Priority Area Four: Regionally Integrated Payments

The operating partners in the Triangle Region have developed a vision for regionally integrated payments where riders are able to easily manage transit payments for mobility services across the region with equitable options for unbanked/cash-based riders. The purpose of this memo is to identify and examine technologies available to collect transit fares and discuss potential opportunities and benefits of regionally integrated payments. This assessment of the region's fare collection solutions will focus on cost-effective integrated payment options for agencies to better serve existing riders, attract new riders, and improve rider experience. The assessment will be part of a comprehensive Regional Technology Plan to guide transit technology integration and innovation across the Research Triangle region. This memo prioritizes collaboration among counties, cities, and transit providers, ensuring that technological solutions are scalable, interoperable, and sustainable.

Current Status of Fare Collection in Triangle Region

In the immediate years following the COVID-19 pandemic, transit agencies in the region were not requiring fares of passengers for transit service in an effort to increase ridership. Since 2024, three transit agencies have returned to fares to include GoTriangle, GoRaleigh, and Orange County Public Transportation (OCPT). GoDurham and GoCary have not yet returned to fares, and Chapel Hill Transit has not accepted fares for over 20 years for public transit service.

Figure 1. Summary of Transit Agencies Collecting Fares in Triangle Region

Transit Agencies	Collecting Fares?	Notes
GoTriangle	Yes	Returned to fares in 2024
GoRaleigh	Yes	Returned to fares in 2024
Orange County Public Transportation (OCPT)	Yes	Returned to fares in 2024
GoCary	No	Have been fare-free since 2020
GoDurham	No	Have been fare-free since 2020
Chapel Hill Transit	No	Have not been accepting transit fares for over 20 years

While the agencies are at different stages of fare collection, transit service will continue to grow throughout the region and understanding how fare collection technology can support this growth is important for all transit agencies in the region.

Interoperability in payment integration and cash collection systems

The components of an Automated Fare Collection (AFC) system usually includes smart cards (i.e., GoPass), fare gates or validators, ticket vending machines (TVMs), inspection devices, back-end servers, and mobile applications / web portals. Interoperability requires these system components to exchange data that is understandable, accessible, and in a common format. Clean data available in open systems, with Application Programming Interface (API) connections allow AFC systems to be interoperable.

Common fare media that operate within similar technology, processes, and commitments is often a catalyst for interoperability. Agencies with regionally aligned fare structures and systems report that the common fare media promotes a reliable, easy payment experience.

Aligned fare rules and common back office and reporting requirements facilitate regionally integrated payments. In the case of the Triangle Region, common fare media (Umo Go Pass/mobile ticket), and integration elements like APIs help to accomplish account based ticketing and fare capping in a regional setting. Operating partners have already begun services in an interoperable manner by organizing the budgets, staff, and technical resources towards a goal of a regional fare collections system.

Market Analysis on Fare Collection Systems

Figures 2 and 3 compare features for regionally integrated fare systems to quickly visualize common software and functionalities available from Software-as-a-Service (SaaS) system integrators and Mobility-as-a-Service (MaaS) providers.

SaaS is cloud-based software that is accessible from the internet. Its subscription pricing model makes for simple scaling and stay current with the latest updates and security features. Industry experts, like Microsoft, show future SaaS trends include greater Artificial Intelligence (AI) adoption, the rise of low-code and no-code platforms, and stronger focus on security and compliance.

MaaS from a rider's view is a platform, mobile app, website, and/or a phone number that provide(s) a source of information about available transportation in the area including eligibility, pricing, schedule, and payment options. Realtime alerts and information are also part of a typical MaaS technology platform. For an agency, Maas is an approach to view a transportation network of which transit modes are a key element. From this view point, all providers of transportation are not in competition with one another, they are part of one ecosystem. MaaS solutions incorporate modes like fixed route and on-demand services like mobility-as-a-service offerings.

Fixed route refers to the region's bus fleets and on-demand refers to transportation and transit services that riders schedule. They could be from a transportation network company (Uber, Lyft, Lime, etc.) or a micromobility service operated by an agency in the region. These are also first mile and last mile travel options for riders to get them from point A to point B. Agencies offer many creative first/last mile solutions for their riders locally. With the proper integrations, paratransit services can potentially be part of the MaaS solution as well.

As summarized below, SaaS payment system integrators have different configurations. Some back-end solutions rely on third-party services to process funds, while others manage accounts internally. Certain vendors have a third-party cash option – such as mechanical fareboxes for cash, while others have third party partnerships to distribute or load contactless smartcards at third party retailers. Most providers have a mobile application to access services. Since a seamless transit journey usually starts with the app, there is a compelling argument for agencies to use app ratings found in mobile app store platforms as an indicator of rider satisfaction or room for improvement.

Figure 2 compares several transit payment integrator SaaS offerings with the key features present in a regionally integrated payment system. Data was gathered from publicly available sources such as industry reports, websites, or transit agency publications.

