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SMART CARD NEWS

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Smart Cards in Finnish Health Care System

Multi-function Smart Cards are being used in experiments in Finland for refunding medical expenses covered by sickness insurance by The Social Insurance Institution (SII). The project, which has concentrated mainly on testing the technology, has involved experiments at the SII's own offices and in the cities of Tampere and Turku.

So far no decision has been made by the SII concerning extending the use of Smart Cards to other SII services which include pension insurance, rehabilitation, unemployment protection and disability benefits.

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Smart Card News

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Next Month

Smart Card Tutorial Part 4 - Electronic Signals and Transmission Protocols.

Smart Cards in South Africa.

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The SII have been experimenting with Smart Cards since 1989. Markku Kiiski, Section Head of the SII's ADP-Center, says: "The most interesting feature of the Smart Card is the improved level of data protection. Another special characteristic is the independence and individuality that it affords. The cardholder carries around a small data bank with a data application which he can use - or not use - as he wishes."

The objectives of the experiments are to:

Explore the Smart Card as a means of data transfer between various organisations.

Evaluate the multi-function capabilities of the card.

Test Smart Card products of several vendors.

Evaluate technical reliability of hardware and software products and routines in public use, and

Examine how people feel about carrying and using Smart Cards as a personal information tool.

First experiment

The first experiment involved the SII's own staff in setting up an application used by the staff physician for the recording of prescriptions on about 300 employees' Smart Cards. The cardholder could then use his card to obtain the medication prescribed from a pharmacy which had signed on to the project.

This experiment was expanded in 1990 to include banking services. The Finnish bank, Postipankki, and IBM Finland co-operated in evaluating the multi-function capabilities of the Smart Cards. Cardholders were able to make an arrangement with their banks to have their current account linked to the Smart card which was used to interface with an ATM. The card could be used as a cash card and security was provided by a password selected by the cardholder and comprising four to eight characters. The experiment ended last April.

Tampere and Turku experiments

In March 1991 the project was extended to the city of Tampere, where about 3,200 people were involved; and in November 1991 to the city of Turku, where some 2,000 residents participated.
In these current experiments, each participant receives their card when visiting their personal doctor. The card contains the cardholder's name, registration number and details of their doctor. The card also holds personal data, for example, the cardholder's right to preferential refunds on medical expenses.

Doctors involved in the project write their prescriptions into the Smart Card's memory using a PC. To do this the Doctor has a personal "authorisation card" which enables him or her to read and write data on the patient's card. Verification of their authorisation to write Smart Card prescriptions is by signature sample in Tampere and a PIN in Turku.

The signature verification method used is based on IBM dynamic signature technology. A template of the authorised user's signature is stored in the card and is checked by the PC.

Under the Personal Register Act in Finland, individuals have the right to see all information stored on them in data files, and on request the doctor is able to print out the contents of the patients' Smart Card's memory.

In participating pharmacies there is a Smart Card reader attached to a PC and the pharmacy has the same type of "authorisation card" as the doctors to enable staff to read and write Smart Cards. For dispensing purposes items are selected on the PC's screen and appropriate labels are automatically printed out. The card is updated with the dispensing information. At the same time, information on charges for the medicine is recorded on the pharmacy's computer and later transferred to the SII.

The SII refunds medical expenses on prescriptions and with the Finnish pharmacies have devised a system whereby customers can have the refund deducted from the cost of the prescription at the time of purchase. The pharmacy is later reimbursed by the SII on their sales receipts.

Details of card used in Turku:

Card type	Contact
Fabricator	Setec Oy, Finland
Dimensions	ISO 7816-2
Contact location	Front
Chip manufacturer	Motorola
Chip Ref No.	MCC 68HC05 SC21
Chip type	CPU
Memory type	EEPROM
Memory capacity	
Mask ROM	6Kb
EEPROM	3Kb
RAM	128b
Standards	ISO 7816-3
Comms protocol	T0
Security	PIN (0-8 digits)
Cryptography	DES
	FEAL

Details of card used in Tampere:

Type	Contact
Fabricator	Setec Oy, Finland
Dimensions	ISO 7816-2
Contact location	Front
Chip manufacturer	IBM
Chip type	CPU
Memory	EEPROM
Memory capacity	
Mask ROM	10Kb
EEPROM	8Kb
RAM	256b
Standards	ISO 7816-3
Comms protocol	T14
Security	PIN (0-8 digits)
Cryptography	DES

Findings

Mr Kiiski says: “Early results of the experiments indicate that the Smart Card as a technical product works as expected, but the size of the chips memory proved to be too small for this type of application. A survey of user opinion is to be carried out in November.”

Dudley TEC Using Smart Cards

Dudley Training and Enterprise Council, one of 12 TECs in the UK, has launched a Smart Card application to administer the progress of people who have been made redundant and are seeking employment. Clients, who normally receive vouchers up to the value of £100 to have access to professional advice and guidance on job seeking and re-training from a number of local organisations, will now be issued with TECFUTURES Smart Cards.

Chris Parlett, Executive Manager of JerseyCard Ltd, who are supplying the Smart Card technology to Dudley TEC, said: “Each client enroling will receive a Smart Card with an individual PIN number. The organisations providing the consultancy services each have a reader terminal on which the details of each client/consultant meeting will be entered. This covers the length of the meeting.”

The terminals produce a receipt in duplicate, one for the client and one for the consultancy organisation, and the terminals are programmed to telephone JerseyCard overnight to down-load the information from each meeting. Reports are produced with a copy going to the TEC to allow monitoring of the progress of each client and action payment to the consultant organisations.

Benefits of the scheme are seen as the automatic recording of the details of each client’s progress and the simultaneous recording of the consultants’ claims for payment by the TEC, with a significant reduction in the associated paperwork.

