

Emergency Health Card Trials to Start in Ireland

A town in Southern Ireland will be the first to trial Cardlink, a European Commission-funded Emergency Health Card to be piloted in four countries.

Strategic issues are to examine how the immediate availability of essential data can improve the effectiveness of patient care in an emergency, and demonstrate European interoperability of the solution through projects in countries with different healthcare systems.

The card will be the link between patients, doctors, hospitals and pharmacists and contain vital information in code understood irrespective of the nationality of the cardholder or the linguistic ability of the medical personnel involved.

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First sighting of one of the new Smart phonecards which BT will trial in the City of Portsmouth in the Spring in its run up to introducing prepaid Smart Card payphone cards. GPT Card Technology is supplying the first 100,000 cards in several prepaid amounts to BT while GPT Payphone Systems is one of the Smart payphone suppliers.

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Next Month

Smart Card Tutorial - Part 3
From There to Here -
The Making of a Chip continued.

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Emergency Health Card Trials

Continued from page 41

The trial, scheduled to start in June in Bray, near Dublin in the Republic of Ireland, will be the first and largest of five trials in four countries.

The others pilot schemes are:

Place	Commercial Partners
St. Nazaire, France	Solaic
Valencia, Spain	Er itel
Lazio region, Rome, Italy	Univ. Roma/ Gemplus
Lombardy area, Milan, Italy	Univ. Roma/ Gemplus

The project is being directed by EUROCARDS which was launched in 1993 by the AIM Office with the objective of extending the use of patient data cards in Europe and is fully funded by Directorate General XIII of the European Commission to co-ordinate research activities carried out in the Member States.

Data on the card will include identification of the patient, usual medical carer, next of kin, health insurance details, and clinical data, for example, blood group, heart condition, diseases, immunisations, drug allergies etc. It will also contain prescription data on drugs - quantity, strength, frequency.

The project in Ireland has been developed by the Eastern Health Board and will involve the issue of 12,000 Smart Cards on a voluntary basis to patients in the town of Bray, doctors, the accident and emergency unit at the local Loughlinstown Hospital and 12 pharmacies.

DelPhic Card Systems, the joint venture between De La Rue Card Technology and Philips, will supply Philips TB100 3K bytes EEPROM Smart Cards with a Motorola SC21 chip, terminals, software and personalisation equipment as well as provide technical support. Software interfaces have

GPT Launches Card Company

been developed by S3 (Silicon Software Solutions) based in Dublin. Solaic Smart Cards is responsible for the project management.

Benefits

Benefits of Cardlink in hospitals are seen as the provision of initial data (reducing examination and testing), a source of where further information is held, information to care provider when card holder is abroad, eligibility data, casualty staff see prescription details, treatment can start soon and prevent an emergency developing.

Doctors will benefit as on-call doctors will have information on the patient, can see prescription details, download information to the General Practitioner system and key in prescription details.

Pharmacists will receive the prescription on the Smart Card, save time on input, will not require clarification from doctors, and write dispensing details onto the card.

Patients will benefit from having a mobile medical record which will reduce the need for tests in an emergency and will be available when abroad.

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Berne Technology Forum

"The Cashless Society" is the theme of the 6th Berne Technology Forum organised by The Hasler Foundation and Ascom Tech at the BEAexpo Conference Centre, Berne, Switzerland on 23 March. The conference language will be English and lectures will have a technical background but will be application oriented covering public, private, open and closed systems.

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to Racom Systems Inc in the United States, but did manage to provide London Transport with cards for its AFC trial in Harrow.

But Steve Prentice, Director of Marketing says: "Our production problems have been solved and we can launch our contactless card with confidence."

GPT Payphone Systems is the world's largest payphone company with sales to more than 70 countries. Founded in 1985, it reached record export figures of 71% last year and recently produced its 500,000th payphone as part of a shipment to Thailand.

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Colin Beardmore, General Manager and Director of the new company, GPT Card Technology

GPT has consolidated its card technology division as part of GPT Payphone Systems to bring together the production of its three core technologies - GPT Imprint Magnetic (GIM) cards, GPT Integrated Smart (GIS) cards and GPT Integrated contactless (GIC) cards - at new state-of-the-art headquarters in Coventry, England.

The new division, known as GPT Card Technology, already produces over 100 million cards a year and has the backing of GEC of the UK and Siemens AG of Germany.

Colin Beardmore, General Manager and Director, says card production has developed into a £30 million business and they produce some 2,000 different card designs each year for production runs from 1,000 to one million cards.

GPT is one of the key suppliers for the next generation of Smart Card payphones to replace BT's existing optical phonecard payphones and has an on-going contract to supply Smart phone cards to BT.

