

Canada's Largest Banks to Introduce Mondex

Royal Bank of Canada (RBC) and Canadian Imperial Bank of Commerce (RIBC), the two largest banks in Canada, are to introduce the Mondex electronic cash system to the Canadian market place starting with a pilot involving telecommunications company Bell Canada early next year with national roll-out sometime in 1997.

Tim Jones, Chief Executive and co-inventor of the Mondex system, says: "This announcement represents a significant step forward in the acceptance of Mondex by the world's major banks. The introduction of Mondex to North America, Europe and the Far East is under way, and in 1996 we will have pilots in major economies around the globe."

Continued on page 83

Smart Card News

Managing Director: Patsy Everett

Editor: Jack Smith

Technical Advisor: Dr David B Everett

Editorial Consultants:

Dr Donald W Davies, CBE FRS
Independent Security Consultant

Peter Hawkes,
Principal Executive
Electronics & Information Technology Division
British Technology Group Ltd

Chris Jarman
Vice President, Chip Card Technology
MasterCard

Published monthly by:

Smart Card News Ltd
PO Box 1383, Rottingdean
Brighton, BN2 8WX, England
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Next Month

Smart Card Tutorial - Part 5
From There to Here -
The Total Smart Card Manufacturing Process

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Canada to Introduce Mondex

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NatWest Group, which has been developing Mondex since 1990, intends to licence its intellectual property rights associated with Mondex to an international consortium so that Mondex is capable of becoming a globally accepted electronic cash Smart Card.

The incorporation of the consortium under the name of Mondex International is conditional on agreements being reached with sufficient financial institutions around the world who will become shareholders in the company.

RBC and CIBC will jointly licence the Canadian Franchise rights to Mondex and will become shareholders in Mondex International along with other prospective international partners.

A number of sites are currently being explored for the Canadian pilot, and the two banks are working with Bell Canada to examine the deployment of screen-based telephones and the conversion of public payphones to accept the Mondex card.

Not just small purchases

Bob Janeau, Senior Vice President, Card Services and Point of Sale, RBC, says: "Whatever amount of ordinary cash you normally carry around with you in your wallet or purse, you can have an equivalent amount of electronic cash stored in your card. So we are not talking about just small purchases that you make with a few dollars or loose change - although that too is possible."

Exact pricing will be determined by each bank after the pilot, but a joint statement says it is expected the cost to consumers for a Mondex card and balance reader will be in the region of Canadian \$1.25 to Canadian \$3.00 per month.

Mondex is being launched in Swindon, England on 3 July in a joint venture between NatWest Group and Midland Bank, working with British telecommunications group BT. Bank of Scotland has also announced it will be joining the UK scheme.

Other major banks intending to take part in Mondex are the Hongkong and Shanghai Banking

Gemplus Creates New Card Giant

Corporation which will introduce the system to a number of Asian countries.

Wells Fargo to Join Mondex

Wells Fargo Bank is to join the Mondex scheme. An official announcement is expected soon from NatWest and Wells Fargo.

Contact: David Morton, Mondex UK - Tel: +44 (0)171 920 5061. Fax: +44 (0)171 920 5505.

BT Payphone Security Module

Landis & Gyr Communications of Switzerland is supplying its new plug-in security module, Phoenix, to BT for installation in all its new chip card payphones irrespective of the make.

Phoenix, an anti-fraud device available for the new Euro-chip standard on which BT's Smart payphone card is based, encrypts data and validates debit chip cards.

Landis & Gyr is also delivering combined card readers which accept both magnetic stripe and debit chip cards to replace existing card readers in their P2000 public payphones in use by BT and which currently accept coins, optical phonecards and magnetic stripe cards.

Contact: Pierre Oberholzer, Landis & Gyr Communications, Switzerland - Tel: +4122749 3355. Fax: +4122 733 5219.

SAS Looks at Smart Cards

Scandinavian airline SAS is developing a Smart Card for secure electronic identification with the major Swedish banks and Swedish telecommunications company Telia. The project is at the specification stage and SAS is considering using the Smart Card to enable air travellers to book their tickets and carry the ticket data on the card which will be read at the check-in desk prior to departure.

Contact: Björn Boldt-Christmas, SAS, Sweden - Tel: +46 8 797 000. Fax: +46 8 851 677.

Gemplus, the French-based Smart Card manufacturer, has acquired DataCard Corporation's four worldwide plastic card manufacturing plants, creating in the words of Gemplus President Marc Lassus, "a new card giant" in major world markets.

Headquartered in Minneapolis in the United States, DataCard is a leading manufacturer of plastic magnetic stripe cards and also produces serial memory cards and microprocessor cards.

The sale to Gemplus involves four plastic card manufacturing facilities in the USA, UK, The Netherlands and Germany with a total production capacity of over 400 million cards a year.

Included in the deal is the take-over of DataCard personalisation centres in the USA, England, Germany, The Netherlands and Belgium which gives Gemplus a leadership role in personalisation bureau services including packaging and distribution direct to the end user.

In exchange, DataCard will assume an equity position in Gemplus and acquire from Gemplus the manufacturing and sales of a range of card personalisation equipment. It will now focus on its core business of card personalisation systems, transaction terminals and systems integration and will offer a broad spectrum of card-related products and services including embossing and encoding systems and photo identification systems. The two companies will sign a broad long-term technology and marketing agreement for certain markets, particularly in the USA.

600 million cards a year

The agreement significantly strengthens the position of the Gemplus Group in the card industry by adding to its Smart Card capabilities PVC plastic and magnetic stripe cards. Gemplus will be able to supply its customers with a worldwide production capacity exceeding 600 million cards a year.

Marc Lassus, President of Gemplus, says: "We are excited by this exchange because it significantly expands our base in the plastic card industry. We have truly created a new card giant by combining the established and successful plastic card

NBS Move to Smart Cards

NBS Card Services Inc., North America's second-

manufacturing from DataCard with Gemplus's leadership position in Smart Card technology.

"This will give Gemplus another edge in leading the Smart Card revolution in major world markets like the USA, Germany, United Kingdom and France."

Hubert Giraud, Chief Executive, says it is Gemplus strategy to have the capacity to manufacture Smart Cards and embed chips at all four plants, possibly within 12 months.

Gemplus predicts that with the DataCard transaction the Group's provisional 1995 revue forecast should be in the range of 2 billion French Francs (\$400 million) of which 90% will come from exports.

Management appointments

Gemplus has reinforced its management teams with the recent appointments. Stuart Bagshaw has been appointed President of Gemplus International and is responsible for the worldwide sales and support organisation.

