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Developing a Recommended Standard for Automated Fare Collection for Transit:

Scoping Study—Regional Fare Management Programs

This digest summarizes the results of TCRP Project J-6/Task 42. The digest was prepared by Richard Lobron, principal investigator, Lobron Consultancy, Limited.

This digest provides guidance on how best to apply automated fare collection in multiagency, regional environments. It identifies a representative sample of existing regional fare management programs, reviews their structure, and offers suggested procedures for implementing such regional programs. For this digest, a regional fare management program is defined as a system that allows multiple, unaffiliated agencies within a geographic zone to provide patrons with a consistent policy of transit fares and instruments to board vehicles operated by various carriers.

PROJECT DESCRIPTION

Background

The success of any form of standardization can be enhanced with sensitivity to the real-world needs of the target markets. Accordingly, development of recommended standards for automated fare collection systems requires a careful assessment of the operating environment into which such systems can best be applied.

Standardized automated fare collection is particularly well suited to locales where transit patrons rely on multiple neighboring carriers to journey within the region for work or pleasure. Formation of regional automated fare collection approaches involving multiple agencies and coordinated in terms of policy, technology, and strategy can offer a new approach for providing movement services to the population of the entire region. Operation of regional fare management programs involving multiple carriers not only improves the ease of travel for patrons, but also provides a broader base of financial and operational support for high-cost automation efforts. Such operating environments will clearly benefit from standardization of automated fare systems.

In light of this prospective outlet for standardized automated fare collection processes being considered by this project, a scoping study was devised to assess how best to apply automated fare collection in multiagency situations. The scoping study was tasked with identifying a representative sampling of existing regional fare management programs, reviewing the structural construction of such existing regional efforts, and providing a "straw system" outline of tasks necessary to establish such arrangements effectively.

The goal of this scoping study was analysis of cooperative efforts that have resulted in multiagency fare systems. For this purpose, a regional fare management program is defined as a system that allows multiple, unaffiliated agencies within a geographic zone to provide patrons with a consistent policy of transit fares and instruments to board vehicles operated by various carriers. A regional fare management program in this context does not include intra-agency fare programs and

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instruments that are operated by separate divisions of a regional transportation agency—instances in which cooperative policy, investment, and operating circumstances exist within the entity's governance structure.

This scoping study was tasked with reviewing the features, processes, and issues affecting regional fare management programs existing worldwide. The intended product of the study was a synopsis of key issues impacting the formation and implementation of such programs, whether successfully or unsuccessfully.

Scoping Study Tasks

Literature Search

The initial task of the scoping study was performance of a literature search and industry review to identify representative samples of regional fare programs for assessment. The results of this review provided nine examples of regional systems of various natures operating in North America, Europe, and Asia.

Program Assessment

Management representatives of the selected regional fare management programs were contacted for discussion. A series of questions was posed, through which derived the details of the program operations and pertinent factors that impacted the system formation and management. (See the appendix for a summary of findings.)

Straw System Formation

Following review of the program assessments by the project panel, a "straw system" of regional fare program formation was drafted. This document presented the steps and issues to be addressed by a region in creating a regional fare program. The document did not address a specific technology, but instead focused attention on the underlying management, policy, and financial issues associated with establishing multiagency automated fare collection.

The straw system document was submitted to 15 industry leaders for review and comment, with such comments applied to the final document.

Summary of Findings

The results of this review of regional fare management programs revealed several actions that are vital to the successful implementation of a regional fare management program. Among the specific areas to be addressed in the early phases of such an effort are the following:

- **Formation of governance structures for the program,** including agreement on the specific bodies to be responsible for program policy development, ongoing program management and operating functions, and project management duties related to the actual implementation of the program. *All participants must concur on relinquishing some levels of policy and operating governance to these coordinating entities.*
- **Cooperative establishment of policies** on topics such as fare levels, media formats, cost-recovery methods, accounting protocols, and customer service activities. Operating policies impacting onboard operations as well as policy interpretations must also be defined clearly at the commencement of such programs.
- **Resolution of financial issues,** including the respective roles of each participating agency in coverage of operating costs for the program, clearinghouse functions related to reconciling revenue receipts with service delivery levels, and capital funding for program initiation and related technology investments.
- **Clarification of operating issues,** including fare media pricing and acceptance, sales procedures, employee training, and maintenance topics.

The study noted that successful regionalization of fare collection management can be achieved through the use of a variety of technologies.

In the formative stages of regionalization efforts, reliance on legacy technologies, modestly adjusted to reflect the agreed-upon regionalization policies, can offer a platform to demonstrate the ability of participating agencies to cooperate on policy, financial, and operating issues. Use of legacy systems during this phase allows the agencies to avoid wholesale replacement of long-standing systems, along with associated impacts on patrons, operators, and financial structures.

The costs of designing and implementing integrated automated collection on a regional scale can be postponed until such time as the benefits of regionalization to agencies and patrons can be better weighed through the experience of the initial implementation phase.

Regional systems have successfully used paper flash passes, magnetic stripe instruments, and other legacy instruments such as tokens and tickets during the early attempts at regionalization. More sophisticated technologies such as "smart" chip card technology have also been applied successfully at those sites with clear capabilities to define, implement, and manage integrated policy and operating programs. Those locations having no prior history of interagency interaction have often chosen to join forces through the use of simpler instruments in order to avoid costs and concerns associated with technology selection, application, and operation.

This study's "straw system" proposal reflects a multiphased approach to pursuing regional fare collection. It recommends that such programs be governed through the resources of a broad-based regional agency, either newly established specifically for the task of crafting interagency fare programs or already existing for the purpose of crafting

regional transportation efforts, such as a metropolitan planning organization (MPO).

The "straw system" also recommends creation of other appropriate bodies to assume responsibility for core policy, project, and operating management tasks. It further suggests preliminary implementation of the regional fare management program through reliance on modified legacy technologies.

Following a period of operating the desired multiagency fare collection program, with agreements on policy formation and operating protocols serving as a "testbed" for cooperation, the programs can be enhanced over time with investment in integrated technologies. Subsequent technology and operating enhancements can then be achieved through continued application of a proven platform of interagency responsibility delegations. Use of the standardized automated fare programs can be best applied under this environment.

Recommended Next Steps

To be deemed successful by the target markets, an approach to standardized automated fare collection should reflect sensitivity to the need of regional fare management programs to interface with a variety of legacy systems. Conversion of legacy systems to wholly integrated standardized systems must be achievable without substantive disruption to patrons, employees, or the overall financial position of participating agencies.

The ease of such conversions is vital to retaining regional operating agreements. Long-standing investment in legacy fare systems at individual properties is not readily discarded solely to benefit a regional effort or to apply new technologies. It is likely that only those standardized automated fare collection systems that allow retention of some aspects of existing equipment and systems will be well received in the market. Standardized automated fare collection methods that can demonstrate definitive benefits to the patrons of transit operators without causing undue tension among participants of the regional programs in terms of impacts on policy, finances, or operations will also be well regarded in the target markets. Conversely, those approaches that require wholesale dismemberment and replacement of existing systems within cooperating agencies will not be readily applied due to the need for coordination of such major initiatives across multiple funding, operating, and sales arenas, each of which are ultimately directed by separate policy governance bodies.

Toward the goal of presenting forms of standardized automated fare collection that will be well received throughout the transit community, the transit industry may choose to undertake further analysis into several aspects of the use of automated fare collection within a multiagency environment. Areas to be examined could include

- Methods through which the transference of legacy systems to newer technologies can be best achieved, noting specific technology hurdles faced in integrating various legacy fare systems into single systems and those aspects of legacy systems that owners wish to retain;
- Fare media design, customer service, and field operation issues that are directly impacted by conversion of fare systems;
- Clearinghouse functions deemed essential by participants in regional programs to ensure appropriate internal controls and equitable reconciliation between revenue recognition and service delivery;
- Specific policy, operational, and financial issues that must be addressed in implementing proposed standardized automated fare system collection methods; and
- Respective benefits and costs associated with the proposed approaches to standardized automated fare collection.

In addition to serving as an outline for developers of the standardized automated fare systems on areas of concern to regional fare management program participants, the scoping study can assist transit operating or planning authorities in crafting regional cooperative efforts in the field of fare management, regardless of the specific technologies intended for such undertakings.

REPRESENTATIVE REGIONAL FARE MANAGEMENT SYSTEMS

Introduction

This digest provides guidance for efforts related to the creation of regional fare collection systems in the U.S. transit industry. In concert with efforts to craft a universal transit farecard, the material provided in this digest offers examples of existing practices and clarify structures that have proven effective in providing regional interoperability of fare systems.

The initial task in this effort involves the identification of various regional automated fare systems, noting the related technologies employed in such operations. Issues and concerns addressed in the formation of these systems are also noted.

Automated Fare Systems Defined

The transit industry has employed automated fare collection processes for decades in the form of electronic fareboxes used to collect cash or instruments at the point of entry to the system. Greater levels of automation allow enhancements to patron convenience, data management, and security of funds through the use of fare instruments with data and value stored on magnetic stripes or chip technology.

A survey performed by the Volpe National Transportation Systems Center in 1999 indicated that 43 transit

agencies operated automated fare payment systems using magnetic stripe, smart card, or credit or debit card instruments.[1]

The core function of an automated revenue management system is the collection of proper levels of revenue from persons using the transit resource for travel. Fare collection systems are designed to provide accurate validation that payments are proper for the service provided and to provide security over revenues received. Systems that provide automated distribution functions are designed to provide patrons with convenient access to instruments that validate payment of requisite fares, as well as to provide security over funds remitted for the purchase of the instruments.

All automated fare systems are designed to perform their respective tasks within the fare guidelines and regulations established by the operating agency. Management and operation of the automated systems impose a plethora of internal control functions, reports, and tasks associated with protection of revenues, validation instruments, and related data associated with the financial transactions. Tactics used to ensure reliable performance of equipment and data management systems are also defined by the agency. Such practices are developed and imposed over time on the basis of experience.

Regional Fare Management System Defined

As the geographic service regions of mass transit providers expand and the historic commutation patterns of riders shift, transit patrons must often use multiple transit agencies to complete a single through-travel event. The ease of such travel can be hampered by the need to transact a variety of inconsistent, uncoordinated transactions for the purchase of transit privileges for a single journey. Inconvenience in payment processes can deter travelers from selecting transit.

In an effort to foster more efficient, convenient transit practices in multiagency travel patterns, several regions have crafted various forms of cooperative multiagency efforts to provide patrons with improved cost-efficiencies and convenience in travel processes. Greater internal efficiencies and cost savings can also be realized by the participating agencies through synergies in control systems, sales protocols, and interagency accounting systems. The multiagency fare coordination programs addressed in this study differ from instances in which multiple operating divisions of a single regional agency employ coordinated fare practices, since such single agency models benefit from a single governance and management structure.

