Smart-Cards: Technology For Secure Management Of Information

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ABSTRACT
The increasing need for de-centralized information systems offering data to the people who need them irrespective of their physical location make the system’s architectural and functional design more complex and in many cases extremely vulnerable in respect to its security attributes. The need, for security and enhanced privacy, is increasing as electronic forms replace face-to-face and paper-based identification. The concept of a “secure portable information file” can nowadays be easily implemented through the available smart-card technology that can significantly ease information management and ensure maximum data protection with respect to their integrity, confidentiality, and availability. This paper presents the use of smart-cards, which are capable of providing an extremely secure operational framework in terms of user and application provider authenticity, management of access privileges and data integrity, and confidentiality. This paper especially deals with the application of smart-card technology in India.

KEYWORDS
Smart-card, Libraries automation, Libraries management.

INTRODUCTION
Information technology is evolving at an amazing pace. The advancements in the digital communication and the embedded industry have a great impact on the ways people communicate and transact. Personal computers, fax-machines, and cell phones are in the hands of millions of people Worldwide. Similarly, interest in smart-card technology has soared in the 1990’s, and by the year 2000 the number and variety of smart-card-based applications dramatically increased around the world. Apart from the security features and ease of use, smart-cards also provide the user with an effective way to conduct e-business and enjoy the luxury of the value-added services provided by vendors. This has enabled smart-cards to make their way into millions of lives. A smart-card is like a ‘pocket-size powerhouse’, empowering the cardholder with a facility to store personal and financial information and perform several electronic transactions with ease and efficiency.

WHAT IS SMART-CARD?
Smart-card or Chip card technology is fast becoming commonplace in our culture and daily lives. A smart-card, typically a type of chip card, is a plastic card that contains an embedded computer chip—either a memory or microprocessor type—that stores and transacts data. This data is usually associated with either value, information, or both and is stored and processed within the card's chip. The card data is transacted via a reader that is part of a computing system. Systems that are enhanced with smart-cards are in use today throughout several key applications, including healthcare, banking, entertainment, and transportation. All applications can benefit from the added features and security that smart-cards provide. Smart-cards provide a high level of security and enable a new family of information systems to be designed. A smart-card is “a plastic card, similar to a credit card, with an embedded microchip”. It is distinguished from the more prevalent “mag-stripe” card by its vastly increased storage capability and its microprocessor. These cards take the form of either “contact” cards that require a card reader or “contact less” cards which use radio frequency signals to operate.

Smart-cards improve the convenience and security of any transaction. They provide tamper-proof storage of user and account identity. Smart-card systems have proven to be more reliable than other machine-readable cards, like magnetic stripe and barcode, with many studies showing card read life and reader life improvements demonstrating much lower cost of system maintenance. Smart-cards also provide vital components of system security for the exchange of data throughout virtually any type of network. They protect against a full range of security threats, from careless storage of user passwords to sophisticated system hacks. The costs to manage password resets for an organization or enterprise are
very high, thus making smart-cards a cost-effective solution in these environments. Multifunction cards can also be used to manage network system access and store value and other data. Worldwide, people are now using smart-cards for a wide variety of daily tasks. In the U.S., consumers have been using chip-cards for everything from visiting libraries to buying groceries to attending movies, firmly integrating them into our everyday lives. Many industries have implemented the power of smart-cards in their products, such as the GSM digital cellular phones as well as TV-satellite decoders.

The primary advantage of using a smart-card is security for the patron. Since the patron information is stored on the card and encrypted, information providers do not have access to it and cannot track users. In addition to the organizational advantages and enhanced flexibility exhibited, smart-cards can provide extensive support for implementing state-of-the-art mechanisms for protecting the main security attributes of the information; namely confidentiality, integrity and availability. They also offer several different ways for managing authorization privileges, in respect to who has the right to read, write or erase the information, as well as for classifying data depending on whether they are public or they need a certain level of protection.

**CHARACTERISTICS OF SMART-CARDS**

In brief the characteristics of the Smart-cards are:

- They offer quick, easy, and personal way to verify the identity of a user.
- They are more secure and durable than magnetic stripe cards and more difficult to tamper with than bar code cards.
- They can store more data and physically separate the data into a multi-partition file system, so that many applications can safely run on a single card.
- They can control who has access to files on the card as well as in a computer network.
- They can carry unlimited monetary value. The electronic manipulation of the card can add or subtract value.
- They can store biometrics for complete security.
- They can be designed with their own levels of cryptographic algorithms.
- They can accommodate and upgrade all current technologies in piggy back fashion instead of replacing the standard 39 bar code or the three track, high energy stripe systems.
- They can carry a photo, text, and magnetic strip, bar code, and embedded computer chip all on one standard size card.

