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SMART CARD NEWS



Europay Switzerland Launches CASH Purse

Europay Switzerland is to announce the launch of its CASH Electronic Purse scheme at the end of this month and plans to issue some two million cards with a target of 2.6 million cards by the end of the year.

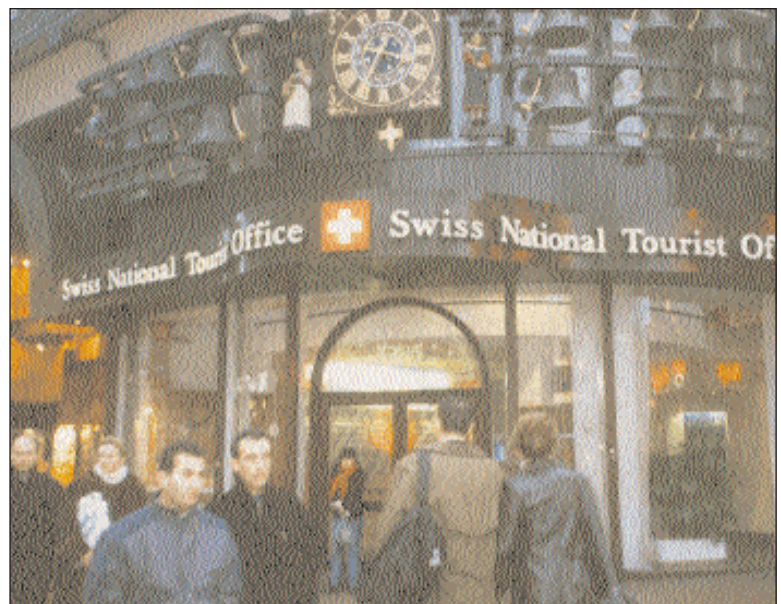


The scheme will be operated by Europay Switzerland which will be responsible for the acquisition and marketing. Telekurs Payserv AG will carry out the processing. The system has been developed by Banksys of Belgium and Telekurs and will use the PROTON electronic purse technology of Banksys.

The first electronic purse scheme in Switzerland, POSTCARD, which is operated by Swiss PTT, Payment Services, began trials back in November 1991. The technology will be upgraded and will use the same system in a co-operation agreement with Europay Switzerland which will enable it to issue the CASH cards.



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Electronic Commerce and Payment
Mechanisms, Part 4:
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Europay Switzerland CASH Purse

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Europay Switzerland, Telekurs and Banksys have been planning the development for some time and began before the announcement by Europay International last year of its CLIP electronic purse offering to member banks.

Jacques Bischoff, CEO of Europay Switzerland, said: "We are not obliged to use the CLIP system or technology and every country is free to chose its own system. We have chosen PROTON."

The Smart Card electronic purse will have 1K bytes of EEPROM and will be reloadable at ATMs in amounts up to Sfr 300 (US \$240). All cards will carry the Europay brand.

Contact: Jacques Bischoff, CEO, Europay Switzerland - Tel: +41 1 832 911. Fax: +41 1 832 9112.

Electronic Purse in Thailand

An electronic purse, called Micro Cash, has been launched in Bangkok, Thailand, with plans to issue 50,000 cards.

The scheme is operated by Bangkok Payment Technology Co (BPT) set up by PCC, the ATM operator for the major banks; Micro Bus Co (partly owned by Bangkok's Mass Transport Authorities), Thai Dany Bank, and the Pro-line Group, a Bangkok system integrator.

Finnish company, Setec Oy, which created the Finnish electronic purse AVANT, has supplied its Setpurse intersector electronic purse solution which includes 3K bytes EEPROM reloadable Smart Cards, secure application modules, terminals for both payment and card loading, and a complete clearing software for the purse operator BPT.

Nearly 100 loading points and up to 1,000 payment terminals are serving the initial ten service providers of Micro Cash, including Micro Bus with its fleet of thousands of buses.

Contact: Fred Granberg, Setec, Oy, Finland - Tel: +358 9 89411. Fax: +358 9 8786133.

Electronic Purse Forecast

There could be as many as 450 million Smart Cards with electronic purse functionality in 2001, according to a new report from London-based consultants, Datamonitor.

Datamonitor believes that in terms of market development, US electronic purse growth at 54 per cent will grow more rapidly than the rest of the world at 40 per cent. However, in terms of card and terminal volumes, Europe will be the first to attain a critical mass.

IT in Digital Payments 1996-2001: The Future of Electronic Commerce, priced £995, is available from Datamonitor - **Tel: +44 (0)171 625 8548.**

Bull / Aladdin Co-operation

Bull CP8 and Aladdin Knowledge Systems have announced that they will co-operate on the development, promotion and distribution of PC Smart Card tools in compliance with the new PC/SC standard.

They plan to deliver a new Master Developer's Kit (MDK) which will conform to the specifications developed by the PC/SC Workgroup consisting of Microsoft, Bull CP8, Hewlett-Packard, Schlumberger and Siemens Nixdorf (www.smartcardsys.com).

The MDK will be based on Aladdin's ASE Developer's Kit and Bull CP8's Smart Advantage kits, including readers, cards and software libraries. Yanki Margalit, Aladdin's President, said the new MDK would provide a comprehensive toolkit for software developers, systems integrators and OEMs wishing to develop Smart Card applications for Personal Computers.

He explained: "The rapid growth of three key markets - electronic commerce, corporate Intranets and security - is driving the demand for numerous PC-based Smart Card applications."

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Hebrew University Card

UNICARD, a unified Smart Card launched at The Hebrew University in Jerusalem, is said to be the biggest Smart Card project implemented in Israel with around 30,000 cards being issued to students, faculty members and administrative staff. It is expected some 8,000 cards will be added each year.

The UNICARD is a multi-function card combining identification, data storage and a reloadable electronic purse function. In its function as an identity card, it carries the holder's photograph, name, ID number and contains information on student eligibility for examinations, services, access to restricted laboratories, health club, swimming pool, library and book checking. The same card, with its security and encryption technology, also serves as an access key to computer services, databases and Internet surfing. Its data storage file application includes a portable file in which grades, academic status, tuition fees and personal data are stored and ported.

Campus Money

The addition of a reloadable electronic purse enables the card to be loaded with "Campus Money" at many locations in the university. The card can then be used to purchase goods and services such as faxing, photocopying, vending, parking permission and, eventually, for participation in loyalty schemes in campus shops.

Faculty members and administration staff use the same technology for all these services, and in addition for time and attendance recording, computer log-in, parking privileges and special employee benefits.

Later, it is envisaged that other parties will join the project and UNICARD will be co-ordinated with national electronic purse, transportation, public telephony and health insurance schemes.

The project combines the expertise of The Hebrew University, Caspit Ltd and Be'eri Printers. Caspit is the main technology supplier and technical co-ordinator and has written the relevant software, installed the hardware and integrated the cards and readers into new and existing systems. Be'eri

Printers is responsible for card sales, initialisation and personalisation as well as database management, card distribution and handling.

Gemplus supplied MPCOS 2-8K bytes EEPROM cards and special information stands around the campus in which the cardholder can verify the card's contents and status. Gemplus is exclusively represented in Israel by Caspit.

VeriFone Inc., USA, also exclusively represented in Israel by Caspit, has supplied all the card accepting devices. The standard device is the SC552 terminal which serves all applications either as a stand alone device (stationary or portable) or in some cases connected to VeriFone terminals such as the O395 or to Personal Computers and VAX terminals.

The UNICARD project has an Internet home page giving status reports and regular updates on www.caspit.com/unicard.