Contactless problems solved

The company says it has solved its problems in producing contactless cards. Last year it lost an order to supply 5,000 cards for Greater Manchester's automatic fare collection (AFC) pilot

London Buses Take Smart Route

London Transport Buses has launched a new Smart

Press Banned from Conference

After a long and unhappy relationship with the international media, the organisers of Smart Card '95 in London last month banned the Press from attending the three-day conference - typically without even the courtesy of informing them in advance. Journalists were only aware that they were excluded from the conference when they arrived at the venue.

It was a decision that angered journalists and stunned many of the industry's leaders.

The organisers appear to have forgotten that their event was built on a great deal of goodwill and support from many companies and individuals such as conference chairman and speakers who gave their valuable time and effort for no personal gain. The media, particularly the specialist media, gave its support too in pre- and post publicity. The organisers should not think this will be so forthcoming again.

The message for Smart Card companies is clear. If you want media coverage for major announcements, make them at CeBIT in Germany, CarteS in Paris, CardTech in the States, or any of the other conferences where the Press are warmly welcome.

Card electronic bus ticket called the Farecard in a further test of the technology in its trials in the Harrow area of the capital.

Following successful trials of the Smart Photocard, the Farecard is a rechargeable ticket storing cash value from which the fare is electronically deducted each time the holder boards one of the 200 participating buses.

The new Farecard is aimed at passengers who do not use buses regularly enough to buy a Bus Pass or Travelcard. The cards are sold for £10 and can be recharged in units of £5 at over 70 agencies in the area or on the buses. Cardholders can receive nearly 20% in travel bonuses. Farecards are transferable between passengers but may only be used by one passenger at a time.

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One Million Byte Transactions

Over one million transactions have been completed in the National Westminster Bank's Byte Smart Card technology trial in which some 6,000 staff use their Byte cards in staff restaurants, coffee bars and shops in the bank's computer centre in Goodmans Fields, London. The Byte project is the prototype for the Mondex global payment scheme.

Nick Walling, project leader, says the object was to measure the reliability of Mondex and it has "passed with flying colours."

Finnish AFC System for Spain

Inter Marketing of Finland, specialists in fare collection and ticketing systems, has supplied a contact Smart Card automatic fare collection (AFC) using contact Smart Cards to the Vitrasa bus company in Vigo, Spain.

The contract involves 25,000 contact Smart Cards, 116 Electronic Ticketing Machines (ETMs) with integrated Smart Card and magnetic stripe readers, 116 contact Smart Card Validators (SCVs), 10 Portable Ticket Validators (PTVs) for use by ticket

Food Card in Mexico

Over two million Smart Cards are being used in Mexico to provide poor families with basic foods of

inspectors, one depot system.

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Exploiting GSM with GemXplore

GemXplore from Gemplus is a Smart Card SIM (Subscriber Identity Module) card compatible with phase 2 of the GSM/DCS1800 standards and is offered to the telecommunications industry to allow service providers to develop subscription programs targeting customer needs and to exploit the potential of mobile digital telephone systems.

Amongst the possibilities are individual management of card-contained frequently called numbers, a joint professional/personal subscription on a single card, integration of voice mail with card-controlled call back to callers, adapting GemXplore card features to mobile fax machines and portable computers, special promotions offered and confirmed through short messages etc.

Gemplus says that with the different features offered, the card could become a means of connecting to all types of systems such as identification, exchanging messages and changing memory layout.

An interconnected card could open the way to new developments such as co-branding agreements with major retailing chains, customer loyalty programs managed by the card and based upon agreements between the GSM operator and service providers, partnerships between banking institutions and telephone operators in an electronic purse application.

PILOTgms II is offered as a special learning and diagnosis tool for GemXplore cards. It includes sample cards, a card reader and software.

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tortilla and milk powder.

This social programme, initiated by the Mexican Government, is run by Conasupo (Compania Nacional De Subsistencias Populares) to ensure that

bread and milk is available on a daily basis to those who qualify.

Smart Cards were introduced last year to cut substantial fraud in the system. New chip card reading units provide sufficient storage capacity to list the daily transactions and a black list of misusers. The cards are personalised by thermal transfer printing on the surface and other security functions are provided by the chip. Validity of the card is determined between the terminal and the card by a security code.

Another improvement is the involvement of FIDELIST, a third party company, to manage the daily accounting and payment process to the store owners who take a removable cartridge with a RAM memory to the FIDELIST settlement centre.

Misuse of the system is decreasing as the Smart Card stores information on the daily allocation of tortilla and milk in the chip.

Development path

Prior to 1986, there was a programme which offered foodstuffs at subsidised prices in certain shops, but if people had no money they were unable to buy anything so coupons were introduced.

In this scheme the family purchased a coupon for cash from Conasupo and this could be exchanged for tortilla or milk. The coupons were collected by the outlets and directly cashed in at Conasupo for the market prices.

