

# **Co-Branded Multi-Application Contactless Cards** for Transit and Financial Payment

A Smart Card Alliance Transportation Council White Paper

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Smart Card Alliance 191 Clarksville Rd. Princeton Junction, NJ 08550 www.smartcardalliance.org

# About the Smart Card Alliance

The Smart Card Alliance is a not-for-profit, multi-industry association working to stimulate the understanding, adoption, use and widespread application of smart card technology. Through specific projects such as education programs, market research, advocacy, industry relations and open forums, the Alliance keeps its members connected to industry leaders and innovative thought. The Alliance is the single industry voice for smart cards, leading industry discussion on the impact and value of smart cards in the U.S. and Latin America. For more information please visit <a href="http://www.smartcardalliance.org">http://www.smartcardalliance.org</a>.

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# 1 Introduction

The mass transit and financial payment card<sup>1</sup> communities have a common goal: improving the customer experience with cost-effective products and services that offer increased convenience. To help reach this goal, both communities are embracing the use of contactless smart card technology to create new value propositions and reduce operating costs. By using technology based upon common physical standards, the two communities are creating opportunities for collaboration and partnership.

The Smart Card Alliance white paper titled "Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence" presented one approach to mass transit and financial payment convergence.<sup>2</sup> The approach is based on direct acceptance of American Express, Discover, MasterCard and Visa contactless payment products at the point of transit payment/boarding, with the paper discussing some of the issues and challenges involved in implementing this approach.

This white paper complements that work, describing an approach that leverages co-branded card marketing programs and the multi-application<sup>3</sup> capabilities provided by smart card technology. The white paper is intended for mass transit agencies that are considering implementing a new contactless fare payment program or enhancing an existing program through collaboration with the financial community. It is also intended for financial payment card issuers, processors, and service providers who are considering working with mass transit agencies.

Currently, five types of contactless payment systems are used or contemplated for use by mass transit agencies. They are:

- Traditional fare payment systems that incorporate a stored value model. These systems (often referred to as transit applications) use contactless smart cards to carry a data file that is read and updated by readers on buses, fare gates, and platform ticket validators. The data file includes all of the information about the electronic token or pass purchased by the customer that is required for the reader to calculate transaction-specific charges. In most instances, real-time connection to the back office system has not been provided for normal fare payment operations, but instead periodic updates occur throughout the day. To date, implementations throughout the world have used this model, including U.S. transit systems in Washington, D.C.; Baltimore; San Francisco; Oakland; Los Angeles; Chicago; San Diego; Seattle; Minneapolis; Houston; Boston; Philadelphia; Atlanta; and the New York–New Jersey area.<sup>4</sup>
- Traditional payment card industry systems that use existing financial networks to process
  transactions and load value onto traditional fare payment cards. These systems typically use
  standard magnetic stripe credit and debit cards, although contactless technology is now being
  introduced by a variety of retailers (such as quick service restaurants) that generally process small
  transaction values. Transit agency devices such as ticket vending machines and point-of-sale
  (POS) systems are simply merchant terminals that process fare payment transactions just as they
  would any other retail transaction. It is common for most medium and large transit agencies in the
  United States to accept credit and debit card payment for some or all fare products sold.
- Enhanced payment card industry systems that incorporate an intermediate back office step.<sup>5</sup> This step calculates the correct fare before the transaction is processed through traditional

<sup>&</sup>lt;sup>1</sup> This white paper uses the term "financial payment card" to refer to credit and debit cards carrying the American Express, Discover, MasterCard or Visa brands.

<sup>&</sup>lt;sup>2</sup> "Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence," Smart Card Alliance Transportation Council white paper, October, 2006. Available at <a href="http://www.smartcardalliance.org">http://www.smartcardalliance.org</a>.

<sup>&</sup>lt;sup>3</sup> In this white paper, a multi-application card is defined as a smart card that runs multiple applications – for example, physical access, logical access, data storage, and payment – using a single card.

<sup>&</sup>lt;sup>4</sup> Additional information on U.S. transit smart card implementations can be found at <u>http://www.smartcardalliance.org/pages/smart-cards-applications-transportation</u>.

<sup>&</sup>lt;sup>5</sup> Additional detail on this model is available in the white paper, " Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence," available at http://www.smartcardalliance.org.

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financial networks. These systems sometimes aggregate transactions to reduce transaction fees. An example of this model is the New York City Transit pilot program, which accepts contactless credit and debit transactions for paying subway fares.<sup>6</sup> The Utah Transit Authority has conducted a pilot program, which accepted contactless credit and debit transactions for paying bus fares, and is now launching a full system bus/rail deployment using this approach.<sup>7</sup>

- **Basic combined systems that use contactless media**. With this system, the contactless payment media carry two types of data files. One is the transit application data file used in traditional fare payment systems. The other is the credit/debit cardholder information needed to process transactions using traditional financial payment card industry systems. The two payment systems are not integrated in any way at the card level. The transit application is used to pay for transit fares; the credit/debit card application is used for other retail purchases. Examples of this model are the London Oyster/Barclaycard and the Taipei EASYCARD.<sup>8</sup>
- Enhanced combined systems that give customers a choice of fare payment methods. Methods include the contactless fare card used in traditional fare payment systems, the multiapplication card used in basic combined systems, and the standard credit or debit card used in traditional financial payment card industry systems.

This white paper focuses on the *basic combined system* and provides an overview of an approach for transit/financial payment convergence that leverages co-branded card business models and the multi-application capabilities provided by smart card technology. The white paper is intended to provide a framework for reviewing the opportunities for a co-branded multi-application transit/financial payment card and an understanding of the key considerations for implementing such a program. The white paper explores the following:

- Current transit payment system architecture and trends and financial industry card marketing programs and contactless initiatives.
- Definition of a basic combined system that leverages existing transit and financial payment technologies and infrastructure.
- Case studies of three overseas programs, the Oyster/Barclaycard, Taipei smart card program and TaiwanMoney card, that have implemented co-branded multi-application contactless transit/financial cards.
- Key commercial, operational support and technical considerations that financial issuers and transit agencies should discuss when contemplating the implementation of a co-branded multi-application transit/financial payment card.

Additional information on other transit payment models and co-branding programs can be found in the appendices.

<sup>&</sup>lt;sup>6</sup> Additional information on the New York City pilot can be found at http://www.mastercard.com/us/paypass/subway/index.html

<sup>&</sup>lt;sup>7</sup> Additional information on the Utah pilot can be found at http://www.rideuta.com/mediaRoom/pilotPrograms/contactlessFare.aspx

<sup>&</sup>lt;sup>8</sup> See Section 3 for additional information on these implementations.

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# 2 Current Payment Systems

# 2.1 Overview of Transit Payment Systems

Since the late 1970s, transit operators have processed electronic tickets as passengers board buses, enter train stations, or board commuter trains. Tickets or other fare products are purchased using cash or credit/debit cards that are authorized online, and the transit product data is encoded on either magnetic stripe or contactless smart card media. On-board or in-station equipment reads, interprets, and processes this data to apply fare policies and generate transaction records. Terminals are designed so that the fare payment process can occur offline. Records are stored for forwarding or collection later, supporting consolidation, detailed audit reporting, and security. Networks are designed to leverage intermediate consolidation nodes that facilitate this process and protect against data loss.

Figure 1 below depicts the transit payment system architecture. Transaction records created by fare collection devices (such as fareboxes, gates or contactless smart card processors) are forwarded first to depot or station data concentrators, then to operator-specific systems, and finally to regional processing centers (when more than one agency is accepting a common contactless smart fare payment card). Transaction records at each node are preserved until the destination node has confirmed record receipt and logging.



## Figure 1: Transit Payment System Architecture

This distributed architecture evolved to address several challenges: fare terminals are spread over large geographic areas; individual fares can depend on user profiles and previous trip histories; and the cost, availability, and reliability of high speed real-time communications networks can be an issue, particularly for bus transit systems. This last constraint is easing with the increasingly widespread availability of low cost mobile data networks.

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To make this distributed architecture easier to design, procure, implement and operate, the transit industry is beginning to apply standards for the contactless smart fare card-to-reader interface and to define and publish new transit-specific application-level and intersystem messaging standards. These standards include the American Public Transportation Association (APTA) Contactless Fare Media System (CFMS)<sup>9</sup> standard in the U.S., the ITSO standard<sup>10</sup> in the United Kingdom, and the Electronic Fare Management (EFM) standard<sup>11</sup> defined by the Verband Deutscher Verkehrsunternehmen (Association of German Transport Undertakings – VDV) in Germany.

Since the late 1990s, U.S. transit agencies have made and are continuing to make significant investments in contactless smart card-based automatic fare collection (AFC) systems. Over the past few years, the financial industry has begun introducing new payment media based on contactless smart cards for use in the retail point of sale environment. Both of these industries have settled on the common ISO/IEC 14443 standard defining the card/reader interface. This very important development provides the opportunity to establish links between the two industries, and is key to the feasibility of the payment model described in this paper.

# 2.2 Overview of Financial Payment Industry Initiatives

Recent initiatives by financial institutions have had a significant impact on the potential viability of multiapplication cards for transit fare payments. These are the development of partnerships between financial payment card issuers and transit agencies and the adoption of contactless card technology by card issuers.

# 2.2.1 Card Marketing Programs

Marketing partnerships are already established between financial institutions and transit agencies for the purpose of issuing financial payment cards. There are two basic partnerships—those that require the cards to feature the financial issuer's brand, and those that require the transit agency's brand to be more prominent ("co-branded cards").

Establishing these partnerships (regardless of the technology used by the underlying payment device) results in a cooperative environment, laying the groundwork for the development of innovative payment solutions.

# 2.2.1.1 Brand Card Marketing

Financial payment card issuers sometimes establish partnerships to leverage additional marketing channels for acquiring new accounts. While specific agreement terms vary, the owner of the marketing channel may receive compensation based on the volume and quality of accounts generated. These arrangements are more common in scenarios where extensive customization is not warranted or where the channel owner's brand is not expected to drive acquisition efforts as effectively the card issuer's brand.

