

A New Method for Online Payment of Electricity Charge Based on USBKEY

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Keywords: USBKEY, encryption, payment system.

Abstract. This paper presents a new method for online payment of electricity charge based on USBKEY. We integrate payment software with the USBKEY, working with the background management module, to realize the safe and efficient payment for large power customers. Guarantee the construction and promotion of online service channel for electric power enterprises, and realize quality improvement of safety protection level on the marketing automation system in enterprises.

Introduction

With the development of social economy, the Internet trading occupies more and more proportion in economic activities. So far in 2014 June [1], the scale of Chinese Internet users reached 632 million, which paid use Internet users reached 292 million, accounted for 46.2%. This will produce a lot of new challenges to the electric power enterprise, such as new business models are emerging, electricity customers, increase the surge in the number of service radius, supply increases, customer demand difference power customer service experience to improve, customer and power information interactive etc. How to service based on the existing channels of expanding the service content, improve service means, enhance service efficiency, the introduction of the establishment of new service channel new technologies, to reduce the construction cost, it is essential to improve the channels of customer service quality.

Therefore, there is an urgent need to develop a new method for online payment of electricity charge based on USBKEY, to provide the guarantee for the safety of large customers' online payment for power enterprises.

Requirement and Design

Through visiting the electric power company, communication with experts who engaged in scientific and technological research of electric power, and the research data of an electric power company, we draw the following conclusions:

Customers get the authentication by the USBKEY which containing the certificate provided by electric power company. After we insert the USBKEY into the computer, we should input the PIN code firstly. Only verified before they can start electricity charge payment software [2]. Using this electricity charge payment software, users can maintain personal information, query electricity information, payment, view the history of the bill, and arrears forewarning information. All of the above are encrypted communication process. According to the above requirements, we designed the following entities: A USBKEY, which mainly used for authentication, would be written a certificate while it is issued to the customers. A desktop applications, as the interface of Human computer interaction named payment software, could provide customers a panel for the maintenance of personal information, electricity information, the record of payment etc. Encrypted communication process is transparent to the user. The premise for starting to use this software is that users have a USBKEY which contain a certificate provided by electric power company, and know its PIN code.

A security server, communicating with the desktop application, is responsible for encryption involves the user's personal information and other sensitive information. We decided to adopt the hardware encryption - encryption card. Payment software would encrypt the request-URL, and sent it to the security server. The security server decrypts the request field, and then sends a request to the payment platform. Finally it gets results returned, encrypts it and send to the desktop application, the application would display the results. A payment platform, responsible for the interaction between internal network and external network, has been prepared by the electric power company. Payment belongs to the intranet system of electric power company. In order to provide service support, power companies provide Web Services for external network user. We do the firewall protection, only allowing the communication with the security server to keep it safe. A management tool, for manager, could write the certificate to the USBKEY when issuing USBKEY to the user, and binding USBKEY with the user. Similarly, when the users report the loss of USBKEY, the administrator would unbound the relationship between the USBKEY and the user.

Technical Support

USBKEY Technology

USBKEY is through a USB (Universal Serial Bus) connected directly to a PC, with password authentication function, reliable and high-speed small storage devices. The technology base on trusted computing and smart card ensure that the operation of users with the USBKEY cannot be altered. The biggest characteristics of USBKEY are high safety, technical specification, strong consistency, good compatibility of operating system, portable [3].

PKI Technology

PKI means public key infrastructure. Its core technology is based on encryption of public key cryptography and signature technology. It is a system on international solution to the open Internet information security requirements. It provides encryption and decryption, digital signature and authentication cipher service for all web applications and the necessary key and certificate management system.

Digital Certificate

A digital certificate is an authoritative electronic document. It is a certificate issued by an authoritative and justice third party authority, (CA). All the contents of electronic document must have a digital signature of authority. The main contents of the digital certificate contain user real name and uniquely identifies -- ID and the user's public key. You can encrypt and decrypt, digital signature and signature verification of information transmitted over the network, to ensure the safety of online transmission of information.

Digital Signature

Digital signature technology is a method for signature of electronic information, it can be equivalent to handwritten signatures similar to the role of. To prevent the signed message forgery or alteration, ensure the legitimacy of the information in the electronic transaction and non-repudiation, furthermore, the digital signature can also be used for the identification of two sides of communication [4].

Function Design

The research content of this paper is mainly involved in the payment method of power system taking USBKEY as carrier, the realization of the physical binding client user ID and electricity payment account, realize the real-time electricity to rolling update account and customer pay, arrears and electricity and automatically send electronic bill and electricity bills. The structure of the system as shown below:

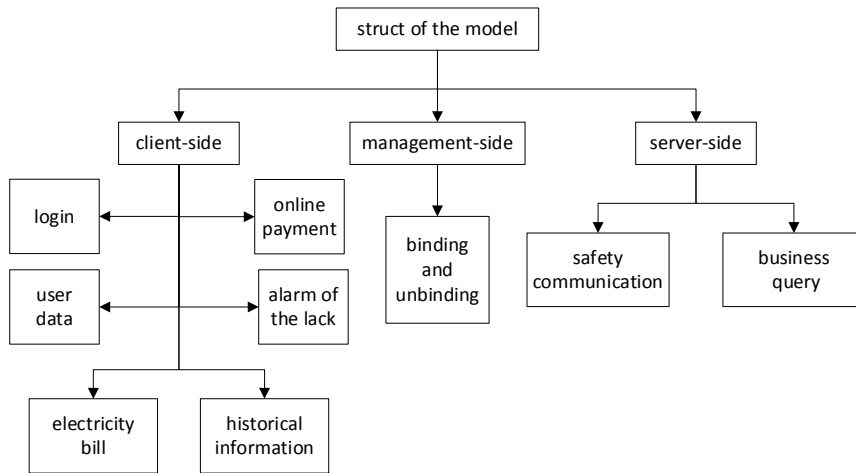


Fig. 1 Structure of the system

The system is divided into three sections, client, management and server. Section client could achieve the interaction of human-computer with customers. The main function modules include user login module, the user basic information module, query module electricity information, online payment module, the alarm module and the history of arrearage information query module. Section management could supply the way for administrators to complete the initialization of USBKEY and the maintenance work. The main function modules include binding module and unbundling module. Section server complete the security transmission of information and response of client request.

