BUS TRANSFORMATION PROJECT

White Paper #2: Strategic Considerations

January 2019

WASHINGTON AREA BUS TRANSFORMATION PROJECT

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I. Purpose of White Paper

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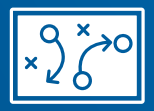
1. Present a set of strategic considerations for regional bus transformation

2. Provide supporting analyses relevant to each consideration in a neutral manner

3. Enable the Executive Steering Committee (ESC) to set a strategic direction for bus in the region



1. Present a set of strategic considerations for regional bus transformation

This paper is a thought piece; it is intended to serve as a starting point for discussion and a means to frame the ensuing debate

The strategic considerations in this paper are not an exhaustive list of all decisions to be made during this process; they are a set of high-level choices for the Bus Transformation Project to consider at this early phase of strategy development

Decisions on each of these considerations will require trade-offs to be continually assessed throughout this effort

2. Provide supporting analyses relevant to each consideration in a neutral manner

Each strategic consideration in the paper is supported by pros and cons for a range of options, with selected case studies and supporting data

The information included in the paper is not intended to advocate for a specific answer, but to provide perspectives on various models

3. Enable the ESC to set a strategic direction for bus in the region

While the paper will be shared with members of various project Committees, the paper is meant to enable the ESC to discuss critical trade-offs and set strategic direction

With guidance from the ESC, the Project Team – in partnership with the other three project Committees – will then conduct in-depth analyses focused on driving towards an integrated strategy for bus in the region

This paper does not represent or constitute a set of recommendations for bus in the region. The purpose of the paper is solely to inform discussion; the ultimate strategic direction for bus may or may not resemble the contents of this paper

II. Vision & goals for bus as voiced by stakeholders

Vision: Bus is the roadway mode of choice in the Washington region by 2030

Goals for bus in the region as voiced by stakeholders

	Theme	Goals
1	**Regional connectivity**	• Provide reliable on-street transit options that efficiently connect people to places and improve mobility
2	**Rider experience**	• Ensure convenient, easy-to-use, user-centered mobility option
3	**Financial stewardship**	• Maintain a transit mode that is financially sustainable in the long-term
4	**Sustainable economic health & access to opportunity**	• Encourage vibrant, economically-thriving and sustainable communities
5	**Equity**	• Create a transit system that is affordable and equitable

Regional Connectivity

GOAL: Provide reliable on-street transit options that efficiently connect people to places and improve mobility

Objectives	Key Performance Measures
a) Align routes and resources with travel demand	1) Percent of jobs accessible within 45 min by auto, 60 min by transit
b) Mitigate congestion by increasing transit usage	2) Percent of jobs and residents with access to high frequency bus service
c) Enhance integration of bus systems and integration of bus with other transportation modes	3) Reliability (on-time performance)
d) Invest in transit facilities and assets that support transit speed, reliability and efficiency	4) Person throughput along designated corridors
	5) Ridership

Rider Experience

GOAL: Ensure a convenient, easy-to-use, user-centered travel choice

Objectives	Example Performance Measures
a) Provide clear, accurate, integrated customer information across all regional operators	1) Customer satisfaction ratings
b) Make it easy to plan, pay, and ride all modes	2) Number/percent of bus stops with key amenities (i.e. seating, shelter, information displays)
c) Provide a safe, comfortable experience for passengers while waiting, riding, and transferring	3) Accuracy and availability of real-time, open-source information provided by bus agencies
	4) Crowding/load factor during peak and off-peak periods
	5) Incident rates at bus stops and on buses

Financial Stewardship

GOAL: Maintain a transit mode that is financially sustainable in the long-term

Objectives	Example Performance Measures
a) Maximize the value delivered by the bus system to the public and taxpayers	1) Farebox recovery rate
b) Work within our means: use available funding efficiently by lowering costs where possible	2) Cost growth per revenue hour and revenue mile (productive vs. non-productive costs)
c) Align agency funding allocations with consensus role for bus	3) Subsidy and capital Return on Investment linked specifically to other goals
d) Provide transparent and understandable reporting on financial performance to the public	
e) Optimize operating costs related to capital investments	

Sustainable Economic Health and Access to Opportunity

GOAL: Encourage vibrant, economically thriving and sustainable communities

Objectives	Example Performance Measures
a) Leverage bus investment to catalyze new economic development	1) ROI of public transit investment for business and development
b) Link bus service with land use decisions to support housing affordability and reduced automobile usage	2) ROI of public investment for workforce accessibility
c) Realize the positive environmental potential of bus	3) Per capita vehicle miles traveled
d) Nurture a high-performing transportation workforce	4) Energy consumed and/or greenhouse gas emissions by bus fleets
	5) Housing + Transportation Affordability Index
	6) Mode share (by area and region-wide)

Equity

GOAL: Create a transit system that is affordable and equitable

Objectives	Example Performance Measures
a) Ensure equitable transit service for those who most depend on it (e.g., low-income, seniors, youth, individuals with no vehicle)	1) Transportation costs vs. income ratio for riders
b) Provide riders with affordable end-to-end transportation	2) Percentage of transit dependent population served by high-frequency service (all-day, peak, weekend)
c) Enhance mobility options for people with disabilities	3) Ratio of resources spent toward riders across income spectrum (includes information resources)
	4) Percent of jobs accessible (by transit dependent people) within 45 min by auto, 60 min by transit
	5) Number of ADA accessible stops (and frequency of ADA accessible vehicles)

III. Key definitions

Key Definitions

Bus: Throughout the paper, "Bus" is defined broadly to include:

- Various vehicle types with different capacities, including traditional 30 and 40 foot buses, smaller shuttles, vans, etc.
- Fixed route or on-demand services
- Different provider types – including public and private operators of multi-passenger publicly accessible vehicles

Regional governance body: An existing or future entity that is given authority to make and enforce service standards for bus, and facilitate coordination on funding and operations across bus providers

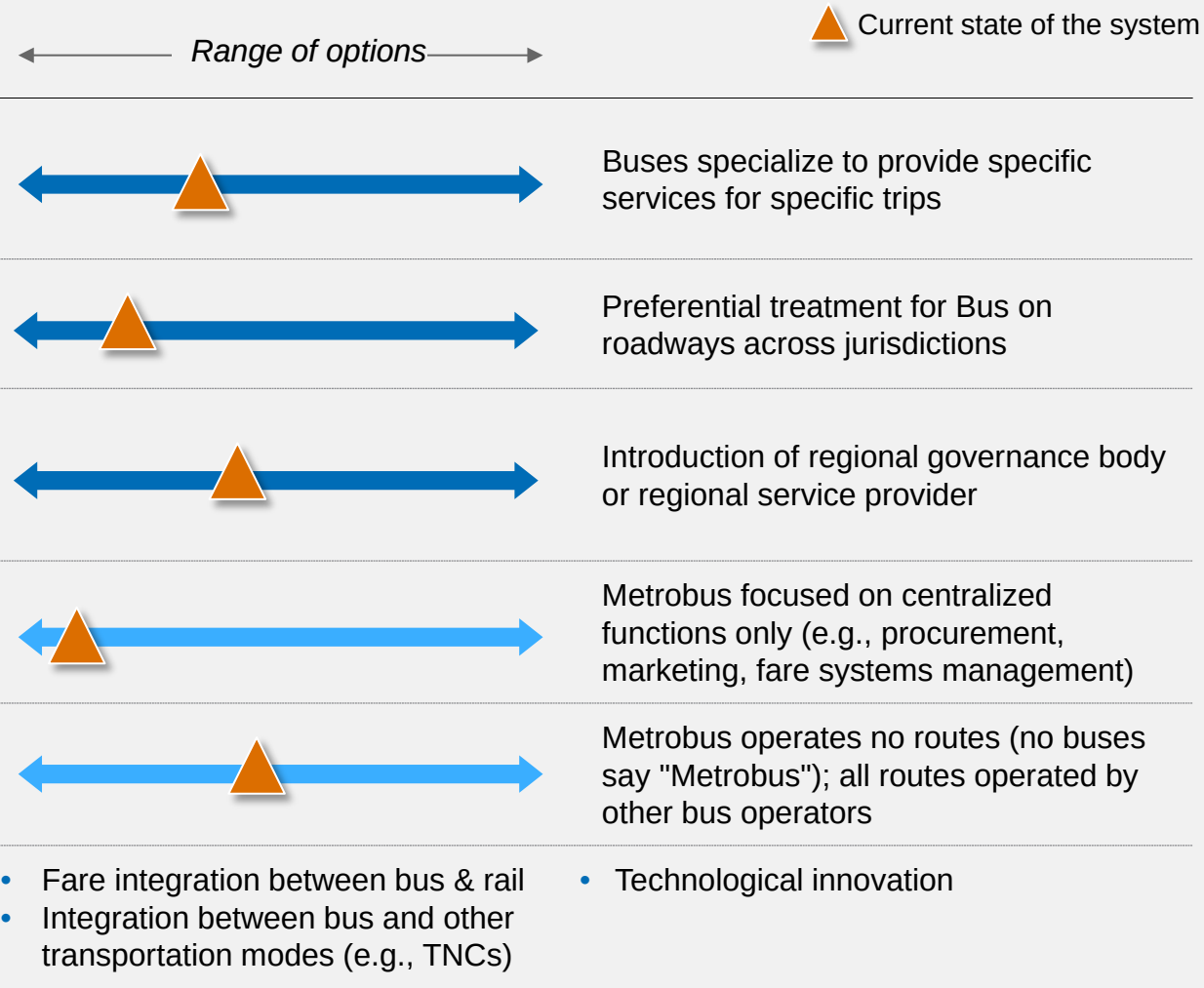
Service standards: Definition of where, how, and how much service is provided based on factors including (but not limited to) vehicle miles per hour, roadway characteristics, travel patterns, land use, and connection to rail

Transit-dependent: Individual with a household income of $30,000 or less and no personal vehicle

IV. Strategic considerations

Six strategic considerations

Questions to be considered in sequential order



V. Deep-dive into strategic considerations

Deep-dive chapters provide additional information to inform discussion

Regional

Role of Buses

1. Overview of potential roles of Buses
2. Role of Buses in region today

Regional commitment

3. Overview of regional commitment
4. Transit Signal Priority & queue jumps
5. Dedicated Bus Lanes
6. Resource pricing
7. Curb side fees

Regional governance

8. Regional coordination today
9. Current opportunities for enhanced regional coordination
10. Examination of alternative regional governance models

Metrobus

Metrobus model

11. Elements of Metrobus model today
12. Exploration of alternative models

Metrobus service areas

13. View of Metrobus coverage today
14. Examination of alternative scenarios

How to operate

15. Level of fares
16. Fixed vs. on-demand bus services
17. Fare integration with rail
18. Integration with other modes (e.g., TNCs, bike shares)
19. Technological innovation

Consideration #1:Role of Buses?

Executive Summary: What is the role of Buses?

There are a number of potential roles for Buses in the region, ranging from bus as a "human right" (accessible to all people for all trips) to bus as a "retail service" (providing specific services for specific trips)

Benefits on both sides of the role of Buses spectrum, e.g.,

- Bus as a human right: Equitable access to bus regardless of race and socio-economic status; less disruption for current bus riders (no need to switch to another mobility mode)
- Bus as a retail service: May be more productive use of current bus resources; could create opportunity to simplify regional coordination and funding structures

In deciding where Buses should fall on the spectrum, it is helpful to understand the role that bus currently plays in the region

Today, bus operators in the region provide 164M trips a year; despite broad access to bus, there is room to improve bus service

- Within the region, 81% of the total population and 94% of the transit-dependent population have access to bus within a quarter of a mile of their home while 48% of the population and 77% of the transit-dependent population have access to high-frequency bus (15-minutes or better) within ¼ mile of their home during peak periods
- 1.7 million jobs in the region are accessible by transit; of those jobs, only 755,000 are accessible by bus transit
- While transit in the region provides broad coverage, there is still room to improve access to opportunity (e.g., jobs) within a 45-minute transit commute

Benefits on both sides of the role of Buses spectrum

Bus is accessible across the region for all people and all trips

- **Equity:** Equitable access to bus regardless of race, socio-economic status, etc.[1]
- **Less disruption:** No need for current bus riders to switch to another mobility mode if bus is always available

Bus specializes to provide specific services for specific trips

- **Productivity:** More productive use of current bus resources
- **Simplification**: With focused deployment of bus, potential to simplify regional coordination models, funding structure, etc.

