

**Smart Card
Alliance**

***Transit and Contactless Open Payments: An
Emerging Approach for Fare Collection***

A Smart Card Alliance Transportation Council White Paper

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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 <http://www.smartcardalliance.org>.

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1 Introduction

1.1 Purpose and Objectives

The Smart Card Alliance Transportation Council developed this white paper for two reasons:

- To inform the transit industry of the opportunities and benefits of accepting contactless open bank cards for fare payment
- To inform the bank card industry of unique requirements for transit fare collection

The white paper includes the following information:

- Describes how contactless bank card payments work.
- Defines key transit requirements for fare payment.
- Explains how transit can benefit from accepting contactless open bank cards for fare payment.
- Describes both the challenges in accepting contactless open bank cards for fare payment and potential solutions to these challenges.
- Describes transit implementations, pilots and planned deployments of contactless open bank card payments.

1.2 Previous and Related Publications

The Smart Card Alliance Transportation Council is committed to communicating opportunities for collaboration between the transit industry and the bank card payments industry. Since 2003, the Council has published a series of white papers that explore opportunities for the use of bank-issued contactless credit, debit and prepaid cards for direct payment of transit fares, including the potential for all segments of transit ridership to be served with traditional bank card products. Past Council white papers can be found on the Smart Card Alliance web site at <http://www.smartcardalliance.org/pages/activities-councils-transportation>.

1.3 Notes on Terminology

This white paper is focused on a specific model for transit fare payment, describing the benefits and challenges for transit to accept contactless open bank card payments using an account-based architecture. The white paper uses the following terms:

- *Open payments, open loop payments and open bank card payments* are used synonymously and defined as the use of financial industry-issued credit, debit or prepaid contactless cards (e.g., American Express, Discover, MasterCard, Visa) for fare payment at points of entry/exit to modes of transportation.
- *Account-based architecture* is defined as the transit fare collection system architecture that uses the back office system to apply relevant business rules, determine the fare, and settle the transaction. The terminal reads information stored on fare payment media and sends it to a back office over a network. The back office determines whether the card is valid and returns an “approve or deny” signal that enables the terminal to open the gate or to signal the rider and the bus operator on whether to allow passage.
- *Card-based architecture* is the more traditional transit fare collection system architecture where the fare payment media and card reader make the decision to approve or deny the fare payment transaction (including determining the fare).

These and other terms used in the white paper are defined in the glossary in Appendix I: Glossary.

2 Executive Summary

The value of using contactless smart cards in the mass transit marketplace is already well documented. Transit agencies throughout the world have implemented or plan to implement contactless smart card payment systems. These systems typically issue agency-branded smart cards that are either used exclusively by riders in a closed payment system or, in some cases, used in retail locations established as extensions of the closed system. Transit fare payment systems are typically stored-value or stored-pass implementations: the card holds a fare product or cash value that is updated with each use of the card.

The financial payments industry is now offering contactless credit and debit payment card programs and has focused on capturing increased volumes of low-value transactions. Changing business rules and practices, such as signature and receipt requirements, were necessary to foster that expansion. Advances in payment processing and increased transaction speeds have produced compliance with transit payment requirements. The adoption of the ISO/IEC 14443 technology standard, which defines the interface between a contactless card and an electronic reader, provides an additional opportunity to link the two industries.

Transit agencies seek to improve customer service and operating efficiencies by reducing their role as a payment media issuer and transaction acquirer and acting more like a retail merchant in an open payment system. This Smart Card Alliance Transportation Council white paper discusses the latest developments and case studies in the use of contactless open bank cards for transit fare payment (and updates the 2006 publication, *Transit and Contactless Financial Payments: New Opportunities for Collaboration and Convergence*). This white paper describes how traditional financial payment products are used and details transit industry requirements for payment systems. It discusses the opportunities and challenges of using bank-issued cards for transit fare payment and describes how the two industries can link payment products and services.

In addition, the paper updates the results of two projects undertaken since 2008. The first project, in Salt Lake City, led the Utah Transit Authority to implement the first complete open bank card payment system for transit fare payment in the United States. The second project involved transit operators in the New York–New Jersey region, who collaborated on a pilot to test the concept of open payments on two subway lines, several connecting bus routes in New York, and bus routes and connecting service to the PATH system in New Jersey. Currently, transit agencies in numerous locations, including Philadelphia, Chicago, Washington, DC, Dallas, and Toronto are actively pursuing open payment solutions.

The approaches discussed in this white paper focus on the acceptance of standard contactless financial payment devices at the customer's point of entry/exit to the transit system. The implementation considerations center on business and operational issues, rather than issues arising from technology definition, standards, and technical infrastructure.

Like other merchants who accept financial payment products, transit agencies continue to work with the financial industry and payment brands to develop methods, business rules, and risk models to enable acceptance of all financial industry-issued contactless payment devices. One result of this collaboration will be the definition of a risk model and business case for implementation.

3 Contactless Payments in the Open Payments Industry

In the past few years, the bank card industry has introduced programs that make traditional cards more attractive for low value transactions. Recognizing that transactions below \$25 are conducted in environments that require faster transactions, MasterCard and Visa have both adopted programs to facilitate transactions by eliminating time-consuming processing requirements such as signatures and receipts. Transit agencies benefit from these changes which enable contactless bank cards to be used quickly enough to accommodate transit throughput requirements.

In addition, the industry now offers a variety of prepaid products accessible to any consumer. Prepaid program managers recognize the need for a bank card product that can reach any rider and support programs to meet the need for transit agencies to serve all rider demographics. A prepaid bank card is as accessible to an agency’s riders as any proprietary transit agency card. Combined, these developments make contactless bank card payments viable as an alternative for an agency’s fare payment system.

This section provides an overview of how contactless bank card transactions are processed and describes the typical fee structure for contactless bank card payments, the current programs that address low-value transactions and unbanked individuals, and the effect of new technologies (Near Field Communication and EMV) on the bank card market.

3.1 Contactless Bank Card Payments

Contactless transactions require no physical connection between the consumer’s payment device (typically a card) and the merchant’s point-of-sale (POS) terminal. Contactless payment is simply a different way of presenting a card to the POS system; there is little distinction between the functionality of a contactless bank card and a standard magnetic stripe bank card. Since mid-2005, financial issuers across the leading payment brands, including American Express, Discover, MasterCard, and Visa,¹ have been issuing contactless cards, and an increasing number of merchants in a wide variety of categories now accept contactless payments.

These payment brands, which account for most of the payment card transactions in the United States, operate within a unique multi-party system that includes the consumer, the depository institution that issues the payment card (the *card issuer*), the retail merchant, and the merchant’s depository institution (the *merchant acquirer*). Figure 1 illustrates the flow of a traditional credit card payment transaction in an open loop payment network (such as MasterCard or Visa).

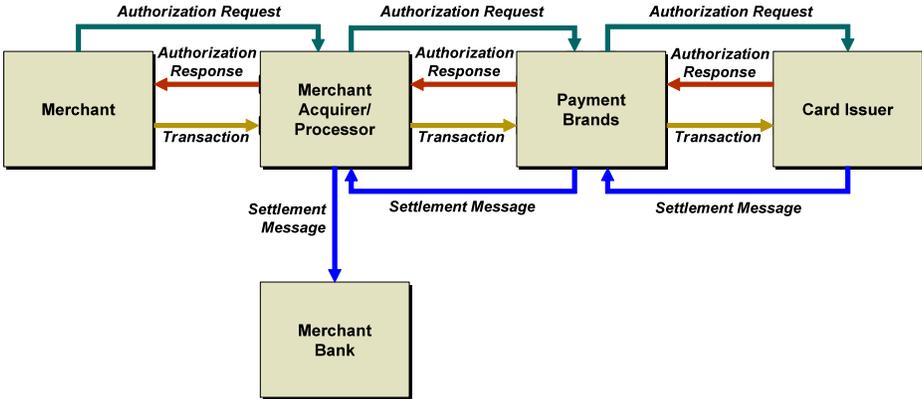


Figure 1. Credit Card Payment Transaction Flow²

¹ The contactless bank card product brands are American Express® ExpressPay, Discover Zip®, MasterCard® PayPass™, and Visa payWave.

² Source: Booz Allen Hamilton.

The payment transaction includes the following steps:

1. The consumer payment device is presented to the POS system either via a magnetic stripe swipe, a contact chip dip, or a contactless tap via a radio frequency (RF) interface compliant with ISO/IEC 14443.
2. The merchant's POS system sends a request to authorize a transaction to the merchant acquirer/processor, which forwards it through the payment brand financial networks to the card issuer. The request includes the cardholder's account number and the transaction amount. For a contactless transaction, the transaction also includes a unique, dynamic card verification value, cryptogram, or authentication code that identifies each transaction exclusively to prevent fraudulent transactions.³
3. The issuer performs necessary checks (e.g., checks the security information included with the transaction, determines the validity of the payment card, analyzes cardholder behavior to determine whether the transaction could be fraudulent, determines whether the cardholder has exceeded their balance or credit limit), authorizes or denies the transaction, and returns an authorization response to the merchant acquirer/processor, who passes it to the merchant.
4. The merchant completes the transaction usually providing a sales receipt for the cardholder to sign. As explained in Section 3.1.2, many low value transactions will not require a receipt or signature.
5. Authorized transactions are captured from the merchant daily, and packaged into a settlement file. This settlement file is sent over the financial networks for processing; funds are then transferred to the merchant's bank account.

3.1.1 Credit/Debit Fee Structure

Each payment network has different rules, regulations, operating costs, and procedures. Fee structures vary by payment brand. The following describes the typical fees paid for transactions on open loop payment networks (i.e., MasterCard and Visa); fee structures for a payment network where the acquirer, network, and issuer functions are performed by a single entity (e.g., American Express) are different.

Merchants pay the acquirer/processor the "discount rate" for payments processing services. The discount rate is often presented to the merchant as interchange plus acquiring fees. The discount rate is negotiated between the merchant and the merchant acquirer and is composed of three components:⁴

- Interchange, which is paid by the acquirer to the issuer, is included in the costs passed to the merchant. This component of the discount rate is set by the payment brands and is not negotiable.
- Merchant services fees, which are paid to the acquirer/processor. These fees are negotiable.
- Payment brand fees, which are paid to the payment brand. These fees are set by the payment network, are not negotiable, and are passed to the merchant.

The merchant agrees to the fees, the frequency of billing and operating rules for the payment brand through a "merchant services agreement" or contract with the acquirer. The acquirer manages fee collection and reports all transaction, settlement/clearing and billing activity to the merchant.

Interchange is a mechanism by which participants in a payment system balance the costs and benefits of providing joint services. Interchange is paid by acquirers to issuers, in compensation for the costs of

³ EMV transactions have additional risk management capabilities. The Smart Card Alliance white paper, "Card Payments Roadmap in the United States: How Will EMV Impact the Future Payments Infrastructure?," has additional detail on EMV transactions and is available at <http://www.smartcardalliance.org/pages/publications-card-payments-roadmap-in-the-us>.

⁴ Source: "Open Bank Card Payments 101: The Banking and Payment Ecosystem," Burt Wilhelm (MasterCard) presentation, Transportation Council Open Bank Card Payments for Transit Workshop, March 27, 2011.

running the card program. The amount of the interchange fee is specific to the merchant category, the card type, and the transaction type.⁵

3.1.2 Programs for Low-Value Transactions

American Express, Discover, MasterCard,⁶ and Visa⁷ have implemented programs that apply to low value transactions (transactions of \$25 or less) in specific market segments. The programs include new rules for consumer signatures and transaction processing that make the use of bank card products more operationally efficient for merchants who accept low-value transactions.

3.1.2.1 New Signature Rules

The payment brands now offer programs that waive the requirement to acquire a customer signature under certain transaction values for a range of merchants. The programs, which apply to both magnetic stripe and contactless transactions, can feature the following:

- No consumer signature is required when the transaction value is below a certain amount (typically \$25).⁸
- A customer receipt is only required if requested by the cardholder.⁹
- The merchant generally has full chargeback protection for transactions that meet the program requirements.
- Merchants in certain categories may be offered decreased processing rates below a certain limit.

In general, transactions processed within the guidelines of these programs require online authorization. However, some payment brands may allow certain merchant categories to accept transactions offline and process them in a batch or aggregate them prior to processing. If a transaction is not authorized online at the time of payment, the merchant generally bears the risk of financial loss due to fraudulent cards and transactions and of cardholder chargebacks for certain reason codes.

3.1.2.2 Approaches for Low-Value Transactions

The fixed portion of the merchant discount rate can be large enough to make low-value transactions uneconomical. To reduce the impact of these fees, merchants can use “aggregation” for processing low-value transactions. An aggregation system identifies repeat transactions that use the same payment instrument (such as a credit card) and aggregates the charges up to a certain value (or for a certain amount of time) to process a smaller number of higher value transactions. Each payment brand has rules that define how aggregation is done. Aggregation can reduce the cost of accepting bank cards, subject to the payment brands’ rules. A limited number of third-party processors offer aggregation services. One example of a merchant using aggregation is the Apple iTunes online store. Aggregation was also available to the agencies in the New York/New Jersey Transit trial (Section 7.1).

In addition to aggregation, merchants can also provide options for subscription-based payment or prepaid accounts for customers. Merchants using subscription-based payment collect an initial payment to cover “all you can buy” over a particular period of time. Merchants using prepaid accounts collect an initial payment that is stored in a customer account and decremented as purchases are made (similar to electronic toll collection systems). In both of these cases, the merchant would incur a single transaction processing fee for the initial purchase with no additional processing fees, therefore lowering overall processing costs.

