London Transport Seeks Private Sector Service

London Transport is looking to the private sector to design, build, install and operate a ticketing and revenue collection service covering London Underground's 12 lines serving 273 stations, and some 6,000 buses currently operated by over 40 independent bus companies. It must also interface with British Rail. The service caters for over 1.8 billion passenger journeys raising over £1 billion in fare revenue per annum.

Currently London Transport is successfully piloting a major Smart Card ticketing trial in the Borough of Harrow, but is not specifying Smart Cards as mandatory. Bidders will be invited to propose "innovative" value for money solutions to the services to be provided and which will transfer significant risk to the private sector.

Continued on page 103

Smart Card News

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Next Month

Smart Card Tutorial - Part 6
"Let's get physical"

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London Transport

Continued from page 101

In a notice published in the official journal of the European Community, LT says it wants the revenue collection service to replace or enhance existing systems and equipment. Prime requirements are to:

* offer increased product and system flexibility
* speed up operations relating to ticket purchase and ticket validation (on entry to Underground gates and boarding buses)
* provide the means to allocate revenue to transport operators in an auditable, equitable and secure manner
* improve protection against fraud
* provide better planning information
* provide flexibility in respect of emerging technologies and commercial strategies

It is expected that contract to tender will be advertised in August for the system which is expected to start operating in quarter one of 1998.

LT says that the current notice is not a call for competition and requires only that parties register their interest at this stage.

Contact: Ms Anne Vivian, LT reference LT95/004F, London Transport, Ground Floor, 17 Dacre Street, London, SW1H 0DT, UK.

AT&T Contactless Licences

AT&T announced last month that it is to licence it's contactless Smart Card technology to customers in the US and around the world who want cards to speed transportation access, highway toll collections, banking transactions, cashless retailer purchases and other uses.

"We are already negotiating with three companies in different parts of the world for technology licences," says John Bermingham, President of AT&T Smart Cards. "The time is right for global development of Smart Card applications. People see what can be done, the time and money that can be saved, and they are saying, 'Why not?'"

The company says it will help customers who licence the technology to develop applications for transportation, banking, financial services, retail, security, health and other industries.

Currently, AT&T contactless Smart Cards are being used by Delta Airline's Shuttle service for ticketless boarding on flights; for highway toll collection in Italy and in California, by cashless vending machines company GiroVend in the US and Europe, and by the company itself for employee identification and access control in its offices worldwide.

Businesses interesting in licensing the AT&T technology should call AT&T Smart cards in Somerset, New Jersey - Tel: +1 908 627 9179.

ICMA Conference for Germany

The 1995 International Card Manufacturers Association (ICMA) annual conference and exhibition will be held at the Munich Park Hilton Hotel, Munich, Germany from 5-8 September.

Aimed at plastic card manufacturers, card issuing organisations, industry suppliers and bank card executives, the conference will include a day of presentations on Smart Card strategic and technical issues, plus two half-day seminars on card production and materials.

Topics to be discussed include Smart Card production, operating systems, personalisation, equipment and applications, plastic card printing, standards, testing and high coercivity magnetic stripes, PVC alternative card materials and environmental issues.

The programme includes tours of German manufacturing plants and the annual Secure Card Congress for Europay/MasterCard/Visa-certified card manufacturers.

Contact: Jennifer Busch, ICMA, USA - Tel: +1 609 799 4900. Fax: +1 609 799 7032.

Europay EP Targets Internet

Europay is targeting the rapidly growing number of consumers on the Internet with its first electronic purse application.

While MasterCard is launching its Stored Value Card in Canberra, Australia, and Visa is aiming at the Summer Olympics in Atlanta, Georgia, USA, Europay has opted for the Internet which currently has 30 million users - a figure estimated to increase to over 100 million by the year 2000.

Europay has joined forces with IBM to develop a secure electronic purse system for use on the Internet and plans to be in the pilot stage early next year.

The system will provide World Wide Web users with the ability to shop for goods, services and information by putting a chip card into a reader attached to electronic devices such as personal computers, telephones or televisions.

The initiative merges IBM's multi-party secure payment protocol, iKP, with Europay's electronic purse product which enables low value payments to be deducted from the stored value on the card. Higher value purchases on the Internet will also be covered as debit and credit cards with Europay brands start being converted from magnetic stripe to chip cards in early 1997.

The electronic purse offers a practical way to pay for low-value purchases over the Internet, for example, retrieving an article or information, while renting a video, ordering a pay-per-view programme. Paying for fast food, public transport, tolls, car parks, and making purchases from vending machines are some of the projected uses.

IBM's iKP is compatible with operating systems such as Windows, DOS, OS/2, Macintosh and leading browser programs. Devised to enable consumers, merchants and banks to engage in a secure transaction on the WWW, it takes advantage of a technology called "snap-in" which can be used to implement iKP with any Web browser complying with open industry standards.

Contacts: Richard Tischler, Europay International - Tel: +32 2 352 5304. Mike King, IBM - Tel: +1 914 766 1119.

Grigny Takes Cards To Court!

In sports-mad Grigny, one citizen in five makes active use of the four tennis courts and the gymnasiums available. Now the Lyon-area city (pop. 7,500) has launched a Smart Card scheme based on the Innovatron Funchip system to manage its sporting facilities.

Anyone for tennis in Grigny needs a card to gain access to the courts, and the time spent playing can be logged. Anyone using the gymnasiums also needs a card - which also controls lighting and heating. Doors and emergency exits opened outside normal working hours, and doors opened and not closed, are recorded by remote surveillance and an alarm system triggered.

