

Netherlands to Launch Electronic Purse

All the Dutch banks are co-operating in the launch of The Netherlands national electronic purse Chip Knip (chip purse) scheduled for pilot testing in October 1995.

They will be using some of the equipment involved in Belgium's electronic purse scheme PROTON to be operated by Banksys, but the intention is to migrate to the specifications being developed by Europay with the aim of having a European rather than a Dutch system.

It is estimated that eventually 16 million electronic purse cards will be issued but the total could be as high as 25 million if the purse is extended to credit cards.

Continued on page 223

Smart Card News

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Next Month

So much has happened since we first started our tutorial in September 1992 that the time has come to go back to the very beginning and start again. In February 1995 a new series of the Tutorial will start which will incorporate a major revision of our original work taking into account the various changes in the technology, standards and the applications.

David Everett

CONTENTS

DANYL Premiers Purse Card	223
Sligos Reports Drop in Profits	224
Highland School Meals Success	225
Top Team Look at Smart Cards	226
Golden Card Project in China	227
Retailers and Chip Cards	229
Cashless Holidays in Turkey	230
Britain Woos Loyal Customers	231
Specialised Silicon for Mondex	232
Smart Plan for Motor Industry	233
London Taxi Smart Card Plan	234
Smart Card diary	235
SIMs for Latvia and Estonia	236
Intelligent Tagging of Merchandise Part 1	237
Chip Card Payphone	240

Netherlands Electronic Purse

Continued from page 220

Currently the Dutch banks have issued more than 15 million debit cards which are operated on-line with a PIN code. There are about 2.5 million credit cards and 2 million private label cards.

The Dutch PTT and a group of retailers have already introduced an electronic purse called the Primeur Card.

The Dutch Central Bank has ruled that single purpose electronic purses may be issued by certified issuers and that the multi-purpose electronic purses are to be issued by a bank.

The Chip Knip project is being developed by Interpay BV, a joint venture company bringing together the Bank Giro Center, which handles giro payment systems; BeaNet, a national switch for on-line debit card authorisation and processing, and Eurocard Netherlands under the chairmanship of Ben van Eldik, former Europay Chairman.

In the pilot scheme some 100,000 Smart Card electronic purse cards will be issued by the banks.

Loading of the purse up to a maximum of 150 guilders (approximately £55) will be carried out at ATMs using a PIN but the PIN will not be required for making purchases at the point-of-sale.

While the banks will be issuing the electronic purse to account holders for the pilot it is expected that they will later offer it to interested non-banking partners and that the cards will be available to people without bank accounts.

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Dutch Progress in Chip Cards

There are currently 27 chip card projects operational in the Netherlands in six industry sectors - financial services (seven), healthcare (seven), government (four), transport (four), retail (three), and telecommunications (two), according to the first national survey.

"Chipcard Projects in The Netherlands 1994," 155 pages A4, is published by the National Chipcard

Forum (NCP) and is available in Dutch for f 175. It can be ordered from NCP - Fax: +31 70 320 6614: or bookshops - ISBN 90 75218 02 8.

DANYL Premiers Purse Card

DANYL Corporation has released its PurseCard which it says is the first in a series of rechargeable integrated circuit chip cards.

It is designed for use in multiple prepaid card applications such as food and beverage vending, laundry services, games and amusements, reprographics, point-of-sale, payphones etc. as depicted on the front of the card.

The company manufactures Card Acceptance Devices (CADs) for various unattended point-of-sale/self-service vending systems in educational, financial and commercial environments.

Around 2,000 DANYL PurseCards are already in use at the Smart Card-equipped laundry of a mid-western college in the United States, while others are to be used in correctional facilities, corporate campuses, laundromats and universities.

This first reusable prepaid card is manufactured by Gemplus and is based on its GPM 896 (Gemplus Protected memory) Card. It has been produced in a limited issue of 50,000 cards and should be of interest to collectors.

Contact: Robert J Merkert Sr., Executive Vice President, DANYL Corporation - Tel: +1 800 732 6868. Fax: +1 609 234 7178.

New Ecological Card

The new Ecological Card developed by Giesecke & Devrient in Germany is to be known as the ecard.

It is described as an environmentally compatible card material that can to a large extent replace the PVC materials used in card production and is chlorine-free.

Contact: Mr Jäger, Marketing, Card and Card Systems Division - Tel: +49 89 4119 784.

Car Pool Contactless Card Trial

Daimler Benz AG in Stuttgart is using contactless Smart Cards in a trial to manage and control vehicles in their car pools at the main offices and factories in the area.

To obtain a car the individual must book it first, then using his or her magnetic stripe card obtain the keys and a corresponding contactless card from a machine at the car pool. The Mercedes Benz cars in the pool are equipped with contactless card readers and the driver has to use his card to open the car door.

About 20 C2 contactless Smart Cards from ADE Angewandte Digital Elektronik GmbH are being used in the trial.

In a further development the use of the global position satellite system (GPS) is being considered for locating pool cards during their use.

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Sligos Reports Drop in Profits

Groupe Sligos reports a sharp drop in profits for the six months ending 30 June from FF62.1 million to FF13.1 million.

It gives four main reasons for this decline -changes in the group's markets, lack of recovery in corporate capital spending and the continued erosion of margins in some segments of the systems development business, deferment of phonecard orders from certain telecommunications operators and the decline in the financial markets which reduced the return on cash investments.

The report says Sligos is refocusing its systems development business on high value-added segments while maintaining its medium-term investments in the areas of cheque processing, facilities management and Smart Cards and expects this to have a positive effect on operating income beginning in the second half of the year with an even greater impact in 1995.

Highland School Meals Success

GSM Sales for AU-System

Swedish Smart Card system integrator AU-System has sold its SIM Personalisation system Avi-SIM to Telia Mobitel in Sweden, Tele Mobil in Norway and to CYTGA, the GSM operator in Cyprus. The company expects to add four or five more GSM operators to its customers by the end of this year.

