

Design and Implementation of Campus Card Recharge System in Local Area Network

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Abstract. In order to solve the problem of campus card system recharging in LAN, in this paper we build a cross network one-way transmission channel from the Internet to the LAN, using the image ferry equipment, and design the campus card recharging system on this channel. With ensuring the physical isolation between the Internet and the LAN, users can easily complete the campus card recharging on mobile phone. After testing, the system can almost recharge in real-time, with a delay of less than 2 seconds. The system is stable and has a good using experience. It has strong innovation and popularization.

Keywords: Cross Network Transmission, Image Ferry, Campus Card Recharge.

1. Introduction

With the continuous development of information technology, colleges and universities are accelerating the construction of smart campus with the help of the Internet platform, and have made great progress. The concept of smart campus has gradually taken root in the hearts of the people, the construction ideas have become clearer, and the relevant technologies have been gradually improved [1]. In order to facilitate the work and daily life of teachers and students, the vast majority of colleges and universities have built campus card system in the working LAN. Teachers and students can use one card to realize the functions of consumption, dining, access control, etc. However, many university office networks are local area networks, which are physically isolated from the Internet and cannot communicate directly. To recharge the campus card, teachers and students can only go to the self-service recharge machine to complete the recharge through cash payment or take the card to the manual recharge window to realize manual recharge through cash or code scanning payment. Both of these two methods require users to recharge at a specific place, which is very restrictive, and has fallen far behind the era of mobile consumption, bringing a lot of inconvenience to teachers and students.

To solve this problem and realize the mobile phone automatic recharge of LAN campus card system, the first thing to realize is the information transmission from the Internet to the local intranet. At present, the technology of one-way data transmission between two physically isolated networks mainly consists of two ways: optical disc ferry and image ferry. The principle of optical disc ferry is to simulate manual disc recording. Data from the external network to the internal network needs to undergo complete disc recording, disc moving and disc reading operations. The time delay is very large, which is suitable for the transmission of large files. The principle of image ferry is to simulate the human eye to identify the QRcode on the display screen through the camera. The time delay is very small, which is suitable for the transmission of small amounts of data. In the application scenario of campus card recharging, only a few bytes of information are transmitted each time, and the data transmission delay is required to be as small as possible. Therefore, the image ferry technology is more suitable for this scenario. In this paper, the image ferry technology is used to build a cross network transmission channel from the Internet to the local area network where the campus card system is located, and based on this, we design implement the campus card recharge system in LAN.

2. Cross network transmission channel

The image ferry technology mainly aims at the demand of real-time cross network one-way transmission of a small amount of data, such as message or string transmission, adopts advanced QRcode coding and decoding technology, and uses the display screen and camera to simulate human eye recognition, so as to realize the real-time automatic one-way transmission of data from the Internet to the LAN under the condition of ensuring the physical isolation of the Internet and the LAN [2]. Image ferry uses QR code to transmit information. The amount of information transmitted each time is small, but the delay is very low. It is suitable for fast transmission of small amount of data, such as the transmission of campus card recharge information.

The system is composed of sending server, one-way isolation channel and receiving server. The sending server is located in the Internet and the receiving server is located in the LAN. The unidirectional isolation channel is composed of a display screen and a high-definition camera. The display screen is connected to the encoder at the sending server, and the camera is connected to the decoder at the receiving server. After encoding the transmitted data, the encoder displays the encoded QR code image on the display screen. After reading the QR code, the camera sends QR code to the receiving server for decoding and verification, and restores it to the original data, The receiving server then forwards the data to the LAN target server.

There is no physical connection between the sending and receiving servers and the display screen and camera of the one-way isolation channel, ensuring the physical isolation between the internal and external networks. At the same time, the characteristics of the display screen and camera determine that the receiving end cannot send data to the sending end, ensuring the security of one-way data import. Therefore, the image ferry system can meet the requirements of safe, real-time and high-frequency data transmission across networks.