Apart from the security aspects, the system helps to keep down operating costs. Lights, heating and ventilation shut down when the building is empty.

Accurate statistics are produced on the occupation of facilities and on potential risks such as intruders and card use at unauthorised times.

Contact: Geneviève Bœuf. Tel: +33 1 40 13 39 42. Fax: +33 1 40 13 39 59

AviSIM Is Fine For The Finns

Radiolinja, the Finnish cellular operator with 70,000 subscribers in Finland and Estonia, has purchased AviSIM, the personalisation system for GSM SIM cards produced by AU-Systems of Stockholm.

Radiolinja will now be able to produce Subscriber Identity Module cards in-house, instead of using preconfigured cards from external sources. AviSIM supports GSM Phase 2 SIM cards, making it possible to implement new GSM-based services such as fax, e-mail, broadcast messaging, charge advice and conference calls.

It is already used by operators in seven countries, including Telia Mobil of Sweden, Telenor Mobil of Norway and Post & Telecom, Iceland.

Contact: Anders Hardebring, AU-System - Tel: +46 8 726 7546. Fax: +46 8 193 322.

Review of Contactless Cards

Contactless Smart Cards are successfully establishing themselves in two major market sectors - Automatic Fare Collection (AFC) and electronic toll collection - and will take an increasingly larger share of the card market.

The contactless card is ideal in a situation where a person on the move (like a bus passenger) or a moving object (like a car) has to pass a fixed read/write unit quickly. They are also being used for ticketless boarding on aircraft, in cashless vending, as ID and access control cards, production control, ski passes, and as stored value cards or electronic purses.

A further boost in the marketplace comes this month with the announcement that Sony Corporation (as predicted in last month's SCN) has won the world's largest contactless Smart Card order to date for Hong Kong's next generation transportation ticketing system. ERG of Australia, contracted to design and install the system, selected the Sony technology.

Three million Sony FeliCa cards and 5,000 card readers will be supplied through Mitsubishi Corporation, Japan's leading integrated trading company which has negotiated commercial terms of supply on behalf of Sony.

It has already been stated that the same card used in Hong Kong will be used for the Greater Manchester AFC system. Some 500,000 contactless cards will be required for the next phase of development.

Plans for a new ticketing and revenue collection system for London Transport buses and the London Underground (see front page) could involve three to five million contactless cards. Although the forth-coming tender will not stipulate a preferred technology, Smart Cards must be a front runner with contactless cards currently under trial on 200 buses in the Harrow area of London.

At the same time, road tolling trials are underway in Germany and the UK Department of Transport is expected to announce, within the next few weeks, plans to start automatic toll collection trials on the M3 motorway. The results of these trials may well lead to substantial contactless card orders.

This scenario brings sharply into focus the need for standards. Card manufacturers are offering cards which operate at different frequencies resulting in incompatibility of systems as a card reader designed to operate with one card will not operate with cards from another manufacturer.

While major strides have been made in the industry in producing ISO ID-1 thickness cards, battery less cards and cards with improved battery life, the vital question of interoperability remains - causing confusion for service providers and frustration for operators looking for more than one source of supply.

The standard dealing with contactless Smart Cards is ISO 10536 (Identification Cards - Contactless Integrated Circuit Cards) which is the equivalent to ISO 7816 for contact cards. Progress to date is that Part 1- Physical Characteristics and Part 2 - Dimension and Location of Coupling Areas are now standards.
Michael Hegenbarth, Chairman of Joint Technical Committee 1, Sub-Committee 17, Working Group 8 (JTC1/SC17/WG8), dealing with the development of contactless card standards, says Part 3 - Electronic Signals and Reset Procedures is likely to be approved as a standard this month, while Part 4 - Operational Procedures is at working draft stage and will be issued as a committee draft soon.

The next major development will be a combined contact and contactless card. Shown in prototype at the CeBIT Fair in Hanover earlier this year, it is expected to be ready for mass production from the end of this year.

"We will have a combined contact and contactless card with only one chip," says Hegenbarth. "This makes it specially interesting for the banking sector because they can load their card and carry out banking applications as a contact card, and also open up applications for those that require contactless techniques."

Details given in the following review have been supplied by the contactless card manufacturers.

Review of Contactless Cards

Manufacturer	**ADE Angewandte Digital Elektronik, Germany**	**AT&T Smart Cards USA**	**Buscom Oy Finland**
Type	CombiCard (manufacturer under negotiation)		Proximity Card
Memory or Microprocessor Chip	Memory with connection to processor	Microprocessor	
Memory size	1K bytes	3K bytes or 8K bytes	
CPU	Optional	Yes	
Power supply	Induction	Induction	Induction
RF operating frequency	4.92/13.56 MHZ	3.58 MHZ	
Method of communication	AM, PSK	Capacitive coupling: at lower level ISO 105361, Part 1: at higher level ISO 7816 using T=0, T=1	
Communication distance	ca. 6 cms	Separation of 30 mil (.03 of an inch); misalignment of 100 mil (0.1 of an inch), with separation and misalignment at same time	up to 10 cms
Communication speed	19200 baud	19200 baud maximum, selectable 2400, 4800, 9600 per ISO standard	up to 10,000 baud. Read 30 ms. Read and write 200 ms.
ID-1 dimensions	Yes	Yes	Yes
ID-1 thickness	Yes	Yes	No. 1.6 mm
No. manufactured in 1994	-	N/A	
Products under development	-	Proprietary information	
Typical card costs	ca. DM25	Depends on quantity, memory size, special customer requirements, etc	
Applications		Electronic toll collection in Orange County, California; stored value card for retirement benefits in Italy; ticketless boarding on Delta Shuttle flights in the USA; ATM and pre-paid retail transaction cards, cashless vending machine operations and ID and access control cards for AT&T's 300,000-plus employees worldwide	AFC in 10 cities in Finland and in Norway and Denmark