Contacts: *Haim Bassan*, Project Manager, The Hebrew University - **Tel:** +972 2 588 2938. **E-mail:** mshaim@pluto.mscc.huji.ac.il. *Eyal Ron*, Director, Projects Department, Caspit Ltd - **Tel:** +972 3 961 6538. **E-mail:** eron@caspit.com. *Boris Capitanov*, Be'eri Printers - **Tel:** +972 7 993 8279. *Flavie Gil*, Gemplus, France - **Tel:** +33 (0)4 42 36 56 83. **Internet:** flavie.gil@ccmail.edt.fr. *Mark McMurtrie*, VeriFone, UK - **Tel:** +44 (0)1895 824031. **E-mail:** mark_ml@verifone.com.

Gemplus Success in UK

Since purchasing DataCard's plant in Havant in the UK a year ago, Gemplus says it has achieved 35% growth in turnover to £38 million and produced over 70 million plastic cards for banking and other applications.

It has announced a £1 million investment in new technology to manufacture Smart Cards starting in Spring 1997 as Gemplus gears up to produce many of the 30 million payphone cards BT is expected to issue. It will also be targeting the UK banking industry as it starts introducing Smart Cards.

Contact: *Jackie Shambrook*, Gemplus - **Tel:** +44 (0)1705 486444.

Industry Review 1996

It has been an exciting year for the Smart Card industry, but not so much in the UK where two major schemes were in danger of collapsing at year end - the much-heralded **motorway road toll trials** and **electronic ticketing for London Transport**, while the Government's second attempt to launch a **UK Smart Card Forum** was receiving a lukewarm reception.

A major announcement was **MasterCard's** take over of **Mondex International** signalling an electronic cash battle with rival Visa. **American Express** suddenly entered the Smart Card arena in a venture with **IBM** to introduce ticketless travel on American Airlines, and then followed this by licensing Proton electronic purse technology from **Banksys** in Belgium with plans to implement multiple pilots.

Europay demonstrated its multi-currency electronic purse system, CLIP, to members at its congress in Spain in early June and announced that banks in the Czech Republic were to launch CLIP as the country's national electronic purse and that Italy would integrate CLIP into the MiniPay purse card.

This activity was spurred by the mid-year completion of the **EMV (Europay / MasterCard / Visa) specifications** for a global payments framework using chip cards. Publication of the updated version of the joint specifications for *Integrated Circuit Cards (ICC) for Payment Systems, EMV '96* - was the culmination of a two-and-a-half year joint effort by the three payment organisations.

Electronic purse schemes

Visa International was the most active of the card issuers in launching its **Visa Cash** product starting in Atlanta, Georgia with First Union Corporation, NationsBank and Wachovia, in the USA's first full-scale introduction to stored value cards

Other schemes followed such as: Spain with a pre-paid card and a target of one million cards within a year; Brazil with 14 local banks and a target issue of 50,000 cards; Taiwan pilot with eight local banks

each planning to issue 200,000 disposable Visa Cash cards in the first phase; Hong Kong with the Bank of China Group and Standard Chartered Bank using pre-paid disposable cards in a planned issue of 200,000 and plans for a reloadable card in 1997.

But it was November before Visa launched its card for the future - the first multi-function Smart Card (combining debit, credit and pre-paid stored value) in partnership with First National Bank and Nedcor Bank in South Africa.

Westpack and Trust Bank started in-house trials of **Mondex** electronic cash in Christchurch and Wellington in October, while in the same month Mondex was officially launched in Hong Kong by Hongkong and Shanghai Banking Corporation Limited (HongkongBank) and Hang Seng Bank.

The national roll-out of **Proton**, the Belgian electronic purse developed and operated by Banksys, operator of the Belgian network for electronic payment - Bancontact/Mister Cash - began in May.

Sparbanken and Nordbanken in Sweden launched a pilot scheme called "**cash**" with a target issue of 50,000 cards using Belgian Proton technology.

Singapore's **CashCard** was relaunched in November with additional security. Operated by NETS, the Network for Electronic Transfers Systems and its seven local share holding banks it planned to issue 160,000 cards by the end of 1996.

German banks planned to have nearly 25 million **Geld Karte** electronic purses by the end of the year as it took on two rival schemes - the **P-CARD**, a bank independent system run by a commercial consortium lead by EBS Elektronik Banking Systems GmbH, and the **PayCard**, the payphone and bus and rail travel card backed by Deutsche Telekom, the federal railways (Deutsche Bahn) and the association of transport authorities (VDV).

ZKA (Zentraler Kredit Ausschuss) representing the savings, public, co-operative and commercial banks) began issuing the cards in October and planned to change 15 million Eurocheque cards from magnetic stripe to chip card, 4-5 million co-operative bank cards and over 4 million Postbank cards to chip cards - all with the electronic purse function.

Special Feature

Allstates Trust Bank in Nigeria launched an electronic purse pilot system called the **Electronic Smart Card Account (ESCA)** initially for their most important customers to carry large amounts of value without the risks associated with carrying cash. The cards can be loaded from their bank accounts in amounts up to 16 million Naira - more than £100,000 for purchases at retail and wholesale merchants or cashed at any of the bank's branches.

Interoperability

Mondex joined with **MasterCard** and **American Express** to test interoperability of different Smart Cards in the same terminal.

Transport

A contactless electronic ticketing system in **Korea** is the largest in the world to be actually operating although others are in development. Close to one million contactless Smart Cards are being used in Seoul where all 8,725 buses have been equipped with card readers and the scheme is being extended to a further 4,300 buses in Kyung Ki Province. Systems integrator INTEC Ltd., which licenses MIFARE contactless technology, expects to issue four million cards during the next 18 months. Operational tests have started in the capital's underground system to enable Seoul Subways and Seoul Bus Union to have compatible ticketing.

The FAHRSMART bus travel scheme in the towns of Lueneburg and Oldenburg in Lower Saxony, **Germany**, is interesting for two reasons. First contact Smart Cards were used and then contactless cards were added to assess response time and card handling. As a result all buses are to be equipped with contactless technology starting early 1997. Second, unlike other ticketless travel schemes where payment is deducted on the spot from pre-paid fixed value cards or rechargeable Smart Cards, FAHRSMART cardholders pay DM10 for the card - which is used for identification as the passenger enters and leaves the bus - and has a contract with the bus operator to enable the operator to charge his/her bank account monthly. Passengers who wish to remain anonymous can obtain a pre-paid card.

In **Germany**, Lufthansa, the national airline, introduced ticketless flying on all domestic flights following the successful testing of its ChipCard with more than 600 frequent flyers on the Frankfurt-Berlin route and a positive response from customers. The ChipCard integrates contactless Smart Card technology in a card combining ticket, boarding card, customer card and credit card.

Student cards

The Dutch multi-functional Studentchipcard scheme which had been running in a one-year pilot was expanded to a total of 10 **Dutch** universities and schools with 80,000 cards being issued.

Multi-purpose Smart Cards incorporating the Mondex cashless payment system were being issued in pilot schemes at Exeter and York Universities in **England**.

The UK Government announced a £200,000 grant to Aston University in Birmingham, **England** to develop a multi-functional Smart Card application student card which will contain cash, education details, medical records, provide access to premises and services such as computers and links to the Internet. Called The Smart Campus, the three-year project will also evaluate biometric authentication.

More than 100 schools in the **UK** are currently using Smart Cards to allow pupils to pay for their lunch and the number is expected to double within a year.

