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# SMART CARD NEWS

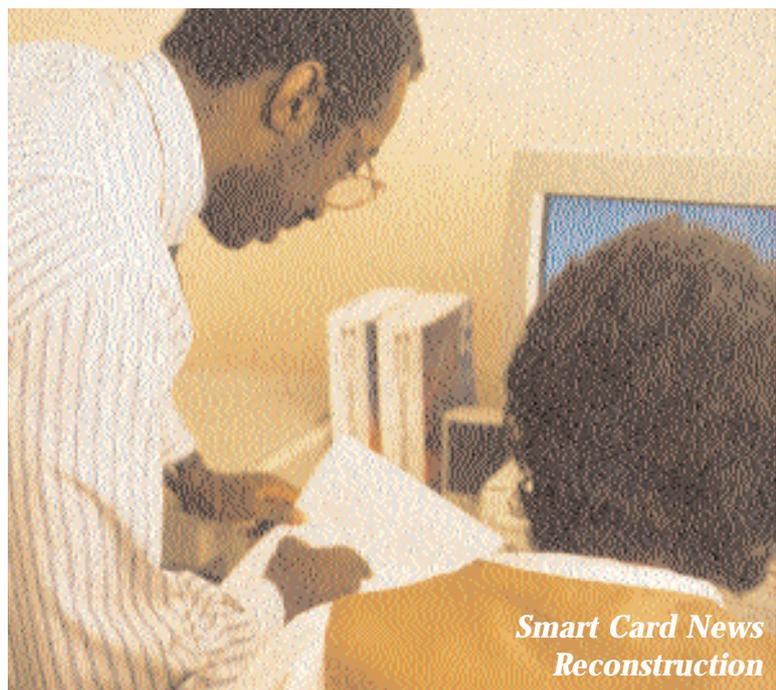


## Smart Card Threat: "Not a Real-World Risk"

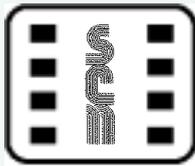
Bellcore (Bell Communications Research) in the US has issued a warning that Smart Cards could be vulnerable to attack which could "significantly impact" their security. They say that their scientists have developed a mathematical technique that can be used to extract secrets stored in the card, including the secret key used in public key cryptography to authenticate the card.

Industry reaction to the claim was swift, notably from the US Smart Card Forum which dismissed the claim as a "theoretical attack" which was "not a real-world risk" and emphasised that the Bellcore research should not be perceived in any way as diminishing the security of Smart Card products consumers are now using.

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*Smart Card News  
Reconstruction*



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## Smart Card Security Threat

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Bellcore says that its cryptographic attack on tamperproof products such as Smart Cards and tokens exposes a serious flaw in assumptions made by manufacturers.

The work, formally called "Cryptanalysis in the Presence of Hardware Faults," attacks public key cryptographic schemes such as RSA authentication and digital signature algorithms when they are implemented in tamperproof devices such as Smart Cards used for stored value, cards that generate digital signatures and cards that authenticate users for remote log-in to corporate networks. The underlying security risks are impersonation and fraudulent use of data.

The attack model has been developed by Richard Lipton, Professor of Computer Science at Princeton University and a Bellcore chief scientist; Dan Boneh, a Bellcore research scientist and Richard DeMillo, a Bellcore Vice President and Head of Bellcore Information Sciences and Technologies Research Laboratory.

The basis of the attack is to induce faulty computation when the processor is performing security-related calculations by applying physical stress, for example, certain levels of radiation or high temperature, or incorrect voltage, or high clock rates. An algorithm is then used to compare the faulty values with correct values and then to infer the cryptographic key stored in the tamperproof device. In some RSA implementations, the algorithm effectively factors the RSA modulus to derive the private key of the private/secret pair.

The scientists claim RSA, Rabin's Signature Scheme and the Fiat-Shamir Identification Scheme can be broken with the model algorithm which is effective against the algebraic structure used in public key cryptography. The attack is not effective against the non-algebraic operations used in secret key cryptography such as DES. It is claimed that the attack is more powerful than cryptanalysis that uses factoring. The scientists say that the Number Field Sieve factoring technique developed by Arjen Lenstra and others has so far broken RSA implementations using 130-digit (i.e. 431-bit) moduli, but has not succeeded against 512-bit implementation which is used in products worldwide. However, the Bellcore

scientists claim that their attack applies to any length of modulus and even if all of the products currently using RSA authentication were upgraded to use 1024-bit moduli, they could still break the code. A solution against this new attack offered by the scientists is to make the computing device verify the computed value, for example, by repeating the computation and checking that the answer is the same. Unfortunately, in some systems this usually slows down the computation by a factor of 2, making it unacceptable for some applications. Professor Lipton said even this method might not stop all attacks and a better way would be to develop fault resistant protocols.

It is important to point out that the threat model has been tested using hypothetical calculations, but no physical attack has been carried out by the scientists.

### Industry reaction

Describing the Bellcore warning as "just mathematical theory," the US Smart Card Forum commented: "The Smart Card Forum does not believe that this theoretical attack presents a real-world risk. Multiple techniques are used together to make the entire system secure. And good systems are designed so that they cannot be attacked successfully at a single point. Even if a single card could be compromised, though unlikely, it would not compromise an entire system nor allow the production of counterfeit cards.

"For a Smart Card product to be successful, consumers must have confidence in its security. The Bellcore research should not be perceived in any way as diminishing the security of Smart Card products consumers are now using. The Smart Cards used in North American stored value trials today are not vulnerable to this kind of theoretical attack."

Chris Jarman, Vice President of Chip Card Technology at MasterCard, said: This is very speculative. I have yet to see a Smart Card scheme with a vulnerability."

Richard Poynder of the UK Smart Card Club said Bellcore was adding little to what the industry already knew. "I do not think the commercial world need have any serious concern about this. It does, however, demonstrate the need always to design many controls into a complete system."

## Dr David Everett, SCN's Technical Advisor, comments:

As a leading supplier of consulting services it is not surprising that Bellcore has entered the world of Smart Card technology. Whilst their motives for wishing to make their customers aware of possible limitations in products based on Smart Cards is clear, no doubt they were surprised at the significance accorded to their discoveries by the media.

In view of the confusion surrounding this issue it seems appropriate to clarify the assumptions surrounding this attack in the context of practical systems.

It is well known that Smart Cards do not represent a tamper proof device, in general they would be referred to as a tamper resistant module. This is best described as a module that is not economically viable to attack. In other words there is some work function that costs more to execute than the potential rewards. The designers of products based on Smart Cards usually go to considerable lengths to ensure that the system as a whole can achieve this fundamental necessary property.

The attack proposed by Bellcore in their paper (Cryptanalysis in the Presence of Hardware Faults by Boneh, De Millo and Lipton) is based on effecting a miscomputation of part of a digital signature with the availability of a corresponding correct signature and the modulus of the signature computation. In a manner similar to the attack analysed by Davida, Wells, and Kam (a database encryption system with subkeys; ACM transactions on database systems; June 1981) they show the possibility of extracting one of the components of the secret key used to make digital signatures. They cite the use of the Chinese remainder theorem which is widely used in the implementation of an RSA digital signature. The attack is based on the ease with which the greatest common divisor (GCD) of two elements can be computed by using Euclid's algorithm.

