



Seamless Payments for Complete Trips

A Guide for Transit Agencies



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Acknowledgements

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Executive Summary

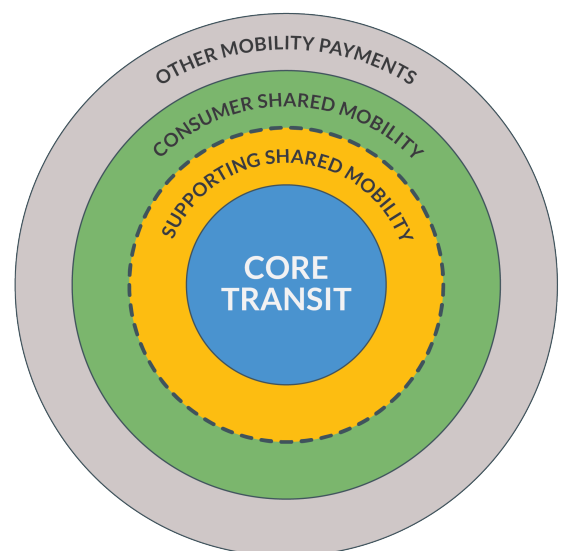
A multimodal network of public transit and new mobility options that are widely accessible and convenient to use is critical for people to unlock access to opportunity. Payment systems are a key aspect of this. They play an important role in supporting transportation networks but can also introduce friction during the traveler experience. Drawing on prior research as well as conversations with transit agencies in North America and the UK, this paper was developed to serve as an educational resource that transit agencies can use to successfully integrate payment across multiple modes of transportation. This paper recommends the following:

Community needs and characteristics should drive payments solutions. Technology has expanded the menu of transit payment options, such as mobile ticketing platforms and open payments systems that allow bankcards and mobile wallets to act as fare media. While these options have various operational advantages, agencies should focus on solutions and features that fit the needs and characteristics of the agency’s community, including easy-to-use options for those who are unbanked or don’t use smartphones.

Desired outcomes and adaptability should drive fare payment system partnerships. Agencies should seek to implement systems that are adaptable and outcome-driven. In practice, this means prescribing flexible performance features, such as open architectures, acceptance of credit and debit cards, and mobile platforms, even if certain features are phased in over time.

Mobility services that support public goals should be the priority for payment integration. Thanks to advancements in payment technology, fare payment systems have become a means to harmonize transit services across a region as well as integrate transit with shared mobility services. When examining opportunities to integrate payment beyond traditional transit services, agencies should prioritize modes and use cases that serve the public interest, increase the effectiveness of the agencies’ services, and improve the efficiency of their operations.

A conceptual framework was developed to help agencies systematically approach payment integration for their community. In concert with the recommendations above, the framework involves prioritization of public transit and other agency-supporting shared mobility services and the creation of a unified fare policy across these services. With private-sector providers also taking an interest in being mobility integrators, an active role by a public-interest entity, such as a transit agency, is vital to ensuring that all eligible services can be accessed by all travelers.





Introduction

Public transit plays a crucial role as the core of many transportation systems around the world, providing both high-capacity and lifeline mobility services. By using the scale of transit service and infrastructure to their advantage, transit agencies can play a leading role as mobility integrators in their communities to produce a transportation system that achieves complete trips for all, where no step in the chain of a traveler’s trip, from the decision to take a trip, to planning the trip, traveling, and reaching the destination safely, efficiently, and carefree, is broken.¹ Through this process, agencies can create greater awareness and expansion of travel options, reduce payment friction for travelers, provide equitable mobility solutions, and eventually enable fewer trips made by driving alone, thus leading to significant benefits to the economy, environment, and quality of life. This coordination has usually come through:

Integrated Infrastructure

Coordinating the location of public transit and shared mobility services allows travelers to seamlessly access multiple modes of transportation in a safe, comfortable environment. Mobility hubs, anchored by high-frequency transit service, offer clearly identifiable sites with features such as interactive kiosks, service maps, and ticket vending machines to enable travelers to choose the mode that makes the most sense for their journey.²

Integrated Data

Data availability and data specifications are a critical component to multimodal integration. Planning a trip on either public transit or shared mobility is now most often facilitated through mobile devices, where quality data feeds are critical. For public transit, data feeds are typically publicly available and use the General Transit Feed Specification (GTFS), which details routes, schedules, and fares that can be accessed through an open Application Programming Interface (API). While similar data standards exist for shared mobility, such as the General Bikeshare Feed Specification (GBFS), data availability varies across modes. For example, data for carshare and ridehailing services are generally less available than micromobility (bikeshare and scooter share) services.³

Integrated Payment

To provide a truly seamless experience that can compete with the ease of driving, the transportation system must support the ability for all travelers to pay for their journey. From magnetic stripe tickets



to contactless smartcards to smartphones, payment technology is the thread that connects services across different transit operators or mobility service providers.

This paper focuses on the payment component of integration, summarizing the evolution of the integration of public transit fare payment systems with shared mobility services, recommending broad principles for agencies embarking on multimodal payment integration, and describing a conceptual framework for agencies to systematically approach payment integration for their community. This paper builds on academic research from the Transportation Research Board's (TRB) Transit Cooperative Research Program (TCRP) and organizations such as the Secure Technology Alliance (STA), supplemented with interviews of transit agencies in North America and the UK that leveraged fare payment systems to expand travel options and improve traveler experience.⁴

The COVID-19 pandemic underscores another important aspect of transportation systems: *resilience*. Though the research for this paper started before the COVID-19 pandemic, payment integration can support resilience through easier access to multiple modes of transportation that can meet travelers at their own comfort level, and supporting payment technologies can support safer ways to access and pay for transportation.