Avi-SIM personalises SIM (Subscriber Identity Module) cards with subscriber data and services available on the SIM card. The system uses client/server technology based on Windows NT, SQLServer and Visual C++ development tools.

The system has a modular design and consists of modules for local personalisation, external personalisation, production management, quality control, operation and maintenance, after treatment and communication which handles the integration with AUC and customer care and billing systems. It supports GSM Phase 1 and 2 SIM cards from different suppliers and is prepared for DCS1800, PCN and PCS.

Avi-SIMPOS

In another development, the company has released Avi-SIMPOS, a SIM point-of-sale application. It supports SIM cards from different suppliers and is an MS-Windows application to be run on industry standard PCs using standard low-cost Smart Card readers. It has been developed using Visual Basic, MS-Access and Visual C++ for low-level functions.

Release 1.0 supports Phase 1 SIM cards and includes functionality for changing PIN code, unblocking locked SIM cards, maintaining abbreviated dialling numbers, copying abbreviated dialling numbers between SIM cards, quality control, short messages and a PLMN selector. The first order is for a European GSM operator to be installed at 200 retailers this month.

Release 2.0 will be available in January 1995 and will support Phase 2 SIM cards.

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A Smart Card school meals payment scheme in the

Highlands of Scotland is proving a big success in the five schools which are piloting the system introduced by Highland Contract Services.

In the opening weeks of the project, the number of school meals taken has risen by an average of 31% and the number of pupils taking advantage of their entitlement to free meals has also increased substantially.

Alistair Kirkwood, Commercial Manager, Highland Contract Services, says: "We are very pleased with the response from parents and pupils to the Smart Card, and interest from other local authorities is intense with more than 30 requests for information or visits to see the system in operation.

"We hope that the success of the pilot scheme will result in an extension to involve other secondary schools in areas where we operate."

Highland Contract Services is a direct service organisation contracted to provide the school meals service for the Highland Regional Council except in the Lochaber area.

Pupils at Alness Academy, Fortrose Academy, Glenurquart Secondary, Portree High School and Thurso High School are the pioneers of the Smart Card scheme which was launched with the incentive of taking part in a free draw with prizes donated by a range of suppliers to the school meals' service.

The Smart Cards, from McCorquodale Card Technology, are rechargeable MCT 416 cards with 416 bits EEPROM.

Cards are issued free to all pupils and parents can pay for their children's lunch as far in advance as they wish. Payment is either by cash or cheque above a minimum of £5 direct to Highland Regional Council. The amount paid is then recorded electronically on the pupil's Smart Card.

The card carries the student's name and an identification number. When the card is presented at the canteen cash desk, the current balance is shown, the amount due is debited and the new balance displayed. Pupils are advised when the balance is low, but no-one will go without a meal if they discover their card has run out of credit on one

Top Team Look at Smart Cards

particular day.

Should the card be lost or stolen, a new one can be issued immediately with the current balance. The old card is cancelled.

Pupils who receive free meals will have a Smart Card the same as everyone else but it can only be credited to the value of their free meals.

The Smart Card system will operate alongside the traditional cash till so parents who would rather continue giving their children lunch money can continue to do so.

Healthy eating plan

An incentive-based programme is being planned and is aimed at encouraging healthy eating amongst the young. Points can be awarded for buying healthy food, recorded on the Smart Card and subsequently cashed in against items such as music or book tokens or leisure centre tickets. It is also possible to redeem the points and convert them into cash for the benefit of a local charity.

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Cryptographic PCMCIA Card

International Micro Industries, Inc has won a research contract from the US Department of Commerce for a Wide Band Cryptographic PCMCIA Card for use as an interface between a host computer and an IC Smart Card. The card will be used for secure transmissions on the Information Superhighway.

The crypto card, called the Citadel Card, will incorporate a 32-bit RISC-based cryptographic processor chip designed and fabricated for the US Government, and IMI's bare chip scale TAB and Flip-Chip interconnect assembly technology.

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A high-powered UK Cabinet committee is studying developments in card technology including Smart Cards, identity cards and electronic vehicle tagging.

The card technology group known as GEN 34 consists of 13 Cabinet ministers and one civil servant. It includes Foreign Secretary Douglas Hurd, Home Secretary Michael Howard, President of the Board of Trade Michael Heseltine and Employment Secretary Michael Portillo. It is chaired by Prime Minister John Major's designated chief-of-staff David Hunt.

The committee is charged to consider the developing technology of card systems and the potential demand for such systems from government departments. There should be some interesting debates in committee with several Departments known to be interested in Smart Cards, for example, Social Security to combat benefits fraud, Health for medical cards and proof of entitlement to NHS services, Transport for motorway tolling going to trial next year, and the Home Office to assist in the fight against crime. Already there is division in the Cabinet over the introduction of ID cards and Mr Howard's plan to introduce a compulsory national ID card was eventually watered down to consideration of a voluntary scheme and publication of a discussion Green Paper next spring.

Existence of the committee was revealed in Downing Street's annual update on the membership of Cabinet committees. GEN 34 will report either to the Cabinet or to Ministerial Committee on Economic and Domestic Policy which is chaired by John Major.

Multi-function Chip/Optical Card

Drexler Technology Corporation has unveiled a new data storage product - a multi-function chip/optical Smart Card which features a standard integrated circuit chip on one side of the card and more than one megabyte of read/write optical data storage on the other side.

The optical memory stripe adds data storage capabilities to the Smart Card such as for medical records, vehicle warranty and service records, or data involving frequent buyer programmes.

Golden Card Project in China

A US\$1.7 million contract has been awarded to Groupe Bull of France by the Shanghai Pudong

Drexler says that by including the inexpensive read/write optical memory stripe it is possible to add a number of functions demanded by market needs and card price can be minimised by use of the optical memory plus a small memory chip instead of an expensive, larger memory chip.

Contact: J P Protsik, Public Relations Manager, Drexler Technology, USA -Tel: +1 415 969 7277.