Whilst the mathematical analysis is not in doubt the assumptions about the behaviour of Smart Card chips are somewhat misleading. The necessary property for the attack relies on inducing a faulty calculation in just one part of the signature

creation. It is suggested in the Bellcore paper that high clock rates, higher / lower voltages or high temperatures may be used to induce such a fault. We would suggest that such attacks are unlikely to succeed. More sophisticated attacks on the normal operation of the chip would involve substantial skills and a very high work function to produce the necessary faulty data.

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## ADE Wins Innovation Award

Angewandte Digital Elektronik GmbH (ADE), of Germany, won the innovation award for its CombiCard at the ESCAT (European Smart Card Applications and Technology) Conference in Helsinki, Finland, last month. Conference chairman, Juhani Saari, presented the award to Hans-Diedrich Kreft, ADE's founder and Chief Executive Officer at the banquet dinner.

ADE picked up the award for the "innovative idea of connecting the contact and non-contact technology using one chip modules."

The CombiCard is a combined contact and contactless card which was first presented at the CeBIT '95 Fair by ADE which then started a joint project with the Volksbank Stormarn (a middle-sized bank in Hamburg, Germany) to demonstrate the CombiCard in a bank application. The card enabled different electronic purses to be loaded in the single chip of the card via the contact. The units could then be debited contactlessly when using public telephones, opening parking barriers, access control or time access. Additionally, the card has a magnetic stripe for normal credit card functions.

Patent rights for the CombiCard are held by GAC (Gemplus ADE CombiCard) which grants licences to interested parties.

**Contact: Hans Diedrich Kreft, ADE, Germany - Tel: +49 4104 9710-11. Fax: +49 4104 9710-99**

## Dutch Student Card Progress

An independent foundation has been set up to run the Dutch multi-functional Studentchipcard scheme (*SCN October 1995*) which is now expanding following the success of a one-year pilot scheme.

Ten universities and schools of high and middle level education, are supplying their students and employees with the card and it is expected that 80,000 cards will be issued - four times the amount of last year.

The new organisation, Studentchipcard Foundation, based in Rotterdam, has been formed by IBM Netherlands, Informatie Beheer Groep and PTT Telecom and will assist educational establishments in implementing the student card scheme. It will also work on expanding the applications and expects to have 200,000 cards in circulation next school year. By that time, the institutions will also have payment terminals at their disposal that will facilitate payments with several electronic purses.

The multi-functional card functions as a student ID card, an access card, library card, electronic purse (for payment in canteens, at photo-copiers and at all kinds of vending machines on the campus) and telephone card (with an option for programmable telephone numbers).

The purse can be loaded at special terminals at the universities and schools and at 18,000 public telephone boxes. It can also be used at all acceptance points of the Zeelandkaart, such as local public transport and retail outlets.

A useful feature for the students is that they can use the card to contact the IB-Groep in Groningen (responsible for financial flow management between the government and students), via special self-service terminals at the schools to obtain information about their student grants and go on-line to change their personal data. A PIN code is used to protect the privacy of the card holder. The Studentchipcard is also compatible with the Chip Knip national electronic purse card in The Netherlands.

New pilot schemes have already started, for example, where students can obtain authorised access to the school or university's central computer from their homes.

**Contact:** *Peter Ritsema, Studentchipcard Foundation - Tel: +31 10 457 3241.*

## Forecast by European Banks

Remote banking by personal computer and by telephone will be the norm by the end of the century coupled with an explosion in the implementation of chip card technology, is predicted by European bankers.

Research conducted among 300 senior executives within the European retail banking industries who were attending the Visa EU region's annual member meeting in Vienna last month, indicated that remote banking services will be the norm by the end of the century with the personal computer becoming the preferred mode of access.

Over three quarters (77 per cent) expect to be offering a PC banking service by the year 2000, with two thirds (66 per cent) offering telephone banking.

"Closely allied to this development will be an explosion in the implementation of chip card technology," said the survey. "Well over half (60 per cent) of delegates expect to be offering chip card based loyalty schemes, with 63 per cent saying they will be offering a stored value card programme."

Increasing competition, particularly from non-bank sectors, was seen as a definite factor. Retailers were viewed with most caution (49 per cent believing them to be the greatest competitive threat) followed by telecoms operators (28 per cent) and software providers (26 per cent).

Hans van der Velde, President of Visa EU, commented: "Europe's retail banks are far from complacent. Faced with increased competition they clearly intend to make a very strong response. Visa's mission is to assist them on all fronts.

"On their behalf, we have made significant investments in the emerging technologies, achieving industry leadership in remote banking, electronic commerce and the implementation of chip card technology." He added that at the same time they intend to assist in developing the market for existing products, for example, credit cards - a market which remained undeveloped in much of mainland Europe where debit and deferred debit cards were the norm.

**Contact:** *Peter Halliday/Colin Baptie, Corporate Communications, Visa EU Region - Tel: +44 (0)171 937 8111.*

## Lessin Joins ESCAT Hall of Fame



Smart Card pioneer, Arlen R Lessin, has been named by the European Smart Card Applications and Technology (ESCAT) conference in Helsinki, Finland, as its third Hall of Fame member.

Juhani Saari, ESCAT Chairman, said: "Arlen Lessin has demonstrated unique vision, dedication and understanding of Smart Card applications technology and strategic requirements. This honour is in recognition of his pioneering contributions to Smart Card innovation."

In the early 1980s, Lessin represented the French government in its introduction of the French-invented Smart Card to North America. In 1983, he became the first non-French licensee of the technology and formed SmartCard International, which introduced "computer-in-a-card" technology in the US. He was co-inventor of the self-contained ULTICARD, a stand alone version of the Super Smart Card, for which a patent was issued in 1989. The card was initially developed for Visa, and used in several US and European trials.

He left the company in 1989 and formed Lessin Technology Group. In 1991 he was the first recipient of a special President's Honorary Award "for Services and Contributions of the Highest Order in Introducing and Pioneering the North American and World Smart Card Industry" from a consortium of organisations in Washington D.C.

He re-formed SmartCard International as a consulting and systems integration company in late 1995.

Lessin serves as Distinguished Professor, Chair and Director of Wilkes University's Allan P Kirby Center for Free Enterprise and Entrepreneurship in Wilkes Barre, Pennsylvania.

## Motorola Chips for ec Card

Motorola has announced that it has begun shipping the first chips from its newly-qualified plant in South Queensferry, Scotland. The chips will be used in Germany's Eurocheque (ec) card project which goes live on 1 January 1997.

The South Queensferry plant, bought from Digital Equipment Corporation, was qualified for production of Smart Card ICs in the second quarter of this year, in time, says Motorola, to meet delivery commitments for the Eurocheque programme.

Allan Hughes, Worldwide Operations Manager for Motorola's Smart Card operation, said: "Worldwide interest in the benefits of Smart Cards is growing. As more and more products such as the German ec card go live, we are ready to meet the requirements of our customers around the world."