A British citizen, aged 49, he has spent his career in the computer industry particularly in sales and marketing, most recently as Vice President of XSoft's Worldwide Operations, a division of Xerox in Palo-Alto, USA. Previously he was General Manager of Sequent Computer's Asian and European operations. Before that he was with Apple in London.

Jean-Pierre Samson, aged 49, is the new Director of Operations responsible for the industrial activities of the group. He was a production manager with Motorola, then Financial and Software Director at Matra-Harris.

He joins Gemplus from SGS-Thomson where he was Head of the Microcalculators Division and responsible for product strategy, design and marketing and technical support.

Contacts: Marc Lassus, President, Gemplus - Tel: +33 4232 50 00. Fax: +33 42 32 51 17. Glen Highland, President, DataCard - Tel: +1 612 930 2895. Fax: +1 612 930 2800.

largest producer of financial transaction cards, plans to enter the Smart Card marketplace.

In a major recapitalisation, \$85 million has been raised by its parent company, NBS Technologies Inc. of Toronto, Canada through the issue of shares to CAI Capital Corporation, a Canadian-based equity investment fund; and Canadian merchant bank, Hees International Bancorp Inc.

Al Vrancart, President and CEO of South Plains, New Jersey-based NBS Card Services, says: "This recapitalisation will provide us with the stable financial structure needed to expand into new geographic markets and increase our product offerings, especially in the burgeoning Smart Card arena."

With MasterCard, Visa and Europay now committed to converting existing credit cards to Smart Cards, says Vrancart, NBS will "invest in state-of-the-art equipment to manufacture Smart Cards and maintain its competitive edge."

NBS manufactures 160 million cards per year at its two North American manufacturing plants in the United States and Canada, and 40 million cards in the UK.

Contact: Al Vrancart, President and CEO, NBS Card Services, Inc., USA - Tel: +1 908 668 0999. Fax: +1 908 668 7976.

Phonecards for Eastern Europe

ODS Oldenbourg Datensysteme of Germany has won contracts from the Hungarian Telecom for seven million telephone cards over two years with a first delivery consignment of 900,000 cards this month.

In addition, the Slovak Telecom company has ordered 1.6 million phonecards for delivery in 1995/96.

Contact: Monika Schlesinger, Marketing Manager, ODS, Germany - Tel: +49 89 45019-163. Fax: +49 89 45019-315.

Philips Buys SG2 Personalisation

Philips TRT Smart Cards & Systems has bought the **Schlumberger Over Great Wall**

Schlumberger Smart Card & Systems of France has

banking card personalisation activity operated by SG2, a subsidiary of Société Générale banking group. The agreement involves 4.5 million cards per year.

France has the largest Smart Card-based banking system in the world with some 22 million cards issued, and SG2's decision to transfer its card personalisation business to Philips is in line with the current trend by banks to look for a partner which can handle the three major steps of card supply - plastic card delivery, microprocessor chip embedding and personalisation.

Contact: Andre-Jacques Selezneff, International Marketing Manager, Philips TRT Smart Cards & Systems - Tel: +33 1 41 28 55 84. Fax: +33 1 41 28 71 88.

MARC Takes US Award

The US Department of Defense's Multi-technology Application Reader Card (MARC) programme won the "Outstanding Smart Card Application" Award at the CardTech/SecurTech conference in Washington DC.

MARC combines an integrated circuit chip, magnetic stripe and bar code and is being prototype-tested with the 25th Infantry Division of the US Pacific Command in Hawaii. Multi-functions being tested include medical services, food service, troop mobilisation and manifesting applications. Other applications will be added later and the programme will be extended to all services and the Department of Defense.

Solaic Quality Certification

Solaic, Smart Card manufacturing subsidiary of Groupe Sligos, has been awarded ISO 9001 certification and its European equivalent, EN 29001 for its Smart Card operating systems business. The certifications are awarded by the French Quality Improvement Association (AFAQ) and the European Network for Quality System Assessment and Certification (EQNET).

signed a co-operation agreement with China Hua Xu Golden Card Co., the company appointed by the government to lead the development of a modern national payment system called the "Golden Card"

project.

The agreement paves the way for co-operation on a wide range of Smart Card applications including payment systems, and covers the spectrum of electronic transaction technology required to implement systems from Smart Cards and terminals to applications support. Schlumberger says it will also be jointly studying the introductions of Smart Card technology into applications such as healthcare, driver identity and gas and electricity metering.

Schlumberger will introduce Smart Card technology to Hau Xu's engineers, co-operate on developing applications and products and set up a joint service centre in Beijing with Hua Xu for system installation, maintenance and support.

Hua Xu, a subsidiary of the giant Taiji Computer Corporation, is developing the US\$8.8 billion Golden Card project network for credit/debit cards which will include Smart Card technology. Chinese observers expect the project to attract 200 million credit card users by the year 2003.

With technical support offices in Beijing and Shanghai, Schlumberger recently won the contract to supply Smart Card Subscriber Identity Modules (SIMs) for China's GSM cellphone network. The initial phase calls for 120,000 SIMs for use throughout Guangdong province, Beijing, Shanghai, Tianjin, Hainan and Hubel.

Contact: Sally Chew, Schlumberger Measurement & Systems Asia, Singapore - Tel: +65 746 6344. Fax: +65 747 5186.

Bell Canada Takes Gemplus Card

A Smart phonecard, called Telecarte LaPuce, is being introduced by Bell Canada payphones throughout Quebec City in an eight-month trial starting this month.

The cards, supplied by Gemplus of France, are available in \$10, \$20 and \$50 at newsstands, Bell Sales outlets, bus stations and drugstores. Automatic vending machines will also be installed

Ascom Buys Elsydel of France

In a move which will give it a presence in the growing market of toll collection systems, Ascom

in public areas such as college campuses and airports.

Bell is refitting some 38,000 payphones throughout Quebec and by 1 May 14,000 payphones have been equipped with Smart Card readers. Distinguished by their bright yellow colour, the Smart payphones are manufactured by Northern Telecom under the name Millenium.

Within five years all payphones in Quebec will be refitted to accept the new phonecard.

It is planned to introduce the Telecarte LaPuce in Ontario next year.

Contact: Caecilia de St Victor, Communication, Gemplus, France - Tel: +33 42 32 51 54. Fax: +33 42 32 51 17.

Chips on Menu at UK Show

Smart Cards continue to edge into the consciousness of British retailers, as shown by the presence of Schlumberger, OMRON and VeriFone UK at the Retail Solutions exhibition in Birmingham this month (2-4 May).