Electronic Fare Payment Systems: Elements & Evolution

Fare Structure

An agency's fare structure, how much and whom it charges to access its system, is an important policy decision to help the agency achieve its goals with respect to its travelers, finances, management, and community.⁵ As publicly funded services, transit agencies typically set fares below operating cost to ensure equitable and affordable service. Furthermore, many transit systems offer discounted pricing, or **concession fares**, to certain groups, such as senior citizens. Fare-free systems in North America also exist, usually for smaller scale services without required farebox recovery metrics, such as those oriented around universities or tourist attractions.⁶ Agencies may also temporarily suspend fare collection during unique circumstances, such as the COVID-19 pandemic.⁷

Flat fares, where the price remains the same for a single journey irrespective of its length, is the most common method across modes of transit or payment collection methods. When the point of entry to transit service is the vehicle, this is considered the easiest fare structure for travelers to understand and it encourages quick boarding.

Conversely, **distance-based fares**, adjusted incrementally over a base value according to a network or straight-line distance traveled, have been a staple of service design in commuter and intercity rail, where organizational priorities



Figure 1: Zone-based fare structure in the Vancouver region. (Source: Translink)

remain more diverse and service covers a larger geography.⁸ Comparatively simpler **zone-based** structures often work in conductor or driver-validated settings, such as on commuter rail or express bus service.⁹ **Peak fares** can be charged during periods of high demand and where riders are less price sensitive.¹⁰

Agencies often sell **period passes**, allowing unlimited travel within all or part of the system for a given period of time, usually daily, weekly, or monthly. One notable innovation has been **fare capping**, which guarantees that travelers purchasing single tickets pay no more than a maximum amount over a specific period of time, essentially earning a period pass without needing to pay for it in advance.

Fare Technology

Important technological components of electronic fare payment systems (EFPS) include **fare media** and **system architecture**. Fare media are the instruments accepted by a transit system, such as cash, tickets, mobile devices, or credit cards, to grant travelers access to its services. System architectures include **card-based**, where fare value is carried on the fare media itself, and **account-based**, a more advanced system where fare media are used to associate travelers with information held in a separate account but no value is carried on the fare media itself.¹¹

EFPS have enabled various methods for travelers to pay their fares, including cash. Cash payments add costs for transit agencies associated with fare collection, maintenance, and revenue allocation and add time to the payment transaction, often increasing boarding and travel time, thus impacting overall schedule reliability.

Transport for London (TfL) was among the first transit agencies to use radio frequency identification (RFID) enabled “smartcards” as an alternative fare media to cash or the similarly resource-intensive paper and magnetic stripe ticketing. TfL’s now widely used Oyster electronic fare payment system ushered a movement among large transit agencies towards smartcards in the 2000s. Smartcards’ increased data storage capacities allowed for specialized fare products, such as unlimited daily or monthly passes. Early card-based EFPS required business rules, such as transfer policies, concession status, fare products, and fare structures, to be built into each individual fare reader. As mobile network coverage advanced in the late 2000s, readers could be connected in real-time to a centralized database containing information specific to the traveler. By requiring less physical infrastructure, these account-based architectures can extend EFPS beyond traditional fare readers. They also have the capability to implement more sophisticated and equitable business rules, such as fare capping.

As part of a larger push to improve traveler experience, transit agencies have been adopting trip-planning tools and **mobile ticketing** through smartphone apps. Mobile ticketing includes Quick-Response (QR) codes for visual-inspection based services and near-field communication (NFC) technology to replicate contactless cards.¹²



Traditionally, EFPS have been **closed-loop**, where only fare media specific to a transit system are accepted on its network of fare readers. However, they can also be set up with **open payments**, where contactless credit and debit cards are accepted as fare media. In some systems, agency fare media can be used as payment for retail transactions, though this is less common. While adoption of contactless credit and debit cards has been slower in the United States, NFC capabilities are now standard in mobile phones, allowing **mobile wallets**—smartphone apps that store payment information—to be used as fare media in open payments systems. Open payments in transit requires compliance with Payment Card Industry (PCI) standards in the same manner as retail credit card transactions. TfL was among the earliest adopters of open payments, leveraging the popularity of contactless credit/debit cards in Europe.

EFPS design, procurement, and management have most often been handled by a lead agency and then extended to other operators over time through inter-local agreements or licensing terms. This has happened under a regional entity that is not a transit operator, such as a metropolitan planning organization, and through direct agreements between the lead agency and other transit operators. Capital-intensive EFPS projects often facilitated consolidation of business rules, contributing to the trend towards flat fares in transit.



Payment Integration in Action

The following examples describe recent implementations of multimodal payment integration—within and beyond traditional transit services—in both earlier card-based systems and more recent account-based systems in several regions in North America.