**Contact: Kathleen Reid, Motorola -  
Tel: +44 1355 565447.**

## Smart Parking at Denver Airport

Park n' Save Airport Parking has opened a new 4,000-space off-airport parking facility near Denver International Airport, Colorado, USA, to cater to the business traveller by offering corporations low daily rates, a pre-paid Smart Card payment system or easy monthly billing.

There is a free continuous shuttle service to and from the airport and valet parking for a small additional charge. Daily parking rates are US \$5, half that of the airport rate for the first two days.

**Contact: Laura Keane, Park n' Save, Denver -  
Tel: +1 303 694 2142. Fax: +1 303 694 2949.**

## Sligos First-Half Sales up 5%

French Group Sligos, which includes Smart Card manufacturing subsidiary Solaic, reports a 23% increase in net income in the first half to 41.4 million francs. Sales rose 5.3% over the period.

The group says the results were shaped by strong growth in sales from operations outside France, the success of new services developed and marketed in the four operating divisions, and the earnings impact of restructuring and strategic refocusing.

## Electronic Commerce Alliance

An alliance between 15 North American banks and IBM has been formed to offer a broad range of interactive banking and electronic commerce services to banks in the US and Canada starting early in 1997.

Under the name of Integrion Financial Network, the alliance will help to ensure that banks can rapidly deliver secure, convenient and reliable electronic banking services for the fast growing segment of the population expecting to participate in electronic commerce over the Internet and other electronic channels.

In a statement, the company said: "The Integrion alliance creates unprecedented opportunity for banks to develop industry standards for electronic commerce, to gain significant economies of scale and to offer levels of customer service in electronic banking unmatched in the industry today."

In addition to IBM, the initial owners of Integrion include: ABN AMRO, BANC ONE, Bank of America, Barnett Bank, Comerica, First Bank Systems, First Chicago NBD, Fleet Financial Group, KeyCorp, Mellon Bank, Michigan National Bank, NationsBank, PNC Bank, Royal Bank of Canada and Washington Mutual, Inc.

These owner banks claim to serve over half of the US and Canadian households which they say puts the new company in an outstanding position to gain scale quickly. Technology development is well underway and two initial pilots are scheduled for launch by BANC ONE and NationsBank in early 1997, with other banks to follow.

It is planned that through Integrion, the banking industry will work with leading technology providers to establish open standards for electronic commerce that will speed banks' ability to deliver a wider range of integrated products and services at lower costs.

Eventually, customers may be able to access services through interactive television and kiosks as the market for these devices develops. Eventually the services will extend to electronic cash and Smart Cards, says the company.

**Contacts:** *Ian Colley, IBM - Tel: +1 914 642 6219. John Russell, BANC ONE - Tel: +1 614 248 5989. Mary-Alice Rogers, NationsBank - Tel: +1 704 386 0261.*

## CIDCO Enters Home Banking

CIDCO Inc., producer of subscriber terminal equipment that supports intelligent network services being offered by telephone operating companies, is to integrate VeriSmart Smart Card technology into its intelligent phones under a licensing agreement with VeriFone.

The agreement will bring Smart Cards into the home for personal use. With the new system, consumers will be able to use their personal phone to transfer funds from a bank or other cash account directly to a Smart Card. The card can then be used like cash for retail purchases, with the previously transferred funds debited to each store.

C Lloyd Mahaffey, VeriFone's Vice President of Global Marketing, explained: "The VeriFone and CIDCO P-ATM (Personal ATM) with Caller ID will be designed to enable a consumer to access everything from electronic cash to loyalty programmes from one device on their kitchen counter."

The VeriSmart system is being developed by a cross-section of industry providers including Gemplus, Hewlett-Packard, Key Tronic, Mondex International and Scientific Atlanta.

CIDCO sells its products to telephone subscribers through a variety of channels which include distribution arrangements with over 100 telephone companies worldwide and through more than 20,000 retail stores throughout North America.

**Contact:** *Charles Gay,*  
*Director of Marketing Services, CIDCO -*  
**Tel: +1 408 778 8191. Fax: +1 408 778 8190.**

## Card Interoperability Group

Visa International has announced that it has joined MasterCard International, Mondex International and American Express in a working group that will create standards for the interoperability of chip payment cards at card accepting devices. The group is being assisted by vendors Dassault AT, ORGA, Solaic and VeriFone.

"We all recognise the importance of having standards for interoperability purposes," said Stephen Schapp, Executive Vice President, Products and Marketing for Visa EU.

## Visa Loyalty Card for Taiwan

Visa International is to pilot the specifications which will allow member banks to introduce interoperable chip loyalty programmes by launching a scheme in partnership with ChinaTrust Commercial Bank and retailer HANG TEN Enterprises in Taiwan in the first quarter of 1997.

Called the Visa Chip Loyalty Template Programme, the scheme will use chip cards conforming to the EMV (Europay, MasterCard and Visa) specifications developed to ensure a chip card issued in one market can operate in another.

According to Bob Hepple, Director of Chip Card Payment Services for Visa International Asia-Pacific: "The Programme will provide all Visa members with a blue-print for creating their own interoperable chip-based loyalty programmes, significantly reducing their programme development time and investment."

The cards will be issued in two forms - Classic and Gold. Customers applying for the card will initially receive a special bonus worth US \$65 which can be used at any of HANG TEN's 205 fashion outlets nationwide. When cardholders make purchases with the card they will receive bonus points, with extra points if they shop at any HANG TEN outlets. Points can be redeemed against other purchases.

**Contact: Ian Gatherum, Visa, UK -Tel: +44 (0)171 937 8111. Fax: +44 (0)171 937 0877.**

## Securing Computer Access

A pre-boot computer access security system utilising Smart Cards has been announced by Integrated Technologies of America, Inc. (ITAI) Called SecureVAULT, it is available to computer manufacturers as a factory installable option for enhanced security.

SecureVAULT is one of a series of privacy/anti-intrusion systems offered by the company. It will render a computer useless unless the user has the appropriate Smart Card and proper authorisation. An encrypted user profile is stored on the Smart Card from Micro Card Technologies. The Minneapolis, Minnesota-based company says uses include securing records for medical, banking, insurance, legal, accounting, research, small businesses and corporate executives.

David Mooney, Chairman and CEO of ITAI, says: "SecureVAULT is an affordable option and convenient solution to secure your desktop PC from unauthorised access before any information is even booted up."

**Contact: Patrick Howard, Marketing and Sales, - Tel: +1 612 933 7306. E-mail: SalesITAI@aol.com**

## Mikron Targets China

Mikron of Austria, a wholly-owned subsidiary of Philips, has signed a licensing agreement for production and marketing of the MIFARE Core Module (MCM) with UniVision headquartered in Hong Kong and with facilities in Shenzhen, Guangzhou, Beijing and Shanghai giving a strategic foothold in mainland China.

The MCM is the core of each MIFARE contactless Smart Card reader and can be integrated by system integrators according to customer requirements.

UniVision will be targeting integration of contactless Smart Cards into its Integrated Building System for building management and security applications, open/closed road toll systems and other related Smart Card applications in the transportation field.

Mikron believes contactless Smart Cards will play a major role in large Asian infrastructural projects with significant potential in fare collection systems, ID cards and banking-related businesses.