[1]*Advanced Public Transportation Systems Deployment in the United States,* January 1999, Volpe National Transportation Systems Center, Cambridge, Massachusetts, Table 1-8.

Types of Regional Multiagency Fare Programs

Integrated fare structures. A fully integrated multiagency fare system operates under a singular standard of fare computations, consistently applied across all member agencies. In addition to using a single revenue instrument of transport, a patron pays fares based on a single standard of fare tariffs, such as consistently defined zones, discounting formulas, flat boarding rates, or vehicle transfer rate conditions.

Coordinated fare structures. Coordinated regional fare systems provide patrons with the ability to use a single instrument to purchase transit privileges from several agencies. However, the business rules established for operating the cooperative fare instruments allow each member agency to retain its own fare structure and policies. Coordination of customer service protocols, technical development, and system management efforts allows revenue processing to be achieved without the need for amending the fare policies unique to the member agencies.

Types of Automated Fare Collection Processes

The primary types of automated fare systems that are used in transit applications include the following.

Magnetic stripe pass—time based. This system uses a paper or thin-gauge plastic instrument containing a magnetic stripe on which pertinent validity period data are stored. Patrons may use the instrument for a predefined period of time, after which the instrument becomes obsolete and unusable. The data are accessed by readers located at the appropriate fare collection point. The electronic readers validate the time period noted on the instrument.

Magnetic stripe pass—value based. This system uses a paper or thin-gauge plastic instrument containing a magnetic stripe on which data pertinent to the amount of funds used to acquire the instrument are stored. Patrons may use the instrument for travel events until the instrument value is fully expended. The data are accessed by readers located at the appropriate fare collection point. The electronic readers decrement the value of the requested journey and re-encode a lesser amount on the instrument.

Flash pass. This system uses a paper or thin-gauge plastic instrument distributed to patrons upon presentation of appropriate payment to a sales agent or dispensing machine. The instrument face presents a unique appearance, associated with the period or form of validity. Patrons present the instrument to an employee for visual confirmation of the instrument's validity for the period and journey.

Smart card. This system uses a plastic card containing a computer chip and antenna device on which data are placed upon agency receipt of appropriate payment. Patrons may

use the instrument to purchase travel or other services under arrangements provided by the issuing entity. Electronic readers located at payment sites decrement value and reencode a lesser amount to the chip memory. Contact cards require physical insertion of the instrument into the electronic reader. Contactless cards are read when in proximity to the reader, while a "hybrid" card has both capabilities. Patrons may add value to the instrument through payments processed at available payment centers or equipment.

A study performed by the Federal Transit Administration and the Volpe Center in 1999 indicated that 25 transit agencies employed automated fare payment systems using magnetic stripe, while 6 agencies reported systems with smart card technologies. [2]

Factors Associated with Regional Fare Programs

All forms of automated fare collection must be managed with attention to similar factors.

Internal Controls

Internal control systems must be established and executed to manage the risk of loss at various points in the supply, distribution, sale, and collection chain. Stringent controls over payment instrument authenticity and handling of receipt data must be imposed at all phases of the processing cycle. The complexity of systems is directly associated with the variety of fare policies and payment formats imposed by the operating agency.

In creation of regional systems, the complexities of the individual fare collection practices operated by each member agency must be assessed. Opportunities for creating cost reductions through interagency cooperation in performing internal control tasks associated with operating the automated systems should be identified in the early phases of system development. Methods through which partners can rely on each other for executing specific tasks without undue risk of loss can generate the desired efficiencies without harming the interests of each individual entity.

Issues pertaining to internal controls and operating concerns related to instrument production, sales activities, and onboard handling of the presented instruments must be addressed and fully defined prior to implementing a multiagency fare system. Delegation of settlement and clearinghouse functions to an independent entity such as a nonoperating public agency in the region can preclude difficulties related to perceptions of partiality that can damage cordial relationships among participating agencies. Alternatively, with the mutual agreement of all parties, major operating tasks can be assumed by a member agency with the resources, capabilities, and financial resources needed to support the effort.

Patron Issues

Patrons should be encouraged to use automated fare systems in order to achieve the savings or efficiencies expected from such systems. Such encouragement can be achieved through pricing policies that allow discounting or other financial benefits to be directly received by the customer. The availability of the instruments through a variety of sales outlets is another key ingredient to encouraging use of the instruments.

The convenience and ease of use for patrons of an automated product is a key factor in the acceptance of the program by the local communities. Design of instruments, as well as processes employed for the sale and acceptance of the regional instrument, must be sensitive to the patron experience. Security on the data contained on the card is another important component of customer comfort with the technology.

Employee Issues

The ability to collect fares usually relies on the vehicle operator or other field personnel tasked with revenue collection. Overly complicated fare tables, instrument formats, and onboard collection decisions can create an untenable position for field personnel. Confusing fare decisions that can create arguments with patrons can detract from safe vehicle operation, the prime responsibility of the operators. Accordingly, the accuracy and completeness of fare collection tasks may suffer over time. Multiagency fare systems should be sensitive to field conditions, providing simplistic transaction formats for the benefit of the patrons and field personnel. Failure to account for the environment in which the actual transaction event occurs can result in an unfavorable fare climate, which is counterproductive to the goal of attracting riders.

Findings Related to the Development of Regional Systems

In reviewing existing practices related to regional multiagency fare programs, several examples of each form of cooperative arrangement were noted. Issues experienced in the formation of these systems were noted, as were causes of success or discord.

Operational Regional Multiagency Fare Programs

Integrated systems. The Valley Metro structure—as created and operated by transit agencies in the Phoenix, Arizona, region—is an integrated fare system, with patrons on any agency remitting the same fares for travel, using the same tokens or flash pass instrument for all agencies. Twelve agencies have created the regional entity known as "Valley

[2] *Advanced Public Transportation Systems Deployment in the United States,* January 1999, Volpe National Transportation Systems Center, Cambridge, Massachusetts, Tables 1-8, 1-9.

Metro," a program used to craft a joint market position for transit operations in the region. The Valley Metro participating agencies offer a fully integrated fare program. Tokens, tickets, or monthly flash passes can be purchased by patrons for presentation on any transit vehicle in the region.

In Hong Kong, the Octopus system permeates all forms of commerce, including acceptance on seven transit providers in the region. The Octopus card was developed and is operated by Creative Star, Ltd., a private corporation formed by the participating transit providers for the purpose of developing and operating a regional smart card system. Octopus transit agency participants accept only cash and the Octopus card for transit access. Over 1.6 million Octopus transactions occur daily from the more than 500,000 cards issued. Cards are used for applications, including retail stores, parking, and local sports venues.

Coordinated systems. In the United States, three major multiagency coordinated regional fare programs are currently in operation.

The region of Ventura County, California, enjoys use of the Passport service, a multiagency smart card system that serves the needs of five agencies located in that area. In recent months, a pilot operation of the Translink smart card system has been activated on six transit agencies located in the San Francisco Bay area in California. The transit agencies of the Seattle, Washington, region offer commuters the "Puget Pass," a recently established paper flash pass system that provides patrons with convenient movement across multiple agencies with a single instrument.

The transit operators of these three regions have crafted protocols that permit patrons to present a single fare instrument to all operators for transit privileges. The form of instrument is standardized for ease of patron and vehicle operator recognition. While the price points of each trip vary based on the unique characteristics of the vehicle agency, the patron's experience is not complicated by the application of different charges and transactions for a trip. Instead, the patron merely performs a standardized purchase transaction to add value to his or her individual instrument or the purchase of an instrument tailored to his or her desired travel pattern.

The European use of the Calypso standard for smart card development has enabled multinational use of the instruments designed to this standard. Calypso cards are currently in operation at more than six transit agencies in the five participating nations. In addition, the cards are available for patron use in various electronic purse applications. Each participating agency operates its own card system, in conjunction with local banking institutions and with cards produced by one of eight licensed manufacturers of Calypso products. However, growing levels of fare coordination are occurring, particularly as use of the newly integrated currency of the European Community, the "Euro," expands into all layers of commerce.

Planned Multiagency Systems

Several other transit properties are developing similar regional multiagency fare systems. In the Los Angeles metropolitan area, a regional paper flash pass instrument, the "EZ Pass," will become available to patrons on 12 independent agencies in late 2002. The EZ Pass will be an integrated regional fare system, with patrons presenting the same instrument to all participating agencies for travel privileges.

Efforts are underway at several other sites around the nation to develop multiagency acceptance of existing single agency smart card fare instruments. In the Washington, D.C., region, the Washington Metropolitan Area Transit Authority (WMATA) is working closely with Maryland transportation officials to expand use of the existing WMATA SmarTrip instrument into the neighboring systems. In the Chicago region, the Chicago Transit Authority (CTA) and Pace suburban bus continue to coordinate acceptance of the ChicagoCard across agency operations.

Discussions also continue in the New York metropolitan area for potential expansion of the New York Metropolitan Transportation Authority's (NYMTA's) Metrocard instrument into applications in neighboring locales, although technical and operational issues continue to hinder such plans.

Factors in Developing Successful Regional Systems

The process of crafting fare systems acceptable to several independent agencies requires careful consideration of a variety of factors.

Level of regional support. The most effective regional fare systems have resulted from active, direct support from the region's leadership. Such direction can range from assignment of coordinating functions to a specific agency through the provision of financial resources in support of the regional effort. In many instances, agencies have been directed to participate in regional programs by governmental authorities or funding sources. Under such conditions, individual agency concerns related to maintaining historic operating practices or financial positions are superceded by the overall requirement to create a system for the perceived benefit of the entire region's population.

Common customer interface protocols. All transit agencies maintain a discrete set of practices related to dealings with patrons on fare issues. Agency policies on addressing topics such as demands for credit or refunds as a result of fare disputes are directed by factors such as the historic expectations of the public, the complexities of the fare media, or pricing models. Employee latitude in dealing with customers is defined uniquely by each agency.

Such issues are of great concern to agencies in developing multiagency arrangements. Consistent treatment of passenger comment and concern is essential to maintaining

cordial relationships with all patrons. However, all parties must understand the level and format of deviations from policy, and acceptable levels of delegation to fellow agencies must be provided to ensure smooth operations.

Financial issues. The methods employed in meeting the costs involved with establishing and implementing a regional fare system can be a primary concern of the participants. The diverse financial condition of each independent entity is reflected in varying levels of fiscal capacity for investments in such efforts. The willingness of agencies to participate is driven by the magnitude of the project's cost structure, the relative share of cost allocations, and the perceived financial benefits to be derived by the individual "partners." Several smaller agencies have been enticed into participation with regional multiagency consortiums by assumption of development costs and certain operating revenue risks by a larger agency or an independent governmental unit.