The main function modules include security communication module, authentication module, and business query module.

The client-side design.

Login module. The main work in this module is to validate the PIN code, then read the USBKEY certificate, and verify the legitimacy of the certificate. **User data module.** This module mainly displays the user personal information, including user name, type, grade, contact, address achieves users after login authentication **Electricity bill module.** This module is mainly to query the user's electricity consumption information, including communication with a remote server, sent query request to the server. Query data include electricity consumption of this month, electricity bill and the historical electricity information. **Online payment module.** This module mainly completes the function of user online payment. Online payment implementation calls the Union Pay online payment interface. After the completion of the payment, it need to send a request to the server to complete the verification. **Alarm of the lack module.** This module mainly completes the arrears notification function. After the user has successfully logged in, the server query the database. If it is found that the user arrears, it would display the information of customer arrearage in section client. **historical information module.** This module is mainly to query the information of users' history payment, and displayed the information in the client.

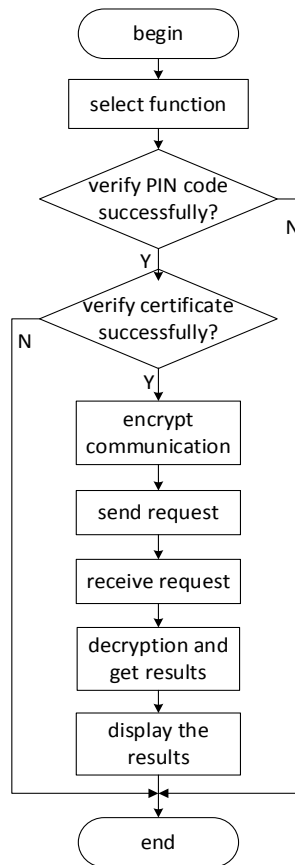


Fig. 2 flow chart of business in section client

The management-side design.

Binding & unbinding. Binding is the initialization of the USBKEY, save the relationship of USBKEY and customer into database. In contrast, unbinding is mainly to delete this relationship.

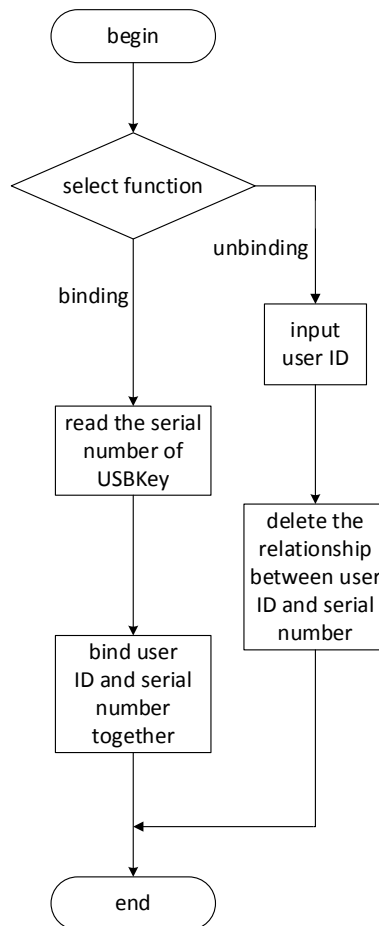


Fig.3 flow chart of business in section management

Server-side design.

Safety communication module. This module mainly to realize the security reliable connection and information transmission between the client and server. It includes verifying identity of connection the object identity, information of transmission, encryption and decryption work. Business query module. This module is responsible for querying the information of user, the electricity consumption of user, payment, user's history information in database. The query information would be transmitted to the client section through the security communication module.

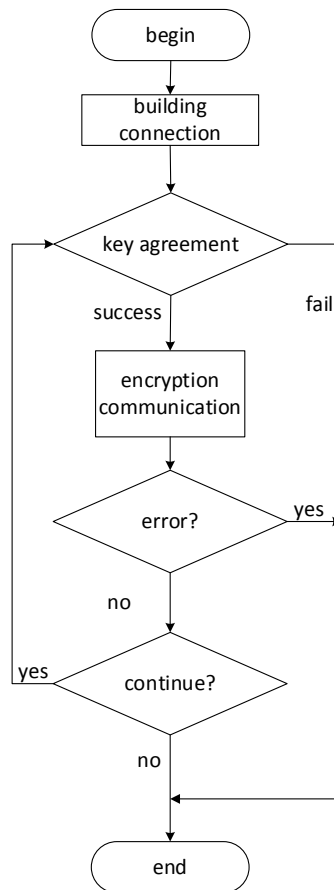


Fig. 4 flow chart of security communication in section server

Summary

This paper provides a safety electricity online payment method by using the USBKEY as the carrier of authentication, asymmetric encryption algorithm as the protection of communication, to protect the user's property safety and improve the service level of electric power company. At the same time, the system also can be adjusted according to the actual situation, in order to adapt to the other company. So it has high promotional value.

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