**Contacts: Francis Tse, UniVision - Tel: +852 2389 3256. Fax: +852 2797 8053. Max Staudinger, Mikron, Austria - Tel: +43 3124 299 980. Fax: +43 3124 299 270.**

## MasterCard IC Card in China

The Shanghai Pudong Development Bank is to launch China's first EMV (Europay, MasterCard and Visa) compatible IC card programme. Warren Liu, MasterCard's Senior Vice President and General Manager for Greater China, said: "The launch of China's first globally compatible IC card will be an important step as Shanghai strives to maintain its banking leadership position in China."

**Contact: Vivian Fung, Shandwick China - Tel: +86 21 6249 1901.**

## Watercard Scheme Suspended

North West Water in the UK has suspended the installation of its Watercard budget payment scheme units - which use Smart Cards to enable customers to pay-as-they-go - while they investigate concerns that some customers are self-disconnecting their water supplies.

In an official statement last month, the Water Company said "some local authorities and other interest groups have expressed concern about the use of the units. Some of this concern has been based on misunderstandings about the company's operating procedures and the customer safeguards involved, particularly where customers self-disconnect their water supply because they have not recharged their unit."

Bob Armstrong, North West Water's Customer Services Director, said: "We have put a temporary hold on installing any further units so that we can address the concerns that have been expressed."

Currently, some 2,000 households in the North West area are using the Watercard budget option as their preferred payment method. A number of other water companies in England and Wales are introducing the units - a move supported by Ofwat, the customer watchdog.

The system in general is aimed at people who want to budget their payments and is particularly useful for customers on low incomes and/or who are in arrears with their payments.

The Watercard unit fixed in the house is not a meter i.e. it does not measure the amount of water used as a means of assessing charges. It simply allows the customer to make regular payments using a Smart Card. The customer takes the card to a payment outlet, currently the local post office in the North West Water area and makes the agreed payment which is loaded onto the card. When the card is inserted in the unit at home, payment details are transferred and the customer has water for the period covered by the payment.

### Customer safeguards

When credit is running out, the Watercard unit gives an audible warning. If the customer does not buy more credit, they can still activate an emergency credit facility which runs for a minimum of seven days. However, if the unit is still not recharged, it will interrupt supply. The water company has built a number of safeguards into the

service. Computer software at the customer services centre monitors all payments and highlights customers who have not purchased further credit. These customers are contacted by telephone or by first class post if they have no telephone or alternative number.

The local authority environmental health officers are notified within 48 hours. If the water company has no response from the customer they visit the home to try to make contact.

Once contact has been made, the company says, if there is a problem they can make a temporary arrangement to overcome short term problems, renegotiate a more affordable arrangement or decommission the unit if the payment method is proving unsuitable for that particular customer.

Before introducing the scheme, the company carried out an extensive trial involving over 900 volunteer customers over an 18-month period. This was followed with independent market research carried out by BEM Ltd and it showed:

- \* 92% of customers surveyed found it an affordable way to pay
- \* 94% found it a convenient way to pay
- \* 92% said they preferred Watercard to any other payment method
- \* 86% had already recommended, or would recommend, the scheme to others.

In the past, water companies have been severely criticised by the media for cutting off water supplies for non-payment, especially for families living on low incomes, but now have a new problem of a very small number of customers self-disconnecting their supplies.

Technology may provide the answer as the Watercard system is quite sophisticated and can be configured to provide emergency water supply to the customer.

In addition to providing seven days of emergency water after payment has run out, information programmed on the Smart Card can enable a trickle flow option or full water supply for one hour a day at whatever time the customer wishes. This may be the solution to allay concerns about self-disconnection while other arrangements are made.

**Contact: Sue Wright or Jan Murray, North West Water - Tel: +44 (0)1925 233023/233988.**

## Amsterdam Arena Card



A new Smart Card, called the ARENA Card, was launched in The Netherlands last month at the Amsterdam Arena, a multi-functional stadium on the outskirts of the city capable of hosting football matches, pop concerts and even weddings!

Already, more than 400,000 thousand cards have been issued and the future total is expected to be in the millions. This is not surprising as during a football match the stadium can seat nearly 45,000 people and hold 70,000 for a pop concert.

The card was introduced to ensure better security and to increase the speed of transactions in shops, bars, restaurants and parking areas. In addition the cards have become collectors' items and designs have featured football players and singers Michael Jackson and Tina Turner.

The system was developed by SCas and the card readers are also able to read the other two main chip cards in the country - Chipknip, the national electronic purse issued by the banks, and the Chipper, issued by ING Bank and Postbank. This is achieved by special software developed by SCas.

The Smart Card reader is battery operated and can be programmed with time and date of any event, making it impossible for the reader to accept transactions outside of this set time. The readers were developed and supplied by SCas in a contract from PTT Telecom.

The Arena Card is a disposable card which can be bought from any one of 50 dispenser machines in values of 10, 25 and 50 guilders. The cards are supplied by PTT Telecom and Philips with chips from various suppliers, for example, Philips T104 and Siemens SLE4433.

**Contact: Gergan Apeldoorn,**  
Marketing Manager, SCas -  
**Tel: +31 184 419255. Fax: +31 184 422898.**

## UK National Smartcard Forum

Ian Taylor, the UK Government's Science and Technology Minister, has announced that the Department of Trade and Industry (DTI) is to set up a National Smartcard Forum "to facilitate industry's consideration of the key issues raised by advanced Smart Card applications."

The DTI attempted to act as the catalyst to set up an industry-led Smart Card forum four years ago without success. Industry reaction was less than enthusiastic. Shortly afterwards the UK Smart Card Club was launched in 1993 and is now well established with some 110 members. Then came UK-based Card Europe which acts as a focal point for all those interested in Smart Cards and wishing to be involved in European activity.

Now that the DTI has resurrected its plan, it will have to offer some benefits, like funding for research and development, to attract industry leaders to join the Forum or it will flop like the last attempt.

In announcing the scheme, the Minister said: "Increasing use of Smart Cards can raise new issues. DTI wants to provide a forum for all those with an interest to help address these.

"We want to make it easy for people right across the industry to work together on issues affecting the way Smart Cards are used. This would build further on the good work already being done by some of the more specialised industry groups."

He said he would welcome ideas on priority areas for consideration. The Forum will consist of a Steering Group, to be chaired by a senior DTI official and a number of working groups which will address specific issues including developing recommendation on standards and interoperability and on security and consumer issues.

It is expected that the Steering Group would consider the key developments in Smart Card technology relevant to global applications and to UK competitiveness, and make proposals for developing those applications and promoting Smart Card use in the UK.

Companies or organisation wishing to comment on the proposal for a Forum should contact: **Ms Jan Dixon,** Communications and Information Industries Directorate, DTI, 2.111, 151 Buckingham Palace Road, London, SW1W 9SS. **Tel: +44 (0)171 215 5000.**

## Mondex Launch in Hong Kong



Mondex was officially launched in Hong Kong on 17 October by HongkongBank and Hang Seng Bank. The new card is marketed under the slogan "The Cash of Tomorrow Today," suggesting the anticipated wide-spread use of the Mondex card worldwide as an alternative to notes and coins.