Reconciliation processes. A major factor to be resolved prior to commencing multiagency operations is clarification of reconciliation and clearinghouse functions by the participating agencies. In several instances, allowing each agency to retain proceeds from its own sales of joint instruments or farebox collections has circumvented the issue. In other instances, the agencies have agreed to formulas that provide a means to settle sales receipts to collections through a periodic assessment of ridership levels and average fare levels. Failure to clearly define revenue reconciliation processes prior to system implementation can cause serious financial difficulties in maintaining the effort.

Technology issues. While it is often assumed that regional multiagency programs require investment in high-cost, state-of-the-art sales and data systems, many successful multiagency programs rely solely on paper instruments and historic practices. Modifying existing systems to allow acceptance of a broader variety of fare instruments can minimize the initial investment in equipment processing capabilities.

Under such structures, cooperating agencies retain their individual fare tables and collection equipment at the individual sites, while providing patrons with a single instrument. In efforts to achieve the desired convenience for patrons, the participants in such systems establish new business and operating rules defining rules for acceptance of foreign agency fare media presented on their routes. Regional efforts involving the use of paper instruments, such as flash passes or magnetic stripe instruments, can be achieved by establishing mutually acceptable business rules regarding acceptance criteria, customer interface parameters, and distribution and handling of sale proceeds from the instruments.

Through the use of commonly recognized flash pass instruments, the difficulties experienced in the joint development and implementation of costly new technologies can be avoided. Patrons experience the desired levels of convenience generated from use of a single instrument, while agencies maintain the same operating and financial systems.

Such application of historic, low-cost fare technologies can provide an effective first-step entry into multiagency operations.

Employee issues. The impact on the agency's employees of performing accurate and simplistic transaction tasks must be fully considered in crafting regional programs. If vehicle operators are required to decide on the validity of multiple instruments from numerous sources and formats, the accuracy and completeness of fare collection will suffer.

In a multiagency arena, operators are generally unfamiliar with the idiosyncrasies of neighboring agencies. The ability of operators to make accurate fare decisions based on familiarity with total travel patterns across multiple agencies is doubtful. Accordingly, multiagency fare structures should minimize the need for cross-agency knowledge of zones, time restrictions, fare tables, or routes. Automated fare collection systems used to support multiagency systems should be self-reliant, not requiring interaction with the vehicle operator.

Patron issues. Patrons should be encouraged to use multiagency programs through pricing policies that allow discounting or other financial benefits to be directly received by the customer. Providing use of the instrument in non-transit activities, such as retail transactions, can also provide added incentive to use the instrument because of the clear convenience offered.

While some interest in automated fare systems, such as smart cards, may be generated through improved safety over lost instruments, the public may be more driven to the new instruments through financial benefits and clear convenience. Establishing links to neighboring retail establishments and commercial enterprises can further entice patrons to use transit instruments.

Difficulties Experienced in Crafting Multiagency Programs

Inadequate local support. The implementation of effective multiagency fare programs is heavily affected by the ability to garner support and assistance from all leadership of the region to be served through the system. Obstacles inserted into the process from parties comfortable with existing conditions can only be overcome with a dedicated, concerted effort by the region as a whole to craft a program.

Legacy systems interface. Efforts to craft new programs can also be impacted by technical difficulties caused by an inability of all participants to interface with legacy revenue processing systems. The cost of replacing legacy systems or expending an inordinate amount of resources in overcoming

technical obstacles to coordination efforts can destroy the ability of a region to successfully craft multiagency fare programs.

With development of mutually agreeable business rules allowing consolidation of technologies or manual overrides of closed systems, multiagency fare programs can be achieved. With such adjustments to rules and processing tactics, closed legacy systems can be modified or circumvented in the validation or acceptance of non-conforming instruments from other participating agencies.

Lack of customer incentive. A program's inability to offer patrons financial incentive to use multiagency instruments can cause such undertakings to fail because of a lack of customer interest. While some patrons may partake of the convenience of new systems, customer effort to change practices will usually not be taken without some encouragement to try the new product or service. Financial incentives in the form of discounts or credit to future uses can generate sufficient interest to inaugurate a new fare program.

In efforts involving the introduction of smart cards to multiagency fare programs, additional public interest in the program can be generated though extensive links with the region's commercial sector. Although no current U.S. multiagency programs actively interface with local retailers, such opportunities are being explored. In Hong Kong, where the Octopus transit instrument is accepted at hundreds of grocery stores, health clubs, and other commercial enterprises, more than 1.6 million Octopus transit transactions occur daily from the more than 500,000 cards issued, a level of use partially driven by the instrument's broad capabilities. Similar experience is evident in Europe, where the Calypso instrument is fully integrated into regional economies.

Legal restrictions. Many transit agencies are governed by strict legal guidelines on their operations imposed by enabling legislation or other statutory conditions. Issues such as geographic service territories, procurement processes, fare policies, or revenue management restrictions may impose unavoidable hurdles to an agency's ability to cooperate with other entities in business practices.

Financial burdens. The inability of many transit agencies to invest resources in the creation of a multiagency fare program may outweigh the perceived benefits from participating in such a venture. The costs associated with new technologies that may be a requirement for such participation, as well as unavailability of financial or personnel resources to share on such efforts, may be cause for avoiding such arrangements. Many existing programs have provided some financial relief for smaller partners in the regional enterprise, with larger participants assuming larger shares of project costs in order to generate benefits for their joint consumer base.

Successful Multiagency Program Conditions

Consistent Goals

Regional multiagency fare programs are created for the achievement of clearly consistent goals:

- **Improved convenience for patrons,** particularly in conditions requiring use of multiple agencies for single journeys. The desired systems allow patron transfer from one agency to another without interruption or transactions.
- **Reduced fare processing costs through synergies.** The costs related to instrument production, sales, reconciliation, and control can be allocated across multiple partners without the need for duplicative operating efforts.
- **Simplified fare structures across multiple providers,** improving the level of public comprehension and reduction of public avoidance due to perceived complexities of transit use.

Coordinated Program Business Rules

Regions with effective cooperative arrangements have addressed the need to delegate certain levels of decision making to a single entity either through formation of an independent body or through the services of a major participant.

Topics such as customer service protocols, refund policy, and handling of patron concerns on fare instrument operation demand consistent policy. To be cooperative, all participating agencies resolve to rely on the expertise and judgment of a single coordinating entity, often wholly independent from transit operations. If a program's proposed protocols in these areas do not conform to the historic practice of all participating agencies, the effectiveness of the overall program may require some level of concessions from each agency for the common welfare of the program.

The willingness of all participating agencies to delegate certain levels of decision making to another body is an essential component of any cooperative effort. Similar delegation of authority is essential to ensure effective management and oversight of suppliers or operating contractors in multiagency programs. Although all protocols applied to the oversight and management functions may not be consistent with normal practices at each participating agency, the needs of the program may necessitate alternative approaches.

It is essential to clearly define all pertinent accounting rules prior to commencing service. All participants must be comfortable with their risk position in areas such as revenue recovery levels, security of revenue and data, customer service, and impacts on internal accounting systems and reporting requirements. Clearinghouse functions or acceptance of retained independence of revenue handling tasks can be tailored to address all expressed concerns.

The action, inaction, or concern of a single potential participant should not necessarily restrain the implementation of a multiagency program. If at least two agencies agree with practices developed in the discussion phase, the system should be instituted for the benefit of patrons. With proven success and public acceptance, issues of concern can be addressed through program modifications, thereby enticing other agencies to join the program.

Mutually Defined Program Goals

The historic approaches to fare collection and relevant data management and financial control may require completely new handling under a regional environment, particularly in situations using new technologies. Prior to establishing a definite approach, the participating agencies should carefully review and define the respective goals to be achieved through fare regionalization.

New programs of regional fare collection should not be self-limited by reliance on historical procedures or controls that may no longer be needed to achieve the ultimate goals. Installation of controls and practices that maximize the benefits to be gained from the new technology can provide cost savings and patron convenience. Increased reliance on other agencies for performance of certain tasks and decisions can provide savings through synergies.

The benefits of regionalization and the ability to justify the costs for implementing such cooperation can vary dramatically among local participants, depending on factors such as ridership levels, capital funding resources, or operating ratios. To achieve the benefits of regional fare systems for the patrons of the systems, the differences in perceived business needs must be addressed and resolved with sensitivity to the business climate of each prospective participating agency.

Each participating agency will have different goals for its aspect of the program. Each agency's goals should be addressed in the development of the project.

Minimal Technological Adjustments

The establishment of a regional revenue management system can be achieved with minimal disruption to the existing investment in revenue handling infrastructure within the operations of the participating agencies. Data handling and clearinghouse functions can often be addressed without replacement of existing equipment or personnel at the local agencies.

Regional fare systems can be designed with paper or plastic instruments. The application of smart card technology can offer added features, such as eventual interface with nontransit applications. However, the core fare collection event for multiple agencies can be achieved though establishment of consistent business practices by the participating agencies.

Sensitivity to Vehicle Operator Impact

The effectiveness of any revenue system is greatly impacted by the ability of vehicle operators to comprehend and implement the system. Systems that place greater burdens on the operator for reliable data collection or accurate recovery of complex fares can detract from safe vehicle operation and eventually will result in inaccurate transactions.

Regional system development should be sensitive to the level of operator tasking required to ensure transaction accuracy. Minimization of operator impact through establishment of fare structures that allow equipment data handling can greatly enhance the overall reliability and accuracy of fare transactions.

Comprehensive Business Planning

A thorough plan for implementing regional fare structures is essential to the success of the program. Addressing topics related to the respective customer service needs of the region allows all participating agencies to maintain desired service quality levels while delivering improved convenience to their mutual patrons. Clear definition of actions and responsibilities for sales, refunds, and reconciliation processes prior to system implementation minimizes confusion to patrons and consternation among participating agencies.

Complete business planning will also address all prospective investments required to produce a reliable, technologically versatile system. The appropriate volume of computing and marketing resources to be directed toward the effort must be accurately established. All program members must be resolved to contribute a reasonably defined level of financial support, consistent with the respective level of gains to be experienced from the effort.

Existing systems have devised revenue and cost allocation formulas driven by ridership levels, transaction values or volumes, pass usage levels, or relative financial strength. The appropriate plan for resource allocation must be defined in a manner supported by all participants at the outset of the program to avoid differences or difficulties during the implementation or operating phases.

Successful systems internationally have resulted from the creation of a regional entity, independent from the participating operating companies solely for the purpose of crafting regional systems. Such entities not only direct all aspects of the technical development necessary to operate interagency programs, but also assume responsibility for operating the systems.