⁵ Published MasterCard and Visa interchange rates can be found at http://www.mastercard.com/us/merchant/support/interchange_rates.html and http://usa.visa.com/merchants/operations/interchange_rates.html, respectively.

⁶ MasterCard Quick Payment Service program, <http://www.mastercard.com/ca/merchant/en/products/qps/index.html>.

⁷ “Visa to Offer Popular ‘No Signature’ Program to Majority of Merchant Categories in the U.S.,” Visa press release, February 8, 2010, <http://corporate.visa.com/media-center/press-releases/press990.jsp>.

⁸ Floor limits for these programs vary by payment brand and by merchant segment.

⁹ Regulation E requires that a consumer receipt for debit card transactions be made available. For more information, see <http://www.bankersonline.com/regs/205/205.html>.

3.2 Prepaid Bank Cards

Over the last five years, the financial industry has significantly expanded the number of prepaid card programs available to consumers. Prepaid cards are payment cards that allow the cardholder to spend only the amount of money that was funded prior to its use. Consumers currently spend nearly \$120 billion using prepaid cards as alternatives to credit and debit cards.¹⁰ Consumer awareness of prepaid cards is very high, driven primarily by the fast adoption of gift cards. In addition, government agencies are increasingly mandating direct deposit for the receipt of social benefits and offer prepaid card programs to benefit recipients who do not have bank accounts.

Prepaid cards, as defined here, are part of a host-based, online account management system where the value is recorded and managed in the host system (as opposed to stored value cards, which are usually associated with a chip-based, offline account management system). Some prepaid cards have values set at issuance, have limited replenishment features, and are anonymous. Other prepaid cards can be personalized and reloaded through a variety of payment system networks. In almost all cases, no personal credit history is required to acquire either type of card. Reloadable cards with higher maximum balance limits (generally over \$500) are subject to U.S. Patriot Act requirements to verify the identity of the cardholder.

Prepaid cards can be branded with one of the payment brands, thus enabling their use at any merchant accepting that brand and form of payment. Alternatively, the cards can be issued as part of a closed system; these cards can be used only at a specific location (for example, gift cards for a specific retailer or a transit-only card for an agency). The prepaid cards being issued today also include general purpose reloadable cards, prepaid government disbursement cards, payroll cards, pretax program cards (e.g., transit benefits accounts), and transit cards.

Prepaid cards are currently primarily magnetic stripe cards; transit agencies will need work with prepaid program managers to acquire contactless versions of prepaid cards.

Additional information on prepaid cards can be found in the Smart Card Alliance white paper, *A Guide to Prepaid Cards for Transit Agencies*.¹¹

3.3 Bank Card Industry Technology Trends

The bank card industry globally is utilizing two new technologies for credit, debit, and prepaid cards: Near Field Communication (NFC) and EMV.

3.3.1 NFC

NFC technology is a standards-based wireless communication technology that is being integrated with mobile phones and that allows devices that are a few centimeters apart to exchange data. The bank card and mobile telecommunications industries have run pilots in the United States and internationally testing NFC-enabled mobile payments. Commercially available NFC payment products are already in the market in other countries and are starting to be available in the U.S. in 2011.

An NFC-enabled mobile phone incorporates a chip (called a secure element) that allows the phone to store a payment application and the consumer's account information securely and use the information as a virtual payment card in a contactless bank card transaction executed via a mobile device. An NFC-enabled phone communicates the consumer's payment account information to the POS terminal via RF, using the ISO/IEC 14443 standard protocol (which is also used by contactless bank cards). NFC-enabled mobile contactless credit and debit payments can be made at POS readers that currently accept contactless credit and debit card payments.

In addition to supporting contactless credit, debit and prepaid payments, NFC-enabled mobile phones can carry a transit-specific payment application that communicates with closed loop transit-only readers. NFC-enabled mobile phones can also support non-payment applications such as ticketing, coupons, or

¹⁰ <http://money.usnews.com/money/blogs/my-money/2011/06/13/5-ways-to-slash-prepaid-credit-card-fees>.

¹¹ <http://www.smartcardalliance.org/pages/publications-prepaid-cards-for-transit-agencies>

promotions. POS terminals need to comply with ISO/IEC 18092 (the NFC standard) and will require software to support these applications.

Additional information on NFC can be found in Section 15, on the Smart Card Alliance NFC Resources web page,¹² and in the Smart Card Alliance Payments council white paper, “The Mobile Payments and NFC Landscape: A U.S. Perspective.”¹³

3.3.2 EMV

The Europay MasterCard Visa (EMV) specification defines technical requirements for bank cards with embedded microchips and for the accompanying POS infrastructure. Globally, the payments industry is migrating from magnetic stripe bank cards and infrastructure to EMV chip cards and infrastructure to improve the security of bank card transactions. EMV is an open-standard set of specifications for smart card payments and acceptance devices. Eighty countries globally are in various stages of EMV chip migration, including Canada and countries in Europe, Latin America and Asia. Approximately 1.2 billion EMV cards have been issued globally and 18.7 million POS terminals accept EMV cards.¹⁴ In August 2011, Visa announced plans to accelerate chip migration and adoption of mobile payments in the United States, through retailer incentives, processing infrastructure acceptance requirements and counterfeit card liability shift.

U.S. issuers are now starting to issue EMV credit and debit cards, initially focused on international travelers and major merchants indicate that they will upgrade their POS infrastructure to support EMV cards.¹⁵ The Visa announcement is expected to accelerate the U.S. move to EMV and mobile contactless payment adoption; merchant incentives are based on the installation of POS terminals that support both contact and contactless EMV cards.

Additional information on EMV can be found in Section 14 and on the Smart Card Alliance web site.

¹² <http://www.smartcardalliance.org/pages/smart-cards-applications-nfc>

¹³ <http://www.smartcardalliance.org/pages/publications-the-mobile-payments-and-nfc-landscape-a-us-perspective>

¹⁴ <http://www.emvco.com>

¹⁵ <http://www.smartcardalliance.org/pages/smart-cards-applications-emv>

4 Traditional Transit Contactless Payments

The transit industry first introduced electronic ticketing systems for automatic fare collection (AFC) in the 1970s. When the first-generation systems reached maturity in the late 1990s and early 2000s, the U.S. transit industry embarked on a massive infrastructure replacement effort, resulting in the investment of over \$1 billion in new systems. Most of these systems use agency-branded contactless smart cards as the primary fare medium and are based on proprietary software. Most major U.S. metropolitan areas now have closed-loop, stored value contactless smart card-based AFC systems.¹⁶

This section provides an overview of how traditional agency-branded, stored value, contactless smart card systems operate and summarizes key transit requirements for payment systems.

4.1 Contactless Stored Value Smart Card-Based Transit Payment Mechanics

Transit fare payment systems rely on transit agency issuance of some form of fare media or ticket. In an AFC system, the fare media (cards) typically carry a stored value. The stored value can be a dollar amount, a fixed number of rides, or a period pass. Transit customers prepay a certain amount, which is then stored in an electronic purse (e-purse), either on the fare card (e.g., a contactless smart card) or in a central account on a host system that communicates with the fare card.

Credit, debit, and prepaid payment products are widely accepted in the transit industry for purchasing fare media and for loading value onto the agency-issued card in advance of accessing transportation services. Transit patrons now use magnetic stripe payment cards to buy transit fare cards from vending machines, customer service agents, and transit web sites. Patrons receive the fare card, which is then used for payment at the entrance to a subway, bus, or other mode of transportation, or at a transit parking lot.

Transit agency-issued stored value cards are typically valid for fare payment only to the agency issuing the card. Exceptions are emerging, as transit agencies pursue ways of facilitating regional travel by agreeing on a common payment medium and service provider, or by promoting a single technical standard to which systems can be built.

In a fare payment transaction, the fare value is deducted from the stored value at the point of entry or validity is checked for a period pass. Transit e-purse transactions resemble typical cash transactions with two important differences:

- The communication between the local reader and the fare card at the point of entry completes the transaction. The interaction generally includes a validity check (through the application of rules that apply to the use of the fare card) and updates the value on the fare card. The transaction occurs offline (for example, on a bus) and a central system is updated later (for example, when the bus returns to the depot and connects to the system).
- During the transaction at the point of entry, data elements critical to the transaction (such as location identifiers or descriptions of past use) are transmitted to enable payment of the proper fare using applicable rules.

Most transit fare payment system implementations today rely on a "card-based architecture" in a closed system, in which the agency issues and manages its own media. A card-based architecture has the following characteristics:

- The system performs fast transactions and can perform well without online communication. Transit agencies have historically required typical transaction times between 300 ms to 500 ms.
- Fare calculations are performed by the card and the reader, the fare product or value is stored on the card, and the card allows both reading and writing. Completed transactions are stored on the reader and the card, and are collected by the system for accounting and reconciliation at the end of the day.

¹⁶ See summary of major programs in Section 1 - Appendix II.

- A transaction record and account status are carried on the card and mirrored in the agency's back office. The back office performs accounting and auditing and provides customer service and device management functions.
- System and data formats are proprietary, as are security keys.
- Agencies typically require card-initializing devices for entering the inventory of initialized cards. The agency must maintain a network of revaluing devices for riders to purchase and add value to the fare media. A special POS device is typically required.
- The agency also needs to maintain a customer service function to support cardholders.
- Fare changes typically require software changes or fare table download to validating devices and on equipment and systems where fare rules are processed.
- Interagency product integration requires extensive coordination of requirements.

4.2 Transit Payment Requirements

Transit AFC systems handle a number of functions, including issuing the payment card, applying agency-specific rules for determining the fare to be charged when the payment card is used, and processing the payment. To fulfill these functions, transit AFC systems must meet certain critical requirements.

4.2.1 Transaction Speeds

One factor critical to a fare collection system is the speed at which the payment transaction takes place. Transaction speed has a significant impact on transit customer service, especially with crowds. Shorter transaction times reduce the length of queues and speed passengers through the system. A transit-agency-issued electronic payment instrument has typically allowed the customer to use the fare card at a gate or bus entrance and perform the transaction in less than 300-500 ms.

4.2.2 Flexible Transit Fare Policy Support and Pricing

Another critical factor is that transit customers must be charged the correct fare for the trip, and they must also have the option of purchasing a suitable type of fare. Transit payment fare structures typically include fare policies and rules that are tailored to different rider populations, accommodate operating and financial constraints, and account for other factors. In general, transit fare policies include a single-ride, flat fare component and a distance, or "zone-based," component. Systems may also offer a variety of unlimited use passes and discounts for individual fares purchased in advance or in bulk. Other factors can also influence fare pricing: when the fare is in effect (time of day), the specific route or direction on a route or line to which the fare applies, and even the demographic characteristics of the individual who purchased the fare.

The prices for fare instruments—whether single ride, passes, or bulk purchases—are changed regularly. A transit fare payment system must be able to update pricing for all instruments globally and quickly and inexpensively introduce new fare instruments to respond to policy changes.

4.2.3 Data Integrity and Customer Service

Like all payment systems, it is critical that transit-specific payment systems ensure data integrity and provide easy and fast access to data to support customer service, either through in-house customer service agents or through direct access by the customer (e.g., a web site that allows customers to track transaction activity or reload a card). AFC systems also support risk management through specific measures such as velocity checks, hot-listing, and other fraud detection techniques (similar to those used by the payments industry) and enable such techniques to be applied by transit risk management staff.

4.2.4 Multiple Payment Options

Transit operators in general are interested in reducing cash payment options. Paying with cash is a slower process, particularly when bill acceptance is required, and collecting, transporting, and back-end processing of cash are labor intensive and expensive. In response to rider desires, transit operators have sought to increase the range of payment options, promoting advance payment fare products (e.g., passes and multiple ride fare products) and encouraging the switch from cash to bank card-based payment options. Sales at standalone ticket vending machines or at kiosks where online authorization is easy have been successful for rail systems.

4.2.5 Data Security and User Privacy

State and federal laws require transit agencies to protect the personal information they collect as merchants and to notify customers about their use of the information and their privacy policies. Transit agencies, working together with their vendors, must comply with the security standards of the financial payments industry, ensuring the security and confidentiality of customer information and protecting it against threats or hazards. Agencies must implement a comprehensive security program to protect against unauthorized information access or use that would result in substantial harm or inconvenience to any customer.

As is the case for all merchants, transit agencies who accept credit and debit card payments must also comply with the Payment Card Industry Data Security Standard (PCI DSS) to help ensure the safe handling of sensitive information.¹⁷

4.2.6 Transit Benefits Program Support

An area of increasing importance to many transit fare payment systems is the proper handling and treatment of fare payments made through transportation benefit programs. Since 1993, employers have been able to provide employees with a tax-free benefit for commuting by transit and vanpool, and to pay for commuter parking. Employees in 2011 can use up to \$230 per month or \$2,760 per year of their pretax salary to pay for transit or vanpooling and can use an equal amount of pretax salary for commuter parking.¹⁸ Employees can save up to \$1,000 or more by commuting by transit, and even more if they pay to park to access transit. Employers save by avoiding payroll taxes on the amount their employees set aside for this benefit. As a result, a growing and, in some markets, a significant proportion of commuters pay their transit fares through employer-sponsored transportation benefit programs.¹⁹

The use of transportation benefits is governed by IRS regulations that require, among other things, that benefit funds be used for their intended purpose. Mixing funds between separate eligible categories is not permitted; for example, employees who elect to use their pretax monies to pay for transit expenses must substantiate use of the funds for transit only and not for commuter parking. Substantiation can be accomplished in several ways, such as: using transit vouchers; using electronic payment cards that include appropriate transaction filters to ensure compliance; making direct payments to individual transit fare accounts associated with ticket-by-mail programs and maintained by transit operators; and, most recently, using dedicated benefit accounts linked to contactless smart cards.