The image ferry system the method of multi copy transmission to ensure reliable transmission and data integrity: the data of the same task is transmitted multiple times according to the set transmission times, and the MD5 value of multiple copies is verified at the receiving server. The same data can be confirmed to be received successfully, otherwise it is discarded to ensure the reliability of the transmission data.

3. Campus Card Recharge System In LAN

In order to realize the function that users can recharge the campus card system deployed in the LAN through their own mobile phones, this paper designs and implements the campus card recharge system in LAN with the help of the cross-network transmission channel constructed by the image ferry equipment, and realizes the function of campus card recharge on the Internet. Users can recharge their personal campus card in the system anytime and anywhere. After the user completes the payment and deduction on the mobile phone, the system will import the encrypted recharge information, including recharge account number, recharge amount, etc, to the campus card recharge server in the LAN through the image ferry system to complete the recharge, so as to realize the mobile phone online real-time recharge business of the campus card and ensure the convenience of users' life.

The image ferry system transmits information from the Internet to the LAN in one direction. Therefore, the Internet server of the system cannot receive the feedback information on whether the system in LAN recharging is successful. As the Internet server needs to confirm the deduction according to the feedback of successful recharging, the lack of feedback information will make the recharge process unable to complete the closed-loop operation. In order to solve this problem, the system adopts step-by-step operation and manual verification. First, after the user submits the recharge request, the Internet terminal does not need to wait for the feedback information of successful recharge to directly complete the charge deduction operation. Then, the information of successful charge deduction is encrypted and transmitted to the LAN through the image ferry system. The LAN recharge system completes the recharge operation according to the recharge information. If the user finds that the recharging fails, he / she needs to contact the card recharging administrator to manually recharge

or refund after manual audit and confirmation. Finally, at the end of each month, the person in charge of the financial department checks the recharge data of the current month. If it is found that the Internet terminal has completed the deduction but the LAN recharge has failed, recharge manually. After confirming that the recharge is successful, complete the recharge closed-loop process.

The specific process of user recharge is as follows:

(1) Users recharge their campus cards through the Internet recharge system, and complete the payment process at the Internet server according to the payment steps.

(2) The system will feed back the message of successful fee deduction to the user, and automatically push the message of recharge account, amount, etc. to the image ferry system after encryption.

(3) The sending server of the image ferry system encodes and sends the received recharge information stream.

(4) The receiving server of the image ferry system collects and decodes the received QR code.

(5) The receiving server of the image ferry system pushes the decoded recharge data to the campus card recharge server to complete the actual recharge process.

(6) If the user finds that the recharging is unsuccessful when using the campus card, he / she needs to go to the campus card recharging office to find the card office administrator for manual online verification and manual recharging based on the payment records.

(7) At the end of the month, the financial principal reconciliates. If abnormal recharge data is found and confirmed, there are two processing methods: one is to manually recharge, and the other is to refund the recharge fee on the Internet.

The system has been deployed in the campus card system in the local area network of a certain university. After the using test, there are 5000 times of actual recharge, and 5000 times of success, 0 times of failure, and the success rate is 100%. It shows that the stability and reliability of the system are very high, and can fully meet the needs of practical application.

In order to calculate the time delay data for recharging, we first adjust the time of the Internet mobile terminal to be consistent with the standard NTP time to ensure the accuracy of the time. At the same time, keep the time of the intranet campus card recharging system consistent with the mobile terminal. The time interval from the completion of payment on the Internet mobile terminal to the recharge and receipt of the intranet campus card system is defined as the time delay. The time delay of 5000 recharge times is between 0.5 seconds and 2 seconds, with an average time delay of 1.03 seconds, which truly realizes the campus card recharging in seconds.

4. Conclusions

In order to solve the problem of campus card system recharging in LAN through mobile phones, in this paper we construct a cross network transmission channel from Internet to LAN based on image ferry technology, and design and deploy the LAN campus card recharging system. After the actual deployment test, the system has high reliability and stability. The recharge delay is a little bit more than 1 second, realizing the recharging in a second time. The system effectively solves the problem of the campus card system recharging deployed in the LAN, and has strong feasibility and popularization.

References

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