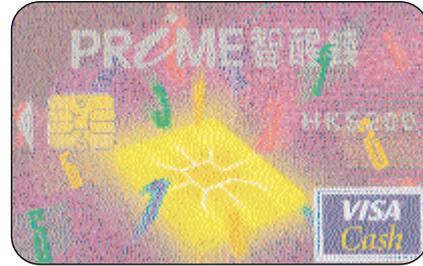
Mondex service centres have been opened in Taikoo Shing's Cityplaza and Shatin's New Town Plaza to cater to the needs of merchants and customers using the new product. The centres will function as outlets for those wishing to apply for or pick up a Mondex card and those seeking information. They will also distribute Mondex devices such as balance readers, which display the cash value on cards, and wallets, which can be used to store cash value in up to five currencies.

More than 400 merchants in the two shopping areas have already signed up to accept the card and about 100 ATMs are being programmed to enable customers to download cash from their account to their Mondex card.

Market research indicates that some 70-80 per cent of the banks' customers in Hong Kong - around 3.5 million people - would be interested in using the Mondex card. Eric Tai, Senior Executive, HongkongBank's Senior Executive Retail Marketing and Planning, said: "Mondex is a major step forward in the evolution of payment systems. We are confident that our launch will generate growing enthusiasm among customers and merchants and establish Mondex as a new global payment system."

William Leung, Hang Seng Bank's Assistant General Manager and Head of Credit Card Centre, said: "Mondex is superior to traditional cash in terms of both security and convenience."

## VISA Cash Card Unveiled



Visa International launched a VISA Cash Card pilot in Hong Kong with the Bank of China Group and Standard Chartered Bank in July of this year using US \$25 disposable cards (HK \$200). It is planned to issue 200,000 cards in the first phase of the pilot and to issue reloadable cards by the end of the year. By last month, 50,000 cards had been issued and average transactions had risen from US \$2.32 to US \$3.48 (HK \$18 to HK \$27).

**Contact:** Colin Baptie, Visa, UK -  
**Tel:** +44 (0)171 937 8111.

## Industry Speculation Continues

Industry watchers are expecting major moves in the field of electronic money as the big players struggle for dominance in the electronic purse market.

Rumours persist that MasterCard is negotiating to acquire Mondex technology, the electronic cash system developed by NatWest bank in the UK. Significantly, several senior executives in MasterCard's chip card programme have left the card issuer recently while there are reports that its MasterCard Cash pilot in Canberra, Australia, is not performing as well as expected. MasterCard has also divorced itself from the SmartCash stored value card scheme where bickering amongst the partners is said to have delayed the pilot launch scheduled for mid-1996 in Delaware in the US.

Meanwhile, Visa is said to be taking a renewed interest in SmartCash. So will it step into MasterCard's shoes?

To add to industry speculation, American Express, is said to be looking at PROTON, the electronic purse system developed by Banksys in Belgium who have exported the technology to several countries. Watch this space!

## Pay Later Travel Card



FAHRSMART bus travel cards in operation in the towns of Lueneburg and Oldenburg in Lower Saxony, Germany, enable passengers to pay after travel unlike other ticketless travel schemes where payment is deducted on the spot from pre-paid fixed value cards or rechargeable Smart Cards.

In the FAHRSMART system, cardholders pay DM10 for the card - reimbursed if the card is returned - and have to make a contract with the bus operator, allowing the operator to charge the customer's bank account once a month. The card is, therefore, only used for identification.

If a passenger wishes to remain anonymous he/she can obtain a pre-paid card validated by a minimum amount in advance (only 1.5 per cent of passengers are using this option).

The scheme has been operating in Lueneburg since September 1990 and 50 buses have been equipped to accept the 7,000 cards now in use and which account for 15 per cent of the 6.5 million DM revenue/year. In Oldenburg, the system has been operating since September 1991 with 95 buses equipped. Currently 14,000 cards are in use and account for 12 per cent of 10.6 million DM revenues/year.

Since October 1995, contact and contactless Smart Cards have been in operation. The contact card is supplied by Giesecke & Devrient with a 1K bytes EEPROM Siemens chip. The contactless MIFARE card is also supplied by Giesecke & Devrient with a 1K bytes EEPROM Siemens chip.

Contactless technology has been implemented to increase response time and to improve card handling, as operators found that inserting the card into the card reader during the bus ride sometimes became difficult, especially for the elderly.

Bus drivers are reported to be very satisfied with FAHRSMART as ticket-selling has been considerably reduced. Advantages to the operator include less money management, improved punctuality of services and shorter trip times.

The FAHRSMART system consists of card, card readers and on-board computer, data transmission between buses and central computer, the central computer and a service centre.

On entering the bus, the passenger inserts his card into the reader or holds it close to the reader in the case of a contactless card. The card number is then checked according to a white or black list. Card number and bus location (buses are equipped with a positioning system), time, bus route and bus number are stored on the on-board computer as well as on the card, in order to enable ticket inspectors using hand-held readers to confirm that the user has checked in.

Before leaving the bus, the user again inserts or holds his card at the reader and the procedure is repeated as the system does not differentiate between checking-in and checking-out.

Data stored in the on-board computer is transmitted to the central computer via infra-red transmission while the bus is being refuelled in the bus depot. New data is later transferred to the bus, for example, bus routes for the next day and white and black lists.

At the end of the month, the fare to be paid is calculated via "best price" i.e. the cost of a monthly pass is the highest amount to be paid. The amounts to be paid are charged to the cardholders' bank accounts within one week. In the case of pre-paid cards, calculations are done each day in order to give users the necessary information quickly for revalidating their cards.

If the cardholder wants to have a list of his trips made during the last month, he can go to the service centre, insert/hold his card at the reader and receive a print-out. Because of German data security regulations, the data list can only be activated by the cardholder.

At the beginning of next year it is planned to equip all buses with contactless Smart Card technology. With the exception of single trip tickets no other tickets will be sold.

**Contact: Dr Heino Nuppenau -**

**Tel: +49 40 6327 980. Fax: +49 40 6327 9899.**

## L&G Takes Majority Stake in ODS

Landis & Gyr Communications of Switzerland has acquired a majority stake in German card manufacturer ODS from the Oldenbourg Group.

ODS produces annually more than 30 million chip cards as well as magnetic stripe cards at its plants in Munich and Seebach (Thüringen) for applications in telecommunications and media, finance and banking, healthcare and government, traffic and transport. L&G Communications is a major supplier of payphones, associated financial transaction management systems and visual security devices.

Joël Bourez, L&G Communications' CEO, said: "The strategic acquisition of a controlling stake in ODS demonstrates our commitment to maintaining worldwide leadership in payphone technology and payment systems." He added that they would continue to drive the company forward into new areas such as banking, electronic purse or financial applications.

**Contact:** *Adolf Deyhle, L&G Communications - Tel: +4122 749 3355. Fax: +4122 749 3539.*

## New smART Product Line

A new smART product line designed for public transport operators by ART Automatisierung und Rechnertechnik GmbH, of Überlingen, Germany, was on show at the 56th International Commercial Vehicles Fair in Hannover, Germany, last month.

