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| **《epay Project》**  **Requirements Explanation**  **V1.1** | |
| Version history |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **版本/状态** | **作者** | **参与者** | **日期** | **备注** |
| 1.0.0 | K Huang |  | 2013-8-20 | create |
| 1.0.1 | K Huang |  | 2013-8-21 | modify |
| 1.1.0 | K Huang |  | 2013-8-22 | finish |
| 1.1.1 | Xingyu Chen |  | 2013-9-14 | examined |

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# Introduction

## Introduction

The purpose of the preparation of this manual is to accurately explain project specific business needs, the authors of this manual is ePay project team, this specification is confirmed by Huang Kai , the readers of this manual are  all direct stakeholders of this project. This manual is an important guiding document to guide the implementation of the project, but also the basis of  final system acceptance (final inspection)二、定义

### **E**pay

Epay is a Bluetooth-based payment and financial management system it is aimed at the development of mobile payment users Citibank and financial terminal application, it has the following advantages:

#### Convenience

epay can be used  in any supermarket installed with payment terminals, individual shop for mobile payment, no queuing, do not need to spend too much time on the payment, quick and easy.

#### Practicality

We can manage the balance，choose thedeposit methods on balance, make full use of portability of mobile devices，we can use the system anywhere and anytime，simplify the payment process，facilitate financial management，Integrated part of the remote functionality of bank accounts，provide a good user account management and interface for banks。

#### Flexibility

Individual users may not be required in the use ofnetwork, be applicable to mobile operatorschanges，missing service, etc. and simplify the operation of the process。

#### Safety

1. Depending on your phone's IMEI number to control the equipment connected with, to ensure that operations are paid from the correct phone.
2. Account information is stored locally and backup on the server, password is encrypted with md5. .
3. We use RSA encryption to encrypt and produce mobile phone token, to ensure that payment operation is from users.

##### 1.1.5 Versatility

Use the xml for data communication, andretain a portion of the database xml file,easy to provide external interfaces.

#### 1.2 BlueTooth

Bluetooth is a [wireless](http://en.wikipedia.org/wiki/Wireless) technology standard for exchanging data over short distances (using short-wavelength radio [transmissions](http://en.wikipedia.org/wiki/Transmission_(telecommunications)) in the [ISM](http://en.wikipedia.org/wiki/ISM_band) band from 2400–2480 MHz) from fixed and mobile devices, creating[personal area networks](http://en.wikipedia.org/wiki/Personal_area_network) (PANs) with high levels of security. Created by telecom vendor [Ericsson](http://en.wikipedia.org/wiki/Ericsson) in 1994,[[2]](http://en.wikipedia.org/wiki/Bluetooth" \l "cite_note-2) it was originally conceived as a wireless alternative to [RS-232](http://en.wikipedia.org/wiki/RS-232) data cables. It can connect several devices, overcoming problems of synchronization.

#### 1.3 IMEI

The International Mobile Station Equipment Identity or IMEI [/](http://en.wikipedia.org/wiki/Help:IPA_for_English)[aɪˈmiː](http://en.wikipedia.org/wiki/Help:IPA_for_English#Key)[/](http://en.wikipedia.org/wiki/Help:IPA_for_English)[[1]](http://en.wikipedia.org/wiki/Imei#cite_note-3gppspec-1) is a number, usually unique,[[2]](http://en.wikipedia.org/wiki/Imei#cite_note-bbcnews-2)[[3]](http://en.wikipedia.org/wiki/Imei#cite_note-3) to identify [3GPP](http://en.wikipedia.org/wiki/3GPP) (i.e., [GSM](http://en.wikipedia.org/wiki/GSM), [UMTS](http://en.wikipedia.org/wiki/UMTS" \o "UMTS)and [LTE](http://en.wikipedia.org/wiki/LTE_(telecommunication))) and [iDEN](http://en.wikipedia.org/wiki/IDEN" \o "IDEN) [mobile phones](http://en.wikipedia.org/wiki/Mobile_phone), as well as some [satellite phones](http://en.wikipedia.org/wiki/Satellite_phone). It is usually found printed inside the battery compartment of the phone, but can also be displayed on-screen on most phones by entering \*#06# on the dialpad, or alongside other system information in the settings menu on[smartphone](http://en.wikipedia.org/wiki/Smartphone) operating systems.