Following its recent agreement with Visa, Mastercard and Europay involving the joint development of the first world-wide Smart Card application, Schlumberger representatives were ready to discuss the implications for dual technology EFTPOS terminals, offering consultancy services and showing the latest technology.

Card Systems (UK) Ltd, the UK distributor of OMRON Cardware Japan, included 256k bit memory to 16K Byte EEPROM Smart Cards and card acceptor devices among its magnetic stripe card devices.

VeriFone UK Ltd demonstrated the SC450 Smart Card reader/writer terminal as well as a range of tailor-made customer loyalty schemes on both Smart Card and magnetic stripe technology.

of Switzerland has taken over French company Elsydel SA, one of the leading suppliers in this field and in parking systems - a market in which Ascom already has a strong presence through its

subsidiary Ascom Zeag.

Elsydel and Ascom subsidiary Monétel SA will be incorporated in a French holding company with Ascom as majority shareholder, and become part of Ascom Vendomation, the fare collection and parking systems division.

Ascom sees contactless toll collection via Smart Cards from moving vehicles as a "key application" in the future, and Elsydel has sold toll collection systems for motorways in France, Spain, Thailand, Turkey, UK and USA among other countries. Elsydel's customer base in parking systems includes the international airports of New York (John F Kennedy and La Guardia), San Francisco, Montreal, Frankfurt and Sydney. Last year, the Paris-based company earned CHF 75 million, two-thirds in exports.

Contact: Peter Wullschleger, Ascom Service Automation, Switzerland - Tel: +41 31 999 6724. Fax: +41 31 999 6208.

Topcard Touchless Take-Off

Topcard Monétique is about to announce an industrial partnership agreement which will enable it to produce up to 20,000 units of its contactless products every month.

Based in Le Canet, France, Topcard has sold over 50 Contactless Development Kits since these were launched at the CarteS '94 exhibition held in Paris last October. The kit permits integrator companies to evaluate and develop applications using Topcard's PCCR 100 Pocket Contactless Card Reader/Writer and MN2048 Infra-red Badge in the fields of transportation, parking, access control and identification.

The PCCR 100 enables transfer of data with an ISO 7816 Smart Card in a contactless way through a bi-directional infra-red link.

The MN2048 features a secured data EEPROM memory and can transmit data bi-directionally through an infra-red link. It can be considered as an asynchronous Smart Card to perform data

Spanish Social Security Card

Orders for the equipment required for the Spanish Social Security Card project (Tarjeta de la Seguridad Social Espanola - TASS) are expected to be placed

transactions with a high level of security and without any physical contact with the reader/writing device.

The TPOS operating system's main functions enable memory access, memory and secret code management while allowing it to share the memory with up to eight memory areas that can be configured in read only, read/write or electronic purse modes.

Contact: Jean Marc Mathieu. Tel: +33 42 58 61 62. Fax: +33 42 58 69 96

Have Card, Can Fly Delta Shuttle

Ticketless travel is under test on hourly flights between New York and Washington DC, and New York and Boston in the USA. In the second phase of trials using AT&T Smart Cards (see SCN, October, 1994), high frequency customers of Delta Air Lines have been issued with personalised Delta Shuttle Cards.

Cardholders can go directly to the Delta Shuttle gate - a previous reservation is unnecessary - to insert the card in a reader. Within five seconds, a reservation is created, the customer's Frequent Flyer account is credited, his credit card charged and a receipt is issued. The customer can then board the aircraft. In the first phase, the transaction was made by a gate agent who inserted the card.

Delta Senior Vice President Marty Braham (Airport Customer Service) reports a high level of satisfaction among passengers for ticketless travel and says: "It has generated an unbelievable level of interest among our other customers, particularly our major business accounts."

Delta says it will expand the scheme to include approximately 5,000 Shuttle customers, including corporate customers, within the next few months.

Contact: Corporate Communications, Delta Air Lines, USA - Tel: +1 404 715 2590. Fax: +1 404 767 8499.

in the second quarter of this year.

According to Jesús Merino Salmerón, Director of the General Treasury of Social Security, the overall project foresees issuing Smart Cards to about 40

million Spanish citizens over a five-year period; the installation of over 3,000 self-service information terminals throughout the network of branch offices; and over 20,000 LAN PCs for health management in all health centres.

The first phase, which will cover about one-fifth of the project (seven million cards) will be implemented during 1995 and 1996.

Objectives

The objectives of the project initiated by the Ministry of Labour and Social Security are to substitute the previous Social Security membership document, personalise its authorisation to cardholders, facilitate citizen's access to their own personal information contained in different Social Security databases, speed administration and facilitate control over services and health management.

Official bodies involved in the project are the National Institute of Social Security (Instituto Nacional de la Seguridad Social - INSS), the National Institute of Employment (Instituto Nacional de Empleo - INEM), the Social Institute of the Navy (Instituto Social de la Marina - ISM), the Andalusian Health Service (Servicio Andaluz de Salud - SAS) and the General Treasury of Social Security (Tesorería General de la Seguridad Social - TGSS).

TASS is being developed in two phases. First, the pilot project in the Córdoba Province of Andalusia where over 300,000 Social Security cards have been distributed to working members, unemployed members and pensioners. At present, data verification for the rest of Córdoba's population, including beneficiaries, is taking place in order to issue the rest of the cards which are Bull CP8 TB100L 3K bytes EEPROM cards manufactured and personalised by FNMT (Fabrica Nacional de Moneda y Timbre), the State National Mint.

Information and Management Automatic Terminals (Terminales Automáticos de Información y Gestión

AMICA Loyalty Card in Italy

A new Smart Card loyalty programme, has been jointly developed by Philips TRT Smart Cards & Systems of France and Promoptima of Italy.

Called AMICA, the scheme involves rewarding

- TAIG) and desktop PCs have been installed in 19 offices of the participating bodies to enable cardholders to obtain personal information and to perform certain self-service transactions. Local healthcare management networks have also been installed at two health centres and a total of 60 PCS for the issuing of transitory sick leave (Incapacidad Transitoria - IT) vouchers and prescriptions.