GPT Card Technology	**Mikron**	**Mikron**	**Mikron**
GIC Card (GPT Integrated Contactless)	MIFARE	MICARD	HITAG
Memory/Microprocessor	Memory (EEPROM)	Microprocessor	Memory
256 byte memory to 8K bytes EEPROM microprocessor	1K bytes	2K bytes	2K bits
Yes	No*	Yes	No
Induction	Induction	Induction	Induction
308 KHz	13.56 MHZ	4.91 MHZ	125 KHz
FM to card and AM from card			-
2 cms	up to 10 cms	up to 3 mm	up to 70 cms
19.2k baud	105k baud	300k baud	4k baud
Yes	Yes	Yes	Yes
Have supplied 0.75 mm thickness. Current cards 1.6 mm thick	Yes	Yes	No. 1.0 mm
125,000	Approx. 1 million	-	N/A
-	-	-	-
£4.50 to £8.00	US$ 5-7	N/A	US$ 5-7
AFC trials in London, UK and in Tampere, Finland	Transcard electronic purse scheme for payments, transport ticketing and incentive programme applications in Sydney, Australia. AFC in Oslo, Norway; Pori, Finland; and Liverpool, UK		

*Processor functionality implemented in hard-wired logic

Manufacturer	**Mikron**	**Mitsubishi Electric Corporation, Japan**	**Nedap NV The Netherlands**
Type	MIDAT	MELCARDS	Show & Go Card
Memory or Microprocessor chip	Memory	Mitsubishi 8-bit microprocessor	
Memory size	2K bits	8K bit ROM for firmware, 320 bytes SRAM for user's data	2K bytes
CPU	No	Yes	Yes
Power supply	Induction	Internal battery: min. 300,000 transactions lifetime	Induction
RF operating frequency	4.00 MHZ	512/307 and 125 KHz versions	120 KHz
Method of communication	-	ASK	
Communication distance	up to 12 cms	Variable: 1 cm to 100 cms (read and write)	Read/write up to 10 cms; Read up to 60 cms
Communication speed	10k baud	up to 25.6 kbps	Read/write 60K bits/s. Read only: 3.75K bits/s
ID-1 dimensions	Yes	Credit card and 45 mm square options	Yes
ID-1 thickness	No. 0.85 mm	1.4 mm, 2.5 mm (credit card outline) and 4.5 mm (4.5 mm square)	Yes and 2.7 mm
No. manufactured in 1994	N/A	N/A	N/A
Products under development	-	Battery less cards	N/A
Typical card costs	US$ 4-6	Volume dependent, eg £10 at 1K	N/A
Applications		Mass transport user systems ranging from public transport ticketing to automatic warehousing. Production control, leisure, ID and access control, cashless vending	Typical applications public mass transport, access control combined with payment functions, ski passes, holiday parks, stored value cards (DES algorithm available)

Racom Inc. USA	Sony Corporation	Sony Corporation
LF Memory Card	FeliCa RC-S103	FeliCa RC-S102
Memory	Memory chip	Memory chip
1K bits and 4K bits of FRAM (FerroElectric Random Access Memory	1K bytes	1K bytes
No	No	No
Induction	Battery	Induction
Controller data/power channel: 125 KHz. Card data channel: 62 KHz	High frequency	High frequency
Controller: ASK. Card: PSK	ASK/BPSK	ASK/BPSK
10 cms	0-20 cms	0-10 cms
Controller/host: up to 38400 kbps. Controller/card: 7.8 kbps	250kbps	250kbps
Yes	Yes	Yes
1.5, 1.0, 0.76 cms	Yes	Yes
LF Memory Card entered production in January 1995	N/A	N/A
N/A	-	-
Low volume around $8 per card, substantial discounts at higher volumes.	-	-
AFC projects in Toronto, Canada; Gardena, Los Angeles and Torrance, USA; and trial in Greater Manchester, UK. Airline ticketing in Germany. Electronic purse at Hong Kong Airport.	AFC on Japan Rail	

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TIDE Turns to Touchless Card

On show and in action - the Saturn project's ICL Customer Activated Information Terminal (CAT) linked to a Gemplus contactless Smart Card unit for the first time.

Saturn, funded by the European Commission, displayed the CAT and issued the cards at the TIDE exhibition in Paris. The radio frequency link between the Gemplus GCL 8K Smart Card and the CAT allowed visitors to operate the terminal by passing the cards within 20 cms of the CAT. Once activated, the cardholder could then use the terminal to obtain a printed copy of a car insurance quotation.

The Smart Card reader software, complete with a software package allowing the cards to be recharged with tokens and personalised for individual users with PINs, was carried on a PC adjacent to the terminal. The antenna for the contactless card reader was fitted behind the front panel of the CAT.

ICL's CAT, with its software on compact disc, provides a colour display and stereophonic sound. These features are incidentally useful for the partially-sighted (colours can be adapted to suit) and the blind.

Fumble factor

It can stand alone or be installed as a "through the wall" device. Contactless cards overcome the "fumble factor" particularly affecting the elderly and disabled. Work continues on full integration of the devices and their controlling software.

The Saturn project aims at defining and developing an improved interface between card and terminals, in order to provide a better and easier access to public information terminals and ATMs. It is partly funded by the European Union, through the TIDE programme which is dedicated to the development and adaption of IT-based solutions for the disabled and elderly.