Eight hundred Gemplus Smart Cards have been supplied to Dudley TEC initially and the TEC aims to have put 1,000 clients through the TECFUTURES project by March 1993.

John Woodall, Chief Executive at Dudley TEC, says that in addition to practical and financial benefits, “we believe the issue of individual, high-technology Smart Cards will give clients a keen sense of professional involvement as well as simplifying the procedure for all those involved.”

Contacts: Chris Parlett of JerseyCard - Tel: 0534 37713; or Yvonne Peers at Dudley TEC on Tel: 0384 485000.

Visa Supports Smart Cards

Visa International has announced that it will support Smart Card technology to assist member financial institutions who want to adopt it in their local markets.

In a statement in San Francisco, Visa said it was implementing a new, comprehensive payment service strategy, including support for the full range of payment service options.

Roger Peirce, Executive Vice President, commented: "Since telecommunication costs are the single biggest obstacle to on-line authorisations, the Smart Card approach has proven to be an effective way to keep costs under control without jeopardising card issuers' efforts to control their risks."

Michael Sherman, International Public Relations, said: "It is the most effective alternative to the on-line authorisation, but we are, and remain, committed to the magnetic stripe for on-line and that will continue to be the standard for international card use."

Visa has been following Smart Card developments in Europe, and particularly in France where more than 8 million Smart bankcards were issued by the end of 1991. By 1995, all French bankcards will be converted to Smart Card technology with some 20 million Smart Cards in the marketplace.

In fact the Smart Card technology endorsed by Visa is largely based on the system currently in place in France where Smart Cards allow point-of-sale terminals to immediately validate PIN codes and thus verify the authenticity of the card. For purchases exceeding floor limits, on-line authorisation by the issuers is required to minimise the risk of charge-offs. Terminals capture all transactions at the point-of-sale and clear them once or twice a day with the merchant's bank.

Although the manufacturing costs of a Smart Card are relatively high (approximately $3-$4 each) and IC cards are not fully standardised on a world-wide basis yet, "we see the combination of Smart cards and PIN-codes as the only effective reliable alternative to on-line authorisation," said Pino Francini, Visa International's Executive Vice-President of Corporate Planning.

Card Collectors' Service

Danmont, the company formed by the Danish telephone companies and banks to introduce prepaid Smart Cards throughout Denmark, has launched a "Collectors' Service" to make available their colourful range of cards for people who collect telephone and other kinds of payment cards.

Collectors who send their name and address to Danmont will receive information about new cards being issued. So far, between 125-150 people have registered and Danmont have initially ordered 250 of each series of cards in their scheme.

Henning Jensen, Managing Director of Danmont, says the scheme was prompted by the number of inquiries they received from collectors all over the world. They also discovered that their demonstration card was being traded in Denmark for £2.50-£3 when they were giving them away free.

"A private collector advised us how to set up a collectors' service so the private collector has the chance to obtain these cards without being overcharged by the people who are trading them," he said. The cards will be sold for the cost of the card, the card value plus an administration fee.

Contact: Danmont - Tel - +45 4344 9999. Fax - +45 4344 9030.

Health Card for Scotland?

The Management Executive of the National Health Service in Scotland are considering the potential of using Smart Cards as patient health care cards containing their medical records.

A spokesman for the Scottish Office said the idea of using Smart Cards in this way was in line with their Information Technology strategy. "It is under consideration at the moment but no decision has been made although that is expected shortly," he said.

European Harmonisation

The European Commission directive that member countries must have harmonisation of European payphones in major sites frequented by travellers has put pressure on PTTs to conform while they anxiously watch the progress in Smart Card technology by countries like France and Germany.

In the UK, British Telecommunications is said to be actively evaluating IC Card technology for payphones although no trials have as yet been announced. Industry sources say the move comes as a result of a study carried out for BT by Management Consultants Coopers & Lybrand Deloitte.

In the short term there appears to be little advantage in BT changing from its present optical card, but presumably the Study came up with a positive business case. This clearly cannot be on simple cost as the Smart Card is more expensive, and some industry experts would question whether the memory card would be any more secure than the optical card as there have been numerous cases of fraudulent use of memory cards in France.

However, BT must see other advantages perhaps in greater reliability of the Smart Card, in the cost of the infrastructure or in new business services. Bearing in mind the fierce competition in the telecomms industry, BT is continually looking at new and value-added services to offer to its customers and perhaps the Smart Card will form the basis for some of these.

BT is currently tight-lipped on this subject and we await further developments.

Southampton For Smart Cards

Residents in Southampton and the Solent area may soon be able to use Smart Cards as account cards, membership cards or an electronic purse which can be recharged with value.

Discussions are taking place with JerseyCard Ltd, who have been operating a Smart Card system since 1987, and it is expected that an announcement will be made early next year.

McCorquodale Irish Distributor

McCorquodale Smart Card Systems has appointed Dublin-based Wordnet, supplier of self-service lobby technology to the banking industry, as Irish distributor of Smart Card system software and equipment.

“Wordnet’s extensive experience of new product development and providing technological solutions for major retail banks such as AIB and Bank of Ireland, will enable the company to deliver effective solutions to an important market place,” says Trevor Crotch-Harvey, Managing Director of MSCS.

Contact: Aongus Geraghty, Wordnet - Tel: +3531 8680752.

Golf Driving Range Project

East Kilbride (population 70,000) near Glasgow in Scotland will be the centre for the first state-of-the-art Pro Range Golf driving range featuring Smart Card technology. It is hoped that this unique facility will have the same impact on the game of golf as automated Ten Pin bowling did on traditional pub skittles over 15 years ago.