Functions implemented initially are:

- * General information request for the different bodies participating in the project (directory, services menu, facilities)
- * Request of work history and current status of Social Security member.
- * Pensioners' information
- * Change of general practitioners and inquiry into medical areas
- * Job-seeker status renewal
- * Time and attendance control
- * Filling out of the monthly Special Agrarian Plan (Regimen Especial Agrario de La Social Security - REASS) certification for persons with zero income who have not worked any day during the month.
- * Request of personal data and certificates from job-seekers and from petitioners of services/benefits and REASS
- * Request for enrolment in courses
- * Automatic obtainment of pensioners' certificates and remittance to the requester's address
- * Summary Certificate of pensioners' tax
- * Issue of IT certificates
- * Issue of prescriptions
- * Clinical histories management

When the pilot study results have been evaluated and modifications carried out to the concept, it is planned to roll-out the card nationwide.

Contact: Jesús Merino Salmerón, Tesorería General de la Seguridad Social, Madrid, Spain - Tel: +34 1 503 8680. Fax: +34 1 677 6643.

customers with points according to the amount they spend on purchases and exchanging the points in various gift programmes.

Retailers subscribing to the programme each receive a Philips PE114 Smart Card reader with the in-built AMICA application program, and Philips

D2042 2K bits EEPROM Smart Cards for customers.

Promoptima is offering retailers dedicated terminals, customer and retailer cards, gifts distribution and full management of the system, including statistical data and mailing facilities.

Retailer benefits are seen as increasing customer loyalty, building a customer data base and obtaining more information on customers' purchasing habits.

Contact: André-Jacques Selezneff, Philips TRT Smart Cards and Systems, France - Tel: +33 1 41 28 55 84. Fax: +33 1 41 28 79 68.

Access Control Agreement

AT&T Smart Cards and Lockheed Martin Electronic Security Systems are teaming up to develop and market contactless Smart Card security solutions to control access to buildings and information.

The joint agreement will be co-managed by Charles Thomas, Director of Lockheed Martin Electronic Security Systems and Jack Doering, Director of Applications marketing for AT&T Smart Cards, and will target business, university and government market sectors. AT&T is currently issuing contactless Smart Card ID badges to its 300,000 employees worldwide.

Contacts: Monty Hoyt, AT&T Consumer Products, USA - Tel: +1 201 581 4067. Fax: +1 201 428 8553. Carlton Caldwell, Lockheed Martin Corp., USA - Tel: +1 301 306 8907.

Québec Health Card

A Smart Health Card system is currently being evaluated following a pilot scheme in Quebec, Canada prior to anticipated roll-out in 1996.

EasyReader for Phone Cards

Called the RAMQ (Régie de l'assurance-maladie du Québec) Smart Card pilot, it ran from March 1993 to the end of March 1995 and involved issuing some 8,000 cards to elderly patients, pregnant women and children under the age of two and about 200 service provider cards to doctors, nurses, ambulance drivers and pharmacists.

The cards used were the 8K bytes EEPROM Personal Security Card from IBM who also supplied about 100 IBM 4754 Smart Card readers for the project.

The Smart Card acts as a portable data base, divided into five information zones - Identification, Emergency, Vaccination, Medication and Medical Record. As its use is voluntary, the patient will always be present when the data is accessed, and must give verbal agreement to what is recorded on the card.

Healthcare provider cards are used with a PIN to unlock the zones to which they have access. This degree of confidentiality is made possible by IBM's Smart Card mask, which permits multiple profiles on a single card, allowing multiple providers to share its data within their professional bounds.

The card could be a lifesaver when details of drug prescriptions and previous medical history are urgently needed, obviating the need to track information scattered through doctor's surgeries, clinics, hospitals and pharmacies. It can also enhance the effectiveness of preventative and diagnostic examinations.

The Québec Province project involved RAMQ, a research team from Université Laval, and teams from the Public Health Centre in Québec City and the public health unit from the Centre Hospitalier Régional de Rimouski (CHRR).

Contact: John Noakes, Marketing Worldwide Smart Card Business, IBM UK. Tel: +44 0171 202 3000. Fax: +44 0171 261 9930.

A small, low-cost reader for Smart payphone cards has been announced by Schlumberger Smart Cards & Systems which says it offers a simplified way of distributing cards by offering an alternative to

expensive tamper-evident wrapping as the cards can be verified as they are bought at the point of sale.

Called EasyReader and measuring 11 x 54 x 86mm, the unit has a large five-character LCD and user button. When a card is inserted, the unit displays the amount on the card. When the button is pressed, it then displays the card's serial number. Any data of more than five characters is shown in two steps. The reader automatically turns itself on and off as cards are entered or removed. A hole in one corner allows the unit to be attached by a chain to a sales till or counter.

EasyReader will also be useful for phonecard collectors who will be able to tell if a card has been used or not.

Contact: Isabelle Ferdane-Couderc, Schlumberger Smart Cards & Systems, France - Tel: +33 1 47 46 62 47. Fax: +33 1 47 46 68 66.

Shell Smart Totals 2.7m Cards

Shell UK's customer loyalty scheme, Shell Smart, launched in July 1994, now has 2.7 million Smart Card holders with a reported active card use of over 60%. The scheme involves rewards of points or air miles to customers who buy approved products.

The company is now positioned to add further incentives for motorists and is expected to announce these shortly.

DANMØNT's Most Beautiful Card

The card which prompted Smart Card News to comment on the reputation of DANMØNT for producing visually attractive cards (SCN January 1995) has been elected "the most beautiful DANMØNT card of 1994" by readers of the independent Collectors' Service News.

The winner was a special card issued by

Thumbprint Card from Sweden

A new invention which enables a thumbprint (or fingerprint) to be carried in digitised form in the memory of a Smart Card and be read simply by placing the thumb on a sensor within the card - thus identifying the user as the rightful owner - is being promoted by Swedish company Finansforum.

DANMØNT in connection with an international seminar and showed part of the painting Summer Evening by Skaw painter PS Kroyer. Second was a DANMØNT card with a picture of The Little Mermaid in Copenhagen by artist Lina Murell Jardorf, and third was a Coca Cola card.

The Coca Cola card is interesting since it is one of the examples of using a disposable card as an advertisement media and today more than 50% of the DANMØNT cards in circulation carry advertising. In the US collectors' market, the card is already selling at US\$30, nearly double its face value in the Autumn of 1994.

A special card issued for draught beer from the first international seminar held by DANMØNT in 1991 is now selling for over DKK 8,000 in mint condition and DKK 6,000 if used.

Henning N Jensen, Managing Director of DANMØNT says: "Advertisements are making a positive contribution to the business case for disposable cards. At the same time the cards are far more interesting for the collectors which, through the unused balance on the card, is a further positive contribution to the business case."

Contact: DANMØNT Collectors Service, PO Box 122, DK-2750 Ballerup, Denmark. Tel: +45 44 97 92 00. Fax: +45 44 97 71 31.

