

# One-Card in the Whole Campus Solution Based on RFID

Y. Johny Mercia

**Abstract---** We present a RFID application in which the second generation ID card in China is used instead of all kinds of the existing IC or ID card. For the purpose of solving the confusion of different kinds of card used in One-Card system, we design a One Card in the whole campus solution based on the second generation ID card with adaptable interface to all kinds of utility services in university. It adopts password, fingerprint and other biometrics feature binding information for authentication in addition. Furthermore, the business procedure and developing interface is given. As an application, we implement a One-Card system consists of Electronic Passports module in library online, Sports Test module on the ground offline with SD card being the data storage and transferring media. In the end, layered architecture, clear data process and network architecture of the One-Card system is introduced to discuss the feasibility of the solution. The result of the present work implied that the second generation ID card in China is gradually becoming a new way to solve the confusion problem of One-Card system. It will play an important role in the utility prepayment field.

**Keywords---** The Second Generation IDCard, RFID, One-Card, PSB

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## I. INTRODUCTION

Thanks to the arrival of the second generation ID card in China, the sales revenue of China's domestic RFID market rose greatly. It is obviously that the second generation ID card is the main application market for RFID in China, and

the enrolling of new students at college was a major drive for the increase in the field. Many reports cite the factors that limit RFID's application in China, saying that the first factor is the high cost, and the second one is that there is no unified standard, which as a result makes some of RFID functions not deployable. In consideration of China's overall national status quo, we push the development of RFID application through One-Card system in college based on the second generation ID card instead of ordinary ID card [1, 2].

In 2004, the government of China began issuing a second generation Resident Identity (ID) Card to its citizens. The new computer-readable ID card replaces the first-generation card that has been in circulation for more than 20 years. China's major cities, including Beijing, Shanghai, and Shenzhen were the first to begin issuing the new ID card. Information on the number of second-generation cards issued that approximately 800 million second-generation cards had be issued by the end of 2008. Information stored in the identity database for biometric ID cards documents information such as work history, educational background, religion, ethnicity, police record, medical insurance status, landlord's phone number and personal reproductive history[3, 4].

Citizens within the People's Republic of China must carry identification in public at all times, compulsory from the age of 16. The identity card is the only acceptable legal document to obtain resident permit, employment, open bank accounts, and obtain passport, driver license, application for tertiary education and technical colleges, security checkpoints in domestic terminals of Chinese airports. Recently, there have been more services that require the display of identification cards, such as at college entrance

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examination and Internet cafes. Since Second-generation ID card is issued in the university overwhelming to any other card, it is mostly feasible to be the One-Card media implementing the integration of information, services and data for the management of university in China.

## II. ONE-CARD IN THE WHOLE CAMPUS SOLUTION

The second-generation ID card, referred to as a "smart card," has an embedded digital microchip. The microchip contains cardholder information, including name, sex, birth date, address and household registration location. Fingerprints were initially intended to be stored in the microchip; however, the inclusion of fingerprints has reportedly not occurred. The new ID card's embedded microchip can apparently only be read by "special" card readers. The microchip reportedly uses radio frequency identification (RFID), which allows data stored in the chip to be read by card readers from a distance of 20 to 30 centimeters. Only the Public Security Bureau (PSB) has the technology required to write information in the embedded microchips that is capable of being read by authorized machines so that the information found in the secondgeneration ID card cannot be duplicated, as the process of decryption of its chip information could take as much as 10 million years. Only local companies in China are reportedly allowed to participate in the production of the new ID cards.

The second-generation ID card is expected to facilitate certain activities for undergraduates, such as opening prepayment accounts, library card and class examination. It is also anticipated that the new card, connected to a national network, could pay the expenditure occurrence of refectory supermarket and bedchamber. Undergraduates are required to be inspected identification documents in the whole campus where:

- Race Timing: Many forms of Transponder have been in use for timing races of different types since 2004. When the undergraduate declare score in the

outdoor field, he should be inspected identification through the Second-generation ID card instead of the current student card which cannot be readable by machine.

- Electronic Passports: the Second-generation ID card can be a uniform Electronic Passports for the entrance to the library, classroom, auditorium and some other important building.
- Electronic payments: In the whole campus, mass consumption is paid for almost exclusively through the use of the Second-generation ID card with RFID technology. In the Internet environment, it has grown to be similar to a cash card, and can also be used in vending machines, fast-food restaurants and supermarkets. The card can be recharged with cash at addvalue machines or in shops, and can be read several centimeters from the reader.