In deciding where bus should fall on the spectrum, it is helpful to understand the **role that bus plays in the region today**

1. May need to reduce frequency with maximum coverage, unless the region invests in larger Bus fleets

Today, bus in the region is accessible to majority of the population

81% of the population has **access to bus within ¼ mile of their homes**

94% of the transit-dependent population has **access to bus within ¼ mile of their homes**

48% of the population has **access to high-frequency bus (15-minutes or better)** within ¼ mile of their homes during peak periods

77% of the transit-dependent population has **access to high-frequency bus** within ¼ mile of their homes during peak periods

Source: Foursquare ITP analysis. WMATA 2014 Passenger Survey; US Census 2011-2016 5-Year Estimates

Backup: Several open questions about access to high-frequency bus today

48%

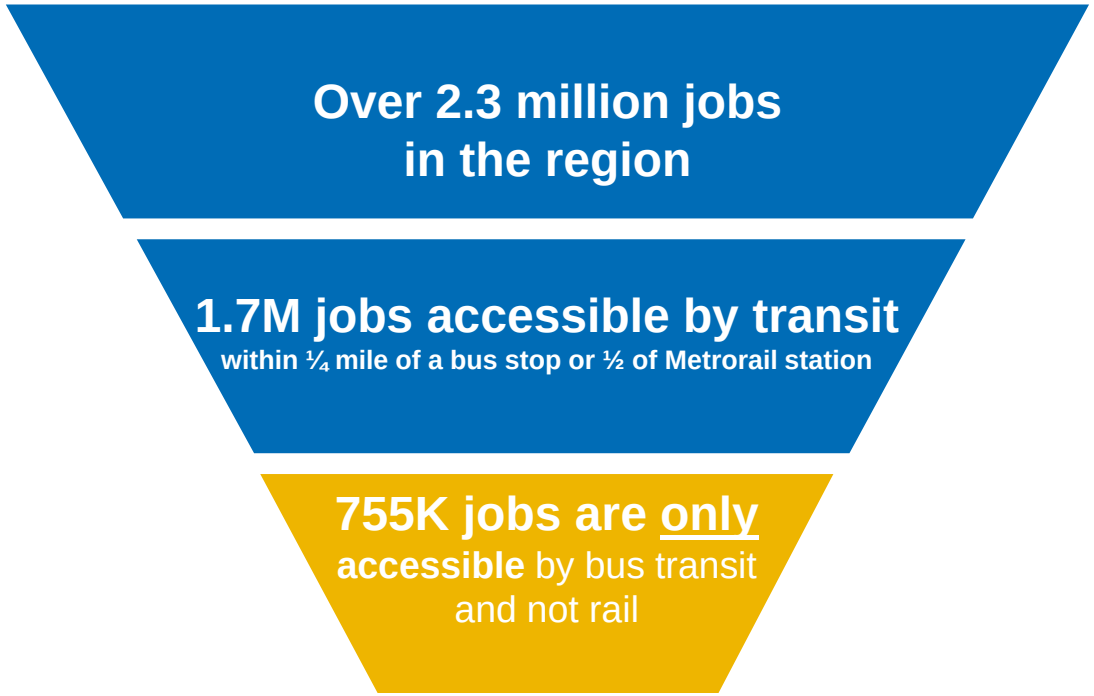
of the population has **access to high-frequency bus (15-minutes or better)** within ¼ mile of their homes during peak periods

Intervals: Are 15-minute bus frequency intervals the right frequency threshold?

Time of day: Is peak period the right time of day to assess frequency, given that bus customers tend to travel off-peak as much as they travel on-peak?

Location: Where are these high-frequency buses going? Are they going to the places where service is needed most?

44% of jobs accessible by public transit are served by bus alone



Source: Longitudinal Employer-Household Dynamics (LEHD) data

Greater Washington Partnership study

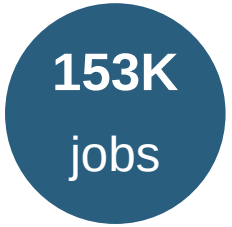
There's still room to improve access to opportunity in the region within a 45-minute transit commute

For the average Washington Metropolitan Statistical Area (MSA) Resident:

Jobs

Auto drivers have access to

While, on average, transit riders have access to



…within 45 minutes

Activity centers

71%

of auto drivers

Can access 50 or more activity centers in the Washington MSA within 45 minutes

31%

of regional residents

Have no transit access to any of the activity centers within 45 minutes

Higher education

50%

of regional residents

Can access 1 or more higher education institutions by vehicle within 45 minutes

66%

of regional residents

Do not have transit access at all to any higher education institution *(majority of this population own a vehicle)*

Note: Data is based on averages for the Washington Metropolitan Statistical Area, which is larger than the WMATA Compact Region.
Source: Greater Washington Partnership, Washington Roundtable Briefing Document

Houston reimagines its bus network to focus on providing more high-frequency services

Context

Prior to 2015, the Houston Metro area had a bus system plagued with infrequent, unreliable service and declining ridership. From 2007 to 2011, bus ridership declined by 20%

In 2013, the Metropolitan Transit Authority of Harris County (METRO) opened three light rail lines, which presented the opportunity to redesign the bus network to be integrated with the rail corridors

METRO began implementing its bus redesign in August 2015 with a focus on optimizing the frequent bus network without increasing operating costs

Approach

The redesign devoted 80% of resources to routes with high ridership - a shift from 50-60% of resources previously spent on routes- and 20% to routes in areas that were expensive to serve due to minimal ridership

Key System Changes:

- **Increased frequency:** Doubled bus routes that run every 15 minutes, extending to weekend service – partially enabled through additional capacity from cutting redundant, low ridership routes
- **Grid System:** Simpler and straighter routes, rather than circuitous, that connected to new and growing activity centers
- **Increased reliability:** Reduced routes that intersected with freight trains, typically causing delays

Outcome

The result of the bus redesign was a more efficient and easier to use bus system. METRO saw the following impact as a result of the changes:

- Bus ridership increased by 8% in the first 12 months
- 95% of the Houston's population now lives within ¼ mile of frequent bus service, and less than 0.5% were moved just above the ¼ mile threshold with the changes

Source: Mobilitylab: Houston bucks national trend of transit bus system decline (2018); Humantransit: Transit, Reimagined (2014); Citylab website (2016); Metro: System Reimagining Website Archived (2015)

Case study

Anchorage, Alaska reduces bus network coverage to focus on high ridership routes

Context

In 2016, Anchorage had a bus system with 14 routes that reached most parts of the city, but service was infrequent, waits were long and ridership had been steadily declining since 2008

City was at a crossroads, and had to choose between maximizing geographic coverage of bus routes, or maximizing productivity (ridership) on each route

Tradeoff involved deciding what percentage of the city's transit resources should be spent boosting frequency and attracting ridership in the densest parts of the city versus providing coverage to less dense areas

Approach

In October 2016, redesigned network to include fewer neighborhood stops and focus on high-density areas

Key system changes:

- Straightened routes to minimize long, winding routes
- Introduced 4 new frequent bus routes (every 15 mins on weekdays / 30 mins on weekends)
- Increased transfers to 8 points outside of the Transit Center
- Extended service hours to later evenings and more weekend hours
- Increase service by 10%, adding smaller buses for Neighborhood and Commuter routes

Outcome

Impact is still being assessed

Source: Next City; Alaska Daily News; Human Transit; Municipality of Anchorage

Role of Buses?

Current state of region

Buses are accessible across the region for all people and all trips

Equitable access to bus regardless of race, socio-economic status, etc.

Bus as a human right

Buses specialize to provide specific services for specific trips

More productive use of current bus resources

Bus as a retail service

Consideration #2: Regional commitment to speeding up Buses?

Executive summary: Regional commitment to speeding up Buses

Two potential ways to demonstrate regional commitment to speeding up Buses (not exhaustive):

- Increase bus speed and reliability by prioritizing high-capacity vehicles on roadways
- Promote full-cost accounting for use of low-occupancy vehicles across region

In practice, regional commitment to increasing bus speed and promoting full-cost accounting of low-capacity vehicles could include:

- **Transit Signal Priority (TSP):** Various techniques used to improve service and reduce delay for bus at intersections controlled by traffic signals
- **Dedicated Bus Lanes**: Lanes restricted to buses on certain days and times, often tied to bus rapid transit network
- **Queue Jumps**: Segment of a lane (usually adjacent to heavy traffic) that allows bus to "jump" over other queued vehicles approaching an intersection, and allows them to merge back into the regular travel lanes beyond the signal
- **Resource Pricing:** Fee mechanisms to discourage single-occupancy vehicles, including cordon zone pricing, dynamic tolling, and vehicle miles traveled fee
- **Curb access fees**: Establishment of fees to discourage motorists from using curbside space
- **Parking restrictions**: Limitation on parking for motorists, either by charging / increasing a fee or reducing number of parking spaces available

Region faces a choice on whether or not to make a regional commitment to preferential treatment for bus on roadways, or to continue with the status quo (implementation of bus preference at a local level)

Some challenges associated with preferential treatment of bus across the region, e.g.,…

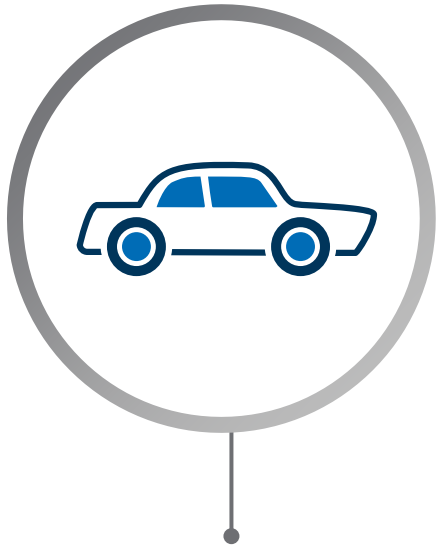
- Capital outlay: Some capital expenditure required to set up TSP, resource pricing systems, bus lane network
- Coordination: Setting up resource pricing systems, bus lanes, TSP requires high degree of coordination across agencies
- Political buy-in: Local businesses in affected area may believe they will lose business due to congestion charge / reduced parking / curb access fees – need to correct that perception to gain political buy-in

…but case studies demonstrate that there are a number of benefits as well, e.g.,

- Increased bus speeds: Less time wasted in traffic allows for increased individual productivity
- Enhanced reliability of bus: Buses less likely to be affected by roadway congestion – more on-time arrivals
- Cost savings: Reduced spending on fuel associated with time spent in traffic
- Reduced pollution: Fewer cars on the road lessens environmental footprint of mobility

Two actions tied to regional commitment to speeding up Buses

Increase bus speed and reliability by prioritizing high-capacity vehicles on roadways



Promote full-cost accounting for use of low-occupancy vehicles across region

Sample list, not exhaustive

Commitment can manifest itself in different ways

Increase bus speed by prioritizing high-capacity vehicles on roadways

★ **Transit Signal Priority (TSP):** Various techniques used to improve service and reduce delay for bus at intersections controlled by traffic signals

★ **Dedicated Bus Lanes**: Lanes restricted to buses on certain days and times, often tied to bus rapid transit network

★ **Queue Jumps**: Segment of a lane (usually adjacent to heavy traffic) that allows bus to "jump" over other queued vehicles approaching an intersection, and allows them to merge back into the regular travel lanes beyond the signal

★ **Deep-dives on following pages**

Promote full-cost accounting for use of low-occupancy vehicles

★ **Resource pricing mechanisms, e.g.,**

- *Dynamic tolling***:** Variable toll amounts charged based on roadway congestion
- *Cordon zone pricing***:** Fees charged to vehicles traveling within specific area
- *Vehicle miles traveled fee:* Charge for motorists based on road usage measured in mileage; fee can be flat or variable

★ **Curb access fees**: Charge to motorists for use of curbside space

Parking restrictions: Limitation on parking for motorists, either by charging / increasing a fee or reducing number of parking spaces available

"No stopping" zone fines: Charges to motorists for stopping in specified "no stopping" zones that restrict traffic movement (e.g., in loading areas)

Why does regional commitment to bus matter?

Several potential benefits from speeding up Buses / limiting personal vehicle usage

Increased bus **reliability**

Cost **savings** on fuel

Reduced **environmental impact**

Reduced **bus fleet** sizes

Regional commitment to these measures drives greater impact, e.g.,

Dedicated bus lanes that run within and across jurisdictions likely to have more impact on bus speeds than bus lanes that are limited to local jurisdictions alone

Embedding **Transit Signal Priority (TSP) technology on all buses and at all major intersections** across region likely to enhance bus speeds more than TSP that is limited to certain jurisdictions / providers

Pros and cons of specific regional bus interventions described on following pages

What is **Transit Signal Priority**?