At the complex, clients pay a £2 deposit to receive a Smart Card to which they then add an agreed value of money. This amount is then converted to tokens equating to individual golf balls and electronically stored on the card.

The customer then enters one of the 38 individual driving ranges built on two levels, and inserts the card into a Smart Card reader mounted on the wall. A tap of the golf club on a pressure sensitive pad releases a ball from the bay onto the driving mat. The golfer can continue driving the balls until the card needs to be re-charged.

Over 15,000 balls are present in the complex and each is electronically tagged to prevent theft (a major problem on traditional ranges). Each bay can contain up to 80 balls and the balls are re-circulated from the range area via a continuous moving sub-surface conveyor belt and an air-driven delivery tubing system.

Built at a cost of around £2.5 million, the facility includes over 15,000 Sq. metres of astro-carpet, a

golf and leisure wear shop and a bar and snack area and a steel perimeter fence over 100 feet high (shortly to be included in the Guinness Book of Records as the highest free-standing fence in the world).

The card chosen for this project is the GPM416 memory card from Gemplus Card International. The ICC offers the security necessary for an electronic purse. The initial order was for 10,000 cards but this is expected to be increased as they are fast becoming collectors' items.

Managing Director Steve McKenzie and his leisure management team spent 18 months studying American and Japanese facilities and added some ideas of their own before coming up with the final design. He is hoping to recover the investment within 18 months.

It was decided to use Smart Cards to solve the problem of using secure and expensive cash handling machines. An additional benefit is that the customer is paying in advance and there is no need to book a driving range.

The system was integrated and designed with unique software and Smart Card operating functions by Cardinal (UK), and the card readers were supplied by Schlumberger.

Contact: Simon Reed of Charta Associates Ltd - Tel: England +44 (0)442 231844. Fax: England +44 (0)442 236604.

Portuguese Electronic Purse

Portugal is developing an electronic purse system using a rechargeable Smart Card. The initiative comes from Multibanco, owned and managed by SIBS (Sociedade Interbancaria de Servicos SA), a private company set up by most of the banks operating in Portugal.

Rui Ferro Meneses, of SIBS, says the Portuguese Electronic Purse (PEP) will be aimed at low value amounts and will be marketed to users as a replacement for the usual currency they carry.

He told delegates at the Retail Solutions 92 Conference in London last month: "To have an electronic purse will be equivalent to carrying a conventional purse loaded with coins and notes." Users will be able to load the cards at an ATM and it will be a more convenient means of payment for transactions that can average 3 or 4 ECU, he said.

The new card will be marketed by the banks and benefit from the existing ATM and POS infrastructure in Portugal. The new service will be managed by SIBS who will also be responsible for the clearing and settlement between the banks and the retailers or service providers.

"The intervention of the banking community,"said Mr Meneses, "will allow the development of a universal service in Portugal, carrying all the advantages of an inter-banking system with generic acceptance and use."

Benefits

He gave a summary of the benefits. Retailers and service providers will find it easier to handle PEP payments than cash, electronic money is safer, as payments will be in the exact amount there is no need to give change, the money received will automatically be credited to his bank account, operators of self-service equipment will not have the cost of processing coins and upgrading to new currencies.

For the consumer the card will be more convenient and payment will usually be faster.It can be offered or exchanged without restrictions (provided that it is not in a card related to a bank account because of other services included).

For the bank/issuer the main advantages are seen as reducing the need to handle cash, the value loaded in the PEP will stay in the bank until it is paid to a service provider, attract new clients and allow new product packages and commercial opportunities with service providers.

Gradually most POS terminals will be equipped with the card reader. At the same time Multibanco are considering issuing terminals to taxis, markets, transport systems and automated self-service systems, parking etc.

Keeping up with Standards

CEN - Comite Europeen de Normalisation (European Committee for Standardisation)

Technical Committee 224 (TC 224) was set up by CEN in February 1990 to establish European standards for inter-industry use of plastic cards and associated device interfaces, with special emphasis on Integrated Circuit Cards.

These standards will be in accordance with ISO (International Organisation for Standardisation) unless there are special reasons why not. A wide-ranging work programme through 13 Working Groups has been agreed and includes the following:

WG 1 - ICC physical characteristics

Convenor: Dietrich Hartmann, IBM, Germany.

Additional electrical specifications for asynchronous cards
Position of contacts (of ISO 7816-2) for cards and devices used in Europe
Tolerance ranges for IC cards
Extended data transfer rates
Additional ICC formats (size and physical characteristics)

WG 2 - General concepts

Convenor Andre Michaud, ECPS, c/o Groupement des Cartes Bancaires.

General concepts applying to systems using IC cards in inter-sector environments
Specifications (formats and codes) for identification and registration procedures

WG 3 - Device Interface Characteristics

Convenor: Bernard Bourin, Dassault Automatismes et Telecommunications

Device interface classes
Tolerance ranges for devices

WG 4 - Communication with ICC

Convenor: Michael Hegenbarth, DETECON GmbH

Inter-sector data elements
Command classes
Inter-sector messages between cards and devices

WG 5 - Communication Between Device and Host

Convenor: Work suspended at this stage

Inter-sector application messages between devices and host

WG 6 - Man-Machine Interface

Convenor: Michael S Radley, Siemens Nixdorf Informationssysteme

Ergonomical specifications - key pad layout
Ergonomical specifications - requirements for persons with special needs
Ergonomical specifications - Icons and pictograms