Health

A patient data card was introduced in the German cities, Neuwied and Andernach as a "model project" to solve technical, organisational as well as the contractual, logistic and data protection problems related to patient cards in **Germany**. There is already a statutory Health Insurance Card throughout Germany with a memory chip containing only basic, statutorily prescribed information. In contrast, the patient card should eventually contain all of an insured individual's relevant medical information such as chronic diseases, completed operations, continuous medications and allergies.

In **Spain**, the national social security identification card project TASS was aiming at issuing cards to around seven million residents in Andalusia in a progressive roll-out.

Telecommunications

Telecommunications continued to be the biggest user of cards for public payphones - and also for GSM mobile phones - with many orders running into the millions. An example was Singapore Telecom's order for 40 million payphone cards from GPT Card Technology in the UK.

Java Card application

Sun Microsystems' Java Card application programming interface (API) specification received an enthusiastic reaction from the industry leaders as enabling the first standard language and open API for Smart Card applications. **Schlumberger** announced the first Java compatible Smart Card called Cyberflex and other manufacturers will follow.

"Cracking" Smart Card secrets

Inevitably there were attempts to break Smart Card security. **Bellcore** in the US warned that Smart Cards could be vulnerable to attack. They claimed to have developed a mathematical technique that could be used to extract secrets stored in the card, including the secret key used in public key cryptography to authenticate the card. The claims were dismissed by the **US Smart Card Forum** as "theoretical" and "not a real-world risk."

Then we had computer scientists **Dr Ross Anderson**, of Cambridge University in England and **Markus Kuhn** of Purdue University, Indiana, in the US, claiming they could crack the secret codes using equipment costing around £200, but admitted it was time-consuming.

On examination, the industry was not impressed or worried by either of the claims and was more concerned about the effects of the publicity on consumer confidence.

Changes in the industry

This part of the review concentrates on the acquisitions and agreements announced in the Smart Card industry in 1996 only and is arranged in alphabetical order by country.

AUSTRIA

Mikron GmbH of Austria, a wholly-owned subsidiary of **Philips Semiconductors**, sold its first US licensing agreement for its HITAG advanced radio frequency identification system to **Allsafe Company, Inc**, one of the largest card manufacturers in the access control, time and attendance and parking marketplace. Allsafe will also manufacture MIFARE contactless Smart Cards.

BRAZIL

Solaic, the Smart Card manufacturing subsidiary of French **Groupe Sligos**, and **Daruma**, a leader in the payphone market, formed a joint venture in Brazil to manufacture memory and microprocessor cards at a plant in Sao Paulo starting in 1997. Called Solaic do Brazil, the new company is owned 51% by Daruma and 49% by Solaic.

CHANNEL ISLANDS

JerseyCard, operator of the multi-function Smart Card payment system in the Channel Islands was acquired by a Jersey company, the **Interactive Telephony Limited (ITL) Group**, and became known as **Supercard Limited**.

CHINA

A Smart Card manufacturing plant for China was announced by a joint venture called **Shanghai Solaic IC Cards** formed by **Solaic**, the Smart Card subsidiary of **Groupe Sligos**, France, and **Shanghai's Post and Telecommunications Authority**. It was expected that 65% of the new company would be owned by Chinese operators, including Shanghai Post and Telecommunications, **Shanghai Feilo** (a Chinese electronics company) and other partners, notably from the banking sector; **Groupe Sligos** (31%) and **Alcatel** (4%).

Special Feature

Gemplus announced it was to manufacture Smart Cards in China in a joint venture with the **Tianjin Telephone Equipment Factory** of the Post and Telecommunications Industrial Company near Beijing. Called **Tianjin Gemplus Smart Card Company Ltd.**, the new company is owned by Gemplus (51%) and TTEF (49%). The new factory is targeting a yearly manufacturing capacity of 100 million cards before the end of the century.

ITALY

A new company, **incard SpA** formed by the **IPM Group**, the leader in Italy in the field of public telephony (51%) and **US³**, the largest producer of chip cards in the United States (49%), announced it is to manufacture Smart Cards in Italy. It forecast that it will be producing some 60 million chip cards by 1997 at its plant in Marcianise (5 kms from Caserta in Southern Italy).

FRANCE

Two French companies, **Philips Smart Cards & Systems** and **CP8 Transac**, joined forces with an agreement that both companies become respective second sources for CP8's CC60 electronic purse card and Philip's GSM subscriber cards.

Ingenico, French specialists in EFT terminals with an installed base of over 400,000, took over **Innovatron Data System (IDS)**, a branch of **Groupe Innovatron**, to open up its East European markets. IDS's activities were integrated through **Sofracin**, a wholly-owned subsidiary of Ingenico.

In a further acquisition, Ingenico took over the German group **EPC/EPOS** which designs, manufactures and sells electronic payment terminals and manages an installed base of 15,000 machines. The company sees Germany as a "promising" market with the banks converting the eurocheque cards to chip cards.

French-based **François-Charles Oberthur Group** strengthened its position in the bank payment card manufacturing market by acquiring the **Kirk Plastic Company** in the US. Kirk Plastic, a leader in the US bank card market, is based in Rancho Domingez, Los Angeles.

At the end of 1996, **Schlumberger Electronic Transactions** announced it had signed a letter of intent for the purchase of **Solaic**, the Smart Card manufacturing subsidiary of **Groupe Sligos** with manufacturing facilities in France and Spain.

GERMANY

Landis & Gyr Communications, headquartered in Switzerland, acquired a majority stake in German card manufacturer **ODS** from the Oldenbourg Group. ODS produces more than 30 million chip cards annually as well as magnetic stripe cards at its plants in Munich and Seebach (Thüringen) while L&G Communications is a major supplier of payphone technology and payment systems.

JAPAN

Hitachi announced in Japan that it was forming a new division for the promotion and development of new financial systems with the emphasis on **Mondex**, the electronic cash Smart Card.

Kokusai Denshi Denwa Co. Ltd, the Japanese telecommunications operator, took an undisclosed share holding described as a "multi-million dollar investment" in French Smart Card manufacturer **Gemplus**. It plans to integrate Smart Cards into the telecoms and multi-media area in the Japanese and Asian markets.

MEXICO

Gemplus announced it was opening a card manufacturing plant in Mexico which over two years is scheduled to reach an annual production of 100 million cards.

Schlumberger Electronic Transactions acquired an 80% interest in a company to be created with its partner, **Printer**, Mexico's leading magnetic stripe card manufacturer.

The new company, called **Schlumberger - Printer**, based in Mexico City will add chip technology to its manufacturing capabilities and plans to triple current card production of 20 million cards a year within two years.

NETHERLANDS

DigiCash Inc set up a subsidiary - **DigiCash Pty Limited** - in Sydney, Australia.

NORTH AMERICA

An alliance between 15 North American banks and **IBM** was formed under the name of **Integriion Financial Network** to offer a broad range of interactive banking and electronic commerce services to banks in the US and Canada starting early in 1997.

RUSSIA

German card manufacturer **ORGA Kartensysteme GmbH** of Paderborn is to manufacture chip cards in Russia through its subsidiary **ORGA Zelenograd** based in Zelenograd near Moscow. The new company is owned by ORGA (61%), **IDIS** (24%) and **Submicron** (15%).

UNITED ARAB EMIRATES

A joint venture was set up by the **Associated Construction and Trading Group (ACTG)**, of Abu Dhabi (51%), and **Gemplus** of France (49%), to market and manufacture Smart Cards in the Middle East.

UNITED KINGDOM

GPT Card Technology, a division of GPT Payphone Systems, opened its new card production headquarters in Coventry, England, bringing the manufacture of magnetic stripe, contact and contactless Smart Cards under one roof.