Figure 2. Key Software-as-a-Service (SaaS) Integrators Providing Integrated Systems

Vendor *Available offerings noted by a ☒*		Description
INIT ☒ Cash on-board (integration) ☒ Mobile app *and* GoPass ☒ Cash substitute on-board ☐ Mobile app *or* GoPass ☒ Trip Planning	☒ Underbanked Solution ☒ Single app pay and plan ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☒ First/Last Mile Integration with micro-transit / micro-mobility providers	INIT is a systems integrator of cloud-based fare management and real-time insights ridership. INIT supports multiple services and contactless EMV payment technology and fare capping. Supports mobile apps and real time trip planning. Features interoperability between fare collection, fleet management and other systems for an **open mobility platform**.
Conduent ☒ Cash on-board (integration) ☒ Mobile app *and* GoPass ☒ Cash substitute on-board ☐ Mobile app *or* GoPass ☒ Trip Planning	☒ Underbanked Solution ☒ Single app pay and plan ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☒ First/Last Mile Integration (custom) with micro-transit / micro-mobility providers	Conduent is a smart mobility technology solutions company that designs and implements contactless payment systems with payment processing and reconciliation. Supports mobile app, bank card and cash payments. Robust reporting for real time insights. Interoperable **connections to existing systems.**
Genfare ☒ Cash on-board (native) ☒ Mobile app *and* GoPass ☒ Cash substitute on-board ☐ Mobile app *or* GoPass ☒ Trip Planning	☒ Underbanked Solution ☒ Single app pay and plan ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☒ First/Last Mile Integration with micro-transit / micro-mobility providers	Cloud-based software service with validating **fare boxes for cash**. Used in the region today. FastFare model upgrades software for open payments. Farebox APIs ready for other vendors to develop integrations. The Mobile Link™ rider application which features trip planning and e-Fare® for mobile payment. API integration helps riders plan and pay for combinations of transit, first mile/last-mile modalities, and even parking. The system solution provides back office support and reporting (transactions, reconciliation, ridership, device monitoring, field equipment monitoring, etc.). *Genfare Link connected all available transit modalities for the Capital District Transit Authority.*.
Vix Technology ☒ Cash on-board (integration) ☐ Mobile app *and* GoPass ☒ Cash substitute on-board ☒ Mobile app *or* GoPass ☒ Trip Planning	☒ Underbanked Solution ☒ Single app pay and plan ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☒ First/Last Mile Integration with micro-transit / micro-mobility providers	Open-loop payment provider for digital mobility payment systems. Solution is more than an overlay. The core offering focuses on **supporting open payments.** Offers solutions for account based fare collection, contactless smartcard, mobile ticketing and MaaS solutions.
Cubic (Umo) ☒ Cash on-board (integration) ☐ Mobile app *and* Go Pass ☒ Cash substitute on-board ☒ Mobile app *or* GoPass ☒ Trip Planning option	☒ Underbanked Solution ☒ Single app pay and plan ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☐ First/Last Mile Integration with micro-transit / micro-mobility providers	Current validator devices for GoTriangle account-based fare collection system with fare capping and regional footprint. **Used for contactless smartcard, mobile tickets and trip planning**. 3rd party integration is required for cash solutions; agency subscription unlocks premium trip planning in Umo. Retail network for cash loading on GoPass. APIs in upgraded validators can access open loop platform for virtual wallet, contactless payment.
Littlepay ☒ Cash on-board (integration) ☐ Mobile app *and* GoPass ☒ Cash substitute on-board ☐ Mobile app *or* GoPass ☐ Trip Planning	☐ Underbanked Solution (custom) ☐ Single app pay and plan (custom) ☒ Interoperable Payments-Fare Capping ☒ Open Payments ☐ First/Last Mile Integration with micro-transit / micro-mobility providers	Scalable transit payment platform that overlays on existing fare system, provides open payment to enable contactless payment solutions. Hardware agnostic approach. Google Transit Insights Integration to access fare tracking and journey information directly into mobile wallets. **Supports multi-agency fare capping..** Reporting tools and fraud prevention. *Cubic TR-4 validator integration at WMATA for open payments.*

While all vendors have APIs that can exchange functionality between systems, each will need to be investigated to ensure features can be supported after the final architecture selection.

For each vendor, characteristics of the MaaS solution are marked with an "X." The nuances of each base product are important to compare when the regional fleets are composed of different services. Notable agency integrations with vendors are italicized in Figure 3 below. Data was gathered from publicly available sources such as industry reports, websites, or transit agency publications.

Figure 3. Key Vendors Providing MaaS fare collection solutions

Vendor *Integration examples*	Description	**Single app for pay and plan trip**	**Open payment**	**First/ Last Mile Integration**	**Unbanked solution**	**Interoperability payment fare cap**
Reach Now (Moovel) *Cubic integration (CTA)*	MaaS solution offers **trip planning for transit modes both public and private** (TriMet).Mobile tickets (MDOT MTA). App integrates virtual cards (rider virtual wallet) with Apple Pay; Google Pay prepaid cards for digital payment.	☒	☒	☒	☐ cash to digital option	☒
Via Transportation	Provides mobility solutions primarily focused on dynamic routing to serve **on-demand, paratransit and microtransit** services. Riders can choose destinations, review multimodal options and pay for travel. Integrates with existing fare system- First and last mile solution integrates with public transit to bridge gaps in fixed route networks.	☒	☒	☒	☐ custom solution	☐ custom solution
Token Transit *Genfare/FastFare integration TARC, COMET, JTA*	Scalable mobility solution lets rider purchase, activate and board by mobile app. Provides mobile ticketing for public transit and **integration with CashApp for unbanked.**	☒	☐ Roadmap 9/2025	☐	☒ cash to digital option	☐ custom solution
Transit (Transit App) ***Used in the region*** *today along with Transit Royal premium subscription.*	Provides transit information specific to a rider location. Provides departure times, track buses and plans trip with a trip comparison tool. Payment for fares when **integrated with other mobile ticketing platforms (i.e., Token Transit).** The ability to pay for multiple modes is only open to cities where Transit has partnerships with agency and Transportation Network Companies (TNCs). Subscription unlocks premium features.	☒	☐	☒	☐	☐ custom solution
Spare Technology Labs *Token Transit Integration DART*	Microtransit and Paratransit platform that facilitates payment for on-demand and first/last mile transit. Integrates payment systems for seamless fare collection. **Fare management system can support fare capping rules.** Riders can book, manage and pay for trips.	☒	☒	☒	☐ custom solution	☐ custom solution

The MaaS marketplace is kinetic. Open loop payment solutions increase with each successful integration achieved. The MaaS industry uses deep links to promote a rider journey payment with third-party apps. When agencies provide MaaS vendors deep links for payment they are "meeting riders where they are." Riders can use the app of their choosing and pay fares in multiple ways.