To meeting the requirements above, we develop One-Card System based on the second-generation ID card (OC-SID) in the Whole Campus. OC-SID is currently widely-adopted to university service management available and provides a set of best-practice guidelines for utility service management. The OC-SID guide breaks down the key bottleneck of the utility service management that every department has its own IC cards, which make the integration of information, data and service difficultly, and greatly enlarge the cost of management. The schematic of OC-SID is shown in Figure 1. (for possible use by future standard amendment).

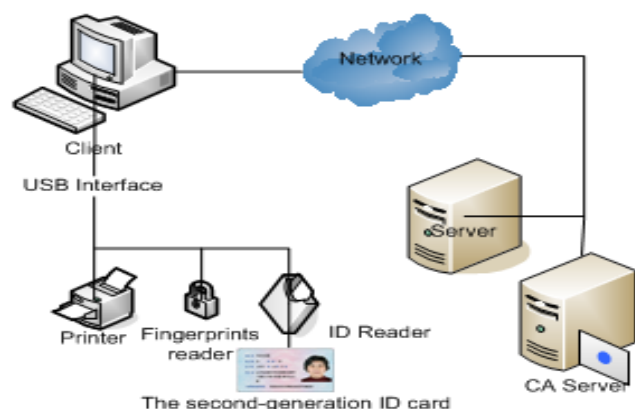


Fig. 1: Schematic of OC-SID

The second-generation ID card readers have been installed in such places as account department, supermarkets, customs and banks in the whole campus. The use of the readers has been authorized by PSB. The procedure of OC-SID is shown in Figure 2. When an ID card of undergraduate is put in the card reader machine, a small device similar to a notebook PC, the information displayed on the card can be seen on the machine's screen. If a fake card is used, no information is visible. Password, fingerprint and other biometrics feature are always the binding information for authentication. The client inspects the picture from the second-generation ID card and process the relative business, and then transmits the information to CA and server through ATM for validation of farther process. If proved to be successful, server executes the deduction and response to the client the success information. On the other hand, the error information should be feedback to the client. At the same time, buzzer is given [5, 6].