Transit agencies typically control physical facilities and online channels that can represent opportunities for marketing payment cards. Relationships between financial payment card issuers and transit agencies will facilitate discussion of card technologies, including multi-application contactless cards.

# 2.2.1.2 Co-branded Card Marketing

A co-branded card carries both a non-payment brand (such as the brand of a retailer, airline, theme park, or transit agency) and the brand of the financial issuer. Examples of co-branded cards in the transportation industry include cards issued by Citibank in partnership with the Washington Metropolitan Area Transit Authority (WMATA) and by Chase in partnership with San Francisco Bay Area Rapid Transit (BART) and Amtrak.

<sup>&</sup>lt;sup>9</sup> Additional information is available on the APTA web site at http://www.aptastandards.com/.

<sup>&</sup>lt;sup>10</sup> Additional information is available on the ITSO web site at http://www.itso.org.uk/.

<sup>&</sup>lt;sup>11</sup> Additional information is available on the VDV web site at http://www.vdv.de/en/index.html.

Co-branded card programs are defined by a business relationship between the brand owner and the financial payment card issuer. The relationship is guided by an agreement that defines the marketing approach that the card issuer will follow, the participation of the brand owner in the marketing efforts, and the financial responsibilities and opportunities of each party. There are a number of co-branding models that can be put in place, each having different business agreements and brand prominence and placement.

For the financial card issuer, the co-branded deal represents an opportunity to leverage new channels for card solicitation and build on consumer loyalty to the brand that will go on the card. Issuers hope to generate active cardholder relationships based on the consumer's loyalty to the brand.

In a co-branded relationship, the financial institution is typically responsible for the following:

- Soliciting prospective cardholders, using techniques such as direct mail, telemarketing, online, direct response television marketing, and take-ones; using targeting and optimization models; managing "do not solicit" requirements
- Issuing cards, authorizing and settling transactions, and creating statements
- Providing customer service related to payment transactions, such as answering questions about disputed transactions, and processing chargebacks, if appropriate
- If appropriate, managing cardholder value propositions (e.g., rewards programs)

The co-brand partner is typically responsible for the following activities:

- Providing access to the brand for marketing purposes
- Providing the financial institution with a list of prospects for acquisition campaigns
- Providing access to marketing channels (e.g., Web sites, physical facilities)
- If appropriate, funding certain elements of the rewards program
- Supporting customer service as it relates to service delivery failures and to questions specific to the brand

The financial payment brand (i.e., American Express, Discover, MasterCard, Visa) is generally responsible for the following:

- The payment system infrastructure
- Rules and governance
- Marketing support

While not necessary for a co-branded relationship, transit agencies may consider a multi-application payment card approach, as defined in Section 3 of this white paper. When issuing a multi-application payment card, financial institutions need to determine how best to integrate a third-party application into current customer acquisition processes, card production and distribution processes, customer service functions, and established business models. Such integration can present unique technical challenges in the areas of key and application management (see Section 4.2), as well as new business challenges in areas such as customer relationship management.

For potential relationships between the financial and transit industries, a co-branding agreement could be developed either to issue a co-branded card that supports standard contactless credit/debit payment at the farebox or gate, or to issue a co-branded, multi-application card that supports the transit fare payment application at the farebox or gate and credit/debit payment at the traditional retail points of sale.

# 2.2.2 Contactless Credit and Debit Payment

At the end of 2007, industry sources estimate that over 33 million contactless financial payment cards had been issued worldwide, and tens of thousands of merchant locations accept contactless credit and debit cards. Some merchants have rolled out contactless acceptance at all locations across the country, and this trend has recently gained traction among traditionally cash-oriented markets such as vending and taxis.

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Contactless payments are currently supported by multiple card issuers and financial service providers. American Express, Discover Network, MasterCard, and Visa have all introduced contactless payment products (ExpressPay<sup>™</sup> from American Express<sup>®</sup>, Discover<sup>®</sup> Network Zip<sup>SM</sup>, MasterCard<sup>®</sup> PayPass<sup>™</sup> and Visa payWave<sup>™</sup>). These products rely on ISO/IEC 14443-based technology, ensuring compatible payment solutions regardless of brand or payment device when used with contactless readers that have been approved by the payment brands. In addition to cards, form factors such as key fobs, cell phones, wristbands, and mini-cards are available or are being developed to support contactless payment transactions. The momentum towards ubiquitous contactless credit and debit card acceptance and general availability of contactless cards creates an environment with greater potential for the development of multi-application contactless payment cards for transit, in which consumer acceptance may be more likely.

Some portfolios may not justify the added expense of incorporating contactless capability—whether to issue contactless devices is a decision that issuers will make case by case. In some cases, a motivated co-brand partner may opt to share the cost of issuing contactless payment cards because it fits well with a strategy the partner has embraced. Some issuers have chosen to incorporate contactless functionality into their debit card portfolio, while others have not yet made this commitment.

As the cost of contactless bank cards declines and the contactless-enabled card base and contactless acceptance base grow, the case will likely become more compelling for other issuers and merchants to participate in order to maintain their competitive position. This, in turn, may create a more favorable environment for co-branded multi-application cards, as issuers look for ways to differentiate their products and agencies look for ways to leverage bank-issued contactless payment cards.

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# 3 Basic Combined System Definition

This white paper defines the *basic combined system* as one that accepts both co-branded, multiapplication payment cards and transit-issued smart cards. In this model, American Express, Discover Network, MasterCard or Visa branded contactless financial payment cards would not be accepted at the point of fare payment. Contactless financial payment cards would be used at online devices to purchase fare products to be loaded onto bank-issued multi-application cards and transit-issued contactless smart cards.

Basic combined systems incorporate three operating principles:

- The multi-application card carries a transit data file and a traditional credit/debit card data file.
- The contactless credit/debit payment application is honored at conventional retail POS terminals but not at the point of transit access.
- The transit data file is processed by the transit terminal as though it were a transit-issued fare payment card.

Smart cards support discrete data files and can control access to them. A smart financial payment card can support both discrete credit or debit payment functionality and a file carrying the transit application that conforms to the requirements of legacy or newly deployed transit fare payment systems.

Use of contactless smart cards in transit will continue to grow, in particular, where transit agencies are either implementing traditional contactless fare payment systems or teaming with financial institutions to expand consumer use of bank debit or credit cards to pay for daily commutes. In the short term, contactless financial payment cards can co-exist with traditional fare payment systems. By working with financial institutions to issue a co-branded multi-application transit/financial contactless payment card, transit agency riders can carry a single card that includes the discrete transit data file and that can also be used for financial transactions. This type of system provides one approach that supports both transitional and long-term strategies for transit and financial payment industry collaboration.

While the use of a multi-application card may simplify financial payment card acceptance in current transit systems, multiple issues must be examined to determine whether such a card offers a viable strategy for participants in the smart card value chain. Supporting the strategy has commercial, operational and technical ramifications that are discussed in more detail in Section 4.

# 3.1 Benefits of the Basic Combined System

Stakeholders in the basic combined system model include transit agencies, financial payment card issuers, merchant acquirers, transit patrons, and potentially, retail partners of both the transit agencies and the acquirers. All of these stakeholder groups can benefit from this model.

Transit agencies may achieve some, or potentially all, the following benefits:

- Reduction of costs associated with card stock acquisition and card distribution, resulting in ongoing savings in both capital and operating expenses.
- Simplified transactions at vending machines, leading to fewer patron issues and lower customer service costs.
- Use of existing fare policies, patron feedback and enforcement features and practices.
- Minimal system costs for deployment for agencies already operating contactless smart card programs. Co-branded multi-application cards can be introduced and accepted without modifying current terminal software or imposing financial industry data security requirements on fare processing equipment. Current systems, standards, and processes can be leveraged.
- Revenue opportunities, such as co-brand revenue sharing, bounties on newly acquired accounts, and, possibly even fees from licensing the transit brand and application to the issuer.

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- Opportunities to link transit usage with particular retail partners by integrating with merchant loyalty programs, thus further motivating patrons to obtain the card.
- Increased migration to smart cards, lowering the operational costs inherent in using other supported fare media (e.g., single-ride magnetic tickets, limited-use smart cards, cash, paper tickets).
- Use of current customer service centers, with the on-card data file assisting customer service and enforcement personnel who may not have access to an online terminal, as well as opportunities for reduction in customer service overhead as patrons look to their financial payment card issuer for information and issue resolution (subject to the development of a business case that provides issuers with the incentive to take on such functions).

Financial payment card issuers can achieve the following benefits:

- Opportunities for new customer acquisition. The transit application and brand may act as an effective marketing tool to target regular transit users and encourage them to adopt and use the issuer's financial payment card. A multi-application transit/financial card may be particularly appealing when there is a pre-existing strong transit brand.
- Generation of additional spending volume for the financial payment card, through fare product purchases (e.g., stored value and passes using POS terminals or autoload functions).
- Top-of-wallet card positioning due to daily use associated with the transit application.
- Improved customer awareness and knowledge of contactless benefits due to the use of contactless media for both transit and retail POS payment.
- Straightforward implementation. The model leverages the current financial infrastructure, with few additional services and little system development required of the financial community.

Merchant acquirers may achieve the following benefits:

- Increased purchase volume due to fare product sales and card reloads.
- Potential for an improved business case for merchant conversion to contactless-enabled terminals, due to customer ability to reload the transit application at properly configured POS terminals.

Transit patrons may achieve the following benefits:

- Enhanced convenience resulting from the use of a single payment card for both transit and retail financial payment.
- Increased ease of use, resulting from the familiarity of the user experience with a transit-issued fare payment card.
- Easy vending machine transactions.
- Availability of current transit-only fare payment card features and benefits (e.g., feedback on balances and transaction activity at point of use; transit balance checking and access to trip history at offline devices; access to proof of payment).
- New transit-centric rewards programs (if offered by the transit agency).