The banking industry sees open loop payments as a must-have for transit agencies. US Bank actively promotes contactless and open loop payment opportunities[1] for transit agencies. Bank-led partnerships are taking hold in other parts of the world in similar industries like road-tolling. Both instances are forward-thinking and would indicate a trend for banks to partner with or be the integrator for transit payment systems in the near-mid-term.

Review of Trip Planning and Payment in a Single App

Part of "meeting riders where they are" means letting riders choose more than payment type or service mode. It also means having the choice to use their preferred app to plan the journey. For example, MaaS providers that specialize in on-demand and mobility can activate ticket purchases when agencies provide APIs and agree to deep link integration. A final consideration for trip planning, tracking, and purchase is the dependence on smartphones. In the unlikely event there is no cellular service or a rider does not have a mobile phone, more traditional methods of fare purchases may be sought.

While adopting modern app-based solutions to streamline rider experiences is often beneficial, trip planning alongside fare purchase in a *single* app may be premature. Operating partners can first consider the rapid growth in the SaaS/MaaS industry and also the current specifics of the region—namely:

- The momentum of electronic fare collection solutions for system integration is gaining speed with each agency implementation. SaaS, MaaS integrations are cost effective solutions so deployment of new features is modular and does not require custom development for efficiencies like trip planning.
- At present, GoTriangle, GoRaleigh, and OCPT collect fares on fixed routes, while GoCary, GoDurham, and Chapel Hill Transit remain fare-free.
- Communities throughout the Triangle Region are served by on-demand services alongside micromobility and, paratransit options. Providers in these on-demand scenarios already 'plan' trips and give riders a time window for arrival.
- Other agencies in the US (e.g., CapMetro) are currently exploring the integration of trip planning systems with separate trip payment applications.

It is a reasonable approach and recommendation that the GoTriangle operating partners monitor and learn from ongoing, successful integrations first, before committing to a single app that provides both trip planning and trip purchase at this point in time. Trip planning tools available in the region are addressed in the following section.

GTFS Fares

General Transit Feed Specifications (GTFS) uses two files to model fares: fare_attribtes.txt and fare_rules.txt. Together, they create a feed for fares. GTFS Fares V1 is a basic representation of fares but its architecture lacks sophistication of complex fare rules and transfers. GTFS Fares V2

[1] https://www.usbank.com/splash/corporate-commercial/mass-transit-contactless-payments.html

improves on describing fare policy rules in a consistent format for standardized consumption. Agencies may publish official V1 and interim V2 independently of one another.

GTFS Fares V2 accounts for fare variations and filters the features in a modular way to account for the many factors that will determine a riders fare. GTFS Fare data is listed by agencies in a tabular spreadsheet to model every instance of the following types of data.

The main data type that agencies would post for agencies to publish in a series of files. The GTFS repository offers a template of the data types required.[2] Agencies further refine the GTFS feed with specifics that:

- Define a transit fare(one day, week pass, month pass, etc.) (fare_products.txt)
- List rules for single leg journeys (fare_leg_rules.txt)
- List rules for transfers (fare_transfer_rules.txt) (use the same unit of measurement, seconds)
- Describe service locations in the same fare zone (areas.txt , stops_area.txt, and fare_leg_rules.txt)
- Describe what fare media is accepted (fare_products.txt and fare_media.txt)
- List price differences based on fare media (fare_media.txt, fare_products.txt,) e.g. ,cash vs. smartcard
- Describe a contactless fare media option “tap to ride” (fare_products.txt) e.g., – tap to ride cEMV (contactless Europay, Mastercard, and Visa).
- Define price differences based on time and day of trip (calendar.txt) (use the same unit of measurement)
- Define time-variable fares along with zone based fares (peak, non-peak)

The greater the ability to organize the data points in the categories above, the more fare costs are discoverable. Trip planners have the ability to consume most of the GTFS Fare feeds so that riders can factor in costs when choosing between transit options.

Existing Fare Collections Systems in the Region

Currently, GoTriangle and GoRaleigh buses have Umo validators for mobile payments and Genfare fareboxes for on-board cash payments. OCPT riders use the Umo smartcard or Umo mobile ticket app. OCPT does not accept cash on-board buses. The validators and fareboxes are the primary means to accomplish fare collection for the region.

Umo smartcard account creation protects stored value and activates benefits for eligible riders. Umo mobile ticketing with a Quick Response (QR) code ticket can be used in place of the Umo smartcard. Umo full-fare account holders benefit from fare capping. Fare capping democratizes transit access to all passengers by removing the cost barriers associated with paying upfront for a period pass. They also guarantee the best fares for riders, ensuring they are never overcharged for their journeys.

[2] https://share.mobilitydata.org/faresv2-template

For cash collection, GoTriangle has the Genfare Odessey farebox on-board buses. Genfare's newer model— the FastFare farebox is on-board GoRaleigh's bus fleet. This newer model of the Genfare fareboxes is redesigned to readily accept software/firmware upgrades to process open payments as well as integrate with other transit tools. The Triangle Region has different fare policies on accepting cash and fares. Regional payment integrations typically involve alignment of fare rules and other payment forms for consistency for riders and help avoid complicated back office reconciliation efforts.