Integration through Card-Based Systems

Montréal

Mobility options in the Montréal region consist of a robust public rail and bus network through the Société de transport de Montréal (STM) and other operators, as well as North America's oldest carshare and bikeshare services. The for-profit Communauto carshare was founded in 1994 and has since expanded to 13 other markets and introduced electric vehicles and one-way service. BIXI bikeshare started in 2009 and has operated as a non-profit since being purchased by the City of Montréal in 2014; since 2019, BIXI has used a mix of pedal and electric-assist docked bikes.

The Opus smartcard was introduced in 2008 in part to reduce fare evasion and fraud that was common under the paper-ticket system, as well as to better allocate revenue from inter-jurisdictional trips. The six-year process of designing Opus was overseen by the regional transit authority, Autorité Régionale de Transport Métropolitain (ARTM), and considered the business rules of its constituent agencies as well as transit operators in the Quebec City region, some 150 miles away.¹³ Despite Opus being an earlier card-based system, travelers are able to add value to their cards through an online account with a custom card reader that travelers can connect to their personal computers via USB. While a cumbersome process by today's standards, these personal

readers have been a bridge to some of the functionality of newer, account-based systems.

Opus can also be used to varying degrees outside of traditional bus and rail services. STM's contracted demand-response "taxibus" and paratransit services accept Opus cards loaded with certain period passes, and Opus cards linked to a BIXI or Communauto account can be used to access bikeshare and carshare vehicles, though a credit or debit card is required for payment. STM has also used monthly Opus passes as a means to offer bundled memberships to Communauto and BIXI at a discount.¹⁴

Beyond Opus, the suburban bus operator Société de transport de Laval (STL) has implemented open payments on many of its bus routes, but STM's implementation in their network is uncertain and more complex given its much larger size and the existence of rail services.¹⁵ In response to the COVID-19 pandemic in 2020, ARTM launched mobile ticketing across the region's bus systems, including STM and STL. Travelers can now plan trips and purchase bus tickets for visual inspection as well as BIXI bikeshare fares through a single account in Transit, the trip-planning app endorsed by STM.¹⁶

Seattle

Transit operators in the Seattle region have taken a highly collaborative approach to EFPS, coordinating the launch of the ORCA card-based system in 2009 through a Joint Board with representation from each participating agency: Community Transit, Everett Transit, King County Metro, Kitsap Transit, Pierce Transit, Sound Transit, and Washington State Ferries.¹⁷

Travelers can manage the value and various regional and period passes on their ORCA card through an online portal.¹⁸ Each agency in the ORCA system uses flat fares, and transfer policies account for any differences in fares between different legs of a trip. Also available are ORCA LIFT, which provides income-adjusted fare discounts, and ORCA Passport, which offers full-time employees access to the region's substantial vanpool and guaranteed-ride-home service.

In addition to the various fixed-route services across the region, Sound Transit and King County Metro have implemented Via to Transit, a first/last-mile on-demand service in areas around select light rail stations since 2019.¹⁹ Travelers can book a ride through the Via app or phone call and use value stored on their ORCA cards to pay for rides on shared vans traveling to and from select light rail stations—the first instance of card-based integration with a transportation network company (TNC), though Via does not operate a direct-to-consumer service in the Seattle area. Fares are collected using ORCA fare readers inside the vans and are equivalent to transit fares, with free transfers to connecting bus or rail service. During the COVID-19 pandemic, the Via to Transit service was temporarily suspended and was reinstated in zones with higher percentages of residents with low incomes, people of color, and individuals with limited English proficiency.²⁰

The region is undergoing an overhaul of the ORCA program to an account-based system with open payment capability. This "next gen ORCA" system will have an open architecture, which allows for easier integration of third-party mobility service providers in the future. In preparation for next gen



OCRA, all agencies eliminated zone-based fares as a way to reduce implementation costs of the new system, and fare-capping features were not pursued, due in part to the complication of allocating revenues across participating agencies.²¹ These moves were taken despite next gen ORCA's capability to implement more complex fare policies, indicating that reducing traveler confusion, reducing interactions between travelers and vehicle operators, and speeding boarding are important driving forces behind fare policies.

Los Angeles

The Los Angeles County Metropolitan Transportation Authority (Metro) introduced the closed-loop TAP card in 2009, eventually expanding to 27 public transit agencies in the LA region over the next eight years. To broaden the reach of the card-based system in a rapidly modernizing mobility environment in a cost-effective manner, Metro began working with its TAP vendor on a soft retrofit, connecting RFID stickers on card readers to an enterprise customer relationship management (CRM) system, allowing for account-based functionality and potential integrations with external mobility services. This new configuration, branded as TAPforce, was unveiled in 2018 and allows travelers to add value to their TAP Wallet through an online portal or with cash through a network of retailers. Value can be applied towards transit trips among participating agencies through the physical TAP card or to non-traditional services in the future. In 2020, the agency enabled iPhone users to add their TAP card onto their mobile wallet, allowing them to tap their phone instead of their physical TAP card to pay for transit fares.²²

Metro Bikeshare, owned by Metro, was the first non-traditional service to be integrated through TAPforce, allowing travelers to unlock bikes using their TAP card, as long as a credit or debit card is linked to their TAP account. A light integration was initially employed in a first/last-mile partnership with Via, where travelers could load their TAP card number into the Via app to receive a discounted fare, though the service has since been made fare-free.²³ Members of the electric carshare service