Prepaid SIMs for Mobile Phones

ORGA Kartensysteme GmbH has scored a world first with the introduction of a prepaid SIM (Subscriber Identity Module) Card which allows GSM cards to be sold directly and with an immediate telephone service at department stores and by mail order companies.

Retailers who have had to rely on the credit worthiness of customers when activating mobile phones now run no risk since the card in the package has been paid for, and service provider payment is guaranteed.

In Germany, customers of the D1 mobile phone network who purchase a telephone for DM 649 as part of the overall package can start phoning the moment they unpack the device and insert the card supplied.

Each card has its own account from which units are deducted automatically. The new telecard has a special combination lock which, when entered, releases the line to the prepaid card. The mobile phone is initially linked to the credit card via a special code. The D1 package contains a simple order form addressed to DeTeMobile or to the D1 service provider which the user must send off to obtain a normal SIM card.

The system has been developed by ORGA and DeTeMobile. Like the chip card used for public payphones, credit units to the value of DM 1,000 can be used by the mobile phone card.

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Development Bank to provide a banking automated payment system in Shanghai City in the first pilot of the national Golden Card project.

Groupe Bull's solution will include the supply of 100,000 CP8 Smart Cards, 450 Electronic Funds Transfer terminals, five Automatic Teller Machines and consulting services for the development of the application.

The CP8 cards will be manufactured by CP8-Oberthur which is jointly owned by Bull CP8 and Group François-Charles Oberthur.

National payment system

Golden Card is a project by the Chinese Ministry of Electronics and the People's Bank of China to provide the PRC with a modern national payment system. It aims to reduce cash circulation, promote and develop the electronics industry in China and establish one standard for Smart Cards.

Jin Yun, Vice Chairman, Shanghai Pudong Development Bank, says: "This contract is strategic. Pudong Development Bank will be the first pilot site of the Golden Card project."

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Changes at Landis & Gyr

Landis & Gyr Corporation, Switzerland, has announced that it is merging two of its operating divisions in the UK and Landis & Gyr Energy Management (UK) Ltd will now be known as Landis & Gyr UK Ltd with headquarters at Hortonwood, Telford, Shropshire.

Peter Robertson will be the Managing Director of the new company and also retains his position as Managing Director of the energy management division.

The merger will bring about 30 new jobs to the Hortonwood site through staff relocating from the commercial and residential building market segments and OEM business at Bourne End, Buckinghamshire, and local recruitment.

Asymmetric Key Unit

Smartcard Scandinavia has driven a project called AKU (Asymmetric Key Unit) where it has

The company is a leader in the manufacture of metering equipment including the Quantum (gas) and Pisces (electricity) prepayment metering systems based on Smart Cards. It employs around 600 people in the UK.

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Pedestrian Area Access Control

Innovatron Systèmes Urbains has been awarded one of the largest European projects for a traffic regulation and pedestrian areas access control system in the city of Marseille.

The company is prominent in vehicle regulation and pedestrian access control systems and has developed a range of dynamic retractable bollards which are in use in nearly 300 towns and cities in Europe. Recent contracts have been with Grenoble, Compiègne and Tours in France.

In the saint-Ferréol zone in Marseille five entries and 11 exits are controlled by 32 bollards via a monitoring unit. The entries are equipped with an access post and users authorised to enter the area have a Smart Card supplied by French manufacturer Solaic. It is used, for example, by delivery vehicles and the drivers must take a ticket delivered by the access post. Other sites at Cours Julien and Cours Estienne d'Orves are also connected to the centralised control.

The company is also developing an international franchise network, and Elektro Schlagenhauf GmbH, which signed an agreement this year covering all of Germany, has now opened four branches to market comprehensive systems including bollards, programming units, Smart Card access controllers, centralised technical management and customer software etc.

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designed a security concept which it says provides a unique security solution adding a new dimension to encryption in conjunction with Smart Cards and applications. The concept is

currently being implemented in a trial for the Swedish Armed Forces.

A consortium of security and ciphering experts lead by Smartcard Scandinavia Holding AB developed the concept which can be used to secure identification, physical access control and logical access control to computer systems, generation of open keys, encrypted transmission of secret keys, verification of documents and signatures, issuing of electronic bank cheques, secure financial transactions, electronic purse and encryption of text.

In addition it can feed an external encryption algorithm such as DES with necessary session keys but specifically supports the fast software implementation of symmetric encryption algorithm HR&S (Hinc Robur et Securitas).

The AKU concept is securely stored in a tamper-resistant microcontroller chip embedded in a standard ISO 7816 Smart Card. A PIN, when used, is verified inside the chip and can be changed by the cardholder as necessary. The AKU card can only communicate with other AKU cards in the family and does not rely on external security elements.

Communication

Communication with an AKU card is performed by a 92 byte long string, called the AKU string, which can only be created, read and understood by an AKU card. When an AKU card is initialised, it internally generates a random number which is used to encrypt a string containing an open key, issuer information, card ID, authority information and key generation information. Encryption is performed by several co-operating algorithms including substitutions and permutations in an irregular way through the string. The string also includes an improved check digit function which provides detection if the string is altered in any way.

When an AKU card receives an AKU string it primarily tests it. If the string is valid and the sender has an accepted ID, key generation, authority etc., the card sends a similar string

Retailers and Chip Cards

Success with the Mondex electronic cash system at Swindon where it is being launched was the best opportunity currently available in the UK to

including session key encrypted by the open key together with ID and overhead information. If testing fails, the card will not answer at all.

For shorter documents the card itself can tie a signature to and secure the document, but when handling larger documents, the software implemented algorithm HR&S, supported by AKU, offers the possibility to secure a document together with up to eight different signatures.

Electronic purse application

In an electronic purse application, electronic money is transported between cards by use of the secure AKU string. Cards are personalised by the issuer and given appropriate authorities. A customer can then, for example, receive money only from the issuer and send money only to an operator card in a purchase terminal given that authority by the card issuer.

The operator card can only receive money from customer cards and only move money into the issuers bank account.