WG 7 - PIN Presentation

Convenor: Andre Michaud, ECPS, c/o Groupement des Cartes Bancaires

Rules for PIN handling in an inter-sector environment

WG 8 - Thin flexible cards

Convenor: Michel Gaucher, Dassault Automatismes et Telecommunications

WG 9 - Telecommunication Applications

Convenor: Ove Bardenfleth, Copenhagen Telephone Company

Requirements for IC Cards and terminals for telecommunications use
Part 1: General concepts applying to systems using IC Cards in telecommunications environments
Part 2: Security specification using IC cards in telecommunications applications
Part 3: Application independent card requirements
Part 4: Application independent card related terminal requirements
Part 5: Payment specification for the use of telecommunications IC cards in telecommunications applications
Part 6: Telecommunications features
Part 7: Security module
Payphones specific application requirements for cards and interfaces
GSM mobile telephone, application in multifunction telecommunications cards

WG 10 - Payment Specification for Financial Transactions ICC Applications

Convenor: Ole Lachmann, Danish Development Service

Intersector electronic purse

WG 11 - Transport Applications

Convenor: Robert Libbrecht, Ertico

Data elements to be used in surface transport applications

WG 12 - Health Applications

Convenor: Philippe Cirre, Centre hospitalier

General characteristics for health care cards
Logical organisation of data on patient data cards
Logical organisation on health care professional cards
Security functions for health care cards

WG 14 - Airline Applications

Convenor: Work suspended at this stage

Data elements to be used in airline ticketing

CEN is based at rue de Stassart 36, B-1050 Brussels, Belgium. Tel: Belgium (32) 2 519 6811.

Smart Card Diary

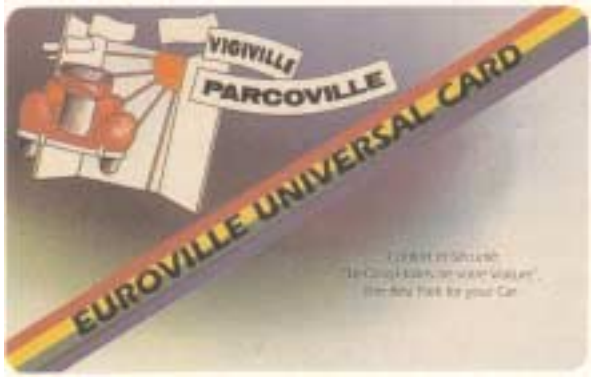
Smart Card '93 Conference and Exhibition, Wembley Conference Centre, London, 16-18 February.

Six conference streams covering communications, market overview and marketing systems, finance and security, medical, technology and innovations, and transport and travel. In addition there will be a half-day seminar on 15 February providing a practical introduction to Smart cards for new and potential users. A second hall has now been opened for exhibitors. Contact Conference Secretariat Tel: +44(0)733 394304.

CardTech/SecurTech/ISSA '93 Conference and Exhibition, Hyatt Regency Hotel, Crystal City, Virginia, USA, 18-21 April.

Ten concurrent seminars will be held throughout the three main days of the conference - CardTech tracks stressing applications of advanced card technologies, SecurTech tracks addressing specific applications, and ISSA (Information Systems Security Association) tracks focusing on security. A major exhibition is being run in conjunction with the conference. Contact: Ben Miller (CTST) Tel: +1 301 881 3383.

Parcoville - A Smart Card Automatic Parking Scheme



Parcoville is a new word in the French language for a revolutionary automatic car parking system using a Smart Card. It is now available in several French cities and towns and is starting to spread into the rest of Europe with projects completed, or under contract, in Belgium, Spain and Portugal.

The problems facing inner city planners are well-known when it comes to providing parking space in congested areas where sites are seldom available, land price is at a premium and there is usually strong opposition from residents and preservation groups who do not want to see another sprawling and unsightly building being erected or a large central area taken up with parked cars.

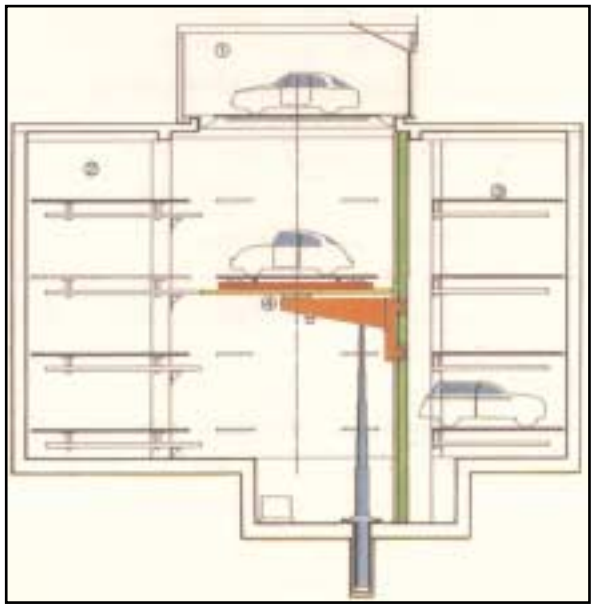
The French have come up with an avant-guardiste system whereby cars are parked underground with minimal impact on the environment. A Parcoville consists of a cylindrical underground building 19 metres in diameter and about 13 metres in depth able to accommodate 55 cars. It can be built underneath a building, squares, roads or gardens. Only the car reception bay is above ground.

The French company, Procedes France Parking (PFP), says that to park 55 cars longitudinally would require approximately 300 metres of space, while in Parcoville only 50 square metres are taken up by the reception bay and entrance.

When the motorist arrives he inserts his Smart Card in the reader at the reception bay at ground level. Ten seconds later, the door opens (the card is still in the reader) and he drives into the reception area, positioning the vehicle on a special platform. Five cameras ensure that the car is positioned correctly. If not, instructions appear on a large screen, advising the driver perhaps to drive further forward or close a door properly. He then leaves the reception area and pushes the “yes” button of the reader to close the door. If there is no-one in the reception area and the car is parked properly, the driver can take his card back to close the door. If there is a problem, for example, someone is still in the car, the door opens again. When all is correct the car is taken underground on the plate it is parked on by a computerised hydraulic system. Cars are parked in a daisy system allowing the maximum use of space.