The system proved to have significant disadvantages as the coupons were passed on to others or sold to obtain cash for other food or liquids and it was not clear whether people shopping with coupons were those entitled to subsidies.

To remedy this, coupons were issued free for tortillas. These were in booklets personalised by name to a family and sent by post. In addition a date stamp ensured that the intended amounts were issued daily, rather than everything on one day.

MasterCard Tests EMV

MasterCard International has announced the successful testing and evaluation of its global stored value application against the EMV (Europay, MasterCard and Visa) Integrated Circuit Card

Then the coupons were replaced with a plastic barcode card - the barcode identifying the authorised beneficiary.

However the barcode card could be used several times each day by going to different outlets which were not networked with each other. The card was also copied not only by families but also by the outlets who were able to generate more turnover and improved accounts. Due to massive misuse, the memory capacity in the reader units was insufficient to store the growing black list. The scheme resulted in subsidies increasing by around 30%, without more families being supplied.

The Smart Card system

A Smart Card system was introduced last year to prevent misuse of the system. The prime contractor is the Technology Application Group, a subsidiary of Datakor Ltd. in South Africa. ODS Oldenbourg Datensysteme GmbH, of Munich, Germany, is responsible for the card manufacture using a Siemens SLE 4404 chip - 352 bits EEPROM.

Project benefits

August Lammersdorf, Director Marketing and Sales at ODS, speaking at the Multicard '95 Conference in Germany, said two million families were involved in this programme and were being supplied with tortilla and milk by chip card.

"This translates into a coverage of 67% within the known target groups. Today, there are almost 13,000 distribution outlets for tortilla and milk.

"Overall costs for the Mexican Government run to about 400 million new Mexican pesetas (approx. 200 million DM)."

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Specifications for Payment Systems. The three-part joint specifications were developed to ensure global interoperability for chip cards.

Robin Townend, MasterCard Senior Vice President Chip Card Technology, said that testing practical

implementation of the stored value application against the specification was necessary for MasterCard and its membership to move forward in the development of chip-based products.

"Members can be assured that our stored value application is EMV compliant and the multi-functional applications will perform against the specifications in an unambiguous way," he said.

MasterCard's stored value application will be piloted in 1996. It is expected that there will be several pilot sites covering different countries. A brand name has yet to be announced for the card.

The technical trial was carried out with the assistance of DigiCash BV, the Dutch developer of electronic money technology. They developed a technical test bed integrating DigiCash's underlying technology into a card conforming to the joint EMV specifications.

MasterCard says it will present its evaluation and recommendations for modifications to the joint EMV group.

Since the specifications were released last October, the document has been reviewed by members, industry experts and Smart Card and terminal manufacturers for their input and will be updated by mid-1995. The document will then remain stable for one year so that the industry has a firm foundation to proceed with manufacturing and development of chip-based products and will be updated annually.

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Toronto Tries Touchless Card

Bus and rail commuters in Toronto, Canada, will be using contactless Smart Cards for automatic fare payments in a trial starting in June.

About 1,000 commuters will use the Combo Card

Secure Chip Cost Breakthrough

A cost breakthrough in secure chip technology for Smart Cards has been announced by DigiCash BV in The Netherlands.

The Amsterdam-based company says it has

for prepaid stored value payments in the trial involving 45 buses from Mississauga Transit and two GO Transit rail stations.

The card is being supplied by Racom Systems Inc., of Denver, Colorado. Passengers will be able to pay their fare simply by placing the card within 10 cms of the card reader/writer, speeding up boarding and eliminating the "fumble factor" in searching for coins and tickets.

Benefits for the transit authority are seen as reduced operating costs, improved efficiency and a more streamlined service delivery for passengers. Travellers can check their transaction records and card balances at station terminals.

Value stored in each card is expected to exceed \$115 Canadian. A payment clearing house managing the fare transactions will be handled by GO Transit.

Double Entry Accounting

Peter Renolds, President of AES Prodata Canada, which is integrating the system, says: "The Combo Card has the added advantage of being an automated double entry accounting system. Not only does the card keep accurate records for the patron automatically, the card system calculates the best discounting available to the user for any particular trip made. We have put the transit ticket to work for the passenger in offering them automated discounting incentives that are awarded conveniently and immediately."

The trial is the first step towards citywide implementation of Smart Cards for public transport ticketing with the potential to include other purchases and services later. Over 400 million passenger journeys were made in Toronto in 1994 with more than 200,000 pass holders.

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developed new technology allowing low-cost chips to meet the security and integrity requirements for widespread use of Smart Cards.

David Chaum, Managing Director of DigiCash, says it is generally agreed that off-line transactions like credit card and stored value need public key

cryptography for security but as public key chips are inherently more complex and significantly more costly, most systems have been built with less secure cryptography and may need to be redesigned.