Fare-free operating partners use Umo's account-based features to register riders, which also could contribute to reporting or reconciliations between operating partners. GoDurham will continue to be fare-free for the immediate time and GoRaleigh has only recently returned to fares. Figure 4 shows the number of GoRaleigh passengers by fare type as a percentage of Automated Passenger Counter (APC) counts.

Figure 4. Passenger Count by fare type for GoRaleigh

GoRaleigh Passengers fare data by fare type	Number of Passengers	Percentage of APC
UMO Stored Value (Self-Pay)	140,064	2.2%
Partner GoPass	197,560	3.2%
TAP Pass (Umo)	3,342,929	53.6%
Youth Pass (Umo)	71,521	1.1%
Cash on Bus	186,821	3.0%
Total all fare types	3,938,895	

GoRaleigh reports that the fare data in Figure 4 represents only 63% of the APC totals for GoRaleigh. Reasons for this data gap may range from registered riders that don't tap or inconsistent operator validation (e.g., Senior Pass). Fare data and APC discrepancies are not uncommon and can be lessened by either a policy (change in fare rules that all riders must tap) or technological solution (confirm APC hardware state of good repair). Despite the variance, volume of GoRaleigh riders that are registered with and Umo account is significant. **The Umo validator/contactless smartcard solution has a significant footprint in the Region.**

When looking at the October 2024 data from fixed route revenue sources that GoTriangle presented at the February 2025 Board of Trustees Meeting, Umo Passes represent a majority of transactions reported for GoTriangle Fixed Route Revenue Sources.

Figure 5. Revenue percentage by fare type for GoTriangle

GoTriangle FY24 Revenue by fare type	Revenue	Percentage of Revenue
Umo Self Pay	$28,000.	16%
Partner GoPass	$63,000.	37%
TAP Pass (Umo)	$58,000.	35%
Youth Pass (Umo)	$2,000.	1%
Cash on Bus	$18,000.	11%
Total revenue all fare types	$170,000.	

TAP Pass and Youth Pass benefits are tied to a registered Umo account, riders receiving either of those benefits are not paying fares. For riders that receive these free fare benefits there is little or no need to pay a fare with a credit card tap or wearable. Even Umo Self Pay and Partner GoPass riders that get a discounted benefit have little incentive to use an unlinked, open form of payment. This 'anonymous' payment from a credit or debit card that is not linked to their Umo account would not, for example, register the reduced fare benefit or count the fare against their fare capping total. Still, registered Umo account holders with credit or debit cards have open payments as an alternate form of payment in the rare instances of phone issues or forgotten wallets.

Operating partners have fare collection systems that support both cash and account-based payments. The software solutions used for trip planning vary widely—some agencies develop their own apps and websites, while others rely on third-party platforms like Google Maps and Transit (Transit App), which are the most commonly used and frequently recommended on operating partners' websites. Figure 6 considers fleet composition and fleet size as a factor in technologies used for fare collection. Trip planning often includes last-mile options for riders. Three agencies collect fares for fixed routes: GoTriangle, GoRaleigh and Orange County. All but OCPT and Chapel Hill Transit (CHT) have private operators running services on agency vehicles.

Figure 6. Agency Technologies for Trip Planning and Fare Collection and Fleet Sizes

Agency Technology	GoTriangle	GoRaleigh	GoDurham	GoCary	Morrisville	Apex	Wake County	OCPT	Chapel Hill Transit	UNC Chapel Hill	NC State Wolfline	Duke
Go Triangle MyRide(Trip spark Trapeze)	x			x								
MyStop (Avail Technologies)			x									
GoAccess (Mobility by Ecolane)		x				x	x					
Morrisville SmartShuttle Via					x							
GMV									x			
Transloc												x
Transit App /Transit x Royale X	x	X	X	x		x	x	x	X	x	x	
Google Maps	x	x	x	x		x		x	x	x	x	x
UMO Bus tracking app	x	x	x	x		x		x	x		x	x
UMO fare collections validator	x	x						x				
Genfare Fareboxes	Odyssey	FastFare										
Operator: Fleet Size	GoTriangle (fixed-route); Transdev (demand response)	RATP-Dev	RATP-Dev	MV Transportation	GoCary fixed routes	GoCary fixed route, GoWake Access	RATP-dev (GoWake Access)	OCPT	CHT	UNC -CH	Transdev	Not reported
Bus – fixed route	44	84	34	11	0	1	0	5	74			
Demand Response**	15	178	67	15	2	1	51	16	14			
Van Pool	17	0	0	0	0	0	0	0	0			

*While Transit App does register routes for smaller communities, without the premium subscription, offered route options are limited.

**Vehicles Operated in Maximum Service (VOMS) data from 2023 NTD presumes demand response vehicle totals include paratransit service vehicles.

The table in Figure 7, below highlights the different mobile app technologies used by operating partners to deliver on-demand and paratransit services. They still rely on call centers, especially with paratransit services. Consolidating call center activities or considering an app-based solution are areas two areas of exploration when looking at regional economies of scale for paratransit regional payment solutions.