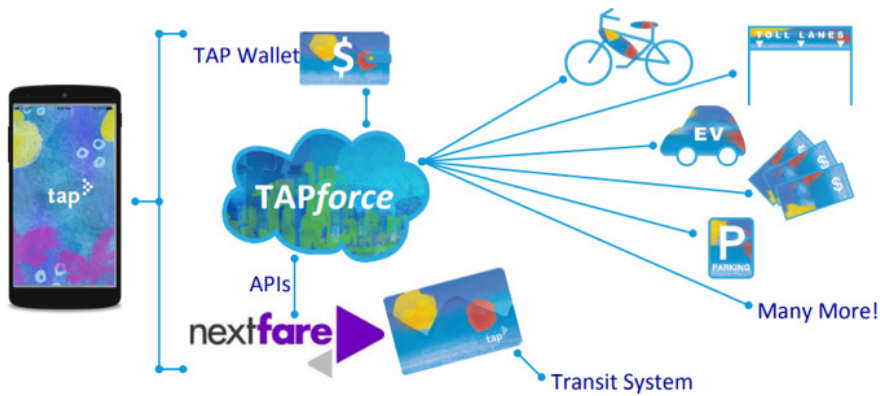


Figure 2: Metro's schematic for the TAPforce ecosystem

BlueLA can also use their TAP card to check out vehicles, as long as their TAP Wallet is tied to a credit card.

Metro's plans involve integration of TAP across more non-traditional services, from publicly managed infrastructure like high-occupancy vehicle (HOV) lanes and electric vehicle (EV) charging, to private shared mobility operators (Figure 2).²⁴

Metro aspires using TAP to incentivize behavior change—making transit or bike trips free during air quality action days, for example. They also plan to implement rewards programs across services and demographic groups.

While Metro's plans are ambitious, they would be highly dependent on the willingness of individual service providers to integrate with the platform since there is no legislative or contractual mandate to do so. Metro is hoping that the initial successes in integrating services like bikeshare and carshare will increase interest among the other service providers and ease the technical burden of future integrations. However, in 2020, Metro launched the Fareless System Initiative, a proposal to eliminate fares across the Metro system.²⁵ If Metro decides to eliminate fares, it would be the largest agency in the country to do so, and may have significant consequences on TAP's role as the region's multimodal payment integration platform.

The EFPS deployments in the Montréal, Seattle, and Los Angeles regions highlight how card-based systems, despite inherent technical limitations, established widespread acceptance of their fare media and initial integrations with shared mobility services. They also show different paths forward for card-based systems that would expand opportunities for deeper multimodal payment integration, whether through supplementing existing fare media through mobile payment options (Montréal), adding account-based functionality through a creative technical framework (Los Angeles), or a full transition to an open-architecture account-based system (Seattle).

Integration through Account-Based Systems

Chicago

The Chicago Transit Authority (CTA) was an early adopter of account-based EFPS, augmenting its card-based Chicago Card with a Plus version in 2004. This was the basis of one of the first direct integrations with shared mobility in North America, where members of the local I-GO carshare could specially register their Chicago Card Plus to unlock reserved vehicles. This was part of an early “mobility hubs” strategy, with many I-GO vehicles co-located near CTA stations. As CTA planned for a system-wide EFPS upgrade and I-GO was purchased by Enterprise car rental, this feature was ultimately dropped.²⁶

The fully account-based Ventra system launched in 2014, notable also for its open payments feature—part of an early partnership with MasterCard that used branded debit cards in lieu of closed-loop agency cards. Initially, Ventra (as with the Chicago Card) could be used only the fixed-route services of the CTA and Pace regional bus but not the Metra commuter rail system, which uses its own paper ticketing. When the Ventra mobile app became available in 2015, and following a legislative mandate from the Illinois State Assembly, Metra joined the platform by making electronic tickets and passes available for purchase using funds loaded onto a traveler’s Ventra account and displayed for visual inspection on the Ventra app.²⁷

In 2020, with support of the Federal Transit Administration’s Mobility on Demand Sandbox grant program, the Ventra app began showing locations of Divvy bikeshare stations and the availability of bikes. Travelers must continue to unlock and pay for rides separately through the Divvy app, Lyft app, kiosks at Divvy stations, or with their physical membership key.²⁸ The City of Chicago’s contract with Lyft, the operator of Divvy since 2018, requires Lyft to work cooperatively to integrate system data with third-party apps requesting such data to enable travelers to purchase rides.²⁹ The agreement further requires this level of integration with the Ventra system by June 2021.

Dallas

After a year of fact-finding trips and discussions with other agencies, including CTA and Metro, Dallas Area Rapid Transit (DART) issued a concept of operations plan for an EFPS in 2012. The original GoPass mobile app launched the following year, allowing users to buy QR-code electronic tickets for DART, Trinity Metro, and the neighboring Denton County Transportation Authority. Early on, the app featured promotions for local entertainment options and eventually links to check-out pages outside the app. In 2015, this functionality was extended to external mobility providers—TNCs Lyft and Uber, and Zipcar carsharing—when they appeared as options in the trip planning interface.

Over the next two years DART processed three RFPs to renew GoPass, transition the larger system to an account-based architecture, and incorporate cash payment; collectively these contracts came to roughly \$31 million.