Contact: Jim Slater, Project Manager. Tel and Fax: +44 (0)1980 610 544.

Another One Along in a Minute

Some of us hop on a bus every day. Some of us haven't used one for 20 years. The latter category included independent consultant Dr David Everett, technical advisor to *SCN*, until he went to the London Borough of Harrow.

London Transport launched its BEST (Bus Electronic Smart Card Ticketing) project in Harrow a year ago, and has since introduced its rechargeable Farecard for infrequent travellers with the same 20% travel bonuses.

Once in 20 years is certainly infrequent travelling, but Dr Everett posed for the standard photocard, completed in three minutes at the Smart Card photo booth. Ready for a Lovely Ride Inside, and prepared to Hold Very Tight Please, he found using the card (which is handed to the driver) took half a second, much faster than fumbling with change.

Fellow passengers discovering there was Plenty Of Room On Top divided by age into Card users (the youngset) and the Have The Right Fare Ready brigade (fewer cardholders among the seniors). Both cards cost £10 and can be recharged in units of £5 at over 70 agencies in the area or on the buses.

à la Carte Menu in French School

An à la carte food services system has been introduced for the first time in a public school in France. The new Renè Cassin High School in Metz is offering students, teachers and administrative staff the opportunity to choose what they like from starters, main courses, desserts and beverages using a Smart Card system to pay.

Each card contains the name, account number, access profile and category of its holder. Users can check the balance on the electronic purse at the entrance to the restaurant, and use the card to pay for the meal.

The FUNCHIP Education Smart Card system developed by Innovatron Data Systems cuts out the handling of cash within the school and is used to control access to the car parking area and the bike shed, and to pay for photocopies. Consideration is also being given to using the Smart Card as a library management tool and to handle class marks, attendance and access control to "sensitive" class rooms.

Contacts: Geneviève Bœuf, Communication Manager, Innovatron Data Systems - Tel: +33 1 40 13 39 42. Fax: +33 1 40 13 39 59. M. Gueusquin, Principal, Renè Cassin High School - Tel: +33 87 31 88 44. Fax: +33 87 31 88 33.

First Card Plant in South Africa

South Africa's first Smart Card manufacturing plant has opened in Johannesburg, giving a local source for Smart Cards which are currently imported from

G&D Rings up 250m Cards

Giesecke & Devrient of Germany has marked the production of the 250 millionth Telekom phonecard with a limited special edition. The first phonecard with a chip pilot project took place in Bonn and Aachen in 1984 and just under two years later the phonecard developed jointly by Deutsche Bundespost (now Deutsche Telekom AG) and G&D was officially issued for the first time. Now Deutsche Telekom Smart phonecards can be used throughout the country.

Contact: Ms Verena Munz, G&D, Germany - Tel: +49 89 4119-668. Fax: +49 89 4119-536.

Get Smart: Get a Condom

Design student Alison Chappell, 23-year-old graduate of Brunel University, has devised a condom dispenser housed in a discreet concrete bollard suitable for exterior and interior sites. It is operated with a 2K bit card, charged with any amount of money and purchased in a shop just like a phonecard. The project is supported by Card Systems (UK) and LRC, makers of Durex, and another condom manufacturer.

Contact: Tony Hutchings, Card Systems (UK) - Tel: +44 (0)1273 495034. Fax: +44 (0)1273 495234.

Europe.

The multi-million rand venture is by specialist card supplier Multi Security Technology (MST) which is owned jointly by packaging group Nampak and German Smart Card fabricator Giesecke & Devrient.

A new MST subsidiary - Integrated Card Technology (ICT), in which publishing group Nasionale Pers has a holding - has been formed specifically to undertake the Smart Card production part of the business.

MST views the new production facility as eliminating the need for local businesses to import premium-priced cards, saving foreign exchange, and offering them competitively priced alternatives with shorter lead times and greater production flexibility.

Nikki Kettles, General Manager, says: "MST can offer its customers a total, one-stop service from artwork design to chip embedding thereby improving lead times and service levels."

Production capacity

Initial card production is for the mobile cellular phone industry and the first deliveries of Smart SIM (Subscriber Identity Module) cards have already been made to GSM network operator Vodacom.

The company has launched the first 8K SIM cards to replace the 3K cards in use locally. It is also intended to target other markets in the banking, transport and retail sectors.

The plant is operating from the premises of security printers Brown Davis & McCorquodale and has a production capacity of 1,500 cards an hour. Technology has been provided by G&D whose production standards are being applied at the plant.

Contact: Nikki Kettles, General Manager, MST, South Africa - Tel: +27 11 493 5453.

Britain Wavers on Card Rules Mobile Phone Card Terminal

Verifone, leading manufacturer of transaction automation card terminals is to launch the first portable cellular phone credit and debit card authorisation and transaction terminals this month.

Vendors such as market traders, repair services and auctioneers will be able to accept card payments almost anywhere in the country with total security

Six options for a UK Identity Card are presented in a Government Green Paper as follows:

* No change, meaning that driving licences, birth certificates and passports will continue to be used to confirm identity.

* ID travel card: Photocard carrying passport details which could be used as a travel document within Europe. (Cost: £5-£10).

* Driving licence photocard, available in July 1966, could also be used as an ID card. Non-drivers could buy one for £10-£15.

* Driving licence ID card: dual function card, to which further details would be added for travellers in Europe. Foreign nationals living in Britain would carry a parallel card.

* Multifunction Card: Smart Card displaying name, birth date and nationality with details relating to Government departments (such as Social Security) stored securely in the chip. Access limited to those who need to know.

