

A DATA CHANNEL CREATION METHOD AND SYSTEM USED FOR MOBILE PAYMENT

Technical Field

This invention is involved in mobile payment, and more especially creation method and system of data channel between NFC transaction module and RFSIM module.

Background

Mobile payment is a payment mode by which user is allowed to use his/her mobile equipment (usually mobile phones) to pay for goods or service, such as to buy tickets when taking bus or subway, buy tickets at cinema and shop at supermarket or hotel. The overall mobile payment value chain includes mobile operators, payment service providers, application providers, equipment manufacturers, system integrators, merchants and users.

At present, the implementation of mobile payment mainly relies on the following technologies:

1. Near field communication (NFC). NFC integrates NFC chip and RF antenna used for near communication in the mobile phones, like Nokia NFC mobile phones working at 13.56MHz. SIM card implements RF payment function by connecting with RF chip in the mobile phones.

2. SIM Pass: such technology uses dual-interface card to implement functions of SIM card. It makes flexible PCB antenna connected with NFC antenna to implement RF payment function.

3. Film card technology: it uses film packaging of dual-interface card and filters interesting instructions between mobile phone and SIM card. The film card can implement RF payment function through flexible PCB antenna.

4. RFSIM card: such technology uses high frequency, very-high frequency, super-high frequency and microwave frequency to implement data communication. Those frequencies are high, so antenna can be laid on the SIM card. Therefore, single card can provide RF payment function.

But each existing technology has unsolvable problems and is difficult to be promoted in actual application.

First, NFC requires user to change his mobile phone, so technical upgrade cost is expensive. And there are few mobile phones supporting NFC in the market, which is unable to satisfy user's demands.

Second, dual-interface smart cards adopting SIM Pass usually have small capacity and are difficult to provide multi-application requirements for every operator. In addition, flexible antenna is relatively expensive and the problem of connection stability can't be solved completely. At the same time, the flexible PCB antenna has the different form along with the different form of SIM base, which leads to users' dissatisfaction.

Third, the film card technology uses flexible PCB antenna, which has the same problem as SIM pass.

Fourth, RFSIM card technology uses high frequency which can penetrate deeply and is not able to implement actual NFC communication. But existing technologies can't make sure the security of information during transaction.

At present, mobile payment based on 13.56MHz has been extensively used in contactless card field such as transportation, finance, social security, government and citizen card. Maturity of its industry chain and technology and security of mobile payment have been fully demonstrated. Additionally, 2.4G RFSIM solution need to redesign existing reader with 13.56MHz frequency like transportation payment equipments and financial payment equipments. But RFSIM card can communicate

with mobile equipment via contact communication interface. User can access to data in the RFSIM card by controlling mobile equipment so as to control the result of mobile payment transactions.

Whereas, this invention brings forward a method to create data channel between NFC transaction module and RFSIM module and a system to provide support for completing mobile payment between them. The system combines the security of NFC payment with convenience of RFSIM payment, which can solve technical issues of all payment means.

Contents of Invention

This invention is to provide a data channel creation method and system used for mobile payment. This invention can be used to expand the technical functions and service scope of existing mobile payment system. It can complete the mobile payment function of NFC transaction module through the convenience of RFSIM module while completing transaction by means of the security of NFC transaction module.

The data channel creation method provided in this invention is used to create data channel between NFC transaction module and RFSIM module. The steps include:

(A1) Set the NFC communication module in the reader to poll NFC transaction module. If NFC transaction module is found, go to step A2. Otherwise, continue polling.

(A2) NFC communication module connects to NFC transaction module through wireless RF to read identifier from NFC transaction module and send it to processor module inside reader.

(A3) Processor controls the RF connection between RF communication module and RFSIM module according to the identifier.

(A4) Use data channel between NFC transaction module and RFSIM module to complete mobile payment and extended functions like load over the air and balance query.