Figure 7. Agency Paratransit and On-Demand Trip Reservations

Agency / Service types	GoTriangle	GoRaleigh	GoDurham	GoCary	Morrisville	Apex	GoWake	OCPT	Chapel Hill Transit
Paratransit Service	GoTriangle Access n/a curb to curb fixed route; call center door to door	GoRaleigh Access	GoDurham Access	GoCary Door to door, cash or ticket fare after tier	Morrisville Smart Shuttle (ADA compliant)	GoApex (Door to Door)	GoWake Access zone fares	GoTriangle Access door to door	EZ Rider paratransit
Paratransit App		Mobility by Ecolane	Spare Labs	TripSpark	Via	n/a call center	n/a call center	n/a call center	n/a call center
Micromobility /On-demand Service	Pilot for RTP commuters	GoRaleigh Microlink Rolesville and Fuquay-Varina	East/North service zones, Senior Shuttle	TripSpark	Morrisville Smart Shuttle nodes		GoWake Smart Ride rideshare	OCPT Mobility on Demand Shuttle	EZ Rider: Sr. Shuttle (Curb to curb)
On-demand App	Uber/ Lyft	Via	Spare Labs		Via		Mobility by Ecolane	Transloc	n/a call center

Services in green have fares or trip fees.

Transit Agency Survey Results

A survey of regional operating partners was distributed in December 2024 to operating partners with questions related to the six technology priority areas for the region. With respect to regionally integrated payments, 2 of the 3 survey respondents who collect fares were favorable to upgrading vehicle fare payment systems in the near future. Meetings, survey results and interviews conducted with operating partners clarified the desire for a fare collection system to:

- Accept Cash
- Integrate with existing systems (i.e., Umo GoPass cards and validators, Genfare fareboxes)
- Calculate fare caps
- Process open payments
- Purchase bus, Bus Rapid Transit (BRT), and micro transit fare products using the mobile app

In the case of the Triangle Region's operating partners, most do not collect payment for transit. Coming together to amplify services at a regional level means considering the value of using a fare collections process goes beyond collecting fares. It also facilitates a transfer even if the fare is $0.00 and captures performance data. Account-based fare collection data allows agencies to extract granular details on how riders use the system.

Opportunities for Improvement / Innovation

In an account-based, electronic fare collection system, agencies today have back-office systems with features and reporting capabilities to adjust and monitor the fare system. Likewise, riders have increased purchasing options such as: cash, prepaid passes, mobile apps for ticket purchasing, loading stored value on contactless smartcards, and most recently open payment with smartphones and wearables. Validator options include hardware with peripherals to read paper tickets, contactless smartcards, mobile QR codes, and other virtual ticket options. A farebox can be part of this validator or separate.

Automating the process of purchase and validation with an account-based solution has proven to improve customer experience and simplify transit. Adding the ability for account holders to pay by a credit card tap (open payments) will further uncomplicate fare payments for riders. The account-

based solution provides technology for greater control over back office activities like reconciliation or fare capping since the architecture is accessible through deep links and APIs.

Operating partners have opportunities to enhance the region's current fare systems while design efforts for new stations are underway. The stations, mobility hubs, and strategic BRT routes create regional gateways that expand transit in the region —and potentially beyond the Triangle Region with connection points with routes from regional transit agencies like Piedmont Area Regional Transit (PART) who also use the Umo Mobility ticketing solution. Seamless transit at these junctures should feature a regionally unified payment system that regular and infrequent users can navigate with ease. Open payments are a clear strategy to accomplish a common form payment.

Recommendations for Regional Integration of Payments

Regional integration of payments in the Triangle region considerations should include:

1. Continue maintaining the current equitable approach to transit with a cash option that includes equipment for riders to pay fares in coins or dollars. This approach allows the unbanked to ride transit without an account, pass, or fare card and typically involve an on-board farebox to collect fares. The alternative to cash-based collection requires a Title VI study to confirm transit equity. A common way is to demonstrate that service nodes are in close proximity to third-party retail networks that sell or reload GoPass fare cards.

2. Consider the ability for the region to adopt an automated fare collections system that accepts each operating partner's fare rules and offer a smartcard/open payment solution such that riders have options for payment (e.g., fare media, credit cards, and mobile wallets (Apple pay, Google pay)). This would imply that physical fare media, mobile ticketing, and open payment options could be securely read by validators or fareboxes with a validator functioning at an optimal transaction rate between 300-500 milliseconds. Software updates for newer fareboxes and a full replacement for older farebox models would be required for current fareboxes in the region to accept open payments. If operating partners consider software upgrades to existing fareboxes as part of the future configuration, age and state of good repair of current equipment should first be considered. An open payment overlay that functions in tandem with existing systems and hardware is also an option. It would likely require a dedicated validator alongside current validators to minimize integration costs with equipment that is in a state of good repair. When developing procurement documents for open payments, it is recommended that transaction threshold times are a requirement in the Request for Proposal (RFP).

3. The focus on rider convenience will be key to keeping fare structures aligned if more agencies consider returning to fares. Consistent communications on fare rules throughout the region should be promoted to encourage riders to venture regionally. Ensure the scalability of fare systems for operational partners can support increased transaction volumes as adoption grows. Establish regionally uniform key performance indicators (KPIs) to measure efficiency, cost, and adoption rates of the fare collections systems. The selected solution for future procurements should meet established KPI thresholds.

Fixed route fare payment integrations with Microtransit / TNC

As with other regional payment integrations, alignments of policy, technologies and operational processes are required.

Operational alignments

Operating partners have achieved regional 'shared ticketing' by the significant use of the Umo GoPass. This milestone allows agencies to potentially integrate payment of different mode types. Further operational opportunities to integrate regional payments include coordinating and streamlining fare rules/policies and aligning eligibility requirements. For example, GoRaleigh and GoDurham list multiple pass products on their websites. They are similar but, GoDurham has local and regional passes while GoRaleigh only has local pass products. It is feasible that GoDurham will return to fares and aligning pass product offerings in the region is recommended. Elimination of the pass products could be justified if there is an open payment solution and would be considered operational efficiency.