Transit Signal Priority (TSP) is a set of operational improvements that reduce dwell time at traffic signals for transit vehicles by holding green lights longer or shortening red lights

Transit Signal Priority uses mobile Wi-Fi or other higher-bandwidth communication, so that transit vehicles can communicate key attributes to traffic signal controller, e.g.,

- Estimated time of arrival at an intersection
- Passenger load
- Schedule adherence

Benefits and challenges associated with regional Transit Signal Priority

Benefits

- **Reduced journey time for bus**: Makes it easier and faster for bus to arrive at destination quickly; in some cases, bus travel times have been reduced by around 10%, and delay was reduced up to 50% at target intersections
- **Increased reliability:** Makes buses more reliable, as it reduces the unpredictability of congestion effects on timely arrivals
- **Cost savings**: Cost savings from fuel costs associated with traffic congestion and fewer operating hours required to provide the same level of service
- **Potential fleet size reduction**: If bus speeds increase, potential that a smaller fleet can be used to meet same service demands

Challenges

- **Capital & timing requirements:** Some amount of capital expenditure and time required to set up system (though DC region has already invested heavily in TSP)
- **Coordination**: Setting up system requires high degree of coordination between the agencies responsible for signals and transit vehicles and operations, as well as roadway officials
- **Implementation difficulty at some intersections**: In cross-traffic intersections (e.g., Connecticut Avenue and K Street), difficult to determine who gets priority

Source: Nacto: National Association of City Transport Officials Guide

Case study

Transit Signal Priority model: Los Angeles Metro Rapid

Context

The Metro Rapid Demonstration Program was initiated in March 1999 by the Los Angeles County Metropolitan Transit Authority's (Metro's) Board of Directors following an initial feasibility study

In partnership with the City of Los Angeles, Metro completed a Bus Rapid Transit (BRT) program within the Metro system

The project included the implementation of a Transit Signal Priority within the key corridors, to improve the on-time performance of the Metro Rapid buses

Approach

As of 2007, the LADOT implemented a TSP system used by Metro Rapid that consists of:

- 210 intersections equipped with automatic vehicle identification (AVI) sensors at the controller cabinet
- 150 emitter-equipped buses, and central control system software at a total cost of $10 million
- 331 loop detectors to detect the presence of a bus approaching the intersection
- Average cost was $13,500 per signalized intersection.

Outcomes

Estimated 25% reduction in bus travel times due to the TSP system

Estimated savings in operating costs of $6.67 per bus per hour due to TSP system; translates to approximate savings in operating costs of $66.70 per bus per day ($24K savings per bus per year)

Sources: US Department of Transportation: Characteristics of Bus Rapid Transit for Decision Making (2009)

Case study

Transit Signal Priority model: Portland TriMet

Context

TriMet, along with the City of Portland and other regional partners, identified corridors to roll out TSP technology in the early 2000s

As a joint effort, TriMet and the City of Portland created the Streamline program, a package of capital projects and service improvements designed to improve service to all passengers and provide operating efficiencies to TriMet

The program was a result of a $4.5 million federal earmark the City of Portland pursued under the Transportation Equity Act

Approach

Initially installed TSP capabilities at more than 250 intersections

Program objectives were to:

- Improve schedule reliability
- Reduce time inconsistencies
- Improve fuel savings and air quality benefits
- Increase ridership through service dependability

Recently, with the help of the City of Gresham, activated eight additional TSP intersections along Division Street in Gresham

Outcomes

TriMet experienced 10% improvement in travel time

TriMet experienced 19% reduction in travel time variability

According to the Journal of Public Transportation, TriMet estimated to have saved approximately $13.4 million over eight years

Sources: US Department of Transportation: Characteristics of Bus Rapid Transit for Decision Making (2009); Trimet: TriMet and the City of Gresham improve transit service along SE Division (2013)

DC area example

Transit Signal Priority: Cost savings opportunity in region

Context

Currently, Metro has 144 buses with Traffic Signal Priority (TSP). There are 229 intersections outfitted with TSP throughout the District as identified by the District Department of Transportation (DDOT) (only a fraction of the total intersections in the area)

WMATA Strategic Energy Study analysis evaluated the savings from installing TSP controllers on an additional 65 buses by 2019 to achieve better utilization of the region's existing network of transit bus-enabled TSP signals

Potential cost savings

Capital expenditure: $405K (incremental)

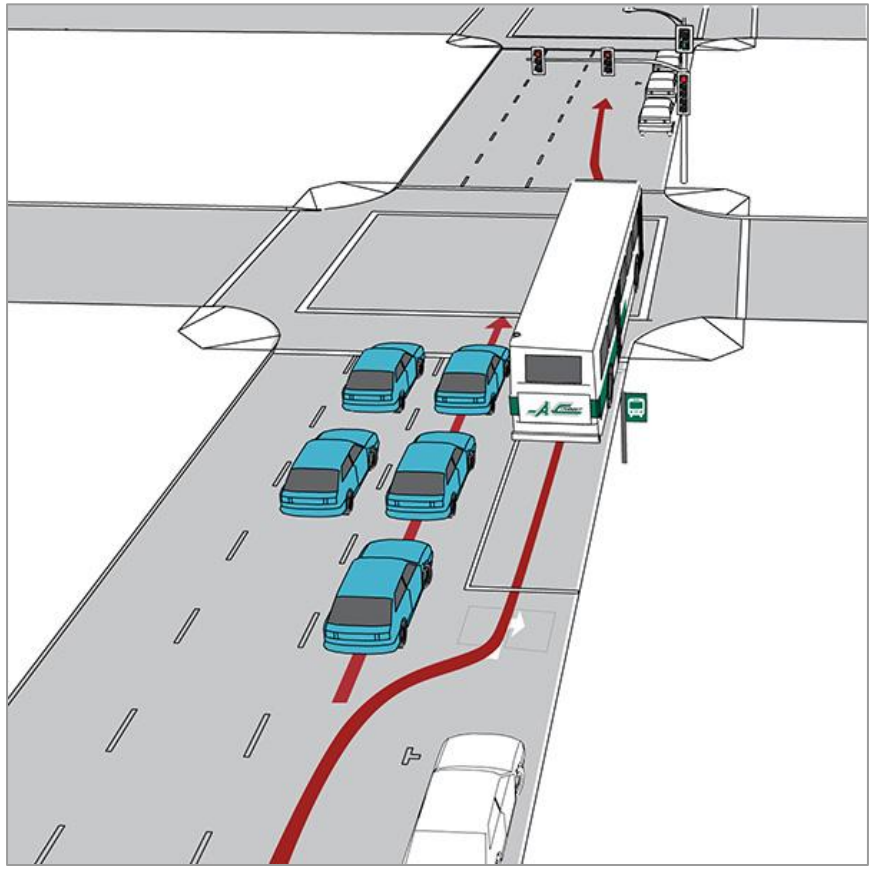
Total savings per year: $357K

- O&M cost savings / year: $343K
- Fuel cost savings / year: $14K

Sources: WMATA Strategic Energy Study (2018)

What is a Queue jump?

A queue jump is a part of a roadway at an intersection that allows buses to get a brief head start on traffic and merge smoothly back into regular traffic lanes



Source: North Crosstown BRT Project; Calgary website: (2018)

Benefits and challenges associated with queue jumps

Benefits

- **Reduced journey time for bus**: Makes it easier and faster for bus to arrive at destination quickly
- **Increased reliability (to an even greater extent than TSP):** Makes buses more reliable, as it reduces the unpredictability of congestion effects on timely arrivals
- **Cost savings**: Cost savings from reduction in fuel costs associated with traffic congestion
- **Minimal roadway impact**: Minimal effect on size of roadway available to other vehicles

Challenges

- **Impact on personal vehicles:** Potential that queue jumps will reduce speed of personal vehicle travel
- **Enforcement:** Could be difficult to ensure personal vehicles don't use jump lanes intended for bus – may require more enforcement personnel
- **Coordination**: Setting up system requires some degree of coordination between the transit agencies and roadway officials to allocate part of the road for queue jump usage
- **Operator training**: Training operators on use of queue jumps could be cost and time-intensive, given operator turnover and changes in operator routes

DC area example

Queue jumps: Component of 16th Street Bus Project

Context

The District Department of Transportation (DDOT) is working on implementing the 16th Street Bus Lane, as well as a number of other changes to make the 16th Street buses faster and more reliable

Approach

Part of the broader bus improvement plan includes queue jump lanes, where the bus can pull out of traffic and then get started when the light turns green before other cars, at M, U, and Harvard Streets heading north and at M Street heading south

Other features of plan:

- Left turns will not be allowed at some intersections
- A few bus stops will go away where they are very close to other bus stops
- All-door boarding, where people can get on through the rear door
- Off-board fare collection, where people pay before the bus arrives

Outcomes

16th Street bus lane updates still in progress – outcome data not yet available

Sources: T4AMERICA: Transportation for America (2018)

What are dedicated bus lanes?

Bus lanes grant buses the right to use specific areas (usually held up by traffic congestion) during certain days or times

Bus lanes could include:

- Busways that are dedicated solely for bus use
- Shoulder lanes (adjacent to regular roadway), which buses can use under certain conditions
- Right-turn lanes, which buses can use under certain conditions
- Business Access & Transit (BAT) lanes, only accessible to buses and vehicles turning into a business area

Bus lanes can run in different locations:

- Median bus lanes (run in the middle of the road)
- Curbside bus lanes (run adjacent to the curb)
- Contraflow bus lanes (bus lane in the opposite direction on what would otherwise be a one-way street)

Source: Transit: Federal Transit Administration (2016); LTD: Business Access and Transit Lanes (BAT Lanes)

Benefits and challenges associated with regional bus lanes

Benefits

- **Increased attractiveness of bus**: Effects of bus lanes on trip speed are highly visible to riders and non-riders; increases competitive advantage for bus and makes people more likely to take bus in future
- **Reduced journey time for bus**: Makes it easier and faster for people to travel on bus
- **Increased reliability:** Makes buses more reliable, as it reduces the unpredictability of congestion effects on timely arrivals
- **Cost savings**: Cost savings from fuel costs associated with traffic congestion and fewer operating hours required to provide the same level of service
- **Increase roadway capacity**: Ensures more efficient use of limited street space by moving 40-70 people per vehicle

Challenges

- **Coordination**: In order to realize full benefits of regional bus lane network, would need greater regional coordination (e.g., coordination between transit agencies and roadway officials in each area)
- **Capital costs:** Construction of new bus lanes can be time and labor intensive (not true in all cases)
- **Enforcement:** Could be difficult to ensure personal vehicles don't use lanes intended for bus – requires more enforcement personnel, technology

Dedicated bus lanes: Chicago's PACE system

Context

Introduced bus-on-shoulder operations in 2011

Illinois Department of Transportation spent $9.5 million to upgrade 15 miles of highway (shoulder lane) from downtown Chicago to Plainfield

Established that buses could only use shoulders when traffic in the regular lanes is traveling at less than 35 mph

Illinois Department of Transportation brought in crews to clear debris off the shoulders, and State police were tasked with enforcing busway policies

Approach

Service began as a pilot project with two existing PACE routes—755 and 855. The benefits were immediate: on-time performance, for example, improved from 68% to nearly 95%

By mid-2013, the buses had roughly doubled their daily ridership, so PACE added new trips, including off-peak service

Ridership continued to increase and in 2014 PACE added more service and divided the 855 into three routes—850, 851 and 855—to accommodate increased demand and simplify the route structure for new customers

Outcomes

Ridership on routes today is now more than six times what it was in 2011

The pace of increase does not appear to be slowing

Though the total daily ridership on this corridor remains low compared to some of the region's top-performing bus commuter lines (about 1,200 daily riders, versus about 4,875 or the Chicago Transit Authority Connector 352 Halsted bus, for example), the rate of increase clearly demonstrates that reliability and speed improvements increase ridership

Sources: VTPI: Victoria Transport Policy Institute (2016); Chicago Tribune website (2011) Regional Transportation Authority Mapping and Statistics (2018)

Case study

Dedicated bus lanes: Component of Minneapolis METRO Orange Line (BRT)

Context

The I-35W corridor is one of the most heavily used transit corridors in the region, with approximately 26 weekday routes and 14,000 daily transit riders

Transit access to suburban jobs and opportunities along the I-35W corridor was limited, and the corridor was experiencing major delays

Goals of busway project:

- Connect people across the region to where they want to go
- Reduce significant delay for transit riders on the I-35W corridor
- Better serve high-density, low-income, minority, and transit-dependent communities
- Leverage past and concurrent roadways

Approach

The METRO Orange Line is a 17-mile planned highway Bus Rapid Transit (BRT) line that will connect Minneapolis, Richfield, Bloomington, and Burnsville along I-35W

Orange Line will provide frequent, all-day service in both directions, seven days a week