* Compulsory Card: Any of the above, but would be carried at all times by anyone over 16. Fines and charges would be imposed for failure to do so. Introducing this scheme would cost an estimated £600 million.

Home Secretary Michael Howard insists that the Government is neutral over the issue, but says that he and the Prime Minister, John Major, believe ID cards could help in the war against crime. Shadow Home Secretary Jack Straw said the Labour Party was opposed to compulsory cards "which are alien to the British tradition of strong individual liberty."

Press comment following the publication of the Green Paper focussed on the compulsion issue, and was largely against the proposal.

provided they have a GSM digital mobile phone.

Currently such transactions require a fixed telephone line, but using software developed by Mobile Communications, Verifone's Tranz 330 and 420 terminals connected to a PC data card/interface and a GSM phone can carry out all the transactions.

The Tranz 420 is already equipped with batteries which permit 200 transactions to be processed without mains electricity and both terminals can be operated from a 12 volt car battery. Thus, card payments can be taken wherever a GSM signal can be obtained. With on-line authorisation available, the vendor can accept any card that passes the authorisation check.

The first product to be offered by Verifone utilises the Nokia PC card and 2110 GSM mobile phone and will work on Cellnet's GSM Data Network. Further products will be offered as appropriate PC cards and adapters become available. The Company is presently reviewing Communicate's PC Digital Data Card for Motorola phones.

"Increasingly people want to make payments by card instead of cash or cheques," says Malcolm Bushell, Verifone's UK General Manager. "Using this digital technology the 'wire free' terminals will provide vendors with fast acceptance of all card payments with the security of on-line authorisation almost anywhere in the country."

Contacts: Malcolm Bushell, Verifone UK - Tel: +44 (0)1895 824031. Mark Pateman, Mobile Communications, UK - Tel: +44 (0)161 839 9919.

No-cash Ale and an Advantage

Delivery drivers working for South African Breweries (SAB), often a target for hi-jackers, now carry the Megalink electronic wallet. Customers pay for their beer consignments with the Megalink card, supplied by Gemplus, which has a SGS-Thomson ST16623 CMOS chip with 3K bytes EEPROM.

Cardholders use PINs to identify themselves and authorise the sale. The average monthly turnover with SAB is estimated at R40 million, with high average transaction values.

The Megalink card is provided by the four major banking groups in South Africa : Nedcor, ABSA, FNB and Standard Bank.

Another joint venture between Nedcor and SAB is the Advantage Smart credit card, which can be used in two large retail chains, Edgars and Sales House. The card is aimed at the emerging middle class who do not qualify for bank credit cards. It is based on the South African Interbank Smart Card standards piloted successfully October 1994-March 1995. It differs in that no funds are loaded on to the card, but the customer is given a personal credit limit. He is charged interest on the amount spent and pays a minimum monthly sum. Once payment is made, the card's credit facility is updated on-line.

Advantage was piloted in Pretoria in October 1994, and a national roll-out begins this month.

Contact: Miss L. Von Hoesslin, Nedcor. Tel:+27 11 358 5300. Fax: +27 11 358 4106

Four Into One for CP8Transac

A single worldwide organisation offering Smart Card transaction providers enhanced security capabilities has been born from the merger of four Bull CP8 companies.

CP8Transac, part of Bull's Emerging Technologies

Verisoft Is In Pole Position

When Turkey decides to go Smart, the changeover will be eased by the fact that many of its EFT/POS terminals already have Smart Card reader/writers. Istanbul-based Verisoft, which holds 45% of the Turkish EFT/POS market share including two acquiring banks, has about 8,000 terminals ready to launch any Smart Card product.

Contact: Onur Alver. Tel: +90 212 275 6355. Fax: +90 212 274 1176.

Division, is headed by Thierry Breton, who is also senior executive vice president of Groupe Bull. Mme Geraldine Capdeboscq has been named president and CEO.

"Before cyberspace can become an electronic marketplace, businesses and customers need to know that electronic commerce transactions are tamper-proof and private. This new organisational

structure gives us the strategic positioning and technological resources to respond to these needs on a global scale, " says Breton.

The new grouping

The companies are Bull PCC (Point of Customer Contact), Bull CP8, Bull Telesincro and North American subsidiary Micro Card with combined revenues of about £87 million ($130 million).

CP8Transac will offer all the tools necessary to ensure a secure transaction environment, including: a contact and contactless Smart Card platform, secure operating systems, development tools and card personalisation systems; general purpose Smart Card terminals; EFT/POS terminals; ATMs and cash dispensing machines; interactive self-service kiosks; local area network (LAN) and wide area network (WAN) security software, and consulting services.

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Turkey Interested in Smart Cards

Turkey is continuing to show interest in Smart Cards. Some 60 representatives of its main banks and companies attended a presentation in Istanbul by Topcard Monétique, Solaic, Dassault, Visa and Verisoft. Topics covered included Smart Card security (Solaic); Smart Card readers for shops and restaurants (Dassault) and a pocket contactless reader for bus, metro, parking and so on, demonstrated by Topcard. At present, use of Smart Cards in Turkey is limited to GSM, but the country has by-passed the cheque and is now poised to moved into chip technology.

* Topcard has a new industrial partnership agreement which will allow it to produce 200,000 units of its contactless products every month, not 20,000 as stated in May SCN. Topcard have not yet named their new partner.

Contact: Jean Marc Mathieu, Topcard - Tel: +33 42 58 61 62. Fax: +33 42 58 69 96.