Key requirements for processing transit benefits include:

- Ensuring that transit benefit funds are used only to pay transit expenses.
- Accounting for funds used for transit and used for parking, as required by the IRS.

¹⁷ Additional information on PCI DSS can be found at <https://www.pcisecuritystandards.org/>.

¹⁸ See [IRS Rev. Proc. 2011-12; IRS Publication 15-B "Employer's Tax Guide to Fringe Benefits."](#)

¹⁹ For example, in the Washington, DC, area, more than 30% of all fares collected by WMATA are transportation benefits administered through the agency's SmartBenefits[®] Program. A BART survey at the end of 2008 found that 46% of its commuters pay their fares using transit benefits. In addition, King County Metro reports that almost two-thirds of its fares are paid through employer programs.

- Adhering to requirements for the monthly limit on the amount of funds excluded from tax, the proper treatment of unused funds each month, and the appropriate disposition of tax-free funds left in an account after termination.
- Ensuring that, if the transit agency administers a transit benefit program through its fare collection system, the program complies with IRS rules to ensure that the employer's transit benefit program is eligible for favorable tax treatment for its employees.

5 Benefits of Contactless Open Bank Card Payments for Transit

The transit and bank card payment industries have historically taken different approaches to processing payments and managing risk (Sections 3 and 4). However, as bank card issuers offer contactless credit, debit and prepaid cards and institute new programs for low-value transactions, transit agencies can take advantage of these programs to directly accept contactless bank cards for fare payment at the point of entry where the fare media is ordinarily presented. This can yield significant benefits for transit fare collection vs. other non-cash approaches.

To frame the discussion of the benefits of transit acceptance of contactless open bank card payments, the following model describes one approach for implementation:

- Riders use contactless credit, debit, and prepaid cards and devices to pay for fares directly at the point of entry to the transit system (e.g., at the subway gate, on the bus, on a train), and, with some agencies, for parking fees.
- The contactless card or device is read at the point of entry and the transaction is routed to the transit agency's back office system, where the fare is calculated, the transaction is authorized through the financial processing network, and the rider's account is managed.
- The transit agency maintains the traditional merchant-acquirer-issuing bank business relationship.
- All contactless credit, debit, and prepaid transit fare payment transactions may be processed through the standard operating infrastructure of the financial payments system and use the standard financial industry processes for clearing and settlement.

The combination of contactless bank card acceptance and changes to architectures and processes to support contactless payments acceptance at entry/exit points offers a number of potential benefits to transit agencies, including: improved flexibility; enhanced operational efficiencies that result in cost savings; improved customer service; and faster deployment. In addition, accepting contactless bank cards opens up opportunities for partnerships, co-promotion and new revenue streams.

5.1 Fare Payment System Architecture Flexibility

An open contactless bank card approach uses an account-based architecture, rather than the traditional card-based architecture. The account-based architecture also offers additional benefits to transit agencies for supporting fare policies and other payment media.

5.1.1 Account-Based Architecture

In a system using an account-based architecture, the terminal²⁰ reads information stored on a contactless smart card and sends it to a back office over a communications network. The back office system (or host) maintains the system's logic, determines whether the card is valid, and returns a signal that enables the terminal to open the gate or to signal the rider and the bus operator whether to allow passage. The terminal may perform security functions, for example, checking a hot list or positive (cold) list to determine card validity before sending any payment data to the host. The card is typically only accessed with a read function by the terminal.

The back office system uses the data sent by the terminal to apply the relevant business rules and determine a price for the transaction using the agency's fare policy/rules.

Transaction types and payment methods can vary with this architecture based on the transit agency's business rules and the types of technologies deployed.

²⁰ The "terminal" is defined as the fare acceptance device at a gate or on a bus. Terminals are also often referred to as electronic readers or validators.

5.1.2 Advantages of Account-Based Architecture

Account-based architectures enable transit agencies to incorporate any contactless smart card into their system as fare media by linking the card to a funding account. The card can be any card, including cards issued by the Federal government, corporations, or universities.

An account-based architecture also enables easier changes to fare policy; changes are made in the back office system. Neither the cards nor the terminals need to change.

Overall, account-based architectures deliver value to transit agencies beyond simply enabling acceptance of contactless credit, debit and prepaid cards.

5.2 Interagency Interoperability

When multiple agencies accept contactless bank cards, automatic interoperability is achieved by all agencies and merchants that accept such payment devices. The need for complex regional organizations and compromises to an agency's policies is no longer present, as in traditional transit fare systems.

Merchants who take advantage of open payment networks expect interoperability to be automatic; transit agencies will see the same benefit as they move to open payments and become merchants.

The links among agencies as merchants for revenue-sharing, common fares and transfers can be added to back office processes later, after deployment.

5.3 Flexible Implementation of Government and Pretax Program Benefits on Prepaid Cards

Both the Federal and state governments issue prepaid cards to administer certain government assistance programs. Rather than mailing a check to the benefit recipient, the federal or state government provides a prepaid card to the benefit recipient. Each month, the government agency transfers the benefit amount to the prepaid card account of each recipient. Examples of government-funded programs that use prepaid cards include Social Security, Temporary Assistance for Needy Families (TANF), Women, Infants and Children (WIC), state unemployment, and court-ordered payments. These cards can include disbursements for child support, disability programs, pensions, emergency disaster relief, tax refunds, unemployment, benefits, veterans' benefits, and worker's compensation.

Pretax program cards are prepaid cards that deposit pretax earnings to a consumer's account to be used only as specified by current IRS regulations. Pretax programs include transit benefits accounts, healthcare reimbursement accounts, and medical savings accounts.

An account-based architecture would allow transit agencies to accept payment from eligible government benefits and pretax programs that issue contactless prepaid cards.

5.4 Flexible Use of ID and Access Media for Fare Payment

Many organizations' ID cards use standard ISO/IEC 14443 contactless smart card technology for physical access to buildings and facilities. An account-based architecture would allow these ID cards to be associated with a transit account; individuals could then use an ID card as a fare payment device. By using an account-based architecture, a transit agency can team with local card issuers (e.g., Federal agencies, corporate employers, or universities) without requiring that the issuing organization change their processes. For example, the agency could negotiate a contract with a university so that the school pays the agency directly based on the use of student ID cards for rides on the transit system. Alternatively, a student could register the student's (or parent's) bank card or bank account with the transit agency to allow payment when the ID is presented for a ride on the system.

Additional information on the use of ID and access media for fare payment can be found in Section 13.

5.5 Merchant Role for Transit Agency

The model described in this section allows transit agencies to maintain the established merchant-acquirer-issuing bank business relationship. By maintaining this relationship, transit can take advantage of the broad-based, market-driven nature of the current global financial payments network. Maintaining this relationship also enables transit to take advantage of competitive products and services built on open standards, to build on established financial payment card customer behavior and expectations, and to leverage the financial payments industry's extensive customer and operations support infrastructure.

5.6 Well-Defined and Globally-Accepted Security Standards

Entities that process credit and debit cards must comply with the Payment Card Industry (PCI) Data Security Standards (DSS). The PCI standards represent a comprehensive security approach that governs the safekeeping of cardholder and other sensitive authentication information as it is processed, stored, or transmitted within a merchant environment. The published security standards and formal approach to revisions provide a common framework for the transit and financial industries to mutually work to protect data processed by a new open fare payment system. As part of system design, transit agencies should discuss the impact of the PCI standards with their merchant acquirer/processor.

5.7 Reduced Payment Media Issuance

Transit agencies that accept contactless bank cards may no longer need to issue fare media for a large number of their riders, avoiding the significant costs associated with ticket issuance and with card lifecycle management. Transit agencies can receive the benefits of account-based fare payment without needing to manage and secure the privacy of those accounts directly.

5.8 Lower Fare Collection Costs

Traditionally, transit agencies function as the fare media issuer and the transaction acquirer, in addition to performing all cash handling responsibilities. Various types of fare media must be manufactured, shipped, distributed, and monitored; all fare media payment transactions must be acquired and settled. In addition to less media cost, fewer revaluing and media dispensing machines are required. When these costs are combined with the substantial capital acquisition costs and ongoing maintenance expense of fare collection equipment, it is not surprising that agencies must expend a considerable percentage of collected fare revenue to operate and manage their revenue systems.

Open payment systems provide options for transit operators to reduce their role within the fare collection supply chain. Central to the value proposition offered by open payments is the ability to avoid playing the role of the media issuer. The transit agency acts as a merchant and can direct more effort toward operating and improving transit services. When considering open bank card systems, transit agencies should determine the full burden of their overall fare collection costs, including the full lifecycle of equipment; this can then be used to objectively compare the costs for open and closed systems.

5.9 Lower Costs from Leveraging Standards-Based Commercial Off-the-Shelf Devices

Moving to an open payments environment entails the adoption of a variety of standards developed and maintained for the financial payments industry. That industry includes a wide variety of hardware and software suppliers that have developed products in response to a market much larger than mass transit. As such, transit stands to gain by such scale economies where mass market products fit the operational needs of fare terminals and back office systems. Examples of these benefits will be found in back office software components, communications devices, and a variety of front-end terminal and terminal components. The impact of standards provides a greater probability that new devices and services will be usable by transit agencies without the need for modifications to their systems, as innovators will choose to develop to financial industry standards. The clarity in financial industry security standards will

also assist in lowering costs by providing a robust infrastructure of compliance professionals who can perform services with a significant degree of efficiency.

The biggest opportunities for front-end devices will be found in the areas of fare product sales and account top-ups where conventional POS devices, handheld terminals, and associated networks will be able to be leveraged. In addition, generally available customer service kiosks may also be used for account management and as top-up terminals. For front-end fare processing devices, the unique environmental demands for transit equipment such as faregates and on-bus equipment will still likely require purpose-built equipment; however, certain components, like readers, may be purchased from a variety of sources.

Standards for messaging simplify interface development, saving time in design and programming efforts. Systems suppliers will also be less frequently called upon to deliver custom hardware solutions, the development of which can be amortized only across the comparatively small market of mass transit.

5.10 Improved Customer Service

For customers, paying a transit fare would be like any other retail experience and carry with it the complete customer support system, claim resolution process, and protection against loss that comes with financial payment products.

5.11 Positive Customer Experience

The transit customer experience improves with the use of bank cards for fare payment. Customers use payment cards that they already have, without needing to stop and buy transit-specific fare media or determine the appropriate fare. Customers paying fares with financial industry-issued contactless payment cards can build on their relationship with an issuer of their choice to pay any transit fare. Customers would have fewer cards in their wallets. If multiple agencies in a region accept open bank card payments, regional travel on public transportation would be easier.

5.12 Speed of Deployment

In general, transit agencies want to be able to leverage payment mechanisms already present in the marketplace rather than build a system from the ground up with the expectation that by doing so they will be able to simplify and more quickly deploy a solution that holds the promise of lower system acquisition and on-going costs.

The following factors contribute to open bank card payments speeding deployment:

- The open standards used for bank card payments allow the use of standards-based hardware, software and processes.
- Lessons learned from one agency's deployment can be used by other agencies to speed the process.
- Back office development can be leveraged across agencies with an account-based system.
- Contactless open payments can result in interagency cooperation more quickly and easily, since the open payments card or device can be used at any transit agency that accepts contactless bank card payments.
- Deployment times may be shorter if the agency is building on an up-and-running platform operated by a service provider. Smaller agencies may also realize some time savings if they are willing to use a software-as-a-service (SaaS) approach to contracting, since the required assets can be built more quickly.
- Agencies that have a closed smart card platform in place and wish to migrate to an open payments solution may be able to leverage work that has already been done. For example, the communication connections will likely be in place and, if capable of supporting additional transactions, can be used for the upgrade. The equipment, if still serviceable, may be already set

for installation of readers that are capable of processing open payment transactions. The upgrade may consist of a reader swap-out, the addition of or connection to the processing system, an update to the communications equipment on vehicles in tandem with the reader or validator upgrade, and development of customer support functions (such as the web site, customer relationship management system, call center procedures and training).

While an open payments approach for transit in a mature environment may simplify deployment and reduce ongoing support, transit agencies should not expect that the approach itself will lead to a significantly shortened overall deployment cycle. Transit agencies exploring the open payments approach need to look beyond the potential shortened lead time for certain system components, like point of sale readers, and ensure their speed of deployment analysis includes a review of planning and procurement cycles.

5.13 Partner Co-promotion Opportunities

Another advantage of open payment is that transit can benefit from co-branding opportunities and other promotional programs offered by bank card issuers. Card issuers are expert at database marketing and can work with a transit agency to identify customers who are likely to respond to various product offerings, subject to privacy policies established by the transit agency and/or the financial community. Using the account-based model, temporary promotional products could be introduced with little effort.

5.14 Additional Revenue Opportunities

Open payment systems, as the name implies, are able to support a number of parties in commercial relationships that can offer additional benefits to transit agencies. Benefits may come in the form of advertising revenue, revenue-sharing with card issuers, enhanced media distribution systems, and accommodation of smaller transit agencies.

To be successful, transit agencies who want to take advantage of such relationships should approach the other party as a partner. Advertisers do not know the restrictions that agencies operate under, and agencies do not know what features will best appeal to a financial institution, retailer, or other commercial partner. A willingness to work together is likely to result in higher revenues over the long term, rather than seeking guarantees of initial revenues from partners before they have had an opportunity to develop confidence in the chosen approach. The ability to work in an open environment will pay dividends over time, and finding the best approach will take time.