A card defined as an "operator card" can house the security scheme for several card issuers. The use of a PIN can be defined into the card by the issuer for loading a card as well as for pay transactions over a predetermined amount, but not for small purchases.

All transactions are numbered internally in the receiving (operator) card and the card can produce a MAC for every transaction onto an alternative media as a back-up should a customer or operator card malfunction.

Every transaction is done in a mode known as two-way authentication which protects against transaction replays, simulated cards, masquerading, debiting by false operator cards, systematic fraud attempts and diversion of genuine certificates.

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begin to lay the foundations for future chip card operations said Oliver Randell, Manager, Retail Systems Solutions, J Sainsbury, speaking at the 10th European Payments '94 Conference in Edinburgh last month.

He suggested that most qualifying retailers would participate for three reasons: to be in at the beginning, because it was virtually free, and to obtain first hand experience of operating with chip cards.

Experimental schemes were proliferating around the world and a number were now turning to operational reality. Recent announcements by the main card schemes, APACS, utility companies and major retailers all pointed to a rapid growth in the real use of chip cards. Now was the time to learn in practical terms of the problems and pitfalls associated with the new technology.

Many of the recent European trials had offered limited operation use, being either closed schemes or restricted to basic functionality. Mondex would give all participants - the issuers, the retailers and customers - the opportunity to work with a system which covered a wide geographical area, many customers, multiple retailer outlets and services and was to be conducted over a realistic time frame.

He saw the major advantages for retailers as improved security at the front end, in the office and on site; the potential for improved speed and accuracy at the front end and in the office; and a faster crediting cycle on a daily or drip feed basis.

But potential drawbacks might be increased costs to the retailer in the form of fees, equipment, procedures and training; the security of the system was unproven in the card, in the terminal and in the transfer and settlement operations; it would be many years before it was generally available in all locations to all people; and it might not be accepted in principle or operationally by the public.

But it was important for the retail industry to be involved now with chip card development. This time the power of the processor was not just with the issuer and the retailer but also in the pocket of the customer. Sooner or later they would choose to use that power and retailers had to act now if

Cashless Holidays in Turkey

they wished to benefit.

Need to co-operate

The need for banks and retailers to co-operate and work closely together to develop their card payment strategies was stressed by Dr Liz Mandeville, Research Manager, RMDP. As an example, if British retailers replaced and/or upgraded their EFTPOS terminals then the banks would be able to proceed with the transition from magnetic stripe to chip cards, but if they did not, then the whole process would be stalled.

The macho attitudes of the 1980s had, to a degree, given way to a more realistic approach and NatWest's Mondex team claimed a completely new relationship with retailers which recognised them as partners in the development of a new strategy. Also the list of retail companies committed to the new electronic cash payment system was impressive.

Retailers were interested in chip cards, but not on any old terms, she said. They wanted cards which could be used with any terminal, terminals which were competitively priced and freely available, and systems which were designed to allow them to use cards for the services they wanted to offer customers. Retailers also wanted information about transactions, she said, adding:

"Retailer demand for far more management information from cards is an old story, and it is old because the demand has not been met."

"Banks should recognise retailers as their customers or business partners and provide them with what they want, rather than treat them as dependants and try to make them like what they get. The introduction of chip cards provides a magnificent opportunity for both retailers and bankers to prove what a supplier/client relationship and good customer service should be like. It will be a tragedy if that opportunity is not seized."

The Turunc Hotel, a four-star holiday resort in Marmaris south west Turkey is using a Smart

Card-based system to control fraud and improve efficiency in stock control and guest service.

It has 256 rooms with some 560 beds and amenities including an indoor and outdoor restaurant, two bars, sports and leisure facilities including water ski and surfing, three service areas and a shuttle transport service.

Brian Todd, Sales Manager, Dione Developments, which installed the system says the owners of the hotel had been aware of severe levels of fraud where guest payments were made in hard currency and had attempted to eliminate this by introducing a token or bead

Technology with the Motorola 68HC05SC21 chip, and Dione Cpt100 portable terminals with a Smart Card reader, integral printer, display and keyboard. The terminal also supports a removable memory card to transport stored transactions. The computer used by the hotel is an IBM PC with a Rhombus card reader/writer attached to the communication port. The PC is linked to a central UNIX based host computer.

Smart Cards are issued to guests by the receptionist who uses a point-of-sale terminal under the control of a supervisor Smart Card to load the card with personal details such as guests name, room number and the amount of money the guest wishes to put on the card. This is paid for in cash plus a small charge to cover the cost of the card should it not be returned at the end of the holiday period.

Point-of-sale terminals at each sales point are preloaded and configured with the selling point

payment system. While this had improved the situation slightly it had not stamped out the fraud and also did not provide stock control and financial statistics.

It was decided to instal a cashless payment system using the AMC03 3K bytes EEPROM microprocessor card from McCorquodale Card ID, the waiters ID and the price look-up table of the items available for sale.

Guest spending is recorded in the Smart Card's internal memory and the prepaid value is decremented by each amount spent. Receipts produced via the terminals show the old balance, the itemised purchase amount and the new balance left on the card. Guests can increase the balance

on the card at any time by going to the reception desk and paying the required amount.

All transactions are recorded by the point-of-sale terminal and at the end of the day this information is loaded onto a memory card by authorised staff and transferred into the PC.

If a card is lost a new one can be issued with the

correct balance as held by the computer system. Lost cards can be recorded within each point-of-sale device by updating the hot card files.

According to Brian Todd, the hotel management say that its investment in the system was recovered within three months of installation, and it plans to introduce the scheme to a private boarding high school where the 5,000 students will be issued with Smart Cards.

These will provide student ID, access to the library/laboratories etc., payment for the use of telephones, fax and photocopiers, and meals in the school restaurant which will provide a range of meals including special dietary requirements with incentives given for healthy meals. In addition the card will control student spending as specified by parents.

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Britain woos loyal customers

Loyalty Smart Cards, almost unknown in Britain, are set to become an accepted feature in supermarkets and department stores next year.