An upgraded GoPass app launched in 2018, along with several changes to the payment structure, including a fare increase as well as daily and monthly fare capping. The app allows travelers to

purchase and activate tickets and keeps track of the traveler's progress toward the monthly fare cap (Figure 3). The launch accompanied an expanded fare media distribution network through retail partnerships to allow travelers to load cash to their account at locations other than ticket vending machines or transit stations/stops. A physical GoPass Tap card is also available for those who cannot or choose not to use the smartphone app.

In 2019, DART partnered with Uber to have UberPool (shared ridehailing) trips be discoverable in GoPass within their microtransit zones. This partnership with Uber has allowed DART to reduce its per-trip cost in these zones, which have relatively lower population densities. Travelers can book and pay for a trip to a designated transit station in the zone through DART's microtransit service, GoLink, directly in GoPass or with the GoPass tap card (which enables a free transfer to or from fixed-route service), or for a shared Uber ride through a deep link from GoPass to the Uber app (Figure 4). The Uber fare to the designated transit station in the zone is free, but is \$3.00 for other trips within in the zone. However, it can only be paid using payment options available through the Uber app, so GoPass cannot be used. In 2020, bikeshare availability in Fort Worth was integrated into the GoPass app, but like DART's partnership with Uber, booking and payment must be done not through GoPass but through the B-Cycle bikeshare app.

Portland

The Tri-County Metropolitan Transportation District of Oregon (TriMet) began its transition to the account-based Hop Fastpass EFPS in 2012, and like DART, developed a concept of operations plan to guide the process. TriMet's goals included improving traveler experience around ticket purchasing and transfers and reducing collection expenses by making fare media available for purchase at local retailers instead of solely through ticket vending machines.³⁰ The Hop Fastpass system launched in 2017 on TriMet service, the City of Portland streetcar, and the suburban C-TRAN bus system. Fare readers accept closed-loop Hop cards as well as open payments via contactless bankcards and mobile wallets. A virtual Hop card can also

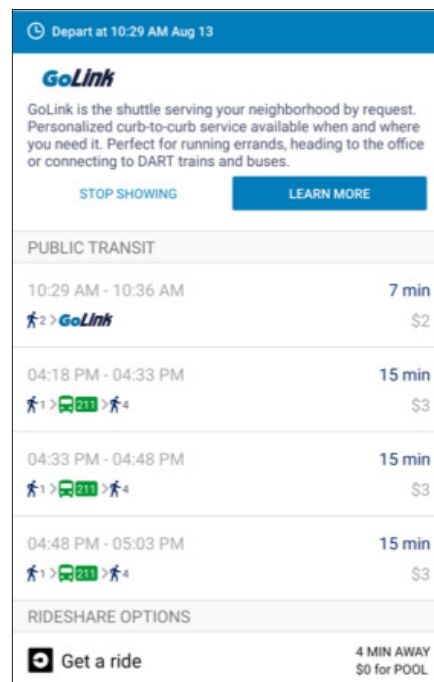


Figure 3: GoPass screenshot showing a traveler's fare capping status



Figure 4: GoPass screenshot of trip-planning function with deep link to a subsidized UberPool trip.

be loaded on to mobile wallets; a physical card is not required to pay with a Hop account. Daily fare caps automatically apply to open payments, and both daily and monthly fare caps automatically apply to Hop card users, whether they use a virtual or physical card.

Since the launch of the Hop card, TriMet staff have emphasized the importance of rider education—particularly when transitioning from paper ticketing—for both travelers and operators. As of December 2019, 80.7 percent of TriMet’s fares have been collected through Hop Fastpass, most paper fares have been phased out, and institutional pass holders have converted to Hop Fastpass.³¹ A full transition of paratransit services to Hop Fastpass is expected by the end of 2021. While the Hop card is widely used, only four percent of “taps” on the Hop Fastpass system are utilizing open payments.³²

The procurement process of this open architecture system led to a separate vendor for each of the major EFPS functions: new ticket vending machines, website and mobile application design, accessibility features, and a backend platform manager that would maintain the open Application Programming Interface. Vendors were working simultaneously on front-end elements such as branding and mobile-interface while the technical back-end elements were still being designed, leading to bottlenecks and highlighting the challenges of a “waterfall” approach—where a fully-formed system goes live—as opposed to an iterative and agile approach.³³

TriMet’s Open Trip Planner allows travelers to plan multimodal trips but directs them via deep links to Uber and Biketown bikeshare apps for payment, as opposed to payment being fully integrated into the trip planner.³⁴ While this offers a healthy distance from delays or any customer dissatisfaction with those third-party providers and allows their trip planner to be more flexible, this may represent a fragmented experience for travelers, who must use multiple apps to complete their bookings.

Moving forward, TriMet is exploring the business case for integrated payments, expanding open payments for concession fares and monthly capping, and expanding functionality of the virtual Hop card. This is funded through the FTA Integrated Mobility Innovation grant program.³⁵

The Chicago, Dallas, and Portland regions show how newer account-based EFPS transitions can focus on mobile devices as the media for agency-issued cards, ticketing, and/or open payments. The examples also highlight ways an upgraded system can enable more equitable fare policies (e.g. fare capping, cash-to-account retail network) and multimodal trip planning. However, deeper payment integration, especially with private or non-traditional mobility providers, is still elusive, relying on one-off agreements, policy actions, or alignment of business interests with agency goals.