De La Rue Card Technology opened a 29,000 square feet extension to its card manufacturing and personalisation facility at Tewkesbury, England.

Gemplus in the UK said it had produced over 70 million plastic cards for banking and other applications at its plant in Havant purchased from **DataCard Corporation**. It also announced plans to start manufacturing Smart Cards at the plant starting in Spring 1997 and is targeting the payphone and bank card markets.

UNITED STATES

Motorola, the world's biggest supplier of microchips for Smart Cards, announced it was to start manufacturing them in the United States at its plant in Research Triangle Park, North Carolina. Plans involve a capacity to manufacture "many millions" of microchips per year by 1997. Motorola's worldwide headquarters for Smart Card operations remains in Scotland.

MasterCard International took a 51% controlling share holding in **Mondex International**, the electronic cash payment system.

INTERNATIONAL

A strategic agreement was signed between **Unisys** in the United States, **Keycorp** in Australia and **Mondex** in the UK for the development and integration and marketing of retail financial solutions based on Unisys solutions services and its K series card readers and merchant terminals, the Mondex electronic cash software and Keycorp point of serve peripherals.

Mars Electronics International (MEI), the worldwide vending and cashless payment systems company, signed an exclusive global technology licensing arrangement with **DigiCash BV**. The deal enables MEI to offer DigiCash Smart Card-based products to complement and expand its existing range of payment solutions.

Applied Communications, Inc (ACI) of Omaha, Nebraska, USA, signed an agreement with **Mondex** which allows both companies to co-operate in the joint promotion and sharing of development information to assist customers deploy the Mondex electronic cash scheme. Some 300 institutions use ACI's BASE24 software for electronic payments.

NBS Technologies Inc and **Bull CP8** of France have formed an alliance to provide Smart Card technology to financial institutions and other markets and to distribute each other's products in the North American market and on a global scale. NBS has a strong market position in North America providing card, personalisation and POS products while CP8 specialises in microprocessor cards.

Michigan University Smart Card

Right
The University of
Michigan's CashChip
Card, "MCARD"

Far Right
The MPCOS-EMV
card for 1997.
[Gemplus]



Smart Cards were introduced to the University of Michigan in July 1995. Eighteen months later there are a total of 52,000 cards in use. Once conversion is completed in 1998 the University expects to have some 100,000 cards in circulation.

The University uses Schlumberger's Payflex card with a 1K chip from Motorola. The card reader terminals are also supplied by Schlumberger.

The cards are multi-functional and can be used as a means of visual identification, as a library card, an electronic purse, for access control and can also be linked to a bank account. In the future there are plans to add further functions. The University is evaluating the use of the chip for computer access and possible storage of basic student demographic data. From late spring the City Bus system will accept the card as a means of payment.

According to Robert E. Russell response from card holders has been "fairly positive". Although he added that it is taking time for people to adapt to the concept of storing cash on the card. An experience Russell likened to that of Visa at the Atlanta Olympic Games.

As well as the standard Smart identity card the University has commissioned four special edition cards which can be purchased, featuring the University's marching band, the Burton Tower/Art Fair, the Michigan Stadium and football helmet (*see above*).

Contact: Robert E. Russell, Assistant Director, Financial Operations, University of Michigan. Tel: + 313 763 3262. Fax: + 313 647 5240.

New Generation Card for 1997



Gemplus is to introduce a new series in its MPCOS card range, designed to support multi-application card development.

Called the MPCOS-EMV series, the new cards to be launched in March, will be compatible with the EMV (Europay/MasterCard/Visa) specifications for chip cards and will feature triple DES encryption for enhanced security.

Contact: Jackie Shambrook, Marketing Communications Executive, Gemplus. Tel: +44 (0) 1705 486444. Fax: +44 (0) 1705 470628.

Hayes Smart Card Modem

Hayes Microcomputer Products, Inc has announced a Smart Card Modem for home banking and secure Internet shopping. The 33.6 Kbps modem will be shipped in the first quarter of 1997.

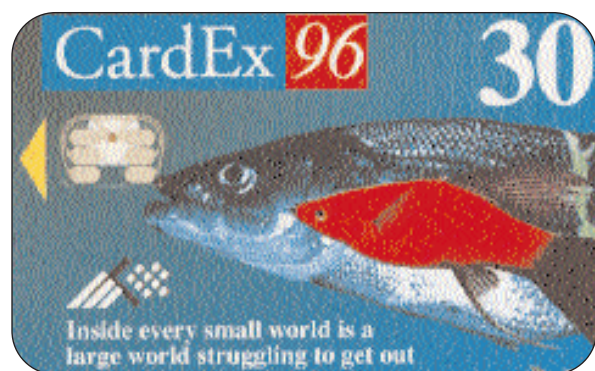
Hayes is working with Smart Card manufacturers Schlumberger and Gemplus on a modem compliant with the Smart Card Communications International Encryption Technology Association's (SCIETA) open standard Smart Card Communication Protocol.

Alan Adamson, Hayes Director of PC Products, explained: "Hayes is recognised as the inventor of the PC modem and the Standard AT Command Set. By supporting the Smart Card technology, Hayes is ready for the explosion of Internet services that will require increasing security measures to allow users to maintain control of their transactions and information access from the comfort of their own homes." For example, to

access a bank, the Smart Card modem user would insert the Smart Card provided by the specific bank. The Smart Card will contain within its secure memory, the user's encryption key and access control details. These details are then read by the modem and passed in encrypted transactions to the bank's host computer to establish a secure, point-to-point communications link. He said Hayes is also working to create usage-based access. This could provide families who want to access the Internet with levels of control which can be individually implemented.

Contact: *Kerri Dimke, Hayes Microcomputer Products Inc - Tel: +1 770 840 9200. Fax: +1 770 441 1238. e-mail: kdimke@hayes.com*

Estonian Telephone Cards



In September 1996 Estonia Telecom issued a telephone card made from wood (*see front page*). The reverse of the card promotes the World Wide Fund for Nature. Only 2,000 cards were issued. The first wooden card was produced by DANMØNT and dz danmark at the end of 1995 (SCN Dec '95). The card recently won the environmental award at the Dutch CardEX '96 conference (SCN Dec '96).

Last September Estonia Telecom also issued 1,000 CardEx 96 cards using MOSAIC technology for testing purposes (*see above*). MOSAIC refers to Solaic's 'Microchip On Surface And In Card' memory card (SCN Nov '95). Neither of the Estonian promotional cards are for sale increasing their value on the collectors market.

Contact: *Lauri Laheb, Product Manager, Estonia Telecom. Tel: +372 6397 234. Fax: +372 6397 347.*

Smart Cards for Skodas



Left
The Skoda Key Card, now available in the SLXi Felicia Skoda [Photo courtesy of "Diesel Car & 4x4" magazine], and below, The Skoda Felicia GLXi estate, in which the Key Card was first introduced in 1994

Middle Left
CardEx 96 Telecom Card from Estonia [Estonia Telecom]

In 1994 the Skoda Key Card was introduced to GLXi models of car. From the beginning of 1997 it will also be available in the SLXi Felicia Skoda. The Key Card was designed to provide extra radio and cassette security as the stereo is useless without the card. In the future the Key Card may also be able to flash, thereby discouraging theft.

The card can also be used to store the car owner's preferred radio settings, including bass, treble, balance and volume. Settings chosen before switching the radio off will remain stored.