5.14.1 Advertising

Many consumer-facing displays now carry advertising. For example, gas station pump screens and ATMs display ads, with advertisers paying for the use of the display. Advertising could also be displayed on ticket vending machines or smart card reader screens in buses and on platforms. Transit agencies may have hundreds to thousands of devices throughout their systems that can display advertising messages that are downloaded or streamed using device management systems. Additional revenue can be achieved by selling space on these devices.

Focused advertising also represents another revenue opportunity for transit agencies. Any process that assists companies in better locating buyers and encouraging them to make purchases offers considerable value to retailers. Transit agencies often use bus tracking systems to manage their fleets. The tracking information could be used to inform partner companies of the location of potential buyers. Companies located near a rider's stop could use the rider's smart phone to offer the rider discount coupons or other benefits. The retailer could be charged a fee or pay a percentage of sales for the transit agency's participation.

5.14.2 Card Revenue

Transit agencies may be well positioned to share revenues with bank card issuers. Regardless of whether the card is co-branded, an agency's commercial relationship with an issuer of network-branded cards could designate a share of the revenues from the program to be paid to the transit agency. Such

partnerships require discussion either with a bank (for credit and debit products) or a program manager (for prepaid card programs).

Retailers also issue payment cards, and discussions with local managers of major retailers may result in a co-branded, private-label card that is compatible with the fare payment system at the transit agency. A relationship with a major retailer to support a common payment card can provide distribution benefits. In many cases, retailers may also be willing to share revenue based on benefits the agency provided to the retailer. For example, free transit to and from the merchant's location could be offered in return for a share of shopping revenues.

5.14.3 Expanded Distribution

Transit agencies cannot always manage their complex fare media distribution channels adequately. Such management requires immense amounts of staff time, quick reactions, and thoughtful marketing and planning. Moving to an open payment system can enable transit agencies to take advantage of their partners' retail channels and practices. For example, a partner who is already stocking inventory can stock co-branded media. Agencies can then redirect their distribution resources to support other core functions or oversee the open payment system.

5.14.4 Expansion to Small Agencies

Open payment systems use an account-based architecture, which enables additional agencies to join the system with relative ease. The lead agency in an area could offer to provide fare collection services to any peers lacking the resources to purchase or operate a modern fare collection system. The smaller agency could then be accommodated without having to change its fare collection requirements.

6 Open Payments: Challenges, Considerations and Recommendations

This section discusses key challenges for implementing the open payments model described in Section 5 and offers alternative approaches to addressing these challenges. The section is intended to promote discussion among industry participants and provide examples of how early implementations and pilots have addressed these challenges.

6.1 Key Operational Issues

Three key operational issues for transit agencies are transaction time, online transaction authorization, and risk management. These issues are interrelated.

The transit fare payment transaction must occur very quickly. Slower transactions can result in unacceptably slow customer throughput and interfere with “normal” customer flows. In most cases, current card-based systems complete the card validation transaction offline at the point of entry. Because any offline transaction carries a certain degree of risk, these fare payment systems include functionality essential to detecting and preventing fraud and managing risk.

As described in Section 3.1, open bank card payments use an online authentication and authorization process to manage risk. An account-based open payments system needs to take this in consideration or the resulting transactions will be slower than those achieved with a card-based architecture.

The bank card industry has come up with a combination of technical and business risk sharing solutions that assures transit agencies can accept open bank card payments with acceptable risk. Examples include:

- Payment brands are supporting real-time card authentication approaches that don't require the full authorization process to validate that cards are authentic, prior to authorization. The full authorization can take place after the first transaction, with some minor risk to the transit agency.
- Transit agencies can aggregate transactions up to a certain number or amount before requesting issuer authorization, with some risk to the transit agency depending on how aggregation is implemented.
- Transit agencies accepting open bank card payments incorporate risk management approaches, including hot-listing, real-time velocity checks and passback rules.

Real-world experience in Utah, New York City and New Jersey has demonstrated that open bank card payment transactions can be undertaken within the time thresholds required and at acceptable risk to the transit agency.

6.2 Fees and Costs

The management and operation of public transportation fare payment systems require considerable amounts of labor and materials. The manufacture and distribution of fare media, ongoing equipment maintenance, and the collection and processing of cash may require agencies to spend 5–15 percent of their total revenue to collect fares. This expense is even more striking when viewed in the context of total annual industry revenues of \$10.3 billion in 2008.²¹

Transit agencies planning to upgrade their fare collection systems must consider all of the costs associated with different methods of fare payment. Transit agencies should evaluate different fare collection models in the context of knowing the cost of collecting fares across all channels.

Transaction processing costs for contactless credit and debit payment transactions are negotiated between the transit agency and the acquirer/processor, as described in Section 3.1.1. To minimize these costs, they should be negotiated competitively. Individual transit fares may be expensive to process

²¹ National Transit Data Base, Fiscal Year 2008.

using traditional credit and debit card payment processing for each transaction. Using aggregation (for pay-as-you-go transactions) or prefunded accounts can reduce the cost of processing low-value transactions.

- Transaction aggregation is a process that identifies repeat transactions that use the same payment instrument (such as a credit card), aggregates each charge up to a certain dollar value or for a certain amount of time, and then processes one transaction. Transaction aggregation results in lower transaction fees, since a smaller number of higher value transactions are processed.
- Transit prefunded accounts linked to a contactless bank card account can allow a customer to fund multiple rides. During this process, the customer could also chose from a menu of transit fare policy options. When the customer uses the contactless payment device at the point of entry, the prefunded account would be decremented by the fare amount and usage recorded (or validated). The transit agency would incur a single transaction processing fee for the initial funding with no additional processing fees for decrementing the prefunded transit account. A majority of the transactions would be handled by back-office systems without involving the financial networks for authorization, thereby also shortening transaction times.

The development of a business model that includes both transaction processing costs and any savings that could be realized from reduced cash handling and fare media costs can help agencies determine whether contactless credit, debit, or prepaid payment acceptance is economical.

The Smart Card Alliance white paper, *Planning for New Fare Payment and Collection Systems: Cost Considerations and Procurement Guidelines*, and the associated Excel transit payment system cost model, are resources transit agencies can use to assess different fare collection models.²²

6.3 External Partnership Management and New Procurement Models

A number of procurement models are being explored for the implementation and operation of open fare payment systems for mass transit. These range from:

- An agency procuring the necessary infrastructure and operating it themselves
- An agency or group of agencies contracting for a complete services offering inclusive of infrastructure finance
- An agency defining specific work packages and separately contracting for specific infrastructure and operational services while retaining some in-house administration and operating functions

Regardless of the model, the following relationships must be managed by the agency and/or the service/solutions provider:

- Merchant acquirer
- Payment brands (Note: Typically an agency's acquirer can represent the agency's interests with the payment brands.)
- Hardware and software vendors
- Data processing/hosting providers
- Call center operators
- Carriers and mobile network operators
- Retail distribution partners
- University, corporate, and government institutional partners
- Reload network operators

²² <http://www.smartcardalliance.org/pages/publications-planning-fare-payment-system-procurement-guidelines>

- Advertising and public relations service providers
- Commercial and promotional partners
- Security and regulatory audit and certification bodies
- Revenue servicing and cash management providers
- Service providers for hardware and software maintenance and asset management

A number of transit agencies have examined the breadth and complexity of the various relationships, standards, and ecosystems that must be monitored and managed and decided to contract with a single entity to manage the overall program and these various relationships.

A number of companies who are experienced in operating fare programs have added expertise in financial payments and mobile services, thus positioning themselves to respond to agency needs.

Other agencies appear to be following more of a hybrid insource/outsource model where the management of certain functions and relationships is contracted out, while other activities are retained for management by agency personnel.

One benefit of the total outsourcing approach appears to be the ability for a private concern to utilize the various revenue streams made available as a source of underwriting for capital necessary to deploy systems and infrastructure. Several ongoing procurements are examining this type of model.

6.4 Fare Policies

One key consideration for transit agencies is how to make the agency's different fare policy options available to customers if contactless bank cards are accepted for fare payment at a point of entry. Transit fare structures typically start with basic per-trip charges and then add rules that address whatever unique transportation services the agency offers (for example, student fares, reduced fares for the elderly and handicapped).

The account-based system architecture (described in Section 5.1.1) allows contactless bank cards to be accepted while providing the flexibility to implement fare policy rules and processes in the back office system. In an account-based system, the contactless bank card is presented at the point of entry and transaction data is sent to the back office. Prior to charging the rider, the appropriate fare is calculated using the fare policy rules established by the transit agency. This approach not only enables use of contactless bank cards but also allows fare changes to be implemented more easily without requiring changes to the fare cards or readers. This also permits implementation of more complex policies than have been available with traditional systems since a data center has greater capacity than a point of entry device.

Implementation of an account-based architecture and acceptance of contactless bank cards require the transit agency to consider how fare policies and processes are implemented for different modes of transit. Considerations include:

- Implementing systems that accommodate validation on boarding and departing, thus establishing the location criteria required to charge the appropriate zone- or distance-based fare (e.g., on buses or light rail). Transit vehicles could be equipped with "tap-on/tap-off" readers and processes to capture the transaction, with the fare calculated at the back office.
- Implementing systems that accommodate proof-of-payment fare collection and on-board inspection (see Section 6.5). Handheld devices are needed that can check the contactless bank card and verify fare payment with the back office.

6.5 Inspection for Proof of Payment

Accepting contactless bank cards in a system with an account-based architecture creates a challenge for open platform systems such as light rail and commuter rail: how to ensure proof of payment. In a ticket-based system, the inspector glances at a ticket to determine compliance; in the traditional card-based

automatic fare collection system, the card holds fare payment history that can be verified with a handheld device. An account-based system, however, requires interrogation of a back office system to determine compliance.

While no off-the-shelf inspection device is currently available to implement such an inspection process for an account-based system, NFC-enabled devices show promise and prototype systems are currently in development at the Utah Transit Authority and other agencies.

6.6 Migration Path

The scope and complexity of a fare payment system implementation require careful planning and strong project management; selecting a migration path from the legacy system to the new or upgraded payment system represents one of the early key decision points of the planning process. Transit agencies considering an open payment, account-based system have several approaches from which to choose – integrating open payments into existing systems, replacing existing systems, or running the new and existing systems in parallel.

As mentioned earlier in the paper, several large transit operators in the U.S. installed conventional, closed loop payment systems over the past 10 to 15 years. These early adopters of contactless payment media now seek to upgrade their aging systems, provide customers with a wider variety of payment options, and transfer some of the customer support functions to the issuer of (non-agency) payment media. Since these agencies already have the sales equipment, infrastructure and communication networks necessary to accept bank and non-bank issued payment media, they wish to overlay the new system on the legacy system. This approach includes the preparation of a requirements document or concept of operations that identifies the assumptions, existing conditions, needs, and expectations of the proposed system. As the requirements become refined and the scope clarified, agencies are then poised to procure the services of a systems integrator and/or equipment supplier.

By contrast, small- to medium-sized transit operators typically have legacy systems with magnetic stripe passes and tickets and may choose to take a “clean sheet” approach to a system upgrade. Although this too requires a thorough planning and evaluation phase, the scale of the agency may allow a modular approach for incorporating an account-based system. This migration path may include development and testing of low cost pilot projects, often with the suppliers providing equipment and expertise without agency cost. The projects allow the agency to develop in-house expertise and allow the agency to decide their level of involvement in the new system.

6.7 Unbanked Riders

Transit agencies must assure that all forms of fare payment are available to all public transit customers, including customers who are unbanked or underbanked (riders who lack a bank-issued payment card or account). Such riders can be accommodated using contactless prepaid cards. Agencies can thereby support open bank card-based payment systems that reach all riders.

The prepaid industry includes several types of cards, each of which is capable of supporting multiple segments of riders. Agencies should explore each type to develop a strategy that optimizes their fare media mix by using third party-issued card products. Additional information on the use of network-branded and private-label prepaid cards for transit and on solutions for unbanked riders can be found in the Smart Card Alliance white papers, *A Guide to Prepaid Cards for Transit Agencies*,²³ and *Serving Unbanked Consumers in the Transit Industry with Prepaid Cards*.²⁴

6.8 Pretax Transit Benefits

As discussed in Section 4.2.6, transit agencies must provide proper handling and processing for fare payments made through transit benefits programs and comply with IRS regulations that require, among

²³ <http://www.smartcardalliance.org/pages/publications-prepaid-cards-for-transit-agencies>

²⁴ <http://www.smartcardalliance.org/pages/publications-serving-unbanked-consumers-in-the-transit-industry-with-prepaid-cards>

other things, that benefit funds be used for their intended purpose. IRS compliance has a direct impact on transit consumers using contactless bank card payment systems.

An account-based fare collection system makes it relatively straightforward for transit agencies to segregate funds for transit benefits programs and comply with IRS regulations.

6.9 Potential Financial Industry Changes

The financial industry is facing many changes and challenges, including changes in technology and regulatory structure.