#### 1.4MAC Address

A media access control address (MAC address) is a [unique identifier](http://en.wikipedia.org/wiki/Unique_identifier) assigned to [network interfaces](http://en.wikipedia.org/wiki/Network_interface_controller) for communications on the physical network segment. MAC addresses are used as a [network address](http://en.wikipedia.org/wiki/Network_address) for most [IEEE 802](http://en.wikipedia.org/wiki/IEEE_802) network technologies, including [Ethernet](http://en.wikipedia.org/wiki/Ethernet). Logically, MAC addresses are used in the [media access control](http://en.wikipedia.org/wiki/Media_access_control) protocol sublayer of the [OSI reference model](http://en.wikipedia.org/wiki/OSI_reference_model).

### 1.5 DESMD5RSA

The Data Encryption Standard is a previously predominant [algorithm](http://en.wikipedia.org/wiki/Algorithm) for the [encryption](http://en.wikipedia.org/wiki/Encryption) of electronic data. It was highly influential in the advancement of modern[cryptography](http://en.wikipedia.org/wiki/Cryptography) in the academic world.

The MD5 message-digest algorithm is a widely used [cryptographic hash function](http://en.wikipedia.org/wiki/Cryptographic_hash_function) that produces a 128-[bit](http://en.wikipedia.org/wiki/Bit) (16-byte) hash value. Specified in [RFC 1321](http://tools.ietf.org/html/rfc1321), MD5 has been utilized in a wide variety of security applications, and is also commonly used to check [data integrity](http://en.wikipedia.org/wiki/Data_integrity). MD5 was designed by [Ron Rivest](http://en.wikipedia.org/wiki/Ron_Rivest) in 1991 to replace an earlier hash function, [MD4](http://en.wikipedia.org/wiki/MD4). An MD5 hash value is typically expressed as a [hexadecimal](http://en.wikipedia.org/wiki/Hexadecimal) number, 32 digits long.

RSA is an [algorithm](http://en.wikipedia.org/wiki/Algorithm) for [public-key cryptography](http://en.wikipedia.org/wiki/Public-key_cryptography) that is based on the presumed difficulty of [factoring](http://en.wikipedia.org/wiki/Factorization) [large integers](http://en.wikipedia.org/wiki/Integer), the [factoring problem](http://en.wikipedia.org/wiki/Factoring_problem). RSA stands for [Ron Rivest](http://en.wikipedia.org/wiki/Ron_Rivest), [Adi Shamir](http://en.wikipedia.org/wiki/Adi_Shamir) and [Leonard Adleman](http://en.wikipedia.org/wiki/Leonard_Adleman), who first publicly described the algorithm in 1977. [Clifford Cocks](http://en.wikipedia.org/wiki/Clifford_Cocks), an English mathematician, had developed an equivalent system in 1973, but it wasn't [declassified](http://en.wikipedia.org/wiki/Classified_information) until 1997.[[1]](http://en.wikipedia.org/wiki/RSA_(algorithm)#cite_note-1)

#### 1.63G

3G, short for third Generation, is the third generation of mobile telecommunications technology.[[1]](http://en.wikipedia.org/wiki/3g#cite_note-1)

3G telecommunication networks support services that provide an information transfer rate of at least 200 [kbit/s](http://en.wikipedia.org/wiki/Kilobit_per_second" \o "Kilobit per second). However, many services advertised as 3G provide higher speed than the minimum technical requirements for a 3G service. Later 3G releases, often denoted [3.5G](http://en.wikipedia.org/wiki/3.5G) and [3.75G](http://en.wikipedia.org/wiki/3.75G), also provide[mobile broadband](http://en.wikipedia.org/wiki/Mobile_broadband) access of several Mbit/s to smartphones and mobile modems in laptop computers.