The topic of revenue reconciliation across the various agencies must be addressed early in the project development. Several multiagency groups have found reliance on facts generated from the fare instruments and data systems to be more reliable and fair in assessing revenue shares than statistical methods previously used. Current technologies allow accurate, reliable reporting of transaction activities,

either on a real-time basis or on a batch processing basis relying on cards to maintain data activity details. The employment of new technologies, data accumulation, and transfer capabilities may eliminate the need for various historic steps or reporting formats in the areas of inventory control, revenue reconciliation, or ridership statistics.

Dedicated Project Management

Successful multiagency fare programs require the focused attention of a discrete project management team dedicated to the implementation of the program. The volume of detailed analysis and activities associated with the formation of such an undertaking cannot be effectively achieved on a partial basis. All participants should share the costs of the project management functions.

Focused attention of a defined group of personnel, to all aspects of the program, in matters including financial, technical, and marketing tasks will allow consistent approaches to be applied to all program components, minimizing opportunity for confusion in system formation. Early in the project development phase, the project team should develop an implementation work plan. Issues including patron introduction, problem resolution, and technical management should be carefully defined and scheduled for attention.

The appendix summarizes regional fare management programs from the following cities:

- San Francisco, California, "TransLink";
- Ventura County, California, "Passport";
- Washington, D.C., "SmarTrip";
- Chicago, Illinois, "ChicagoCard";
- Seattle/Puget Sound, Washington;
- Phoenix, Arizona;
- Los Angeles, California, "EZ Pass";
- Hong Kong, China, "Octopus"; and
- Europe "Calypso."

"STRAW" REGIONAL FARE MANAGEMENT SYSTEM

Introduction

By definition, a "straw system" is developed to generate comment, critique, and constructive criticism on an idea. By soliciting comment from persons familiar with a topic from a variety of vantage points, the final product can be tailored in a fashion that provides realistic solutions to conditions.

This section presents a "straw" regional fare management system. The regional fare management system is intended to provide the patrons of several independent transit agencies with a wholly integrated method for payment of fares, accessing vehicles, and receiving services from the various participating agencies through use of a single set of fare instruments.

The straw regional fare management system documents the operating environment necessary for delivering such a coordinated venture. The straw system recommends approaches, forms, and protocols for the governance, implementation, and operation of a regional fare management system initiative. The straw system has been crafted with consideration to the components of success and failure experienced in forming and operating existing regional fare management systems throughout the world. See Table 1 for a timetable of the straw system.

Goals

The following are goals of the straw system:

- To provide integrated fare media for use by patrons of all agencies.
- To allow for a larger span of transit movement to the patron base of participating agencies.
- To provide operating cost reductions through coordinated fare system management, equipment, tools, and administration.
- To provide a platform for coordinated marketing of transit services throughout the region, generating cost savings and increased ridership.
- To provide a platform for later introduction of commercial applications.
- To simplify fare structures across the operations of multiple transit services providers.

Service Levels

Initial Phase

The initial foray into regional fare management across several independent operators should be crafted in a manner that minimizes the required levels of investment in technical or administrative components.

To the greatest extent possible, fare systems existing within participating transit properties should continue to be employed during the introductory phase of "regionalization." A relatively simplistic approach to regionalization would require visual inspection and acceptance of existing tickets or passes by all participating vehicle operators. Such a system will allow the agencies to develop methods and practices related to interoperability in terms of management and field operations with minimal impact on vehicle operators or patrons.

Acceptance of a simple form of multiagency fare instrument by multiple carriers can be achieved in many instances merely by redefining pertinent operating rules for the vehicle operators. With reliance on this introductory form of "regionalism" to begin the process, ongoing planning efforts can be focused on developing equitable forms of cost allocation and revenue apportionment and other essential facets of interoperability, rather than on addressing complications

TABLE 1 Straw regional fare management system timetable

TASK	TIME FRAME *(in months)*
Agreement between regional coordinating body and participating agencies on regional fare management system development	Month 1
Presentation of regional fare management system concept to governing officials, public bodies, and general public through media channels	Month 1-3
Definition of governance structure and policy forum	Month 2-3
Identification of initial-phase funding sources and participant contribution levels	Month 2-6
Establishment of consistent customer service parameters and protocols	Month 2-6
Designation of regional fare group and project operating agency	Month 2
Selection of project manager	Month 3
Definition of initial-phase service levels	Month 3-6
Development of requisite operating rule amendments, technology modifications, and fare media modifications	Month 7-10
Marketing of new system capabilities to public	Month 11-12
Implementation of initial-phase regional fare management system	Month 12
Evaluation of regional fare management system operating impacts and financial impacts	Month 13-20
Definition of second-phase service levels	Month 21
Identification of second-phase funding sources, capital grant support, private-sector involvement, and participant contribution levels	Months 21-30
Development of requisite technologies	Month 22-36
Marketing of new system capabilities to public	Month 34-36
Implementation of second-phase regional fare management system	Month 37
Evaluation of regional fare management system operating impacts and financial impacts	Month 37+

related to installing new technologies on existing fleets and stations at the outset of the program.

The avoidance of extensive capital investment and modification of historic practices will allow participating agencies to fully evaluate the impact of "regionalism" without incurring unnecessary financial burdens. As the concept of cooperative fare management is proven effective in accomplishing stated goals for the agencies, patrons, and committees, more extensive system integration at the level, form, and substance of integrated, state-of-the-art fare systems appropriate for the region can be implemented as resources can be made available.

Later Phases

Following a period of simplistic regional fare operations, the participating agencies can take steps to enhance the efficiency and effectiveness of the program through investment in coordinated technologies. Through joint development of wholly integrated, fully automated sales and revenue collection fare processing systems, the consortium of operators can benefit from application of systems tailored to the proven needs of the regional approach.

Eventually, the participating agencies can expand the complexity of the integrated sales and collection systems to offer patrons interface with neighboring vendors and service providers. Such broader system applications provide patrons with cashless travel environments while allowing the agencies to generate alternative revenue sources through relationships with participating commercial entities.

Governance

Program Policy Coordination

The regional fare management system must be governed by a single body mutually acceptable to all participating entities—a regional coordinating body. To a certain extent, each participating agency must delegate certain responsibilities associated with the development and operation of the new program to this coordinating party.

The regional coordinating body can be established by forming a new regional agency specifically tasked with attaining interaction and coordination of regional transportation functions, including the creation of regional fare management programs. Although an existing regional entity such as the MPO, the largest transit provider, or a component of the state department of transportation could serve this purpose, an independent entity dedicated to forming cooperative efforts among participating agencies may provide the balance needed to ensure objective management of the fare program.

Policy coordination will address topics such as fare policy coordination and overall technical investment. The regional coordinating body will establish a program policy coordination council (PPCC), comprised of the general managers of all participating agencies, as well as supporting government sponsors of the program. Senior management of neighboring nontransit transportation agencies—such as highway, tollway, bridge and tunnel agencies, and aviation agencies—should serve as nonvoting participants and advisors to the PPCC.

The PPCC will lead efforts to inform the public of the benefits of the regional fare management system. Through coordinated public outreach programs, dedicated public relations efforts, and concerted focus on communicating with elected officials and government bodies, the PPCC members will ensure regional "public buy-in" to the proposed systems.

The PPCC will also lead efforts to address historical legal restrictions that may hamper the effective coordination of revenue management systems. Through dialogue with elected officials and government bodies, necessary legislative or regulatory changes should be addressed proactively by members of the regional coordinating body and the PPCC.

The PPCC will serve as the forum through which individual agency concerns on the delegation of authority from individual entities to a consolidated program governing body are addressed. As bona fide concerns on liabilities, service exposures, or legal limitations are identified that may preclude delegation of authority or responsibility, such concerns will be fully addressed by the PPCC through appropriate legal channels.

Program Management

The regional fare group, comprised of the directors of finance from each participating agency, will manage the program. The regional fare group shall address topics related to technical coordination, fare media development, and sales and collection practices to be employed at all participating agencies. The regional fare group will convene operational meetings monthly. A subcommittee tasked with addressing operating issues will address specific concerns on an as-needed basis.

Program Operations

Interagency program operations will be managed by the program operating agency (POA). The POA will be designated by the PPCC and will most likely be the largest participating agency. The POA will execute defined procurements, fare media production, distribution of fare media, cash management, and all clearinghouse and reconciliation functions. The POA will perform all necessary data collection and accounting functions for the program.

Project Manager

The regional fare group will select the project manager from candidates presented by each participating agency. Project manager candidates will be experienced project managers, with demonstrated expertise in coordinating projects valued at levels consistent with this undertaking. The candidates should have familiarity with revenue operations processes, revenue equipment matters, and general accounting principals, including concepts of internal control.

During the development stage, the project manager will coordinate all activities related to developing the project, acquiring necessary resources, and implementing the system. The project manager will also coordinate all correspondence and communication among participating agencies, as well as patrons of the system. Upon entry into the operating phase of the project, the project manager will ensure activation of protocols and systems within the POA and maintain ongoing communication channels among all participating agencies. The project manager will ensure that operating managers assigned by each agency interact on a daily basis, as necessary, to address issues and concerns faced in the development and operating phases.

Policies

Fare Policies

Efforts will be made to set regional fare management system pricing at levels reflecting patron discounting from amounts charged for the purchase of multiple single-agency instruments under pre–regional fare management system operations. However, all multiagency instruments sold under the regional fare management system program will be priced at levels higher than like-kind instruments issued for single-agency travel (i.e., a multiagency weekly pass will be priced higher than any weekly pass issued by an agency for use on its own system alone, but will be less than the cost of weekly passes for two separate agencies).

Any patron surcharge applied to legacy fare instruments will be approved by the PPCC. The surcharge will reflect the regional fare management system pricing or discount policies.

All interagency travel services will be provided solely through the use of prepaid instruments. No interagency transfer privileges will be available through onboard cash transactions. The regional fare management system benefits are tailored to encourage repetitive use of the systems. Control exposures and accounting protocols associated with the handling of onboard sales across multiple agencies make such services unmanageable. Infrequent patrons may be served through the prepaid sale of "daypasses," which are destructively validated for the date of travel by the initial vehicle operator, or "ten-ride" ticket sets priced to provide discounted access to transit through presentation of a single ticket for each leg of the journey.

Fare Media Types and Cost Recovery Methods

Multiagency instrument. The regional fare group may create a single multiagency instrument for transport privileges under the regional fare management system program. The POA will arrange procurement and accept delivery of the instruments. Each participating agency will purchase the instruments at an agreed-upon discount rate from the POA for resale at its own outlets. The overall operating costs of

the regional fare management system program incurred by the POA might be recouped through the discount pricing charged to the participating agencies for purchase of the instruments. Credits due to the participating agencies for their respective direct program costs incurred can be computed in the applicable discount formulas.

At the time of sale to patrons, the participating agencies will apply necessary surcharges to their cost of the instrument to recoup costs incurred for the program.