This route will upgrade and replace the existing local Route 535 with enhanced service and amenities, and new station features will benefit other transit riders along the I-35W corridor

Project includes bus lanes, upgraded transit stations, and improved bus routes

Network expected to open in 2020-21

Outcomes

Network will provide access to 198,000 jobs and 121,000 residents, including 56,000 jobs outside of downtown Minneapolis

Ridership in the I-35W corridor is expected to grow from 14,000 to 26,500 daily riders by 2040

Sources: MetroTransit: METRO Orange Line Bus Rapid Transit Project (2016); MetroTransit: METRO Orange Line

DC area example

Dedicated bus lanes: Metroway, Arlington and Alexandria, Virginia

Context

Metroway is a bus rapid transit (BRT) line operated by WMATA as part of Metrobus – has been in operation since 2014

Consists of a single bus line operating in Arlington and Alexandria, Virginia

First bus rapid transit line to open in Virginia and in the Washington area in general

Approach

Metroway operates seven days a week with longer hours and more frequent service during weekdays; 15 stations on the route

Metroway is integrated with the regional transit network, and is subject to the same fares and transfer rules as any other local Metrobus service

Highlights

Bus-only lanes along the Route 1 corridor

Extension of dedicated transitway from S. Glebe Rd to Crystal City

A direct link to Potomac Yard shopping and restaurants

Unlock of development potential in South Crystal City and Potomac Yard

Multi-stop, local transit between Pentagon City and Braddock Rd Metro

More bus frequency for more precise commutes

Sources: Metroway

DC area example

Dedicated bus lanes: Montgomery County BRT(includes shoulder bus lanes)

Context

In 2017, Montgomery County finished initial designs for a Bus Rapid Transit system on U.S. 29

The 13.5-mile project between Burtonsville and downtown Silver Spring, set to open in 2020, will be the first Bus Rapid Transit (BRT) system in Maryland

Like many urban-suburban jurisdictions, Montgomery is turning to buses as a relatively quick and more affordable way to improve transit, curb traffic congestion and spur economic growth

Approach

The buses will run on the shoulders between the Burtonsville Park and Ride lot and an area north of Tech Road. They will then run in general traffic lanes to the Silver Spring Transit Center

The road won't be widened, and no vehicle lanes will be converted to bus-only lanes

Other features of BRT

- Passengers will pay before boarding — fares will be enforced by random onboard checks
- Riders also will use three doors for boarding, which will reduce "dwell time" at stations
- Flat boarding between the foot-high platform and buses will also make it faster and easier for people in wheelchairs and with bicycles and strollers

Highlights

No outcomes available yet.

Overall, county officials say the BRT line will cut 22 to 35 percent off travel times compared to Ride On buses

Sources: Montgomery shares designs for Bus Rapid Transit stations on U.S. 29. Washington Post (2017)

DC area example

Dedicated bus lanes: Cost savings opportunity in region

Context

WMATA Strategic Energy Study analysis evaluated the savings for dedicated bus lanes on three high congestion corridors (expected completion date in parentheses):

- 16th Street from H Street to Arkansas Avenue (2020)
- Combined H and I Street corridor between Pennsylvania Avenue and New York Avenue (2023)
- 14th Street between K Street and Columbia Road (2025)

Expected outcomes

Potential cost savings
Capital expenditure: $12.5M
Total savings per year: $243K

- O&M cost savings / year: $228K
- Fuel cost savings / year: $15K

Potential customer-facing benefits
16th Street Bus Lane could save nearly six minutes of travel time during the morning commute for some southbound buses and the same for the northbound traffic in the evening

Sources: WMATA Strategic Energy Study (2018).
Dedicated bus lanes coming to 16th Street, but it could cost you some parking. Washington Post (2017).

What is resource pricing?

Resource pricing is a surcharge for vehicles geared towards reducing the number of these vehicles on roadways

Resource pricing can take many different forms, e.g.,

- Dynamic tolling: Variable toll amounts charged based on roadway congestion
- Cordon zone pricing: Fees charged to vehicles traveling within or entering a specific area
- Vehicle miles traveled fee: Charge for motorists based on road usage measured in mileage; fee can be flat or variable
- Some combination of the above

Benefits and risks associated with resource pricing

Benefits

- **Reduced journey time**: Makes it easier and faster for people to travel
- **Reduced pollution:** Fewer cars on the road lessens environmental footprint of mobility
- **Increased city attractiveness:** Makes city centers more attractive for pedestrians and cyclists
- **Higher revenue:** Money from charge can be spent on other forms of public transport and increasing alternatives to driving

Challenges

- **Political buy-in:** Significant movement away from status quo would require backing by a number of politicians
- **Expensive to administer:** May require additional personnel / technology to track drivers who don't pay
- **Inequality**: A resource pricing fee can be regressive if it takes a higher percentage of income from lower-income individuals (potential to mitigate by setting by mechanism to charge differential pricing based on factors like income)

Resource pricing model: Transport for London

Context

Resource pricing zone includes the area inside London's Inner Ring Road, which is a 13-square mile zone comprising main roads encircling the inner city

Primary goals

- Reduce congestion
- Improve air quality and public health
- Improve journey time reliability

Ancillary improvements

- 300 new buses
- Updated bus routes
- Improved frequency of buses
- 8,500 park-and-ride spaces
- Bike/pedestrian infrastructure

Approach

Price: Flat daily fee of £11.50 (US $15.21)

Payment mode: Payments can be made by telephone, text message, online, by post, or via registering for auto pay.

Hours of effect: 7:00am- 6:00pm Monday-Friday; no charge on weekend, or holidays

Investment: £161.7M (USD $214M)

Annual operating cost: £130M (USD $172M)

Outcomes

Bus ridership has increased by 38%

Traffic entering the zone during charging hours has declined by 18%

Traffic circulating within the zone has declined by 15%

Reliability and journey time improved as well

Annual revenue: £137 million/year (USD $182 million)

Sources: Streetblog: Road Pricing in London, Stockholm and Singapore; Tri-State Transportation Campaign

TRAFIKVERKET

Case study

Resource pricing model: Swedish Transport Administration

Context

Resource pricing mechanism launched in 2007 uses automatic number plate recognition, in a 13-square mile area

System consists of overhead gantries, cameras at all entrance points, pavement markings, and street signage

Primary goals

- Reduce congestion
- Improve air quality and public health
- Improve journey time reliability

Ancillary improvements

- 197 new buses
- 6 new bus routes
- 2,800 new regional park-and-ride spaces
- Bike/pedestrian infrastructure

Approach

Vehicles are registered automatically by cameras that photograph the number plates

Pricing: Variable pricing based on time of day. Highest peak period cost per passage is 35 krona (US $4.14)

Payment mode: Owner of car sent a monthly invoice for charges incurred; payments can be made online, by mail, by direct debit

Hours of effect: 6:30am-6:30pm Monday-Friday; No charge on holidays

Investment: 2B Krona (USD $237M)
Annual operating cost: 100M Krona (USD $12M)

Outcomes

Transit (rail and bus) ridership increased by 6%

Traffic to and from the inner city cordon was reduced by 20%

Traffic delays decreased by 30-50%

Vehicle miles traveled decreased by 14% in the cordon

Annual revenue: 1.3B Krona (USD $155M)

Sources: Streetblog: Road Pricing in London, Stockholm and Singapore

Case study

Resource pricing model: Singapore Land Transport Authority

Context

The electronic road pricing (ERP) scheme is fully automatic on specific routes, times of day, and directions, with variable pricing designed to respond to congestion in real-time

Primary goals

- Reduce congestion
- Improve journey time reliability

Ancillary improvements

- Parking fees inside the restriction zone were doubled
- Buses and bus frequency increased
- HOV+4 lanes were established
- 15,000 park-and-ride spaces were established outside of the restriction zone

Approach

Pricing: $0 -$4.00 (US $0 - $3.00) collected on a per-pass basis at over 50 points across area (rates vary based on traffic conditions)

Payment mode

- Vehicles are required to have unit on dashboard with electronic smartcard on it
- Overhead gantries detect the congestion of the route at specific times, and deduct the variable fee from the smart card

Hours of effect: 7:00am-8:00pm Monday-Saturday; No charge on Sundays or holidays

Investment: S200M (USD $110M)
Annual operating cost: S25 (USD $18.5M)

Outcomes

Bus ridership has increased by 15%

Despite strong population growth, the ERP has reduced traffic in the inner city by 24%

Average roadway speeds have increased from 30-35 KPH to 40-45 KPH

Annual revenue: S150 million/year (USD $100 million)

Sources: Streetblog: Road Pricing in London, Stockholm and Singapore

DC area example

Dynamic tolling: Virginia 66 Express Lanes

Context

Virginia Department of Transportation (VDOT) began allowing dynamic tolling on the 66 Express Lanes Inside the Beltway between Interstate 495 and Rosslyn, VA in order to decrease congestion and improve traffic flow

Tolling is partly a response to the failure of gas taxes and user fees to pay the for road infrastructure

Approach

Solo drivers are charged tolls based on congestion levels at the time, while carpools of two or more are not charged (provided they have an E-Z Pass Flex)

Goal is to keep traffic moving at 55 mph—if traffic slows down, tolls go up, and vice versa

Tolls change every six minutes with the level of congestion, with most revenue benefiting transit

Outcomes

Within a year, travel times in the area dropped by five to 20 minutes

However, there is some concern among stakeholders that the toll rates are too high

Sources: Wired: Virginia's $40 toll road better be the future of driving (2017); Planetizen: Dynamic Tolling Done Right—VDOT shows the way (2018)

Why explore curb access fees?

As new mobility options such as ridesharing, bikesharing and more have entered cities, they've placed **new demands on curb space.** Deliveries made at curbsides are also increasing at the same time. As a result, cities have struggled to effectively manage private providers and adapt to these new modes

With this increasing level of demand for access, many cities have begun to recognize that streets and curbs are some of their most valuable assets—**assets they have largely been giving away for free**

Time is ripe for **exploration of pricing mechanisms to better manage demand** for curb space, which can also serve as a source of revenue for federal, state and local government

Sources: T4AMERICA: Transportation for America (2018)

Transportation for America

Case study

Curb access fees: Transportation for America - Smart Cities Collaborative

Context

In 2018, Transportation for America's Smart Cities Collaborative will explore how emerging technologies and new mobility options are reshaping the right-of-way and curb space

The goal is to examine how cities can think about curb design, determine the value of their curb space and eventually price that space accordingly in an effort to achieve their long-term outcomes

Approach

The Collaborative will first attempt to define different users of curb spaces, which departments are managing the various pieces, and how they're currently valuing curb use

To assess the full value of these assets, the Collaborative will quantify expenses associated with building this infrastructure (like concrete, steel and street furniture), evaluate the long-term maintenance costs, and examine how these spaces can affect areas of concern, such as congestion, safety and pollution

Then, they will develop a formula to derive appropriate pricing levels for curb space

The Collaborative will also explore the various hurdles that come with developing and implementing pricing strategies—technological, financial and political

Outcomes

Outcomes of this study have not yet been published

Sources: T4AMERICA: Transportation for America (2018)

Level of regional commitment to speeding up Buses?

- Jurisdictional flexibility
- Reduced capital expenditure need
- Minimal disruption to personal vehicle speeds

- Increased speed
- Increased reliability
- Cost savings on labor and fuel
- Reduced congestion
- Reduced environmental impact

Benefits across region

Consideration #3: Regional governance / service delivery?