The card is supplied as part of the Blaupunkt radio system and is available in all countries taking the radio option. Skoda were unable to provide SCN with the number of cards issued worldwide, although they did tell us that two cards are issued with every GLXi and SLXi model.

According to Eilish O'Shea, Public Relations Manager, Skoda customers have accepted the card as a good idea. They particularly like the extra security features offered by the Key Card. The only additional cost to customers is incurred if the card is lost. A replacement costs £18+VAT.



Contact: *Customer Hotline Tel: +44 (0) 345 745745*

Gemplus to go Public

Persistent rumours that French Smart Card manufacturer Gemplus is to go public were confirmed during a recent press trip to the company's headquarters in Gemenos.

Dr Marc Lassus, Chairman and Chief Executive Officer, told SCN: "We will go public, [but] I cannot tell you when." Jean-Pierre Gloton, Managing Director, was more cautious only admitting, "it is in our minds."

Marc Lassus revealed that they planned to buy two companies this year. If this happens, he said, Gemplus would then, possibly, go public as a means of raising capital.

He told SCN that a number of changes had been made to the Gemplus share holding structure. These changes plus plans for new investors and customers were part of a strategy to ensure the company's long term stability.

Lassus stressed Gemplus' intention that any new customers and investors would be located outside France. The current non-French share holding figure stands at 55%. French holdings at 45% would drop to 30%, he predicted. German based Quandt hold 27% (approx) and Singapore Technologies 5% (approx).

In the future 30-35% will be allocated to new investors. When asked who these investors might be Lassus said there would be two Japanese companies plus a reputable American company. He added that investors must be industrial and not financial.

New Factory

As Gemplus sales figures continue to rise, from 302 million dollars in 1995 to an estimated 410 million dollars in 1996, Marc Lassus announced plans for a new factory. Although he would not name a location he did say that the decision must be taken before June 1997 and that the site would not be in either France or Germany.

The cost to build a new factory was estimated at 35-40 million dollars, with machinery and equipment totalling a further 160 million dollars.

Discussing the future of the Smart Card industry in more general terms, Lassus identified Java and the new JavaCard as "the beginning of a major change." He described the EMV (Europay/MasterCard/Visa) specifications as "basic" and in need of more layers and that, in his opinion, "compatibility won't be there for some time." However, he suggested Java as a means of cancelling out incompatibilities.

Questioned about the future of markets such as America and Japan, Lassus said that America would not be a truly significant market until three years from now. He added that Gemplus sells more in both Singapore and Russia than in America.

He described Japan as being "afraid," although he also said the country "is a market place for Gemplus". He said Gemplus had 80-90% of the market share in an admittedly small market.

A final comment about Gemplus was made by Lassus with the help of his tie featuring a sunflower. He said that like the sunflower who followed the sun, Gemplus would continue to follow the vision.

Smart Card Club Survey

The Smart Card Club is to conduct what Chairman Richard Poynder described as "groundbreaking research" into the attitude of the general public to Smart Cards. He told SCN that the report would also include a survey of Mondex amongst other Smart Card schemes.

The research will take place in the first half of 1997, with the results expected in June. The survey is to be funded by a consortium of Smart Card Club members, although Poynder stressed that the agreement had not yet been signed. Details are expected to be finalised this month.

He told SCN that the public's "fears, concerns and wishes" would be the survey's main focus. He added that the aim was also to educate, recognising that a large proportion of the public were not informed about Smart Card technology.

Contact: Richard Poynder, Chairman, The Smart Card Club - Tel: +44 (0)01223 329900.

Robin Townend Joins Intellect

Intellect Electronics, Inc has announced the appointment of Robin Townend as Senior Vice President, Smart Card Strategy, based in San Jose, California.

Aged 47, he was formerly Senior Vice President of Chipcard Technology for MasterCard International in New York. Prior to that he was R&D Manager at Barclays Bank in the UK.

Intellect Electronics is a subsidiary of Intellect Holdings, a publicly-traded Australian corporation with products ranging from Smart Card readers, payment systems, electronic wallets and mobile terminals to cryptographic processors that secure facilities such as banking networks.

Contact: *Intellect Electronics* - **Tel:** +1 408 467 0372. **Fax:** +1 408 467 0379.

Singapore Armed Forces Card

All members of the Singapore Armed Forces and Ministry of Defence (Mindef) personnel - around 300,000 - are to be issued with new Smart Card ID cards starting this month. They will replace the current paper-based military identity cards.

The new SAF card has a microprocessor chip to store personal details and carries a photograph of the holder, a magnetic stripe and a barcode. The card is PIN protected for secure applications which require authentication.

The SAF Card also serves as a CashCard - Singapore's electronic purse operated by NETS, the Network for Electronic Transfers (Singapore) - so the card can be used to credit monetary awards which can be withdrawn at any CashCard terminal or CashCard-enabled ATM. It can also be used for other applications such as drawing SAF stores and controlling physical access to facilities and offices. The Smart Cards are supplied by Gemplus Technologies Asia.

Contact: *Chou Fang Soong, Gemplus Technologies Asia* - **Tel:** +65 776 1989. **Fax:** +85 773 0648.

Visa Cash for Tokyo in 1998

Visa International, in partnership with eight banks and two major retail conglomerates, has announced plans to conduct a large-scale Visa Cash pilot in Shibuya, Tokyo, starting in Spring 1998.

The pilot, involving more than 100,000 Smart Cards, will include both reloadable and disposable cards as well as the reloadable Visa Cash function incorporated onto credit and ATM cards.

Participating banks are Bank of Tokyo Mitsubishi, Daiichi Kangyo Bank, Fuji Bank, Sumitomo Bank, DC Card, Sumitomo Credit Service, UC Card and Credit Saison. The retailers are the Tokyu Group and Seibu Group.

More than 2,000 merchant acceptance locations are planned and will include fast food outlets, convenience stores, department stores, cinemas and the Shibuya train station at the centre of the 2km radius pilot area.

Doug Lawson, Director of Chip Card Development, Visa International Asia-Pacific, said: "We expect Visa Cash to be readily accepted by the young people who are leading society to a cashless environment."

Contact: *Sonja Kernon, Visa International Asia-Pacific* - **Tel:** +65 437 5518. **Fax:** +65 437 5567.

PBS Takes Over DANMØNT

PBS (Danish telephone companies and banks / savings banks) has acquired Tele Danmark's 50 per cent holding in DANMØNT A/S, making DANMØNT a wholly-owned subsidiary of the PBS group which plans to develop chip-based bank cards in the future. DANMØNT cards can still be used in Tele Danmark's telephones and it is expected all payphones in the country will be adapted before the end of 1997.

Contacts: *Ralf Egede Andersen, Managing Director, Tele Danmark* - **Tel:** +45 89 33 77 90. *Per Ladegaard, Managing Director, PBS* - **Tel:** +45 44 89 24 60.

Taiwan Electronic Commerce Pilot

SET, the Secure Electronic Transaction specifications developed jointly by Visa and MasterCard, are to be integrated with the Internet in an electronic commerce pilot programme in Taiwan starting in March this year.

MasterCard has signed up with seven member banks - Citibank, Bank of America, China Trust, Fu-Bon Bank, ICBC, Ta-Shin Bank and Standard Chartered - the Financial Information System Centre (FISC) and participants from the information industry including the Commerce Bureau of Ministry of Economy & Finance, Information Industry Institute, IBM, China Telecommunications, Seednet, AcerNet and GCNet. Other participants include Philips, Droadvision and Gemplus.

The first stage of the pilot, starting in March, will run for six months. The second stage will begin after any necessary adjustments and feature international transactions before roll-out.

