

PRESENTATION

Account-Based Systems: A Road to Open Payments

2011 APTA Fare Collection Workshop

Miami, FL
March 29, 2011



Below are some key terms that will be used throughout the presentation

Stored Value	Purchased value that customers can use to pay for transit services (e.g., e-purse, passes, and multi-ride products)
Primary Record of Stored Value	Record of stored value that is used to validate fare payment and modified as stored value is loaded or used
Card-Based System	Fare payment system where the primary record of stored value resides on a smart card
Account-Based System	Fare payment system where the primary record of stored value resides in a back office database
Electronic ID Number	Number encoded on a card that can be read and used to identify a back office account
Business Rules Software	Software that defines an agency's fare policy for the calculation of fares and the loading of stored value
Open Payments	Acceptance of bank-issued credit and debit cards for the payment of transit services



Card-based systems have become a mainstay in the transit industry over the past 15 years

- ▶ In a card-based system, value is stored on the smart card itself
- ▶ The card provides the inputs used for fare calculation (e.g., fare category, purse balance, loaded transit products, and ride history)
- ▶ Fare payment devices contain the business rule software used to calculate fares (e.g., fare tables, product usage rules, and transfer policies)
- ▶ Load devices modify the card data directly to reflect stored value that is purchased
- ▶ The back office uses transactions generated by the devices to maintain a mirrored record of card activity for security, reporting, and in some cases, the settlement of funds

A key feature of these systems is their ability to operate in an offline environment



This ability requires both smart cards and “smart” devices

- ▶ The card must have the necessary memory, format, and security to store and protect the primary record of stored value
- ▶ All of the intelligence must be built into the field devices to perform a wide-range of functions without online communications
 - Validate cards
 - Calculate and process fares
 - Load value purchased at a load device or remotely (via web or phone)
 - Block and unblock cards (hotlisting)
- ▶ Even simple fare policy changes can require software updates to all field devices
- ▶ Card management (e.g., remote loads and hotlisting) and transaction reporting still requires the devices to communicate regularly with the back office

The result is often complex, proprietary solutions



Account-based systems simplify the card and device design by moving the heavy lifting to the back office

- ▶ In an account-based system, value is stored in a back office account
- ▶ The primary purpose of the card is to identify the back office account to which it is linked
- ▶ Fare payment devices need only to read the card ID for validation and transmit it to the back office for processing
- ▶ Load devices also use the card ID to indicate the account where the purchased value is to be added
- ▶ The back office performs the fare calculation, loading of value, and management of the accounts
- ▶ Fare policy changes in an account-based system can usually be restricted to back office software updates



The amount of risk in account-based systems is closely tied to the communications architecture

- ▶ For effective fare enforcement, the field devices require frequent communication with the back office
- ▶ Real-time validation is not critical for fare payment devices, but the frequent distribution of hotlists is necessary to prevent excessive abuse
- ▶ Load devices are usually online and can initiate account updates in near real-time
- ▶ Whitelists, velocity checking, and other forms of card validation can be used to prevent fraudulent cards from entering the system

The proliferation of high-speed mobile data access allows for enhanced security in mobile environments



In summary, both systems have similar components, but the components perform very different functions

	Card-Based Systems	Account-Based Systems
Cards	<ul style="list-style-type: none"> ▶ Hold the primary record of stored value 	<ul style="list-style-type: none"> ▶ Provide a card ID linked to a back office account
Field Devices	<ul style="list-style-type: none"> ▶ Contain the business rules software for fare calculation and the loading of value 	<ul style="list-style-type: none"> ▶ Read the card ID and transmit it to the back office (along with device data) for processing
Back Office	<ul style="list-style-type: none"> ▶ Maintains a mirrored card record for security, reporting, and the settlement of funds 	<ul style="list-style-type: none"> ▶ Contains the business rules software for fare calculation and the loading of value ▶ Manages stored value accounts
Communications Infrastructure	<ul style="list-style-type: none"> ▶ Designed for offline operation 	<ul style="list-style-type: none"> ▶ Can be designed for online or offline operation