The parking plates are the only elements manipulated by the robot lift apparatus which has a central turning platform and a horizontal transfer trolley.

When the driver returns, he simply inserts his Smart Card into the reader to reorder his car by paying for his parking time fee (which is deducted from the card). The card provides the information on which enables the system to retrieve his car in a maximum time of 90 seconds. The car has been turned round for him ready to drive out.



1.Reception Bay, 2. Parking place, 3. Parking deck and 4. Lift and transfer trolley

The cards can be purchased at any reception post at a cost of 20 francs, which includes 10 francs of credit. They can be recharged at any of these machines up to any value the motorist wishes by inserting the appropriate amount of cash. Later this year drivers will be able to use their credit cards to top up the value of their Smart Card.

The philosophy behind Parcoville is to have a number of underground car parks close to shopping or residential areas where they are needed.

There are several important advantages for motorists. The car is secure and cannot be stolen, broken into or vandalised when he is away on business. It won't be damaged, for example, by other drivers carelessly opening their doors. It is protected from the weather. It is also delivered back to him automatically and ready to drive away so there is no danger of him being mugged in a car park. There is also the convenience of using a Smart Card instead of fumbling in his pockets for money.

Vigiville

In another interesting development, PFP have introduced Vigiville which is another system for controlling street parking. Numbered parking bays are marked at right angles to the road and the motorist drives in over a telescopic bollard which rests level with the roadway. When he is parked the bollard, which is controlled by underground sensors, either rises behind the vehicle after a predetermined time, or when the Smart card is inserted in the controlling machine. This prevents fraud by motorists who don't pay for a parking place ticket, and safeguards the car from being stolen. The bollard does not retract until the driver inserts his Smart Card on his return and has the appropriate fee deducted from the card.

PFP have standardised their systems so that the same card can be used for Parcoville, Vigiville and in ticket machines used for payments in more conventional type parking areas. Thus the same card can be used in any town, city or country where PFP schemes are available.

PFP Locations

Country	Town	Parcoville	Vigiville	TicketM/Cs
France	Chamalieres	4	-	54
	Cluses	3	3	46
	Decazeville	1	3	-
	Perpignan	6	4	100
	Toulouse	2	-	-
	Toulouse[1]	12	-	-
Belgium	Charleroi	7	7	-
Spain	Blanes[1]	3	-	12
Portugal	Porto[1]	7	14	-

Note: 1 At this stage only the contracts have been awarded.

Card details:

Type	Contact
Fabricator	Gemplus
Dimensions	ISO ID1 size
Contact location	ISO 7816-2 Front
Chip manufacturer	SGS-Thomson
Chip type	Memory + logic
Memory type	EEPROM 416 bits
Standards	ISO 7816-1 ISO 7816-2

Contact: Luc Lacoste, Procedes France Parking, 1 rue du Mont-Perdu, 31240 L'Union, France. Tel: +33 61 35 27 27. Note: 1 At this stage only the contracts have been awarded.

INTAMIC To Be Disbanded

INTAMIC, the International Association for the Microcircuit Card, is to be disbanded at the end of this year following the withdrawal of several key member countries from the Association. Set up in 1981, it has been active in the creation of IC card standards as they affect the financial sector, and latterly has concentrated more on the business issues and application developments.

The forum has produced 35 publications on aspects of Smart Card technology relating to the financial sector. Among its achievements have been its influence in widening understanding of Smart Cards and influencing standardisation in bodies such as ISO (International Organisation for Standardisation) and CEN (Comite Europeen de Normalisation), including, for example, agreement on one location for the chip contacts.

The main organisation now representing financial interests in IC Card standards is the European Committee for Banking Standards (ECBS).

Physical characteristics of the Contact Card

Many observers have commented that the widespread use of smart cards is being impeded by the lack of standards. Interoperability is of course the name of the game and is the primary purpose of standards. The problems of interoperability start at the bottom, in other words with the physical dimensions of the card and the location of the contacts.

These standards are well established and as we shall show in subsequent parts so are the more important characteristics of a smart card that form the basis of the existing and emerging standards. As you move higher in the architecture towards the specification of the application then the problems of interoperability are less relevant since it is not generally necessary to have compatibility between the applications themselves. The biggest hole in the current standards work is the lack of agreement in the security domain which one might argue is fundamental to the application platform. We will discuss this area however in more detail in a subsequent part of this series.

The physical characteristics of an IC card are defined in ISO 7816 part 1. This standard applies to the ID - 1 identification card specified in ISO 7810 and includes cards which may have embossing or magnetic stripes. Whilst we are all familiar with the use of imprinters to obtain a printed version of the embossed characters on some paper voucher, their viability on an IC card must be questionable. The IC module in a smart card is like any other electronic component and is not normally expected to be hit with a hammer at regular intervals. Even the embossing process itself is mechanically stressful and must raise serious doubts over the appropriate migration strategy.

The physical properties of the contact IC card are referenced against earlier card standards and we will look at each of them in turn.

ISO 7810 Identification cards - Physical characteristics (1985)

This standard specifies the physical characteristics of identification cards including card material, construction, characteristics and nominal dimensions for three sizes of cards (ID - 1, ID -2 and ID -3). It is the ID -1 card that forms the basis of ISO 7816 -1.

The principal parameters of ISO 7810 are the dimensions of the ID -1 card which are defined to be, 85.6mm x 53.98mm x 0.76mm

ISO 7811 Identification cards - recording techniques (1985)

This standard is in five parts and covers the specification of the magnetic stripe and the card embossing.