**APPLICATIONS OF SMART-CARD**

The most commonly the smart-cards are used as / in:

- Credit cards
- Electronic cash
- Computer security systems
- Wireless communication
- Loyalty systems (like frequent flyer points)
- Banking
- Satellite TV
Indian initiatives

India is taking a major initiative in the implementation of smartcards in various applications. IIT Kanpur along with NIC has worked to pen down the complete standards of Operating systems for smartcards which has been termed Smartcard Operating System for Transport Applications (SCOSTA). SCOSTA is the operating system specification for smart-cards to be used as vehicle registration cards and driver’s license cards in India. SCOSTA standards have been recommended for all applications such as the National ID program, driving license, vehicle registration, e-passport, health insurance etc. All Vehicle Registration and Drivers License cards issued in India will have to stick to this standard to ensure national interoperability. Recently I I T Kanpur has developed operating system for contact less Smart-cards which is SCOSTA compliant and is being referred to as SCOSTA CL. It will be used in e-passports in India. The students and employees here have a smartcard based ID card system. There is a Master ID card which is used to create the ID cards for the students and employees of IIT Kanpur. This ID card is being used in different applications in the campus such as : marking attendance of students and employees, and creating memberships for the campus swimming pool. It is also being used as an e-purse application by charging it with cash and then using it for dispensing beverages. Presently work is going on the development of Health cards, Metro rail ticketing, and many other applications. Many smartcard related projects are undergoing at I I T Kanpur. Smartcard initiatives being taken for the I I T Kanpur campus are worth mentioning.

The vice-chancellor of Bangalore University had proposed the smart-card idea to get rid of exam-related mistakes. He said “it would hold all details of each student including attendance, marks card, degree certificate and hall ticket-related information”. The card would also carry information regarding the students’ individual performance and extracurricular activities. M S University, Vadodara is also keen to introduce smart-card for students. Beside these many other academic institutions are working in the same direction.

India is undergoing a smart revolution – make that a smart-card revolution. Smart-cards have been in the news lately with the Government’s decision to set up a Unique Identification Authority (UIDA) to develop multi-purpose identity cards for every Indian. The smart-card UIDS are expected to improve national security, enable easy access to government services, and help eliminate fraud and corruption in the management of large-scale social welfare schemes as National Rural Employment Guarantee Act (NREGA) and Public Distribution System (PDS). But, UIDS are just the tip of the iceberg – there is a vast and untapped market for smart-cards in India. The Indian government is experimenting with smart-cards in sectors such as health care, transport, social security, and defense. Smart-cards are increasingly being used to deliver wages, pensions, rations and even health benefits under programmes such as the NREGA and Rashtriya Swasthya Bima Yojana (RSBY). A number of States including Andhra Pradesh, Bihar, Delhi, Tamil Nadu amongst others have already begun integrating smart-cards in the implementation of government schemes and programmes with interesting results.

In Andhra Pradesh, the State Government has tied up with Mumbai based company - Financial Information Network and Operations (FINO) – to provide biometric smart-cards to disburse social security pensions and NREGA wages in 5 districts. Following a successful pilot of the smart-card initiative in Warangal and Karimnagar districts, smart-cards are now being used for disbursement of pensions and NREGS wages in 259 villages in Andhra Pradesh. In Delhi, the State Government has launched “Samajik Suvidha Sangam” (Mission Convergence) to streamline the delivery of basic services in the National Capital Region (NCR) by converging citizen services provided by various departments into a single window for easier beneficiary access. Key components of the programme include the setting up of a computerised data bank, computer systems at each delivery point and the provision of e-benefit cards to citizens. The e-benefit card is a biometric smart-card issued to individuals to provide them with easy access to a number of government services. At a national level, smart-cards are being used to deliver health insurance benefits to BPL families under the Rashtriya Swasthya Bima Yojana (RSBY). Under the scheme, all beneficiaries are issued biometric smart-cards that contain the fingerprints and photographs of family members.
Rajasthan Roadways have introduced a smart-card for its passengers on all routes across all categories of passengers. As a pilot project, Rajasthan Roadways has introduced this facility in Jaipur at Sindhi Camp bus stand, head office of RSRTC, Narayan Singh circle and secretariat. This will be useful for passengers who travel daily by roadways buses and hate carrying cash or get irritated waiting for the change from the ticket window. The transport department of U.P. is introducing issuance of smart-card driving licenses in 10 districts of UP namely: Lucknow, Kanpur, Ghaziabad, Agra, Jhansi, Allahabad, Barabanki, Varanasi, Aligarh and Meerut in the first phase from January 2013. Chief minister Akhilesh Yadav launched the scheme for smart-card driving licenses at the regional transport office. Besides these Indian government is attempting to implement this technology in many sectors such as transport, gas agencies etc. While there is certainly limitless potential for the use of smart-cards in India, there is also need for caution.