The Gothenburg-based company, an innovation broker, is talking to Swedish and US investors to bring the concept to market. Lennart Carlsson of Finansforum says only about £1.2 million is needed as the Swedish government has agreed to finance some of the costs.

If the concept materialises, a cardholder will no longer have to remember and use a PIN, for example, to draw out money from an ATM. Instead, he or she will press a thumb (or finger) onto the card's sensor which registers it and matches it with the one in the card's electronic memory.

Thus no separate reading device is required and the fingerprint data is not stored in any central register. The cardholder carries this data around with him and can prove his identity at any time.

In the patent diagram below, the functional blocks shown form together a verification device (see Key):

- 2 Sensor (including sensing surfaces 9 in a matrix 9)
- 3 Registering
- 4 Signal processing
- 5 Comparator

- 6 Memory
- 7 Indicator
- 8 Control and current supply
- 10 Switch

The Concept

The sensor (2) senses the fingerprint. Different techniques for sensing the individual fingerprint

are described in the patent specification so the scope for protection is not restricted to any specified technique.

The registering element (3) is supplied with information pulses from the sensor and this information is digitalised and registered.

The signal processor (4) modifies the obtained information with respect to the position of the finger on the sensor and a calculation of a so-called identification bit sequence takes place, meaning the digitalised representation of the sensed fingerprint.

The comparator (5) compares the identification bit sequence of the owner's fingerprint with the template of the owner's fingerprint stored in the card as a reference bit sequence (6). If there is sufficient agreement, the identification is accepted.

An acceptance signal (acc) is generated which may activate the indicator (7) for example an LED, and/or open a signal path which enables the card for an exchange of data with a terminal.

The means for control and current supply (8) may, alternatively, be provided by a card reader. The control signals are generated by a microprocessor, generating the control programs for the registration in (3) and the processing and calculation in (4).

An accumulator is provided for current supply and is activated by the switch (10).

Potential uses

Lars Linde of Finansforum says the invention has been under development for about 10 years but only now has the power of the microprocessor card made it possible to finalise the concept and produce a secure and cheap biometric system.

Potential uses, he says, are wide-ranging in the security field and include identification for bank transactions, access to PCs and portable computers, passports, and in mobile telephone communications where only the genuine holder of a GSM card would be able to activate the phone.

He points out that police forces, insurance

European Card Figures

companies and governments in many countries are all looking for a safe and practical biometric method.

Contact: Lars Linde or Lennart Carlson, Finansforum, Sweden - Tel: +46 31 10 06 75. Fax: +46 31 13 73 85.

Avocard for Paris Lawyers

An electronic purse system is being used by many of the 12,000 lawyers in Paris when they go to court.

Called the Avocard, it is used as an identity card for access to the Law Courts and penal establishments in the French capital, and to pay for a variety of services such as buying food in the restaurants, making photo-copies, sending faxes, hiring books, hiring courtroom attire, managing deposits, and settlement for extracts from the Official Gazette.

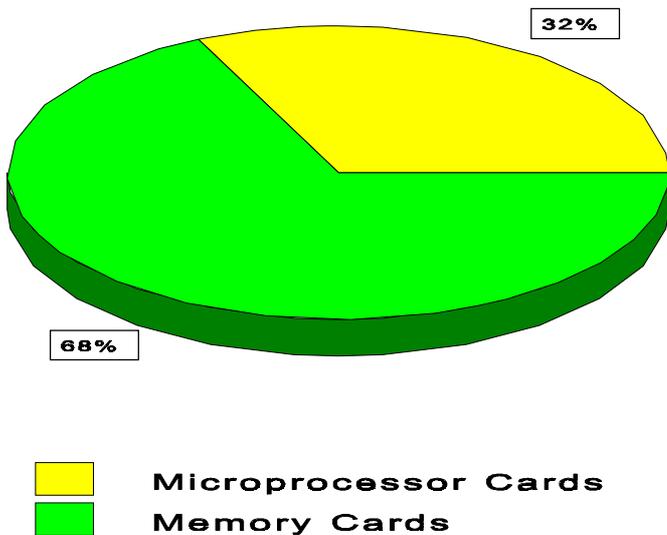
The Smart Card is the 1K bytes EEPROM Pocket Book from Solaic of France. It is reloadable by purchasing units of currency or automatically with the aid of a cash dispenser.

Service providers use a 3K bytes EEPROM Vesta card from Solaic for the security of transactions (loading, remote collection, etc.) as their entitlement card to access the system.

The Avocard system is designed as a single issuer system for managing a proprietary electronic purse and is aimed at closed environments such as leisure centres, swimming pools, tennis courts, car parks, store chains etc. wishing to manage secure and pre-paid monetary transactions within a private entity.

It could also be used as a town card and by country clubs, health clubs, universities or any medium-sized business.

Contact: Nathalie Six, Solaic, France - Tel: +33 1 49 00 92 08. Fax: +33 1 49 01 02 84.



Estimated percentages for the production of memory cards and microprocessor cards in the year 2000.

The major European Smart Card fabricators last year manufactured 193 million microprocessor cards and 1,349 million memory cards giving a total of 1,542 million.

Their predications for 1997 are 667 million microprocessor cards and 2,999 million memory cards - a total of 3666 million.

In the year 2000, the companies estimate production volumes of 2,364 million microprocessor cards and 5,066 million memory cards - a total of 7430.

According to the predications, microprocessor cards will gain an increasing share of the market, growing from 12.5% last year to 18% in 1997 and to 32% in the year 2000.

European card manufacturers who provided figures are: Bull CP8 (France), Gemplus Card International (France), GPT Card Technology (UK), ODS Oldenbourg Datensysteme (Germany), ORGA Kartensysteme (Germany), Philips TRT Smart Cards & Systems (France), Schlumberger Smart Cards & Systems (France), and Solaic Smart Cards (France).

DANMØNT for Rail Services Contactless Order for Sony?

Danish State Railways (DSB) are changing automatic ticket machines at stations on the underground in Copenhagen to accept the DANMØNT pre-paid Smart Card.

In addition to the changes to the ticket machines, the Danish telephone company, Tele Denmark, is making a large number of additional telephones available to accept the card.

Birte Roll Brandt, Sales and Market Manger for the Copenhagen Mass Transit System, says: "DSB constantly works towards improved service for our customers and we see DANMØNT as a fine offer to the busy passenger - and at the same time this new means of payment can contribute in reducing the number of 'free travellers'."

The new payment system will be available on the underground from July. Already it is possible to use the card at some of the kiosks on stations.