Legacy instrument surcharges. Rather than creating a unique multiagency instrument, the regional fare group may choose to establish a direct patron surcharge to be applied to the pricing of existing agency instruments. Payment of the surcharge would be indicated on the instrument with a stamp, sticker, or punch. The surcharge notation on the instrument would permit the patron to access multiple agency routes upon presentation of the instrument under guidelines established in the pertinent tariff.

Program Accounting Policies

The POA will provide all regional fare management system accounting services. All interagency transactions will be subjected to continuous audit and analysis by jointly selected third-party oversight entities selected by the regional fare group, such as major local accounting firms. All accounting results will also be subject to periodic audit and review by a third-party, independent entity. The results of the periodic reviews will be disseminated to all participating agencies.

Program operating revenue. All revenue collected through patron sales of the multiagency instruments will be retained by the selling agency. All revenue collected through collection of legacy instrument surcharges will be retained by the selling agency. All multiagency instrument sales and legacy instrument surcharges will be reported to the POA on a daily basis.

The value of funds collected will be used to compute credits or payment obligations between the participating agency and the POA for recovery of program costs. The value of funds earned by all participating agencies through multiagency transactions will be computed by the POA. The value of funds earned through the regional fare management system program will be used to determine the financial impact of regionalization. The level of contribution toward program costs to be provided by each agency will also be computed through application of respective program revenue generation. The volume and value of such transactions will be derived from data provided by the participating agencies, including

- Volumes of multiagency instrument sales as reported weekly to the POA by all participating agencies;
- Counts of multiagency travel events produced from periodic field observations, counts produced by vehicle operator notations on vehicle farebox equipment, or counts produced from acceptance of multiagency passes inserted into faregate or farebox collection devices; and
- Assessment of ridership statistics on all affected runs and routes at predefined "preprogram" and "postprogram" initiation periods. Ridership statistic analyses should be performed on a monthly basis.

Program operating costs. Costs incurred by each agency for activities specifically related to delivery of services for multiagency travel will be computed by the POA. The volume and value of such transactions will be derived from data provided by participating agencies, including

- Additional transportation service levels required to adequately serve the influx of multiagency travel resulting from the regional fare management system program,
- Costs related to training sales and vehicle operator personnel, and
- Costs associated with increased sales and collection equipment servicing levels necessitated by the regional fare management system program.

Only cost factors that reflect a 10% increase above historical levels of expense should be reported as regional fare management system–related costs. Costs that are related solely to execution of regional fare management system activities may be reported, as well.

Customer Service Policies

The regional fare group should establish definitive policy recommendations for the handling of patron issues prior to program implementation. Such policy recommendations should be reviewed and approved by the PPCC. No participating agency will be authorized to allow deviations from the stated refund or credit policies on multiagency instruments or legacy instrument surcharges.

Refund and credit policies. The straw regional fare management system policy on refunds or credits for instruments presented by patrons will be as follows:

- No cash refunds will be provided for any instrument. All "refunds" will be in the form of credit toward the purchase of another multiagency instrument or any transit instrument issued by any participating agency.
- Instruments that do not have an expiration period for use, such as one-time tickets, tokens, or unexecuted "scratch" passes, will be credited at face value. A 10% administrative surcharge will be levied on instruments valued at greater that $10.00.
- Instruments with a defined validity period, such as weekly or monthly passes, will be credited at full face value, less a 10% administrative surcharge, if presented prior to the validity period noted on the instrument. No

credits will be permitted on instruments presented after validity period commencement.
- Instruments with defined valuation, such as those used in systems with decrementing pass value instruments, will be credited to the level of value remaining on the instrument, if the value exceeds $10.00, less a 10% administrative surcharge.

All refunds valued in excess of $10.00 will be processed at a single location managed by the POA. Prior to refund processing, the serial number of presented instruments will be reconciled to sales reports from all sites in order to validate the authenticity of the instrument and sale transaction. Presentation of stolen or lost instruments for refund will be referenced to law enforcement authorities for investigation. The value of credits will be charged back to the selling agency by the POA. Credits valued below $10.00 that are processed at participating agency sites will be reported to the POA on a daily basis.

Onboard Operating Policies

Vehicle operators will not be required to execute sale or surcharge transactions while operating a service route. Operator duties related to regional fare management system activities will be limited to confirming the adequacy of presented fare instruments for the travel service to be provided. Conflicts with patrons will not be permitted to impact safe vehicle operation or service schedules. Each agency's existing operating practices on dealing with patron conflicts will be applied in cases of regional fare management system–related patron conflicts.

All patron conflict events related to regional fare management system actions and procedures will be reported by the agencies to the POA and the regional fare group. Conflict trends will be assessed on a quarterly basis by the regional fare group in concert with the PPCC and may result in modification of policies and practices as deemed appropriate.

Technology Policies

Actions or projects under consideration by any participating agency that impact revenue instrument sales or collection equipment should be communicated to the regional fare group and the regional fare management system PPCC. The PPCC shall review the conformity of such actions to program plans and procedures of the regional fare management system. Every effort must be expended by the PPCC and regional fare group to schedule regional fare management system investment activity to meet the operating needs of the participating agencies. Acquisition of revenue management equipment for the regional fare management system will be designed and scheduled with sensitivity to the useful lives of existing systems.

Replacement, modification, or augmentation of sales equipment, sales outlets, collection equipment, or fare management systems must be consistent with the overall plans and directions of the regional fare management system program in order to ensure maintenance of a fully integrated, coordinated program of regional fare management. Individual agency actions that do not conform to the regional fare management system efforts and that may be detrimental to the regional fare management system effort should be communicated to the MPO for possible exclusion from the regional transportation improvement plan submission to federal grant funding agencies. Alternatively, the individual agency may be removed from the regional fare management system program.

Fare Policy Amendment Policies

Plans under consideration by any participating agency for the modification of fare tables, fare media, or customer service should be communicated to the PPCC and the regional fare group. Such plans should be fully assessed to determine the impact on regional fare management system activities, policies, procedures, and technologies. The regional fare group, through the POA, should work closely with the agency considering the change in order to ensure that all impacts on other participants are fully assessed and addressed.

The impact on individual agency fare policies or media may (1) generate direct effects on the regional fare management system financial models or design of multiagency fare instruments or (2) necessitate retraining or retooling at other agencies. The individual agency may be required to reimburse the regional fare management system or other participating agencies for costs directly related to maintaining interoperability with the agency's changed fare practices. Alternatively, the agency may be removed from the regional fare management system program.

Financial Issues—Capital

Capital financing requirements for an introductory regional fare management system should be minimal if efforts are focused on mutual acceptance of existing protocols by all participating agencies. Capital investment would be limited to those costs associated with planning and design of revenue modeling, accounting systems, and audit functions associated with managing agreed-upon revenue apportionment and cost allocations. Additional costs associated with creating distinctive fare media designs for the new regional fare tables, as well as program market analysis and sales communications, would be incurred in the early phases of a simple regional system.

Those systems attempting to apply legacy magnetic stripe instruments during the initial phase of regionalism may incur capital costs associated with designing code and revising acceptance hardware to allow acceptance of all forms of instrument. Likewise, some expenditures will be required to produce appropriate reporting capabilities from the acceptance

systems to allow for the accurate clearinghouse analyses needed to reconcile instrument sales to usage points.

As the program eventually proceeds toward development of integrated fare management technologies for use by the regional program, capital costs will become dramatically greater as efforts extend into engineering, acquiring, installing, and implementing the requisite technologies, programs, and entities required to support such an effort.

Capital Funding Sources

Capital financing for the straw regional fare management system can be generated from several sources:

- The PPCC will coordinate efforts to generate contributions from all participating agencies. Agencies will be asked to contribute a portion of required funding at levels comparable to their relative share of affected ridership. Contributions of equipment, staff time, and professional services will be computed as components of each agency's overall contribution to the effort.
- The POA will serve as coordinator of efforts to obtain capital financing from federal and state entities responsible for providing capital grant funding for programs of this nature. Interaction with the Federal Transit Administration and state departments of transportation should be coordinated through the POA in order to minimize the exposure of smaller agencies to the administrative burden associated with grants management. Local governmental grant support should be attracted and managed through action by each participating agency respectively.
- As regionalization attracts transit patrons from a wider span of operations, local chambers of commerce or major attractions (such as convention centers, sports arenas, or theme parks receiving visitors through the service expansion) may also be enticed to contribute to the overall capital campaign.
- As the regional fare management system eventually expands into broader commercial applications, private funding sources may be achievable, as well. Investment in certain fare technologies that allow "off-line" transaction processing, such as "smart cards" or "bluetooth" approaches, may allow the agencies to open the instruments for use at local commercial establishments. Vendor participation in the program would require a contribution to the overall program capital requirements.

Financial Issues—Operating

Initial Phase

During the initial phase of regional fare management system operation, each agency should bear responsibility for its own internal cost exposures. Costs associated with modifying fare media, training field personnel, and administering the sale and collection of revenue instruments should be incorporated into the core operating budgets of the entities. Such costs should be relatively minor adjustments to historical operating cost levels in light of the minimal changes to normal practices required by the introductory system.

Initial phase program operation costs will include items such as joint program marketing and clearinghouse functions. The majority of such program costs will be expended by the POA. Recovery of such POA program expenses from other participating agencies should be shared on a proportional basis. Each agency should be assessed a contribution level relative to the respective level of patron participation as measured by ridership statistics, fare media sales transactions, or route miles operated.

Later Phases

Operating costs associated with larger, more intricate regional fare management system programs will be significantly greater for each participating agency. These costs will include the need to maintain new technologies and address patron issues with new forms of revenue transaction or integration with commercial enterprises and participating entities.

As the regional fare management system program expands into more sophisticated technologies and procedures, the PPCC will develop equitable models for determining the contributions from each participating agency. Although the majority of operating costs will be incurred by the POA, each participant will incur direct costs associated with increased sales, equipment maintenance, and interaction with third-party patrons or specialized marketing efforts.

Operating Issues

In the formative stages of fare management "regionalization," the agencies must agree upon a single formula of operating protocols for the consistent handling of revenue issues and transactions. While each agency may maintain its legacy program of fare management, policies, and procedures in the early stages of a regional fare management system program, efforts to define consolidated operation processes must begin at the earliest phases of cooperation.

As the program progresses, all members of the regional fare management system should implement consistent fare policies, fare tariffs, and fare technologies simultaneously in order to maximize the benefits to all affected parties. By proving the benefits of regionalism through early implementation of a simplistic partnership, public support and internal support from all agencies for complete program integration can be fostered.

Eventually, in the later stages of program formulation, a single-agency or newly created entity should be tasked with

execution of all fare management tasks for all participating agencies. In this manner, the agencies can maximize return from the endeavor through the greatest level of synergies in planning, operating, and executing revenue management activities. In later stages of development, as novel integrated technologies are acquired, large aspects of operations may be outsourced to private parties for implementation and daily execution.