Retail partners may achieve the following benefits:

- Increased foot traffic and commission revenue for merchants facilitating transit reloads.
- Potential for cross-merchant loyalty programs to bring customers into stores and drive spending.

These stakeholder benefits are available now to transit operators with existing contactless programs. The basic combined model allows banks and transit operators to collaborate in the near term on initiatives that can provide useful data on user preferences and market segmentation and that can assist in shaping a longer term business model. Combined transit/financial payment cards can be rolled out quickly throughout the system without the need to go through lengthy development and testing cycles. Riders

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will also benefit since the user proposition is easy to convey and cards are used and supported in the same way as conventional transit cards and conventional credit/debit cards.

The combined model also accommodates future changes in both the market and the technology without loss of the foundation investment. This way, agencies can take advantage of evolving new communications solutions and the business models behind them. In addition, as more banks convert their card bases to contactless cards, the need for redundant systems will decrease.

# 3.2 Case Studies of Co-Branded, Multi-Application Transit/Financial Programs

This section includes three case studies of overseas programs, the Oyster/Barclaycard, Taipei smart card program and TaiwanMoney card, that have implemented co-branded multi-application contactless transit/financial cards.

# 3.2.1 Oyster/Barclaycard<sup>12</sup>

Transport for London (TfL) awarded a concession contract to TranSys Ltd., a limited liability corporation whose principal shareholders were Cubic Transportation Systems Ltd. and Electronic Data Systems. The contract called for the completion of London Underground gating, the upgrade of the London Underground fare collection infrastructure, and the development and deployment of a contactless smart card system for all London Underground and London Bus operations. The new contactless card was branded Oyster<sup>®</sup> and launched in August 2002.

The system was the first large-scale deployment of a fare terminal infrastructure compliant with ISO/IEC 14443, Type A and Type B. The basic card technology uses NXP (then Philips) MIFARE<sup>®</sup> Classic smart cards. The system incorporates over 18,000 devices, including fare gates, ticket vending machines, ticket office machines, bus fare registers, bus validators, handheld terminals, and merchant POS equipment.

Since system launch, a variety of user convenience options have been introduced to complement the original stored value utility provided by Oyster. These include:

- Web-based sales with product collection at point of validation (ad-hoc load)
- Automatic top-up of value
- Daily price capping

The project is a well-documented success, winning a variety of awards, and has a current circulation in excess of 15 million Oyster cards. Today, more than 75% of all daily bus and subway rides use Oyster for payment.

# 3.2.1.1 Business Agreement

The original contract was structured as a form of public-private partnership, with Transport for London retaining specific responsibilities for marketing and customer service. A creative mechanism was established to encourage commercial exploitation of the card and the system. This mechanism calls for the net revenues generated by new commercial products to be split equally between TranSys and TfL. In accordance with these provisions, TranSys and TfL negotiated an innovative arrangement with Barclays Bank PLC for the issuance of a multi-application co-branded bankcard. The nature of the relationship between the organizations is unique, due to the nature of the private financial initiative agreement between TfL and TranSys.

Under the terms of the licensing agreement, Barclays has an exclusive license for a fixed period of time to place the Oyster application and brand on new contactless financial payment cards. This provides Barclays with a unique selling position, given the large number of Oyster users (who are already familiar with contactless payment technology) and the very positive brand association of Oyster. In return, TranSys and TfL receive revenues from Barclays and enjoy reduced card issuance costs.

<sup>&</sup>lt;sup>12</sup> This profile was contributed by TranSys and Transport for London, with input from Barclays.

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The first product resulting from this agreement is the Barclaycard OnePulse card<sup>13</sup>, a three-in-one card that combines Oyster with contactless Visa payWave and traditional contact EMV<sup>14</sup> credit and debit payment. (The Web site referred to in the footnote provides examples of how Barclaycard is marketing this product.)

# 3.2.1.2 Operational Implementation

The Barclaycard OnePulse card carries the transit and financial applications on the same chip. There is no interaction between the two applications (see Section 3.2.1.3 for a technical description). The financial application is a standard, fully certified EMV application.

Under the terms of the agreement, TranSys provides Barclays with the tools and data necessary to load the transit application onto the chip when the card is personalized. The transit application itself is not personalized but is marked as "registered," and the relevant personal details are passed to TfL for its records, thereby providing Barclaycard OnePulse users with all the benefits of Oyster registration. The personal data is passed to TfL after card personalization, using automated processes.



Customers are instructed to contact Barclaycard for payment inquiries and TfL for transit inquiries. For inquiries specifically related to the card itself (e.g., lost or stolen cards), customers contact Barclaycard. Barclaycard's customer service staff direct Oyster-related queries to TfL and vice versa. The bank call-center representatives have no access to transit activity other than to assist a customer in setting up automatic top-up. The transit application itself can be funded by all means currently available for traditional Oyster cards, including cash, debit, and credit.

Card replacement is handled by Barclaycard. Replacement of outstanding transit balances or products is initiated by Barclaycard and passed to TfL, who uses the ad-hoc load facility to load balances or products onto a replacement card.

# 3.2.1.3 Technical Implementation

The two major technical issues associated with the implementation of the Barclaycard OnePulse card are card design and card personalization.

# <u>Card Design</u>

The Oyster transit application, like many other transit implementations worldwide, is a closed-circuit design. The infrastructure is designed to support a range of ISO/IEC 14443-based technologies but to date has used only Type A protocols, which are derived from those used by the NXP MIFARE wired-logic platform. The Oyster application resides in 1Kbyte of memory on a standard MIFARE implementation. The Visa payment applications are an EMV-compliant contact credit application based on the ISO/IEC 7816 (contact) standard and a Visa payWave contactless application based on the ISO/IEC 14443-4 (contactless) standard.

The Barclaycard OnePulse card brings these three applications together on an NXP SmartMX card.<sup>15</sup> This solution is illustrated in Figure 2. The transit



and EMV applications co-reside without interference. The firewalls supported by the SmartMX card and the card operating system ensure that the financial application cannot access or corrupt the transit application. The MIFARE-based transit application uses the passive memory-based command set to implement the Oyster functionality.

 <sup>&</sup>lt;sup>13</sup> Additional information on the Barclaycard OnePulse card can be found at http://www.barclaycard-onepulse.co.uk.
 <sup>14</sup> Europay MasterCard Visa. Specifications developed by Europay, MasterCard and Visa that define a set of

requirements to ensure interoperability between payment chip cards and terminals.

<sup>&</sup>lt;sup>15</sup> For more information, see <u>www.nxp.com/products/identification/smartmx/</u>

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This solution was chosen for two reasons. First, it represented minimal technical risk. The NXP SmartMX was a proven technical solution for combining a microprocessor-based application with a MIFARE-based application on a single chip using both contact and contactless interfaces. Adopting this approach required no changes to the readers for the Oyster transit system. From the reader's perspective, Barclaycard OnePulse cards are indistinguishable from standard Oyster cards. Barclaycard OnePulse cards could therefore be used immediately on every mode of transport and with all retail, validation, and handheld equipment on the transit system. The only change was to create a new configuration setting for these cards so that the transactions they generate on the transit system are distinguishable from transactions generated by other Oyster cards. This change allows card use to be reported easily and relevant management information to be generated (e.g., where the cards are being used, how frequently they are being used, and what travel products are being loaded onto them).

The second reason for choosing this solution was to minimize time to market. In order for Barclaycard to obtain the full benefits of the relationship with Oyster, it was necessary to get the cards to market in time for the Visa/MasterCard launch of contactless payments in the United Kingdom in September 2007. This meant that cards needed to be in customers' hands less than 9 months after the commercial agreements were concluded. A technical solution that required changes to the transit readers would not have been possible, as TfL was already committed to a substantial reader software change during the same time period that could not be interrupted. By adopting this technical approach, TfL could proceed with the reader software change, knowing that the Barclaycard OnePulse cards would be fully compatible with both new and old reader software.



## Figure 2: Using the Barclaycard OnePulse

### Security, Certification and Performance

Oyster cards conform to a technical specification that is issued and maintained by TranSys. The technical specification includes both functional attributes (e.g., electrical characteristics and chip type) and non-functional attributes (e.g., surface coefficient of friction). The same specification is given to all suppliers, one of whom also supplies the Barclaycard OnePulse cards.

The current certification processes for Oyster cards were directly transferable to the Barclaycard OnePulse cards. These processes verify both the electrical and mechanical integrity of the cards to ensure that they will withstand the normal day-to-day use to which a transit card is subjected. Additional

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security assurance was undertaken to verify that any potential risks associated with using a different card platform were appropriately managed or mitigated.

The TranSys certification process verifies that required card performance is achieved both in terms of transaction speed and operating range. A calibrated test rig demonstrates this against a standard Prestige reader, thereby ensuring that performance is adequate for real-world operational situations. Card suppliers to TranSys are furnished with appropriate facilities to test sample card configurations before release to TranSys for final approval.

### **Personalization**

It was understood early in the project that personalization of the Barclaycard OnePulse card had to be a one-step process for the card to be a commercially viable product. The Oyster application had to be loaded onto the SmartMX chip during the same process that personalized the financial application. The solution provided by TranSys accomplishes the following:

- Allows Barclaycard's card producers to enable the Oyster application using industry-standard card production equipment.
- Adds the Oyster application to the card without any impact on the card producer's throughput.
- Protects the Oyster application keys, assuring TfL of the integrity of its transit ticketing system.
- Is readily scaleable to cope with peak demand for cards.

The Barclaycard card production system is integrated with the Oyster back office system to allow regular, secure exchange of card enabling information between the two systems. In addition, the need for additional production process approvals was avoided by using the current Barclaycard card producers.

## Application Ownership

The OnePulse card is issued and owned by Barclaycard, who has the right to cancel a customer's card. The actual Oyster account resides with TfL, allowing that account to be managed independently of the credit card component. Consequently, it is possible to recover the balance from an Oyster account if necessary. The Oyster account is tied to the physical card number, but it is possible to transfer products between card accounts (for example, if a customer wishes to transfer products to a new OnePulse card, or when the card expires).