Soon the cards, which can be bought in banks, tele shops, post offices, kiosks and filling stations, will be available on the underground stations.

Contacts: Henning N Jensen, Managing Director, DANMØNT - Tel: +45 43 44 99 99. Birte Roll Brandt, Sales and Market Manager, Danish State Railways - Tel: +45 33 14 04 00, ext. 13801.

Printing on Plastic Cards

A comprehensive two-day seminar covering multiple aspects of plastic card printing is being held by the International Card Manufacturers Association (ICMA) next month in what is described as a "response to the increasing complexity of printing on plastic cards."

Mike Swiecicki, President of ICMA, will chair the seminar at the Hyatt Regency Hotel in Princeton, New Jersey, USA, on 21-22 June. Topics include multiple aspects of plastic substrate interface, litho printing/UV drying/ conventional drying, and silk screen printing.

Contact: Jen Busch, ICMA, USA - Tel: +1 609 799 4900. Fax: +1 609 799 7032.

Sony Corporation of Japan is rumoured to be the front runner in the bid to supply contactless Smart

Cards for the Hong Kong Mass Transit project.

The largest application of its kind to date, the project calls for a rechargeable contactless Smart Card which can be used for payment of fares on all forms of public transport - bus, rail and cross harbour ferry services.

A contract announcement is expected shortly for trials scheduled to start this year and full public introduction in 1996.

The contract requirement is for three million cards which makes it the biggest order yet placed for contactless Smart Cards.

Sony's FeliCa card, which has been trialed in Tokyo by Japan Rail, is said to be the strong contender. In this trial the power supply was by battery and it is thought that the service providers will prefer the RC-S102 card powered by induction.

The card selected for the Hong Kong Mass Transit project will also be used in the Greater Manchester Automatic Fare Collection (AFC) scheme scheduled for full implementation next year. First phase roll-out will require 500,000 cards, increasing later to an estimated 800,000 cards for the transport application alone.

If Sony is successful in its bid, it will be a blow to Racom Systems Inc. which has supplied the 5,000 cards for the Manchester pilot; and for Mikron of Austria seeking to establish a *de facto* world standard for its MIFARE card.

Chubb Access Control for GPT

Chubb has installed an access control system using GPT's own contactless Smart Cards at GPT Payphones division at Edge Lane, Liverpool, England. The division has a workforce of 3000 at this facility, but 3,000 employees work within other GPT companies on the site.

The system is based on Chubb Prism Plus which has the potential to monitor and control a wide range of facilities, including fire detection, security alarms, heating and ventilation within a building,

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but the system at GPT is initially being used as an access control system within the division's headquarters.

Contact: Chris Swan, Chubb Alarms, UK - Tel: +44 (0)1932 785588. Fax: +44 (0)1932 779150.

Russian Inter-banking Success

Zolotaya Korona's inter-banking centre in Siberia has processed US\$ 5,670,000 in ten months of operations. Starting in June 1994, the centre processed 107,185 transactions from its 78 affiliated banks which have issued some 210,000 Smart Cards.

These figures have been announced by Innovatron Data Systems which says that the results prove that electronic payments are particularly well suited to the CIS (the former Soviet Union) and the Baltic States, as well as to developing countries.

Innovatron has installed Smart Card payment systems in the CIS and Baltic States involving more than 500,000 cards and nearly 7,000 terminals. Its latest order is from the TverUniversal Bank of Moscow to increase the number of Smart Cards in the system from 20,000 to 70,000.

Contact: Geneviève Bœuf, Communication Manager, Innovatron Data Systems, France - Tel: +33 1 40 13 39 42. Fax: +33 1 40 13 39 59.

Philips Certified to ISO 9000

Philips TRT Smart Cards & Systems has achieved full ISO 9000 qualification for all its activities. It was certified ISO 9001 for its Smart Card design, development, marketing and sales centres based at Le Plessis Robinson, near Paris. TRT has already received ISO 9002 and "AQ La Poste" certifications for its production centre in Caen, becoming the first Smart Card industry supplier to obtain ISO 9000 certification for its entire Smart Card activity from initial concept and mask design and development up to the production of final cards and associated readers.

Marriott Hotel, Hong Kong, 29-31 May.

Organised by the Hong Kong Productivity Council, the conference will cover general market trends and

Smart Card applications in finance, telecoms, transport, healthcare, retail and security. Contact: Hong Kong Productivity Council - Tel: +852 2788 5767. Fax: +852 2788 5770.

Cyberbank '95, La Maison de la Chimie, Paris, France, 30/31 May.

The first international forum on electronic banking in superhighways examines the role of credit cards in electronic commerce and digital money or Cybercash applications and the need for a coherent approach to controlling information flows. Contact: Christelle Moyon, Analyses & Synthèses, France - Tel: +33 1 46 28 82 10. Fax: +33 1 46 28 95 63.

Stored Value Cards, The Grand Hotel, Washington, DC, USA, 31 May/1 June.

An update from industry leaders with nine international case studies on electronic purse and other Smart Card applications. Contact: AIC Conferences, USA - Tel: +1 212 952 1899. Fax: +1 212 248 7374.

New Frontiers for Cards, Brussels Hilton Hotel, Brussels, Belgium, 21/22 June.

Includes presentations on card banking strategies in Europe and in the US and chip cards. Contact: EFMA, France: +33 1 47 42 52 72. Fax: +33 1 47 42 56 76.

European Smart Card Summit '95, Waldorf Hotel, London, 26-27 June.

Includes case studies on Smart Card applications in transport, telecommunications, healthcare and the retail and utilities sections, with presentations on standards, security and technology. Contact: AIC Conferences UK - Tel: +44 (0)171 242 2324. Fax: +44 (0)171 242 2320.

Bank Tender for CombiCard

Volksbank Stormarn (VBS), a German bank near Hamburg, has issued a tender for the first combined contact and contactless card, says C2 Intern,

Card Manufacturing in Transition: The Future is Now, Munich, Germany, 5-8 September.

ICMA (International Card Manufacturers Association) Conference and Exhibition. Contact: Jen Busch, ICMA, USA - Tel: +1 609 799 4900. Fax: +1 609 799 7032.

ESCAT '95 (European Smart Card Applications & Technology Conference), Inter Continental Hotel, Helsinki, Finland, 6-8 September.

One of the features of this well-established conference, now in its 8th year, is the presentation of the award for the most innovative Smart Card accomplishment of the year. Contact: Conference Secretariat, CONGREX, Finland - Tel: +358-0-752 3611. Fax: +385-0-752 0899.