Similarly, aligning zone distances between operating partners for services is a key ingredient for a regional system to coordinate modes and last mile solutions towards a single payment. Micromobility rides being available ¾ of a mile from a bus stop is one example where operating partners have aligned fares policies and micromobility "business rules" to simplify a rider journey.

Infrastructure alignments

Stations are locations where riders will congregate to start, continue or complete a trip. The new Raleigh Union Bus Station, Durham Station, RTC, UNC hospital stations, the future Triangle Mobility Hub, and Chapel Hill BRT station facilitate regional movement. Consider maximizing opportunities for fare payment integration in these areas by pointing infrastructure, equipment and technology toward a single payment for transit, micromobility, transportation network companies (TNCs), and other last mile solutions. A few examples follow below.

- **Infrastructure:** Integrating parking payments with a transit trip for commuters who drive to the station "park and ride" is an option to create a seamless journey. Information Technology (IT) and communications infrastructure, such as cable troughs, should be designed to accommodate more than current cabling dimensions. This is especially important when planning for future modes or station equipment.
- **Equipment:** Stations and enhanced stops or platforms should have fare equipment and payment options for routes and modes served at the station, platform or stop. Micromobility areas (bike, scooters, rideshare pick up areas) should be convenient to riders with payment options nearby for a single leg or multi leg trip. In the case of nearby transit oriented development, fare equipment could be considered in lobbies.
- **Technology:** Integrated, open payment solutions accommodate payment of the multiple modes that may be required of a trip. The regional approach to select technologies that promote open payments without needing an account also requires a robust back end payment reconciliation process. The integrated payment solution must accommodate operating partners business rules.

Fixed Route Trip Planning and First/Last Mile

Agencies no longer have the sole burden of developing trip planners. Third-party trip planning apps are developing greater integrations with TNCs, agencies and services that help riders achieve the first or last miles of their journey. The private, transit planning apps integrate with first/last mile providers linking TNC fleets (ride share, bike rentals, etc.) with fixed routes or final destinations. Since TNCs have developed working integrations with most every trip planning app, riders can plan and pay for the different modes. Booking and payment for both transit and TNCs can be paid by one transaction if agencies commit to data sharing and deep links to their existing payment processor.

The Umo app has a trip planning feature with payment, transfer, and last-mile capabilities so long as agencies select the module as part of their agreement with Cubic.

While Umo for fare collection and real-time trip planning information in one application simplifies travel within a specific agency or county, it's less apparent when planning a trip across the region. Regional trip planning in the Umo app with fare payment should offer a complete picture of transit options that the regional operating partners provide. However, testing several use cases for regional travel shows a journey across more than one agency is more time consuming to plan. This was especially true for the Chapel Hill – Apex/Cary journeys. Depending on the origin destination, riders get trip planning results that are enhanced only when they consult local origin or destination agency routes, schedules, and on demand options.

Transit App (Transit) with its subscription feature, Transit Royale, is also used in the region. Larger agencies see the benefit of Transit as a regional solution citing customer and staff feedback. Adoption may depend on whether other operating partner agencies choose to align and further consolidate around this platform and its upgraded features. Metrics from those in the region that use Transit Royal will also help operating partners better gauge the benefits of the upgrade subscription. The Triangle Region can benefit from lessons learned where the similar pairing of Umo fare collections and Transit Royale are underway in other areas of the US (CapMetro).

Agency and Transportation Network Companies (TNCs)

Early integrators like the San Francisco Clipper Card, shared the same fare system and could more easily form a direct partnership between agencies and TNCs like Lyft, Uber, and Lime. These agreements are traditionally an involved and arduous process. Still, TNCs are part of the mobility equation and agencies can capture economies of scale by negotiating at a regional or state level for micromobility solutions at stations or other planned areas like the Triangle Mobility Hub.

Locally, GoTriangle and Research Triangle Foundation (RTF) has extended its pilot program for Research Triangle Park (RTP) commuters wanting to venture beyond the office. A $10 subsidy promo code in the Lyft or Uber app for travel within the RTP Connect service area went towards rides that started or ended at either the Triangle Regional Transit Center or Boxyard RTP.

Microtransit Service Modes

The on-demand and paratransit fare collection process has remained outside the main discussion of the fare collection practices typical for fixed routes (i.e., fare boxes or mobile ticketing). Services offered by the smaller, 'cutaway' buses providing on-demand transit include:

- Paratransit services that are reservation based on-demand

- Senior on-demand services
- Micromobility on-demand services to low ridership and rural areas.

Given the existing state, on-demand services and paratransit service modes in the region may benefit from a more automated approach to fare collections in an eventual return to fares. Agencies may consider adding smaller, tap-style validators for contactless smartcards or open payment options. The region's ACCESS programs for paratransit and mobility programs show a potential opportunity for improvement since fares are paid in cash or by pre-paid punch cards or discount ticket booklet. There is steady phone support by customer service call centers for reservations supported by individual agencies to help reserve rides.

Certain MaaS software solutions specialize in using technology to enhance customer experience in both paratransit and mobility on demand. Technologies like machine learning and AI have catapulted mobility-on-demand offerings because they are now more dependable and flexible for the rider and more trackable by the operator. Routes are planned or cross-verified with AI insights to capture more value in each route driven. Pick-up reminder texts that incorporate Audio Video Interleave (AVI) (speech to text) and robo-texts are two functionalities that support reliable communication for paratransit and other on-demand type services.

Rider facing apps can help book trips, or pay for trips. With a MaaS solution in place, agencies and riders could forego the inconveniences of advanced reservations, processing tickets and cash handling. Introduction of advanced software capabilities such as rider dashboards for reserving and paying for on-demand service have shown to reduce call center volumes (PalmTran). In several instances, mobility-on-demand services also have eligibility requirements whereas paratransit riders have to fulfill eligibility requirements before benefiting from the services. Many vendors have already included eligibility criteria as an offering.