"We have now provided a way to use public key on the least expensive and most proven chips available," he said. "A chip, with public key based stored value, costs under US\$ 1 and can accept multiple additional applications at any time during the card's life, including loyalty schemes, coupons, tokens, tickets and memberships."

The new technology, still known by its code name "Blue," achieves its economy through a minimal requirement for silicon. It is currently implemented as firmware for microcontroller chips produced in volume - the Motorola SC24 and SGS-Thomson ST301/601, with masks for other silicon suppliers under discussion.

"Blue requires only 1K bytes of EEPROM, which is a main factor in the cost of chips for Smart Cards," says Chaum.

According to DigiCash, Blue also provides significant advantages in addition to public key cryptography, for example, most chips can irrevocably scramble the valuable data they store when power is interrupted unexpectedly, such as in a power failure or by a user removing the card too early. Blue solves this problem by protecting all the chip's data. Other cards reveal the card identity and data content to any reader or anyone tapping communications, whereas Blue encrypts everything communicated while revealing only necessary information and only to readers with corresponding keys.

Blue is expected to be released in a form compatible with ecash, DigiCash's software solution to Internet payments. This would give ecash users the option - since only a PC connected to the Internet is required to use ecash - of being able to obtain and carry their ecash on a Smart Card.

Transcard Launch in Australia

Transcard, a contactless Smart Card electronic purse scheme for payments, transport ticketing and incentive programme applications, was launched in Sydney, New South Wales, Australia, last month.

DigiCash will be supplying the technology through licensing arrangements, some of which they say are already in advanced stages of negotiation. Licensees can have chips produced directly by silicon suppliers and then make cards themselves, or have cards made by any of the numerous companies that put chips in cards.

Inexpensive starter kits and development packages will be supplied by DigiCash.

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Mini Reader from Deister

A mini contact free Radio Frequency (RF) reader (50 x 50 x 15 mm) has been developed by Deister Electronic which is offering an evaluation kit as an introduction to the technology.

Basically, the Minireader consists of the reader ASIC (Application Specific Integrated Circuit) m3394b which constitutes the RF part, and a microcontroller which controls the data decoding and interface communication.

Described by Deister as "the world's smallest reader," it incorporates an RS232 interface for direct connection to a host system and its size and low power consumption makes it ideal for battery powered portable equipment.

The RF Minireader Evaluation Kit, priced at £120, consists of the RF Minireader, six transponders or electronic tags in various packaging types ready for connection to an IBM PC, and software supplied on a 3.5 inch disk.

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The scheme has been developed by Card Technologies Australia (CTA) in co-operation with major public transport operators, retailers, vending operators and banks.

During the three-month trial period, applications and functionality will be progressively expanded and CTA, the system operator, says it plans to roll-

out the scheme in Sydney and then nationally.

CTA has moved in quickly before the launch of the New South Wales Government-backed Stored Value Card which goes on trial in Newcastle, NSW, in the second half of this year (SCN January 1995). This six-month SVC trial is seen as paving the way for a national scheme and has significant support with participants including ANZ Banking Group, Coca-Cola Amatil, National Australia Bank, Optus Communications, State Rail Authority, State Transit Authority, Telecom Australia, The Smith's Snackfood Company and Visa International.

Transcard, however, will issue 50,000 cards which can be used at 120 off-line terminals and can be recharged at 25 ATMs. It has the support of the Bank of South Australia, bus and rail operators, multi-national companies like McDonalds and Shell, and Cabcharge Australia.

Challenge to SVC denied

Richard Fleming, Executive Director of Cabcharge (Investments) Pty denies that Transcard is challenging the SVC project, saying:

"I think we will be one of a number of competitors in the Smart Card marketplace."

Transcard is an 8K bit MIFARE contactless Smart Card from Mikron of Austria and it can operate electronic purses, EFTPOS debit, charge and credit accounts, multiple tickets and multiple incentive programme applications.

An open system design approach allows any service provider or card issuer to use the system.

Terminals developed to be progressively introduced during the trial include:

- * bus ticket issue machine with integrated validator
- * rail validator and barrier integrated validator

Deficard Records a Success

- * taxi terminals (both integrated and non-integrated to meter)
- * retail agents terminals with full bank certification
- * retail purchase terminals
- * vending machine integrated reader
- * turnstile integrated reader
- * tollway booth integrated reader, and
- * fast food outlet driveway integrated reader

Terminals will selectively offer a range of data capture technologies including magnetic stripe, contact and MIFARE contactless cards.

Recharging of the electronic purse (maximum US\$ 200), clearing and settlements will be conducted through the existing banking systems.

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Orange Trials Data Services

Orange, the UK Personal Communications Network (PCN), is carrying out customer trials with data services, and has announced that Lotus Mail Mobile and Lotus Notes are compatible with the network.