Part II Requirements Overview

### 2.1 Project Background

With popularity of a variety of mobile networks (3G / Bluetooth) and bandwidth escalating popularity of smart phones. The demand for financial means and access to information for people is growing .In order to achieve the mobile management of bank accounts in the mobile terminal at any time, use mobile terminals to manage payments and transfers with fewer proximityrestrict,Achieve a quick exchange of commodity information, saving manpower and management resources ,to achieve further complete information transaction management to develope this product.The currentshort means of payment generally use cash and pos machine.This product is an advanced near-field means of payment , there are not any similar products in the market.And because of Bluetooth 4.0 technology and low-cost of RFID devices,commodity trading in the future is bound to embark personalizedway with rich information.

### 2.2 goal

Use epay mobile terminal, through a Bluetooth to connect supermarkets, individual store cashier for payment, bank card balance can be conducted by your own financial management. Needed to achieve the following objectives：

##### 2.2.1Advanced

Achieve the mobile payment with the general trend but not implemented, use the low power and high speed of Bluetooth communication to achieve a large number exchange of information, to achieve the requirement from people of trading information and product information, to use mobile Internet to achieve the mobile service terminals which are not access to in most banks.

##### 2.2.2 Safety

Use safe Bluetooth communication, use DES, MD5, RSA encryption scheme combined, greatly improving the liquidity of the security, provide protection for the reliability of the transaction .

##### 2.2.3 Flexibility

Phone can still be used to pay though arrears，as long as you have a Citibank account, you can use the phone to make payments in the world without having to change carriers, can still to achieve to transfer even if there is no signal, the low dependence of Bluetooth on external environment determines the features of flexible and convenience.

##### 2.2.4 Low cost

one-time investment is small: Personal Edition usethe system above the Android 2.0,Supermarket version and the server can be set up by the use of PC, without the need to buy expensive dedicated handheld devices.

##### 2.2.5 Low cost

Provide multimedia information interfaces, not only convenient to business promotion, but also to launch promotional activities in supermarket,pomote their goods, providing personalized shopping guide and security services, achieve the aim of attracting consumers, improving the mall turnover. Shopping malls, self-employed, etc. Users can also build their own access.

### 2.3 Construction principles

##### 2.3.1 Useful Utilities

Actual business to banks and shopping centres, and consolidating Bank is currently the most commonly used business requirements, refer to the mobile terminal equipment features, using a combination of people determine the functional modules of the system.

##### 2.2.2 Advanced flexible

System must have a certain degree of flexibility, to be able to adjust to changes in business processes, business rules change, expansion of business, for rapid preparation of extension.

##### 2.2.3 Friendly interface

Full account of the practical needs of users, combined with Android's style, using graphical techniques.

##### 2.2.4 Safety

System must ensure the safety of network systems, hardware, software, and services, users must be guaranteed funding, data security.

##### 2.2.5 Easy to use

Provides functionality that is easy to understand, but significant, strong attraction power, will enable the people who use Android easily accept this application.

##### 2.2.6 Low Cost

No special hardware requirements, reliable free add-in modules of the basic interface, the whole basic software only labor costs.

Part IIIDetailed business requirements

Personal Edition includes registration, login, payment, transfer, receipt, loss, finance and banking, interest on deposits.

Individual shop includes registration, login, payment, loss.

Supermarket Edition includes registration, initialization, and accounts receivable.

Sever Consists mainly of receive data, process the data, the server sends the data.

#### 3.1 Login

Users need to enter a user name and password, to verify with the local save file, there is no need to download from the server if local file, need to send credit card numbers and social security numbers to verify. Log on unsuccessful shows reasons, need to set gesture after successful password, and then enter the main interface.

Retrieve account information in XML documents as follows

1. information
2. username
3. password
4. gesturepassword
5. cardnum
6. identificationnum

#### 3.2 Registration

When Personal version user registered , first user in registered account interface entered user name, password and real name information,after System confirmed correct , will these information writes database, and client program into set gestures password stage, in here, user need continuous twice set gestures password, if two times gestures password consistent, is into bank card bound interface, if not consistent, is returned to first times gestures password interface again set. Bank card bound interface users will need to enter credit card numbers, bank card password, social security number and phone number, system verification, the data written to the database, registration is completed.

When Individual shop Edition user register, when the registration is completed automatically generates QR code generated according to its Bluetooth address, while offering the download.