Fare Media Design

In designing fare instruments for patron presentation at multiple agencies, the onboard operating environment must be fully addressed. Existing fare instrument designs will be modified by all participating agencies to reflect the media's multiagency status and level of accessibility permitted under the relevant tariffs.

Vehicle operators should not be placed in an untenable position of debating fare policies and instrument acceptance with patrons presenting such items for payment of transit privileges. Accordingly, the regional fare group must approve instrument designs that clearly indicate the multiagency-versus-solo-agency acceptance of each instrument. Extensive marketing of the multiagency instruments should clearly reflect the special conditions that allow acceptance, noting any surcharges associated with the use.

Sales Operations

Sale of multiagency instruments or surcharged instruments will be processed through the same outlets employed by the respective agencies for internal sales. To the extent that existing equipment can transact sales of the instruments without substantive modification, such dispensing equipment will be applied to sale of the multiagency instruments, as well.

Handling of surcharges or issuance of special multiagency instruments will be managed and controlled only at the point of purchase, not onboard the vehicles.

Onboard Operation

For purposes of maintaining safe operation and service schedules, vehicle operator responsibility should be limited to a single accept/reject decision on an instrument's acceptance for the service.

The initial phase of the regional fare management system will require vehicle operators from all participating agencies to accept designated joint fare media for payment of travel fares. Vehicle operators will be instructed to recognize acceptable forms of fare instruments issued from "foreign" participating agencies. On vehicles equipped with magnetic stripe readers, the fare instruments will be inserted by the patron and acceptance indicated by the collection device. Alternatively, the vehicle operator will perform a visual inspection of the instrument to verify validity for travel.

No major rehabilitation of existing access control or fare collection devices will be required for the initial phase of the regional fare management system program.

As the regional fare management system program proceeds to invest in integrated sales and collection equipment systems, the impact of such equipment on vehicle operation will increase. Equipment should be designed to perform checks on fare media authenticity, payment accuracy, and transaction counts automatically without operator intervention or action.

Equipment Maintenance

In the early phases of regional fare management system operation, the individual agencies will continue to retain responsibility for the maintenance of their respective sales and collection equipment.

However, as the regional fare management system proceeds to employ more sophisticated technologies in its cooperative venture, consideration of consolidated, coordinated maintenance of the integrated systems may be appropriate.

In acquiring consistent equipment for revenue management, the program can consider outsourcing the entire maintenance function to the equipment manufacturer or another third party. Alternatively, a single participating agency may be designated to expand its internal maintenance resources to meet the needs of all agencies, receiving appropriate cost reimbursement from all agencies, measured by the number of equipment units in service at each respective locale.

Employee Training

Employees involved with the operation of the regional fare management system will be provided specialized training in topics related to their responsibilities. Training programs will be crafted by the project manager and presented by the POA or the training departments of the participating agencies.

Vehicle operator training will address the forms of acceptable fare media and acceptance procedures. Methods to be employed in providing patron counts will also be presented, as will specialized topics related to patron conflict or clarification of multiagency transactions.

Sales force training will be provided to internal sales personnel as well as to operators of third-party sales outlets. Training will address multiagency instruments (i.e., multiagency fare tables and policies related to the use of multiple agency routes for travel). Clearinghouse reporting functions, sales reporting, and receipt processing tasks will also be presented in the training forums.

Agency financial managers will be trained on the pertinent aspects of regional fare management system accounting systems and audit programs. Revenue and expense recognition at each agency will be defined, and methods to claim recovery of certain defined components of expense

will be presented. Issues pertaining to security and internal controls governing the program, its instruments, sales and collection, and processing functions will also be detailed.

Patron training will be presented by the respective participating agencies, as well as by the POA. Through marketing initiatives provided through the POA or the PPCC, the public will be advised of the availability of multiagency travel, sales outlet information, and the rules for using multiagency or surcharged instruments. Protocols for addressing unique patron travel conditions will be presented, as will methods for handling patron complaints, refunds, and other patron interface issues.

Technology Issues

The introductory phase of the straw regional fare management system program will rely on existing fare instruments and sales and collection equipment operating within the participating agencies.

Initial Phase

Participating agencies will continue to sell and accept instruments historically issued by their own agency for travel within their agency service.

The PPCC may design and produce a unique multiagency transport pass instrument. These regional fare management system instruments will have distinctive designs and patterns clearly designating the items as providing multiagency movements. Alternatively, the sales agent will apply a distinctive surcharge validation to existing instruments through application of stickers, stamps, or punches.

If all participating agencies currently operate collection equipment designed to accept magnetic stripe instruments, the new passes will be designed to be accepted by such devices. However, if any participating agencies do not operate magnetic stripe equipment, or all stripe acceptance devices do not conform to consistent technology standards, paper flash passes will be employed by the regional fare management system program during its initial phases of operation.

Existing internal and third-party sales outlets will sell the regional fare management system multiagency instruments or apply surcharge validation on legacy instruments. In the event that vending machines can be readily adjusted to sell the instruments, the units will be sold in that manner, as well. The instruments will be presented for inspection by the patrons to the vehicle operators, who will note the veracity of the instrument for requested travel.

Later Phases

Following the preliminary phase of "regionalized" fare management, the PPCC may decide to select appropriate technologies for investment and installation at all participating agencies. The selected technology will provide a consistent approach to all fare tables and policies of the participating agencies.

Magnetic stripe technology. Magnetic stripe systems provide extensive data control and data management capabilities at minimal cost. Recent improvements in stripe technology, coupled with recent wireless communication advances, can provide effective "off-line" transaction processing with appropriate security and data control levels. In fact, magnetic stripe technologies can also be applied to a variety of nontransit applications, such as time and attendance systems, commercial vendor programs, or campus card activities. Such a breadth of applicability would fully address all goals of the regional fare management system.

In the event that certain participating agencies employ magnetic stripe technologies using open architecture designs, appropriate readers and data processing equipment can be acquired and installed into existing equipment operated by other participating agencies for a relatively minimal investment.

Smart card technology. Smart card systems can provide all participants with a state-of-the-art method of data management and data control. In concert with private-sector partners, holders of the smart card transit instrument can be provided with the benefit of transacting a variety of commercial activities with a single instrument. The security features and ease of use associated with the smart card provides substantive benefits to the issuer and user.

In selecting a smart card approach, the PPCC should fully consider the use of third-party contractors for development, implementation, and operation of the system. The myriad of technical issues associated with the card, its readers, and telecommunications between transaction points necessitates extensive knowledge and expertise in a variety of subjects. The POA may be positioned with adequate internal resources to properly manage the effort, but can only achieve the task effectively with complete delegation of responsibilities associated with the regional fare management system program.

As the transit industry defines recommended "standards" for smart card technology in the transit environment, the PPCC should fully explore open architecture applications conforming to these standards. The open architecture approach may allow participating agencies to save on the cost of smart card implementation by applying necessary readers and telecommunication devices to existing systems, allowing complete interface with the overall regional fare management system protocols chosen by the PPCC. Use of an industry-defined, standard open architecture approach would be the most effective for achieving consistent and integrated use across multiple independent agencies in an environment provided within the regional fare management system.

APPENDIX: DESCRIPTIONS OF REGIONAL MULTIAGENCY FARE PROGRAMS

For a synopsis of all regional fare management programs, see the table at the end of this appendix. The following sections describe individual programs in detail.

San Francisco Bay, California, Region—"TransLink"

Coordinating agency. Metropolitan Transportation Commission.

System description. A multimodal regional revenue system incorporating 26 transit agencies independently operated in a nine-county geographic area. The TransLink regional fare card is presently operating in pilot mode, serving 6 of the 26 participating agencies. The card is planned to be used for transit and nontransit applications, but no retail or commercial activities are implemented at this time.

Start date:
February 1, 2002.

Number of cards and users:
Approximately 8,000 cards issued, approximately 3,100 cards used.

Total system riders:
471 million annual unlinked passenger miles, approximately 1.6 million riders per day.

Expected full roll-out date:
2003.

Participating agencies:
BART, AC Transit, Caltrain Golden Gate Bus and Ferry Transit, San Francisco Municipal Railway (Muni), and Santa Clara VTA.

Technology:
Dual Interface Card Motorola/ERG MV 5000.

Integrator/card supplier:
ERG license to ASK, SA to manufacture.

Estimated capital cost of system:
Capital costs for fare collection equipment and installation on entire system estimated at $45 million.

Estimated operating cost of system:
Annual operating costs on full roll-out estimated at $8–14 million, depending on usage. Costs are estimated at 3.6–5.0¢ per ride. Items included in operating expenses include data processing, network monitoring, system management, maintenance, and customer support.

Funding sources:
Funding is through federal, state, and regional sources.

Project history. The state legislature empowered Metropolitan Transportation Commission (MTC), as MPO for the Bay Area, to coordinate activities among the Bay Area transit agencies. MTC began consideration of the concept of seamless regional travel more than 10 years ago. MTC commissioned studies to determine manner of approach. A 1995 study led to private-party involvement in management and operational issues, including clearinghouse functions and equipment maintenance.

Governance. MTC is the lead agency in the program. MTC has control over the contractual agreements, design, and implementation of the TransLink system. MTC is the MPO of the nine-county San Francisco Bay region. TransLink is a registered trademark of MTC.

Each participating agency retains its own fare policy and business rules. MTC governs customer service and sales issues pertaining to refunds, credits, exceptions related to card performance, and transaction experience. There is no regional fare policy development.

Operations. The Translink project is a turnkey project, with all activities related to development of the system and its operation performed by ERG. ERG holds the accounts through which the funds flow, although MTC is the account owner. All funds are held by MTC. At this time, all float is retained by MTC, although the amounts are minuscule during the pilot test period.

Other comments. During the pilot phase, the technical systems have performed above expectations. Few transactions have been lost in processing, and, upon review, all such transactions have been fully identified and reconciled by intended processes.

Some transit operators are offering patrons discounts during the pilot program.

Ventura County, California, Region—"Passport"

Coordinating agency. Ventura County Transportation Commission (VCTC).

System description. The Passport system, which is the second interagency arrangement employed by VCTC, is used by six independent transit operators. The card contains electronic purse functions, as well as pass functions. Currently, efforts are underway to expand the electronic purse functions to Metrolink commuter rail operations.

A system is under development through which the Passport functions will be available to California State University at Channel Islands for use as transit access, as well as certain campus functions. No retail or commercial activities are planned.

Start date:
The initial regional fare system was activated in 1995. The Passport system was activated in September 2000.

Number of cards and users:
Approximately 2,500.

Total system riders:
4.7 million annual unlinked passenger trips, about 16,000 daily passengers.