CarteS '95, CNIT Trade Center, La Defense, Paris, France, October 25-27.

The 10th International Forum for Plastic Card Technologies & Applications includes conferences on Access to New Solutions and Cards and Security plus an international exhibition with over 100 exhibitors. Contacts: CEP Expositum, France - Tel: +33 1 49 68 52 64. Fax: +33 1 47 37 75 09. IMEX Management, Inc., North America - Tel: +1 301 460 9751. Fax: +1 301 460 0045.

Electronic Purse Conference, Forte Crest Bloomsbury Hotel, London, England, 2/3 November.

Contact: Ashley Glover, Conference Director, Smi Technology Group, UK - Tel: +44 (0)171 417 7790. Fax: +44 (0)171 417 7791.

Card Fraud & Security Conference, Forte Crest Bloomsbury Hotel, London, 4/5 December.

Contact: Ashley Glover, Conference Director, Smi Technology Group, UK - Tel: +44 (0)171 417 7790. Fax: +44 (0)171 417 7791.

newsletter of ADE Angewandte Digital Elektronik GmbH of Dasserdorf, Germany.

A supplier of contactless card technology, ADE has been developing a combined contact/contactless card in its CombiCard Project (SCN

January 1995).

It says that in the first phase of the project in July, VBS will demonstrate CombiCard applications to special customers for access control, time attendance, parking, cafeteria, public transit and purse functions.

These different applications will be activated in a banking service terminal using the standard contact interface while the applications will mainly operate through the contactless interface at a distance of up to 10 cms from the reader. In the second phase in October, the project will be extended to co-operating companies which will issue about 30,000 bank cards as employee cards in their companies.

This card will use the C2-MX-2000 chip which enables contact cards to operate as contactless cards and meets ISO standard 7816 and therefore works in any contact installed environment.

Contact: Hans Diedrick Kreft, Managing Director, ADE, Germany - Tel: +49 4104 9710-11. Fax: +49 4104 9710-99.

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From there to here - Part 4

How much does the chip cost?

You might argue that this is starting at the wrong end. How can you know what it will cost before you have determined what you want. The main reason for tackling this subject so early is that the Smart card is one component in a system. It is the over all cost of the system that matters and if we can understand the cost of the Smart Card in terms of what you get for your money then it enables us to apportion the various tasks in a system to the optimum components.

At the very least the Smart Card is a portable carrier of data. It is difficult to justify the use of a Smart Card without this attribute. The role of a portable processor in such an expensive format has limited value. So we could start off by defining the Smart Card chip as a memory device with the necessary interface logic and the option of a data processing unit. If we assume for the moment that our Smart Card does not contain a battery (if it did the battery would be most expensive component) then clearly the memory needs to be non volatile. In other words the data must be preserved during power off. This means that the integrity of the data must be assured (1's must not change to 0's or vice versa). And of course we can add a further condition which says that during the course of normal usage only. Hitting a Smart Card chip with a hammer seems just a little unfair. For the purpose of Smart Cards we propose a definition of normal environment as being that in which a human being (the card carrier) might reasonably expect to survive. In fact the Smart Card chip will do better than the human being in almost every case. Survival of the chip is determined primarily by mechanical strength and here the chip must not be subject to abuse such as the hammer or the pressure of the ball point pen used by some French consumers to force their bank Smart Cards. The EPROM memory cell is again constructed by a single transistor per cell but here the device has two gates, a floating (storage) gate and a control gate. These two gates are fabricated one above the other over the channel separated by an insulating layer. The EPROM memory is normally erased by exposure to ultra violet light. This is not practical for a Smart Card application so the use of an EPROM memory really relates to a one time programmable memory cell. The memory cells are programmed by applying a high voltage (12-25

into the fall back mode.

So if non-volatile memory is the name of our game what are the choices,

ROM Read Only Memory

EPROM Electrical Programmable ROM

EEPROM Electrical Erasable PROM

FLASH Flash Erasable Memory

FRAM Ferro Electric Random Access Memory

Previously we have stressed that the cost of the chip (at maturity) is proportional to the area of silicon used. In looking at these different memory technologies the number of transistors used per memory cell is the primary factor in calculating the area of silicon used.

A ROM cell is a transistor that is either present or absent. The term mask ROM is often used because the presence or other wise of the transistor is a function of the mask used in the manufacture of the chip. In other words the chip is made either with or without the transistor in that particular memory cell location. In terms of silicon area this is about as efficient as you can get but quite clearly you can only read the state of the memory cell, it can not be subsequently changed after manufacture. Mask ROM is only normally used when the state of the contents of the ROM memory represent a stable situation. Thus a Smart Card chip operating system would be looked on as relatively constant and would justify a long production run and the initial set up costs in making the necessary manufacturing masks. Clearly you can not use the mask ROM memory for storing any form of variable application data.

volts) to both the drain and control gate whilst holding the source at ground. This causes electrons to flow through the insulating oxide from the substrate thereby charging up the gate. This process is called hot electron injection. When the floating gate is changed its turn on threshold voltage is increased and therefore when the transistor memory cell is normally selected the transistor no longer conducts.

The use of EPROM memory cells was most

commonly seen in early Smart Card chips. Many applications can be operated with the concept of memory that can be written (programmed) once and subsequently cannot be changed. For instance telephone cards could use such a memory where the cells are programmed to indicated the usage of telephone units. There are problems in using such memory technology however which is why they are not commonly seen today. It was mentioned previously that a high voltage is required to program the memory cells. In terms of the ISO 7816 standard this is referred to as V_{pp} . This programming voltage was supplied by the terminal to the chip through one of the contacts on the Smart Card connector plate. Two problems arose, in the first instance some of the early terminals miscalculated the correct voltage (V_{pp}) to apply to the chip and the subsequent over voltage resulted in the rather permanent expiry of the chip. The opposite situation was observed by the hacking population who noticed that if you prohibit the V_{pp} voltage from reaching the chip then the memory write (or program) could easily be inhibited. This was a useful way of making free phone calls or even receiving free subscription satellite television viewing.

The electrically erasable read only memory (EEPROM), sometimes called E squared is the main stay of current Smart Card chips. This memory can be electrically programmed and erased, i.e it is true read and write non-volatile memory.