- **EMV.** Outside of the U.S., bank card issuers are now issuing EMV-compliant credit and debit cards. As described in Section 3.3.2, U.S. banks are also starting to issue EMV-compliant cards to international travelers and Visa has announced plans to accelerate chip migration and adoption of mobile payments in the United States, through retailer incentives, processing infrastructure acceptance requirements and counterfeit card liability shift. A migration to EMV bank cards in the U.S. will affect the transit acceptance infrastructure.
- **NFC.** NFC technology is now commercially available in mobile phones and POS readers, with bank card issuers looking to offer mobile-phone-based credit, debit and prepaid cards. Widespread adoption of NFC will drive contactless bank card issuance and merchant acceptance and help move consumers to contactless payment. Implementing ISO/IEC 14443-compliant readers and accepting open contactless bank cards will position transit agencies for any market shift to NFC.
- **Government regulation.** Emerging government regulation of debit interchange fees will have a significant impact on the cost of accepting bank card transactions. With exceptions allowed for certain types of debit cards, such as general purpose reloadable prepaid cards, recent legislation (i.e., the Durbin Amendment) caps the debit interchange for issuers with over \$10 billion in assets at 21 cents per transaction, along with five basis points to be multiplied by the value of the transaction. Issuers can also receive an additional one-cent per transaction toward the costs of fraud prevention. This is a substantial reduction from current debit interchange rates. If contractually obligated, acquirers will pass the savings from the reduced debit interchange rate to their merchants.

The Durbin Amendment also included routing/exclusivity regulations that require a card issuer to provide at least two unaffiliated debit payment card networks, either one signature and one PIN network, two PIN networks or two signature networks. The intent of this regulation was to provide choice to the merchant from competing networks, which in theory, will result in reduced transaction processing costs in addition to those from the interchange restriction.

Transit agencies moving to contactless bank card acceptance should monitor financial industry developments. In addition, transit agencies need to follow financial industry guidelines for customer receipts (Regulation E), data security (PCI DSS), and terminal, software, and network certification.

6.10 Market Penetration of Contactless Credit, Debit, and Prepaid Cards

The success of a transit agency moving to contactless bank card acceptance will be determined in part by the number of riders who have and use contactless bank cards. The market penetration of contactless bank cards in the U.S. tends to be regional, with issuers focusing on areas that have high merchant acceptance. Visa's recent announcement of incentives for merchants to migrate to EMV POS terminals that support both contact and contactless transactions is expected to drive contactless bank card acceptance.

Transit agencies should work with the card issuers in their markets to understand how many contactless bank cards have been issued in their service areas, develop a migration plan that accommodates these

cardholders, and offer other fare payment options to riders who do not have contactless bank cards (e.g., contactless network-branded prepaid cards or transit-specific fare payment cards).

7 Deployment Case Studies

The Utah Transit Authority has fully implemented and launched a new electronic fare collection system that accepts contactless bank cards for payment of transit fares at the point of entry. MTA New York City Transit, Port Authority Trans Hudson (PATH) and New Jersey Transit conducted an extensive pilot exploring the use of bank-issued contactless credit and debit cards for payments on subways and buses. These agency implementations illustrate the benefits of contactless bank card acceptance and provide perspectives on how challenges can be addressed.

7.1 New York/New Jersey Pilots

In 2010, New York City Transit (NYC Transit), an operating agency of the New York Metropolitan Transportation Authority (MTA), along with the Port Authority Trans Hudson (PATH) train and New Jersey Transit, completed Phase 2²⁵ of an ongoing initiative to explore the use of open standard, bank-issued contactless smart card devices to pay transit fares directly at the point of entry (i.e., at turnstiles in subway stations and on boarding buses) without the need to purchase separate, transit-only fare media. The 2010 initiative was an extension of a successful pilot of contactless payments and open standards completed by NYC Transit with MasterCard and Citigroup that began in July 2006 and included contactless readers at 30 stations on the Lexington Avenue train line.

7.1.1 Business and Customer Service Drivers

A key goal of the initiative was to develop a solution that built on existing financial payment systems and on customer relationships and expectations when using credit and debit cards for purchases. From the agency's perspective, it was important to verify that acceptance of a contactless device at a fare gate or point of entry did not interfere with customer flow and in fact could possibly enhance it, especially on buses. It was also essential that customers be provided with an easily accessible, convenient, and self-directed support mechanism to allow for general information, fare media purchases, and other account management functions.

NYC Transit and its partners also wanted to ensure the integrity and security of the system and enable full reconciliation of fares paid and rides taken. Funds were required to be processed and cleared as with any other electronic fare payment transaction. At a minimum, systems developed to support the initiative needed to replicate all data and controls used by the agency to report on and reconcile sales transactions, payment of funds, and travel usage associated with the current fare payment system (MetroCard).

Phase 1 offered fare policy choices that allowed the customer to pay for one trip at a time or take advantage of NYC Transit's bonus percentage for prepaid rides. Phase 2 included a wider array of fare policy options, while also offering bus/subway transfers and time-based passes. The prime overall objective of the initiative, however, was to validate the technical and operational approach rather than maximize customer acceptance.

7.1.2 Phase 1

For Phase 1, the objectives of NYC Transit included the following:

- Test the contactless equipment/devices in a simplified, "retail" approach to fare payment at the point of entry.
- Demonstrate that NYC Transit's fare policy could be processed in accordance with agency business rules (payment processing, financial reporting, data requirements, audit).
- Validate the performance of contactless readers as payment devices in a transit environment.
- Test the application of payment brand rules and procedures for transit fare payment.

²⁵ "MTA and Partners Announce Joint Smart Card Fare Payment Pilot," MTA Press Release, June 1, 2010, <http://www.mta.info/mta/news/releases/?en=100601-HQ20>

- Acquire customer feedback on contactless payments.

7.1.2.1 Overview

The Phase 1 pilot ran from July 2006 through December 2006 and was implemented at 30 subway stations along NYC Transit's heavily traveled Lexington Avenue line. At least one turnstile at each station was equipped with an industry certified smart card reader that could accept MasterCard PayPass™ devices issued by Citibank. These turnstiles continued to accept NYC Transit's current fare media, the MetroCard.

In addition to the external operating and support system provided by MasterCard, NYC Transit adapted its internal systems to enable full review and reporting on the trial. NYC Transit implemented functionality that generated financial reports to establish revenue accountability, and ridership and revenue reports for budgeting and planning purposes, as well as reconciliation of ride information for each payment transaction.

A dedicated web site developed for the pilot provided customers with secure access to their transit account activity and detailed information about the program, and a staffed customer service center permitted customers to interact directly with an agent over the telephone.

7.1.2.2 Transaction Processing

MasterCard and Citibank solicited customers with a PayPass payment device to participate in the Phase 1 trial. Two transit fare payment options were offered: pay as you go, and prefunded fares. To use the pay-as-you-go option, riders tapped the Citibank payment device on the specially equipped turnstile. The rider was charged the regular full fare for each trip taken. To support this option, MasterCard and Citibank implemented a transaction aggregation process. To use the prefunded fare option, riders registered either on the pilot web site or at the customer service center and purchased value-based fares in advance, much as they do today with the MetroCard. Prefunded fares were automatically replenished when the balance fell below a predetermined amount.

7.1.2.3 Summary

Phase 1 of the initiative met its primary general objective: to test the basic technology of accepting contactless payment cards to enter the transit system. The positive feedback from customers further reinforced the case to move forward with the Phase 2 pilot.

7.1.3 Phase 2

The objectives of the Phase 2 pilot included the following:

- Test real-time authentication and processing of transactions directly from the point of entry, including the use of a wireless solution for buses.
- Demonstrate that a wide array of fare policy components, including bus/subway transfers and unlimited ride passes, could be processed in accordance with business rules.
- Validate that contactless devices issued by various financial institutions and linked with multiple brands would work in a predictable, consistent manner.
- Demonstrate the ability of a single open-standards contactless device to be used on different regional transit modes and systems to provide a more seamless and convenient journey.
- Better understand risk management issues for the open standard payment card/device approach.
- Acquire and evaluate customer feedback.

Key to meeting these objectives was the ability to authenticate a card in real-time and ensure that a feasible solution could be demonstrated using wireless communication on buses (as opposed to in a subway, where a wired communications network was available).

7.1.3.1 Overview

The Phase 2 pilot ran from June 2010 through November 2010 and was the first system to replace the need for riders to carry specific fare cards for three separate transit systems – NYC Transit, NJ TRANSIT and PATH. Commuters transferring between the partner agencies only needed one type of payment device, improving the overall customer experience through increased speed and convenience. The three agencies coordinated linkages between their systems in the Phase 2 trial, such as NJ TRANSIT bus routes that provide feeder service to the PATH system.

For the first two months, any MasterCard PayPass-enabled card or device from any issuer was accepted; starting in the third month, Visa payWave™ cards and devices could also be used. Riders could choose from prefunded or pay-as-you-go fare options. Prefund options for MTA fares were expanded from Phase 1 to include time-based unlimited ride passes with automatic replenishment and discounted fares (e.g., senior citizen reduced fares).

In coordination with the trial partners, several employers participated in a pretax transit benefit pilot conducted by TransitCenter. TransitCenter recruited employees whose commutes aligned with the pilot locations and issued new payment cards with contactless capabilities to replace their magnetic stripe cards. The pilot successfully allowed pretax benefits to be used with no unique issues and virtually no back-office customization.

Because real-time authentication processing was an essential component of the trial, NYC Transit and PATH stations used either wired or 3G wireless communications, and all buses used 3G wireless communications for data transmissions to and from the central system.

The central back office systems developed for Phase 2 provided a variety of key functions, including account authentication, financial authorization/clearing, fare calculations, device and risk management, and self-directed customer support applications. These back office systems also fed information into NYC Transit's sophisticated DataMart facility, which enabled a comprehensive information management capability supporting all of NYC Transit's reporting and reconciliation needs. Similar to the first pilot, a dedicated web site and staffed customer call center with interactive voice response (IVR) capability was specifically set up for Phase 2.

7.1.3.2 Transaction Processing

For Phase 2, pay-as-you-go rides required initial authentication by the back office and real-time authorization by the card issuer. The initial authorization was performed after a decision to allow entry, resulting in "first tap" financial risk to the transit agency. Individual rides (taps) were then aggregated according to each agency's business rules, with the back office providing a real-time "yes" or "no" message to the customer for each tap. Prefunded rides also required that each tap be authenticated at the back office but did not require additional authorization from issuers.

An "orphan mode" and localized hot list provided for secondary processing by the point of entry terminal in the event that a response could not be obtained from the back office in a timely manner. The system also provided for velocity checks at both the terminal/reader and the back office, which provided an additional layer of risk management.

Phase 2 provided agency-specific daily/monthly reporting and raw data feeds. Agency employee online access to customer ride history was available for dispute resolution, while each agency was able to customize specific policies for refunds and customer issues.

Participating transit agencies shared a common back office that allowed a single customer account to be used by all three agencies. No transit agency integration or regional fare policy was required. Customers could purchase fare products for each of the agencies from a single web site.

7.1.4 MTA Summary

All MTA pilot objectives were met. The operational requirements for speed and real-time authentication were measured and validated. The potential to utilize wireless communications to complement the wired subway infrastructure in a manner that was transparent to customers and agencies was successfully

demonstrated. Customers were able to use standard contactless payment cards from issuers around the world at the turnstiles, gates, and fare boxes. Agencies were able to validate the use of comprehensive fare policies, from stored value and transfers to time-based unlimited ride passes and reduced fares. The solution provided a high degree of data security while allowing for significant business and technical flexibility. Finally, customers could conveniently and seamlessly use common fare media across multiple modes and agencies while also having access to a comprehensive suite of customer support functions.

The trial provided valuable experience regarding the risks and benefits of aggregating customer transactions and of the various potential alternatives for processing pay-as-you-go transactions. Issuers employ a variety of risk decisioning models that may lead to different authorization responses to transactions with seemingly similar profiles. Key to the viability of the solution will be a flexible transaction processing approach that balances and manages risk across the various players in the payments ecosystem while providing maximum protection for transit agency revenue.

The MTA continues to plan towards implementing a new fare payment system for NYC Transit that utilizes open standard contactless payment cards and other ISO/IEC 14443 media, such as identification cards and mobile phones. MTA published a concept of operations for a new fare payment system in April 2011.²⁶

7.1.5 Expansion of NJ TRANSIT Tap>Ride Pilot

7.1.5.1 NJ TRANSIT Overview

NJ TRANSIT is New Jersey's public transportation corporation. Its mission is to provide safe, reliable, convenient and cost-effective transit service with a skilled team of employees, dedicated to customer needs and committed to excellence. Covering a service area of 5,325 square miles, NJ TRANSIT is the nation's third largest provider of bus, rail and light rail transit, linking major points in New Jersey, New York and Philadelphia.

The agency operates a fleet of 2,027 buses, 711 trains and 45 light rail vehicles. On 236 bus routes and 11 rail lines statewide, NJ TRANSIT provides nearly 223 million passenger trips each year. NJ TRANSIT also administers several publicly funded transit programs for people with disabilities, senior citizens and people living in the state's rural areas who have no other means of transportation. In addition, the agency provides support and equipment to privately-owned contract bus carriers.

7.1.5.2 Pilot Expansion

After the conclusion of the joint pilot with NYC Transit and PATH (Section 7.1), NJ TRANSIT continued the Tap>Ride program to further test the acceptance of contactless payments on its system.

The initial rollout enabled customers to tap and ride with contactless bank cards at Newark Liberty International Airport Station and on three flat-fare bus routes in Hudson County (route numbers 6, 80 and 87). In August 2011, the program expanded to include three multi-zone bus routes (route numbers 43, 81 and 120), including intra-state and inter-state travel into New York with payments based on distance traveled. Customers now have the ability to pay for fares on twice as many bus routes with a simple tap of their contactless credit, debit, prepaid card, mobile phone or device.

To use the new feature, bus customers simply tap their cards on the designated card reader when boarding the bus and again when leaving the bus, ensuring the correct payment is made based on the number of bus zones traveled and avoiding being charged the maximum fare from the boarding zone.