The difference is usually transparent to the end-user



Account-based systems offer a number of advantages over traditional card-based systems

	Card-Based Systems	Account-Based Systems
Advantages	<ul style="list-style-type: none">▶ Proven solution▶ Can operate in an offline environment	<ul style="list-style-type: none">▶ Any card with an electronic ID can be used to identify an account▶ Field devices do not require complex business rules software▶ Remote loads via web or phone can be added to accounts immediately
Disadvantages	<ul style="list-style-type: none">▶ Require complex cards and devices▶ Fare policy changes can require major software updates▶ Limited connectivity can impact the efficiency of remote loading▶ Typically use proprietary technology	<ul style="list-style-type: none">▶ Not yet widely deployed in the U.S. transit market▶ May require online communications



An account-based architecture is also a requirement for the acceptance of contactless open payments

- ▶ Contactless credit and debit cards provide an account identifier, just like cards in a closed-loop account-based system
- ▶ After capture by a field device, the card ID is sent to a back office system for processing
- ▶ The back office may include business rules software to apply fare policies before passing the charge on to the payment processor
- ▶ Real-time authentication is used in some designs, but abuse can also be managed through velocity checking and the frequent distribution of hotlists

The key to acceptance of open payments is a back office connection to a payment gateway



The acceptance of open payments can place additional security requirements upon the system

- ▶ Additional validity checks (e.g., expiry and checksum verification) may be incorporated into the field devices to detect fraudulent or invalid cards before passing data to the back office
- ▶ If fare discounts will be offered, patrons must register their cards so they will be recognized within the system
- ▶ Any part of the system that reads, transmits, processes, or stores credit and debit card information must be Payment Card Industry (PCI) certified

These concerns need to be taken into account if accepting open payments is under consideration



When implementing a new system, careful design choices can provide a path for future upgrades

- ▶ **Certified Devices** – Consider purchasing PCI-certified card readers, even if acceptance of open payments is not part of the initial design
- ▶ **Real-Time Communication** – Consider devices that are cellular-enabled, even if another technology (e.g., Wi-Fi) will serve as the primary means of communication
- ▶ **Hybrid Approach** – Consider implementing at least part of a card-based system using third-party cards (e.g., employee or student IDs) and an account-based architecture that can be expanded down the road



Migration of an existing card-based system is possible, but presents unique challenges

- ▶ Existing cards can continue to be used following the migration of stored-value to back office accounts
- ▶ Most existing smart readers are capable of capturing a card ID from any ISO-compliant card, but not all are PCI-certified
- ▶ Card-based back office systems already maintain a mirror record of card accounts, but are typically designed for the batch processing of data and scheduled hotlist distribution
- ▶ While cellular is typically the preferred option for near real-time communication in mobile environments, the use of frequent Wi-Fi connections can be used to support an account-based system



Understanding cost drivers for each option is critical when making design decisions

	Card-Based	Account-Based	Open Payments
Capital Expenses	<ul style="list-style-type: none"> ▶ Advanced smart cards ▶ Advanced devices ▶ Advanced back office 	<ul style="list-style-type: none"> ▶ Simple cards (not necessary if third-party cards are used) ▶ Simple readers with cellular capability ▶ Advanced back office 	<ul style="list-style-type: none"> ▶ PCI-certified devices with cellular capability
Operating Expenses	<ul style="list-style-type: none"> ▶ Transaction fees paid to system supplier 	<ul style="list-style-type: none"> ▶ Transaction fees paid to system supplier ▶ Cellular network data access fees 	<ul style="list-style-type: none"> ▶ Bank card processor fees ▶ Cellular network data access fees

Cellular access and bank fees can add additional operating expenses in an open payment system



Thank You

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