Registration send the XML document includes:

1）information

2）userName

3）password

4）customername

5）bluetoothmac

6）cardNum

7）cardPassword

8）identificationcardnumber

9）phonenumber

#### 3.3Payment

Implementing user-pay operation, individual shops at the supermarket.

Supermarket terminal equipped with the software and sends Bluetooth signal, supermarkets post record access QR code Bluetooth information customers by swiping the QR code and register the Bluetooth pairing. Customers by swiping a bar code form purchase and sale, and sent to the cash register via Bluetooth Bluetooth, cash register terminal purchase and sale statistics, price returned to the customer, customer input token to confirm payment, cashier transaction receipt is generated and returned to the customer. For security, the need for commodities increased RFID labels and RFID security door, to have been paid for goods, clearing the RFID information in the database. When there is a payment product by the customer, due to not paying the labels of goods still have a record in the database, through the RFID security door will sound the alarm.

Individual shop is equipped with the Bluetooth signal from the Terminal and software, in-store QR codes to post are registered to receive Bluetooth messages, looked through the brush of this QR code and register the Bluetooth pairing. Merchant enter transaction amounts and shipped to the customer, customer input token to confirm payment, cashier transaction result is generated and returned to the customer.

XML documents you send to the supermarket checkout to get the total price including:

1. information
2. username
3. customername
4. MAC address
5. cipher
6. tradetime
7. goodslist

Confirm the transaction routing of XML document includes:

1. information
2. username
3. MAC buyerdevice
4. MAC salerdevice
5. tradetime
6. totalprice
7. cipher
8. buyercardnumber

#### 3.4 Receivables

Collection includes: personal transfers the cash register, individual store cash registers, cash at the supermarket.

Transfer accounts receivable refers to the electronic check process, after the receipt of electronic checks, electronic checks in the form of XML documents stored in the database, and can be used in "my check" view check information.

Individual shop users collection, individual shops send rates to customers, customers confirmed, Soho server sends transaction information bank.

Supermarket cash registers is that supermarkets are using Bluetooth to receive the customer's payment information and feedback process, the customer determine the payment behavior, receive payment information in XML documents.

Transfer Personal Edition receive XML

1. MAC payerdevice
2. payername
3. transfertime
4. totalprice
5. cipher
6. payercardnumber

Individual stores received XML

1. information
2. MAC buyerdevice
3. MAC salerdevice
4. tradetime
5. totalprice
6. cipher
7. buyercardnumber

Supermarkets receive XML

1. information
2. username
3. MAC buyerdevice
4. cipher
5. totalprice
6. tradetime
7. goodslist
8. payercardnumber

Supermarket analysis XML of information theme information of event property value, if for confirmTrade is will themselves of account information joined the requests, and through network sent to Bank server, then waiting Bank of processing results, if Bank returns said payment into failed of XML is directly returns to looked, if success is will payment requests XML in the of merchandise list and number list save in local database for backup, then will success of XML issued looked, And wait for the customer feedback received information, receive feedback and then close the transaction, transaction was successful.

#### 3.5 Transfer

Users click on the transfer options, jump to the transfer interface.systemautomatically start searching around the user and list all search to users. Users select a user, and enter the transfer amount, click on the confirmation, the system will transfer information to generate an electronic check is sent to the selected user before, restriction of 1000, limited to 10,000 dollars a day.

Transfer transfer data is sent in the form of XML documents, including:

1. MACpayerdevice
2. payername
3. transfer
4. totalprice
5. cipher
6. payercardnumber

#### 3.6Cash

Personal Edition users can "my check" all received cheques from the, as well as cash and cheque can be transferred to others. Networking and click on the cash, the system send a check to the Bank server and complete fulfilment.

Cheque information is sent as an XML document, including:

1. information
2. MACpayerdevice
3. payername
4. MAC receiverdevice
5. receivername
6. transfertime
7. totalprice
8. cipher
9. payercardnumber
10. receivercardnumber

#### 3.7 Modify user information

Users can modify information of interest, such as real name, phone number and so on. Modifying XML content includes:

1）information

2）userName

3）password

4）customerName

5）identificationCardNum

6）phoneNum

#### 3.8 Report the loss

When the phone appears lost when users can apply for a loss, users can access the software at this time, click on the interface of "loss" and enter the loss reporting system. In the system, enter your user name, password, social security number, phone number and real name application immediately. If all the information is correct, it will freeze the account, all Exchange services are not available for this account.