VeriFone (UK) and system suppliers Saunders Jefferies are to pool their resources to develop customer loyalty schemes using VeriFone's CM450 Smart Card reader/writer terminal.

The CM450 can access data stored in the card, enabling the retailer to gather a variety of information about his customers, such as how often they shop, favourite departments and average amount of purchase, for use in promotional programmes. In practical terms: do not offer bargains in weekend joints to someone who never buys meat and is probably a vegetarian! Information can be directly downloaded from the CM450 via a PC.

The hand-held CM450 can be programmed to accept both debit and prepaid Smart Cards as well as credit and proprietary cards. It has 32K bytes RAM to allow the addition of new Smart Card applications or to accept additional Smart Cards. The terminal can be used in a variety of applications that support memory and microprocessor Smart Cards, such as:

- * payment cards - credit, debit or prepaid - to encourage consumer spending by offering added convenience;
- * retailer cards which encourage customer loyalty by supporting frequent-shopper programmes.

It can include: account number, name and address; PIN; date of birth; account type; card start/expiry date; points balance/redeemed; savings (these can be used as a "Christmas Club" with change credited to the card); electronic purse; account credit limit; account balance and account maximum transaction.

Other possibilities are: employee/share holder

number; staff discount rate; staff discount allowance; mother/daughter card indicator; access control indicator and promotional fields.

It has a 16-character, two-line display which provides immediate feedback on entry, for example if a customer is entering his PIN. When functioning as a PIN pad, maximum security is ensured through DES and Key Management operations.

The CM450 is programmed in C to enable upgrading or creating of new programs. It connects to the full range of VeriFone transaction systems via an RS232 serial interface and will connect with PCs and electronic cash registers. For mobile applications, the CM450 will run off a car battery. When connected to a VeriFone automation terminal no additional power supply is required.

The terminal supports ISO standard memory and microprocessor cards from companies such as Gemplus, Bull, Schlumberger and DataCard.

Saunders Jefferies says that current users of the loyalty application are Chelmsford Co-op (SCN February 1994), an hotel group, a major foreign retailer and a major UK retailer (pilot). Discussions have also taken place with Tesco, Sainsbury, W H Smith and House of Fraser.

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Specialised Silicon for Mondex

Hitachi Europe has designed a specialised version of the Hitachi H8/310 series microprocessor which it is manufacturing for the introduction of the Mondex Smart Card-based electronic cash payment service next year.

Tim Jones, Chief Executive of Mondex, says: Since product development specifications for Mondex were released in April to enable manufacturers to produce Mondex-compatible products, over 100 electronics manufacturers around the world have expressed an interest in developing Mondex products.

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"Security is the foundation stone of Mondex. Over the past four years we have worked with leading silicon engineering laboratories around the world on a silicon design which should resist the most determined attacks on the hardware of the chip.

"I am pleased to say that with Hitachi we have such a design - available in the quantity required for our future plans.

"Hitachi is one of a number of electronics manufacturers in Europe, North America and Japan who have played a key role in this successful development and I am pleased to announce that they will be working with us on the next stage of the development to provide an advanced technical platform for the wider introduction of Mondex starting in 1996."

The major UK launch of Mondex will be in England next Summer when this joint venture of NatWest and Midland Bank working with BT starts in the town of Swindon where over 40,000 people and 1,000 retailers will be involved.

Meanwhile negotiations with major financial institutions around the world are also progressing to enable the global introduction of Mondex.

Product development

In addition to Hitachi's work on integrated circuits, devices for Mondex are currently being developed by: AT&T Global Information Solutions - cash machines, BT - residential telephones and payphones, Dai Nippon Printing Co./SPOM Japan Co. - cards, De La Rue Fortronic - retailer terminals, OKI Electric Industry Co. - electronic wallets, Panasonic (Matsushita Electric Industrial/Matsushita Battery) - electronic wallets and personal balance readers.

Smart Plan for Motor Industry

A Smart Card-based scheme to improve communication and information management in the UK motor industry by reducing telephone calls, the high volume of paperwork and clerical administration which are costly, slow and have a high error rate has been developed by Motor Industry Marketing.

Called OASIS (Open Automotive Services through Integrated Systems), it is essentially a two-part system:

- * a bureau service which translates the invoicing codes used by one company into the codes used by another via BT's EDI (Electronic Data Interchange) network; and
- * a Smart Card which allows the service provider to capture more accurately the basic information relating to the transaction.

The scheme is aimed at the general fleet and leasing sector (fleet operators, car rental and contract hire companies) representing 3.5 million company cars in the UK, franchised dealers, the major motor manufacturers and Quick Fit specialists with a combined trade value of over £50 billion.

Roger Macey, Chairman, Motor Industry Marketing (MIM), says: "There are some 3.5 million company cars in the UK today, and on average, each of them makes five visits for service, repair, and general maintenance every year. That adds up to 17.5 million maintenance and repair transactions every year."

He estimates that the new system could save service providers £81.9 million worth of unnecessary costs incurred through invoice errors, manual transactions and the cost of "unnecessary" phone calls for authorisation.

Fleet operators could save £113.75 million a year incurred by transaction errors through the process of coding and rekeying, and producing paper invoices.

Total savings to the industry of using the OASIS **London Taxi Smart Card Plan**

Computer Cab, London's largest radio taxi company with some 2,600 operating cabs, is planning to introduce a Smart Card payment system for customers in 1996.

A trial with about 50 taxis equipped with Financer terminals from Thyron will start early in 1995. Computer Cab is targeting the 11,000 taxis in Greater London which do not have radios. With the new terminal they will be able to accept the

system could amount to £195.65 million, or approximately £56 per car per year.

Pilot tests

The project is scheduled to start in April 1995 with a comprehensive series of pilot tests in which Swan National Leasing, Kwik-Fit, Eurodollar and Kenning Leaseline will take part. Full roll-out will follow later in the year.