The data channel creation system used for mobile payment in the invention is used to complete mobile payment and extended functions like load over the air and balance query. The system consists of reader and mobile equipment. NFC communication module, RF communication module and processor module is inside the reader. There are NFC transaction module and RFSIM module inside the mobile equipment. NFC communication module is used to create near field communication connection with NFC transaction module to complete access to data in NFC transaction module, to exchange data with processor module and indirectly create communication with RF communication module. RFSIM module is RF smart card with functions of contact SIM card and contactless RF communication functions. RF communication module is used to create connection with RFSIM module to receive RF messages from RFSIM module or send RF messages to RFSIM module, and to create communication with NFC communication module via processor module. Processor module is used to convert and transfer data in different formats, and to control the communication between NFC communication module and NFC transaction module and between RF communication module and RFSIM module to implement exchange and identification of data based on different RF frequencies. NFC communication module is Near field communication smart card, which communicates with NFC transaction module with same frequency, execute instructions from NFC transaction module and return result.

Compared to existing technology, the advantage of the invention is, data channel can be fast created between NFC transaction module and RFSIM module with the method provided in the invention to complete payment and information display via NFC transaction module and RFSIM module respectively. The invention makes fully use of security of NFC transaction module as payment means and small size and low cost of RFSIM module, which can greatly improve the security of mobile payment

and decrease the implementation cost of mobile payment.

Brief description of drawings

FIG.1 is an illustration of mobile payment system.

FIG.2 is a perspective view of configuration of mobile equipment.

FIG.3 is a flow chart of reader

FIG.4 is a flow chart in mobile payment application.

Detailed description of the Embodiments

In the following part the invention will be detailed by means of embodiments and drawings. But the embodiments are just illustrative and won't limit the protection scope of the invention.

The mobile payment system provided in the invention can implement dual-frequency cooperation. The mentioned dual-frequency means two RF frequencies, such as 13.56MHz used for near field payment and 2.4GHz for RFSIM card. The system will be detailed with the two frequencies in the following part.

Dual-frequency mobile payment system combines advantages of two kinds of solutions, 13.56MHz near field payment and 2.4GHz RFSIM card, which are controllability of distance of 13.56MHz rear field payment, controllability of dual-interface of 2.4GHz RFSIM card and display of information via contact interface. On basis of security of mobile payment, the data channel created during the dual-frequency cooperation process in the invention can conveniently realizes circling store in air for NFC transaction module and query its balance, and can implement data synch between NFC transaction module and RFSIM module, which means load and balance information of NFC transaction module can be saved into RFSIM module in time. In addition, NFC transaction module and RFSIM module is relatively independent so that NFC transaction module won't make any impact on the RFSIM

module when performing contactless functions like swiping card, so its integrated stability is higher. The relative independence of NFC transaction module, especially its specific architecture suitable for financial payment, makes sure that the mobile payment system described in the invention can achieve to same high security level as common financial payment system.

User can randomly charge the NFC transaction module with the mobile payment system via mobile equipment and control transaction details real time, which can enhance user's payment experience and confidence.

As shown in Fig.1, the feature of the mobile payment system described in the invention is that mobile payment system consists of reader 100 and mobile equipment 200. There are NFC communication module 101, RF communication module 102 and processor module 103 inside the reader 100. NFC transaction module 201 and RFSIM module 202 are inside the mobile equipment 200.

Reader 100 is dual-frequency communication equipment supporting NFC communication module 101 and RF communication module 102. Processor module 103 in the reader can access to NFC transaction module 201 via NFC communication module 101 and access to RFSIM module 201 via RF communication module 102.

NFC communication module 101 is used to create rear field communication with NFC transaction module 201 to complete access to data in the NFC transaction module 201 and implement operations such as charge, payment and balance query, and used to indirectly create connection with RF communication module 102 through data processing and transfer functions of processor module 103.

RF communication module 102 is used to create RF connection with RFSIM module 202, receive or send RF message from or to RFSIM module 202, and create connection with NFC communication module 101 via processor module 103.

Processor module 103 is used to convert and transfer data in different formats, and control the communication between NFC communication module and NFC transaction module and between RF communication module and RFSIM module to implement exchange and identification of data based on two different frequencies and create data channel between NFC transaction module and RFSIM module. It usually can adopt central processor like embedded CPU.

NFC transaction module 201 is 13.56MHz rear field communication smart card, which communicate with 13.56MHz NFC communication module 101, executing commands from NFC communication module 102 and returning result.