Users will be able to send and receive electronic mail, facsimiles and data files at a connection rate of 9600 bps with a notebook computer and a PCMKCIA cellular data card.

Customers away from the office, for example, can be notified that they have received an e-mail message via the Orange Messaging Service so they can connect to a notebook computer and receive the information.

Contact: Mark Davis, Orange Press Office, UK - Tel: +44 (0)1973 201911.

A special multi-function Smart Card holding the medical records of heart patients with electric shock device implants has been successfully trialed at a medical school in Hanover, Germany, and the scheme is to be introduced in other hospitals within the framework of a multi-centred study.

Called the Deficard, it was developed jointly by the Medizinische Hochschule Hannover as represented by cardiologist Dr Med Hans-Joachim Trappe and biostatistician Paul Wenzlaff, and ORGA Kartensysteme GmbH in Paderborn.

The medical school has been implanting defibrillators, electric shock devices that protect patients with life-threatening arrhythmia from cardiac death by transmitting electric pulses.

With the implant, patients can now live at home, but must be examined every two to three months as outpatients.

The card stores all important information concerning the patients and the operation and data on the defibrillator. Using a special reader, attending physicians can immediately display the patient's medical history on a screen making follow-up treatment simpler and safer.

The system has been tested and monitored with 50 patients and it is now planned to extend the scheme to other hospitals.

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Zaploc Door Entry

VeriFone 4 Millionth Terminal

VeriFone, Inc., supplier of transaction automation systems to over 80 countries, has delivered its four millionth system to the New ARBAT Supermarket in Moscow (above).

Since appointing Sprint Networks as its distributor in the Commonwealth of Independent States (CIS), just over two years ago, VeriFone has delivered more than 2,000 systems using magnetic stripe and

Zaploc is a new non-contact access control system from Dialoc ID Systems for use in offices, apartment buildings, clubs, homes, parking lots and hotels.

The system is designed to control one door and gaining access requires no physical contact between the reader and the user ID device which may be a proximity ISO card or key-tag. Reading distance is up to 10 cms.

The standalone proximity reader is a compact 70 x 55 x 10.5 mm, which is easy to install, weatherproof and vandal resistant.

Other proximity modules with RS232-485 communication are available for larger installations of up to 300 user capacity.

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Smart Card technology.

In 1993, the company announced the shipment of its three millionth terminal to Brazilian bankcard service provider Cardway Processamento. Its two millionth was sold to Fouquet's restaurant in Paris, and back in 1989, its one millionth was delivered to a Lapland fur and souvenir shop in Inari, Finland, north of the Arctic Circle.

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822473.

mounted.

Nedap Show & Go AFC System

Show & Go, the remote Automatic Fare Collection (AFC) system from Dutch supplier Nedap, features its first combined contactless and ISO 7816 thickness Smart Card (see front page) which contains only two electronic components - a custom chip and a coil.

They have also developed new remote card reader terminals (shown below) which can also be surface

Operating frequency	120 kHz
Required field strength	130 mA/m(at 1m)
Data speed read/write	60K bits
Max. read/write distance	10 cms
Memory size	4K bit (8K bit
	under develop.) Memory
organisation	128 bit pages
Security	DES (56 bit keys)
Typical transaction time	100 millisec
Chip/coil construction	
Passive card without battery	

Nedap has not integrated the conventional microprocessor in its chip but has opted for wired logic in combination with a reduced instruction set and enhanced security features.

The custom chip contains a 4K bit EEPROM memory and an 8K bit version is planned. Data retention time of the memory is 10 years and endurance is a minimum 100,000 read/write cycles.

The automatic fare collection card has two working modes: read/write and read only. In the read/write mode, the maximum distance between card and antenna is 10 cms. At greater distances between reader and card, the card enters a read only mode. The reader transmits an electro-magnetic field with a frequency of 120 kHz. The necessary field strength is below the European limit of 130 mA/m measured at one metre distance. No battery is required as the magnetically induced voltage in the coil of the card is sufficient to operate the custom chip.

Card specification

Dimensions

ISO ID1

Currently, Nedap supplies contactless access control systems for large banking facilities, Schiphol airport, ministries and government buildings, ECC headquarters, the French senate, etc. It has also installed ski lift access control cards and has developed software for the clearing and financial settlement function between different card issuing companies in one system. The company has also conducted AFC trials on Dutch railways.

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Smart Electricity and Taxi Meters

A system for the prepayment of electricity using Smart Cards and a specially designed meter has been developed for the Asia market by Hong Kong-based Advanced Electronics Ltd (AEL). The company has four sales offices in major cities in China and an affiliated company in the Philippines.

