EURALLMAGY

THE MAGAZINE FOR EUROPEAN RAIL DECISION MAKERS AND CUSTOMER

METAMORPHOSIS BY THALYS

DB REGIO GOES MODULAR WITH TALENT

THE BIRTH OF "COMMUTER" ITAL

SOUTH EUROPE ATLANTIC HSI TAKES PPP PATH

CREAM SPREADS

B REGIO GOES MODULAR WITH TALENT THE BIRTH OF "COMMUTER" ITAL SOUTH EUROPE ATLANTIC HS TAKES PPP PAT CREA

BARCODES, SMARTCARDS & MOBILES – JUST THE TICKET?

SMARTCARDS AND THEIR FUTURE COUSIN, THE NFC-ENABLED PHONE, ARE NOT THE ONLY WAY TO ENABLE E-TICKETING – DESPITE HYPE FROM HIGHLY FUNDED INDUSTRY GROUPS. BARCODES ON PAPER AND ON POPULAR HANDSETS PROVIDE LOWER ROLLOUT COSTS, WITHOUT HAVING TO ISSUE CARDS TO TRAVELLERS OR CHANGE TRAVELLING BEHAVIOUR.

This article will investigate some of the merits of the latest developments in barcode technology, which have not received as much attention as smartcards yet are in daily use around the world.



HIGHER OPERATOR MAR-GINS, BETTER CUSTOMER CONVENIENCE

From an operator's perspective, every ticket sold direct to the consumer before travel provides a higher margin and cuts queues, freeing up station capacity for customer service. The Internet has not proved to be a full solution, accounting for only 12% of ticket sales whilst carrying delivery cost and inconvenience for the user.

From a customer's perspective, true e-ticketing provides flexibility and faster journeys – self-service eliminates queues, reduces the risk of missed trains and eliminates the stress of broken ticket machines.

ROLL-OUT COSTS – CAPEX INTENSIVE OR SOFT-LAUNCH?

Before a smartcard ticket system can be used on a route. card readers must either be installed in stations or on the vehicles, or supplied to the guards. This is a significant barrier to trials and widespread adoption. Cards themselves are also not free, and easily lost. Near Field Communication-enabled phones could eliminate that cost but will not be entering the mainstream for several years, and mobile operator O2 (the biggest backer of U.K. trials to date) has stated it isn't interested in a revenue share from transactions – which implies that at least for the present, operators will not subsidise NFC while they have more compelling handset features like cameras.

Early negotiations in London's Oyster smartcard roll-out revolved around who would pay for the initial capital expenditure of rolling out touch-in, touch-out scanners and gates; eventually this was borne by scheme operator Transys in exchange for a much higher perticket fee over the system's lifetime. This higher fee has slowed the extension of the scheme beyond the core TfL system – London's Mayor subsidised Oyster readers for London rail stations by £40m [€45m] (£20m announced in July 2007, rising to £40m in a January 2008 statement) to encourage overland rail companies to sign up. Can subsidies

be expected for all smartcard systems?

In contrast, a barcode system can be soft launched networkwide. Initially visual inspection is sufficient if the barcode is displayed with animated visual watermarks, and guards can perform a live guery on high value or suspicious ticket ID numbers over SMS or an existing connected terminal. This can be backed up with occasional intensive checks using portable scanning devices, delaying full roll-out of fixed scanners until barcodes are sufficiently popular that the fraud risk warrants a deployment where volumes are high.





Smartcards lack a user interface. so all interactions must be handled through external terminals even simply to query what entitlements are present on the card. Surprisingly, some rail operators want to disable the quick pick-up of internet purchased smartcard entitlements at the gates, and insist that travellers visit a top-up machine first to avoid the risk of delays or queues forming at the gates if the transaction is slow. Barcode tickets by comparison present the ticket entitlement details next to the barcode so that both user and guard can easily understand what the ticket entitles; when using a mobile to display the ticket, users can purchase and receive new entitlements from wherever they are without queuing to access a terminal.

NEW U.K.-WIDE BARCODE STANDARD

As part of the new e-ticketing mix, in December 2008 the U.K.'s Rail Settlement Plan (RSP, part of ATOC*) ratified a new standard for self-print and mobile barcode tickets to be used across all of the country's rail franchises.

In addition to the ticket number, each barcode contains full details of the entire ticket entitlement, validity, ID, discounts, reservations, and journey restrictions; a security signature verifies that the ticket was created by an authorised ticket vendor and has not been modified. Tickets purchased immediately before travel can be validated instantly by an offline scanner without any propagation delay, even if the train is in a tunnel. More than just a ticket format, Masabi worked with RSP to ensure that the standard brought a number of new open technologies into rail ticketing that give operators and retailers benefits over paper tickets and smartcards (some of which are unique to the U.K. standard):

- No license fees, using trusted open standards avoiding any proprietary lock-in
- Ticket purchase/display possible through mainstream mobile phones
- Uses existing pre-purchase fare model
- No top-ups or sign-up required
- Non-rail entitlements can be bundled within tickets
- Supports multiple franchises, with traceable security keys for each vendor
- Decentralised system operators can run stand-alone systems if they prefer

OFFLINE SCANNING

Some early e-ticket scanning systems required Wi-Fi or GPRS coverage at all times to check tickets against a central database, but this is too unreliable and slow for a mass transit system. Some successor systems used portable scanning devices that synchronised with the central database, downloading all tickets in advance; but this approach fails to scale well for mass transit – ticket purchases close to the time of travel are prevented and database synchronisations become extremely data intensive.