The selling a marketing of OASIS to service providers will be undertaken by the national sales force of Wick Hill, specialists in software marketing. MIM will concentrate on the fleet operators. Project co-ordination will be handled centrally.

Smart Cards

The Smart Cards and card readers are being developed by Delphic, a joint venture between De La Rue and Philips Electronics. The card will be the Philips DS 1K bytes EEPROM microprocessor Smart Card.

It will generally contain the name, company and telephone number of the driver; the make, model, registration number, registration date and VIN (Vehicle Identification Number) of his or her vehicle; and the name, telephone number, contact name and authorisation limits set by the operator concerned.

User companies can have their own distinctive card style under the brand name OASIS for corporate promotional purposes.

Contact: Alan Croft, Sales and Marketing Director, Motor Industry Marketing - Tel: +44 (0)1442 219000. Fax: +44 (0)1442 212976.

major credit cards, the Cab Charge card, and later the Smart Card when the reader is enabled at a later stage.

The Smart Card may be a prepaid disposable card or a rechargeable card as the company is still considering what applications to offer.

Next year Computer Cab is planning to bring into London a Global Position Satellite (GPS) system for their 2,600 taxis and at the same time to upgrade the card swipes in these cabs to accept Smart Cards as well.

Mike Galvin, General Manager, Computer Cab, said: "Once the system is in around April/May of 1996 we will launch our own Smart Card product, and we are also hoping to accept the Mondex card as well."

He said that the convenience of being able to pay fares with a card often meant passengers would extend their journey, for example, to their destination rather than to an underground station. Parents could give their children a Smart Card to pay for journeys home if they were stranded, and a relative who had to go to hospital once a week but would be offended to accept money for a taxi would probably accept a prepaid Smart Card as a gift.

"Our market research has shown a considerable amount of interest from taxi drivers," said Mr Galvin.

Driver benefits would include tapping into longer journeys as customers who pay by credit card spend more money per journey which is an additional source of income. There is also the situation where drivers continually complain because they pick somebody up and the second thing they say is "could you stop at a cash dispenser, I need to draw out some cash."

The Financer is a pocket-sized, hand-held data transfer terminal capable of generating and processing transactions from magnetic stripe and Smart Card payment cards. It has full telephone functionality and an internal V21/V22 modem.

Contacts: Mike Galvin, General Manager, Computer Cab, UK - Tel: +44 (0)171 286 2728. Fax: +44 (0)171 286 7259. Rohit Patni, Sales and Marketing Director, Thyron, UK - Tel: +44 (0)1727 875800. Fax: +44 (0)1727 875981.

Smart Card Diary

Smart Card Europe, Royal Lancaster Hotel, London, 13/14 December.

The 2nd annual European conference focuses on security issues, particularly regarding electronic purse schemes, and examines the major applications in the rapidly developing fields of transport and telecommunications. New to the conference is a tutorial on 12 December by Dr

Ticket Machine Order for Ascom

A Sfr 20 million contract to supply more than 350 ticket vending machines to the Mass Transit Railway Corporation (MTRC) in Hong Kong has been awarded to Ascom Vendomat of Switzerland. An option includes an additional 60 machines for the planned extension of the railway to Hong Kong's new airport.

Using the latest touch screen technology, the new ticket vending machines will be installed between October 1995 and September 1996.

MTRC is one of the partners in the Hong Kong mass transit project which will use contactless Smart Cards for the payment of fares on all forms of public transport. Trials will start in 1995 with full public introduction in 1996.

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

David Everett for those who want to get up to speed on Smart Card technology. Contact: IBC Technical Services - Tel: +44 (0)171 637 4383. Fax: +44 (0)171 631 3214.

Added Value Opportunities in Cards, Claridges, London, 14/15 December.

Exploring issues vital to the successful planning, implementation and management of the latest payment card products, topics cover strategic partnerships, retaining customer loyalty, new

market segments and the impact on traditional card activity of debit and prepayment cards. Contact: Kate Briscoe, Conference manager, AIC Conferences - Tel: +44 (0)171 242 2324. Fax: +44(0)171 242 2320.

MULTICARD '95, Grand Hotel Esplanade, Berlin, Germany, 11-13 January 1995.

International conference focusing on Smart Cards in health systems, as an element in modern transportation systems and their use in cashless transactions. Contact: inTime, Berlin - Tel: +49 30 892 9763. Fax: +49 30 893 2848.

Smart Card '95, Olympia 2, London, England, 14-16 February 1995.

The international advanced card exhibition and conference will target prepayment and finance, technology and marketing, transport, communications and advanced identification. Programme available from November. Contact: Conference Secretariat QMS Ltd, England - Tel: +44 (0)1733 394304. Fax: +44 (0)1733 390042.

The 1995 Asian Smart Card Summit, The Pan-Pacific Hotel, Singapore, 22-24 March.

Contact: Joyce Wi, AIC Conferences, Singapore - Tel: +65 222 8550. Fax: +65 225 5906.

Smart Card Security Challenge

A challenge with a US\$1,000 reward has been issued to individuals who claim Smart Cards "can easily be compromised by today's attack

SIMs for Latvia and Estonia

Gemplus is to supply the Smart Card SIMs (Subscriber Identification Modules) for the GSM (Global System for Mobile Communications) networks in Latvia and Estonia.

The exclusive supplier contracts cover the production and personalisation of all GSM Smart Cards which will be used in the phone units. Each operator has ordered 10,000 cards for delivery in early 1995 for the launch of their networks.

The Latvian Mobile Telephone (LMT) company

technology."

It came from Joe Schuler, President of The Schuler Consultancy, speaking at the CardTech/SecurTech '94 West conference and exhibition in Santa Clara, California.

He said he was tired of hearing unsubstantiated claims about "hacking past" the security of Smart Card systems and some proponents of magnetic stripe technology claim that even high-end Smart Card technology can be successfully attacked using equipment available at their local electronics store.

Displaying several cards used in financial and government benefit applications, he said: "If it is that easy, all they have to do to collect the \$1,000 reward is take one of these cards, increase the dollar value contained in its memory, and return it to me in working order," said Schuler. "I will even give them a printout that shows what is in the card's memory. I am very confident I will not have to write a cheque."