Customers who wish to purchase a monthly pass, ten-trip ticket or children's fare can register online by visiting www.njtransit.com/tapride and clicking on "Login/Register."

To enable these features, NJ TRANSIT worked with ACS, a Xerox Company, to implement tap on/tap off logic and global positioning system (GPS) integration capabilities. ACS is providing the host transit payment platform for transaction processing, financial management and revenue reconciliation, an

²⁶ "Concept of Operations for MTA New Fare Payment System and NYCT Deployment Phase, MTA, April 21, 2011, <http://www.nfpsindustryoutreach.com/register/doc1.php>

agency-specific web site for customer support, and maintenance of contactless readers, terminals and other related equipment.

Customers who do not have a contactless bank card can take advantage of a convenient ReadySTATION self-service kiosk at the Hoboken Station in New Jersey that dispenses, reloads and provides balance information for a MasterCard PayPass-enabled prepaid card. This contactless prepaid debit card can be used instantly at all NJ TRANSIT open payment program points of entry, including two bus routes to and from Hoboken. Customers need only pay for the card at the kiosk and are not required to provide any personal information. They can also add value to their cards at numerous retail locations if they choose to register their card.

NJ TRANSIT is also evaluating the innovative use of a unique payment system for their customers with disabilities. The agency is seeking a select number of riders to demonstrate the viability of a rubberized wristband with an embedded contactless chip. These customers can wave or tap their PayPass-enabled wristband at bus readers and airport faregates for convenient access, eliminating the need to handle cash or a card to pay for their fares.

Another initiative underway at NJ TRANSIT's New York Penn Station is the introduction of contactless payments at ticket vending machines and ticket windows for travel on commuter rail. NJ TRANSIT also plans to work with ACS to further introduce the open payment option at ticket vending machines and ticket windows at the Port Authority Bus Terminal in New York City.

In October 2011, NJ TRANSIT became the first transit agency in the world to partner with Google Wallet to test NFC mobile payments, allowing customers to pay with a simple tap of their mobile phone. NJ TRANSIT is testing this technology on ticket vending machines and at ticket windows at New York Penn Station, on the six Tap>Ride bus routes, and at Newark AirTrain Station. This technology benefits NJ TRANSIT's customers by improving the customer payment and ticketing experience through decreased transaction times and boarding times on buses.

7.2 Utah Transit Authority Full System Deployment

The Utah Transit Authority (UTA) is the regional transit provider for the primary urbanized areas of Utah. Its service area primarily consists of a 100 by 20 mile corridor bounded by the west face of the Wasatch Mountains and the Great Salt Lake and Utah Lake. A population of 1.8 million is served. UTA operates 520 buses out of four garages, 80 paratransit vehicles, four light rail lines over 35 miles, and a 44-mile commuter rail line. Two additional light rail lines and a doubling of commuter rail mileage will be added by 2015.

When UTA began its investigation of electronic fare collection systems in 2005, its primary concerns were, and continue to be: the convenience and ease of use for its customers; the efficiency and effectiveness of revenue collection; and the data that could be gleaned to understand transit system use and guide service planning. UTA started its effort with virtually no legacy in automated fare collection systems, and was therefore free to explore the latest advances and opportunities in fare collection technology. At that time, the payments industry had just announced its launch of contactless media under the brands of American Express ExpressPay, MasterCard PayPass and Visa payWave.

Acceptance of contactless credit and debit cards issued by banks and other financial institutions for direct payment of transit fares was appealing to UTA for the following factors:

- Issuance of payment media by other organizations
- Integration with the payments mainstream: payment at the fare box, gate or platform as a merchant POS transaction
- Automatic interagency interoperability
- Customer service with issuers
- Security standards
- Flexible architecture for product development
- Robustness of the open payments ecosystem
- Commoditization of devices
- Potential for a pathway to eliminate cash

- Speed of deployment
- Cost
- Co-promotion by issuers

In 2006, UTA began an electronic fare collection pilot on 41 ski service buses. The purpose of the pilot was to learn about the development and deployment of such a system by actually operating it on a manageable number of buses. The pilot objectives were to: (1) solve an immediate problem – accounting for the use of resort customer season and employee passes issued by and paid for by ski resorts; and (2) learn whether transit fares could be collected using the new contactless open credit and debit cards being issued under the open payment brands. As partners in the pilot, each of four ski resorts issued picture passes with contactless technology embedded. Based on its concurrent experience on open payments in the first New York City Transit pilot, MasterCard agreed to participate in the Utah pilot. American Express and Visa also agreed to participate.

The pilot was deemed a success. UTA was able to learn about most of the processes that it would need to manage in a full system deployment. All of the internal and external stakeholders interested in the system were able to get real-world exposure to the technology. The pilot was continued for another year. UTA decided to aggressively proceed to build and deploy an open payments fare collection system on all of its fixed route bus and rail service. Included would be support for its third party paid pass program associated with employers, universities and ski resorts.

On January 1, 2009, UTA launched the new system. It included: an infrastructure of readers at all doors of 520 fixed route buses and 170 validators installed on 35 TRAX light rail and FrontRunner commuter rail platforms; wireless communications gateways on buses with both 3G connectivity and WiFi connections at garages and optical fiber to all platforms; and Internet links from each device to a hosted back office. The initial fare products were contactless bank card acceptance for single adult fares, including honor of transfer rules and use of third party paid passes (ECO Pass for employers, Ed Pass for colleges and universities, and Ski Pass for five ski resorts within the UTA service area).

Special characteristics of the UTA system architecture include:

- Tap-on/tap-off. Tapping at the entrance and exit of each bus or rail trip segment allows collection of linked origin/destination data that is invaluable for service planning. It also provides information necessary for calculating distance-based fares for commuter services and possible migration to such fare pricing system-wide.
- Account based architecture. Fares are calculated and transactions are processed in the back office easing implementation of fare changes and creation and launch of new fare products.
- Open payments acceptance. The system and card acceptance devices are certified and process contactless cards issued under the American Express ExpressPay, Discover Zip, MasterCard PayPass and Visa payWave brands.
- Hosted back office. The back office is connected through the Internet to each device, enabling flexibility and portability and easing PCI compliance.
- Cold and hot lists. A list of third-party pass card numbers to be accepted are maintained on each validator and in the back office as submitted or modified by the ECO, Ed and Ski pass card issuers. Bank cards that are declined by issuers are placed on hot lists that speed their rejection.
- Near-real-time and real-time authentication. In the initial launch with bank cards, the price of each trip is calculated as the tap-on/tap-off actions are received and then submitted for full authorization and settlement. If the card is declined, it is hot listed and will not be accepted by the system going forward unless and until the customer arranges for payment for the unpaid trip and card acceptance is restored. Real-time authentication will be added as the technical viability and business case for that approach is demonstrated.
- Inspection. Inspection devices for proof-of-payment rail services are using NFC and 3G smart phones to interrogate payment cards and determine through the back office that they had been previously presented and accepted by the platform validators.

UTA is unusual as a merchant accepting open payment brand products directly for access to its transit vehicles in that it accepts contactless media only. It requires transaction speeds of 300 milliseconds from presentation of a card to the green or red light response. The price of the trip is determined in the back office only after completion of the trip with tap-on/tap-off. Ultimately, it must assure that media for use in its system are available to all of its customers, including those who do not have banking relationships with credit and debit cards.

Privacy has been a priority and has been addressed from the initial planning of the electronic fare collection system. UTA values the linked origination-destination data enabled by this system for service evaluation and planning, but does not need nor want to know *who* is traveling. Third-party payers keep the identities of those individuals who are authorized to ride and provide UTA only with the card numbers. UTA provides information about system use by third party employees or students in an aggregated form. For open payment bank card acceptance, the hosted back office contractor separately maintains records and processes for the application of business rules and credit/debit processing. Customer security is also assured by contractor and agency compliance with PCI DSS.

Additional fare products and functions are now in the process of development, including:

- Special fares for seniors and disabled individuals
- Gift card or closed loop prepaid programs
- Open loop prepaid partnerships
- Contactless co-branded cards
- Acceptance of government benefits distribution cards
- Federal Personal Identity Verification (PIV) card use for administering employee transportation benefits
- Use of third-party access and identity media for prepaid or post-paid payment per trip
- System-wide pay-per-trip distance-based fares

8 Agencies in the Process of Moving to Open Systems

A number of transit agencies are moving to incorporate acceptance of contactless bank card payments in their AFC systems. Agencies in Chicago, Philadelphia, Washington, DC, and Dallas have active open procurements for fare payment systems that accept open contactless credit and debit card payments, and Toronto is expanding their system to accept contactless credit cards and mobile payments as well as stored value smart cards.

This section includes brief profiles of each of these agency initiatives.

8.1 Philadelphia

SEPTA is the primary operator of public transportation services in southeastern Pennsylvania, an area that includes the City of Philadelphia and four adjacent suburban counties. On September 30, 2009, SEPTA received proposals for an integrated, electronic fare payment and collection system using new payment technologies that can interface with both interbank and non-bank financial clearing systems. The proposals are currently being evaluated and reviewed.

SEPTA's proposed New Payment Technology Project²⁷ will offer riders a variety of innovative payment choices. The project leverages both wired and wireless communication technologies to create a modern fare payment processing system similar to the E-ZPass toll payment system. Patrons will present either interbank or non-bank contactless fare media (passes, prepaid cards, debit cards, and credit cards) to an electronic processor at the point of entry. The processor transmits the payment information over a network to a backend database for verification. The electronic processor complies with banking industry standards, allowing passengers to use any bank approved payment device or card for fare payment.

The New Payment Technology system design incorporates a merchant or retail purchase payment model, allowing fare payment with conventional bank-issued debit or credit cards. Transit customers without such cards, however, can obtain prepaid media, similar to gift cards, for use anywhere on the transit system. Ticket vending machines and a network of sales locations will supply cards to SEPTA passengers; as the value of the card balance decreases, the prepaid cards can be reloaded from a fare vending machine, at a retail location, over the Internet, by telephone, or at the customer support center.

All of SEPTA's five transportation modes (bus, subway/elevated train, trolley, regional rail, and paratransit) will use the payment system, allowing passengers to ride and transfer between modes using common fare media. This project involves upgrades on 117 bus routes (1,336 buses), eight trolley lines (185 cars), three trackless trolley routes (38 trolleys), two subway/elevated lines (343 cars), one interurban high speed rail (26 cars), 13 regional railroad lines (349 cars), and 149 regional rail stations.

8.2 Chicago

CTA operates the nation's second largest public transportation system, serving 40 suburbs and the City of Chicago. CTA provides 81 percent of the public transit trips in the six-county Chicago metropolitan area, either with direct service or connecting service to Metra and Pace, averaging 1.7 million rides daily.

CTA's 1,190 rapid transit rail cars operate over eight routes and 224.1 miles of track. CTA trains make about 2,157 trips each day and serve 144 stations. CTA's bus system consists of 140 routes operating 1,782 buses. Buses make over 25,000 trips daily, and serve nearly 12,000 bus stops throughout the region.

8.2.1 Current Fare Payment Options

Currently, CTA accepts two media for payment on the rail and bus system:

- A closed loop smart card that is either account-based (Chicago Card Plus) or reloadable (Chicago Card).

²⁷ <http://www.septa.org/fares/npt/>

- Magnetic stripe cards that are sold through vending machines and at certain locations and that are accepted by the turnstiles and the bus fare boxes. These cards are either period passes or cash reloadable cards.

Over 700 authorized retail sales outlets currently place fare media orders daily. An average of 40 orders per day are processed and delivered to the outlets by armored services. The processing turnaround time for an order is 2-3 days. Customers can also purchase fare cards online or at CTA headquarters.

Approximately 60 non-profit organizations (e.g., Department of Human Resources, Cook County probation, Chicago public schools) also order directly from CTA. These customers generally order custom-encoded fare media to support their programs, ranging from \$1 reduced fares with transfers to \$4.50 full fare round trips. Fare media is also provided to RTA to support various programs such as disability and senior free rides and elementary and high schools participating in the Student Permit Riding Program.

8.2.2 Move toward Open Payments

CTA is seeking to enter into a long-term agreement with a private partner to upgrade, design, finance, acquire, and manage the installation, operation, maintenance, repair, and replacement of a fare payment system that relies on open payment business processes and technical standards. CTA expects that the system will initially coexist with the current fare collection system. Upgrading the CTA system to an open payment system requires removing certain components of the current system while retaining and continuing to operate other components, such as fare gates.

8.3 Washington, D.C.

The Washington Metropolitan Area Transit Authority (WMATA) was created by an interstate compact in 1967 to plan, develop, build, finance, and operate a balanced regional transportation system in the national capital area. The Authority began building its rail system in 1969, acquired four regional bus systems in 1973, and began operating the first phase of Metrorail in 1976.

Today, Metrorail serves 86 stations and has 106 miles of track, with additional expansion to Dulles Airport currently under construction. In fiscal year 2011, Metrorail is expected to provide more than 219 million passenger trips. Metrobus serves the nation's capital, seven days a week with 1,500 buses. In fiscal year 2011, approximately 127.6 million trips are expected to be taken on Metrobus. Metrorail and Metrobus serve a population of 3.4 million within a 1,500-square mile jurisdiction. WMATA began its paratransit service, MetroAccess, in 1994 and currently provides about 1.5 million trips per year.

On December 30, 2010, WMATA issued the first step in a multi-step selection process for replacing and modernizing its fare collection system. Under the New Electronic Payments Program, the initiative is designed to move the agency from an issuer of proprietary, agency-specific fare media to a processor of fare payments directly at the gate or managed through central accounts; this initiative changes the customer experience and offers a wide variety of payment forms accepted by the agency. The media accepted will include bank-issued payment media, agency-issued closed loop media, and the Federal government-issued Personal Identity Verification (PIV) cards and Common Access Cards (CAC) that are in common use in the operating area. Over 40% of peak period customers are estimated to be carrying the CAC/PIV identification cards.