Part 1 Embossing

This part specifies the requirements for embossed characters on identification cards for the transfer of data by imprinters or by visual or machine reading.

Part 2 Magnetic stripe

This part specifies characteristics for a magnetic stripe, the encoding technique and coded character sets which are intended for machine reading.

Part 3 Location of embossed characters on ID -1 cards.

As the title implies this part of the standard specifies the location of embossed characters on an ID -1 card for which two areas are assigned. Area 1 is for the number identifying both the card issuer and the card holder. Area 2 is provided for the cardholder identification data such as his name and address.

Part 4 Location of magnetic read only tracks - tracks 1 and 2

This standard specifies the location of the magnetic material, the location of the encoded data tracks and the beginning and end of the encoding.

Part 5 Location of read - write magnetic track - track 3

This standard has the same scope as part 4 except that it defines the read - write track 3.

ISO 7812 Identification cards- numbering system and registration procedure for issuer identifers (1987)

This standard relates to the card identification number or PAN (Primary Account Number) which consists of three parts, the issuer identifer number (IIN), the individual account identifier and the check digit.

ISO 7813 Identification cards - Financial transaction cards (1987)

This standard defines the requirements for cards to be used in financial transactions. It specifies the physical characteristics, layout, recording techniques, numbering system and registration procedures. It is defined by reference to ISO 7810, ISO 7811 and ISO 7812.

In particular the standard defines more precisely the physical dimensions of the card as follows,

Width	85.47mm - 85.72mm
Height	53.92mm - 54.03mm
Thickness	0.76mm $\pm$ 0.08mm

The thickness of the card is particularly important for smart card readers because of the mechanical construction of the card connector mechanism.

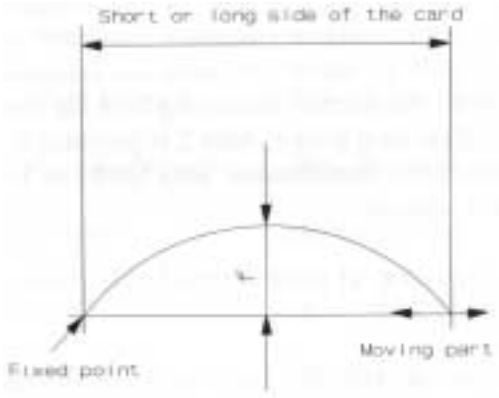


Figure 1
Banding Test

This device often consists of a movable carriage that positions the card under the connector head whilst applying the necessary wiping and pressure action.Variation in thickness or even slight warping of the card can cause communications failure.

ISO 7816 Design and use of identification cards having integrated circuits with contacts (1987)

This standard in its many parts is probably the most important specification for the lower layers of the IC card. The first 3 parts in particular are well established and allow total physical and electrical interoperability as well as defining the communication protocol between the IC card and the CAD (Card Acceptor Device).

Part 1 Physical characteristics

The physical dimensions of the IC card are defined as that specified in ISO 7813. It should be noted that the thickness dimension does not include any allowance for embossing. More particulary the slot for a card may include an extra indentation for the embossed area of the card. In effect it acts as a polarisation key and may be used to aid the correct insertion orientation of the card. This is an additional characteristic to the magnetic field sensor which operates off the magnetic stripe and is used to open a mechanical gate on devices such as ATM's where some vandal proofing techniques are required.

The part 1 standard also defines additional characteristics that should be met in the manufacturer of an IC card. These characteristics fall into the following categories,

- Ultra violet light
- X - rays
- Surface profile of contacts
- Mechanical strength (of cards and contacts)
- Electrical resistance (of contacts)
-Electromagnetic interference (between magnetic stripe and integrated circuit)
- Electromagnetic field
- Static electricity
- Heat dissipation

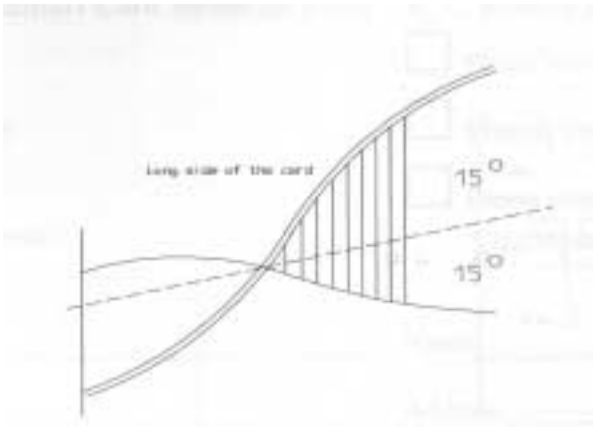


Figure 2
Torsion Test

It has to be said that this part of the standard could be improved and there is currently some work taking place in ISO on this very subject. The three most widely used tests applied by fabricators are specified in the annex to the standard,

A1 Bending properties
A2 Torsion properties
A3 Static electricity

Whilst this is certainly one way of comparing cards fabricated by different companies, whether it bears any relationship to the use of IC cards in the field seems debatable.

The bending properties are tested by deflecting the card on each axis as shown in fig. 1. With a periodicity of 30 bendings per minute the card is deflected to 2 cm at its centre from the long axis and 1 cm from the short axis. The recommended test requires the card to withstand 250 bendings in each of the four possible orientations (i.e 1000 bendings in total).

The torsion properties of the card are tested by displacing the card $\pm$ 15^{o} about the long axis at a periodicity of 30 torsions per minute (fig 2). The standard requires the card to withstand 1000 torsions without chip failure or visible cracking of the card.

The resistance of the card to static electricity is defined by a test set up as shown in fig 3. The test voltage is defined to be 1.5KVolts. The specification requires this voltage to be discharged across each of the contacts in both normal and reverse polarity. The IC should still be operational at the end of the test.