While low-end telephone chip cards can easily be hacked and even cloned, sophisticated microprocessor Smart Cards are another story, he said. "I believe claims about hacking into or reverse engineering Smart Cards are unfounded."

Defending security Schuler said that while Smart Cards are only a small part of a well thought out security scheme, they provide system designers with multiple keys, encryption algorithms and challenge/response techniques not possible with other card technologies.

Contact: Joe Schuler, The Schuler Consultancy - Tel: +1 612 934 8025. Fax: +1 612 934 8020.

and its Estonian counterpart (EMT) have chosen GSM, the pan-European mobile cellular telephone standard which is already in use in more than 70 countries around the world.

Gemplus estimates its market share in 1994 was 38% of all units sold in a total market of 9.2 million SIM cards.

It has supplied SIM cards for the GSM or DCS 18000 networks all over the world including Australia, Belgium, Brunei, Chinese provinces (Shanghai and Guangdong), Denmark, Finland, France, Germany, Hong Kong, Hungary,

Indonesia, Ireland, Italy, Kuwait, Lebanon, Malaysia, New Zealand, Norway, the Philippines, Portugal, Qatar, The Netherlands, Russia, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Thailand, Turkey, United Arab Emirates, United Kingdom, and Vietnam.

Contact: Flavie Gil, Gemplus, France - Tel: +33 42 32 51 83.

African Telephone Card. It has developed systems for the production of both contact and contactless cards and has supplied machines and systems for Smart Card production to nine countries worldwide.

Contact: Mr R Smith, Managing Director, Oakwood Design, UK - Tel: +44 (0)1462 480933. Fax: - +44 (0)1462 480292.

Small but Self-sufficient

Oakwood Design, the Letchworth, UK manufacturer, has introduced a new chip card encoding machine to its range of small-scale production chip card assembly machines.

It is an in-line single channel unit accepting standard plastic cards with 6 or 8 contact IC modules complying with ISO 7816-3. Up to six magazines can hold 500 cards each which are fed automatically via a vision inspection station which checks pre-set chip parameters.

A twin-head encoder with high quality spring contacts enables full encoding to be conducted with a dwell period as short as 800 milliseconds. It allows for parallel encoding of two cards requiring up to 350 ms each. A Domino Solo 515 double head inkjet printer can be added for extra flexibility. The equipment has a continuous operating speed of over 3,000 cards an hour.

Used in conjunction with Oakwood's Benchtop Pocket Forming Machine, hand-operated Chip Module Punch and Chip Module Insertion Unit, the encoder enables any card supplier to become totally self-sufficient in assembling and encoding commercially viable quantities of Smart Cards for applications such as pre-paid telephone cards or health cards.

The company also supplies small litho printing machines to apply full colour images on blank white cards, allowing a production rate of 200 cards an hour. Its IC Card Flex/Torsion Tester can test up to 15 cards simultaneously with five in each station. All these small-scale production machines will be on display at Smart Card '95 at Olympia, London, 14-16 February 1995.

Oakwood, twice winner of the Queen's Award for Export, is the supplier for the complete chip card assembly and encoding system of the South

Intelligent tags - a review of current and emerging technologies

Introduction

According to the dictionary intelligence is defined as "having intellect: endowed with the faculty of reason: alert, bright, quick of mind: well-informed; cognisant: Bringing intelligence." In tagging practice intelligence is usually taken to mean something akin to "bringing intelligence." Thus operational data is stored in the tag's memory. Means are provided to control the writing and reading of such data. The tag brings intelligence to our application systems.

This working definition of an intelligent tag therefore excludes both standard and high capacity magnetic recordings. It also excludes the very useful optical equivalents such as standard one and two dimensional bar codes and high density optical records like CD ROM and laser cards. I will therefore omit such important possibilities but concentrate on the still very widespread field of electronic tags and similar devices, including Smart Cards. All of these artifacts derive their intelligence from a combination of control electronics and digital electronic memory. The hardware is essentially the ubiquitous integrated circuit chip.

Electronic tags can be physically and logically divided into four parts as shown in figure 1. These are (a) the storage area which holds the numeric or alphanumeric data in binary digital form (bits), (b) the control electronics governing access to and from this area, (c) the data transfer interface to a read/write terminal, and (d) the power supply. The terminal is also sometimes known as a scanner or interrogator. For brevity I will exclude detail on applications. I will also avoid describing some of the subtleties of the physics of electronic devices and the mathematics of data coding.

Some History

From about the late 1960s two separate evolutionary streams can be traced for intelligent electronic tags. These are the radio tag path and the Smart Card path. As shown below, these separate paths are now converging as tags become The Smart Card evolutionary path started from a desire to improve on the magnetic ID card used in bank card payment systems. In the late 1960s patents began to appear covering electronic

more intelligent and Smart Cards develop radio interfaces for data transfer.

The origin of radio tags goes right back to World War II in the form of IFF devices fitted to aeroplanes to enable them to be correctly recognised by interceptors (FF=Friend or Foe). The cost and size of such transponders fell dramatically with the advent of firstly the transistor in the 1950s and the integrated circuit in the 1960s. By the early 1970s radio and other wireless tags were relatively common in animal and fish research investigations. I believe the smallest tag known was fitted to a bumblebee.

Subsequently early Electronic Article Surveillance devices appeared. These EAS tags were virtually all radio interface and just the one bit memory. They were followed in the 1980s by more intelligent radio tags with greater data capacity for identity tagging of people, animals and components. These are called RFID tags (Ref.1).

Reliable reading at a few metres range demanded on-board batteries to power up the radio transmitter of the tag, so today we have the active radio tag (Figure 2A). It contains a multi-bit programmable memory. For access control this is used as a pointer to the ID access privileges of the wearer. Access control has turned out to be the main market for such tags. Tag to interrogator ratios are in the order of 8-1 to 50-1.