TranSys supplies the means by which the Oyster application is encoded onto the card and therefore retains control over the formatting and configuration of the application data. Consequently, ongoing amendments to the Oyster application can be accommodated seamlessly through periodic configuration updates to the encoding system. In this way, the production-proving process is restricted to certifying the card and the encoding system integration. Ongoing proving will be restricted to certifying new card construction.

The OnePulse card offers a number of cost advantages over the basic Oyster card. Integration between the Barclaycard and Oyster back office systems enables a high degree of automation of standard processes, including the processes that govern card loss or theft and card replacement. From a transit agency's perspective, it is reasonable to assume that customers place greater value on their combined credit and transit cards and therefore that churn rates will be lower than those experienced to date for transit-only cards.

Because the two applications (credit and transit) remain functionally separate, they can be managed independently. Independent management has significant benefits for the issuers, as it limits the requirement for interaction to activities such as card issuance, withdrawal, and replacement. Card reissuance is managed by Barclaycard and follows the normal bank reissuance cycle, with outstanding Oyster products and balances transferred using a semi-automated process. The Oyster element of the card does not automatically expire until the customer either asks to have the products transferred or decides to exhaust the balance or complete any period contracts held.

Integration between help desks permits both parties to provide the level of customer service to which both Oyster and Barclaycard customers have become accustomed. Cardholder information is shared between the parties as required for registered Oyster cards.

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The Barclaycard OnePulse cards are differentiated by specific Oyster card type (staff, retail, student). The type is encoded in the card and within all transaction data. The Oyster system uses this card type to manage customer-related interactions, including what products can be purchased, what operations can be performed, and what information is provided to customers. TfL uses this information to segregate those Barclaycard users on management reports.

All of these factors are important, not only during the initial period of peak demand when the combined card is launched, but also for routine processing of lost, stolen, and surrendered cards. More value-added services are also enabled, such as allowing Barclaycard OnePulse customers to link Oyster auto top-up capability to their Barclaycard account, which means that they can receive a new card in the mail that is already enabled for auto top-up, with only a simple phone call needed to activate the capability.

# 3.2.2 Taipei Co-Branded Card Program<sup>16</sup>

The Taipei Smart Card Corporation (TSCC) co-branded card was launched in July 2006, as the result of the selection by the TSCC of a four-issuer consortium for a three-year co-brand deal. The program has issued in excess of 750,000 cards to date and is the most successful card collaboration between banks and transit in Taiwan today. This section summarizes the TSCC program through September 2007.

# 3.2.2.1 Business Implementation

TSCC was founded in March 2000. The corporation consists of Taipei City Government, Taipei Rapid Transit Corporation, 13 private bus companies, TaipeiFubon Bank, Mitac Inc., Taishin International Bank, United World Chinese Commercial Bank, Seaward Leasing Co., Chinatrust Commercial Bank, Mercuries Data System Ltd., China Engineering Consultants, Inc., and Solomon Smartnet Corp. TSCC is 43% government-owned and 57% private-sector owned. The four issuing banks are shareholders of TSCC.

The co-branded project was supported by the Taipei City Government, which wished to promote public transit and which believed that smart cards are the way to integrate bus ticketing with Metropolitan Rapid Transit (MRT) ticketing. Motivated by the city government, the issuers joined together to offer the co-branded card.



The motivation for TSCC was primarily the cost of maintaining the transit-only EASYCARD. Co-branding enabled TSCC to offload the cost of handling the cards. In addition, co-branded cards offer TSCC an additional revenue source from the issuers.

For the issuers, the transit application adds value to the credit card. Consumers tend to use the card more often, issuers get autoload transactions, and the credit card moves to the top of the wallet. (The autoload feature is only available to transit riders on a co-branded transit/financial card, providing an incentive for riders to get and use a co-branded card.)

Issuers pay an initial fee for the right to issue the co-branded dual-application card. The banks also pay TSCC US\$15 for each unique cardholder to whom a card is issued. If a card is lost and replaced, banks pay TSCC only a small additional fee to cover the cost of encoding the replacement.

Banks are responsible for marketing the cards to consumers. They have committed to issuing 2.2 million cards over 3 years. TSCC assists issuers with promotion.

# 3.2.2.2 Technical Implementation

The EASYCARD, a MIFARE-based ticketing system, has been operating in Taipei for a few years. EASYCARD can be used to pay for rapid transit fares, bus fares, off-street parking, and on-street parking meters. A total of 10 million EASYCARDs have been issued, and 60% of these cards have been used at least once in the past 2 years. TSCC operates the EASYCARD system.

<sup>&</sup>lt;sup>16</sup> This profile was contributed by TSCC.

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For the co-branded card, the financial application and transit application (provided by TSCC) reside on the same chip. The co-branded card uses the NXP SmartMX chip. Transit fares are calculated on the MIFARE part of the card.

The card also includes a stored value e-purse, called EASYCASH, that can be used in convenience stores. The e-purse can be autoloaded from the credit card account. EASYCARD can also be used to pay for taxi rides.

# 3.2.2.3 Operational Implementation

The co-branded cards come with the autoload feature which allows transit value to be reloaded from the credit card account when the transit balance drops to approximately \$15. This feature is only available on the co-branded card (not the transit-only EASYCARD). The transit application is anonymous, but the reload is traceable back to the credit cardholder. (Cardholders can also load the transit purse with cash.) The autoload feature is only available at rapid transit gates, offstreet parking sites and the cable car for Mou Kon tourist area. (The autoload feature for parking was implemented recently.) This makes the card attractive to drivers as well as transit riders. If the co-branded card is lost, the rider cannot get the transit funds back.



The transit application has the same expiration date as the credit card. When a co-branded card expires, the remaining transit value is returned to the credit card account after 30

days. Since transit transactions take place offline, the system must collect all transit transactions before a customer's account is settled.

Customer questions go to the bank customer service center. The bank then passes appropriate customer questions to the TSCC. However, most riders seem to know where to go to solve problems. For example, when the autoload feature wasn't activating properly, riders went directly to TSCC to get help.

The four issuers use four different outsourced personalization bureaus, who load both the financial and transit applications. Bank and transit security keys are separate and managed separately.

TSCC owns all transit transactions. When banks request information, TSCC provides information in aggregated form. No individual rider data is released to banks, as required by law.

# 3.2.2.4 Results

Over 750,000 co-branded cards have been issued as of September 2007, including replacement cards. As of that date, 670,000 valid cards were in circulation, and a total over 3 million rides have been taken using co-branded cards during September 2007. In addition, 40% of the co-branded cards have used the transit feature at least once, and only 3-4% of the cards have been discontinued.

# 3.2.2.5 Challenges and Observations

The TSCC program has so far yielded the following observations.

<u>Business vs. technical difficulty</u>. Achieving an agreement on business terms across many issuers concurrently was more difficult than the technical implementation, particularly since the agreement involved four competitive issuers who were involved in a single contract. From initial discussions to issuance of the first co-branded cards took three years.

<u>Closed system vs. co-branded card</u>. A closed transit system is still required, since not everyone will carry a dual-application, co-branded credit card. In addition, the city wants to give consumers a choice.

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<u>Use of model elsewhere</u>. Bringing this many issuers together to work collaboratively and introduce this product is unique and would be challenging even in other cities in Taiwan. Government involvement made a big difference in implementing this program. Most dual application programs are easier to launch as a joint effort between a single issuer and the transit operator. The dual application model with a single issuer can be replicated within Taiwan and is seen in many other markets.

<u>Hot lists</u>. A hot list for co-branded cards is not used on buses, but is used for rapid transit gates, off-street parking sites, and the cable car for the Mou Kon tourist area. It was judged that a hot list would be too large and its use would affect transaction time on buses. The agency also considered it too much effort to support this feature (lengthy time to probe buses and download the lists). TSCC is currently considering implementing wireless bus probing and may then reconsider hot lists.

The TSCC co-branded program is the largest and most successful collaboration between banks and transit in Taiwan today. To build on the success to date, the program has extended beyond the simple dual application to allow bank issuers to put EASYCARD/EASYCASH features on other major co-branded cards, such as co-branded department store and gas station cards. This approach has improved customer acquisition rates and incremental spending versus cards that are co-branded only with TSCC.

# 3.2.3 TaiwanMoney Card<sup>17</sup>

The Kaohsiung City Government (KCG) manages a large and costly public transport network for 6.5 million people spread across seven cities in southern Taiwan. The system includes intercity coaches, local buses, trains, harbor ferries, and public parking lots. Like many other large urban governments, KCG actively seeks ways to make life more convenient for its citizens while reducing operating costs.



KCG saw the potential convenience and efficiency of converting from cash-based to card-based fare collection. Yet they wanted to avoid the costs of operating a card program, such as financial risk management, card distribution, transaction clearing and settlement, and customer support. KCG decided to reach out to the payment card industry for help.

MasterCard went to work for KCG, combining core capabilities in card payments with new, market-tested technologies such as contactless payments. The program drew on well-established product offerings, including:

- **OneSmart Pre-Authorized**—offering overdraft-risk-free operation for low-value and offline payments.
- MasterCard PayPass—contactless card transaction technology available on all types of MasterCard card products.
- **MasterCard multiple account programs**—allowing cardholders to use a single card for credit, debit, and prepaid transactions, and select the desired payment method at the point of sale.

For implementation, MasterCard assembled a consortium of issuers and system integrators, including:

- Cathay United Bank (CUB) and E.Sun Bank—two Taiwan card issuers with multiple account card experience.
- Mondex Taiwan<sup>18</sup>—providing processing, clearing, and

product offerings, including:

<sup>&</sup>lt;sup>17</sup> This profile was contributed by MasterCard Worldwide.