Expected full roll-out date:
The Passport system was fully operational in January 2002.

Participating agencies:
Camarillo Area Transit (AT); Moorpark City Transit; Simi Valley Transit (SVT); South Coast Area Transit (SCAT); Thousand Oaks Transit (TOT); and Ventura Intercity System Transit Authority (VISTA).

Technology:
Dual Interface Card Motorola/ERG MV 5000—*incorporates GPS (global positioning system), APC (automatic passenger count), and AFC (automatic fare collection).*

Integrator/card supplier:
ERG licenses to ASK, SA to manufacture.

Funding sources:
Sponsors include Caltrans in coordination with the Federal Transit Administration and the Volpe Center.

Project history. The state department of transportation provided funding to test the capability of creating a regional fare system using smart card technology. The study reviewed issues pertaining to interagency cooperation, technical capabilities, and implementation issues. At the conclusion of the study, VCTC and participating agencies proceeded to continue the program.

Governance. VCTC entered into agreements with participating agencies through which VCTC establishes all business rules related to card operations. VCTC governs rules related to sales, refunds, transaction management, and customer service related to card operations. Each agency maintains its own fare policies and structures. A major program goal was to avoid any interference with existing agency operations. Existing revenue management equipment was retained at each agency.

Operations. VCTC entered into contractual agreements with the ERG/Motorola Alliance for the design and implementation of an integrated smart card system. Initially, systems operations were provided by the ERG/Alliance group. Under the current arrangement, VCTC performs all operations, including order fulfillment, settlement, and clearinghouse functions.

A VCTC project manager directs all card operation activity, serving as the single point of contact with agencies and customers on card development and operation issues.

VCTC holds all receipts upon collection. Electronic purse revenue is distributed based on actual transaction data collected from the system, with 10% of revenue retained by VCTC to cover card operation costs. Pass revenue is distributed based on the relative percentage of pass ridership as determined through the system counters. Periodic comparison between driver counts and system counts has noted virtually no discrepancies.

Other comments.

- Passport provides a 10% discount to card users.
- The Passport system provides ridership statistics to member agencies, allowing Section 15 reporting in a cost-effective manner.
- The earlier regional system suffered from inadequate preplanning on issues related to accounting and field operating conditions, as well as reliance on statistics rather than actual transaction data, for revenue distribution. New technology allows more accurate, reliable revenue data to be applied to the distribution.

Washington, D.C., Region—"SmarTrip"

Coordinating agency. Washington Metropolitan Area Transportation Authority (WMATA).

System description. WMATA historically has offered various interagency magnetic stripe passes to allow patrons access to the services of neighboring transit agencies. The WMATA SmarTrip smart card program serves riders on the WMATA rail network as well as at parking facilities. Although efforts are underway to expand use of the instrument onto the WMATA bus system, as well as to neighboring systems in Maryland and Virginia, the program is not currently a multiagency undertaking. No retail or commercial activities are planned.

Start date:
1977 for magnetic stripe instruments, December 1994 for original Cubic "GoCard" system," and May 1999 for conversion to "SmarTrip" in 2002.

Number of cards and users:
Magnetic stripe has approximately 730,000 riders daily, and SmarTrip has approximately 150,000 riders daily (as of June 2001).

Number of system riders:
Rail has 218 million annual unlinked passenger miles, about 730,000 riders per day. Total system riders is 348

million annual unlinked passenger miles, about 1.1 million riders per day.

Expected full roll-out date:
Rail and parking in full operation.

Technology:
Magnetic stripe and SmarTrip (Cubic contactless smart card).

Integrator/card supplier:
Various for magnetic stripe, and Cubic for SmarTrip.

Project history. Since its inception in 1977, WMATA has provided rail service through the use of a magnetic stripe instrument. The operation is a closed system servicing only patrons of WMATA, although various interagency instruments allow patrons to transfer to neighboring operations. In 1996, WMATA entered into a pilot smart card program, entitled the "GoCard." This card system served patrons of the WMATA rail system. In 1999, the card effort was converted to the "SmarTrip" program, expanding use to WMATA parking facilities.

Governance. WMATA establishes all business rules concerning instrument sales and acceptance. WMATA is the sole participant in the SmarTrip card effort at this time.

Operations. All SmarTrip operating functions are performed by ACS under contract with WMATA. In this role, ACS performs all fulfillment, settlement, and clearinghouse functions.

Other comments.

- Patrons may receive a SmarTrip card for $5.00 and are charged $5.00 for lost or replacement instruments. WMATA adds 10% to the value of a patron's card value increase purchase.
- Discussions are underway through which the SmarTrip instrument would be accepted on Maryland DOT transit operations. Under a multiagency, regional operation, WMATA would remain the coordinator of the program, contracting with ACS for performance of fulfillment, settlement, and clearinghouse functions.
- WMATA and Maryland DOT have undertaken a joint procurement of bus fareboxes with smart card acceptance capabilities. The farebox project is proceeding with first article testing at this time.
- Outstanding topics related to the implementation of a multiagency system include resolution of variations in fare policy on issues such as discounting credits and refund policies. In addition, participating agencies may be required to expend funds for the conversion or replacement of existing fare collection equipment in order to accept the WMATA SmarTrip instrument.
- A demonstration project is under review that may combine the SmarTrip card with automatic teller machine (ATM) capabilities through an arrangement with First Union bank.

Chicago, Illinois, Region—"ChicagoCard"

Coordinating agency. Chicago Transit Authority (CTA).

System description. The Chicago area transit operators currently use several instruments. A magnetic stripe instrument can be used by CTA and Pace patrons. Various interagency passes allow multiagency access between these two agencies and Metra.

The ChicagoCard smart card system serves patrons of the CTA and the Pace suburban bus system. CTA is exploring opportunities for use of the instrument in certain point-of-sale applications.

Start date:
Magnetic card program commenced in 1996. ChicagoCard smart card pilot program began in August 2000.

Number of cards and users:
Approximately 120,000.

Total system riders:
520 million annual unlinked passenger trips, about 1.75 million riders per day.

Expected full roll-out date:
Magnetic card and ChicagoCard program in full operation at this time.

Participating agencies:
CTA and Pace suburban bus.

Technology:
Cubic magnetic swipe and Cubic smart card.

Integrator/card supplier:
Cubic.

Project history. CTA established a magnetic stripe card system in the mid 1990s. The instrument is accepted on all CTA vehicles, as well as by Pace bus fareboxes. An introduction of smart cards commenced in 2000, with introduction of the ChicagoCard. This instrument is also accepted on CTA and Pace vehicles, although no consolidation of data or financial information is performed. Each agency maintains its own record of card activity, with all sales receipts retained by CTA.

Governance. CTA maintains a project management office and technology management office to address card opera-

tions. CTA governs all aspects of card program activity, including sales and settlement. No clearinghouse functions are necessary.

Operations. CTA performs all settlement functions. All funds are retained by CTA. Pace remits a flat fee for program participation to CTA periodically, rather than a payment related to usage, ridership, or transactions. Pace and CTA maintain separate servers to process cards accepted on their respective systems. No consolidation of data or reporting exists.

Other comments.

- The Metra regional commuter rail system does not accept the ChicagoCard for system use. The fare collection procedures employed by Metra do not lend themselves to smart card acceptance without extensive investment in alternative fare collection resources and equipment.
- CTA had established a magnetic stripe card system in the late 1990s. The system encountered limitations related to the control of invalid instruments. These issues have been resolved through the ChicagoCard system.
- CTA is currently planning to explore outsourcing of the settlement and fulfillment functions.
- No expansion of interagency card operations is anticipated in the Chicago region.
- Patrons are charged $5.00 for a ChicagoCard. Patrons are not provided a discount for card usage. The ability to recoup the value of a lost instrument is a benefit for participating in the program.

Seattle/Puget Sound, Washington, Region

Coordinating agency. Sound Transit and King County Metro.

System description. In 1997, Sound Transit was formed as a result of voter referenda. A principal task of the new agency was the formation of regional transit revenue systems. As an initial step, Sound Transit has created the Puget Pass, a flash pass instrument of various denominations accepted by five agencies in the region. The Puget Pass is sold in denominations related to the local fare structures of participating agencies. The Puget Pass can be purchased in 1-month, 3-month, or 1-year increments.

In addition to accepting the multiagency Puget Pass, many participating agencies retain operation of unique single-agency ticketing systems, such as the King County Metro magnetic stripe instrument. Efforts are underway to explore the expansion of instrument use into parking operations and use as employee identification badges for participating employers in the region.

Start date:
The Puget Pass began operation in September 1999.
Regional Smart Card has been under development since 1996.

Number of cards and users:
Puget Pass has approximately 500,000 potential users.
Regional Smart Card has over 1 million potential users due to involvement of local employers.

Total system riders:
138 million annual unlinked passenger miles, approximately 470,000 riders per day.

Expected full roll-out date:
Puget Pass is in full operation, and Regional Smart Card is anticipated in late 2005.

Participating agencies:
Puget Pass—Sound Transit, King County Metro, Pierce Transit, Everett Transit, Community Transit.
Regional Smart Card—Puget Pass participants + Kitsap Transit and Washington State Ferries.

Technology:
Puget Pass—flash pass instrument.
Smart Card—to be determined.

Integrator/card supplier:
Puget Pass—various.
Smart Card—to be determined.

Project history. The Settle region has considered the implementation of regional fare systems since the 1980s. The development of the Puget Pass provides a platform on which cooperative operations can be established in areas such as fund reconciliation and sales programming.

Governance. A regional transit integration group, comprised of the management of all regional transit properties, establishes all forms of regional cooperation. A fare integration group within this organization oversees development of revenue management cooperative efforts.

Operations. Each agency establishes its own fares under the Puget Pass system. Sound Transit coordinates all aspects of the Puget Pass program. Sale proceeds are held in locally managed accounts of each agency. Receipts are settled by Sound Transit, with proceeds distributed to participating agencies through formulas based on estimated boardings. Each agency contributes to the cost of program operation at levels equivalent to their respective fiscal year 1999 revenue management costs. Excess operating costs are funded by Sound Transit's fare integration budget.

Each agency coordinates pass sales with employers in its local service area.

Other comments.

- King County Metro is coordinating the development and implementation of a regional smart card. The agency is currently in the process of evaluating a proposal received from private entities for the creation of a card program, along with a 10-year operating arrangement.
- King County Metro will serve as project manager for the undertaking, serving as primary contract negotiator and oversight agency. An interagency agreement will establish business rules and respective accountability for the program.
- The smart card program will provide a coordinated fare system, rather than an integrated fare system. Under the smart card program, each agency will continue to establish its own fare structure. The card will be programmable to address all fare structure issues.
- Difficulties faced in developing a regional revenue management system included the relative capital and operating cost factors for such an effort. The operating needs and financial resources of the agencies differ due to their relative size and form of service. The financial support of Sound Transit for the implementation and operation of the program allowed participation by all sizes of agency. Each agency covers a proportionate share of capital costs related to their respective share of equipment. Operating costs are based on ridership and historical cost levels.