ART claims to have implemented the first Smart Card system for public transportation in Germany which was not subsidised by the government and that it has been running without major problems since 1991 with some 30,000 cards (memory cards) issued.

It has also implemented more than 80 hard- and software systems for public transportation companies with various features: Smart Card functionality, logical and satellite-based navigation (GPS), digital radio communication, etc. About 10 of these systems have Smart Card functionality involving some 150,000 card holders.

The company was demonstrating its PC-Software for tariff and net recording, accounting and statistics, Smart Card issuing and data management in general.

ART's smART-NT system - an on-board comput-

er system with integrated Smart Card read/write units - enables the bus driver to initialise his working place by using his personalised Smart Card to initialise the electronic cash register, automatically position the driving seat and the mirrors on the bus.

**Contact:** *ART - Tel: +49 7551 4056.*

**Fax:** *+49 7551 4058.*

## Value-added Services for Mobiles

Swiss Telecom PTT is introducing a pre-paid SIM (Subscriber Identity Module) Smart Card for digital mobile phones which will enable customers to pay for calls in advance and reload the SIM card on the handset over-the-air when credit has run out.

The system, being introduced this year, is aimed at helping GSM network operators to gain new customers and exploit mass-market potential.

This is the first application developed by the Swiss telco and Gemplus who are working together in the SICAP (Sim Card Application Platform) project. Future services will address teleshopping, SIM card telemanagement and remote personalisation, service booking as well as business, traffic, weather reports and leisure services.

Gemplus says that SICAP is the key to a new generation of value-added services and makes it possible to communicate directly and securely with a SIM card over-the-air.

The development platform is a combination of SICAP, a solution from Swiss Telecom, and GemXplorer, a compatible Smart Card from Gemplus.

**Contact:** *Paul Naldrett, General Manager, Gemplus, UK - Tel: +44 (0)1705 486444.*

**Fax:** *+44 (0)1705 470628.*

## Correction

In our report, Smart Cards in Schools last month we wrongly stated that a further 30 systems are being installed in schools by Smart Card Solutions. The company carrying out the installations is Smart Card International who can be contacted at: **Tel: +44 (0)1482 650999.**

**Fax: +44 (0)1482 652271.**

## Lufthansa Extends Card Travel

Lufthansa, the German national airline, is planning to extend electronic ticketing using Smart Cards outside Germany, starting with its services to Paris and London. Check-in machines will be installed at London Heathrow and Paris' Charles de Gaulle Airports.

Other plans include introducing ticketless travel on routes to North America in co-operation with United Airlines and then to extend the scheme further in agreements with other airlines.

Anselm Egger, Manager of Electronic Ticketing, said the move would come after agreement on ticket standards by the International Association of Travel Agents (IATA) and he expected Lufthansa's scheme to be introduced in mid-1997.

The Smart Card to be issued to frequent fliers will have added functions such as telephone, credit card and hotel card functions.

## Absec School Meals System

Absec has announced its Smart Card-based school meals system which can also be used for pupil ID, access control, vending, library entitlement and automated roll call.

The Absec 8500 cashless point of sale and card revaluation terminal eliminates many of the problems traditionally associated with the provision of school catering facilities, says the company, for example, by providing itemised sales and audit information, reducing transaction times, and avoiding the costs and risks involved in handling and transferring cash.

In addition the stigma attached to free meals is eliminated as everyone has an identical card. The card can be customised to meet the individual school's specific requirements, including student photographs, school logos, library bar codes and student ID numbers. The same card can also be used to operate other facilities controlled by Absec units, such as vending machines.

The cards, supplied by US<sup>3</sup>, can be personalised on-site using the Absec 9501 Card Personalisation Station comprising Windows-based card management software and a compact card reader.

Recharging of the card can take place either at the Absec 8500 terminals by an authorised operator

such as a member of the catering staff or at chip card revaluating units where pupils can revalue their cards without supervision using coins or notes.

The system was introduced at Rhodesway Upper School in Bradford, England, at the start of the term last month and some 1,600 cards have been issued. The cards are personalised with the pupils' photographs.

Perceived benefits include helping to stop pupils buying cigarettes with their lunch money and reducing bullying in school as pupils do not need to carry cash so cannot be pressurised into handing it over.

**Contact:** *Fiona Billingsley, Sales & Marketing Executive, Absec - Tel: +44 (0)1247 274455.*  
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## VeriFone Reseller for CIS

VeriFone has appointed Austria-based BGS Industrial - a developer of Smart Card payment solutions in Europe - as an international reseller for the CIS (former Soviet Union) region.

BGS already has a market base in the CIS with over 3,500 Smart Card terminal systems installed including applications in Saving Bank of Russia, Promstroybank, Inkombank and the National Bank of Uzbekistan. It is also the developer of an advanced Russian version of the Universal Electronic Payment System (UEPS) for off-line Smart Card payments.

VeriFone says BGS will now offer solutions based on the VeriFone OMNI 395 terminal and high security SC552 Smart Card PinPad payment systems which display messages and print receipts in the Cyrillic typeface native to the CIS.

The company has a contract with Visa to enhance its current UEPS system and VeriFone terminal applications to support the new Visa Chip Off-line Pre-Authorised Card (COPAC) payment card as the future Visa brand product designed to meet the requirements for such markets as the CIS and other developing regions.

**Contact:** *Mark McMurtrie, VeriFone, UK -*  
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**E-mail:** *Mark\_ml@verifone.com*

## The Smart Way to Travel

Early this month, *Smart Card News* flew from London to Paris with AirJet to try out its pre-paid Smart Card scheme for business travellers (*SCN October 1995*). As promised we simply checked in 15 minutes before take-off. Our Smart Card "ticket" was read by the card reader at check-in and one flight was deducted.

The card costs £773 and is valid for five flights and a sixth free (£310 return, or £155 one way) including passenger/airport tax. Once the card is purchased the traveller can take advantage of an "arrive and fly" shuttle service between London City Airport and Charles de Gaulle Airport, Paris. The hassle of travel agents, booking and paper tickets potentially a thing of the past.

Our return journey with AirJet went equally smoothly. It was a champagne and caviar experience with the added luxury of leather seats, walnut tables and ample leg room.

A recent article in the *Financial Times* suggested however that "British travellers [and travel agents] still wanted traditional tickets." Judith Geerdink of AirJet agreed, describing the British traveller as conservative and suspicious in relation to their French counterparts. To familiarise them with the card system, the British are being offered a traditional paper voucher which they exchange for a Smart Card at check-in.

Judith assured *SCN* that "once tried people convert" and we would certainly agree. AirJet has set a standard of travel that other airlines would do well to emulate.

## BP Dutch Loyalty Card

The BP Premie Club (shown on cover) enables card holders in The Netherlands to collect bonus points for purchases and exchange them for free gifts in its service stations. Some 500,000 Gemplus GPM896 cards have been issued.

Also in Holland, Shell has about 500,000 card holders in its collective loyalty scheme which brings together the Air Miles card, the Albert Heijn chain of supermarkets, V&D department stores and ABN-Amro Bank.