<sup>&</sup>lt;sup>18</sup> The TaiwanMoney card neither bears the Mondex brand nor uses Mondex technology.

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settlement services to participants in the scheme.

- Acer—offering systems integration and project management.
- China Engineering Consultants (CECI)—transportation system engineering specialists.

## 3.2.3.1 Implementation

TaiwanMoney was launched in October 2005, with mass rollout scheduled during 2006. The card is offered to consumers via the issuer branch network, transit operators, and third parties such as TaiwanMoney merchants.

To use the TaiwanMoney card in the transit system, a cardholder simply taps the card against a validator device. When tapped, the validator deducts the fare from the card. An electronic receipt may be transmitted to the card for storage. KCG has chosen to operate as a completely ticketless transport system. However the TaiwanMoney solution would also allow a cardholder to purchase a ticket in advance and store an "e-ticket" on the card. In that case, the validator would retrieve the ticket on the card and update its status to "used."

Both types of TaiwanMoney card employ OneSmart *PayPass* technology—cardholders can choose to use the contactless option, but may also choose the traditional "insert card" payment method. That means TaiwanMoney can be accepted at any existing EMV merchant without the need to install a contactless reader at every location.

Both card types can be "topped up"—or reloaded—for additional use. And both products are backed by one of the two participating issuers. The MasterCard credit version of the TaiwanMoney card requires a credit application and approval. However, the standalone version can be issued to anyone onthe-spot without registration.

In addition to the fixed-fare scenario, TaiwanMoney supports more complex ticketing options such as variable fare based on travel distance or special discounts such as limited free travel for senior citizens.



# 3.2.3.2 Payment Options

KCG wanted a prepaid card solution for its transit customers. However, MasterCard saw an additional opportunity: leveraging OneSmart *PayPass*, the consortium could create another version of the KCG transit card that could be used at all MasterCard acceptance locations. This reversed the typical model. Instead of starting with a standalone transit card and pushing to overcome its inherent limitations, the program started with a fully loaded, multi-function MasterCard payment card and simply enabled it to work in the transit environment.

KCG was already sold on the idea of a prepaid contactless card, convinced that it would deliver great convenience and lower operating costs. But MasterCard and its partners persuaded KCG that it could generate far greater value, and increase card adoption by leveraging the OneSmart MasterCard platform.

A transit card with OneSmart would be more widely accepted and capable of supporting more than one type of payment transaction—credit, debit, or prepaid. And consumers would have the option of topping up the card by using a credit or debit card instead of cash.

KCG and the MasterCard consortium decided to offer customers two contactless payment card options:

• The stand-alone prepaid TaiwanMoney card—for transit transactions and other small payments at TaiwanMoney-accepting retail merchants such as supermarkets, convenience stores, and fast-food restaurants.

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• **The MasterCard Credit Plus TaiwanMoney card**—a multi-use card for the KCG transit system and other TaiwanMoney merchants as well as at any merchant accepting MasterCard credit cards worldwide.

## 3.2.3.3 Program Results

By the end of January 2007, over 120,000 TaiwanMoney cards had been issued—about 65,000 standalone and 58,000 Credit Plus.

In addition to being accepted at 1,800 transit locations, all TaiwanMoney cards are now accepted at over 2,000 retail/top-up locations. TaiwanMoney Credit Plus cards are also accepted anywhere MasterCard credit cards are accepted globally.

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# 4 Key Considerations

Financial institutions and transit agencies contemplating whether to implement a co-branded multiapplication transit/financial payment card should consider issues in three key areas: commercial, operational, and technical.

# 4.1 Commercial Considerations

The primary commercial drivers for co-branding relationships between mass transit agencies and financial card issuers are straightforward. Mass transit agencies seek incremental revenue opportunities and reductions in card distribution costs. Financial card issuers seek ways to deliver incremental value to their customers, including new places and more convenient ways to use cards, which will in turn attract new customers. However, while the primary commercial drivers may be straightforward, certain considerations should be addressed before any co-branding arrangement is put in place.

The following list of commercial considerations is far from comprehensive. However, successful cobranding arrangements are possible if each party recognizes that it will need to communicate its objectives and perceived risks clearly while negotiating an agreement.

# 4.1.1 Transit Agency Considerations

Mass transit agencies should not focus only on cost reduction when considering a co-branded multiapplication card program, since it undervalues the potential of the co-branding model. For example, a cobranding arrangement may improve the quality of the card-issuing process since financial card issuers are likely to be more experienced at issuing cards than mass transit agencies. Or, infrequent users may be more likely to make the effort to get a co-branded multi-application card (and maintain a pre-paid fare balance), thus reducing the agency's cost for issuing expensive, disposable single-ride fare tickets. Taking other factors into account, a mass transit agency may decide to proceed even if no significant cost savings can be achieved. However, mass transit agencies need to determine whether cost savings and other benefits achievable through co-branding are worth the effort and the risks associated with ceding a certain amount of control over the card issuance and management process and providing a financial card issuer with access to its customers.

## **Co-Branding Agreement Considerations**

Transit agencies can generally enter into commercial relationships only through a competitive procurement process. However, while transit agencies may have experience with business models such as concessions and advertising space sales contracts, most do not have experience with co-branding relationships. Therefore, transit agencies may be reluctant to enter into such relationships because they are not familiar with the associated risks. Or, they may proceed with such relationships without achieving the best terms for the agency, due to inexperience in negotiating such arrangements.

Especially in small or mid-sized markets, transit agencies may be challenged to demonstrate the commercial value of a co-branding relationship to interested financial card issuers. Transit agencies with accurate, detailed demographic information about their customers and a proven track record for reaching their customers are likely to negotiate the most favorable co-branding agreements.

Depending on the agreement, transit agencies may incur additional costs if they are required to provide any elements of a rewards program. However, in evaluating the impact of such costs on the economic justification for a co-branding program, transit agencies should also determine whether a similar program would be required to promote card acquisition if the agency was running its own card promotion and distribution program.

The length of a co-branding relationship will require a balance between commercial viability (making it worthwhile for both parties) and the desire to check the market on a regular basis to ensure that the most competitive terms are being maintained. However, the market potential will be different for each transit agency's service area. Rather than determining a "typical" contract length for a co-branding agreement,

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transit agencies may consider requesting proposals from multiple financial card issuers to obtain and evaluate offers that cover contract terms of different lengths. The transit agency can then add the costs of the procurement process to the overall cost of each project (or deduct them from the potential revenue stream, if that is the financial card issuer's proposal) and determine the length of contract that provides the most financial benefit. At that point, the agency will be able to at least make an informed decision as to the value of a longer contract term compared to the value of checking the marketplace to ensure that the most competitive terms are being achieved.

At some point, the relationship between the agency and the financial card issuer may terminate. Transit agencies need to consider that termination will necessitate issuing new fare payment cards with a transit application on them to customers who have been using the co-branded multi-application card.

## Customer Relationship Considerations

To maintain a strong trust relationship with their customers, transit agencies will need to ensure that any co-branding agreement incorporates policies regarding access to customer lists (for marketing and direct mail purposes) and to other marketing channels controlled by the transit agency (such as the agency's Web site or physical facilities). Most important, transit agencies should establish customer data management and ownership policies with the financial card issuer during the term of the co-branding agreement. Transit agencies will need to ensure that customer information is not misused.

The need to promote a co-branded card aggressively with the transit agency's customers must be balanced against potential backlash by customers reacting to undesirable direct mail or telemarketing efforts. Transit agencies may prefer alternative methods for reaching customers (such as billboards or print media), but these methods may not be as effective as direct response marketing. Transit agencies should work with the financial card issuer to establish joint policies regarding direct marketing campaigns to their customers before entering into a co-branding agreement.

A typical transit automatic fare collection system produces usage data that is shared within the agency. A multi-application card generates transit system usage data that will be of interest to the issuing bank, so that the bank can track the success of the program. Guidelines for sharing data need to be established between the issuer and the agency. In addition, sharing such data raises data ownership and privacy questions. Agencies and financial issuers need to define and communicate the policies and practices that address these questions.

If the program gains traction, it is likely that more banks will share the same customer pool. The agency will then need to distinguish usage data among issuing banks.

## **Customer Service Considerations**

The co-branding commercial agreement will need to determine the obligations of both the transit agency and the financial issuer for customer service. Co-branding agreements may cause some of the customer service functions related to cards to be transferred to the financial card issuer. The transit agency and card issuer will need to consider how customer service calls will be handled. Customers are likely to contact the financial card issuer first, regardless of whether the problem is with the credit/debit card account or with the transit application.

How to handle customer service is a critical piece of the co-branding agreement. Potential options range from having two customer service numbers on the payment card (one for the transit agency and one for the financial issuer) to directing customer calls to a specific group of financial-card-issuer customer service agents (rather than to the card issuer's standard customer service number), who can be trained to provide at least first-tier customer service for certain transit inquiries. The transfer of customer service functions will affect the economics of the co-branding relationship for the issuer. Due to cost considerations, financial issuers may only implement dedicated servicing queues for larger programs and then only service a limited number of non-banking inquiries. The customer service approach will affect the financial terms of a co-branding agreement.

Transit agencies may also need to resolve labor relations issues if the transit agency's customer service staff are represented workers and the labor agreement restricts contracting out such work.

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## Infrastructure Considerations

Co-branding agreements do not necessarily result in the complete transfer of card issuing and management costs to the financial card issuer. Most transit agencies are likely to be uncomfortable with an agreement that requires customers to establish a relationship with a financial card issuer for access to a transit application. Therefore, transit agencies will probably need to maintain an infrastructure for issuing, replacing and supporting transit fare payment cards for customers who do not want co-branded credit or debit cards. One option may be to include in the agreement a provision for the financial card issuer to issue standard transit cards (perhaps with the card issuer's logo on the card as advertising).

## **Risk Management Considerations**

One of the risks for transit agencies is that the financial card issuer will be unable to meet the performance commitments set out in the co-branding agreement. The financial costs and damage to the reputation of both parties can be quite high if the arrangement is not successful.