Last month, Europay, MasterCard and Visa announced that they will create a specification linking chip card specifications defined in EMV '96 for payment systems with SET specifications, enabling chip bank cards to be integrated with technology for safe electronic payments. The spec will be ready for comment in the third quarter 1997.

Contacts: Flavie Gil, Gemplus, France - Tel: +33 (0)4 42 36 56 83. Thian Yee Chua, Gemplus, Japan - Tel: +813 3238 8300.

Gemplus to Support ICF

Gemplus has announced that it will support Hewlett-Packard's International Cryptography Framework (ICF) which will control international data security and integrity for business and personal transactions on the Internet.

ICF allows users to select levels of security and encryption algorithms according to individual needs and government regulations. Gemplus says it will support ICF with various key product

developments and the development of a Smart Card technology-based Policy Activation Token which will be used by ICF to activate these different levels of security and to adapt to current government encryption policies, new encryption algorithms and changing key recovery schemes.

Back in 1995, Gemplus, Hewlett-Packard and Informix announced the formation of the ImagineCard Alliance to jointly develop a technology infrastructure for the secure delivery of personal and business information over the Internet and corporate intranets. Products being developed by the Alliance will support ICF technology.

Additionally, Gemplus says it envisages embedding ICF technology in a new family of soon-to-be-announced public key products which will enable these products to be exported and then cryptographically configured so that their security will meet a given country's and/or company's cryptography requirements.

Contact: Paul Naldrett, Gemplus, UK - Tel: +44 (0)1705 486444. Fax: +44 (0)1705 470628.

Grant for New Card Process

A project to develop and commercially test an improved and more economical Smart Card manufacturing process has been recognised by the UK Government's Department of Trade and Industry with a grant of £45,000 in its 1996 SMART Awards for small companies.

Technology Development Associates Operations, based in Croydon, England, is carrying out the development work at its technical centre in Market Harborough, Leicestershire. The process, an application of the company's Additive Technology, involves the precise printing of special conductive and insulating inks, which the company claims will reduce the current cost of manufacture of Smart Cards by 50 per cent. David Potter, Commercial Director, said the award would allow the company to produce commercial samples enabling potential purchasers of their manufacturing system to evaluate the product.

Contact: David Potter, Technology Development Associates Operations - Tel: +44 (0)181 649 8792.

INGENICO / IVI Alliance

Groupe INGENICO has turned its attention to the Americas as it continues implementation of its strategic plans with an alliance with International Verifact Inc (IVI) of Toronto, Canada, which will provide their customers with a range of products, including Smart Card technology.

In Paris, France-based specialists in EFT terminals, INGENICO last year took over Innovatron Data System (IDS), a branch of Groupe Innovatron, to open up its East European markets. They then acquired German group EPC/EPOS which designs, manufactures and sells electronic payment terminals with its sights on the "promising" German market as the banks convert their eurocheque cards to chip cards.

In the new alliance, INGENICO and IVI will licence their technology to each other. IVI will incorporate INGENICO's Unicapt secure Smart Card architecture, which is compliant with EMV requirements, in its own products and become the exclusive distributor in Canada and the USA for all INGENICO products and related technology. INGENICO will acquire a minimum of 15 per cent equity interest in IVI.

In addition, a new joint venture owned by IVI (51 per cent) and Groupe INGENICO (49 per cent) will be the exclusive distributor for both company's products in Latin America while Groupe INGENICO has the right to distribute selected IVI products in all countries outside the Americas.

IVI develops and sells electronic payment solutions and its hardware and software products include point of sale terminals and Smart Card readers.

L Barry Thomson, President and CEO of IVI, said the agreement had achieved, in one transaction, IVI's strategic objectives of gaining access to world recognised Smart Card technology, improving profitability through joint development and purchasing and creating additional cash resources to finance IVI's growth in the Americas.

Contacts: L. Barry Thomson, IVI - Tel: +1 416 245 6700. Gerard Compain, Senior Vice President, Groupe INGENICO - Tel: +33 (0)1 46 25 82 05.

Smart Card Diary

Optimising on the Potential of the Electronic Purse, The Kensington Hilton, London, 30 - 31st January 1997.

This event will demonstrate how to develop and implement an efficient electronic purse scheme. It will also provide discussion on current issues. Kathy Gardner, Tel: +44 (0) 171 252 2222.

Smart Cards and Electronic Ticketing within the Air Industry, Central London, 17-18th February 1997.

This conference will cover key issues relating to Smart Cards and electronic ticketing including technical applications, IATA's regulatory requirements, marketing of new services, partnership development and usage within airports. Barbara McManus, Tel: +44 (0) 171 453 1904. Fax: +44 (0) 171 580 2071.

International Smart Card '97, Olympia 2, London, 11-13 February.

New applications and technologies will be discussed and exhibited at this event. QMS - Tel: +44 (0) 1733 394304. Fax: +44 (0) 1733 390042.

Interfinances Expobanques, CNIT, Paris, France, 26-28 March 1997.

Provides a showcase for new trends and development in banking and finance. Adeline Vancauwelaert, Tel: +33 1 4968 5261. Fax: +33 1 4737 7509.

IBM Smart Card Post

IBM has appointed Peter Sany as General Manager of its Global Smart Card Solutions operation. He has been with IBM for 12 years, much of the time within the banking sector and for the last two years has been Vice President and Director of Operations for IBM in Central Europe and Russia. He is currently based in Vienna.

Integrated Circuit Card Standard and Specifications - Part 4

In this month's discussion we will continue to look at Smart Card communications in the light of the ISO standards. Whilst this is a pretty dry subject a little perseverance is well worth while. In our treatment of the subject we will only look at the core features necessary for a top-level understanding of the communications protocols.

The proposed ISO7816 - 3 review has incorporated an extension to the Global interface bytes. At the current time there are two particular concepts,

- To assert the capability of stopping the clock
- To assert the class (voltage wise) of operation

The extension is achieved by defining a pseudo communications protocol T=15 in the TD_i character. Under these conditions the next TA_i (where I > 2) is defined as follows:

G8	G7	G6	G5	G4	G3	G2	G1
X1	RFU	RFU	RFU	RFU	RFU	C1	C1

X1 is the reference to the clock stop mode indicator where,

- X1 = 1 means clock stop mode is supported
- X1 = 0 clock stop mode is not supported (the default)

C1 is the reference to the class indicator which currently refers to two modes of operation

- Class A = 5 volt operation
- Class B = 3 volt operation

the two last signal bits b2 and b1 are defined to indicate the possible classes of operation

G2	G1	OPERATING CONDITIONS
0	1	Class A Only [default]
1	0	Class B Only
1	1	Class A and B

The new revision also defines two modes of operation,

- Negotiable mode

- Specific mode

An ICC that operates in a negotiable mode may have its communication protocol changed by the use of the PTS command. An ICC that operates in the specific mode cannot accept a PTS command but may be put into the negotiable mode by a further assertion of the reset command. Although the ICC indicates to the interface device (by means of TA) its capability to change to the negotiable mode, an existing device in the market place may however be unaware of these changes and therefore will not be prepared to reset the card. The operation of these mode changes are shown in *figure 1*. It should be noted that a multi protocol card which by definition offers the negotiable mode of operation should give priority to the T = 0 communication protocol. In other words if the T = 0 protocol is available it should be the default protocol offered in the answer to reset. The TA₂ interface byte which is part of the answer to reset data (discussed previously) gives the necessary information to allow the appropriate choice of protocol. The coding of this byte when present is shown in *figure 2*. In fact the presence or otherwise of this byte is used to determine the mode of operation of the card as follows,

