes | 0x0B |  |
| 5 | Data type value | 0xFF | Manufacturer specific data |
| 6 | Company identifier LSB | 0x01 |  |
| 7 | Company identifier MSB | 0x01 |
| 8 | Contact card share method | 0xXX | Not in Use |
| 9 | Index of contact card to be shared | 0xXX | 0x01 – 0x19 (1-25 decimal) |
| 10-15 | MAC address | 0xXXXXXXXXXXXX | Mac address of the device (in reverse order) |
| 16 | Length of item in bytes | 0x07 |  |
| 17 | Data type value | 0x03 | Complete list of 16-bit service class UUIDs |
| 18 | Service UUID LSB | 0x00 | Command service = 0x1400 |
| 19 | Service UUID MSB | 0x14 |
| 20 | Service UUID LSB | 0x00 | Card transfer service = 0x1500 |
| 21 | Service UUID MSB | 0x15 |
| 22 | Service UUID LSB | 0x16 | Information service = 0x1600 |
| 23 | Service UUID MSB | 0x00 |
| 24 | Length of item in bytes | 0x06 |  |
| 25 | Data type value | 0x09 | Complete local name |
| 26-30 | Local name | 0x4449474D45 | “E-Ink” |

1. Information Service

|  |  |
| --- | --- |
| **Service UUIDs** | |
| Base UUID | 0xXXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX  0xXXXX**XXXX**-XXXX-XXXX-XXXX-XXXXXXXXXXXX |
| Service UUID | 0x1600 |

|  |  |
| --- | --- |
| **Characteristic UUIDs** | |
| Battery level | 0x1601 (not in use) |
| RFID TID | 0x1602 (not in use) |
| RFID User Memory | 0x1603 (not in use) |
| Device information | 0x1604 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic Description** | | | |
| **characteristic** | **type** | **length** | **values** |
| Battery level | Read | 1 byte | 0x00 – 0x64 (0% to 100% in decimal) (not in use) |
| RFID TID | Read | 12 bytes | Not in Use |
| RFID User Memory | Read | 20 bytes | Not in Use |
| Device information | Read | 2 byte | Byte 1 = hardware version (0x00 – 0xFF)  Byte 2 = firmware version (0x00 – 0xFF) |

1. Command Service

|  |  |
| --- | --- |
| **Service UUIDs** | |
| Base UUID | 0x440FAD5E-E9C6-40DB-8711-B63A046AEC67  0x440F**XXXX**-E9C6-40DB-8711-B63A046AEC67 |
| Service UUID | 0x1400 |

|  |  |
| --- | --- |
| **Characteristic UUIDs** | |
| Command id | 0x1401 |
| Command data | 0x1402 |
| Command result | 0x1403 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic Description** | | | |
| **characteristic** | **type** | **length** | **values** |
| Command id | Write | 1 byte | 0x00 = display card (front)  0x03 = wipe device clean  0x06 = remove card |
| Command data | Write | 20 bytes | Associated data to complete the command |
| Command result | Read | 1 byte | 0x01 = Success  Otherwise, error. Error codes are described below. |

1. Card Transfer Service

|  |  |
| --- | --- |
| **Service UUIDs** | |
| Base UUID | 0xXXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX  0xXXXX**XXXX**-XXXX-XXXX-XXXX-XXXXXXXXXXXX |
| Service UUID | 0x1500 |

|  |  |
| --- | --- |
| **Characteristic UUIDs** | |
| Memory index | 0x1501 |
| Compressed | 0x1502 |
| Card data | 0x1503 |
| Write done | 0x1504 |
| Card back | 0x1505 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic Description** | | | |
| **characteristic** | **type** | **length** | **values** |
| Memory index | Write | 1 byte | 0x00 – 0x1A (0-27 decimal) |
| Compressed | Write | 1 byte | 0x00 = Data is uncompressed  0x01 = Data is compressed |
| Card data | Write | Max length |  |
| Write done | Read/Write/Notify | 1 byte | Set to 0xF1 by Device if the memory index provided is not valid  Set to 0x01 by Device to let the application know it can send the next chunk of data  Set to 0xBB by application to signify entire contact information has been written. |
| Card back | Write | 1 byte | 0x00 = Front of card  0x01 = Back of card |

# Command Data and Results

This section defines the required data fields for each command in the command service and the possible result values.

1. Display Card (command 0x00)

|  |  |
| --- | --- |
| **Characteristic** | **Possible values** |
| Data | Card index between 0x00-0x19 (0-25 decimal) that currently contains a card. |
| Result | 0x01 = Success  0xF9 = Error |

1. Remove card (command 0x06)

|  |  |
| --- | --- |
| **Characteristic** | **Possible values** |
| Data | Card index between 0x00-0x19 (0-25 decimal) that currently contains a card. To delete all cards send the value 0xAA |
| Result | 0x01 = Success  0xF9 = Error |

If a bad command value is sent, result characteristic will be 0xFF.