Consideration should be given to using incentives, not penalties, to drive performance. In addition, transit agencies should only seek compensation for actual losses. The potential benefits that accrue to transit agencies will be affected by the level of coverage required in the co-branding agreement to cover potential agency losses. It would be anticipated that an agency entering into a co-branding agreement for the first time would be more risk averse than a more experienced agency and thus require more extensive coverage for potential losses.

# 4.1.2 Financial Card Issuer Considerations

The limited current deployment of co-branded, multi-application products in the U.S. markets makes it difficult to estimate the initial value of a co-branded, multi-application transit opportunity for issuers.

## **Customer Acquisition Considerations**

For the financial card issuer, a co-branding agreement has the potential to capture new customers. However, a transit agency may not have an extensive customer contact list, especially if the agency is just launching a smart card-based system. Many agencies sell fare products such as multi-ride tickets or passes anonymously at retail merchants and ticket machines, rather than online or through accountbased relationships. In these situations, issuers will need to consider the cost of acquiring transit customers and any transit agency programs that could help move customers to the co-branded multiapplication card; these considerations may affect the commercial terms that can be offered to the transit agency.

Furthermore, the transit ridership demographic may not align well with the issuer's target customer base. Some transit markets are commuter-based and may be attractive to credit and debit card issuers. But other markets may include predominantly unbanked customers, offering less opportunity for traditional credit and debit issuers.

## **Co-Branding Agreement Considerations**

The financial card issuer's agreement with the transit agency will be more successful if the proposed cardholder acquisition approach seeks to increase mass transit use. The card issuer needs to communicate with an agency before the procurement process begins, to learn about the agency's operating environment and its medium- and long-term strategic objectives. Agencies are well-served by encouraging pre-procurement discussions with financial institutions, such as circulating a draft requirements document or publishing a request for information.

To understand the potential value of a co-branding agreement with a transit agency, financial card issuers must be able to evaluate the approaches proposed by the transit agency for driving card use. For example:

- Is the agency willing to offer a discounting program related to use of the co-branded multiapplication card? Will the discount be effective at driving card use (and thus move the card to the top of the wallet)?
- Is the agency willing to require its concessionaires (such as newsstands and station coffee shops) to accept contactless credit or debit card payment?

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- How much advertising space will the agency make available at its properties and on its trains and buses?
- Is the agency willing to provide an introduction to its partners in the community (e.g., colleges and universities, corporations) that can provide the financial card issuer with additional marketing channels for cardholder acquisition?
- What is the demographic profile of the agency's customers, and does the financial card issuer have products that would be desired by these customers?

# 4.2 Operational Support Considerations

# 4.2.1 Personalization Process

Contactless financial payment cards and devices require personalization. The customer's data must be encoded on the embedded chip and the magnetic stripe; often additional personalization, such as embossing or printing, is also required.

For a contactless financial payment card, several parties serve various roles in the personalization process. The process typically works as follows:

- The issuing bank orders cards from a licensed card manufacturer who has successfully completed relevant testing and certification requirements.
- The card manufacturer orders chip modules from a chip provider. Each module is protected with a security key.
- The card manufacturer incorporates a chip module into each card; the card is pre-personalized and remains protected by a security key. The pre-personalization step may initialize the chip with an application and/or file structure (which may require the injection of application or file-specific keys), and then lock the chip with a transport key.
- The pre-personalized cards are provided to the bank-certified personalization bureau, which loads the personalization data provided by the issuer onto the card. The personalization data can include the name, expiration date, CVV/CVC values<sup>19</sup>, and possibly other optional data. This information is written to the magnetic stripe and to the chip.
- The contactless financial payment card is mailed to the consumer or a distributor (in the case of bulk cards).

The supply chain is different for non-card form factors. The issuer typically deals with a device manufacturer who receives chip modules from a chip provider. The device manufacturer installs the application and builds the device. Because current high volume personalization equipment may not be able to process three-dimensional devices, either the device manufacturer or a third party performs personalization, depending on the form. Personalization of devices faces an additional challenge—scalability of the process.

# 4.2.2 Transit Application Loading

To support a co-branded multi-application transit/financial payment card, card issuers will have to modify the supply chain outlined in the previous section to include a step that loads the transit application. They will also have to modify back office processes to support processing, personalization, initialization, and key control for the transit application. Depending on how and where in the distribution process the transit application is loaded, issuers may need to customize distribution, which can have associated costs. This decision may also require issuers to expose keys to a third party, which will probably entail risk management or audit approval.

The transit application can be loaded during pre-personalization, personalization, or post-personalization. Each solution has advantages and disadvantages.

<sup>&</sup>lt;sup>19</sup> Card Verification Value/Card Verification Code. Security codes used by the financial payment brands for credit and debit transactions to protect against credit card fraud.

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**Pre-personalization**. Loading the file during pre-personalization is more efficient from the standpoint of card production and offers better economies of scale. A disadvantage is that the issuer and the owner of the transit application are required to exchange keys.

**Personalization**. Loading the file during personalization gives the issuer greater flexibility. If not all cards receive the transit file, the issuer can identify which cards are to receive the file during the personalization process. If the issuer performs this function in-house, loading the file during personalization provides greater control over key management and costs. Lastly, loading the file at this point in the process may allow the issuer to load an updated transit file without affecting the card stock in inventory. However, loading the file during personalization is not as efficient as loading the file during pre-personalization and may contribute to slower throughput.

**Post-personalization**. Loading the transit file after personalization is completed provides issuers with the most flexibility regarding what transit file gets loaded and when. One disadvantage is that cardholders may have to take action after they have received their cards, which may suppress adoption. In addition, the issuer may have to share essential keys with a transit operator if the transit agency is loading the file.

In addition, rules and guidelines will need to be established between the issuer and the transit agency to cover the presence of the application on a bank-issued card. The security of the cardholder data will have to be guaranteed both before and after the application is installed on the card.

Currently, vendors who support contactless financial payment cards and devices are required to complete approval testing and obtain certifications, using an established registration, evaluation, and review process. A similar process will be required to ensure the integrity of any multi-application transit/financial payment card solution. Issuers and agencies will have to agree on who is responsible for this testing and certification.

# 4.2.3 Regional versus Cross-Regional Agreements

Each co-branding deal will require an agreement between each financial card issuer and a specific transit agency. Transit agencies whose objectives are to reduce cash handling and increase card usage will be required to execute an agreement with each issuer. From the agency's standpoint, this is a large undertaking. From the financial card issuer's standpoint, agreements will be limited to agencies with systems that can accept the transit application. Usage and interoperability across geographic regions can therefore be challenging.

# 4.2.4 Customer Support

In order to support a transit co-branding program effectively, the transit agency and the financial card issuer must share the task of customer support. To ensure that customer service quality is maintained or improved, co-brand partners must define the process for dealing with customer inquiries, including how these inquiries are to be transferred between the agency and the card issuer, what technologies will be required to support such processes, and what training will be required for both transit agency and card issuer personnel.

Simply forwarding a transit application call to the transit agency may turn out to be an unsatisfactory solution. The customer will have a sense of being bounced around, rather than being served. The transit agency will be unhappy if it starts receiving complaints that the customer service process is complicated. And the financial card issuer's reputation may be tarnished because the issuer's brand is on the card.

Using the same instrument as a payment product and ticket medium raises the question of customer perception. Customers will view the cards as both a financial payment card and a transit fare payment card. Customer support facilities and help desks for the agency and issuer should therefore be seamless. Guidelines and procedures must, at a minimum, account for policies that administer negative listings, application management, card management issues such as card activation, card deactivation, and lost/stolen/never received cards, journey inquiries, credit/debit charge inquiries, card reissuance, and balance transfers.

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If multiple banks share the same customer pool within an agency, customer support will become more complicated. In addition, the transit application will have to be managed independent of the financial payment card, which becomes more challenging with more shared customers. A key consideration for the co-branded multi-application program is the definition of customer support processes and policies and possible integration of back office systems to facilitate customer service.

# 4.3 Technical Considerations

The implementation of the basic combined system is straightforward from a technical standpoint. There is no integration between the transit payment system and the financial payment card industry systems. A transit smart card system compliant with ISO/IEC 14443 can be leveraged for use in a multi-application contactless deployment. For example, an approach very similar to the one used by TfL and Barclays can be used to combine a financial payment card application and a transit application on a single card. This common card could be accepted by a single transit agency or multiple transit agencies (if multiple agencies accept the same contactless fare product), depending on the approach utilized in the transit smart card implementation.

This approach requires a microprocessor card conforming to payments industry standards that supports the financial payment card application together with a firewalled card operating system that supports the transit application. Such cards are currently available and can be set up with both the financial payment card application and the appropriate transit keys and data.

Another consideration in the launch of such a product is that the end result must achieve reasonable transit transaction time to support the throughput needs of most transit agencies. Card operating distance should be acceptable with microprocessor technology, given a high quality card antenna design.

The personalization process will also be impacted for the co-branded multi-application card. Sections 4.2.1 and 4.2.2 outline the options for personalization processes that need to be considered, including throughput for additional incremental encoding time. For a large program, personalization should be automated and use industry-standard card production equipment.

Application ownership, security requirements, and links to the transit regional central computer could be similar to those used by the Oyster implementation.

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# 5 Conclusions

This white paper examines the potential benefits and commercial, operational and technical considerations of issuing a co-branded, multi-application contactless financial payment card that carries a transit brand and transit application data file. The approach will enable collaboration between the financial payment card issuer and transit agency and leverage existing systems, technologies, and operational models.

Three successful large-scale overseas implementations of co-branded multi-application contactless payment cards demonstrate the viability of the model described in this white paper. Financial payment card issuers in London, England, and Taiwan have issued hundreds of thousands of cards that perform fare payment transactions. In these implementations, the transit application file enables fare collection devices to perform card-based transactions while the financial credit/debit payment functions allow for conventional contactless credit/debit payment capabilities at the retail POS.