Program award is forecasted for early to mid-2012.

8.4 Dallas

Dallas Area Rapid Transit (DART) is a regional transportation authority consisting of the City of Dallas and 12 surrounding jurisdictions. DART is a multi-modal transit agency providing bus, light rail, commuter rail, paratransit, and HOV service to an area of approximately 700 square miles and including approximately 2.4 million people. DART is pursuing a project intended to create a region-wide electronic payment infrastructure for transportation and other services, using contactless devices such as smart cards, credit and debit cards, RF devices, barcodes, and NFC devices. The scope of payment

capabilities can be wide-ranging, including parking, tolls, and event tickets. However, payment processing must support the complex fare systems, first and foremost, for public transit fares and services.

The initial vision of the system is for contactless card readers that authenticate the card in real time, including on-board buses, vans, sedans, and rail cars as well as at ticket vending machine locations, with a back-end transaction processing system that applies business rules and account management capabilities.

DART has determined that an account-based “open” system is required that will accept RF-enabled third-party credit/debit cards, general purpose prepaid cards, proprietary smart cards and NFC-enabled mobile phones. The system must provide many ways in which the customer can conveniently acquire, pay for, and reload values on media. In addition to routine transaction processing, DART wants to address the special requirements associated with handling large events, with the goal of sharply reducing the impact on TVMs and in-person ticket sellers through the use of downloadable tickets to mobile phones.

An RFI-Q was issued in February 2011 followed by the development of a list of qualified respondents.

8.5 Toronto and Province of Ontario

Canada has the highest penetration of contactless bank cards of any country, with estimates suggesting that as many as 90 percent of all bank cards will be contactless by the end of 2011.

Introduced in late 2009, PRESTO is the regional transit electronic fare collection system serving the Province of Ontario in Canada. This is a broad geographic region which includes the cities of Toronto, Ottawa and Hamilton and provides over 3 million daily transit trips across multiple modes of transit – bus, bus rapid transit, regional rail, light rail and subway – and 30 distinct transit agencies. To date, PRESTO is focused on the 11 transit agencies that represent the largest agencies in the Province.

PRESTO, under its next generation program, will include open payments within an open architecture and system design, enabling customer choice and providing long-term flexibility by supporting multiple cards and form factors. PRESTO is focused on enabling a diversity of payment form factors, including stored value/product smart cards, preloaded cards, contactless credit cards, contactless identity cards (such as student passes), mobile devices (including NFC), and other emerging non-card form factors.

Implementation of PRESTO’s next generation system is currently in progress, with the overall design completed. PRESTO will deploy its first set of devices capable of processing contactless credit card transactions in the fall of 2011. PRESTO will deploy its first set of dual mode devices capable of reading both contactless credit cards and stored value/product smart cards in spring of 2012. Future implementations will expand support for mobile platforms, other transport modes such as parking, and commercial partnerships that can generate new revenue.

9 Conclusions

Two of the undeniable forces behind the evolution of transit fare payments have been passenger needs for rapid fare payment transaction speeds and payment choices. A third legitimate element, more recently, merits inclusion: payment security. Throughout the 1990s and into the new century virtually all of the major transit agencies in North America invested in automatic fare collection (AFC) technologies, allowing the development of robust transaction-based systems. These card-based, closed loop systems appealed to core transit customers as agencies refined and then promoted stored value and stored pass product implementations. Despite this success, however, the industry was still challenged in at least two key areas: first, the means to attract rider markets either unfamiliar with or not needing the purchase of these specialized fare instruments; and second, the burden of owning, operating, and maintaining proprietary card-based systems.

Transit rider preferences, however, represent a subset of the broader consumer marketplace. According to the 2010 Federal Reserve Payment Study, credit, debit and prepaid payments made up over 65 percent of all non-cash payments in 2009, with a value of \$3.52 trillion. Further, the number of non-cash payments in the United States has increased at a compounded annual rate of 5.2 percent since 2006. These findings and trends, as the study points out, result from a combination of technological and financial innovations that influenced the payment instrument choices of consumers and businesses.²⁸ The banking and payment industries understand consumer desires for faster transactions, the convenience of not carrying cash, improved theft and loss prevention, and ease of record keeping. Recognizing opportunities to expand card use in low-value transactions, the payment industry re-defined payment requirements, including the elimination of signatures and receipts, contactless technology adoption, and expansion of prepaid bank card products.

This white paper examines the confluence of two industries, transit and financial payments, moving toward the mutually compatible goal of market expansion through customer convenience, transaction speed and data security. The contactless payment card transaction process and fee structure operate within a unique multi-party system, in direct contrast to the transit agency model of proprietary card payments. Understanding the two approaches is key to recognizing the tradeoffs and merits of open payments for transit agencies. The white paper outlines the mechanics of the bank card payment process, including payment aggregation and advanced processing techniques to address transit needs dealing with authentication, authorization and approval in real-time or near-real-time. Transit integrators are implementing risk management solutions tailored to the transit environment, and the industry is working with the card-issuing community to ensure processing rules are in place that are suitable to transit as a merchant category.

Two new technologies, NFC and EMV, are also being introduced in the market. NFC, a short distance wireless communications technology, may completely alter the payment landscape by allowing purchases from mobile phone users, and enabling location-based advertising and communication. EMV is an open standard specification for smart card payments and acceptance devices designed to improve the security of bank card transactions. Eighty countries are in various stages of EMV chip migration.

Through the publication of this paper and others like it, it is hoped the transit community will gain a new understanding of the architecture of open payments and its benefits. Like many industries, transit agencies struggle with multiple standards and the challenges of interoperability. By adopting bank industry standards for payment, however, the goal of interoperability is achieved. Increasingly, as shown by the pilot projects conducted in the New York-New Jersey region, the open payment operation of the Utah Transit Authority, and several ongoing procurements among large North American operators, the industry will develop further insights into the opportunities and benefits of open payments and account-based fare payment approaches.

²⁸ The 2010 Federal Reserve Payments Study, Noncash Payments in the United States: 2006 – 2009, http://www.frbservices.org/files/communications/pdf/press/2010_payments_study.pdf

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Publication of this document by the Smart Card Alliance does not imply the endorsement of any of the member organizations of the Alliance.

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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. 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.

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 http://www.smartcardalliance.org/about_alliance/councils_tc.cfm.

11 Appendix I: Glossary

Account-based architecture

Transit fare collection system architecture that uses the back office system to apply relevant business rules, determine the fare, and settle the transaction. The terminal reads information stored on fare payment media and sends it to a back office over a network. The back office determines whether the card is valid and returns an “approve or deny” signal that enables the terminal to open the gate or to signal the rider and the bus operator on whether to allow passage. Account-based architectures can be used with any media type (magnetic stripe, contactless) and can support fare payment approaches using contactless bank cards, transit-issued cards and identity cards. The account-based architecture is also used with host-based stored value systems, where the back office stores and tracks the remaining value on a prepaid transit payment card.

Card-based architecture

Transit fare collection system architecture that uses the fare payment media and the card reader to make the decision to approve or deny the fare payment transaction (including determining the fare). The back office primarily performs accounting and auditing and provides customer service and device management functions.

Closed loop payment system

See closed payment system.

Closed payment system

Payment system that is specific to single merchant organization or small group of merchants (e.g., in a mall). A closed system will have only one or a few merchants accepting the payment card or media.

Cold list

A list of issued cards that are to be allowed for normal use if presented to any applicable card reader in a system.

EMV

Europay MasterCard Visa. The EMV specification defines technical requirements for bank cards with embedded microchips and for the accompanying POS acceptance infrastructure

Hot list

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

NFC

Near Field Communication. NFC technology is a standards-based wireless communication technology that is being built into mobile phones and that allows devices that are a few centimeters apart to exchange data.

Open architecture

A type of computer architecture or software architecture that allows adding, upgrading and swapping components,²⁹ based on accepted standards set by a standard setting body or by convention.

Open loop payment system

See open payment system.

Open payment system

Payment system that enables any bank, anywhere in the world, to link its customers (cardholders or merchants) with those of any other bank to transact business via payment cards almost instantaneously.³⁰ This is also called a four-party system where the parties are the bank issuing cards,

²⁹ http://en.wikipedia.org/wiki/Open_architecture

³⁰ "Benefits of Open Payment Systems and the Role of Interchange," MasterCard, <http://www.mastercard.com/us/company/en/docs/BENEFITS%20OF%20ELECTRONIC%20PAYMENTS%20-%20US%20EDITION.pdf>

the merchant's bank that acquires the transaction, the merchant, and the cardholder who conducts the transaction and now must make payment in the case of credit or that made payment in the case of debit.

This type of payment system requires no contractual relationship between the merchants accepting the card for payment and the card issuer. Instead all card issuers and all merchant acquirers agree to abide by the rules and policies established and adopted by neutral third-party organizations. Visa and MasterCard are examples of third parties who set standards and policies for open payments. They neither issue cards nor accept or acquire transactions, yet the merchant accepting the card for payment is assured of getting their money while the bank issuing the card must ensure it issues cards to consumers or companies that are able to pay for the transactions they conduct.

Open source

Practices in production and development that promote access to the end product's source materials.³¹

Open system

Non-proprietary system based on a publicly known standard set of interfaces that allow anyone to use and communicate with any system that adheres to the same standards. Open system standards have four basic requirements: (1) they must be defined fully, so that vendors can work within the same framework; (2) be stable over a reasonable length of time, so that the vendors have fixed targets to aim at; (3) they must be fully published, so that their interfaces are publicly available; and (4) they are not under the control any one firm or vendor.³²

Proprietary

Something that is used, produced, or marketed under exclusive legal rights of the inventor or maker.³³

Stored value card

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

³¹ Wikipedia, http://en.wikipedia.org/wiki/Open_source

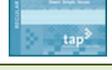
³² <http://www.businessdictionary.com/definition/open-system.html>

³³ <http://www.merriam-webster.com/dictionary/proprietary>

12 Appendix II: Smart Card-Based Fare Collection Systems in North America

Since the late 1990s, transit agencies have been implementing contactless smart card-based fare collection systems. **Table 1** summarizes the status of deployment in several North American regions. (“N/A” means that the transit system does not have that mode of travel; “No” means that the transit system has not implemented that feature.)

Table 1. Contactless Smart Card Fare Systems in North America – June 2011³⁴

TRANSIT SYSTEM	NO. OF CARDS (x000)	Where Used								
		BUS	RAIL			REGIONAL PARTNERS	OTHER APPLICATIONS			
			GATED METRO	LIGHT RAIL	COMM. RAIL		PARKING	ACCESS CARD	FERRY	
Atlanta, GA ... MARTA <input type="checkbox"/> Breeze Card	 1,400	Yes	Yes	N/A	N/A	3	Yes	No	N/A	
Baltimore, MD ... MTA <input type="checkbox"/> CharmCard	 10	Yes	Yes	Yes	No	10	No	No	N/A	
Boston, MA ... MBTA <input type="checkbox"/> CharlieCard	 4,000	Yes	Yes	Yes	No	2	Yes	Yes	Yes	
Chicago, IL ... CTA <input type="checkbox"/> Chicago Card	 780	Yes	Yes	N/A	No	1	No	No	N/A	
Houston, TX ... Metro <input type="checkbox"/> Q[®] CARD	 350	Yes	N/A	Yes	N/A	No	No	No	N/A	
Lindenwold, NJ ... PATCO <input type="checkbox"/> FREEDOM Card	 70	No	Yes	N/A	N/A	No	Yes	No	N/A	
Los Angeles, CA ... LA-MTA <input type="checkbox"/> TAP Card	 500	Yes	Yes	Yes	No	N/A	No	No	N/A	

³⁴ Source: Survey conducted by Ashok Joshi /KEI – in June 2010.

TRANSIT SYSTEM	NO. OF CARDS (x 000)	Where Used								
		Bus	RAIL			REGIONAL PARTNERS	OTHER APPLICATIONS			
			GATED METRO	LIGHT RAIL	COMM. RAIL		PARKING	ACCESS CARD	FERRY	
Miami , FL ... MDT <input type="checkbox"/> EASY Card		1,024	Yes	Yes	N/A	Yes	2	Yes	No	N/A
Montreal, Quebec...STM <input type="checkbox"/> OPUS Card		3,000	Yes	Yes	No	Yes	18	No	Yes	Yes
NJ/NY ... PATH <input type="checkbox"/> SmartLink Card		350	No	Yes	No	No	2	No	No	No
Salt Lake City, UT ... UTA <input type="checkbox"/> EFC Card		150	Yes	No	Yes	Yes	No	No	Yes	No
San Francisco, CA ... MTC <input type="checkbox"/> Clipper Card		800	Yes	Yes	Yes	Yes	7	Yes	No	Yes
Seattle, WA ... KC Metro <input type="checkbox"/> ORCA Card		800	Yes	N/A	Yes	Yes	No	No	No	No
Toronto, Ontario ... Metrolinx <input type="checkbox"/> PRESTO Card		54	Yes	Pilot	No	Yes	10	No	No	N/A
Washington, DC ... WMATA <input type="checkbox"/> SmarTrip Card		1,800	Yes	N/A	Yes	Yes	11	No	Yes	No

Notes

- On bus systems, it is a “one tap” operation. The few exceptions are multi-zone trips.
- Some gated metros require a “two tap” operations, once for entry and once for exit.
- Light rail usually has tap on entry/tap on exit; commuter rail requires conductors to inspect cards using handheld devices.
- Early starts for parking application have begun using pay by mobile phone and/or smart cards.
- UTA system data is based on all active cards – contactless bank cards and third-party paid passes. The UTA system also accepts access cards issued by others.

