

PRESENTATION

# Account-Based Systems: A Road to Open Payments

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

<b>Stored Value</b>	Purchased value that customers can use to pay for transit services (e.g., e-purse, passes, and multi-ride products)
<b>Primary Record of Stored Value</b>	Record of stored value that is used to validate fare payment and modified as stored value is loaded or used
<b>Card-Based System</b>	Fare payment system where the primary record of stored value resides on a smart card
<b>Account-Based System</b>	Fare payment system where the primary record of stored value resides in a back office database
<b>Electronic ID Number</b>	Number encoded on a card that can be read and used to identify a back office account
<b>Business Rules Software</b>	Software that defines an agency's fare policy for the calculation of fares and the loading of stored value
<b>Open Payments</b>	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"> <li>▶ Hold the primary record of stored value</li> </ul>	<ul style="list-style-type: none"> <li>▶ Provide a card ID linked to a back office account</li> </ul>
Field Devices	<ul style="list-style-type: none"> <li>▶ Contain the business rules software for fare calculation and the loading of value</li> </ul>	<ul style="list-style-type: none"> <li>▶ Read the card ID and transmit it to the back office (along with device data) for processing</li> </ul>
Back Office	<ul style="list-style-type: none"> <li>▶ Maintains a mirrored card record for security, reporting, and the settlement of funds</li> </ul>	<ul style="list-style-type: none"> <li>▶ Contains the business rules software for fare calculation and the loading of value</li> <li>▶ Manages stored value accounts</li> </ul>
Communications Infrastructure	<ul style="list-style-type: none"> <li>▶ Designed for offline operation</li> </ul>	<ul style="list-style-type: none"> <li>▶ Can be designed for online or offline operation</li> </ul>

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





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

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



# Thank You

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