Loss of XML content includes:

1）information

2）userName

3）password

4）customerName

5）identificationCardNum

6）phoneNum

#### 3.9 Deposit Money

Personal Edition users can choose the deposit banking wealth management interface, select credit card balances in deposit methods, such as deposit taking, demand deposit, once you alter deposit method, prior to the termination of deposit will be calculated as current interest rates.

Deposit banking information transmitted transmitted in the form of XML documents, which reads as follows:

1. information
2. applicantname
3. applicantcardnumber
4. totalprice
5. way
6. deadline
7. applytime

#### 3.10 Interest Money

Personal finance and wealth management interface a user-selected interest, interest on deposits to be credited to the investment account, bank finance and investment. Users will need to enter the amount, and then sent to the server.

Interest financial information transmitted transmitted in the form of XML documents, which reads as follows:

1. information
2. applicantname
3. applicantcardnumber
4. totalprice
5. deadline
6. applytime

#### 3.11 Receive Data

Server parts data receiving major supermarket customer enquiry and payments requests received by the server, and the Bank accepts the payment request, the registration request and logon requests.

Carry the corresponding XML document data via socket and is ready for processing.

Need to receive the XML document includes:

1）Customer Inquiryxml

1、information

2、barcode

2）Total queriesxml

1、information

2、goodslist

3、quanlity

3）Payment requestxml（超市接收）

1、information

2、account

3、MAC address

4、cipher

5、account

6、time

7、goodslist

8、quanlity

4）Payment requestxml（银行服务器接收）

1、information

2、payeraccount

3、receraccount

4、MAC address

5、cipher

6、account

7、time

5）Registration Requestxml

1、information

2、id information

3、account information

6）Login requestxml

1、information

2、name

3、password

7）Deposit Money Requestxml

1.information

1.appliantname

2.appliantcardnumber

3.totalprice

4.way

5.deadline

6.applytim

8）Interest management xml

1.information

1.appliantname

2.appliantcardnumber

3.totalprice

5.way

6.deadline

7) Deposit management xml

1.information

2.username

3.useramount

4.amount

5.method

6.deadline

7.time

8)Interest management xml

1.information

2.username

3.useramount

4.amount

5.method

6.deadline

7.time

After receiving the above information processing modules for XML parsing, you implement the function, and returns the XML document that contains the results.

#### 3.12 Data processing

Servers for data processing are mainly based on the above XML document received and parsed accordingly and returns the result. When the input document is:

1）Customer Inquiryxml

Query barcode product information from the database, including the price and name, fill in the query XML documents and return.

2）Total queriesxml

Commodity price information corresponding to all barcodes from a database query, and then multiplied by the quantity in the quantity list, calculate the total price and the sum results fill in the returns that XML document.

3）Payment requestxml（超市接收）

To join the supermarket of account information, go directly to the Bank server.

4）Payment request（银行服务器接收）

Under the account gets the person's private key to decrypt the encrypted information, can decrypt, then the debit from the payer account, if deductions are increased corresponding to the receipts account value and returns a string that represents the success of XML, in which any failure to return XML that represents a failure.

5）Registration Requestxml

File status information, binding the appropriate accounts, generate the key and return

6）Login Request xml

Check the identifiable information, and returns whether successfully log on

7）Payment failurexml

Forward to payer

8）Payment successfulxml

XML Archive payment requests before filing, forwarding the success of XML to the payers.