First Smart Phonecards in Korea

Korea Telecom Card (KTC), manufacturer of magnetic stripe telephone cards, is following the trend towards chip phone cards and delivered its first order for 500,000 IC cards to its parent company Korea Telecom in December 1994.

The new card with 128 bytes EEPROM was produced in face values of 3,000, 5,000 and 10,000 Won.

Chin Kang-Hyun, President and Chief Executive Officer, says in the company's annual report that medium and long term management strategies have been launched to cope with environmental changes expected during an interim period in which magnetic stripe and IC cards co-exist.

In another Smart Card development, KTC has developed Smart Cards for use as personal ID cards and to control access by employees to security and other restricted areas.

Fifty-nine million cards

Last year, the company produced 59,490,000 telephone cards - a 27% year-on-year increase which cut unit manufacturing costs to 250 Won from 257 Won, reducing the expenses of Korea Telecom by around 500 million Won in 1994.

Contact: Do Myung-Uhi, Director, Sales and Marketing Division, KTC, Seoul, Korea - Tel: +82 2 786 5675. Fax: +82 2 786 0329.

Smart Card Diary

Conferences UK - Tel: +44 (0)171 242 2324. Fax: +44 (0)171 242 2320.

European Smart Card Summit '95, Waldorf Hotel, London, 26/27 June.

Includes case studies on Smart Card applications in transport, telecommunications, healthcare and the retail and utilities sections, with presentations on standards, security and technology. Contact: AIC

Third à la CARD Technology Symposium, Hotel Atlantik, Hamburg, 6/7 July.

Presentations and workshops by 30 speakers covering topics such as security, electronic purse, chips on bank cards, standards, loyalty cards, healthcare and card production. Contact: à la CARD

Conference Services - Tel: +49 4542 8461-0. Fax: +49 4542 8461-11.

ATMs & Self-Service Banking, The Langham Hilton, London, England, 20/21 July.

Conference covers the latest developments in the ATM industry and includes presentations on Smart Cards and biometrics and three bank case studies. Contact: AIC Conferences - Tel: +44 (0)171 242 2324. Fax: +44 (0)171 242 2320.

Card Manufacturing in Transition: The Future is Now, Munich, Germany, 5-8 September.

ICMA (International Card Manufacturers Association) Conference and Exhibition. Contact: Jen Busch, ICMA, USA - Tel: +1 609 799 4900. Fax: +1 609 799 7032.

ESCAT '95 (European Smart Card Applications & Technology) Conference, Inter Continental Hotel, Helsinki, Finland, 6-8 September.

One of the features of this well-established conference, now in its 8th year, is the presentation of the award for the most innovative Smart Card accomplishment of the year. Contact: Conference Secretariat, CONGREX, Finland - Tel: +358-0-752 3611. Fax: +385-0-752 0899.

CarteS '95, CNIT Trade Center, La Defense, Paris, France, October 25-27.

The 10th International Forum for Plastic Card Technologies & Applications includes conferences on Access to New Solutions and Cards and Security plus an international exhibition with over 100 exhibitors. Contacts: CEP Exposium, France - Tel: +33 1 49 68 52 64. Fax: +33 1 47 37 75 09. IMEX Management, Inc., North America - Tel: +1 301 460 9751. Fax: +1 301 460 0045.

Electronic Purse Conference, Forte Crest Bloomsbury Hotel, London, England, 2/3 November.

Contact: Ashley Glover, Conference Director, Smi Technology Group, UK - Tel: +44 (0)171 417 7790. Fax: +44 (0)171 417 7791.

The 11th European Payments '95 (EFTPOS & Home Services) Conference, Sheraton Grand Hotel, Edinburgh, Scotland, 21/22 November.

Overview of the changing payments scene plus sessions on fraud and security, Smart Cards and the electronic purse, chip standards, cross border payments, etc. Contact: SETG, UK - Tel: +44 (0)141 553 1930. Fax: +44 (0)141 552 0511.

Card Fraud & Security Conference, Forte Crest Bloomsbury Hotel, London, 4/5 December.

Contact: Ashley Glover, Conference Director, Smi Technology Group, UK - Tel: +44 (0)171 417 7790. Fax: +44 (0)171 417 7791.

GPT Wins with Nelson Touch

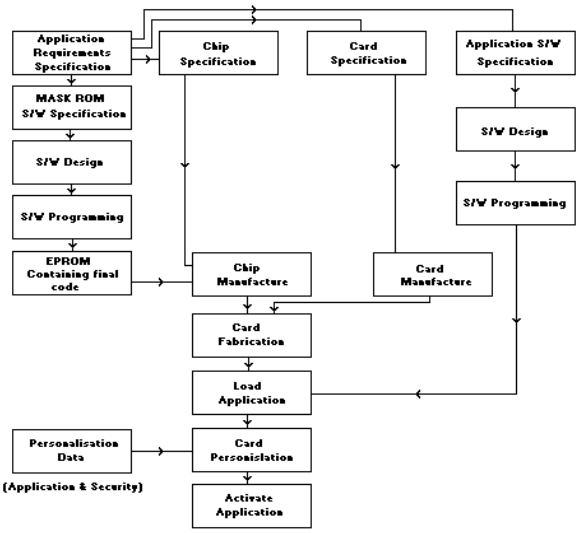
The first 12 months of the South African Government of National Unity has been commemorated with 500,000 Smart payphone cards featuring President Nelson Mandela and supplied by Britain's GPT Technology.

GPT won the order from TM (Telephone Manufacturers of South Africa) which manufactures and supplies payphones and cards to PTTs in South Africa, Botswana, Namibia and other countries worldwide.