Executive summary: Regional governance / service delivery

Today, regional coordination among Washington area bus operators is already occurring, e.g.,

- Shared facilities: WMATA and Fairfax County co-occupy the West Ox bus facility
- Shared infrastructure: Metroway in Arlington/Alexandria – multiple bus operators allowed to use certain parts of busway
- Joint procurement: MTA and ART have piggybacked in the past on WMATA Procurement for buses

Going forward, the region can choose to maintain the status quo, or move towards less or more coordination

Some benefits and challenges associated with no regional coordination, e.g.,

- Benefits: Greater jurisdictional independence, increased ability to be responsive to local needs
- Challenges: Narrow reach of bus improvement projects, missed efficiency opportunities from partnering with bus providers in other jurisdictions

Potential positive and negative effects of a regional governance body, e.g.,

- Benefits: Improved customer experience and cost efficiency through shared maintenance & infrastructure, enhanced technology integration, and shared service standards across regional bus providers
- Challenges: Limits on jurisdictional independence, difficulty deciding decision rights and managing competing interests

Some opportunities for value creation associated with enhanced regional coordination already identified, and governance body could help drive implementation, e.g.,

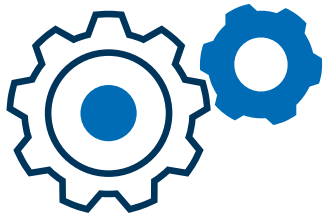
- Shared maintenance: Eight planned parking / maintenance facilities in DC region with potential to house multiple operators
- Shared infrastructure: Eight planned corridor projects with dedicated bus infrastructure - potential to serve many operators
- Joint procurement: Opportunity for bus operators to obtain better pricing by working together to increase size of orders

Another option for increased coordination is to move fewer / one bus provider(s) in the region, which comes with a number of benefits and challenges as well

- Benefits: Increased service level consistency for bus across region, enhanced rider experience by reducing the need to navigate multiple providers, potential for improved financial sustainability of bus by allowing for increased economies of scale
- Challenges: Service disruptions during transition from local bus operators to fewer operators; decreased control for individual jurisdictions on what services are provided in their areas

Regional cohesiveness of bus system can take different forms

Where we are today



Regional coordination

Interaction between jurisdictions to align services, share functions, etc. but not in a systematic way

Regional governance body

Entity with authority to make and enforce service standards for bus, and facilitate coordination on funding and operations across bus providers

Fewer / one regional operator(s)

Fewer providers (or single provider) of bus services in the region with unified functions and service standards, reducing the need for coordination amongst numerous individual providers

DC area example

Today, limited regional coordination among Washington area bus operators exists…

Sample coordination efforts (not exhaustive)

Operational efficiencies	• Shared facilities: WMATA and Fairfax County co-occupy the West Ox bus facility • Shared infrastructure: Metroway in Arlington/Alexandria – multiple bus operators to use certain parts of busway • Joint procurement: MTA and ART have piggybacked in the past on WMATA Procurement for buses
Customer experience	• Regional payment systems: SmarTrip card accepted by all local transit providers, except for the VRE and MARC commuter rail systems • Shared passenger facilities: Metrorail Stations; Takoma/Langley Transit Center; Mark Center Transit Center; Pentagon Transit Center • Regional signage: WMATA developed standard regional bus stop signage
Technology integration	• Regional Transit Signal Priority (TSP) project: The TIGER Transit Service Priority Project allows buses to run along the same corridors, across jurisdictions, using the same TSP technology

…the region can stay in the same place, or move towards less or more coordination

Source: MWCOG study

Benefits and challenges associated with no regional coordination

Benefits

- **Independence**: Jurisdictions have complete independence to make and execute operational decisions without having to align with other areas
- **Local focus:** Jurisdictions can be very responsive to local customer needs, instead of considering more diverse needs of broader region

Challenges

- **Narrow reach:** Difficult to set up and maintain cross-jurisdictional projects that could boost bus speed and ridership without engaging across jurisdictional lines
- **Missed efficiency opportunity:** Lost opportunity to realize operational efficiencies from shared maintenance, infrastructure, procurement that could result from regional coordination
- **Fragmented user experience:** Customers continue to experience a fragmented regional bus system, with limited front-end cohesiveness across bus providers

Benefits and challenges associated one regional governance body

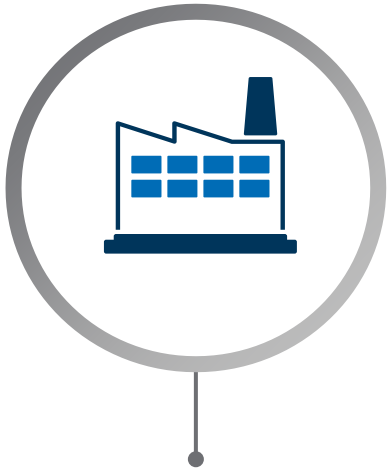
Benefits

- **Operational efficiencies:** Shared maintenance / infrastructure reduces redundancies in property, staff, and equipment
- **Technology integration**: Shared technology allows for more efficient flow of scheduling / dispatch / rider information across operators, enables them to share tools needed to enhance bus speeds (e.g., Transit Signal Priority)
- **Customer experience:** Schedule coordination, uniform fare structure, and information sharing across region would allow customers to have a more seamless, convenient trips
- **Service standards:** Shared service standards ensures consistent levels of service across providers

Challenges

- **Limits on independence:** Makes it difficult for jurisdictions to make decisions independently – would need to ensure alignment with regional body / regional operator
- **Decision rights**: Complexities associated with deciding which stakeholders hold decision rights / veto powers across range of topics
- **Competing interests**: Difficult to decide how to balance competing needs and priorities across jurisdictions

Many value creation opportunities associated with greater regional coordination

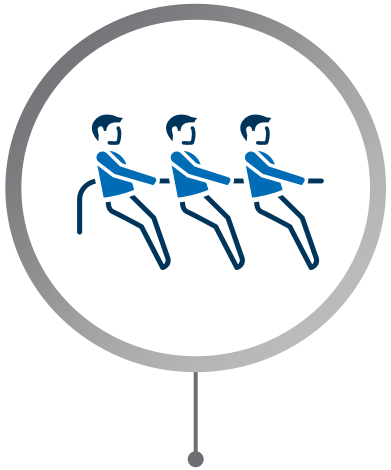


Shared facilities

Potential for eight new facilities in DC region to be shared by multiple operators

Shared infrastructure

Potential for eight corridor projects with dedicated bus infrastructure to serve many operators



Joint procurement

While available today, potential for bus operators to combine purchasing power and reduce costs with regional procurement agreement; for smaller operators, benefits are even greater

Shared administration

Potential for administrative functions (e.g., planning, fare collection) to be shared across providers – reducing costs for any one operator

Establishment of a regional governance body could facilitate execution of these opportunities and drive identification of further opportunities

Source: MWCOG study

Sample list, not exhaustive

DC area example

Potential for eight new facilities in DC region to be shared by multiple operators

Planned facilities in Washington region where sharing may improve efficiency

	Facility	Benefit	Feasibility	Notes
1	Arlington—New ART Satellite parking facility (Nauck, VA)	High	High	6 agencies and 175 routes operated within a 5-mile radius
2	DC—New DC Circulator maintenance facility (option 1): Armed forces Retirement Home	High	Med	6 agencies and 169 routes operated within a 5-mile radius
3	DC—New DC circulator maintenance facility (option 2): Southeast Blvd	High	High	7 agencies and 213 routes operated within a 5-mile radius
4	Montgomery—New ride on maintenance facility	Low/none	Low	1 agencies and 23 routes operated within a 5-mile radius
5	Arlington—New ART heavy maintenance facility	Medium	Med	4 agencies and 83 routes operated within a 5-mile radius
6	WMATA—New parking facility and bus division (option 2): Bailey's crossroads	Medium	Med	5 agencies and 128 routes operated within a 5-mile radius
7	WMATA—New parking facility and bus division (option 3): Silver spring	Medium	Low	4 agencies and 124 routes operated within a 5-mile radius
8	Prince George's county—New TheBus maintenance facility to provide capacity for vision plan expansion[1]	NA	NA	NA

Benefits measured by number of routes and operators within 5-mile radius of faclilty

Feasibility measured by density of development between 0.25 miles of facility

Source: MWCOG study

BTP White Paper #2 page 68

Sample list, not exhaustive

DC area example

Potential for eight corridor projects with dedicated bus infrastructure to serve many operators

Planned corridor projects with dedicated bus infrastructure – could be used by multiple operators

	Facility	Benefit	Feasibility	Notes
1	Arlington—Columbia pike premium transit network	High	High	2 agencies, 11 routes, total length of all routes: 24.1 miles
2	Fairfax—VA-7 Transitway	High	High	3 agencies, 15 routes, total length of all routes: 18.0 miles
3	Fairfax—US-1 Transitway	Medium	High	2 agencies, 7 routes, total length of all routes: 30.3 miles
4	Alexandria—West End transitway	Medium	High	3 agencies, 14 routes, total length of all routes: 18.8 miles
5	Alexandria—Duke Street transitway	Low	High	2 agencies, 9 routes, total length of all routes: 18.4 miles
6	Montgomery—MD 355 BRT corridor	High	Low—level boarding/off-board payment, infrequent stations	2 agencies, 11 routes, total length of all routes: 35.6 miles
7	Montgomery—US 29 BRT corridor	High	Low—level boarding/off-board payment, infrequent stations	2 agencies, 12 routes, total length of all routes: 42.0 miles
8	MTA—Southern Maryland rapid transit project	Medium	High	3 agencies, 8 routes, total length of all routes: 17.6 miles

Benefits measured by number of routes and operators that operate along new corridor

Feasibility measured by ability of multiple bus types to use corridor (example: corridors being planned with off-board payment systems cannot be used by agencies that don't operate compatible buses)

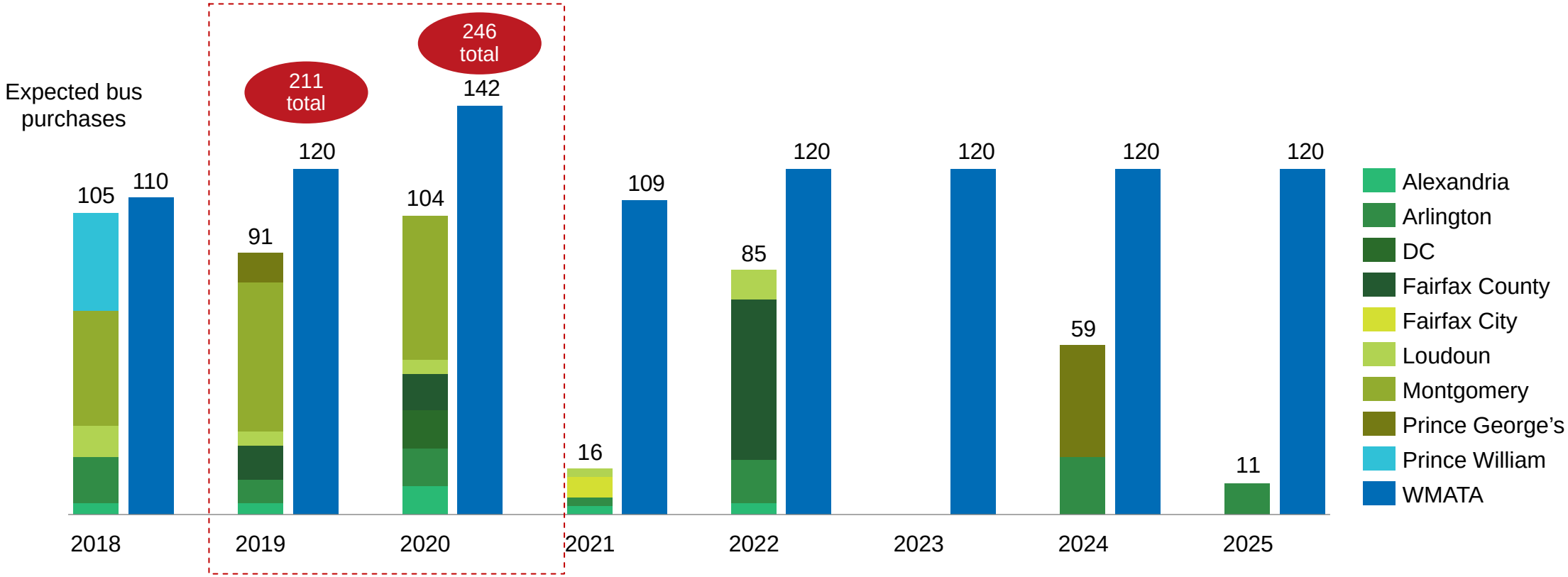
BTP White Paper #2 page 69

Source: MWCOG study

DC area example

Over next two years, potential for all operators to increase purchasing power with joint procurement…

Overlap in planned bus purchases in the Washington region from 2018-2025



…which would result in better per-vehicle pricing across region

Source: MWCOG study

Regional governance model: Chicago RTA – oversight and planning body with limited authority

Context

The Chicago Regional Transit Authority (RTA) is a financial oversight and planning body for three transit agencies in Northeastern Illinois:

- Chicago Transit Authority (CTA)
- Metra Commuter Rail
- Pace Suburban Bus & Pace ADA Paratransit

Serves two million riders each weekday in six counties with 7,200 transit route miles throughout Northeastern Illinois

Dominant transit player is CTA

Approach

Allocates funding across agencies based on funding formula

Provides "shared services"

- Integrated travel information to public, e.g.,
  - RTA Travel Information hotline
  - Automated Trip Planner
- Shared "Try Transit" advertising

Sets and enforces information design standards (e.g., bus times and boarding area signs)

Service standards still set by independent agencies

Insights

RTA is not powerful enough to be productive in pursuing regional goals

- Agencies retain effective veto power over any RTA action
- RTA controls funding, but most of that money is allocated according to a predetermined formula, giving the RTA little discretion
- At times, agencies focused on operating own services, instead of thinking from regional perspective