#### 3.13 Transmit data

Data sent depends largely on the results of previous processing, based on the results, sends the corresponding XML source socket to a port

1）Product search resultsxml

1、information

2、barcode

3、goodsname

4、price

2）Total Resultsxml

1、information

2、totalprice

3）Payment successfulxml

1、information

4）Payment failurexml

1、information

5）Successful registrationxml

1、information

2、e

6）Registration failedxml

1、information

7）Login succeed xml

1、information

8）Login failedxml

1、information

Part IVAcceptance criteria

### 4.1 Functional scope definition

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **单元** | **模块** | **规格** |
| 1 | Personal Edition | registration | Enter your account information, is sent to the server to verify, after successful registration on the local save account information |
| 2 | Log in | Enter your account information matches with the account files in the local file, logged in to access the main interface |
| 3 | Payment | In individual shops, through Bluetooth connection from the phone the cashier, click on confirm payment in supermarkets through the Bluetooth connection from the phone till, brush bar code shop, click on confirm payment |
| 4 | Transfer | Find nearby users, select a user, send e-check |
| 5 | Receivables | Receive e-check |
| 6 | Delivercheck | Deliver electronic check, transfer of funds to your account |
| 7 | manage finances | Deposit banking, select finance and bank card balance deposit interest, interest on deposits to be credited to the investment account, Bank investment funds |
| 8 | Report the loss | Click on the report button, and check the account information, the freezing of accounts |
| 9 | Individual shop version | registration | Enter your account information, is sent to the server to verify, after successful registration to save account information locally, the system generates QR code and download |
| 10 | Log in | Enter your account information matches with the account files in the local file, logged in to access the main interface |
| 11 | Payment | Request receipt of customer's payment, enter the amount and sends the transaction information to the banks closed accounts receivable |
| 12 | Supermarket version | registration | To the Bank for the record, gets the personal key |
| 13 | Initialization | Open the supermarket version of the software, enter your personal key, download your account information |
| 14 | Payment | Receive customer payment information, transaction information is sent to the Bank server, receive the results, the results are sent to customers |
| 15 | Sever | Receive Data | Establish socket to wait for a connection |
| 16 | Data processing | According to the XML document to the appropriate operation and generates a corresponding XML documents |
| 17 | Transmit data | Sent over the socket handling XML documents |

### 4.2 Performance Indicator Definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Project** | **module** | **Level** | **configuration** |
| 1 | Design and implementation of specifications | System Architecture | A | Three-tier structure with c/s mixed-mode, meet iPhone mobile terminal access needs, easy customization of software features. |
| 2 | Object-oriented development language | A | Developed using object-oriented languages and middleware technologies |
| 3 | Comments and documentation | A | Meet the CMMI software process standards documents (at least: demand, overviews, detailed design, test, deploy, and environment, user's Guide), code >=30%. |
| 4 | Modular and suitable for training | A | SOA design, modular units of each module to ensure strong independence suitable training teaching. |
| 5 | Test coverage | A | Functional coverage >=100%, >=100% business coverage, coverage of language >=100%, >=80% logic coverage. |
| 6 | The number of concurrent users require | Concurrent single business | C | PC terminal modules:> = 100 / sec concurrent |
| 7 | all online | C | Unlimited (test number >=100) |
| 8 | Resource utilization requirements | CPU utilization | B | <= 50% utilization (near the standard configuration) |
| 9 | Memory usage | B | <= 75% utilization (near the standard configuration) |
| 10 | Response time requirements | Sever | B | <= 100ms (near the standard configuration) |
| 11 | Netword | B | <= 100ms (near the standard configuration) |
| 12 | Client | B | <= 5s (near the standard configuration) |
| 13 | System stability requirements | Maturity | A | A real user, successful use of the system |
| 14 | Stability | B | Trouble-free uptime >=365 days, system recovery time <=2 hours. |
| 15 | Advanced | A | Realization of the mobile terminal and bridging the specific application systems. |
| 16 | Typical Significance | A | Case study projects are typical, and promising. |
| 17 | Integrated deployment environment | Phone | A | More than Android 2.2 system |
|  |  |  |  |  |
| Description: level (a: very important technical performance requirements that must be met, b: indicates that the important recommendations to achieve technical performance requirements, c: weakening of non-important technical performance requirements.) | | | | |

Part VEnvironment and deployment requirements

### 5.1 Network deployment diagram



#### 5.2 Runtime Environment Description

Server configuration: Oracle 11g database, Windows Server

Supermarket computer configuration: WinXP/win7/win8

Phone configuration: Android 2.2 per cent, over Bluetooth 2