One of the issues surrounding the use of the IC card relates to the temperature range for operational use. ISO 7810 defines that the ID-1 card should be structurally reliable and usable between -35^{o}C and +50^{o}C. The draft CEN standard on requirements for IC cards and terminals for telecommunications use, part 2 - application independent card requirements (EN 726-2) defines more stringent requirements for operational use as -25^{o}C to +65^{o}C with occasional peaks up to +70^{o}C. In addition the draft identifies multi-application cards for portable battery operated equipment to be used between -25^{o}C and +70^{o}C with occasional peaks of up to +85^{o}C. The word occasional is defined to mean not more than 4 hours each time and not over 100 times during the life of the card.

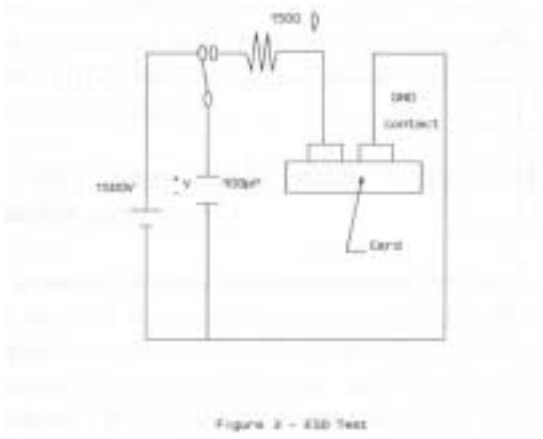


Figure 3 - ESD Test

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.

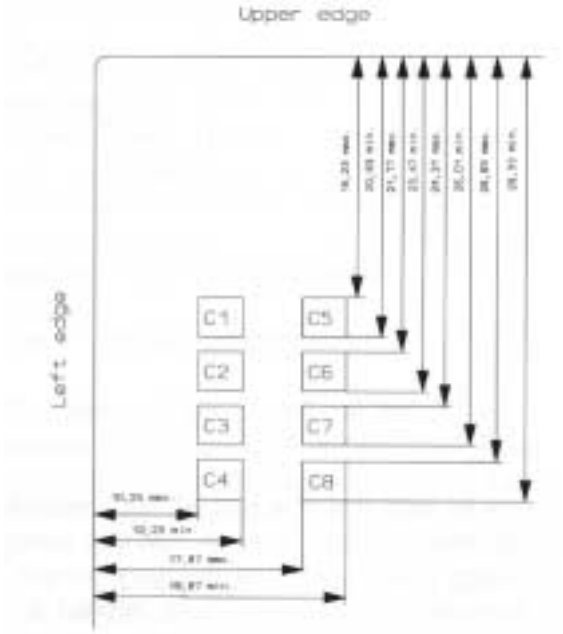


Figure 4 - Contacts location

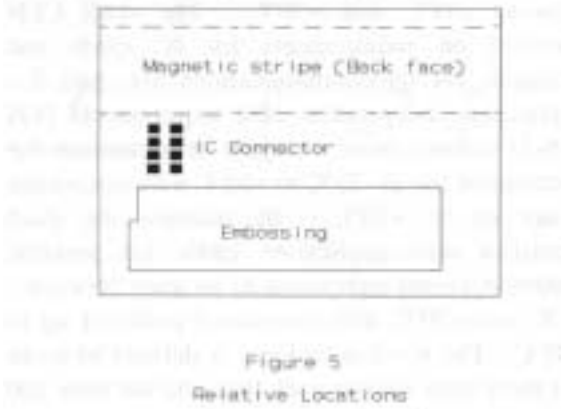


Figure 5
Relative Locations

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.

Swiss PTT Postcard

Postcard, the Swiss PTT integrated payment card trial project in Bienne, is based on Bull CP8/M4 64Kbit EPROM card technology and is used as a debit card for cashless payments at points of sale.

"This consolidated card represents a great step forward on the road to a single card," said Beat Tschannen, Head Project Manager, speaking at the Retail Solutions Conference in London last month.

The multifunction chip card with rechargeable prepayment facility is seen as a step towards standardising and simplifying operations in the plastic money sector. The aim is to avoid any further proliferation of cards and to eliminate as many as possible with the ultimate objective of reducing the number of cards needed to pay for all PTT transactions and services.

Mr Tschannen said the project in Bienne (50,000 population) represented the first-ever field trial of a card combining a variety of features such as debit, prepayment and identification functions. Since the project started a year ago, some 10,000 residents have been able to use their Postcard at a number of retail shops, hotels, restaurants, and petrol stations. They have also been able to use it to purchase rail tickets, pay for stamps, make telephone calls, bus journeys, visit the cinema and indoor swimming baths, make cash withdrawals, and even buy a Big Mac at McDonalds. The card provides identification of the cardholder by a PIN, and the card can be recharged at 30 payphones, three post offices or the Postgiro centre.

Progress in GSM - The Global System for Mobile Communications

Mobile telecommunications operators are starting to roll out the planned pan-European digital cellular radio telephone network with several countries now offering subscriber services. But the major impetus is likely to occur next year as the networks are extended. In Britain, for example, Cellnet and Vodafone are scheduled to begin public services next year.

GSM, originally called Groupe Speciale Mobile, was set up by telecommunications operators in a large number of European countries to establish a standardised pan-European cellular radio telephone network which would enable users to make or receive calls in any of the member countries.

But this original concept has changed dramatically with several Eastern European countries planning to join in and Australia, Hong Kong, New Zealand, Singapore and the Middle East looking to take up GSM. There is interest too in the United States but this will be a more difficult market in view of its heavy investment in its own technology.