## Mondex/CyberCash Agreement

Mondex International, the group of 17 financial institutions in four continents formed to implement the UK-developed electronic cash system globally, has announced a joint development agreement with CyberCash Inc., a leading developer of secure Internet payment solutions.

Under the agreement, CyberCash will integrate Mondex Smart Card technology into its CyberCash Wallet software alongside other global payments brands, enabling Mondex card holders to use their cards to make purchases over the Internet securely from any location - home, office, the Cyber Cafes which are starting to appear and the public kiosks currently under development. Cardholders will also be able to use the wallet and card to download and transfer funds. To access the Internet the card is inserted into a card reader connected to a PC.

"This partnership represents a major step forward in making Mondex the worldwide alternative to cash, both for the supermarket and the super-highway," said Richard Fletcher, Head of Strategy and Planning at Mondex International.

Bruce Wilson, CyberCash's Executive Vice President, Revenue and Corporate Growth, described the agreement as "another step toward the total integration of on-line finances."

**Contact: Takako Yamakura / Lizette Kodoma, Shandwick USA -Tel: +1 212 420 8100.**

## Five Card Contracts for Gemplus

Gemplus America Inc., has won five contracts with US mobile phone networks and expects to supply some 3 million SIM (Subscriber Identity Module) Smart Cards to them in 1997 alone.

The contracts with the PCS1900 digital networks - American Personal Communications, American Portable Telecommunications, Bellsouth, Omnipoint Communications and Western Wireless - also includes supplying software, point of sale equipment, and personalisation and over-the-air (OTA) services.

**Contact: Dr Patricia Neptune - Tel: +1 203 221 2820. E-mail: pneptune@neptunegp.com**

## Integrated Circuit Card Standards and Specifications - Part 2

The primary purpose of standards is to ensure interoperability between products from different manufacturers. This is an area that is often misunderstood and needs further elaboration. Last month we looked at ISO 7816-1 (physical characteristics) which defines the size of the card with the appropriate tolerances. Now quite clearly we cannot achieve interoperability if the cards are of different physical generation or if the electrical connector plate is positioned differently (This is the subject of ISO 7816-2 ). However we should not expect interoperability between different commercial applications. There is no way that a VisaCash application can interoperate with a Mondex application, it would be a nonsense to do so. This sort of discussion causes great anxiety with many retailers who inevitably envisage a row of terminals lined up at their point of sale. This of course is equally unacceptable but is not a necessary outcome if the products defined by the various application providers conform with the appropriate level of standards. This is really the importance of ISO 7816 which defines the interface with the application, this covers the physical property of the card, its electrical properties, the communication protocols and the basic command structures. In addition ISO 7816-5 also defines the registration of different applications that would allow a Smart Card terminal to interoperate with cards using products from different application providers. The retailer would have to decide which applications he wants his terminal to handle and this is largely a commercial issue.

An associated problem relates to the reliability of the Smart Cards both as a component and when operating as part of an integrated system. This is probably a more difficult problem and is as yet poorly covered by the ICC standards and specifications. Last month we discussed the tests described in part 1 of ISO 7816 and suggested that it did little other than to test the properties of the card plastic. This is certainly true of the bending and torsion tests. How about resistance to ultra violet light, X-rays and other forms of electromagnetic radiation. Well the truth of the situation here is that the semiconductor industry has learnt to cope with the hostile environments that their chips routinely experience. The automobile

industry is just one example where extreme temperatures and mechanical stress are commonplace. In general we can propose that if the human body can withstand it, so can the chip. I have personally seen Smart Cards that have lived through being put into washing machines, cookers and even microwave ovens. I cannot begin to explain all these situations but no doubt most of us are guilty of occasional strange behaviour.

So why do Smart Cards fail? In simple terms we can classify failure modes under two headings, operational and non operational. In the first case we are looking at failure induced through the use of the card in a terminal. For instance if the terminal applies 12 volts to the chip it will probably expire with some catastrophic electrical failure. Equally it is possible that bugs in the software of the card may result in the card misoperating or even going mute. This is somewhat different to the attack raised by Bellcore which is discussed elsewhere in the newsletter. A more obvious problem may occur when the power supply to the chip is suddenly removed at an inopportune moment. This may well result in corrupted data which the chip software must detect and manage appropriately, if necessary forcing the card to cease normal operation. There is nothing in the current standards and specifications to cover this class of problem.

The non operational failure mode really relates to the storage and transport of the Smart Card. This is the area that the standards attempt to address but in which they are decidedly lacking. What you would really like is some machine into which you drop a sample of cards as a result of which a display tells you the mean failure rate to be expected in field operation. Regrettably such a machine seems a long way off. We should also note that careless or deliberate abuse is a major contributor to the overall field failure statistics and if we remove these components from the figures many systems in use today could probably claim that their failure rates are no more than a few hundred part per million ( i.e. a reliability of say 99.98% ). In practice total failure rates are typically between 0.1 - 1%. Needless to say this is very much better than the reliability of magnetic stripe cards. Telephone cards do much better here because of the much smaller chip die size which is about 1 or 2 mm<sup>2</sup> compared with the 12 - 20mm<sup>2</sup> of the

typical microcontroller chips. In fact the biggest improvement to chip card reliability would come about by better educating the users to look after their cards.

The principal failure mode in this non-operational environment is mechanical failure either of the chip or the bond wires connecting the chip electrically to the front connector plate. It is remarkably difficult to devise tests that in any way represent the actual experience from field operations. It is here that the black art of the Smart Card industry comes to the fore. Different laboratories have devised their own particular tests, on which they compete to produce the most reliable statistic for field use. Without giving away trade secrets most of these tests are based on the application of dynamic forces to the various faces of the card.

**ISO 7816 part 2 - Contact Locations and Minimum Size**

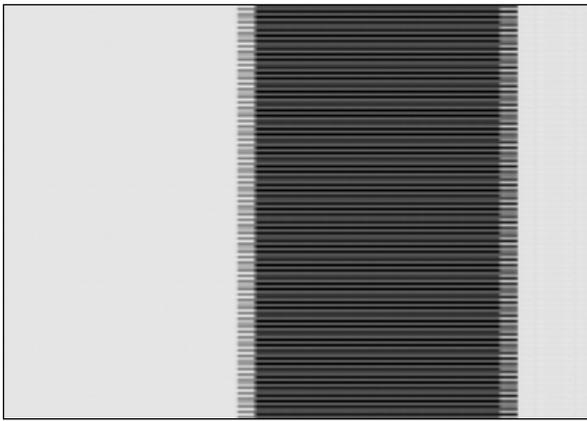
This part of the standard has taken a lot of effort in order to reach agreement. Early applications of Smart Cards emanated in France where the

Transac magnetic stripes were more central on the card than that eventually defined by ISO 7811. Unfortunately the French chip position overlaps the ISO magnetic stripe definition. As a result it was eventually agreed that after a transitional period ( to the end of 1990 ) the position for the IC connector would be as shown in *fig. 4*. This position is much closer to the longitudinal axis of the card. We might like to conjecture on which is the better position for the chip in terms of mechanical stress but perhaps we should just settle for agreement.