Open Payment Implementation: Fixed Route and BRT boardings

The term 'open payments' describes the purchased fares without advanced purchase or registration with an agency. Contactless forms of payment are typically represented by a bank card, mobile applications, or digital wallets. The secure transaction must be certified secure by US banking regulations and comply with security and safe banking practices. Payment Card Industry Data Security Standards (PCI DSS). And our validator possess Payment Card Industry - PIN Transaction Security (PCI – PTS) certification are essential to open payment processing.

Agencies that adopt open or contactless payments have considerable investment in integration efforts, equipment purchases, and operational forethought (alignment of operations with fare system). Options to implement open payments on fixed route and BRT service modes in the region typically start with exploring the incorporation of the existing hardware and equipment. If the legacy equipment supports integration with the contactless payment solution, it's likely an economical solution to explore. However, if hardware requires significant investment to upgrade equipment to accept open payments then, operating partners can explore other options such as a payment overlay integration with multiple and existing fare collection systems in the region as was done recently at WMATA.

Integration programming and systems design come with any payment system upgrade. A clear inventory of existing fare systems (including system age) will inform the level of effort required to perform an overlay, an integration, or replacement.

Open payments encourage infrequent riders to board transit. Tourists can be nudged towards transit with a comfortable form of payment without the need for account registration, exact change, or customer service interactions. Routes to and from RDU Airport could serve as pilot for open payments given likely concentration of non-local riders. A phased approach which includes a pilot just prior to implementation is considered industry best practice.

Open payments allow riders to tap-to-ride with a credit card or payment device (watch, phone, contactless smartcard, etc.). Open payments enable contactless payment methods beyond the credit card tap-and-ride use case. Contactless payment methods create an overlay to use radio-frequency identification (RFID) or near-field communication (NFC) to make and process secure payments in near real time. They include:

- **Contactless Smartcard Systems** are account-based and integrated to accept open payments. With custom interoperability development and APIs, bank cards and devices can be used in this hybrid system. Development timelines typically leverage the existing infrastructure reducing time and costs to implement. Riders, operators and operations are familiar with the equipment.
- **Mobile Digital Wallets** are present on phones or wearables for the purchase of virtual tickets on a mobile app where a QR code appears for validation.
    1. Integrators offer a tandem app that works with their automated fare collection solution and can be agency branded or integrator named.
    2. Some larger agencies like SEPTA are working directly with Google and Apple Pay to achieve a payment overlay to mimic the open payment of fares with a virtual wallet.
    3. Implementation could also include the use of a third-party app to purchase a mobile ticket without creating a rider account.
- **Other contactless payment options** such as contactless off-board payment are typically found at stations or mobility centers, on platforms, at kiosks, at TVMs, or on validators to serve express modes like BRT. The point of sale could be a TVM at a station or platform, however, open payments are possible if the validators are integrated to accept open payment methods. Proof of payment is verified per the fare enforcement policy.

Fixed route: Options for open payments on fixed routes include a validation device that is onboard a bus, typically located near a boarding location. Credit or debit card, contactless smartcards or wearable payment devices are the means to pay when purchasing a fare. The purchase can occur before the actual ride by an in-app purchase while trip planning if that feature is activated by the agency.

Transfers are a good incentive for riders to see local transit as a regional system. Areas of the region have a sponsored transfer from a fare free operating partner to an operating partner who does collect fares when riding. This ensures the fare-free tariff remains in place throughout the journey. Operating partner agencies with validators on-board and who are not collecting fares could still gain insights by requiring a tap to board even if the fare is zero. Account based fares accumulate route data that can confirm analyses by other data-rich tools used in the region.

For cash riders, solutions for their transfer activities should be considered. The ability to print receipts from the farebox or validator could be a policy consideration which will inform procurement decisions for equipment.

BRT: Options for open payments on BRT routes typically include a validation device that is offboard a bus, and located on platforms. Station TVMs take payment forms as well for credit or debit card, contactless smartcards or wearable payment devices to pay when purchasing a fare. Increasingly, purchases occur before the actual ride by or even arrival at the station with an in-app purchase if this feature is supported by the agency.

Regional reports suggest that off-board validation is the preferred payment collection concept in the region. Swifter boarding times and lower implementation costs (several validators at stations versus on every bus in the fleet) are two reasons for this preferred validator configuration on BRT modes. Additionally, fare inspection could be done on BRT "platforms" which allows fare enforcement to occur at the station and not on the buses.

Stations: Options for open payments that enable contactless payments require operating partners to make regional decisions about transit stations in the region. Major capital projects like the Chapel Hill Bus station and the Triangle Mobility Center are examples where early decisions about regional fare collection could benefit efforts during design. When planned early, civil works and IT infrastructure related to fare hardware solutions can be incorporated into the station design and be built according to a regional solution for fare collection. Such a strategy can reduce the costly retrofitting of fare collection IT cabling and equipment for a brand new station.

Coordination with station designers for the fare solution is especially important if the station concept includes TVMs (for purchases, contactless smartcard replenishment or printing tickets), validators, or even potentially faregates. Equipment has various footprints depending on the vendor and model. With the Triangle Mobility Hub schematic design underway, it is advisable to collaborate with the selected developer and subconsultants responsible for the 30% schematic design. The design "includes adjacent architectural buildings that support the transit operating functions: including customer service, ticketing… information technology,… expansion capacity for future passenger rail support services including rail ticketing" amongst other design tasks.