Electricity units are pre-paid and loaded into the meter by Smart Card. Features include a warning signal when units have run low. A management information system provides customer profile information and details household electricity consumption and other statistics.

Optional features include monitoring peak power consumption of individual users and tampering detection.

Taxi payment system

The company also has a taxi payment system using a rechargeable Smart Card as a replacement for taxi vouchers. Lost cards can be refunded as transaction and driver data are stored on the host computer system as well as a card hot list.

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First Smart Cards in Poland

Innovatron Data Systems says the first Smart Cards in Poland can be expected soon following the signing of a franchise network agreement with The contracts are another step toward Mikron's goal of establishing MIFARE as a *de facto* standard for contactless Smart Cards through selected licensing to enable multiple sourcing of all components.

A second licence agreement for the MIFARE Core Module (MCM) has been signed with Gemplus. The MCM is the kernel of the reader and can be adapted by different system integrators according to the needs of their customers.

Licences granted to date are:

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Warsaw-based IT specialists Bonair Ltd.

Bonair has acquired rights for FUNCHIP Smart Card systems in four application sectors - payment cards used in loyalty, electronic purse and EFT applications; city cards used to improve funds transfer management and access control to municipal facilities and services; company cards for access control management and EFT; and leisure cards for sporting and recreation centres, health clubs, etc.

Discussions are currently taking place with major Polish banks and recreation centres.

MIFARE in Mass Production

Mikron of Austria reports that its MIFARE contactless Smart Card Automated Fare Collection (AFC) system is now in mass production with about one million cards and 4,000 readers manufactured by the middle of this year. The cards conform with ISO dimensions and have passed ISO bending and torsion tests.

Roland Koo, President of Mikron, says that 15 different integrators worldwide are currently implementing the system. Amongst them are Scanpoint and Ascom/Monétel.

In addition to existing orders from Oslo, Norway; Sydney (Australia) and Pori, Finland, it received two more contracts this year. One is for the Italian market placed by Ercole Marelli Trazzione (Gruppo Firema), and the other from system integrator Wayfarer which will equip buses and train in Liverpool, England, in conjunction with service provider Merseytravel.

	MIFARE Card - ASIC	MIFARE Core Module
Mikron	X	X
Siemens	X	
Monétel		X
Gemplus		X

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PIM and MICROFIT for SIMs

Gemplus has developed two devices to provide a simple solution to issues of the two different sizes of Smart SIM (Subscriber Identity Modules) for GSM mobile phones.

The PIM (Plug-In Module) card trimmer is a manually-operated device to trim a standard-sized card down to the plug-in format. The trimming operation is carried out one card at a time. The card is inserted into a slot, the user lowers a lever and a forged steel cutting die trims the plug-in which is ejected into a bin on one side of the machine. The remainder of the original ISO-size card can then be removed from the slot.

MICROFIT is used to convert plug-in cards to the ISO format. The device is an ISO-type card body with a precise cut out cavity to insert the Plug-In module.

Contact: Caecilia de St. Victor, Gemplus, France -
Tel: +33 42 32 50 00. Fax: +33 42 32 50 90.

Russians Launch Loyalty Card

A new Electronic Loyalty System (ELS) has been developed by the Centre of Financial Technology in Novosibirsk, CIS. This software product, not yet on the market, can be adapted to meet customer requirements.

Aimed at small and middle-sized businesses, the equipment required comprises a VeriFone CM450 pinpad and a PC with an OMNI 395 terminal. The cards are Gemplus MCOS 16 K, with the SGS-Thomson ST 16812, 2K Byte EEPROM chip.

Each purchase (by cash or card) earns the customer a discount. A further discount is calculated on the amount he spends over three-months. Interest accrues monthly on the amount left on the card.

ELS will be on show at Card Tech/Secure Tech '95, Washington, 10-13 April.

Contact: Tatyana Nesterova, Centre of Financial Technologies. Tel: +7 3832 9829 03. Fax: +7 3832 9804 26.

Smart BT Makes Change Easy

British Telecom is bending over backwards to ease its customers over the switch to Smart phonecards in the Portsmouth area and the Isle of Wight. And it is looking ahead to make full use of Smart Card technology, with plans for loyalty schemes, using the Smart phonecard in European payphones and to store personal short dialling codes.

The new cards will go on sale in the chosen areas in late spring, prior to a nationwide launch. Local customers will be tempted with special introductory offers: a card with face value of £2 will cost £1.60, and a £20 Smart Phonecard will be offered at a bargain £16.

Customers will no longer be able to buy the old style green phonecards - but they will be able to "use up" existing cards in certain payphones. Of the 1,150 public payphones currently in the Isle of Wight and the Portsmouth area, over 400 accept phonecards - a figure which is set to double.