Source: Regional Transportation Authority: Interagency Transit Passenger Information Design Standards Manual (2016); TransitCenter: The role of Governance in Regional Transit (2014); Regional Transportation Authority: Interagency Transit Passenger Information Design Standards Manual (2016); Chicago Tribune

METROPOLITAN TRANSPORTATION COMMISSION

Case study

Regional governance model: Bay Area MTC – governance body with broad authority

Context

Metropolitan Transportation Commission (MTC) plays a coordinating role across all 26 Bay Area transit entities in nine counties

Serves as the arbiter of federal funds, has regional tax authority, and is the region's fiduciary agent for transit empowered by California state law

Manages several regional operational programs

- Regional pavement management
- Arterial operations
- Regional signal timing programs
- Ridesharing
- FasTrakelectronic toll collection

Approach

Oversees operational and capital funding

- Distributes significant funding to transit projects
- Apportions operational transit funding on a discretionary basis
- Created regional criteria to evaluate new capital investments

Sets shared service standards

- Outlined regional transit performance metrics (Transit Sustainability Project)

Plans regional operational improvements

- Implemented regional fare card (Clipper) that operates on major systems
- Sets broad regional plans for transit

Insights

MTC more powerful than most other regional oversight bodies, making regional coordination more effective

- State grants MTC significant power through legislation
- Surplus toll revenues give MTC a funding source that it can leverage to exercise discretion over the selection of transit capital improvements

Source: TransitCenter: The role of Governance in Regional Transit (2014); MWCOG study

Regional governance model: Hamburg HVV – governance body with full authority

Context

Hamburger Verkehrsverbund (HVV – The Hamburg Public Transportation Association) formed in 1965 as a regional transit association with the goals of:

- One ticket – passengers would need only one fare pass to reach their destination, regardless of provider
- One fare structure – passengers would always pay the same fare regardless of provider or mode
- One schedule – schedules were coordinated so that transfers between different modes and different providers were possible

(All goals realized in 1960s)

Source: Boschalumni: German Transit, Innovations and lessons for US transit agencies

Approach

Manages contracts between the governments and the transit providers

Sets and enforces service standards across transit providers

Coordinates regional priorities across all transit providers, e.g.,

- Marketing and appearance
- Customer service and information
- Planning and coordination of schedules
- Electronic payment and ticketing
- Coordinating mobility services like car-sharing

Oversees funding, involving complex web of 10 government entities and 29 different transit providers

Insights

HVV's regional coordination correlated with increased ridership and bus improvement mechanisms

- Transit ridership in Hamburg has grown faster than the national average for last several years
- Major MetroBus lines are at capacity
- Hochbahn has developed a mobility platform (called switchh) which calculates the fastest mode to get somewhere among several transit partners
- Bus Rapid Transit: Region is pursuing several infrastructure improvement projects to speed buses, similar to Bus Rapid Transit projects in the US

Another option for increased coordination is moving to a system with fewer bus providers

Benefits

- **Consistent levels of service**: With fewer bus operators in the region, easier to deliver service in line with guidelines across all routes
- **Enhanced rider experience**: Instead of needing to understand / navigate many different bus providers (e.g., schedules, websites, payment systems) riders would interact with small number of bus providers
- **Scale benefits:** Consolidation of bus providers means each individual operator would likely enjoy increased economies of scale, e.g., purchasing, infrastructure, other operating efficiencies
- **Regional connectivity**: Easier to seamlessly integrate between services and modes with fewer bus providers

Challenges

- **Potential service disruption**: In order to move to system with fewer bus providers, significant transition of service and assets would be required, which could cause disruptions to current service
- **Political feasibility**: Move to smaller number of regional operators may be met with political pushback
- **Jurisdictional independence**: Decreased control for individual jurisdictions on what services are provided in their areas

PRELIMINARY

Regional governance / delivery model for bus?

- Jurisdictional independence in decision-making
- Ability to quickly respond to local customer needs
- Reduction in project delays that result from aligning multiple jurisdictional stakeholders

- Operational efficiencies from shared property, services
- Technology integration benefits
- Consistent levels of service across region
- Seamless customer experience

Consideration #4: What business should Metrobus be in?

Executive summary: What business should Metrobus be in?

Three key components of bus service delivery

- Frontline operations: Bus driving, vehicle maintenance, labor management
- Business administration: Marketing and sales, procurement, financial management
- Systems management: Route design, scheduling, payment systems, electronic data information systems

Metrobus doing all three, requiring it to wear many hats

- Frontline operations require management of fixed assets (e.g., buses, garages) and training and management of large frontline staff
- Business administration requires knowledge of traditional support functions, e.g., contracting expertise to manage procurement
- Systems management requires agility and technical expertise in order to optimize routes and set up various tech-enabled structures (e.g., payment systems)

Some benefits associated with maintaining Metrobus' end-to-end operating model….

- Ease of collaboration: Allows Metrobus to easily coordinate on initiatives across the value chain – everyone sits "under one roof"
- Historical precedent: Does not upset status quo – avoids disturbing current contracts and relationships and that have been in place for decades
- Shared overhead: Enables sharing of overheard costs across value chain (e.g., rent, utilities, procurement, HR, etc.)

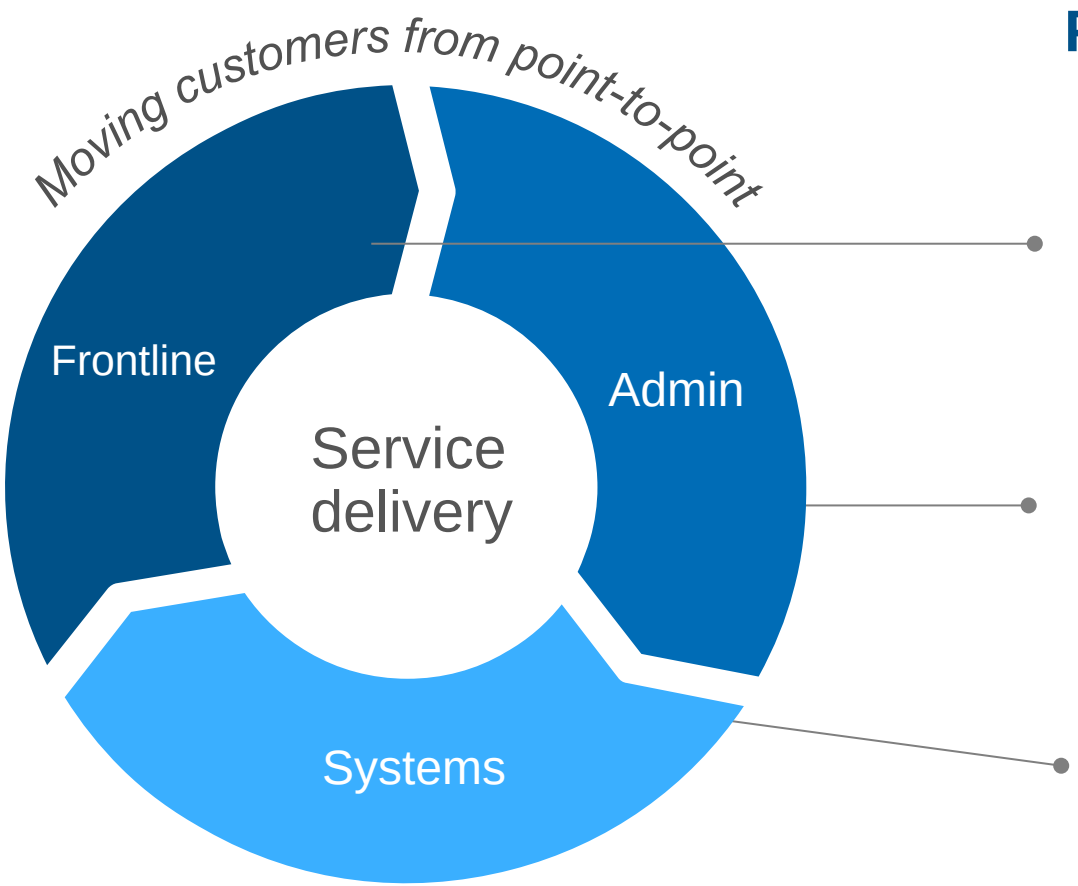
…but the current model also poses some challenges, e.g.,

- Limited ability to diagnose problems: Makes it difficult to isolate and address root cause of inefficiencies
- No competitive advantage: Resources and efforts are fragmented across many functions instead of focusing them on select areas where Metrobus has a particular expertise or advantage compared to other potential service vendors
- Reduced agility: Creates difficulty generating or executing new ideas quickly, as it's difficult for multi-dimensional organization to adapt quickly

Some transit agencies have split off frontline operations into a subsidiary, which focused solely on driving, vehicle maintenance, and other direct service delivery activities

- Stockolm: Instead of focusing on day-to-day management, operations, and maintenance, agency's core mandate evolved into metropolitan-area planning; setting standards, policies, and priorities; and overseeing contractor service provision

Three key components of bus service delivery



Frontline operations

- Bus driving
- Vehicle maintenance & facilities mgmt.
- Labor management

Business administration

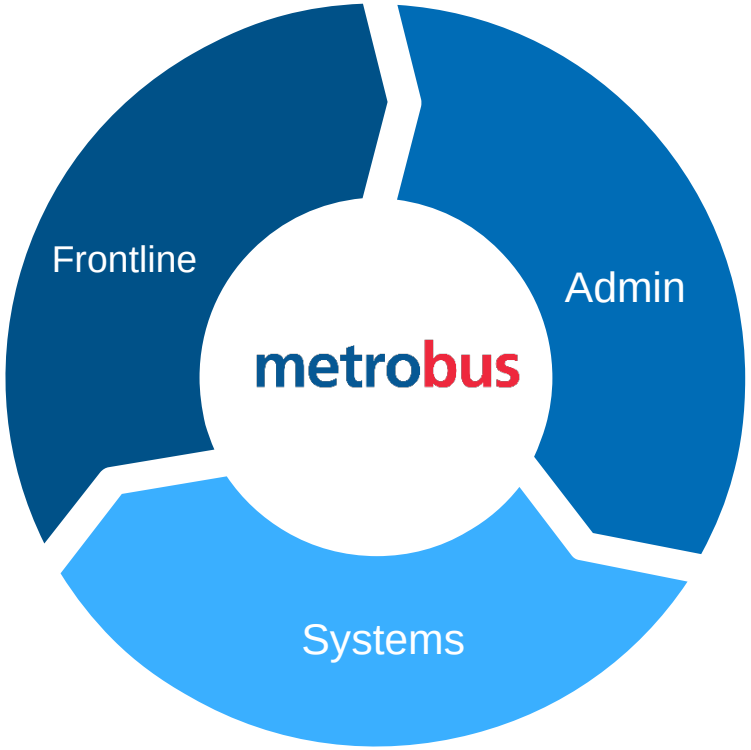
- Marketing & sales
- Procurement
- Financial management

Systems management

- Route design
- Scheduling / dispatching
- Payment systems
- Electronic data information systems

Metrobus currently an end-to-end bus operator

Metrobus covering all parts of bus service today…



…requiring organization to wear many hats

Frontline operations require **management of fixed assets** (e.g., buses garages) and training and management of large frontline staff

Business administration requires **knowledge of traditional support functions**, e.g., contracting expertise to manage Procurement

Systems management requires **agility and technical expertise** in order to optimize routes and set up various tech-enabled structures (e.g., payment systems)

While there are some benefits associated with maintaining Metrobus' full-service model, there are also challenges

Benefits

- **Ease of collaboration:** Allows Metrobus to easily coordinate on initiatives across the value chain – everyone sits "under one roof"
- **Historical precedent:** Does not upset status quo – avoids disturbing current contracts and relationships and that have been in place for decades
- **Shared overhead**: Enables sharing of overheard costs across value chain (e.g., rent, utilities, etc.)