An offline scanning mode removes the need for a database of valid tickets on every scanner. Instead, each vendor accepted by the system has a public validation key, usually valid for several years, which can be used to validate a ticket's source and contents without network connectivity, improving robustness.

Removing any complex central infrastructure also reduces the implementation cost, reduces vulnerability to central system failure (as happened to the Oyster system in 2008) and allows operators to join without paying large service fees to the company running the central system.

U.K. BARCODE ASYMMET-RIC SECURITY VS SMARTCARD SYMMETRIC SECURITY

This offline security is enabled with the introduction of open

internet standards for asymmetric encryption - known as public/private key cryptography (PKI) – where different keys are used to encrypt and decrypt. Public keys, used to decrypt and validate tickets, can be distributed anywhere without losing security; a criminal gains nothing by stealing a scanner. Vendors must keep their private keys secret, but this is a well understood procedure performed by every e-commerce website; if stolen, the vendor must create another key-pair and reissue the public key, but the source of the theft is traceable to that vendor and others remain unaffected. >> p.82





<< *p.79* Conversely, current smartcard systems use *symmetric* encryption to protect entitlement details, where the same key is used for encryption and decryption. This means if any scanner is stolen, the ticket generating secret keys can be retrieved – and all scheme participants are compromised in an untraceable way. The security of such a system depends on rigorous policing and certification, alongside trust of every employee and their protection from theft.

Public Key Infrastructure (PKI) based ticket validation software can be openly and cheaply distributed, without the need for more expensive hardware protection or certification processes to protect sensitive components, as has been required for ITSO or Oyster-style smartcard systems. This allows a much faster and cheaper development and integration path for scanning



BARCODES OFFER NEW OPPORTU-NITIES FOR OVERLAND TRANSPORT COMPANIES TO SELL SIMILAR ENTITLEMENTS, COMBINED WITH THE TRAVEL E-TICKETS

systems, also open to any EPOSenabled partner company.

CROSS-SELLING OPPOR-TUNITIES

All the major airline operators are already introducing additional revenue streams as core service margins fall – when a traveller buys a plane ticket they are also offered hotels, insurance, car hire and refreshments, all relevant to their specific journey and destination. Barcodes offer new opportunities for overland transport companies to sell similar entitlements, combined with the travel e-tickets. The new U.K. rail barcode standard already has space within it for adding additional non-rail entitlements in a manner that is easy to share, not only for joined-up travel between rail and bus, but also for refreshment promotions, attraction entry or retail vouchers. Everything from a free coffee to entry into theme parks can be supported, without requiring that external vendors sign up to any transport-specific security process.

BARCODE SCANNER OPTIONS

Barcode scanning systems require no special hardware security,

resulting in a wide selection of off-the-shelf scanners that bring down the cost of the system. Portable scanners can either be stand-alone, with their own screen and logic, or integrated into the existing portable terminals carried on-vehicle.

Early trials of 2D barcodes for ticketing usually used Datamatrix or QR encoding, which can be difficult and slow to scan from a mobile phone screen. The new U.K. standard instead uses the Aztec encoding scheme, which is much less bothered by the constraints of the screen – it can be displayed right to the edge, allowing more error correction to be added to compensate for screen reflectivity.

In the U.K., the most widespread ticket vending devices carried by rail staff are the AVANTIX[™] Mobile II from Atos Origin; these can easily be upgraded to scan the Aztec barcodes with a



pocket-sized scanner that connects to the Avantix terminal wirelessly. Alternatives include traditional plug-in scanners connecting to PCs, EPOS cash registers or fully integrated units added to gates (as seen at London's Marylebone Station).

DETECTING PHOTOCOPIED TICKETS

It is possible for users to easily

photocopy paper barcode tickets, distributing copies to other travellers who then need to show them to different train





IN FOCUS: PERFECT QUALITY FOR YOUR CONTROL ROOM

Your competent partner for large screen systems

|) Reliability: | Systems for critical environments for 24/7 operation |
|----------------------|--|
|) Quality: | Best image quality and high resolution |
|) Flexibility: | Real-time display of many different sources: |
| | IP video, analog video, RGB/DVI, LAN |
|) Connectivity: | Compatibility with any system, open architecture |
|) Userfriendly: | Flexible system management, easy administration |
|) One stop solution: | DLP cubes and LC displays for video walls, graphics |
| | controller, wallmanagement software made in German |
| | |

) eyevis GmbH, In Laisen 76, 72766 Reutlingen/Germany Tel.: +49 (0) 7121 43303-0, Fax: +49 (0) 7121 43303-22, www.eyevis.de, info@eyevis.de





guards – successful fraud, if each guard's scanner is offline and cannot verify the ticket with the central database at the time of scanning.