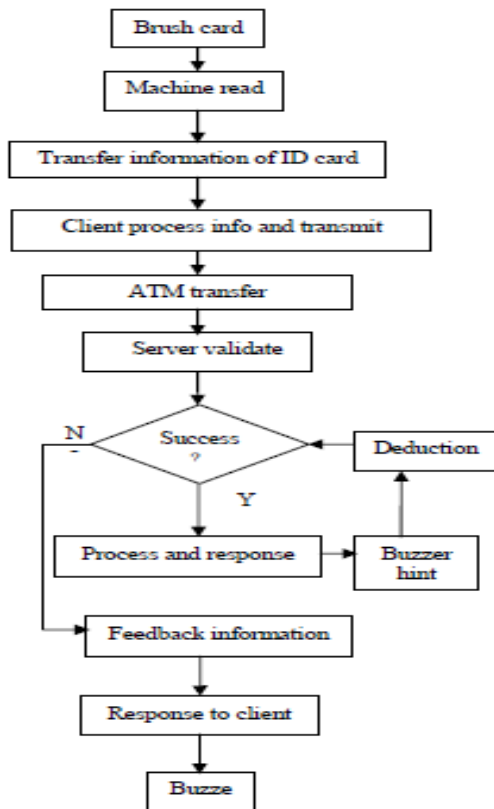


Fig. 2: The Procedure of OC-SID

It is the most important thing that how the OC-SID system integrate the second-generation ID card reader. We solve the problem by developing Syn\_IDCardRead.dll and the partly main relative API function is defined in headfile of Syn\_IDCardRead.h as follow:

```

typedef struct tagIDCardData{
char Name[32];
char Sex[4];
char Nation[6];
char Born[18];
char Address[72];
char IDCardNo[38];
char GrantDept[32];
char UserLifeBegin[18];
char UserLifeEnd[18];
char reserved[38];
char PhotoFileName[255];
/*Picture of the cardholder of the second-generation ID
card*/
Char* pPhotoFile;
/*Service type, such as Race Timing, Electronic Passports
and
Electronic payments*/
char Type;
/* The available Length of Value */
char Length;
/* The value of service type */
char Value[255];
}IDCardData;
/*Port Class API */
int STDCALL Syn_GetCOMBaud(int iComID,unsigned int
*puiBaud);
int STDCALL Syn_SetCOMBaud(int iComID,unsigned int
uiCurrBaud,unsigned int uiSetBaud);
int STDCALL Syn_OpenPort(int iPortID);
int STDCALL Syn_ClosePort(int iPortID);
/* SAM Class API */
int STDCALL Syn_GetSAMStatus(int iPortID,int iIfOpen);
int STDCALL Syn_ResetSAM(int iPortID,int iIfOpen);
  
```

```

int STDCALL Syn_GetSAMID(int iPortID,unsigned char
*pucSAMID,int iIfOpen);
int STDCALL Syn_GetSAMIDToStr(int iPortID,char
*pcSAMID,int iIfOpen);
/*The second-generation ID card Class API */
int STDCALL Syn_StartFindIDCard(int iPortID,unsigned
char *pucManaInfo,int iIfOpen);
int STDCALL Syn_SelectIDCard(int iPortID,unsigned char
*pucManaMsg,int iIfOpen);
int STDCALL Syn_ReadMsg(int iPortID,int
iIfOpen,IDCardData *pIDCardData);
    
```

### III. DEVELOPMENT OF OC-SID SYSTEM

There are two kinds of solution to developing the OC-SID system. One is storing the prepayment money into the microchip of the second-generation ID card which is regard as electronic purses instead of any other IC card. This is the best solution for OC-SID system, but it needs the support of PSB, bank, and relative utility department which is complicated and huge project for implementing. At present, the PSB has not opened the interface of the second-generation ID card for developing, so that it is impossible in the current condition. The other is storing the prepayment money into database of server and the second-generation ID card is regard as ordinary ID card for authentication which is available and reasonable project to reduce any other ID card in the campus. This is easy deployed for implementing. The responsibility of issuing and managing ID card is diverted to PSB which greatly reduce the load of management for university. We only pay more attention to the core utility service which can be substituted by using the second-generation ID card in campus.

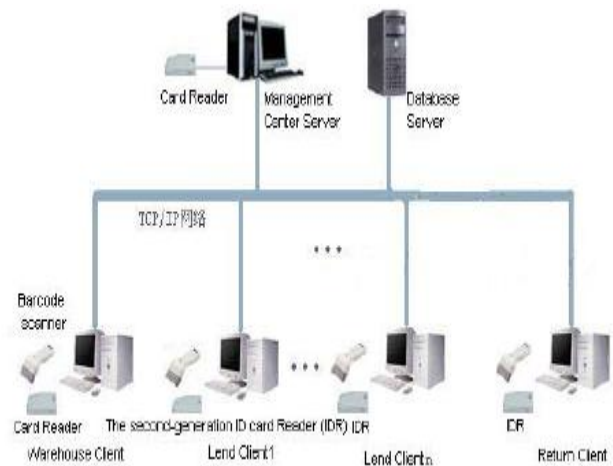


Fig. 3: Electronic Passports of Library

According to the different of network condition, we develop OC-SID system by two ways: online or offline. In the online environment, we develop the Electronic Passports services of library which reducing the library card by the second-generation ID card and existing system is easy updated, shown in Figure 3. It can be applied at other online occasion such as refectory, utility prepayment and etc. As to the offline environment, such as race timing on the ground, we use the portable reader to record the score of the undergraduate and the procedure design of sports test is shown as Figure4:

Firstly, Sport teacher powers on the portable card reader on the ground, inputs passwords for security, and select the class number of the testing undergraduates, and enter the main menu of the portable reader. The portable reader from the authorized agency of University and PSB have slots of SD card for recording and transferring the score data and RFID interface for connecting with the second-generation ID card according with ISO 14443 Type B protocol .

Secondly, the teacher selects the item for test, e.g. Physical test. The sub-items are shown on the screen. Suppose 50-meter running test is select, then the correlative test window is shown.

Thirdly, the testing undergraduate brush its secondgeneration ID card on the reader of the teacher, its correlative information is shown, including name, sex,

grade, class etc. which has been download from management system by SD card, and the teacher give the score and confirm the information is stored on the SD card which is plug into the reader.