Challenges

- **Limited ability to diagnose problems:** Makes it difficult to isolate and address root cause of inefficiencies in each part of the value chain
- **Less competitive advantage**: Resources and efforts are fragmented across many functions instead of focusing them on select areas where Metrobus has a particular expertise or advantage compared to other potential service vendors
- **Reduced agility**: Creates difficulty generating or executing new ideas quickly, as it's difficult for multi-dimensional organization to adapt quickly

Case study

Stockholm splits frontline operations from rest of organization

Context

Historically, metropolitan transit in Stockholm was directly managed and operated by Storstockholms Lokaltrafik (SL) for the Stockholm metropolitan region, home to 2.2 million people

SL wanted to rein in administrative and operational costs, which had been rising at the time

SL also wanted to increase customer satisfaction with transit, which hovered near 50 percent for local transport services

Approach

Instead of focusing on day-to-day management, operations, and maintenance, SL's core mandate evolved to focus only on metropolitan-area planning; setting standards, policies, and priorities; and overseeing contractor service provision

Starting in 1988, SL took the departments previously focused on operations and created several subsidiary operating entities—still part of SL but operating under contract-like agreements

This step, which could be considered SL contracting with itself, allowed the agency to slowly and safely gain experience in administering contracts for public services (the agency eventually transitioned to a competitively contracted public transportation system)

Outcomes

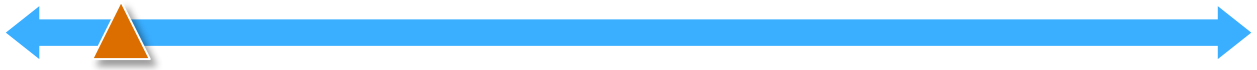
Since the organizational split in 1988, bus ridership increased steadily in Stockholm

In 2005, SL introduced bonuses for contractors in the form of a "Verified Paid Boardings" (VPB) system (based on number of riders, as well as other factors such as cleanliness) – bus ridership on the bus has increased nearly 20 percent since then

Source: Transit Center: A Bid for Better Transit (2017)

PRELIMINARY

What business should Metrobus be in?



Metrobus continues to operate all functions as it does today

- Ease of collaboration with everyone "under one roof"
- No disturbance to current contracts / relationships
- Shared overhead costs across organization

Metrobus focused on centralized operations only (e.g., procurement, marketing, fare systems management)

- Ease of diagnosing root cause of inefficiencies
- Allows management to focus on areas of comparative advantage
- Increased agility to generate and execute new ideas quickly

Consideration #5: What services should Metrobus operate?

Executive Summary – What services should Metrobus operate?

Region needs to determine the role of Metrobus within the broader bus system. Today, Metrobus covers a mix of routes within and between jurisdictions while local operators cover intra-jurisdictional routes.

In the future, Metrobus has a number of options, ranging from operating all routes in the region today, to operating no routes at all. Many dimensions such as performance criteria, service standards, land-use implications, environmental impact and class of services should be considered in determining what services Metrobus operates.

Potential implications of Metrobus operating all routes in the region include:

- Benefits: Increased service level consistency for bus across region, enhanced rider experience by reducing the need to navigate multiple providers, potential for improved financial sustainability of bus by allowing for economies of scale
- Challenges: Potential service disruption during transition from local bus operators to Metrobus could impact customers and employees

Operating a focused network tied to service or performance standards, such as high density routes only, could deliver benefits, but also some challenges:

- Benefits: Potential for increased boardings per revenue mile/hour for Metrobus on a system level, higher farebox recovery for Metrobus, reduced operating costs for WMATA
- Challenges: Increased effort for local bus operators, who would have to manage service gaps left by Metro and manage any short-term service disruptions

If Metrobus did not operate any routes at all, the following benefits and challenges could result:

- Benefits: Reduced costs for Metrobus, increase jurisdictional control, increased ability for Metrobus to focus on other value-add services
- Challenges: Need to determine provider(s) for inter-jurisdictional routes, potential service disruption during transition from local bus operators to Metrobus could impact customers and employees

Many dimensions to consider in determining what services Metrobus should operate

Performance Criteria

Examples

- Farebox recovery
- Boardings per revenue hour/mile

Service Standards

- Frequency
- Hours of operation

Land-use Implications

- Based on current or expected density
- Proximity to affordable housing

Environmental Impact

- Based on threshold for emissions

Class of Service

- Late-night service
- Connectivity to rail

Key considerations for expanding Metrobus operations to include all routes in the region

Benefits

- **Consistent levels of service**: With one bus operator in the region, easier to deliver service in line with guidelines across all routes
- **Enhanced rider experience**: Instead of needing to understand / navigate many different bus providers (e.g., schedules, websites, payment systems) riders would only have to interact with one operator
- **Scale benefits:** One regional operator could enjoy increased economies of scale, e.g., purchasing, infrastructure, other operating efficiencies
- **Regional connectivity**: Easier to seamlessly integrate between services and modes

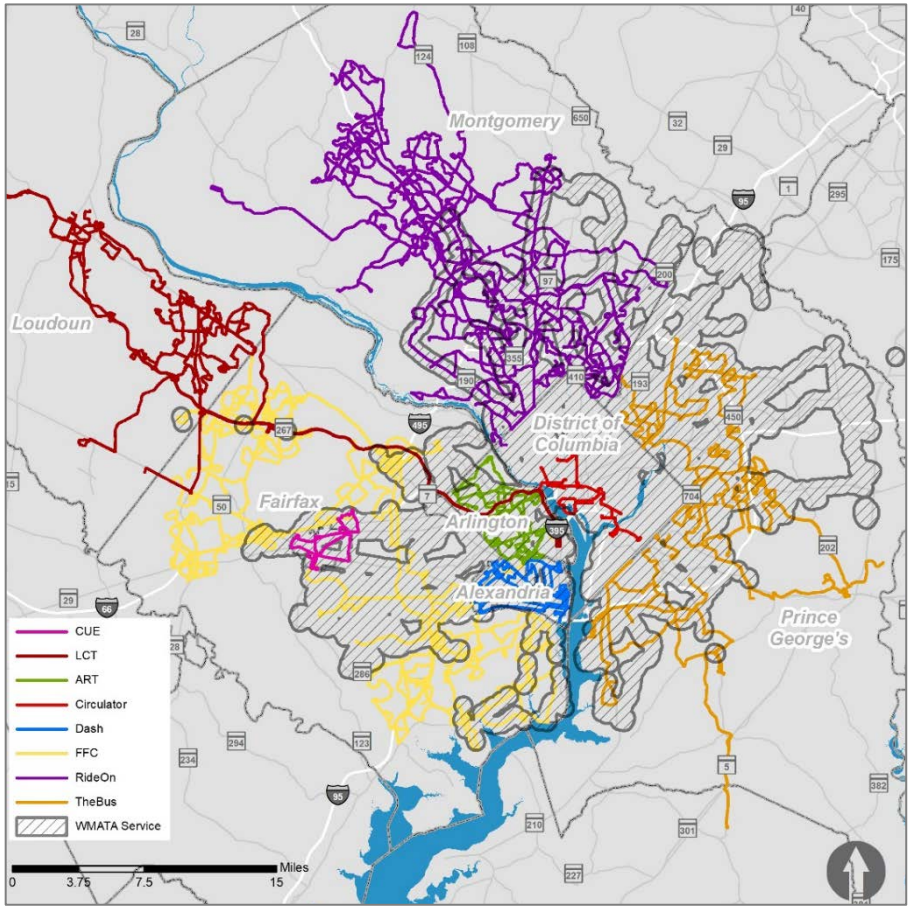
Challenges

- **Potential service disruption**: In order to move to one operator, significant transition of service and assets would be required, which could cause disruptions to current service
- **Labor considerations**: Need to consider implications of Metrobus expansion for current staff at local operators
- **Political feasibility**: Replacing local operators with one regional operator may be met with political pushback
- **Jurisdictional independence**: Decreased control for individual jurisdictions on what services are provided in their areas

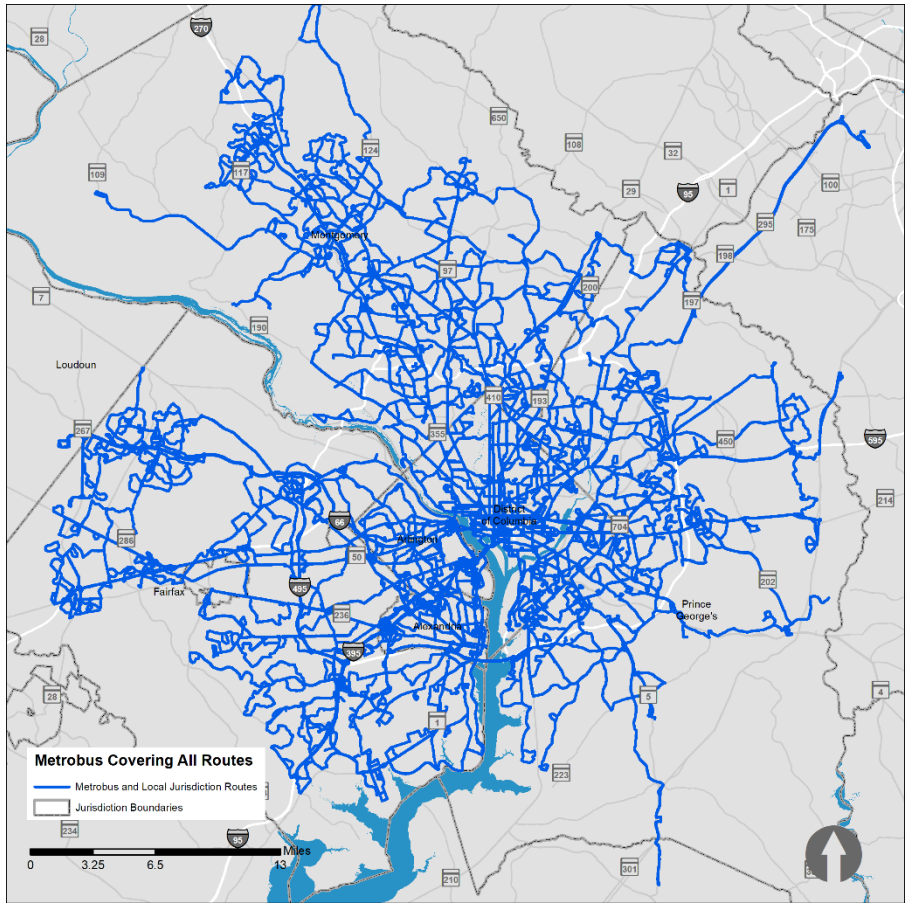
For illustrative purposes only

What would expanding Metrobus operations to all routes in the region look like?

Current regional bus operator coverage



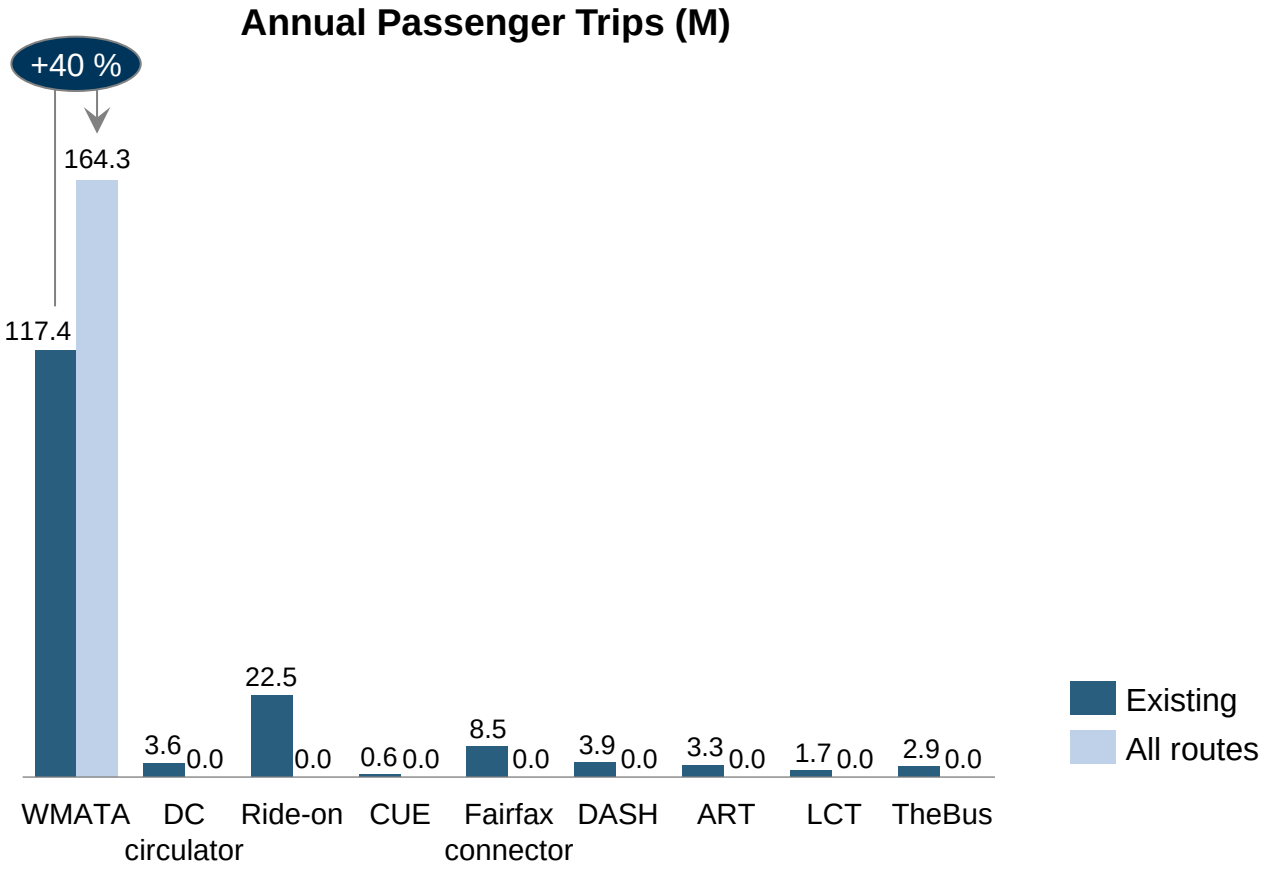
Metrobus coverage of all routes in the region