13 Appendix III: Identity and Physical Access Media Use in Transit

The use of contactless smart card technology for identity credentials and access control is expanding, creating opportunities for convergence with transit fare collection systems. With the move towards open architectures and account-based fare payment systems, transit authorities are able to accept identity cards that comply with ISO/IEC 14443 for contactless smart cards. When these cards are presented for fare payment, the transaction is linked to an account established with the transit authority by the organization that issued the credential. For example, Utah Transit Authority, which has an account-based fare collection system, is accepting contactless identity cards issued by many employers and universities as part of their Eco Pass program. A growing number of corporations and educational organizations throughout the United States are adopting credentials for physical and logical access control that comply with ISO/IEC 14443.

Many government programs issue credentials that use compatible contactless smart card technology. The Federal government has mandated the Personal Identity Verification (PIV) card as a common credential for all federal employees. Similarly, the Department of Defense (DoD) issues the Common Access Card (CAC) to their employees for physical and logical access to DoD facilities and information systems.

The Utah Transit Authority has conducted a proof-of-concept demonstration, accepting PIV and CAC identity cards from employees from several Federal agencies. PIV and CAC cards will be issued to approximately 8 million employees and comply with Federal Information Processing Standard (FIPS) 201 technical specifications. The Transportation Worker Identification Credential (TWIC) and the First Responder Authentication Credential (FRAC) are other examples of identification cards being deployed that use the PIV specifications. The Federal government's Identity, Credential and Access Management (ICAM) initiative is coordinating common identity and access management policies and approaches across government.

Many state and municipal government agencies and government contractors are adopting PIV-interoperable identity credentials. These identity cards use the same technology and data models as the PIV card and follow Federal issuance standards for interoperability with the Federal government. Other organizations are adopting credentials that are technically compatible with the PIV specifications for access to municipal services and public or private facilities. These credentials do not necessarily require the same level of identity vetting for the cardholder. In the future, compatible identification credentials could also be issued by social benefit programs.

Accepting identification credentials for public transit fare payment has several benefits. Transit authorities do not have to issue as many cards, transit benefit program administration can be streamlined and will be subject to less fraud, more accurate information can be generated regarding transit ridership and services provided, and the process of using transit will be more convenient and attractive to riders.

To ensure the security of contactless payment transactions, a secure process must be established for the identity token and the reader to perform mutual authentication. The Open Protocol for Access Control Identification and Ticketing with privacy (OPACITY) program has been established to design and promote a protocol suite that is optimized for fast contactless transactions.

14 Appendix IV: EMV and the U.S. Payments Industry

Globally, the payments industry is migrating from magnetic stripe bank cards and infrastructure to EMV contact and contactless chip cards and infrastructure to improve the security of bank card transactions. EMV is an open-standard set of specifications for smart card payments and acceptance devices. Eighty countries globally are in various stages of EMV chip migration, including Canada and countries in Europe, Latin America and Asia. Approximately 1.2 billion EMV cards have been issued globally and 18.7 million POS terminals accept EMV cards.³⁵ In August 2011, Visa announced plans to accelerate EMV migration and adoption of mobile payments in the United States, through retailer incentives, processing infrastructure acceptance requirements and counterfeit card liability shift.

U.S. issuers are now starting to issue EMV credit and debit cards, initially focused on international travelers and major merchants indicate that they will upgrade their POS infrastructure to support EMV cards.³⁶ The Visa announcement is expected to accelerate the U.S. move to EMV and to mobile contactless adoption; merchant incentives are based on the installation of POS terminals that support both contact and contactless EMV cards.

Several factors are driving the U.S. payments industry to implementation and deployment of EMV. Most important are the increasing amount of card-related fraud losses³⁷ and the cost of enhancing security features incrementally. In addition, the investment being made by merchants to comply with PCI DSS and by the industry to implement new capabilities for contactless and NFC mobile payment transactions provides an opportunity to move to EMV in the U.S. Finally, as other markets have adopted chip cards, the per-unit costs for cards and devices have decreased. Some POS device manufacturers now sell only hybrid devices with both chip and magnetic stripe capabilities.

Six U.S. bank-card issuers are issuing or have announced plans to issue EMV credit and debit cards: Chase,³⁸ Silicon Valley Bank,³⁹ the State Employees Credit Union (SECU),⁴⁰ United Nations Federal Credit Union,⁴¹ U.S. Bank,⁴² and Wells Fargo.⁴³ It is expected that other U.S. issuers will follow suit.⁴⁴ In addition, Walmart⁴⁵ and the Merchant Advisory Group⁴⁶ have been advocating the use of EMV in the U.S. to control the merchant investment required to protect cardholder information and address card payment fraud.

³⁵ <http://www.emvco.com>

³⁶ <http://www.smartcardalliance.org/pages/smart-cards-applications-emv>

³⁷ *The Nilson Report*, "Global Card Fraud," June 2010

³⁸ "Chase to issue EMV card in U.S.," *SecureID News*, April 14, 2011, <http://www.secureidnews.com/2011/04/14/chase-to-issue-emv-cards-in-u-s>

³⁹ "Silicon Valley Bank Chooses Gemalto for EMV Cards," Gemalto press release, June 1, 2011, <http://www.finextra.com/news/announcement.aspx?pressreleaseid=39475>

⁴⁰ "SECU Leads in the US With the Addition of EMV Card Chip Technology," SECU press release, February 17, 2011, <http://www.prnewswire.com/news-releases/secu-leads-in-the-us-with-the-addition-of-emv-card-chip-technology-116429294.html>

⁴¹ "UNFCU to be first issuer in the US to offer credit cards with a high security chip," <http://www.unfcu.org/content.aspx?id=1484&linkidentifier=id&itemid=1484>

⁴² "U.S. Bank and Chase Add to E.M.V. Chip Cards for Travelers," *New York Times*, August 4, 2011, <http://bucks.blogs.nytimes.com/2011/06/20/u-s-bank-and-chase-add-to-e-m-v-chip-cards-for-travelers/>

⁴³ "Wells Fargo piloting EMV chip for travelers," *San Francisco Chronicle*, April 14, 2011, <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/04/13/BU091IVQ4M.DTL>

⁴⁴ "More Issuers Considering EMV-enabled Cards?," *US Banker*, March 2011, <http://www.americanbanker.com/bulletins/-1033718-1.html>

⁴⁵ "EMV Comes to U.S. for International Travelers, Wal-Mart Calls for Chip and PIN," *Smart Card Alliance* press release, May 25, 2011

⁴⁶ "Merchant Advisory Group Releases Recommendations for Move to Mobile Payments," November 28, 2010, http://www.merchantadvisorygroup.org/MAG_News/default.aspx#MobilePayments

For transit agencies moving to open contactless bank card payments, a move to EMV would require new readers and infrastructure. Additional information on EMV and the changes needed within the payments infrastructure can be found on the Smart Card Alliance web site.⁴⁷

⁴⁷ <http://www.smartcardalliance.org>

15 Appendix V: Mobile/NFC

Use of mobile phones has evolved dramatically over the last few years. While voice and SMS are still important, a broad range of additional mobile applications, such as mobile Internet, location-based services, mobile e-mail, and other office applications, are now in mass-market use. The continued growth of mobile subscriptions has been accompanied by innovation and the introduction of new mobile services, including Near Field Communication (NFC)-based mobile applications and services.

NFC is an evolution of contactless and short range RF technologies that enables a mobile phone to interact with other devices over a distance of a few centimeters. The NFC-based “touch paradigm” supports a range of new applications for mobile phones, including card emulation that allows an NFC phone to execute contactless smart card transactions such as payment and ticketing.

NFC-enabled mobile phones are compatible with the contactless smart card acceptance infrastructure that is based on the ISO/IEC 14443 standard. This means that NFC phones can be used with current contactless payment and ticketing services without requiring additional investment in the terminal infrastructure. Contactless credit and debit payment applications, such as American Express ExpressPay, Discover Zip, MasterCard PayPass and Visa payWave, and transit-specific payment applications can be supported on a new form factor, the mobile phone. NFC-enabled mobile phones can provide a mobile contactless ticketing platform and support transit agency-specific fare payment applications. A number of international implementations of NFC-enabled mobile ticketing and transit payment have been piloted or launched.

15.1 NFC Mobile Contactless Payments⁴⁸

NFC mobile contactless payments take advantage of the installed POS infrastructure for contactless bank card payments. An NFC-enabled phone is provisioned with a version of the payment application (i.e., credit or debit card) issued by the consumer’s financial institution. The application and payment account information are loaded into a secure area in the phone named the secure element. The phone uses the built-in NFC technology to communicate with the merchant’s contactless payment-capable POS system, similar to the contactless payment cards and devices in use today. To pay, the consumer holds or taps the phone within an inch or two of reader, and the transaction occurs. The payment and settlement processes are the same processes used when the consumer pays with a traditional contactless or magnetic stripe credit or debit payment card.

There have been many NFC pilots and implementations globally, for both payment and mobile marketing applications.⁴⁹ In the U.S., two noteworthy services have been announced, will be piloted within the next 12 months, and are expected to accelerate mobile contactless payment deployments.

- Isis, the mobile carrier joint venture that includes AT&T, Verizon and T-Mobile, will be piloting its NFC-based payment service in Salt Lake City, UT, and Austin, TX. Users will be able to tap their phones to pay for fares on UTA buses and trams, along with making purchases at merchant outlets that accept contactless payment in both Salt Lake City and Austin. The pilots will begin in to the first half of 2012. Isis will be working with American Express, Discover, MasterCard and Visa for its NFC rollouts.⁵⁰
- Google Inc. announced Google Wallet in May 2011, and the service is now available in New York and San Francisco. Using the Google wallet, consumers are able to use their Sprint NFC-enabled phones to pay for purchases at merchants who accept MasterCard PayPass contactless payment, using MasterCard PayPass or a Google Prepaid card. Google is also working with

⁴⁸ Additional information on NFC mobile contactless payments can be found in the Smart Card Alliance Payments Council white paper [insert title & link – still to be published]

⁴⁹ Near Field Communications World lists NFC pilots and commercial services around the world, <http://www.nearfieldcommunicationsworld.com/list-of-nfc-trials-pilots-tests-and-commercial-services-around-the-world/>

⁵⁰ <http://www.paywithisis.com/#/news/>

point of sale systems companies and top retail brands to allow consumers to be able to pay for an item using a credit card or gift card, redeem promotions and earn loyalty points.⁵¹

15.2 NFC Ticketing

Using the same process that supports mobile contactless payment, NFC-enabled mobile phones can carry a transit application and be used for ticketing with ISO/IEC 14443-compliant transit readers.

The following are examples of NFC ticketing pilots and services.

- In March 2011, Deutsche Bahn (DB) and Rhein-Main-Verkehrsverbund (RMV) announced that they will be creating a common NFC-based ticketing system⁵² that will be used with their current NFC-based DB Touch & Travel system⁵³ and RMV HandyTicket system.⁵⁴
- In Italy, Telecom Italia and ATM, Milan's public transport network operator, announced in March 2011 that they would be conducting an NFC ticketing trial for buses, trams and underground network.⁵⁵
- As of 2008, mobile ticketing was in use in Japan by over 1 million users. Tokyo's JR East, in collaboration with NTT DoCoMo, issued the Super Urban Intelligent Card (Suica) transit application to FeliCa-enabled mobile phones in January 2006. The application supports the same functionality as the Suica smart card and uses the handset display to provide additional features. Residents with NFC-enabled mobile phones can use Suica to avoid long lines at the station, reload fares, and display ticket information.⁵⁶

In addition to ticketing, transit agencies are also using NFC tags in smart posters to deliver travel and schedule information to riders.

Additional information on NFC can be found on the Smart Card Alliance NFC Resources web page.⁵⁷

⁵¹ Google, Citi, MasterCard, First Data and Sprint team up to make your phone your wallet, Google press release, May 25, 2011, <http://gw-press.appspot.com/index.html>

⁵² <http://www.nearfieldcommunicationsworld.com/2011/03/03/36340/transport-operators-deutsche-bahn-and-rmv-to-co-operate-on-national-nfc-ticketing-system-for-germany/>

⁵³ <http://www.railwaygazette.com/nc/news/single-view/view/touch-travel-by-iphone.html>

⁵⁴ http://www.rmv.de/en/Fahrkarten/Fahrkarten_kaufen/39726/RMV-HandyTicket.html

⁵⁵ <http://www.nearfieldcommunicationsworld.com/2011/03/28/36639/milan-to-get-nfc-ticketing-system/>

⁵⁶ "Mobile Phone Ticketing Service in East Japan Railway" East Japan Railway Company, JR East Japan Information Systems Company, 2008

⁵⁷ <http://www.smartcardalliance.org/pages/smart-cards-applications-nfc>

16 Appendix V: Smart Card Alliance Resources

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Smart Card Alliance Transportation Council, <http://www.smartcardalliance.org/pages/activities-councils-transportation>

Smart.Transit LinkedIn Group, <http://www.linkedin.com/groupRegistration?gid=4029015>. The Smart Card Alliance Transportation Council established the Smart.Transit LinkedIn Group to stimulate discussion of transportation industry use of open contactless payments. The LinkedIn Group is open to all Smart Card Alliance members and public transportation agencies.

Transit Open Payments Resources web page, <http://www.smartcardalliance.org>