As described in Section 3.1, all stakeholders in transit and financial payment value chain may benefit from a co-branded multi-application transit/financial payment card.

- The transit rider sees improved convenience and ease of use by carrying a single card capable of both transit and retail financial payment.
- Transit systems operating a traditional fare payment system using contactless technology can accept such cards with little change to current software or operating models. The implementation can result in both cost savings and new revenue opportunities.
- Transit systems maintain the flexibility of the full gamut of fare policies and can use existing patron feedback and enforcement features and practices.
- The model leverages the current financial infrastructure, with changes primarily required in the personalization and customer service processes.
- Current customer service centers can be used, with the on-card data file assisting customer service who may not have access to an online terminal.
- Combined transit/financial payment cards can be rolled out quickly throughout the transit system without the need to go through lengthy development and testing cycles.

While all stakeholders can benefit, and technical implementation is straightforward, implementation of the co-branded, multi-application transit/financial payment model in the United States will depend on the development of business partnerships that drive value for both financial payment card issuers and transit agencies. Key acceptance factors for both transit agencies and financial payment card issuers include:

- The rate at which financial payment card issuers convert credit/debit cards from magnetic to contactless technology.
- The geographic fit between banks making such conversions and the presence of a contactless transit infrastructure.
- The maturity of a given transit operator's contactless fare payment card program and the technology used in the implementation
- The willingness of an issuer or its personalization bureau to establish the capabilities and processes that are unique (while manageable) to the multi-application card.
- The presence of a positive business case for the financial issuer to include transit capability on a credit/debit card and provide support in the back office. Business case variables include:
  - The extent to which the financial issuer's card base has been converted in a region.
  - The demographics of the region and the transit agency's ridership base.
  - The relative market share of the issuer within a region that has a contactless transit infrastructure in place.

Currently, traditional fare payment systems are the dominant contactless smart card systems being implemented in transit, with advanced payment card industry systems showing promise. This paper has

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described the implementation of the basic combined system, which provides both the proven benefits of traditional fare payment systems and the advantages of traditional financial payment card industry systems.

However, transit agencies should recognize that technology continues to evolve. Implementing any contactless technology based system that is available today will allow for a future migration to more advanced or sophisticated payment models. Through system strategies that support multiple media types, transit agencies can continue to support conventional fare payment practices while expanding their systems to accept one or more types of contactless financial payment, including standard contactless credit or debit cards, co-branded multi-application contactless payment cards carrying a discrete transit data file, transit-issued contactless smart cards, and cards or objects issued by non-transit issuers.

In short, every transit agency, big or small, should initiate the steps to implement a contactless fare payment system, if they have not done so already. As found by the many transit agencies who have already implemented contactless fare payment systems, contactless technology delivers substantial benefits for both transit agencies and their patrons.

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# 6 Publication Acknowledgements

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# About the Smart Card Alliance Transportation Council

The Transportation Council is one of several Smart Card Alliance Technology and Industry Councils, focused groups within the overall structure of the Alliance. These councils have been created to foster increased industry collaboration within a specified industry or market segment and produce tangible results, speeding smart card adoption and industry growth.

The Transportation Council is focused on promoting the adoption of interoperable contactless smart card payment systems for transit and other transportation services. Formed in association with the American Public Transportation Association (APTA), the Council is engaged in projects that support applications of smart card use. The overall goal of the Transportation Council is to help accelerate the deployment of standards-based smart card payment programs within the transportation industry.

The Transportation Council includes participants from across the smart card and transportation industry and is managed by a steering committee that includes a broad spectrum of industry leaders.

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Transportation Council participation is open to any Smart Card Alliance member who wishes to contribute to the Council projects. Additional information about the Transportation Council can be found at <a href="http://www.smartcardalliance.org/about\_alliance/councils\_tc.cfm">http://www.smartcardalliance.org/about\_alliance/councils\_tc.cfm</a>.

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# 7 Appendix A - Additional Combined Transit / Financial Programs

In addition to the Oyster/Barclaycard, Taipei smart card and TaiwanMoney co-branded initiatives that were profiled in Section 3 of this white paper, a number of other co-branded programs have been implemented using magnetic stripe, contactless transit and/or EMV chip technologies. Example programs include the following:

- The Citibank and WMATA co-branded card launched in 2005. This card includes a magnetic stripe for financial payment and the SmarTrip<sup>™</sup> contactless chip and application for transit payment.
- The Moscow Social Card offered by the Moscow city government, Moscow Underground, Bank of Moscow and Visa. Since its launch in 2001, over 4 million<sup>20</sup> cards have been issued and are being used for financial payment, transit payment, pension and social benefits distribution, medical insurance payments and retail discounts.
- The Singapore EZ-Link card launched in 2006. The EZ-Link card uses magnetic stripe technology for financial payment and FeliCa<sup>®</sup> contactless chip for transit payment and is used for both transit payment and low value purchases. Partners in this program included EZ-Link, Visa, Citibank, SMRT and QB Pte Ltd.
- The JR East-issued Suica transit card that also includes a retail electronic purse used in Tokyo, Japan.
- Visa issuer programs in South Korea and Bangkok, Thailand, that combine financial payment and transit fare payment.

<sup>&</sup>lt;sup>20</sup> GlobalPlatform, http://www.globalplatform.org/showpage.asp?code=transitindustry

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# 8 Appendix B—Payment Systems Used in Transit

# 8.1 Traditional Fare Payment Systems

In traditional fare payment systems, electronic media carry a data file that is read and updated by the fare processing device (the reader). The data file carries information necessary for the reader to apply the fare rules used to calculate transaction-specific charges. Once the reader calculates the fare, the card file is updated with current usage and balance information (if applicable). The reader creates a finished transaction record to be forwarded to a host system for audit control and reporting.

The data file carries prepaid fare products in the form of value-denominated tickets, time-based products (e.g., daily, weekly, monthly passes), and multi-trip ticket books, in addition to usage history and fare classification parameters. Prepaid products are paid for at online devices capable of real-time authorization of conventional credit and debit card purchases. These online devices can often accept cash to support cash-to-card transactions or cash purchases.

These systems are designed to facilitate complex fare-policy administration using a distributed processing architecture while allowing for velocity controls to curb potential transit and payment card abuses. Additional features support card issuance, track card inventory, and can immediately deactivate cards exhibiting suspicious behavior. Typically, a variety of additional utilities support customer service programs, such as auto-load, best fare, and electronic benefits administration.

These systems have traditionally been closed (i.e., proprietary) systems that restrict acceptance to cards from a single operator. Recently, however, the systems have been opened to include multiple agencies at a regional level. The transit industry has also been defining standards that are designed to enable interoperability among agencies and systems.

The American Public Transportation Association (APTA) published the Contactless Fare Media Standard (CFMS), which defines the data elements and their on-card organization as well as the messages sent between operator-specific systems and the regional processing center. Using CFMS, multiple fare products, detailed trip histories, and user profile data are available to a terminal so that fare rules can be applied and appropriate transactions generated. Fare products on a single card. The presence of the on-card data file also assists when offline or portable devices are used for enforcement and either assisted or unassisted queries of usage history. Standardized messaging enables the delivery of transaction records from disparate devices or automatic fare collection (AFC) systems to a common clearinghouse for multi-operator settlement and customer service support.

Multiple transit providers across the United States (and internationally) are implementing systems that use ISO/IEC 14443 compliant communications protocols, along with data formats and message structures that are consistent with the approach described in the CFMS standard. These new systems have the capability to support a co-branded, multi-application transit/financial payment card. One potential advantage of a multi-application card is that financial payment cards carrying a transit data file can leverage these new systems and current system utilities to provide the full range of transit discounting schemes and fare policy rules.

# 8.2 Traditional Financial Payment Card Industry Systems

Traditional financial payment card industry systems use the current financial networks to process transactions, with card information transferred to the reader using magnetic stripe or contactless technology. In this case, a transit agency is a merchant just like any other merchant. Transit agency payment systems such as ticket vending machines, POS terminals, and Web sites are merchant terminals that determine how much to charge the customer. The transaction is then processed as follows (Figure 3):

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- 1. The agency's POS system sends the transaction (including the cardholder's account number and the transaction amount) and an authorization request to the merchant acquirer, who sends it through the financial networks to the card issuer.
- 2. The issuer performs the necessary security checks (e.g., checks the security information included with the transaction, determines the validity of the payment card, analyzes cardholder behavior to assess whether the transaction could be fraudulent), authorizes or denies the transaction, and returns an authorization response to the merchant acquirer, who passes it to the transit agency.
- Authorized transactions are captured from the transit agency daily, and a settlement message is sent over the financial networks to transfer funds to the transit agency account (sales less any processing fees).



Figure 3: Credit Card Payment Transaction Flow

The traditional financial payment card industry system is used by a large number of transit agencies for the sale of a wide range of fare products.

# 8.3 Enhanced Payment Card Industry Systems

Enhanced payment card industry systems incorporate an intermediate back office step to calculate the proper fare before the transaction is processed through the traditional financial networks. In effect, the back office carries out the functions of the ticket vending machine or transit agency's POS. These systems sometimes may also use transaction aggregation to reduce transaction fees.

These systems are in pilot stages, with the most notable being trials in New York City and Utah. The Utah Transit Authority is now launching a full system bus/rail deployment using this approach.

In October 2006, the Smart Card Alliance published a white paper about this approach, "Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence." The paper is available at <u>www.smartcardalliance.org</u>.

# 8.4 Enhanced Combined Systems

Enhanced combined systems accept both multi-application cards and American Express, Discover Network, MasterCard and Visa-branded contactless financial payment cards, as well as standard transit cards, at the point of fare payment.

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While no such system has yet been fully implemented, an enhanced combined system would offer tremendous convenience to customers, who could choose to use a standard transit fare payment card, a credit/debit card, or a co-branded multi-application card for fare payment.