Fourthly, when the test is over, the teacher plugs out the SD card stored test scores and plug in the PC for updating the database and upload the scores to the management system. The backend of offline system is just the same as the online ones. The principle of OC-SID system design includes: Feasibility and Applicability, Practicability and Economy, Reliability and Maturity, Opening and Standardization, Reliability and Stability, and Security and Confidentiality.

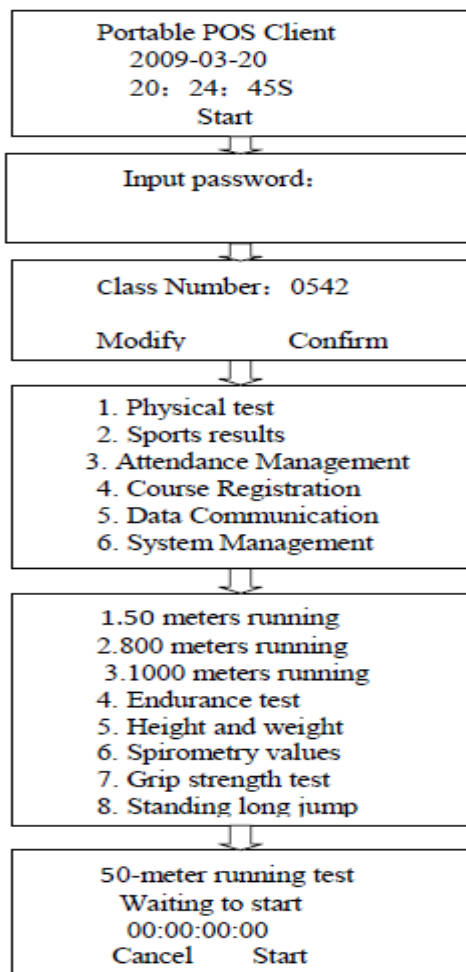


Fig 4

OCSID includes library, eatery, examination, supermarket, utility prepayment and racing test etc. which requires layered architecture and clear data process flow. It

is a 4-layer system shown as Figure5. The first layer includes clearing system, card issue and recharge system bound to OC-SID center. The clearing bank is Ningbo bank. The second layer is the balance system of library, eatery, examination, supermarket, utility prepayment. The third layer includes the stations of all kinds of services and the operation company of power and water. The last layer includes the terminal equipment/POS and the secondgeneration ID card holder. OC-SID network includes host, application system, database and terminal equipment. It consists of OC-SID center, subsystem balance center and terminal point bound to card issue & recharge, fee collection and card exchange. OC-SID center undertakes university interdepartmental exchange, clearing and management etc [7].

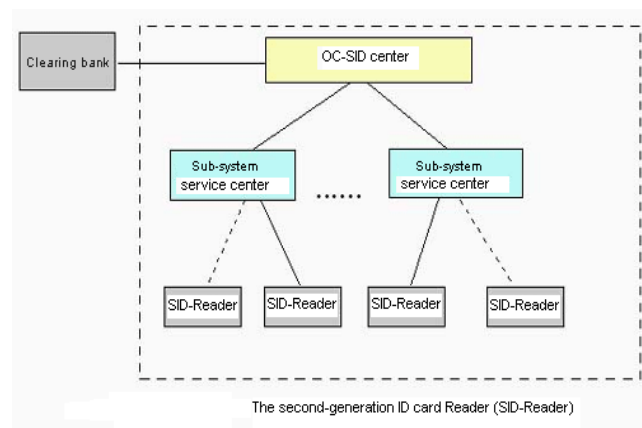


Fig. 5: Network Architecture of OC-SID System

Given the interoperation between the second-generation ID card and One-Card system is feasible; there is a new way to solve the confusion of the typical One-Card system. In this paper, we have presented such a One-Card in the whole campus solution that can be used for different kinds of utility services in university without changing the existing One-Card system too much by using the second-generation ID card instead of all kinds of IC or ID card. Furthermore, we have discussed the OC-SID system design in online or offline environment.

In terms of future work, there is a need to provide OC-SID system adapted interface to more services in particular that will allow us to better show the applicability of our

solution to a wide variety of application domains. In addition, the use of actuators will eventually improve the development of our one card solution.

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