RFSIM module 202 is RF smart card with functions of contact SIM card and contactless RF communication functions, like 2.4 GHz RFSIM card supplied by Nationz Technologies. It communicates with mobile equipment and RFSIM module 202 via contact communication interface and contactless communication interface respectively. The said contactless communication interface is 13.56MHz contactless wireless interface in compliance with ISO RF standards like ISO 14443A and ISO 15693.

NFC communication module 101 and RF communication module 102 in the reader 100 can create connection with NFC transaction module 201 and RFSIM module 202 in the mobile equipment 200 respectively and exchange data under the control of processor module 103 so as to create communication between NFC transaction module 201 and RFSIM module 202 to provide base for implementing load over the air and balance query between NFC transaction module 201 and RFSIM module 202. The NFC transaction module 201 is 13.56MHz contactless smart card. Its physical shape can be film card or other. It connects to NFC communication module 101 through frequency 13.56MHz and exchanges data. RFSIM module 202 is 2.4GHz RFSIM card laid in the SIM card slot in the mobile phone. It connects to RF communication module 102 through frequency 2.4GHz and exchanges data. The NFC communication module 101 and RF communication module 102 exchange data via

processor module 103.

The invention makes use of RF identification technology which has been extensively applied to other technical fields to control the creation of multi-frequency data channel and 协同. After NFC communication module 101 successfully gets identifier information from NFC transaction module 201, RF communication module 102 just can create RF connection with RFSIM module 202 and transfer data. Then, mobile equipment 200 accesses to data in the reader 100 and NFC transaction module 201 through communication between RFSIM module 202 and RF communication module 102 so that mobile equipment 200 can make NFC transaction module implement extended functions like load over the air and balance query via mobile network.

A perspective view of configuration of mobile equipment 200 is depicted as shown in Fig.2. NFC transaction module 201 is fixed on the surface of outer of mobile equipment or any other place on the mobile equipment 200 readable by NFC communication module 101.

The invention is also involved in the method to implement dual-frequency cooperation and mobile payment system based on the dual-frequency cooperation depicted as shown in fig.1 and fig.2. The method includes the following steps:

(1) Fix a NFC transaction module 201 used for rear field communication on the said mobile equipment 200.

(2) Set NFC communication module 101 in the reader 100. The NFC communication module 101 is used to get and transfer identifier information from NFC transaction module 201.

(3) Create RF connection between RF communication module 102 and RFSIM module 202 according to identifier information from NFC transaction module 201. Only when NFC communication module 101 has read the identifier information

of NFC transaction module 201 successfully, RF communication module 102 just can create RF connection with RFSIM module 202 in the mobile equipment 200 according to the identifier and transfers data.

The process of communication between reader 200, NFC transaction module 201 in the mobile equipment 200 and RFSIM module 202 in above step (3) is depicted as shown in fig.3. The detailed steps are:

(A1) Reader 100 is power on and initialized.

(A2) NFC communication module 101 polls NFC transaction module 201. NFC communication module 101 sends RF electromagnetic wave discontinuously to poll the NFC transaction module 201 within allowed distance. The said allowed distance means the distance between NFC transaction module 201 and NFC communication module 101, about 5cm, within which a transaction can be fulfilled. If NFC transaction module 201 is found, go to step (A3). Otherwise, go to step (A2) to continue polling.

(A3) NFC communication module 101 creates RF connection with NFC transaction module 201 through 13.56MHz, then reads identifier information from NFC transaction module 201 and sends it to processor module.

(A4) RF communication module 102 creates RF connection with RFSIM module 202. Processor module 103 controls RF connection and data exchange between RF communication module 102 and RFSIM module 202 according to identifier information from NFC transaction module 201. Access to data between NFC transaction module 201 and RFSIM module 202 based on 13.56MHz and 2.4G is performed via reader 100.

Identifier information from NFC transaction module 201 can be RF communication address of RFSIM module 202 in the mobile equipment 200, or data used to obtain RF communication address of RFSIM module 202. Processor module

103 makes RF communication module 102 create wireless communication with RFSIM module 202 according to RF communication address of RFSIM module 202.