Key Observations

Fare payment systems are a means to harmonize transit operations. Whether bringing transit services in entire regions to a common payments platform, as in Montréal, Los Angeles, and Chicago, or the consolidation of business rules and fare policies, as in Seattle, Dallas, and Portland, advancements in payment systems have been a means to coordinate transit operations and communications and enhance the traveler experience.

Fare payment systems can be a means to harmonize transit with shared mobility. Smartcard systems in Montréal and Chicago integrated access to carshare, connecting public transit with community-oriented mobility services. Seattle introduced actual payment for on-demand transportation through their smartcard system. Los Angeles's vision for the "TAP ecosystem" is a blueprint for how payment integration can be a means to make the planning, access, and use of multiple mobility options closer to a true network of services. However, successfully integrating payments fully with private mobility services, through both technology and fare structures, is still largely elusive in the absence of any policies, requirements, or incentives as driving forces.

Upgrades to fare payment systems can take on various forms as mobile technologies have matured. Thanks to recent technological advancements, account-based architectures offer a robust ability to implement multimodal payment integration and flexible fare policies both among regional transit operators and with outside service providers. For agencies moving from a paper-based system, this transition may be easier than for card-based systems with existing contract arrangements and widely used fare media and hardware that are already implemented over a large service area.

Even as systems in Chicago, Portland, and Dallas show that a massive overhaul of EFPS is doable, incremental steps can be taken to implement the right solution for a given community to reduce payment friction, improve access for the unbanked, and expand mobility options. The experiences in London and Los Angeles demonstrate that is possible for card-based systems to add account-based functionality without requiring wholesale EFPS replacement. Furthermore, payment solutions have expanded to include companies specializing in mobile ticketing and trip planning. These partnerships have ranged from turnkey solutions through existing third-party business-to-consumer apps, as in Montréal, to "white label" agency-branded apps on a business-to-government basis, as in Dallas.

As adoption of contactless bankcards has been much slower in the US than in other developed countries, usage by travelers on open payments-enabled systems in the US has been low. However, contactless bankcards are gaining traction in North America in the past couple years through the efforts of card issuers and supporting industries, and systems such as those in the Montréal, Portland, and Seattle regions have shown an interest to partially implement, fully implement, or be ready to accept open payments as they expand payments solutions.



Recommendations

Transit agencies remain uniquely positioned to leverage their service network and payment technology to integrate public and private mobility services in ways that best support the public interest. The examples above demonstrate that agencies do have the ability to integrate elements of fare payment systems across public transit agencies, as well as some municipally supported and private-sector shared mobility services. The recommendations below provide guidance for agencies that envision themselves as the hub of mobility transactions in their communities.

Community needs and characteristics should drive payment solutions.

Agencies should strive to reduce the barriers to access and payment for transit services, and solutions should be oriented towards the needs and preferences of travelers. Both traditional and advanced payment technologies can serve this goal, so agencies should be open to innovative forward-looking solutions. Agencies should understand the prevalence of unbanked, underbanked, and socio-technologically disadvantaged populations and the penetration of contactless bankcards in their community to inform implementation of suitable payment systems, including cash-to-account options, mobile ticketing, and open payments. Cash payment options will likely need to exist since US Department of Transportation policy requires avoiding or mitigating disproportionate harm to low-income populations.³⁶

As the prevalence of contactless cards and mobile wallets increases, agencies can periodically assess the costs versus benefits for an open payments system. In addition, as the COVID-19 pandemic has been shown to spread through close in-person contact, the industry is seeing potential benefits of using open payment to accelerate moving away from onboard cash payment or other similar payment methods that risk increased interaction time between riders and bus drivers.

Mobile ticketing currently offers access to a wider audience, including travelers who are unbanked or underbanked. Mobile apps also offer the clearest pathway to integration with shared mobility services, which are mostly app-driven. Common business models for mobile ticketing include an app shared with other agencies, a white label app, or partnering with existing third-party mobility apps so travelers can pay for transit trips using apps they may be already using for other transportation purposes.³⁷ Here again, agencies should learn which apps are popular in their community to explore ticketing partnerships to expand the reach of their services. These mobile-first efforts can offer a path toward an account-based system, especially for smaller transit agencies.



Desired outcomes and adaptability should drive payment system partnerships.