Phoenix, Arizona, Region—"Valley Metro"

Coordinating agency. Regional Public Transportation Authority (RPTA).

System description. Since 1986, RPTA has served as a regional coordinator of public transit services in the Maricopa County region. In 1993, the Valley Metro identity was established to provide a singular presentation of public transit services to the public. The fixed-route transit organizations of the region coordinate all fare policies through the Valley Metro structure. A single format of passes is sold and accepted by all participating agencies.

Start date:
Approximately 1993—introduction of Valley Metro.
1997—regional service coordination program initiated.

Number of cards and users:
Monthly Pass—approximately 60,000 per month.

Total system riders:
38.7 million annual unlinked passenger miles, approximately 137,000 riders per day.

Expected full roll-out date:
Valley Metro is in full operation, but expanding with new revenue sources.

Participating agencies:
RPTA, City of Phoenix, City of Tempe, and City of Mesa.

Technology:
Magnetic stripe instrument.

Integrator/card supplier:
Various.

Project history. The Phoenix region has maintained cooperative transit fare activities since the late 1980s. In 1993, the Valley Metro designator was created to present a coordinated transit structure to the patrons. In 1997, a regional services program was developed for managing marketing, customer information, and other programs, including fare data collection, analysis, and coordination.

Governance. All participating agencies are involved with RPTA policy definition. Fare policies are defined in a cooperative manner, with City of Phoenix Transit historically leading fare decision processes.

Operations. All participating agencies have the same fare tables and policies. The Valley Metro passes are processed, distributed, and sold throughout the region through both public- and private-sector outlets. When an instrument is presented onboard vehicles, the count is taken either through a farebox magnetic stripe reader or through manual operator counts. All pass usage counts are accumulated by RPTA, and revenue is distributed according to these counts by the RPTA Regional Services operation. The cost of processing the revenue is allocated to each participating agency by revenue miles.

Other comments.

- Some rates for Valley Metro pass instruments are discounted from singe-ride payments.
- RPTA participants are considering investment into new farebox technology that would provide more efficient data processing capabilities. The participating agencies would procure fareboxes cooperatively.
- The Phoenix region's transit agencies rely heavily on contracted service for fixed-route operations. Some contractors are incentivized to provide high-quality service through participation in farebox receipts above predefined levels.

Los Angeles, California, Region—"EZ Pass"

Coordinating agency. Los Angeles County Metropolitan Transportation Authority (LACMTA).

System description. LACMTA is developing a monthly interagency flash pass that will be accepted by 12 agencies in the Los Angeles metropolitan area.

Start date:
September 2002.

Number of cards and users:
Approximately 150,000–200,000.

Total system riders:
505 million annual unlinked passenger miles, approximately 1.7 million riders per day.

Expected full roll-out date:
Fully operational as of September 2002.

Participating agencies:
City of Commerce, City of Gardenia, Culver CityBus, Foothill Transit, LACMTA, Los Angeles DOT, Long Beach Transit, Montebello Bus Lines, Santa Clarita Transit, Santa Monica Blue Bus, Norwalk Transit, and Torrence Transit.

Technology:
Paper flash pass.

Integrator/card supplier:
Paper flash pass—various.

Governance. LACMTA will be responsible for production and coordination of instrument sales.

Operations. Each participating agency will sell passes and retain proceeds from sale until settlement. Each quarter, the agencies will remit sales proceeds and unused instruments to LACMTA. Each agency will be reimbursed an amount equal to the agency's boardings times its average fare. LACMTA will settle accounts.

Hong Kong Region, China—"Octopus"

Coordinating agency. Creative Star, Ltd., a private corporation created by participating transit agencies for the purpose of developing and operating a regional fare card system.

System description. The Octopus card system provides patrons with an integrated fare collection system serving patrons of seven regional transit entities, including operators of bus, light and heavy rail, and ferry services. The cards also provide small-value retail transactions at affiliated sites. Discussions are currently underway to consider expanding the system to users of local taxicab services, as well.

Pilot start date:
September 1997.

Number of cards and users:
7 million cards issued in 2000. 6.5 million transactions per day in 2001, or 1.6 billion per year.

Expected full roll-out date:
Fully operational.

Participating agencies:
Mass Transit Railway (Hong Kong's citywide rail system); New World First Bus; Kowloon Motor Bus Co.; Citybus Ltd.; Hong Kong and Yaumati Ferry; Kwoon Chung Bus; Kowloon-Canton Railway Corp. (East Rail, Light Rail and bus divisions connecting the city to its outlying districts and mainland China.)

Technology:
Contactless smart card.

Integrator/card supplier:
Integrator is ERG Transit Systems (HK) Ltd. (AES Prodata), and card suppliers are Sony Corp. and Mitsubishi Corp.

Project history. In 1994, a consortium of transit operators serving the Hong Kong region came together for the purpose of creating a common fare payment method to make the public transportation network more efficient and convenient to use. The consortium formed a new independent entity called Creative Star. Creative Star developed the Octopus system and serves as the operator of the program.

Governance. Creative Star, Ltd., is responsible for all development, operations, and policies of the Octopus program.

Operations. Clearinghouse functions, including all software, hardware, and integration, were developed and installed by ERG. The Central Clearinghouse System (CCHS) is operated by Creative Star. The CCHS receives all transaction data from each service provider that has a service provider central computer (SPCC), which consolidates data from all the service locations. The CCHS receives data from each SPCC, settles the transactions, and then distributes back the results to each SPCC. Creative Star has a partnership with Sun Enterprises Services to provide technical support for training and problem resolutions. ERG continues to support Creative Star with maintenance and development.

Other comments.

- Sun workstations at bus depots are linked to a wireless local area network that allows buses to upload and download data each day.
- Member transit systems accept only cash and the Octopus card.
- Future developments to include Octopus processors that are smaller and cheaper to be used on minibuses and other smaller transport vehicles where an online network would not be required by these peripherals.
- Patrons charged approximately HK$50.00 (~US$6.00) deposit on card. Patrons provided some discounts for Octopus card usage.
- The Octopus card is presently expanded to limited non-transit use after the approval of Creative Star, Ltd., as a deposit-taking company by the Hong Kong Monetary Authority in April 2000. This lifts the restrictions on use of the card to transit only. But the card's major use will still be transport related.
- Creative Star, Ltd., is considered a private company by the government of China. The sole purpose is for a group of public transport operators to develop and promote a common ticket system that enables people to use one common card for multimodal, multiagency travel.
- For nontransport, Creative Star, Ltd., focuses on small-value, high-volume transactions as in convenience stores, fast food shops, cake shops, and vending machines.

Europe—"Calypso"

Coordinating agency. RATP, Paris.

System description. A multimodal regional revenue system serving six transit agencies independently operated across a five-nation geographic area. The Calypso organization is a consortium of transit agencies, bankers, service providers, and system developers located in five European nations. Each member agency develops its own card instruments, conforming to the Calypso standards.

Start date:
1996–1998 ICARE tech development mass transit only; 1998–2000 Calypso project mass transit and multiservice applications.

Number of cards and users:
Approximately 1 million annual subscribers.

Participating transit agencies:
France: RAPT, SNCF; Germany: LKRKN; Italy: ACTV; Portugal: OTLIS; Belgium: STIB.

Technology:
Hybrid contact and contactless smart card, three types of cards with different abilities used in transit applications:

- Contactless ticket for occasional or single-trip use "minipass," low-cost.
- Contact or contactless for frequent use—the "pass."
- Top model for customized transit and sales—"maxipass"(includes a screen with 4 lines, 20 characters, a keyboard, a receiver, and an emitter).

Integrator/card supplier:
Each member has different developers and banking relationships. Each smart card meets standards set by the Calypso consortium. Each member agency deals with its own nation's participating bank. Developers of the Calypso card instruments include MTA, ASK, INNOVATRON, LETI, FHG, TCAC, IBM TSP, and INESC.

Funding sources:
The European Union along with local-level government supports at federal, state, and local levels.

Project history. ICARE set up a CLUB (ContactLess User Board) in 1995 with the goal of producing a standard smart card and specifications of a transit ticket urban pass. The ICARE project involved highly different public transport systems: those of Lisbon, Portugal; Constance, Germany; Venice, Italy; and Paris, France. Brussels, Belgium, is now a member.

The Calypso standard resulted from the ICARE project and was dedicated to mass transit applications. Calypso is a consortium of transportation agencies, bankers, service providers, and developers in five European countries. A Calypso card is a multipurpose instrument that is used for transit ticketing, electronic payment (banking), and other services.

The Calypso project developed an urban transit pass for each site having electronic purse functionality for use within each nation separately. A cardholder can use a Calypso card for electronic purse transactions only within the nation in which the card is purchased.

The ticketing function is common to all the Calypso partner sites, allowing a cardholder to board transit vehicles at any participating agency, regardless of nation.

Governance. The European Union supports the Calypso project. It supports a license strategy where eight manufacturers produce compatible equipment under license from the Calypso organization.

Operations. RATP of France is the coordinator of all Calypso transit activities, including oversight clearinghouse functions.

TABLE A-1 Synopsis of regional fare management programs

System	San Francisco *Translink*	Los Angeles *EZ Pass*	Ventura County *Passport*	Phoenix *Valley Metro*	Seattle *Puget Pass*	Washington, D.C. *SmarTrip*	Chicago *ChicagoCard*	Hong Kong *Octopus*	Europe *Calypso*
Start Date	2/2002	9/2002	9/2000	1997	9/1999	5/1999	8/2000	9/1997	1998
Number of Cards Issued	8,000	150,000	2,500	60,000	500,000	150,000	120,000	7,000,000	1,000,000
Number of Agencies	6 (pilot)	12	6	4	5	1	2 (related)	7	6
Technology	Dual Interface "Smart Card"	Paper Flash Pass	Dual Interface "Smart Card"	Magnetic Stripe	Paper Flash Pass	Contactless Smart Card	Contactless Smart Card	Contactless Smart Card	Dual Interface Smart Card
Coordinating Agency	MPO —MTC	Largest Agency — LACMTA	Regional Agency — VCTC	Regional Agency — RPTA	Regional Agency — Sound Transit	Largest Agency —WMATA	Largest Agency — CTA	Private Corp. Created by Agencies — Creative Star	Largest Agency — RATP
Governance	MPO —MTC	Largest Agency — LACMTA	Regional Agency — VCTC	All Agencies, Coordinated by RPTA	Regional Transit Integration Group	Largest Agency —WMATA	Largest Agency — CTA	Creative Star	Government — European Union