In the United Kingdom, the Vodafone network now covers London and a large area of South-East England, and is planned to expand to Bath, Birmingham, Liverpool and Blackpool by the end of the year. Start of public service is scheduled for July next year, but Vodafone hope to be able to offer public services early in 1993.

Cellnet, the largest of the UK cellular operators does not plan its commercial launch until June 1993. It takes the view that the time is not yet right for the UK market with GSM not sufficiently proven to be able to provide the service that customers expect.

A major concern of Cellnet is that prices of approved GSM phones will be high for some time and the most popular handportable type will not be widely available until the middle of next year. In addition the possibility of "pan-European roaming" is considered as not likely to start to become a proposition until late 1993 and beyond.

In the meantime, Cellnet has been doing trial network tests in London and while some infrastructure is already in place another £30 million of GSM equipment has been ordered with a projected investment of £100 million.

"Customers buy benefits, not technology," says Mike Short, Contracts Director, Cellnet. "Quality of service, handset portability, value for money and a range of useful features are the key criteria of a mobile phone service."

The GSM system uses a Smart Card, known as a SIM (Subscriber Identification Module) to allow the mobile equipment to be standardised and personalise it by providing the data necessary to access the network, authenticate and bill the holder of the card. The SIM is also available in a small plug-in format.

One thing looks certain, the GSM application for Smart Cards is the most important single Smart Card application in the world. By 1996, according to Carl Morris, Chief Executive of CMA, London, GSM could account for over 14 million subscribers in Europe as a whole.

Speaking at the CommEd Publishing conference, "GSM and Beyond," in London last month, he said that the prices of GSM handsets now being suggested by companies such as Motorola and Nokia were in the £650-£725 range - considerably higher than the prices of analogue handsets in the UK, but significantly lower than those in France and Germany.

Many observers believe that much will depend on the technology in the handset. The technology in the Smart Card is already proven and affordable compared to the handset. If suppliers can get the cost of the handset to the customer down to between £100 and £200 it will bring the mobile phone within reach of a mass market.

GSM is a remarkable example of European countries working together successfully to define a new communication standard in a relatively short period compared with the usually time-dependent work of other groups working on IC Card standards.

The fact that standards - driven by the PTTs - have now been established for European

Country	Operator	Infrastructure Suppliers	Start of Public Service	Coverage
Austria	PTT	Siemens, Alcatel, Kapsch & Schrack	September 1992	-
Belgium	Belgacom	Siemens and Philips	February 1992	80% of the country by end '92
Denmark	TeleDenmark Mobil Dansk Mobil Telefon	Ericsson Nokia	March 1992 March 1992	Copenhagen: 60% of land mass by end '92 Copenhagen: 60% of land mass by end '92
Finland	Telecom Finland Radiolinja	Ericsson and Nokia Nokia/Siemens	June 1992 January 1992	Helsinki, Tampere and Turku 50% of population
France	France Telecom Cofira SFR	Alcatel and Matra Alcatel and Siemens	June 1992 January 1993	Paris, Lyons and autoroutes Paris, Lyons, major cities, autoroutes
Germany	Telecom D1 Mannesmann D2 private	Siemens and Philips Ericsson Siemens PK1 & Bosch	July 1992 July 1992	60% area and 80% of population by end '92 17 main cities including Berlin, Frankfurt, Bonn, Cologne and Hamburg. 60% of W Germany, 40% E Germany at end '92
Greece	Two consortia	-	-	
Ireland	Eircell	Ericsson	April 1993	Dublin area only
Italy	SIP	Ericsson, Telettra Matra, Italtel, Alcatel and Siemens/Marconi	October 1992	-
Luxembourg	PTT	Siemens	April 1993	All of country by mid-1993
Netherlands	PTT Telecom	-	October 1993	Not decided
Norway	Telemobil Netcom	Ericsson Siemens, Motorola	December 1992 June 1993	-
Portugal	TMN Telecel	Siemens, Motorola Ericsson	August 1992 September 1992	Coastal strip Coastal strip
Spain	Telefonica	Ericsson, Motorola	January 1993	Seville, Madrid, Barcelona by end December '92
Sweden	Nordictel Televerket Comvik	Nokia Ericsson Siemens, Motorola	November 1992 November 1992 June 1992	- Stockholm, Malmo, Goteborg and nearby airports -
Switzerland	PTT	Ericsson	March 1993	Geneva, Lausanne, Basel, Berne, Zurich and Lugano airports
United Kingdom	Cellnet Vodafone	Motorola, Nokia, GPT/Siemens Ericsson, Nokia and	June 1993 July 1993	Urban areas Opening within M25 London orbital

communications must raise the question “Will this override what anyone else attempts to do?” For example, will the financial institutions, and the banks in particular, have to fall in line and use the standards developed by the telephone companies?

There is no doubt that the commercially driven telecommunications industry has been a leading force in setting up de facto standards and carries a great deal of weight in other sectors so the opportunity for multi-application Smart Cards is significant, hence the on-going work in organisations like ETSI (European Telecommunications Standards Institute) to define multi-application Smart Cards.

It is possible in the future that we will see some European PTTs and European banks reaching an agreement to share a card for multiple applications. After all, there is little point in reinventing the wheel if there is already a card out there and working.

Several significant factors arise out of the development of GSM:

1. GSM, as it exists now, has led to the single most important application of Smart Cards in the world with the potential for becoming, by far, the biggest user of Smart Cards with a projected 30 million subscribers.

2. The concept is rapidly becoming a global one, rather than simply European, with interest being shown in the United States, the Middle East, Australia and New Zealand.

3. The GSM Smart Card, or SIM, can be easily upgraded to a multi-application Smart Card raising the question of what Value Added Services might be provided in the future, and by whom?