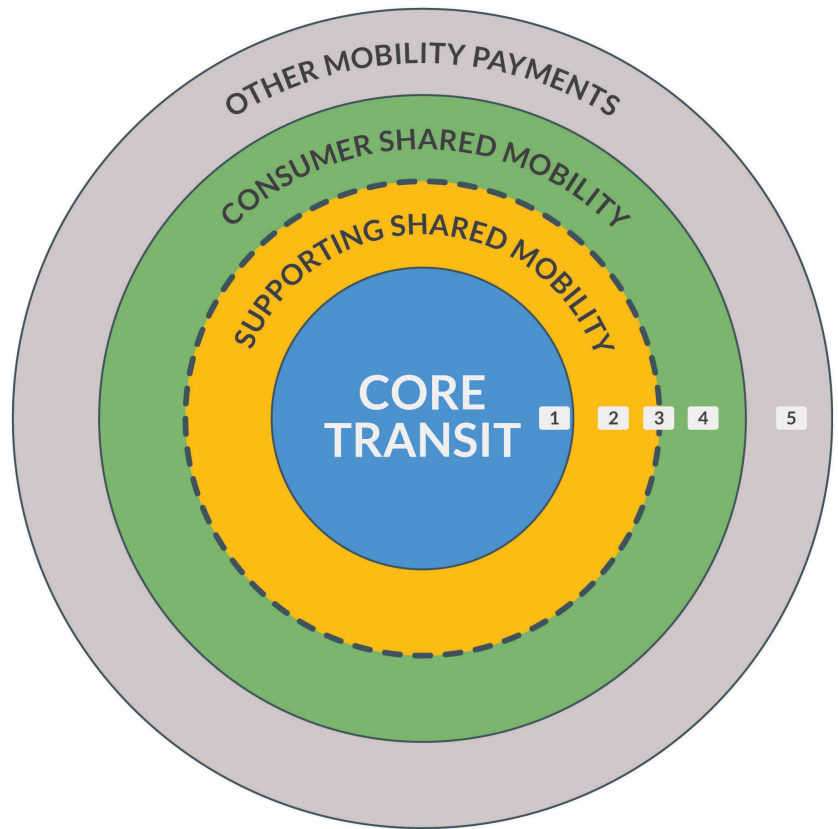
Agencies should consider prioritization of flexible performance features—such as open architectures, the ability to connect to external (preferably standardized and public) APIs, or open payments—during the EFPS procurement process and transition plans. These help to ensure adaptable “future-proof” arrangements that keep open the option to integrate different mobility services and payment options that serve the agency’s goals.

Mobility services that support agency goals should be the priority for payment integration.

Various forms of payment integration are common among separately operated transit services within a region because they are often planned and operate as a connected network. With advancements in payment technologies, additional services, including ones in the private sector, can be integrated in a similar fashion. When exploring opportunities to integrate payment beyond traditional transit services, agencies should prioritize modes and use cases for traveler-centric solutions that serve the public interest, increase the effectiveness of their services, and improve the efficiency of their operations. Typically, the agency would subsidize or otherwise partner/contract with third-party providers for these services, such as taxi/ridehailing services for certain populations or geographic areas or access to municipal bikeshare systems. Payment integration would facilitate seamless and efficient integration of such partnership-based services.

Conceptual Framework for Integrating Mobility Payments

With many opportunities and challenges associated with multimodal payment integration, following a systematic approach can help agencies derive the most benefits for their communities. Agencies can consider the concentric conceptual framework described below, where public transit is at the core, and payment integration is pursued outward from there, prioritizing shared mobility services and use cases that serve public goals in concert with a single fare policy.



1 First, payment integration should be prioritized across all traditional **Core Transit** services within a region. These include services branded or operated by transit agencies in the region, including fixed-route bus and rail, ADA paratransit, and any agency demand-response services. Integrating payment across the regional transit system, including different operating agencies, has the obvious benefit of easier travel across the region, but also increases seamless payment options for a greater number of people, thus providing an opportunity for making transit more accessible and increasing the potential for ridership.

2 Next, agencies can focus on integrating payment for **Supporting Shared Mobility** services. These are services that support the mobility and policy goals of an agency, usually as a supplement to core transit services, but are not operated by the agency. Context and goals can vary by agency or region, but these services could include first/last-mile connections to fixed-route transit, on-demand service for people with disabilities, and more. Often, these services are part of a larger set of a mobility services offered directly to consumers. Targeted services in certain geographic zones or time periods, such as the one between DART and Uber, are common recent examples. Community-supported services, including community carshare or municipal bikeshare, could also be good candidates for this category. To date, these partnerships have linked fare media to accessing/unlocking vehicles as opposed to paying for actual trips.

3

In parallel, the agency can develop a **single fare policy** encompassing **Core Transit** and **Supporting Shared Mobility** services as a cohesive unit. Features of the single fare policy would depend on the agency but could include a simplified fare structure, with fare capping and clear transfer policies between modes, and acceptance of a common set of fare media across all services in these two categories. The fare policy could also include more dynamic features, such as incentives to use different services to alleviate crowding or to use transit to reduce emissions. Through subsidies or contracted operations, the agency can attract mobility service providers to operate Supporting Shared Mobility services and, in exchange, require them to integrate with the agency's payment systems. Integration of the Via to Transit service with the ORCA system with free transfers to fixed-route transit in Seattle is an example of this.

Advancements in payment systems technology could also enable virtual reconstruction of travelers' multimodal trips and application of the appropriate fare benefits for which the traveler is eligible. For a wider reach, this integration could be done through an open payments system, which would remove an important obstacle for many travelers (having the right account/media) as well as infrastructure costs for agencies (card readers), but this would require sensitive transaction and trip information to be exchanged between providers and the agency, for which new technological and contractual arrangements may be required. To date, the combination of open payments with a single fare policy has been limited to Core Transit services (e.g. London, Portland).

4

After establishing an effective presence in core and supporting services, agencies can look to integrate payment with **Consumer Shared Mobility** services. These are the direct-to-consumer shared mobility services, typically enabled through apps, such as ridehailing/ taxis, micromobility services, and carshare.