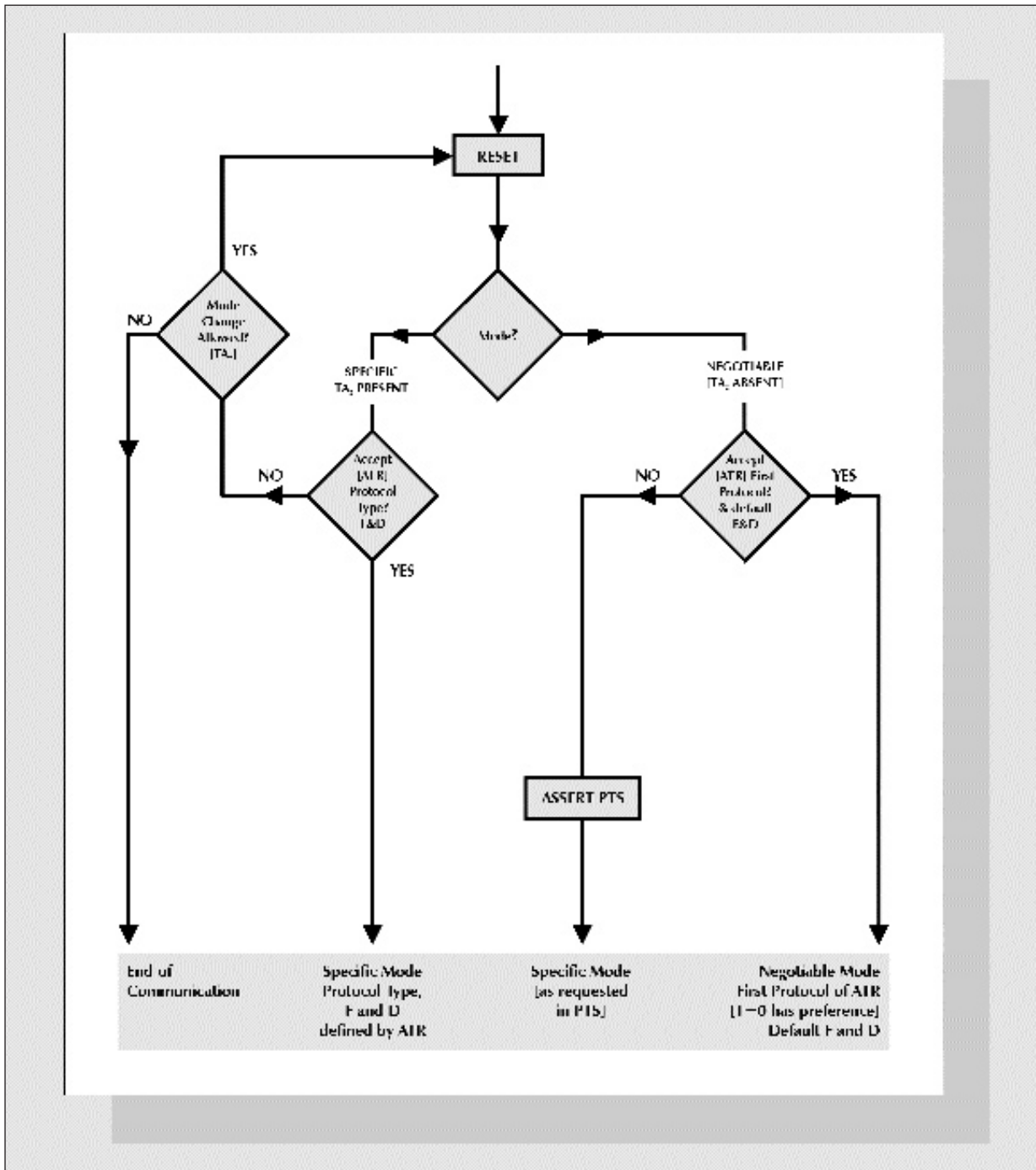
- TA₂ present in ATR - Specific mode
- TA₂ absent in ATR - Negotiable mode

It can be seen that bit 8 in the TA₂ byte is used to tell the interface device whether the card can change to the negotiable mode.

Protocol Type Selection (PTS)

Protocol Type Selection is used by the interface device to change the communication protocol and/or the default values of FI and DI. The PTS command must be issued immediately after the answer to reset and only applies when the IC card is in the negotiable mode. The interface device may choose to operate by using the first indicated protocol after the answer to reset and by using the default values of F and D. This results in an implicit selection of the protocol and the communication parameters. Should the interface device wish to effect any change to this situation then it must issue the PTS command. The PTS request consists of an initial character PTSS (coded FF_{hex}), followed by a format character PTSO

Left
Figure 1:
Modes of Operation



and three optional characters PTS1, PTS1, PTS2, PTS3 and PCK the check character. This is shown in figure 3. The response from the ICC follows the same format as the request. The PTSO format character is encoded as shown in figure 3. The bit map is used to indicate the presence or otherwise of PTS1, PTS2 and PTS3. These are encoded by bits 5, 6 and 7 respectively where a logic '1' level indicates the presence of the character. The protocol type is indicated by bits 1, 2, 3 and 4 which are binary encoded for T = 0 The PTS1

character when present is used to define the values for FI and DI as coded for TA₁ (see part 4). These parameters are used for defining the work etu (elementary time unit). The check character PCK is computed such that the exclusive OR (XOR) of all the characters from PTSS to PCK inclusive is equal to zero. When the ICC implements the PTS request message correctly it replies by echoing the same request as the response message. If bit 5 of the PTS1 response character is set to zero then the default values of F and D will be used. to T = 15.

Smart Card Tutorial

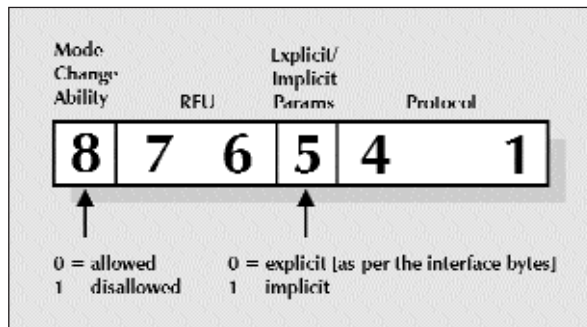
The T = 0 communication protocol

Right
Figure 2:
The TA₂ Interface Byte

Below Left
Figure 3:
PTS Request and
Response

Below Right
Figure 4:
The T=0 Message
Protocol

The interface device always initiates the command for the T = 0 protocol. Interaction between the interface device and the ICC results in successive commands and responses. For this protocol, data can only flow in one direction for the command response pair. In other words, either the command message contains data for the ICC or the command request data from the ICC which is then included in the response. The direction of data flow is implicit on the definition of the command and hence both the interface device and the ICC need to have the necessary a-priori knowledge. When it is required to transfer data in both directions for a particular command then a get response command may be used after the primary command to recover the response data.