To enable this capability, a transit agency would operate two parallel systems (a traditional fare-payment system and an enhanced payment card system) that are integrated for financial reporting and customer service. Both systems would use the same card readers at faregates and on train platforms and buses. Enhanced combined systems give transit agencies the option of limiting complex discounting schemes to multi-application cards and transit-issued cards, while allowing contactless credit/debit cards to act as cash fare substitutes. Alternatively, an account-based system could be established to extend such discounting to contactless credit/debit cards as justified by economics and market penetration.

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# 9 Glossary and Definitions

# 9.1 Abbreviations and Acronyms

3DES	Triple Data Encryption Standard
AFC	Automatic Fare Collection
ΑΡΤΑ	American Public Transportation Association
CFMS	Contactless Fare Media System
CVV/CVC	Card Verification Value/Card Verification Code
DES	Data Encryption Standard
E-Purse	Electronic Purse
EMV	Europay MasterCard Visa
IEC	International Electrotechnical Commission
IC	Integrated Circuit
ISO	International Organization for Standardization
KCG	Kaohsiung City Government
MRT	Mass Rapid Transit
PIN	Personal Identification Number
POS	Point of Sale
RF	Radio Frequency
TfL	Transport for London
тѕсс	Taipei Smart Card Corporation

# 9.2 Definitions

## Acquirer

A financial institution that initiates and maintains contractual agreements with merchants for the purpose of accepting and processing credit and debit card transactions.

## Authorization

Approval from the financial institution that issued the cardholder's card to accept a transaction for a given amount.

## Autoload

A method which automatically loads a contactless smart card electronically with a transit fare product using a process which is usually transparent to the cardholder.

## Automatic fare collection system

A fare collection system that provides a method of processing electronic fare media through computational devices to account for a ride or access onto a public transportation system. AFC systems were intended to require little or no operator interaction.

## Best fare

A program possible with smart card-based AFC systems that uses an ongoing calculation to ensure that a participating passenger pays the lowest possible fare every time they travel.

## Class A

The operating conditions for IC cards with contacts that use a 5 volt supply, as defined in ISO/IEC 7816-3:1997.

## Class AB

The operating conditions for IC cards with contacts that can successfully use either a 3 volt or a 5 volt supply, as defined in ISO/IEC 7816-3:1997.

## Class B

The operating conditions for IC cards with contacts that use a 3 volt supply, as defined in ISO/IEC 7816-3:1997.

## **Contact smart card**

A smart card that requires physical contact with a card reading device to exchange data. A conducting element on a smart card ensures galvanic continuity between integrated circuit(s) and the external interfacing equipment. (ISO/IEC 7816-1:1998, section 3.3)

### Contactless

Pertaining to the achievement of signal exchange with and supplying power to an IC card without the use of galvanic elements (i.e., the absence of an ohmic path from the external interfacing equipment to the integrated circuit(s) contained within the card). (ISO/IEC 14443-1:2000, section 3.2)

## **Contactless Fare Media System standard**

A standard published by APTA that describes the data format on smart cards used for fare payment, as well as the messages used between an agency central computer and a regional computer for processing fare transactions.

## Contactless integrated circuit(s) card

A card of the card type ID-1 (as specified in ISO/IEC 7810) into which integrated circuit(s) have been placed and in which communication to such integrated circuit(s) is done in a contactless manner. (ISO/IEC 14443-1:2000, section 3.3)

## Card Verification Value/Card Verification Code

Security codes used by the financial payment brands for credit and debit transactions to protect against credit card fraud.

## **Data Encryption Standard**

The term given to a widely used public-domain symmetric key cryptographic algorithm. DES is based on a published algorithm with secret keys.

### **Data formats**

A set of files containing records or objects that define the card format for a given application or a set of applications such as applications for transit, building access and biometrics.

### **Dual-interface smart card**

A smart card that has a single smart card chip with two interfaces – a contact and a contactless interface – using shared memory and chip resources.

### **Electronic fare payment**

Systems that allow electronic debit or credit processing of fares.

### **Electronic purse**

A payment card that stores prepaid monetary value in an embedded smart card chip.

### **EMV** standard

Specifications developed by Europay, MasterCard and Visa that define a set of requirements to ensure interoperability between payment chip cards and terminals.

### Encryption

The process of translating information into a code that can only be read if the reader has access to the key that was used to encrypt it. There are two main types of encryption – asymmetric (or public key) and symmetric (or secret key).

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## Fare media (electronic)

Electronic portable media used to gain access to public transportation system services.

#### Firewall

A combination of specialized hardware and software designed to keep unauthorized users from accessing information within a networked computer system.

#### Form factor

The physical device that contains the contactless smart card chip and antenna and that is used by the consumer for payment. Contactless payment devices can come in a variety of form factors, including plastic cards, key fobs, wristbands, wristwatches, PDAs, and mobile phones.

### Hotlist

See negative list.

#### ID-1 card type

An identification card, usually made of PVC, PVCA or similar material, having the dimensions usually associated with "credit cards," and having other physical properties conforming to ISO/IEC 7810:1995.

### International Organization for Standardization

An agency of the United Nations concerned with international standardization, including stored value and other bank cards. Some of the pertinent standards for contactless payment cards are ISO/IEC 7810, 7811, 7816, 9992, 10202, and 14443.

### **ISO/IEC 14443**

The international standard for contactless smart chips and cards that operate (i.e., can be read from or written to) at a distance of less than 10 centimeters (4 inches).

#### ISO/IEC 14443 Type A card

A contactless card compliant with the ISO/IEC 14443 standard that uses 100% ASK modulation of the RF carrier and Miller Pulse Position coding to send data from the reader to the card. For the return link the carrier frequency is loaded to generate an 847 kHz sub-carrier. Type A uses On/Off Keying of the sub carrier with Manchester bit coding.

### ISO/IEC 14443 Type B card

A contactless card compliant with the ISO/IEC 14443 standard that uses 10% ASK modulation of the RF carrier and NRZ coding to send data from the coupling device to the card. For the return link the carrier frequency is loaded to generate an 847KHz sub-carrier. Type B uses Binary Phase Shift Keying of the sub-carrier with NRZ bit coding.

### Keys

In encryption and digital signatures, a value used in combination with a cryptographic algorithm to encrypt or decrypt data.

### Loyalty program

Promotional programs in which value is credited to a cardholder's card for various reasons, determined by the vendor or merchant instituting the program. The accumulated awards can then be redeemed by the cardholder by purchasing products and services at the participating providers.

#### Merchant bank

See acquirer.

#### Microcontroller

A highly integrated computer chip that contains all the components comprising a controller. Typically this includes a central processing unit (CPU), random access memory (RAM), some form of read-only memory (ROM), input/output ports, and timers.

## MIFARE

A proprietary contactless card, developed by Philips Semiconductor (now NXP), that has been widely deployed in transportation. The technology meets ISO/IEC standards 14443, Type A for contactless smart cards.

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## **Multi-application card**

A smart card that runs multiple applications – for example, physical access, logical access, data storage, and payment – using a single card.

### Negative list

A list of issued cards that are to be prevented from normal use if presented to any applicable card reader in a system. (See also hot list.)

## Offline

Not connected to a communications network; an environment in which events are not processed in real time, but rather in batch mode.

## Online

Connected to a communications network.

### Point-of-sale device or terminal

A device used to capture purchase transactions at the point they occur (i.e., at the merchant location). The transaction may be immediately validated via a communications link to a financial institution network or may be recorded against a stored value card.

### **Prepaid card**

A payment card that provides access to a prepaid value, rather than a line of credit. The card is used until the value is gone and the card is discarded or reloaded.

### **Radio frequency**

Any frequency within the electromagnetic spectrum associated with radio wave propagation. Many wireless communications technologies are based on RF, including radio, television, mobile phones, wireless networks and contactless payment cards and devices.

### Reader

The electronic device that provides power to and communicates with a contact or contactless smart card. Contactless readers generate an electromagnetic field. When a contactless device is brought into the reader's electromagnetic field, the contactless smart chip is powered on, a wireless communication protocol is established between the card and reader, and data can then be exchanged. For contactless payments, contactless readers used at merchant locations integrate with point-of-sale terminals and comply with the ISO/IEC 14443 standard.

### **Reloadable card**

A smart card that is capable of being loaded with value multiple times during the life of the card.

### Scalable

Easily expanded to suit future requirements. Applies to hardware or software.

### Server

A host computer that stores information (e.g., Web sites) and responds to requests for information (e.g., links to another Web page).

### Single DES

A security scheme that used one DES key and one DES function.

### Smart card

A device that includes an embedded integrated circuit that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone. The card connects to a reader with direct physical contact or with a remote contactless RF interface.

### Stored value card

A smart card containing one or more purses which can be loaded and reloaded with value and used to make purchases.

### Track 1

Information on a payment card that usually contains all of the information on Track 2 plus the name of the person to whom the card was issued. It may also contain other discretionary data.

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## Track 2

Information on a payment card that contains the Primary Account Number (PAN) of the card, its expiration date, and other discretionary data (sometimes used for PIN verification). The first 2 to 8 digits of the PAN usually identify the issuing institution for settlement and authorization processing.

### Track 3

One of the tracks on a debit or credit card's magnetic stripe that contains information defined by ANSI and ISO/IEC standards. It can be written to (updated) by devices such as ATMs and airline reservation terminals.

### Transponder

A wireless communications device that detects and responds to an RF signal.

#### Triple DES

A security scheme based on DES that uses two or three DES keys and three applications of the DES functions algorithm to perform a secure function.

#### Velocity count

A count (or amount) that is retained for a card or account by a switch, processing system or other host in order to limit the amount of activity in a given period of time. It is a way of limiting the effects of possible fraud.

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# **10 References**

Smart Card Alliance, *The What, Who and Why of Contactless Payments*, November 2006, white paper available at <u>http://www.smartcardalliance.org</u>

Smart Card Alliance, *Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence*, October 2006, white paper available at <u>http://www.smartcardalliance.org</u>

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