BT are issuing 300,000 Smart Cards to retailers in these areas, and installing 800 new payphones supplied by GPT Payphone Systems/Schlumberger. Of these, 200 will be multipayment phones, accepting both old and new phonecards, credit cards and cash. Of the others, 400 will accept cards and 200 will be equipped with Smart Card readers supplied by Landis & Gyr. If you want to make calls in the Isle of Wight, there should be no problem finding a payphone to suit your needs.

Other features of the new payphones include last number re-dial and instructions in four languages.

The GPT Card Technology/Gemplus cards will have a Siemens SLE 4438 chip with 221 bits EEPROM. They are designed to be "posted" longways rather than sideways into the payphone, which is the only possible source of confusion for customers used to the old-style card. This is currently sold at 50,000 outlets in the UK and can be used in 40,000 cardphones - an indication of the size of the national roll-out.

The value on the Smart Card is helpfully shown in pounds instead of units, and customers can check how much is left on their card simply by popping it into a payphone which accepts the Smart Card.

BT has been studying the Danish Danmønt Card

trials, in which Smart phonecards are also used for public transport and car parking. Director of BT Payphones Bob Warner is already hinting of plans to develop loyalty schemes to reward customers using their card at selected retailers, and to enable them to use the Card elsewhere in Europe.

It introduced the phonecard based on optical technology into the UK in 1981. As elsewhere in the UK, the move to Smart Cards has been slower than the rest of Europe, partly because the old-style technology has worked well.

Contact: Leslie King, Business Unit BT Payphones.
Tel: +44 (0)171 587 7089. Fax: +44 (0)171 587 8668.

Smart Card Diary

CeBIT '95, Hannover, Germany 8-15 March.

More than 6,000 exhibitors and around 700,000 visitors are expected at this annual fair. Contact: Deutsche Messe AG - Tel: +49 511 89 312 41. Fax: +49 511 89 312 49.

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.

CardTech/SecurTech '95, Washington Hilton, Washington, DC, USA, 10-13 April.

The world's largest advanced card and security technology conference and exhibition featuring over 130 presentations and more than 190 exhibitors. Contact: CTST - Tel: +1 301 881 3383. Fax: +1 301 881 2430.

Payment Cards '95, The Hyde Park Hotel, London, England, 27/28 April.

2nd annual conference looking at the commercial opportunities and applications in prepayment and electronic purse schemes. Contact: AIC Conferences - Tel: +44 (0)171 242 2324. Fax: +44 (0)171 242 2320

Electronic Card Payments '95, The Atrium Hyatt Hotel, Budapest, Hungary, 27/28 April.

The 7th European Conference on EFTPOS will this year place emphasis on Eastern European needs and on the electronic purse. Preceded by a half-day tutorial on chip cards, fraud and security, database marketing and EDI. Contact: IBC Technical Services, UK - Tel: +44 (0)171 637 4383. Fax: +44 (0)171 631 3214.

Retail Solutions '95, NEC Birmingham, England, 2-4 May.

From there to here - part 2

Now in its fifth year, the conference includes half a day on Smart Cards in retailing involving a critical comparison of the design of different electronic purse systems and the role of Smart Cards in customer loyalty schemes. Contact: Pat Chard, RMDP, UK - Tel: +44 (0)1273 722687. Fax: +44 (0)1273 821463. Accompanying exhibition. Information from emap Business Communications - Tel: +44 (0)181 688 7788. Fax: +44 (0)181 680 0306.

Customer Loyalty Asia '95, Sheraton Towers, Singapore, 17-18 May.

Presentations on how to keep customers happy and loyal, followed by a separately bookable workshop conducted by Brian Skirving, Principal, Loyalty Programmes International, Australia. Contact: AIC Conferences - Tel: +65 222 8550. Fax: +65 226 3264.

Co-Branded, Loyalty & Affinity Cards, Harrington Hall, London, 22/23 May.

Second annual conference giving an update on card-based loyalty schemes including loyalty Smart Cards. Contact: AIC Conferences - Tel: +44 (0)171 242 2324. Fax: +44 (0)171 242 2320.

The 9th European Financial Self-Service '95, Sheraton Grand Hotel, Edinburgh, Scotland, 23/24 May.

Conference and exhibition preceded on 22 May with a tutorial on Smart and Prepay Cards chaired by Bob Carter of Orchard International. Contact: SETG, Scotland - Tel: +44 (0)141 553 1930. Fax +44 (0)141 552 0511.

Ensuring Sustained Momentum in Affinity, Loyalty and Co-Branded Cards, Euston Plaza Hotel, London, England, 25/26 May.

Latest market developments and case study presentations including Express Newspapers, Save & Prosper, Texaco and Meadowhall Shopping Centre. Interactive workshop on 24 May. Contact: SMi Conferences - Tel: +44 (0)171 417 7790. Fax: +44 (0)171 417 7791.