The travellers will get away with the fraud for a short time, in that they can continue their journey. However at some point the scanner will get online and synchronise; post-processing systems will then identify the multiple uses of the ticket and place an alert against the credit card used to purchase the original, preventing further purchases.

Once the fraud has been detected it is up to the rail operator or merchant to invite the user to pay a penalty (unlocking their card for future use), or pursue the credit card holder for the value of the fraudulent travel. If the fraud is detected during the journey and transport police are available, a networked gate at the destination station could be alerted to flag the ticket as cancelled and allow an ID check to be made against the traveller.

The window of opportunity for fraud is limited to the period

when scanners are offline, for each credit card the fraudulent traveller is willing to 'throw away'. A fraudster using stolen credit cards (that aren't detected by existing anti-fraud systems) may as well buy a few tickets, but the overall scope for fraud is limited.

MOBILE PURCHASE

Finally, with the advent of barcode ticketing (even on very old mobile phones) the value of the mobile as a network connected interface can be realised to provide each traveller with their own personal ticket machine. Now a user can purchase their ticket on the phone as they walk across the station platform or on their way to the station, without queues, without top-ups, without accessing a machine and without having to plan their journey in advance.

The most effective time to encourage a user to try a new ticket purchase process is when their old process is failing – either because a ticket machine is out of service or peak time queues are causing significant delays.

A simple printed advert next to station queues will give a

number of travellers the opportunity to try the new system while they remain in line (just in case); when they complete the self-service purchase, they can then leave the queue and let everybody else reach the front faster. To enable this, the ticket sales process only needs to offer instant, hassle-free sign-up and on-handset ticket delivery.

It is essential that a new user entering credit card details onto a phone is defended against interception during the purchase, and from later snooping by a phone thief. Some of the latest mobile phones have full HTTPS (internet security) on their mobile browsers, enabling secure purchases and new user sign-up as for a conventional e-commerce website. But despite improvements in mobile internet coverage this can be slow, fiddly and unreliable when on the move.

For best results, users can download our secure application to their handset that allows them to purchase tickets, and acts as a ticket wallet to automatically display relevant tickets when run. To allow the widest selection of old and new handsets to provide instant credit card

purchases, we have had to build a full security library for the mobile, which is now certified by the US government, to give consumers and merchants safety and security without having to send users off to websites or IVR services to complete lengthy registrations. The application takes almost all of this interaction offline, keeping the experience fast and responsive and minimising potentially expensive connections, whilst also eliminating the need for users to remember yet another username and password. Purchase workflow is swifter and easier - it has been described as, "better than buying tickets on the Web".

Initial purchases require credit card details to be entered, but on repeat purchases this can be reduced to only the CV2 (written on the back of the card) – enough to prevent a phone thief or child accidentally buying a ticket. Data can be transferred over GPRS (as normally used for mobile websites) or via SMS, which is much more likely to work in a moving vehicle, crowded station or any other area with poor reception; live tests have shown this can



double user uptake when compared to mobile purchases without the SMS option.

A dedicated mobile application also has full control of the handset screen. This offers significant advantages when showing barcodes, making them full-screen, therefore much quicker and easier to scan and eliminating a number of common scanning problems found in early trials when sending simple pictures of barcodes to a handset via MMS or SMS without an application.

TOWARDS A FLEXIBLE FUTURE?

Early issues encountered in barcode ticketing trials, such as scanner reliability, connectivity, security and standards, have now been solved. Barcode tickets have the ability to provide e-ticketing with more flexibility on roll-out and customer adoption than their smartcard equivalents, with a lower capital commitment before verifying customer demand.

Each technology has its advantages, and there are valid situations where customers may prefer one over the other, but I believe that barcode ticketing, particularly in conjunction with mobile phones, has a bright future in the U.K. rail industry and beyond

*Association of Train Operating Companies, www.atoc-comms.org





Overwhelmingly supported by all markets!

- 1, 053 exhibiting brand names
- 27, 000 visitors 96 nationalities
- ▶ 46, 500 sqm of exhibit space 8 halls
- 250, 000 connected professionals

FREE INFORMATION REQUEST

| Exhibitor's information Vision | tor's information |
|--|--|
| Name | First Name |
| Company | Country |
| Email | To be returned to: JEC - 19 bd de Courcelles, F-75008 Paris, France |
| Get your FREE access badge online at: | or by fax : +33 1 58 36 15 13 |
| www.jeccomposites.com/jec-s | how/ with your code: EURAIL |