The problem with EEPROM is its size, each memory cell consists of 2 transistors, a select transistor and a storage transistor. Some times the EEPROM cell is referred to as read mostly since it has a limited endurance. Although it can be read a practically infinite number of times the erase and write cycles are technology limited, typically to about 100 thousand cycles. It should also be noted that a high voltage is required to erase and write the memory cell but here the high voltage is usually generated on chip using a charge pump. For EEPROM memory a typical erase/write cycle for a memory cell is 10mS. In practice this is long time, for comparison the random access memory (RAM) of a micro controller is probable capable of 100nS or less (i.e 100 thousand times faster).

The cost for such a chip at maturity and in volume would be about \$2. By comparison a simple EEPROM memory chip (of say 512 bits) with some security logic could be fabricated in 2mm^2 of silicon with a chip cost of nearer 20 cents.

The FLASH memory technology is relatively new for Smart Card chips and uses similar technology to the EPROM in that there is only one transistor per memory cell. It is also limited in its number of erase/write cycles. The electrical erasure is either for the entire memory array or for blocks of the array. This makes the memory very suitable for constant data such as application program modules but less suitable for dynamic application data.

The FRAM or ferro electric random access memory is the newest technology which has been developed by Ramtron. The ferro electric effect is the ability of a material to retain an electric polarisation in an absence of an applied electric field. Current memory cells use two transistors and two ferro electric capacitors. However new devices are expected to be available that only use one transistor and one ferro electric capacitor per memory cell. The FRAM has a 400nS read/write cycle time and has an endurance of 10 million cycles. It should be noted however that the endurance includes standard read cycles as well as write cycles. FRAM technology is not yet available in any chips designed for Smart Card applications.

If the Smart Card chip includes a micro controller then it will be necessary to include some random access memory (RAM). There are two types of RAM, dynamic RAM (DRAM) and static RAM (SRAM). A DRAM memory cell is made up of one transistor and one storage capacitor whereas static RAM uses six transistors. Unfortunately the DRAM memory which is widely used in computers is not really viable for Smart Card micro controllers because the memory needs to be constantly refreshed to allow for leakage from the storage capacitor. For Smart Card chips the SRAM is the biggest user of the valuable silicon real estate, 256 bytes of RAM may take up to 1/5 or more of the whole chip. In fig. 1 we show an example floor plan of a Smart Card micro controller chip showing the relative area taken by each component of the chip. In a typical example the EEPROM might be 8K bytes, the ROM 12K bytes and the RAM 256 bytes. In the example shown the total chip is 25mm^2 .

The examples here are based on the use of 1 micron technology where the smallest feature size is 1 micron. As the technology advances the smaller feature size will allow more transistors to be packed in the same area. Today 0.35 micron technology is routinely being used for DRAM memory devices

and laboratory fabrication units are operating at about 0.1 micron. We have already mentioned that the cost of processing the wafer is relatively constant at a few hundred dollars. However the cost of these fabrication lines is increasing enormously. Today 500M dollars is not unusual and the cost is projected to reach 2 Billion dollars by the end of the decade. The problem here is the investment in these enormous capital costs. This is a game for big players where you need to fund the cost of the new generation from the current generation. Its a bit like the housing game in an inflating market, coming in late is a very expensive proposition. Today there are predominantly six companies producing microcontroller chips for Smart Card applications,

Hitachi
Motorola
Oki
Philips
SGS Thomson
Siemens

There are also one or two others players in the wings that may well move into the game

but what is clear is that there will never be that many companies and that the list above is more likely to get shorter. In any event the lowest cost will only come by taking advantage of the new technology and here we have one of our first dilemmas. All Smart Card chips today operate at 5 volts, chips developed in the new sub-micron technology at say 0.65 microns or less would operate at 3 volts or lower. You cannot easily support a 5 volt infrastructure into the next century. This is currently occupying the minds of experts developing the ISO standards for Smart Cards. It is important not to assume that these new chips will be capable of withstanding 5 volts without damage.

Well back to our initial question, ' what does the chip cost '. What we have tried to show here is that the price of the chip is largely a function of the size and type of memory. This is the area that the system designer should concentrate upon. The higher security applications will almost certainly require a CPU where the memory can be managed in a more controlled and secure way. General purpose multi application type chips by their very nature will require a large memory and therefore the higher cost. The use of FLASH memory is also consistent with this type of application and may become more commonplace in Smart Card chips of the future.

David Everett

Next month: Part 5 The total Smart Card manufacturing process.

Star Visual Smart Card

A new "visual" Smart Card on which the user can see and update information has been developed by Star Micronics special products division in partnership with Dai-Nippon Printing of Japan.

Called the Visual Smart Card, it differs from traditional Smart Cards by having one line of data, visible to the user, on the front of the card. This displayed information is updated each time the card is used. The read/write card reads data from the magnetic stripe and updates the visual display and IC chip or stores new/updated information.

The card displays or erases the character string using a magnetic field. The display area is a magnetic strip attached to the card.

Range of applications

Star Micronics are launching the card for a wide range of applications including club memberships, identification numbers and data to hold and update personal banking information, as a bonus scheme card to indicate accumulated points, as an appointment card for hospitals, dentists and doctors, etc., car parking pass and as a loan card for video clubs and libraries.

Simon Martin Sales Manager, says: "The flexibility that is available to the card user, to see and update information on the card, gives it tremendous potential in many applications.

"We believe we are bringing to the market a product that will be globally accepted in a very short time span, replacing old fashioned plastic cards as we currently know them."

The Visual Smart Card read/write system will be available from December 1995 for purchase as a

packaged unit or in mechanism form for OEMs.

Contact: Simon Martin, Star Micronics UK - Tel: +44 (0)1494 471111. Fax: +44 (0)1494 473333.

AFC Trial in Yorkshire

An Automatic Fare Collection (AFC) system on buses using contactless Smart Cards is to be piloted in Yorkshire, England later this year by the West Yorkshire Passenger Traffic Executive.

In the first phase, 20 Yorkshire Rider buses on the Leeds-Gusted busway in North Leeds will be equipped with Smart Card readers and about 1,000 contactless cards will be issued in the trial.

The decision to use contactless technology is in line with the two major AFC projects in the UK - London and Greater Manchester. It is likely that Yorkshire will use the same contactless cards as in Manchester where an announcement is expected soon on the card which will be ordered for the next stage in the scheme.

Contact: John Carr, West Yorkshire Public Transport Executive, UK - Tel: +44 (0)113 251 7272. Fax: +44 (0)113 251 7333.

Oki Value-Checker

The Value-Checker Personal Smart Card Reader from Oki Advanced Products Division for consumers to verify the balance on electronic purses, pre-paid phone cards, or display healthcare information, ID numbers and electronic benefits transfer values (SCN April 1995).