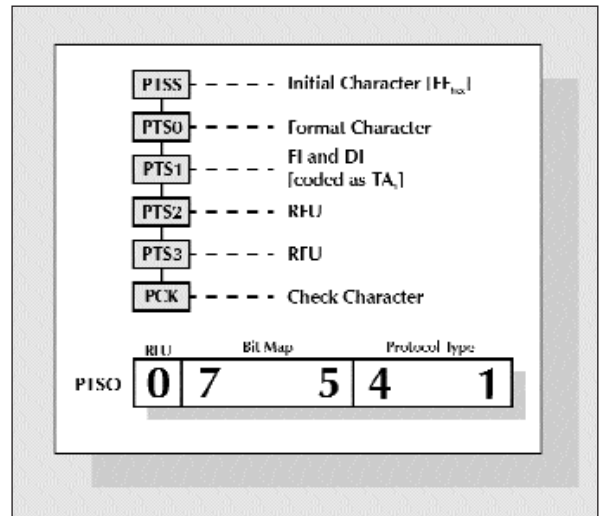


The command message consists of a 5 character header which the interface device sends the ICC. The ICC then replies with a procedure byte after which either data is sent to the ICC, or from the ICC, depending on the particular command. This procedure byte is to allow the interface device to control the V_{pp} EPROM programming voltage. In the case of EEPROM memory this procedure byte is effectively redundant. The message flow for the T = 0 protocol is shown in figure 4. The command header consists of the following 5 bytes.

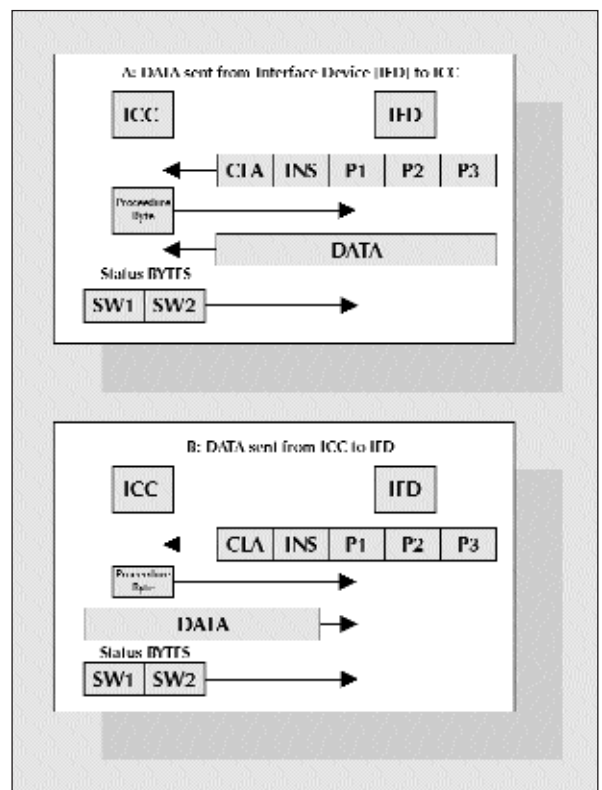
CLA - the instruction class (FF is reserved for PTS)

- INS - the instruction code (e.g read memory)
- PI - instruction code qualifier (e.g memory address)
- P2 - additional INS code qualifier
- P3 - the length of the data block

When P3 is equal to zero the data from the card will be 256 bytes, when data is to be transferred into the card then a zero data transfer is implied.



The normal condition for the ACK procedure byte is for this byte to echo the instruction byte (INS). Other options allow the interface devices to control the V_{pp} programming voltage as required. The card may optionally send a NULL procedure byte (60_{hex}) which allows further time for the processing of the command. In this situation the IFD should await a further procedure byte. The ISO standard also allows the card to send the first status .There are two status bytes SW1 and SW2. These bytes are sent from the ICC to the interface device on completion of the command to indicate the current card status.



Subscription Form

The normal response is,

- SW1, SW2 = 90_{hex} 00_{hex}

When SW1 = 6x (but not "60") or 9x various error conditions are reported by the card. ISO 7816-3 defines 5 such error conditions,

- SW1 =6E - Card does not support instruction class
- = 6D - Invalid INS code
- = 6B - Incorrect reference
- = 67 - incorrect length
- = 6F -no particular diagnosis

The T = 0 protocol also includes an error detection and correction mechanism. This was described previously and relies on the receiver detecting a parity error upon which it takes the I/O line to the low logic level within the first etu guard time (10.5 ± 0.2 etu) for a minimum of 1 etu and a maximum of 2 etu. The transmitter looks for this condition and retransmits the corrupt character.

David Everett

Next month we shall continue our discussion on communications protocols.

Privilege Range of Printers

French company Privilege Card has developed a new Privilege 300 range of printers for the personalisation of all types of credit card format plastic cards, including Smart Cards.

Privilege Card has also developed printers which can print on both sides of the card automatically.



Contact: Françoise Hivert, Privilege Card - Tel: +33 (0)2 40 09 70 70. Fax: +33 (0)2 40 83 47 45.



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Left
Privilege 300
Plastic Card Printer
[Privilege Card]

Cards for Chinese New Year

Right
The colourful "CashCard"
launched to celebrate
Chinese New Year
[Singapore Mint].



Singapore Mint is to issue CashCard electronic purse cards featuring traditional greetings to celebrate the Chinese New Year.

The cards, in festive colours of red and gold, will be issued on 10 January. A single version featuring the word "Fortune" will sell at HK \$18 but will have a stored value of HK \$10 and can be topped up to HK \$200. The number to be issued will depend on demand.

A set of four cards carrying the greetings of Luck, Abundance, Prosperity and Good Health will cost HK \$88 in a special issue of only 18,000.

CashCard is Singapore's national electronic purse and is operated by NETS, the Network for Electronic Transfers. Cards are supplied by Gemplus Technologies Asia.

Contact: Chou Fang Soong, Gemplus Technologies Asia - Tel: +65 776 1989. Fax: +85 773 0648.

Danish Red Cross Card

Every year the Red Cross issues a Christmas seal sheet which customers can buy to put on their mail. In December 1996 the Danish Red Cross also issued a limited number of DANMØNT Smart Cards featuring the same design (*see front page*).

The cards were sold for DKK50, mainly to collectors, and can be used like any other stored value DANMØNT card.

Contact: Henning N Jensen, Managing Director, DANMØNT - Tel: +45 4344 9999.

Leisure Card in London

A Leisure Card is now available to residents in the London Borough of Barking & Dagenham for use at the local authority's four leisure centres. It is being used initially as an identity/membership card.

Suppliers of the Leisure Card management system, Microcache and ORGA Card Systems (UK), claim that a typical system offering between 15,000 and 20,000 residents the use of five leisure centres can save around £20,000 in administrative costs.

Tony Stephens, Leisure Services Manager, said that initially the system will be used within the Council's directly provided leisure facilities, but added: "We are already in discussion with other Council departments and private providers on extension of the card's use."

It is possible in the future that the card will be used at other local authority amenities such as libraries and museums or by privately run facilities like cinemas who want to target local audiences.

The Smart Card supplied by ORGA has a Siemens SLE4442 chip with 256 bytes EEPROM and the card carries a barcode. Some 10,000 cards have been issued and it is expected that this number will rise to between 15,000 and 20,000. The card also has a purse element and the first use of this is likely to be for purchases from vending machines. ORGA also supplied ICCR 6.1 card readers for the project.

Contacts: Simon Reed, ORGA Card Systems (UK) - Tel: +44 (0)1628 24265. Fax: +44 (0)1628 24838. E-mail: sreed@orga.co.uk. Keith Emery, Microcach - Tel: +44 (0)1491 652121. Fax: +44 (0)1491 651751.

Alan Scott is New ICMA President

Alan J Scott, Managing Director of Wessex Interprint in the UK, has been appointed President of ICMA, the US-based International Card Manufacturers Association, and will serve a two-year term, taking over from Michael Swiecicki.

Contact: Mary Kay Metcalf, ICMA - Tel: +1 609 799 4900. Fax: +1 609 799 7032