From There To Here Part - 5

How the IC card is made

The manufacture of a smart card involves a large number of processes of which the embedding of the chip into the plastic card is key in achieving an overall quality product. This latter process is usually referred to as card fabrication. The whole operation starts with the application requirements specification. From the requirements individual specifications can be prepared for the chip, card, mask ROM software and the application software. The ROM software is provided to the semiconductor supplier who manufactures the chips. The card fabricator embeds the chip in the plastic card. It is also quite normal for the fabricator to load the application software and personalisation data. Security is a fundamental aspect in the manufacture of a smart card and is intrinsic to the total process. However we will consider security separately in subsequent articles in this series. We will look at each of the stages in the manufacture of the smart card as shown in fig. 1.



Chip specification

There are a number of factors to be decided in the specification of the integrated circuit for the smart card. For the purpose of this discussion we will consider a CPU based card although the manufacture of a memory card is substantially a subset of that described here. The key parameters for the chip specification are as follows,

-Microcontroller type(e.g 6805,8051)
-Mask ROM size
-RAM size
-Non volatile memory type (e.g EPROM, EEPROM)
-Non volatile memory size
-Clock speed (external, and optionally internal)
-Electrical parameters (voltage and current)
-Communications parameters (asynchronous, synchronous, byte, block)
-Reset mechanism
-Sleep mode (low current standby operation)
-Co-processor (e.g public key cryptography)

Fig 1 The Complete Process

The specification of a card involves parameters that are common to many existing applications

In practice the semiconductor manufacturers have a range of products for which the above parameters are pre-defined. The task of the designer is therefore concerned with choosing the appropriate product for the particular application. As mentioned previously security may be an important issue for the application and accordingly there may be extra requirements on the physical and logical security offered by the particular chip.

Conformance to ISO standards is also likely to be a requirement and in this area ISO 7816 - 3 (Electronic signals and transmission protocols) is the principle standard to be considered. It should be noted however that ISO is currently producing a revision for part 3 of the ISO7816 standard. This revision is likely to alter some of the electrical characteristics of the chip. In particular there is the need to allow for low voltage (3V or less) chips and lower current supplies as required in portable battery equipment. ETSI (European Telecommunications Standards Institute) have also produced standards for smart cards and terminals which are more stringent than that described by the current ISO standards.

Card specification

using the ISO ID-1 card. The following list defines the main parameters that should be

defined,

- Card dimensions
- Chip location (contact card)
- Card material (e.g PVC,ABS)
- Printing requirements
- Magnetic stripe (optional)
- Signature strip (optional)
- Hologram or photo (optional)
- Embossing (optional)
- Environmental parameters

The characteristics of the smart card are part of the ISO 7816 part 1 (physical) and 2 (contact location) standards. The choice of chip location has been a difficult subject due largely to the use of magnetic stripes. The early French cards put the IC module further off the longitudinal axis of the card than the standard eventually agreed by ISO. This was preferable because of the residual risk of chip damage due to bending. The French Transac tracks were lower on the card which also made this position preferable. The now agreed ISO standards for magnetic stripes resulted in the French chip position and the magnetic stripe being coincident. Hence the now agreed lower location which does of course result in higher bending stress on the chip. The ISO 7816-2 standard does however allow the position of the contacts to be either side of the card. More recently there have been moves to remove this option with the front (opposite to the side containing the magnetic stripe) being the preferred position for the IC connector.

The choice of card material effects the environmental properties of the finished product. PVC was traditionally used in the manufacture of cards and enabled a higher printing resolution. Such cards are laminated as three layers with transparent overlays on the front and back. More recently ABS has been used which allows the card to be produced by an injection moulding process. It is even possible to insert the chip micromodule in one step as part of the moulding process. Temperature stability is clearly important for some applications and ETSI are particularly concerned here, such that their higher temperature requirement will need the use of polycarbonate materials.

Mask ROM Specification

The mask ROM contains the operating system of the smart card. It is largely concerned with the management of data files but it may optionally involve additional features such as cryptographic algorithms (e.g DES). In some ways this is still a relatively immature part of the smart card standards since the early applications used the smart card largely as a data store with some simple security features such as PIN checking. The relevant part of the ISO standard is 7816-4 (commands) and the new work item for part 7 (security). There is a school of thought that envisages substantial changes in this area to account for the needs of multi-application cards where it is essential to provide the necessary security segregation. Finally the developed code is given to the supplier who incorporates this data as part of the chip manufacturing process.

Application Software Specification

This part of the card development process is clearly specific to the particular application. The application code could be designed as part of the mask ROM code but the more modern approach is to design the application software to operate from the PROM non volatile memory. This allows a far more flexible approach since the application can be loaded into the chip after manufacture. More over by the use of EEPROM it is possible to change this code in a development environment. The manufacture of a chip with the user's ROM code takes on average three months. Application code can be loaded into the PROM memory in minutes with no further reference to the chip manufacturer.