More recently ways have been devised of using external power sources to energise the RFID tag electronics. Such sources are usually radio from a transmitter built into the interrogator. There are some devices that use light (solar powered). The generic name is passive radio tag. A good example is the Texas Instruments TIRIS radio tag. Like the Cotag this operates at around 130 kHz frequency. This frequency gives the right combination of range and radio power for applications in access control and animal tagging etc. Greater range can be obtained at higher frequencies but passive higher frequency radio tags are currently much less common. There is a well known battery powered tag manufactured by SAAB Automation in Sweden. This PREMID device operates at microwave frequencies (2.45 and 5.8 Mhz).

memory cards based on integrated circuit digital memory. These have an edge contact interface to readers. In essence these devices were miniature versions of the familiar printed circuit memory

boards of personal computers etc. They were soon overtaken by inventions from Dr Arimura in Japan and M. Moreno in France. These had control electronics to govern the reading and writing of data to the card's memory. By the mid 1970s this class of IC card had been named by Mr Roy Bright of the UK as "Smart Cards." These days Smart Cards are the subject of ISO standards work where they are known as ICCs (Integrated Circuit Cards).

As is well known, very large scale production and use originated in France. This began with the France Telecom public payphone card. So far over 800 million of these have been supplied. To the purists this is not a Smart Card because the control electronics is very simple logic. They prefer to use the name Smart Card for an ICC containing an on-board microprocessor. Thus in effect the final device as shown in Figure 2B is a complete digital computer together with a set of electrical contacts providing a network interface.

These contacts can wear out, especially when used in harsh environments. Beginning in the late 1980s some suppliers, including GEC and AT&T devised Smart Cards with a short (10cm or less) range radio link to connect them to a read/write terminal. This led to a new class of contactless Smart Cards. The ISO is now working on standards for these "Contactless" Integrated Circuit Cards (CICC). The GEC card is described in references 2 and 6.

The latest "contactless" development is the coil-on-chip device. In these the tag electronics is in the single chip form and the chip carries on its top surface a printed spiral coil to act as an antenna for the radio link. Mikron in Austria has devised such a device (Ref 3). Figure 2(c) illustrates the "blurring" between CICC and intelligent tags.

Finally, mention should be made of PCMIA cards. These evolved as memory only cards from the Smart Card. To provide a parallel interface to the large (1 Mb+) memory they carry an array of contacts on one edge of a credit card shaped substrate. Since the creation of a Trade Association with de facto standards, PCMIA cards

are now available for a wide range of data acquisition and manipulation purposes as plug-in peripherals to all manner of portable and other electronic equipment.

Peter Hawkes

British Technology Group Ltd.

(Continued next month.)

Disclaimer

The views expressed in the above are the author's own and do not represent the policies of the British Technology Group Ltd. Information supplied is obtained from public sources and is believed to be accurate at the time of writing.

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References

1. *Perspectives in radio frequency identification* - Ron Ames, Van Nostrand, New York '90, ISBN 0-442-00406-0.
2. *Integrated Circuits, Cards, Tags and Tokens* - P Hawkes, D Davis & W Price; BSP, London 1990; ISBN 0-632-01935-2.
3. *Mikron Austria Bid for World Ticket Card* - Smart Card News, September 1994, ps 161 & 163.
4. *ASICs for Chip Cards* - Roland Koo (Mikron), ps 118-122, Smart Card '94 Conference, London, 15-17 February 1994, pub. by Quality Marketing Services Ltd, Peterborough, UK.
5. *Electronic Identification and Counting of Grouped Items* - P Hawkes, ICAP'94 Conference, Birmingham, UK, 21 June 1994.
6. *Smart Card Tutorial - Contactless Cards* - Dr D Everett, Smart Card News, September 1994, ps 175-8.

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Chip Card Payphone

ACC Long Distance UK's Equipment Services Division was showing its new GNT 809 card-operating payphone at the Telecommunications Managers Association convention in Brighton, England, last month.

The new payphone is designed to use prepaid chip cards or read-only magnetic cards. With the addition of its Payphone Management System, ACC can offer control of a network of payphones.

It has an agreement with Monétel Nordic to supply, install and maintain the GNT 809 in the UK and the Republic of Ireland.

Part of the ACC Corporation based in New York, ACC companies in the UK, US, Canada and Australia provide long distance telephone services to customers in business, education, health and the home. It is the largest independent long distance carrier in the north eastern United States and second in the Canadian market.

Contact: Colin English, Sales Manager, UK - Tel: +44 (0)1223 577777. Fax: +44 (0)1223 577778.

households in Quebec, Canada, with access to a wide range of products and services through their television sets is being pioneered by the UBI Consortium.

The first phase will start in the Autumn of 1995 and run for about 15 months with the deployment of 34,000 terminals in the Saquenay region. The project will then be extended throughout Quebec and Montreal with a forecast of 1.5 million terminals in these three territories.

Services offered will include home shopping, direct marketing, government services, health and education services, banking and financial services.

The UBI Consortium partners will also provide their own services to consumers: The National Bank - banking services; Hydro-Quebec - energy management and home automation services; Loto-Quebec - lottery services; Canada Post Corporation - electronic mail and parcel delivery services; The Heart Corporation - a multi-media business directory; and Videoway Communication - an illustrated classified advertisement service.

Access to all of these services will be free of charge for consumers while access to the specialised services of cable operators will require paid subscription. The reasoning is that consumers do not pay to enter and browse through a shopping centre. They pay only for the products or services they buy in the stores. The stores rent space and pay for services.

A multi-function 2K bytes EEPROM Smart Card will be used to identify and authenticate its holder through the use of a PIN, and allow the storage of personal information. It will also support payment functions of the Electronic Wallet which allows payments of small amounts to be made simply and economically. It is expected that this will be the payment method for the 25% of adults who do not hold either a credit card or a debit card. It also allows users to check their balance and displays their last ten transactions.

Home Electronic Highway

A Smart Card-based home electronic highway project which will provide at least 80% of