Agencies' strength building a recognizable brand for their payment system across the Core and Supporting Shared Mobility services can entice Consumer Shared Mobility services to integrate with it, putting the agency in a position to be the regional mobility payment integrator, either directly or as an overseer of a third-party entity. Agencies can first work with service providers who voluntarily integrate, but policy changes may be needed to ensure that all private shared mobility operators make their data public to allow for integrated trip planning and payment. Such public API requirements exist in select areas in the US and are generally limited to availability of micromobility vehicles. In Finland, mobility service providers across the country are required to make their data about schedules, availability, and payment public for use in third-party trip-planning platforms.

5

Finally, the agency can extend their integration into **Other Mobility Payments**. These can include payments associated with private driving, such as tolls, parking, or electric vehicle charging.

Together, the components form a comprehensive strategy for payment integration. The wheel shows an example for a hypothetical transit agency (Figure 5). In practice, agencies must determine which services and modes should be included in which layers based on their own goals. Note that a single mode can be considered Supporting Shared Mobility or Consumer Shared Mobility (or perhaps in another layer) depending on the use case.

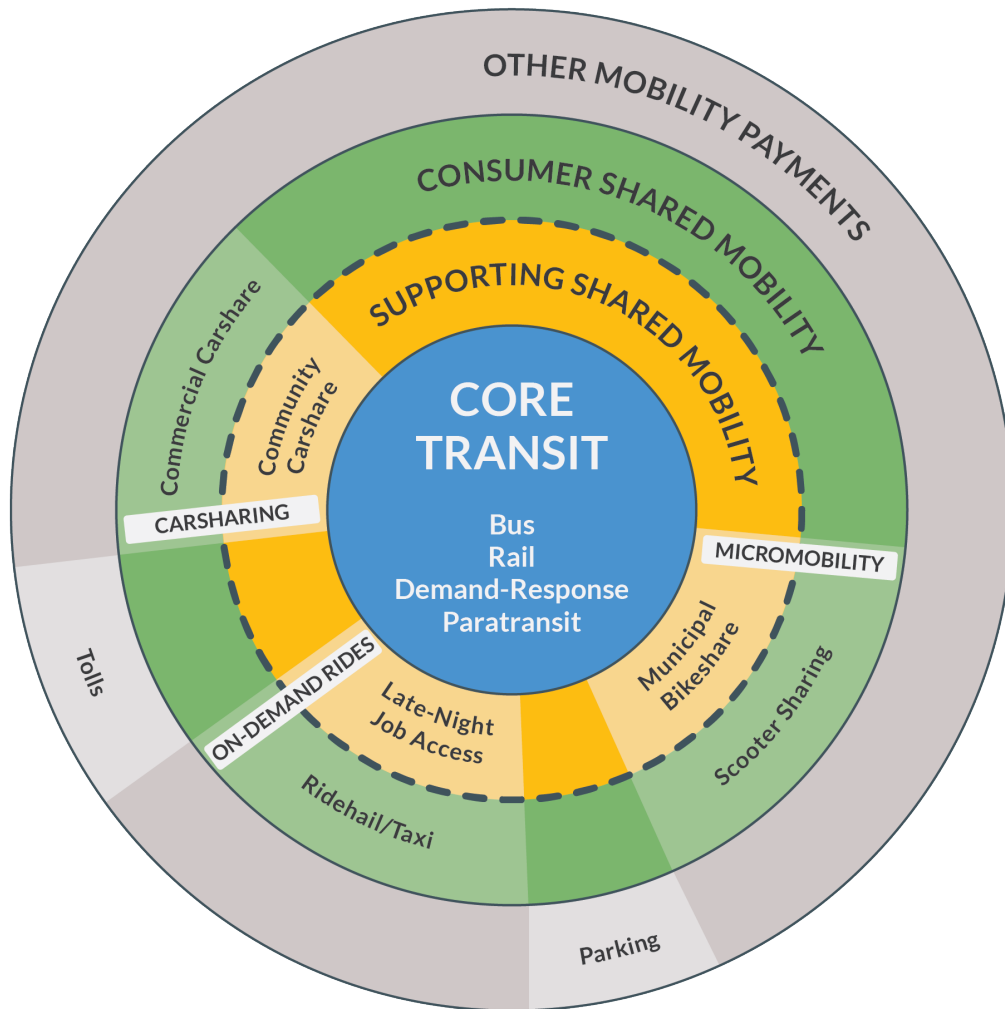


Figure 5: Conceptual Payment Integration Approach for Transit Agencies. Agencies should start at the center of the wheel and work outward. Specific shared mobility services and the layers in which they are listed are only examples.

Conclusion

Payment integration is an important step toward a multimodal transportation system that works for all. The reach of public transportation in our communities is an asset that uniquely places transit agencies as the party to drive payment integration across the mobility ecosystem, allowing for more seamless travel across a region.

Agencies' journeys toward more traveler-friendly, technologically advanced payment systems have varied based on their initial conditions, community characteristics, and goals. In most cases, agencies have not yet fully realized the potential of these advancements to implement integrated multimodal fare structures, which may be more complex on the administrative end but remove an important source of friction for the traveler.

With private-sector providers making progress in becoming mobility integrators themselves, and some being resistant to involvement in public agency integration efforts, it is vital for a public-interest entity, such as a transit agency, to ensure that all eligible services can participate and that all travelers can access services. By approaching this systematically, with public transportation at the core, a coordinated fare structure, and contractual or policy requirements for private mobility services, transit agencies can become the go-to source for unbiased mobility information and payment transactions for all travelers.

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