Transfers: Fare reconciliation should consider the rider journey upon transfer. When riders transfer from one to the other mode in a regional system, money between partner agencies changes hands. An aligned regional fare policy facilitates reconciliation of transfer rules. For example, for WMATA and others, fare collection starts on the line on which the rider first travels. The rules apply throughout the journey. In the back office, reconciliation accounts for transfer rules, each agencies Memorandums of Understanding (MOUs) and, business rules are devised to uncomplicate the journey for the rider.

Standards for Regional Fare System

Standards to promote regionally integrated payments are founded around the following principles: equity and inclusion (cash payments); seamless integration (regional fare system); flexible and scalable (prepare for future modes); reliable(simple to use), resilient (operational in outages), secure (data privacy and compliance); transparent and accountable (easy to understand, accurate information across regional websites).

Interoperability standards to promote a regional payment integration effort are at the core of the topics discussed throughout this memo:

1. **Unify the payment system across a region.** Beyond cash, account based payment can process many types of payments, smartcards, mobile tickets, contactless, and open payments. Cash and contactless smartcards are in use today. Open payments allows riders to purchase fares without prior purchase or registration with an agency. Contactless forms of payment typically represented by a bank card, mobile applications, or digital wallets. The secure transaction should comply with US Banking compliances with security and safe banking practices such as PCI compliance for the equipment that reads and transmits sensitive personal and credit card data.
2. **Align user experiences for transfers, fare capping and payment means:** Paying for transit should be straightforward. Riders need clear feedback when they tap in, know how much they've been charged, and see transfer options. Interfaces should be multilingual and intuitive. Use data to confirm rider needs.
3. **Standard data used by operating partners:** Draw from existing standards like GTFS and GTFS FARES so operating partners are talking the same regional 'language' when providing data feeds for consumption.
4. **Align fare policies and business rules:** Alignment should include fare categories, service classifications, rider classifications and characteristics; ridership by fare type, by service, and fare collection systems in use. Assess the current physical condition, age, cost of operating, maintaining, and administering the current systems in place.

Roadmap Strategies for Regional Fare Collection

The following roadmap in Figure 8 takes into consideration the existing fare collection system and ongoing efforts for operating partners while continuing development of regionally integrated payments. While the steps are planned over three years, the timeline may shift based on advancements, priorities and the marketplace's technological improvements and offerings.

Figure 8. Roadmap of Recommendation Strategies for Regional Fare Collection

Step 1: Inventory existing systems Coordinate with operating partners to determine existing hardware / software components of fare collection system. Rank needs and capabilities. Inventory existing equipment useful life; weigh cost of integrating with existing or new equipment. Address potential for alignment of contract terms from current vendors. Consider further automation of paratransit fare collections.	→	**Step 2: Analyze Fare Payment practices** Coordinate with operating partners to provide updated payment integration matrix that outlines, fares, rider classes, fare products and pricing, transfers, and fare media for fixed route, BRT, on-demand and, paratransit modes. Confirm the current Title VI study still applies to equipment or payment integration changes under consideration.	→	**Step 3: Identify Payment Approach as a Region** Confirm operations solutions to align fare collections (i.e., policy, processes, business rules). Identify/resolve variances across the region as much as practical. Consider a vendor Request for Information (RFI) process to learn about developments in rapidly changing industry. Confirm software / hardware /coms upgrades needed to integrate payment systems.
Years 0-1		**Year 1**		**Year 2**
Step 4: Procurement and Implementation of Payment System to Allow for Open Payment and Platform Payments on BRT Use system inventory, regional fare rules, and RFI insights to develop procurement documents. Select a vendor to provide a system that can allow for open payment from passengers and provide for platform payments at BRT stations. Consider phased approach with a pilot just prior to full system implementation.				
Years 3-4				

Regional Fare Collections Budget Recommendations (Wake, Durham, and Orange County)

The region's operating partners have different fare collection equipment systems on-board their buses. The following provides a rough order-of-magnitude (ROM) estimate for 3 options to achieve regionally integrated payments. See Appendix A for details.

Most operating partners use Umo 2.0 validators and two currently collect cash using Genfare fareboxes. All but three agencies operate with a free-fare policy. The ability for operating partners to have a cohesive fare collection system at a regional level with a mix of hardware and software modules relies on structured fare policy that is currently aligned. This benefits implementation efforts in back offices as well as simplifies fare rules for riders.

In addition to the capital costs below, agencies must consider funding of internal work aspects such as inter-agency collaboration before, during, and after procurement as well as throughout design and implementation.

Assumptions: While initial integration effort is considered, none of the on-going operational costs (SaaS, transaction fees, cell service, etc.) are included. Estimates are limited to equipment, hardware, and related software implementation including initial integration development and back office development. Fleet size is based on 2023 NTD data.

	OPTION A. Replace/upgrade current fareboxes with single validating farebox for all payments and open loop functions. Remove validators in use. Single back office.		OPTION B. Replace validators to accept open payment. Replace fareboxes with mechanical farebox. Single back office.		OPTION C. Integrate existing systems with open payment overlay. Keep existing fareboxes. Preserve back office status-quo.	
	Low	High	Low	High	Low	High
System Costs	$4,112,500	$6,557,800	$1,582,500	$3,278,800	$3,007,500	$4,524,800
Variable System Costs	$2,454,990	$5,177,870	$2,454,990	$5,177,870	$2,454,990	$5,177,870
Warranty	$104,400	$182,700	$104,400	$182,700	$104,400	$182,700
Option Estimate TOTAL	**$6,671,890**	**$11,918,370**	**$4,141,890**	**$8,639,370**	**$5,566,890**	**$9,885,370**

NOTE: Staffing and internal operations costs are not included.