Mifare in action

The Philips Mifare technology behind London Underground's Oyster card project is tried and tested in mass transit projects around the world. To date the company has shipped more than 250 million Mifare ICs worldwide and claims a market share in the region of 80%. This article provides a whistle-stop overview of the technology, reviewing the latest product line up and some of the major implementations worldwide.

Philips Mifare is the industry standard for contactless and dual interface smart card and reader technology operating at 13.56Mhz. Operating in accordance with ISO 14443, the platform consists of chip solutions for pure contactless and dual interface smart cards and reader devices. The card portfolio covers a range of products for use in both low and high-end applications.

Pusan

Showcase for Mifare technology is the digital *Pusan Card*, issued to mass transit users in **Pusan**, South Korea since 1998. This is a dual interface multi-application card that can be reloaded with value by users over the internet.

Philips executives explained the Pusan card's potential to *CTT*: "If you lived in Pusan, you might leave your home and catch a bus to work, buying a newspaper with your e-purse on the way. Your ticket would be debited as you left the bus, via an on-board reader, with the correct fare for your journey. At the terminus, you place your card in a reader terminal and check the balance, transferring some more cash from your bank account. Later in the day, you access a municipal terminal and pay the balance of your local taxes.

"Your e-purse also takes care of the bill for lunch, while it could also be used for more shopping if you needed. Finishing work late, you take a taxi, also paid electronically. Back at home you log on to the internet using the card, and pay utility bills and check balances. All of this has been achieved with a single piece of plastic."

Moscow transport

Visa International, the Moscow City Government, Bank of Moscow, Moscow Metropolitan (Metro), Moscow Regional Railway and **Rosan Finance** are currently co-operating on a new Mifare-based multi-application in Eastern Europe. The system started as a contactless-only solution, developed in 2000 for travellers using the Moscow Metro and Moscow Railway; it now covers a broad range of applications stored on a multi-functional Mifare *PROX* dual-interface smart card.

The card can function as a public transport ticket but it also works as an identity card allowing the user to gain access to a range of government and consumer services.

Cornwall

In the UK, e-government initiatives are helping local authorities to take advantage of new technologies and modernise services. A series of *Pathfinder* partnerships have now been set up and UK councils are beginning to deliver services electronically. One of these partnerships, which is currently spear-heading e-government initiatives in the country is the *Cornish Key Card*, a project initiated by **Cornwall County Council**. In Phase One of the scheme cardholders will use smart cards based on Mifare PROX dual-interface technology to make car park payments, borrow library books, obtain concessionary bus fares, register at local schools and gain access control to required buildings. Through the card's *Open Platform* Java Card technology, further applications can be added or removed at later phases – after the cards have been issued.

Smart gadgets

Watchmaker **Junghans** has developed a multi-application *Future Watch* based on Philips' Mifare technology interface platform. Designed to replace all the cards and documents people currently need in everyday life, the Future Watch can be programmed with appropriate applications to function equally well as a key to open doors, as a token to access computer networks, as a ticket to the cinema or even to make electronic payments on public transport systems.

Card portfolio

Mifare *Standard ICs* are today primarily used in closed systems where value is debited in a secure and authorised way from a card by a service provider, or for fixed value tickets (e.g. weekly or monthly travel passes). It is also used where physical access control is required – for employee ID and company or building access cards. This is the card initially being used in London's Prestige project.

Expanding on the functionality of the existing 1K standard ICs, the new 4K Standard and Mifare DESFire ICs provide increased memory, which could be used for identity cards, applications requiring biometric identification and multi-application tools.

The Mifare *DESFire* is the latest addition to the Mifare portfolio. It is a high speed, contactless-only multi-application smart card IC which has 4K EEPROM and 3DES encryption. As a low-cost, high security product, this has been designed for public transport, corporate access, ID cards and biometrics.

The Mifare *UltraLight* is a low cost solution that enables smart paper tickets to be used in ISO 14443A compliant infrastructures. It is designed for high-volume applications such as public transport and event ticketing and could be a replacement for existing magnetic stripe and paper tickets. Additionally, it could be used for loyalty schemes and the internet.

The Mifare *PROX*, is a top-of the-range high security and performance dual interface IC. Cards using this chip feature industry standard protocols on both the contact (typically for banking applications) and contactless (typically for transit) interfaces. Applications provided can include banking, e-commerce, e-government, e-business, ID card and biometrics, and electronic ticketing as well as mass transit. Philips was awarded Visa International's Level 3 accreditation for this card early in 2002.

Readers

The Philips Micore contactless reader IC family includes the MF RC500, MF RC530, MF RC531 readers for contactless smart cards and the SL RC400 for smart labels. In the final half of 2002, the company introduced a new multi-standard CL RC632, designed to handle high volume contactless reader applications. The CL RC632 uses a modulation and demodulation concept. Its technology can vary the amplitude of radio frequency signals to recognise different RFID-based smart cards, tags and labels operating in accordance with Mifare and I.Code-based chips.

Open and compatible

With over 250 million cards and 1.5 million read/write units in the field, Mifare-based systems still dominate the contactless smart card market.

In this environment, the compatibility ensured within the Mifare architecture platform enables service providers to use Mifare products from low-end memory cards up to sophisticated microcontroller cards, with existing Mifare infrastructures. **Testhouse Arsenal**, an independent certification authority, certifies the compatibility of Mifare-based products from different suppliers.

Contact: Marijke Sas at Philips,
Tel. +31 40214 6014, email: marijke.sas@philips.com