Till now, dual-frequency cooperation has been completed. Its actual effect is that data channel between 13.56MHz NFC transaction module 201 and 2.4G RFSIM module 202 has been created to provide base for functions (load over the air and balance query) in the subsequent preferred embodiments.

The preferred embodiment of the invention is load over the air to NFC transaction module on basis of data channel created during the dual-frequency cooperation process as depicted as shown in fig.4. The detailed steps are involved in each stage shown in fig.4. The dual-frequency cooperation process in step 2 has been detailed and won't be described here. The detailed steps of load over the air is as follows:

(B1) Request for load over the air. Mobile equipment 200 sends request for load over the air to load over the air platform via mobile network. The load over the air platform includes mobile access gateway, database server for mobile payment and China Unionpay transaction gateway and similar infrastructure related to load over the air.

(B2) Respond to request. Load over the air platform responds to the request for load over the air from mobile equipment 200, generates load over the air command and sends it to mobile equipment via mobile network. Mobile equipment saves the command into RFSIM module 202.

(B3) Create connection through dual-frequency cooperation. When the distance between NFC transaction module 201 in the mobile equipment 200 and NFC communication module 101 in the reader 100 is within the scope of communication distance, NFC transaction module 201 gets power by electromagnetic coupling and starts to work and then creates data channel between NFC transaction module 201 and RFSIM module 202.

(B4) Account charge. Mobile equipment 200 sends load over the air command got in step (B2) to NFC transaction module 201 via data channel created in step (B3) to complete charge operation to NFC transaction module 201.

(B5) Swipe card. Reader 100 sends request for purchase to NFC transaction module 201 in the mobile equipment 200. NFC transaction module 201 completes deduction operation and sends response to reader 100. The response contains transaction details and balance of NFC transaction module 201. If required, transaction details and balance can be displayed in the reader with display function.

(B6) Synch data. Reader 100 sends transaction details and balance got in step (B5) to RFSIM module 202 in the mobile equipment 200.

The function of querying balance of NFC transaction module 201 at any time described in the invention can be implemented by using STK menu of mobile equipment 200 to read balance saved in RFSIM module 202 as stated in foregoing step (B6). Detailed implementation process is not detailed hereby.

Explicitly, embodiments mentioned herein are just part of embodiments of the invention and but not all embodiments. All other embodiments based on the invention obtained by technicians in this field who haven't made innovation are also protected by the invention.

Patent Claims

1. A data channel creation method for mobile payment is used to create data channel between NFC transaction module and RFSIM module. The steps include:

(A1) Set the NFC communication module in the reader to poll NFC transaction module. If NFC transaction module is found, go to step A2. Otherwise, continue polling.

(A2) NFC communication module connects to NFC transaction module through wireless RF to read identifier from NFC transaction module and send it to processor module inside reader.

(A3) Processor module controls the RF connection between RF communication module and RFSIM module according to the identifier.

(A4) Use data channel between NFC transaction module and RFSIM module to complete mobile payment and extended functions like load over the air and balance query.

2. A data channel creation system used for mobile payment is used to complete mobile payment and extended functions like load over the air and balance query. The system consists of reader (100) and mobile equipment (200). NFC communication module (101), RF communication module (102) and processor module (103) is inside the reader (100). There are NFC transaction module (201) and RFSIM module (202) inside the mobile equipment (200).

NFC communication module (101) is used to create rear communication connection with NFC transaction module (201) to complete access to data in NFC transaction module (201), to exchange data with processor module (103) and indirectly create communication with RF communication module (102).

RFSIM module (202) is a RF smart card with functions of contact SIM card and contactless RF communication functions.

RF communication module (102) is used to create connection with RFSIM module (202) to receive RF messages from RFSIM module (202) or send RF messages to RFSIM module (202), and to create communication with NFC communication module (101) via processor module (103).

Processor module (103) is used to convert and transfer data in different formats, and to control the communication between NFC communication module and NFC transaction module and between RF communication module and RFSIM module to implement exchange and identification of data based on different RF frequencies.

NFC communication module (201) is rear field communication smart card, which communicates with NFC transaction module (101) with same frequency, execute instructions from NFC transaction module (101) and return result.