The making of a chip

The chip is what it's all really about, after all the plastic card is just the carrier for the embedded chip fabricated on its associated micro module. We cannot really appreciate the issues surrounding the use of a Smart Card without some understanding of the underlying technology. Its a bit like driving a car without knowing what's under the bonnet. You can certainly get from A to B but you don't really have the basis of the knowledge necessary to analyse the economics, performance, reliability and security.

The technology of the chip is one of the wonders of modern science. The advances made over the last twenty years are probably unsurpassed by any other technical invention. The key to the advances in this technology are geared to size or how to put twice as much in the same space as last year. In 1971 we saw the introduction from Intel of the 4004 the worlds first microprocessor. This chip was made up of 2300 transistors on a piece of silicon about 3mm by 4mm. Today this same company is producing the Pentium microprocessor about ten times the size but containing over 3 million transistors. Those of us brought up in the era of the valve will marvel at the thought of interconnecting 3 millions valves to make something that works reliably for many years without failure. It would have been an impossible dream.

The transistor at the centre of this technology is an apparently simple device but readers are warned that the subject of semiconductor physics is not a matter to be entered into lightly. We can cheat however and jump straight into the meat of the matter. In figure 1 we show an MOS transistor. The MOS comes from Metal, Oxide, Silicon which makes up the sandwich of the transistor. The conducting gate material used to be made of metal but today it is generally made from doped polycrystalline silicon which is a reasonable conductor. The insulating layer is silicon dioxide which is an extremely good insulator. The final layer in the sandwich is the lightly doped silicon semiconductor substrate.

One of the most useful comments to make here is how the different forms of silicon can be used to create anything from a perfect insulator (Silicon dioxide) to a conducting track (doped polysilicon) as typically used to make the gate connection. The doping of the silicon is fundamental to altering its conductivity. Two types of doping are used, one produces n - type silicon which is rich in electrons (negative charge) and the other p - type which is rich in holes (electron duality to produce positive charge).

In figure 1 we can see the two types of MOS transistor the n - channel and the p - channel. In a CMOS device which is the form of most Smart Card chips today both channel types are fabricated in a single chip. The input to the transistor is the gate which by means of an applied voltage controls the current flowing through the output terminals, the source and drain. These terminals are interchangeable but by convention the source is the common reference terminal to the input and output current while the drain terminal is connected to the output load. The source current is equal to the drain current since there is negligible gate current and as shown in figure 2 by convention it is in the opposite direction to the flow of electrons.

The operation of the transistor is controlled by applying a potential field across the gate insulator. Assuming the applied voltage is positive then as shown in figure 2 a negative charge is induced on the semiconductor which repels the holes in the p - type substrate. This forms what is called a depletion region on the surface of the substrate. As the field in the gate region is increased electrons are drawn into the channel region under the gate from the heavily doped n - type source and drain regions. When this electron density is higher than the hole density then a surface inversion channel is formed. At this point the channel becomes resistive between the source and drain. As the gate voltage is increased further current flows across the channel and the transistor is switched on. This basic transistor operation is the core of the building blocks for the logic in the microprocessor by which various gates (AND, OR etc) can be constructed to implement the overall functionality of the device.

Before moving on to the actual fabrication of the chip on the silicon wafer we need to examine some of the concepts of size which are fundamental to our understanding of the cost of the final chip. First of all lets look at the size of the gate region shown in figure 1 where W and L represent the width and length of the gate. This is the smallest feature size on the chip and is still limited (For a few years yet) by the process technology used to make the wafer. When you hear 1 micron (I millionth of a metre = 10^{-6} m) technology what is being referred to is the minimum feature size that can be fabricated. The total transistor is of course much bigger than the gate region and has to allow for the source and drain areas as well as the necessary interconnections. As a first approximation the average space per a transistor is about 100 times the gate size. The Pentium microprocessor is about 100mm^2 and is fabricated with a 0.6 micron process (moving to 0.4 micron in 1995).

million transistors we end up with an average area per transistor of $33\mu\text{m}^2$. These are pretty small figures, just for comparison the human hair is typically 300 microns in diameter. By the way that gate insulator, the silicon dioxide, well in some cases that may only 100 Angstroms thick ($1\text{A}^0 = 1$ ten billionths of a metre = 10^{-10} m = average width of an atom).

When you get these dimensions in perspective it is readily apparent that a few defects on the wafer will significantly alter the yield (Figure 3) and this is one of the reasons why the size of the chip is so important to the final cost of the chip since the wafer processing cost is relatively constant at a few hundred dollars per wafer.

Thus the minimum gate size is $0.6\mu\text{m} \times 0.6\mu\text{m}$. Taking the total area of the chip divided by the 3

David B Everett

Next month - Making the chip - continued.

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