Chip Fabrication

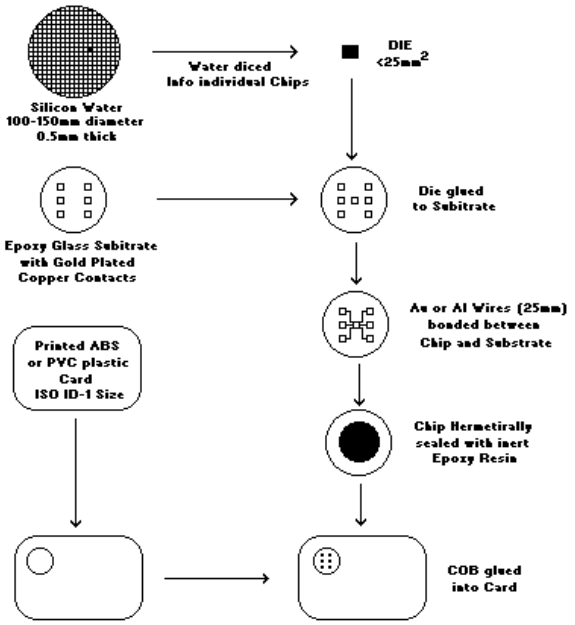
The fabrication of the card involves a number of processes as shown in fig. 2. The first part of the process is to manufacture a substrate which contains the chip. This is often called a COB (Chip On Board) and consists of a glass epoxy connector board on which the chip is bonded to the connectors. There are three technologies available for this process, wire bonding, flip chip processing and tape automated bonding (TAB). In each case the semiconductor wafer manufactured by the semiconductor supplier is diced into individual chips . This may be done by scribing with a diamond tipped point and then pressure rolling the wafers so that it fractures along the

scribe lines. More commonly the die are separated from the wafer by the use of a diamond saw. A mylar sheet is stuck to the back of the wafer so that following separation the dice remain attached to the mylar film.

Wire bonding is the most commonly used technique in the manufacture of smart cards. Here a 25uM gold or aluminium wire is bonded to the pads on the chip using ultrasonic or thermo compression bonding. Thermo compression bonding requires the substrate to be

Fig 2 The Manufacturing Process

maintained at between 150C and 200C. The temperature at the bonding interface can reach 350C. To alleviate these problems thermo sonic bonding is often used which is a combination of the two processes but which operate at lower



temperatures.

The die mounting and wire bonding processes involve a large number of operations and are therefore quite expensive. Because in general only 5 or 6 wires are bonded for smart card applications this approach is acceptable. However in the semiconductor industry generally two other techniques are used, the flip chip process and tape automated bonding. In both cases gold bumps are formed on the die. In flip chip processing the dice are placed face down on the substrate and bonding is effected by solder reflow. With tape automated bonding the dice are attached by thermocompression to copper leads supported on a flexible tape similar to a 35mm film.

The finished substrate is hermetically sealed with an inert material such as epoxy resin. The complete micromodule is then glued into the card which contains the appropriately sized hole.

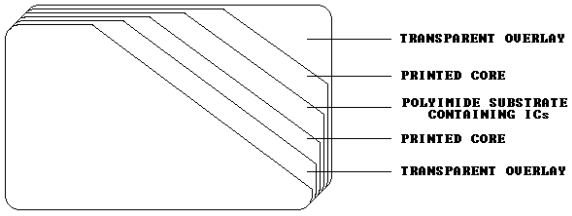
The fabrication of a contactless card is somewhat different since it always involves a laminated card as shown in fig. 3. The ICs and their interconnections as well as the aerial circuits are prepared on a flexible polyimide substrate.

Fig 3 The Contactless Card

Application load

Assuming the application is to be placed in the PROM memory of the IC then the next stage in the process is to load the code into the memory.

This is accomplished by using the basic



commands contained in the operating system in the mask ROM. These commands allow the reading and writing of the PROM memory.

David Everett

Next week - Part 6 "Let's get physical".

Payflex Electronic Purse System

A new electronic purse system known as Payflex has been released by Schlumberger Smart Cards & Systems who says the product combines a dedicated chip design with a uniquely powerful operating system providing a fast and elegant means of implementing the powerful multiple application, multiple supplier concepts of ISO 7816-4.

The software embraces the experience of several electronic purse systems, offering a simple means of implementing functions such as proof of transaction, guarantee of encashment, control over recharging, PIN verification, DES-based authentication, control of file access, transaction logging, and control of balance through floor limit management.

The chip is specifically targeted at the electronic purse application and is based on a microprocessor core with 1K bytes of EEPROM for storing money or tokens.

Schlumberger says that special operating features let the code run from EEPROM allowing application ideas to be explored and debugged easily before committing to silicon, cutting months off typical Smart Card development timescales

Contacts: Europe: Isabelle Ferdane-Couderc, Schlumberger Electronic Transactions, Smart Cards & Systems, France - Tel: +33 1 47 46 62 47. Fax: +33 1 47 46 68 66. Asia: Sally Chew, Schlumberger, Singapore - Tel: +65 746 6344. USA: Patrick Gauthier, Schlumberger - Tel: +1 804 578 7589.

Card Marks Danish Liberation

Only 5,000 of the above DANMØNT pre-paid Smart Cards to celebrate the liberation of Denmark on 5 May, 1945 have been issued to mark 50 years of peace.

Issuing bank Diskontobanken in Næstved, the DANMØNT trial city, kept the card secret until the last moment and initially offered it to shareholders. Cards not sold on 5 May were then offered to the public.

It was the first black and white design on a DANMØNT card and shows a picture of the main square in Næstved taken on 5 May, 1945. The Danish flag, in colour, was superimposed on the print.

The cards are normally issued at a minimum value of 100 kroner, but this special card has a value of 50 kroner to represent the 50 years of freedom.

World Cup Rugby Cards

An order to supply 900,000 pre-paid Smart phonecards to commemorate and be used during the Rugby World Cup, was won by GPT Card Technology of Coventry in the UK.

The order was placed by TM (Telephone Manufacturers of South Africa) who distribute payphones and cards to the PTTs in South Africa and other countries. They ordered four limited edition designs to give the thousands of rugby fans the opportunity to collect them and for the English supporters to phone home while at the tournament. It brings to over six million, the number of payphone cards GPT has supplied to TM in South Africa.