Further problems arose in deciding on which face of the card the connector should be located. In order to avoid further delay in publishing the standard, two options were allowed to include both the front and back of the card. This anomaly has been a source of irritation and it is now widely agreed that the IC connector should be on the front of the card. For this purpose the back is defined to be the side with the magnetic stripe. The embossing is defined to be on the front of the card and therefore on the same side as the IC connector. The relative location of these components (when present ) is shown in *fig. 5*. (See overleaf).



**Figure 4  
Contacts Location**



**Figure 5**  
**Relative Locations**

The electronic properties and transmission characteristics of the IC card are fundamental to interoperability. These specifications are defined by ISO as part three of the 7816 standard. This standard has been subject to a major revision and now exists as a 3<sup>rd</sup> committee draft. The principal subjects to be considered are as follows:

- \*Electrical characteristics
- \*Character transmission
- \*Answer to reset (ATR)
- \*T=0 transmission protocol
- \*T-1 transmission protocol
- \*Protocol type selection (PTS)

We will consider each of these topics in turn.

### IC Card Electrical Characteristics

We have previously discussed the position and definition of the IC connector and have identified 8 contacts of which 6 are currently defined:

$V_{cc}$	Power supply
GND	Ground or reference voltage
CLK	Clock
$V_{pp}$	Programming voltage
RST	Reset signal
I/O	Serial Input/Output

### Power Supply ( $V_{cc}$ )

The new committee draft defines two classes of supply voltage operation:

- Class A - 5V operation.
- Class B - 3V operation

Cards and interface devices may work in class A only, class B only or in both A and B defined as

class AB. It is further defined that the class B cards should not be damaged by insertion into a class A terminal. This is a pragmatic approach towards the evolution of lower voltage cards in an existing infrastructure. Clearly we must also in the future worry about lower voltage cards that may not be able to withstand a class A 5 volt interface device. The important point in this new committee draft (CD) is that the class AB terminals should first attempt to operate the card at the lower voltage or class B operation. The card is defined to only respond to reset when an acceptable class of operation is provided although its not clear how the chips would know since many chips will operate quite adequately at 3V even though this is outside the manufacturers specification. In the event that the card does not respond the terminal should attempt the next highest class ( where available ). The other important change in the CD is the respecification of the chip current consumption (  $I_{cc}$  ). This is now defined to be a maximum of 60mA ( previously 200mA ) at 5V operation and 50mA at 3V operation. There are some important improvements in the way these figures are defined and also in the definition of maximum current spikes on  $I_{cc}$ .

### Clock signal

Although the integrated circuit could contain its own clock circuit for driving the internal logic, in practice most IC chips are supplied with an external clock by the interface device. It should be noted that the speed of the serial communications on the I/O line is effectively defined by the frequency of this clock. The ISO standard aligns with the use of two widely used external clock frequencies, 3.579545 MHz and 4.9152 MHz. The former frequency is more widely used (being based on the NTSC colour sub carrier frequency) and results in a clock divider of 372 in order to produce a 9600 bit per second (not exact but within tolerance) serial communication speed. The latter frequency has a simple divisor of 512 in order to achieve a 9600 bit per second communication speed. The standard defines the situation after reset whilst allowing the frequency to be selectively changed by means of protocol type selection.

*David B Everett*

Next month - To be continued.

### Smart Card Diary

**CarteS 96**, CNIT, La Defense, Paris, France, 29-31 October.

International forum for plastic card technologies and applications with a major conference and exhibition. CEP Exposium / Cartes -  
Tel: +33 1 49 68 52 87. Fax: +33 1 47 37 75 09.

**CardTech/SecurTech West 96**, Convention Center, San Jose, California, USA, 10/11 December.

The third West conference will showcase over 80 exhibit booths. The focus of the show will be secured Internet commerce, multi-media applications, encryption issues, transportation and digital cellular programs. Kelly E Kilga, Marketing Manager - Tel: +1 301 881 3383.

**Smart Card Europe: Developing and Managing Smart Card Applications**, The Royal Lancaster Hotel, London, 11/12 December.

Conference focusing on the efficient deployment of Smart Card applications and how best these schemes can be managed. Pre-conference workshop, Introduction to Smart Cards, at same hotel, 10 December; and post-conference workshop on Smart Card Security, The Marble Arch Marriott Hotel, 13 December. IBC Technical Services -  
Tel: +44 (0)171 637 4383.  
Fax: +44 (0)171 636 1976.

**12th European Payments 96**, The Sheraton Grand Hotel, Edinburgh, 19/20 November 1996.

This conference provides an in-depth review of financial payment systems and includes items on cheque and card crime, utilising the internet for payments and contemporary and future views of the payments industry.  
Tel: +44 (0)141 553 1930 Fax: +44(0)141 552 0511.

**CARDS Hong Kong '96**, Hong Kong Convention and Exhibitions Centre, HongKong, 25-27 November 1996.

A three day symposium focusing on various trends and development in the Smart Card industry in Asia: Hong Kong, Taiwan, Korea, Japan and the Peoples Republic of China. The main areas covered will relate to personnel involved in the banking, finance, retail, telecommunications, healthcare and security industries.  
Tel: (852) 2520 2545 Fax: (852) 2591 1548.

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## Mondex UK University Pilots



Students at Exeter and York Universities are being issued with multi-purpose Smart Cards incorporating the Mondex cashless payment system.

Over 11,000 students and staff at the University of Exeter will be issued with the cards at registration together with balance readers to enable them to monitor the amount of value stored on their cards. To encourage use, NatWest, which developed the Mondex system, has pre-loaded all cards with £2.

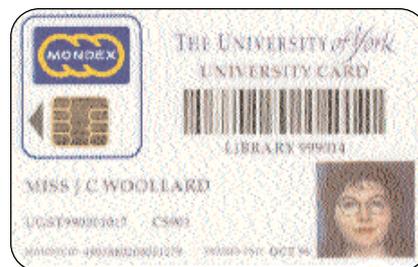
Called the NatWest University Card, it will be piloted throughout the academic year with the support of the National Union of Students.

The multi-function card will combine Guild/NUS membership, library facilities, access control to certain buildings, allow students to register their vote in local student elections, provide a range of discounts on goods and services inside and outside the University, and act as a phonecard. In addition, the Smart Card incorporates the Mondex electronic purse for cashless purchases which can be used in restaurants, bars, shops, vending machines, photocopiers and at payphones. Patrick Boylan, Managing Director of Card Services at NatWest, said: "The NatWest University Card is the most advanced card of its type in the UK, replacing a number of existing cards with a single, secure and easy to use Smart Card."

Four NatWest cash machines and around 30 BT telephones will be adapted to accept Mondex.



The card can be loaded directly from their account



if they are a NatWest customer. Eight special loading points have also been established throughout the campus allowing non-NatWest customers to transfer cash from their debit cards into Mondex value.

The University of York scheme being piloted by Midland Bank (joint developer of Mondex with NatWest and BT) is being issued initially to about 1,600 first-year students, but will be extended to include other students and staff once the system is established.

Called the University Card, it includes the Mondex electronic purse for cashless purchases throughout the University, photograph and student details for membership purposes, library barcode for usage and access and information for access to computing services.

As at Exeter, special card loading points have been installed and Mondex compatible BT payphones have been installed.



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