USE OF SMART-CARDS IN LIBRARIES

The need for security and enhanced privacy is increasing as electronic forms of identification replace face-to-face and paper-based ones. The appearance of electronic text centers within libraries during the last several years has been a significant development for both the libraries and research communities. At the same time, electronic texts have become great challenge to the traditional roles in the libraries, research, and publishing communities. The libraries and information centers have always been quick to apply new information technologies in their libraries to face the challenges. Smart-card is a technology designed to facilitate ease of use of library resources, solve the problem of multiple passwords, and save important personal information of students. Smart-card technology in libraries offers state-of-the-art collection management and security applications to meet the needs of organizations. From simple plastic security cases to the ultra-sophisticated RFID based intelligent systems this solution help organizations to reduce losses, enhance staff productivity and support increased circulation and greater patron satisfaction.

Academic Institutions need simple identity cards for all employees and students. Most of them are also granted access to certain data, equipment, and other sources of institutions according to their status. Multifunction, microprocessor-based smart-cards incorporate identity with access privileges and can also store value for use in various locations. Smart-cards have been in use, primarily as identification and debit cards, in colleges and universities since a few pilot projects were implemented in the mid-1990s. The first university smart-card system was implemented at the University of Exeter (U.K.) in 1996. It was used as a pass card for campus buildings and services, a debit card, and a library card. In the mid-1990s, a consortium of European libraries began using the Total Library Management Concept (TOLIMAC) system to provide easy access to fee based information services through libraries. The card also has debit card capabilities and can be used to pay for the services. The Englewood (Colorado) public library began using the Public CARD Smart Guardian system in 1999 to limit children’s access to the Internet. Smart-card used for both transferring the data and also enable remote and mobile computing. In addition to the same, it also helps in obliterating the redundancies of workflow increasing both efficiency and effectiveness of the systems. In libraries smart-card has following uses:

- It can replace the library software with its own feature of “all in one technology”.
- It can be used as library management software.
- Complete bibliographical details of the book (author, title, publisher, etc) are stored on the tags attached to the book and can be traced out easily.
- The information about the book or data within the book can be searched with the help of search engine.
- The books can be issued as per the reservation made by the individual, and the book can be returned at any time.
- The overdue charges calculation and collection can be made easily.
- The requisition of the book can be made by the faculty/ student/ member
- Annual reports can be generated.
- Completely customizable to classify books as per librarians wish.
- Stock verification can be done easily with no time lag.
- Easy maintenance.
- All types of database searches are possible.
- All types of reports like ordering, invoice, list of dead books, statistical reports, missing accession number, members’ reports, daily-transaction reports, etc are possible within no time.
- Subject-wise sorting is possible.
With the implementation of smart-card, library becomes smarter, so we can call the library as a “smart library”. The new system delivers increased efficiency by providing a means of regularly updating the library’s inventory and maintaining an accurate control of borrowing records. RFID labels placed in or on books, assets and other items can also be identified on the shelves using a hand-held reader, which can detect labelled items at a distance of up to one meter. These advantages lead to a much more efficient updating scheme and eliminate endless searching for misplaced books – a serious problem in organizations/university libraries where visitor often incorrectly replace books on the shelves.

CONCLUSION
Since the Library is a powerhouse of knowledge, and the intellectuals interact with library personnel vis-a-vis emerging technology, the use of smart-card technology can significantly improve the flow of information inside an organization, improving its efficiency by minimizing time-consuming bureaucratic operations, and facilitating the creation of new services. A dominant advantage of this technology is the EEPROM, a feature allowing applications to add or update the information stored in the smart-card. This multifarious smart-card technology is not only useful in library but also in maintaining academic, examination, hostel, and others records in the institution. Smart-cards clearly have the potential to revolutionize the way we think about service delivery – but the success of this technology depends greatly on how well they are implemented. The biggest challenge is surely in the execution and implementation of smart-card technologies. Ironically, it appears we need to be smart about smart-cards!

REFERENCES