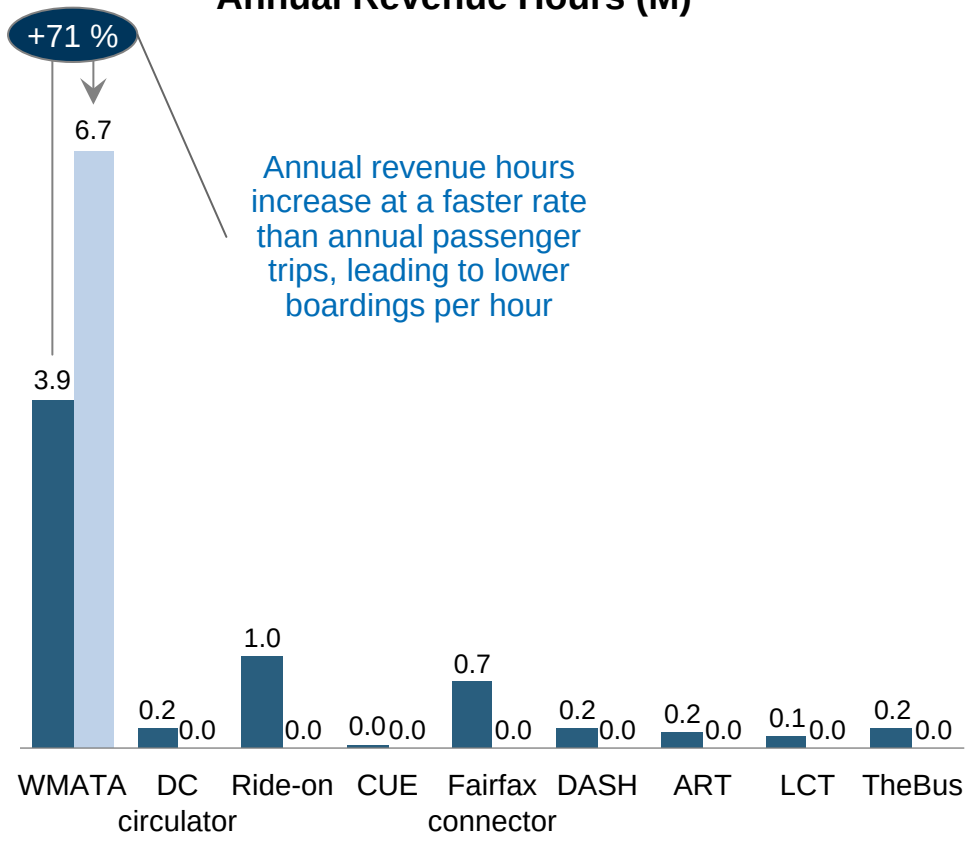


Source: Foursquare Analysis

For illustrative purposes only

If Metrobus expanded operations to all existing routes, passenger boardings per hour would decrease by 18%





Boardings per hour would decrease by 18% from ~30 to ~25

Source: National Transit Database, 2017 data; Foursquare analysis.

Key considerations for Metrobus operating a focused network based on service or performance standards

Benefits

- **Potential increase in productivity for Metrobus**: Simplifying the route network and focusing on high-density areas could increase boardings per hour/mile, enabling higher farebox recovery for Metrobus
- **Cost savings for Metrobus:** Reducing the coverage area could decrease operating costs for WMATA and requires lower contributions from jurisdictions (though costs for region as a whole may stay the same)

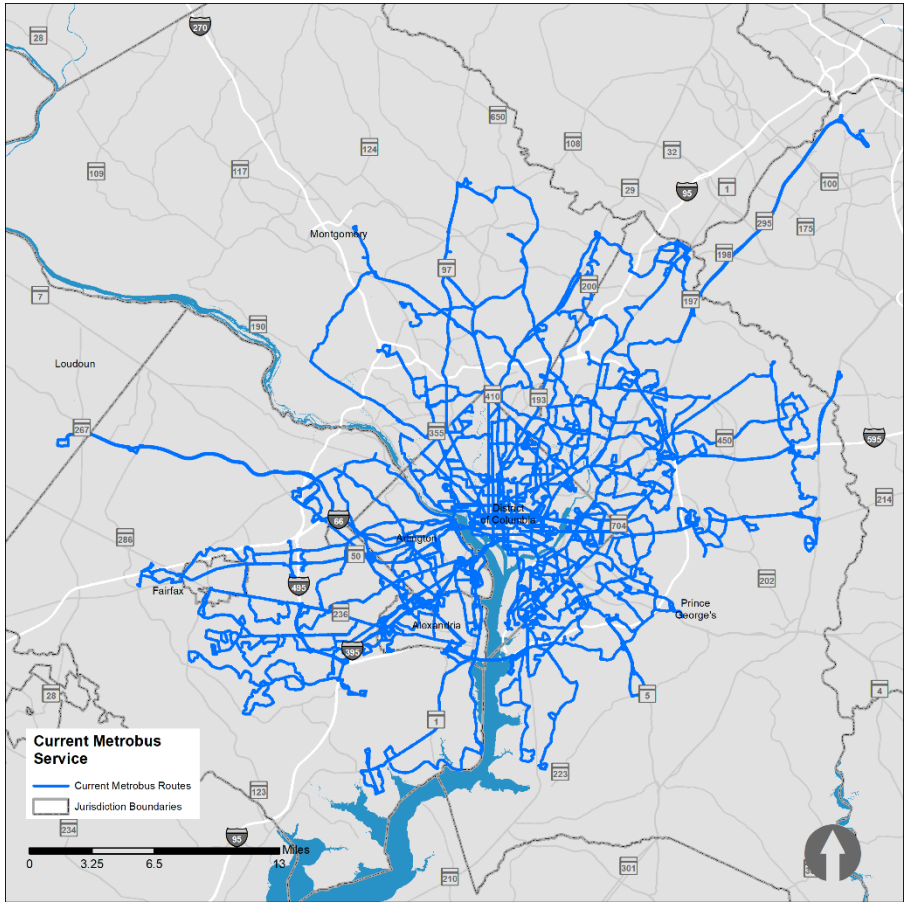
Challenges

- **Increased burden on local operators:** Local bus operators would have to manage service gaps left by Metrobus if coverage area were reduced
- **Labor considerations**: Need to consider implications of focused network for current Metrobus frontline staff
- **Potential service disruption**: Transition of service and assets would be required, which could cause disruptions to current service

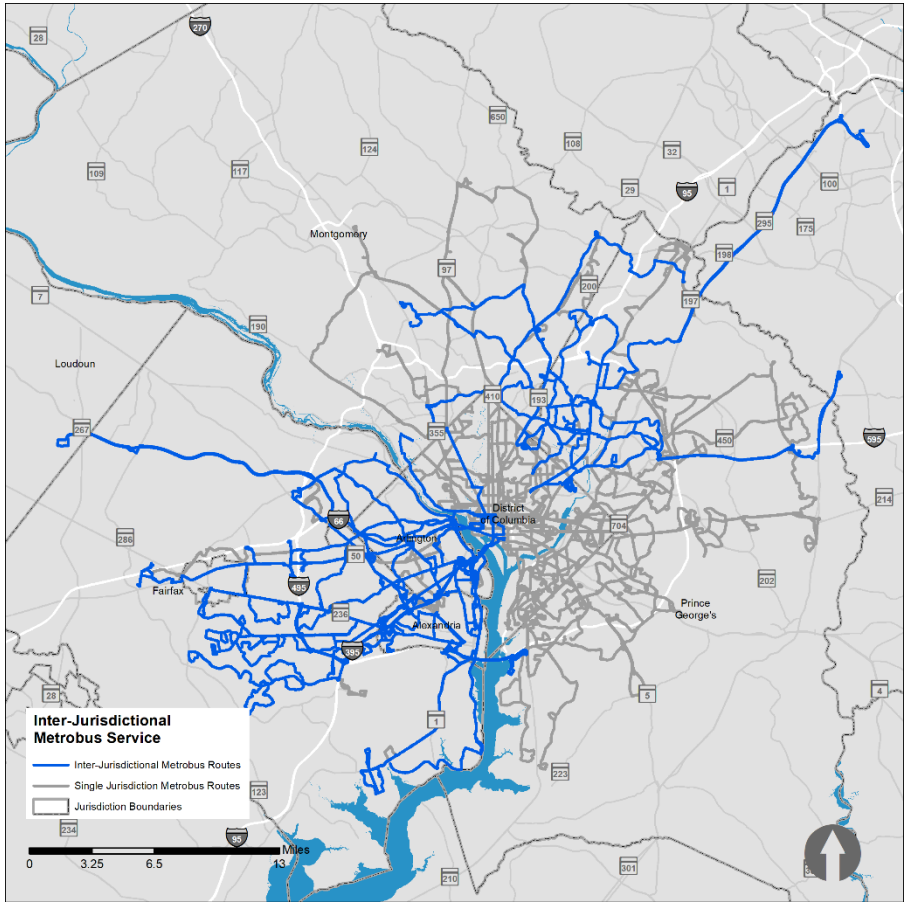
For illustrative purposes only

Inter-jurisdictional routes[1]: Potential option to focus network based on service or performance standards

Current Metrobus coverage



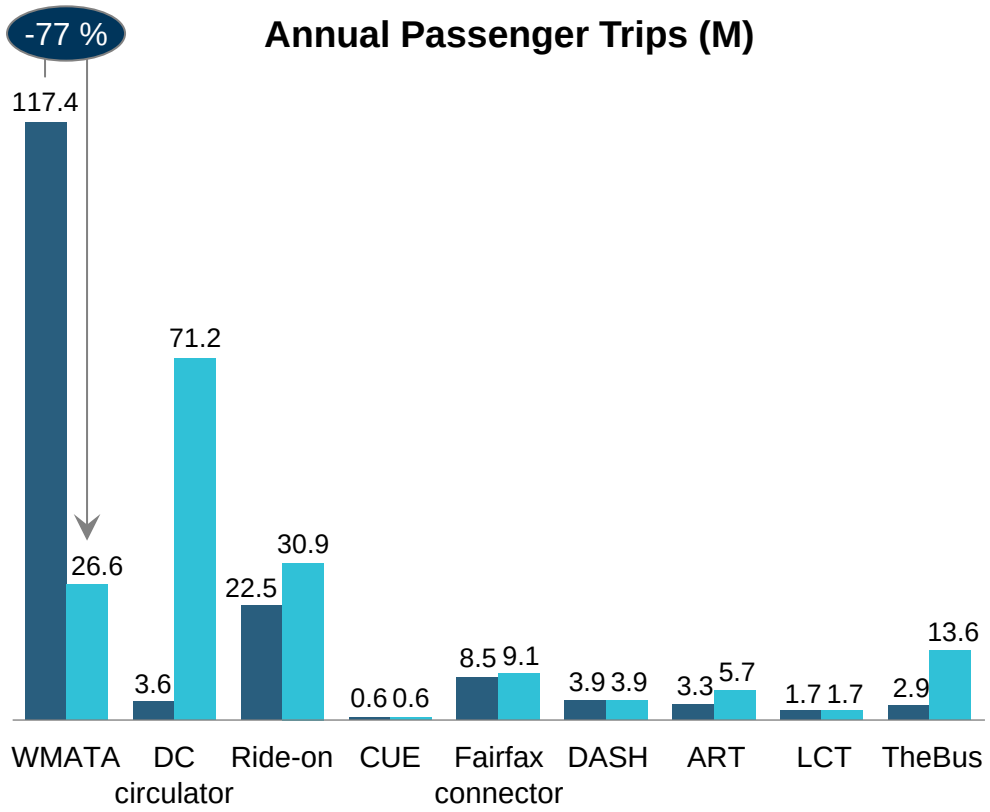
Metrobus' inter-jurisdictional routes

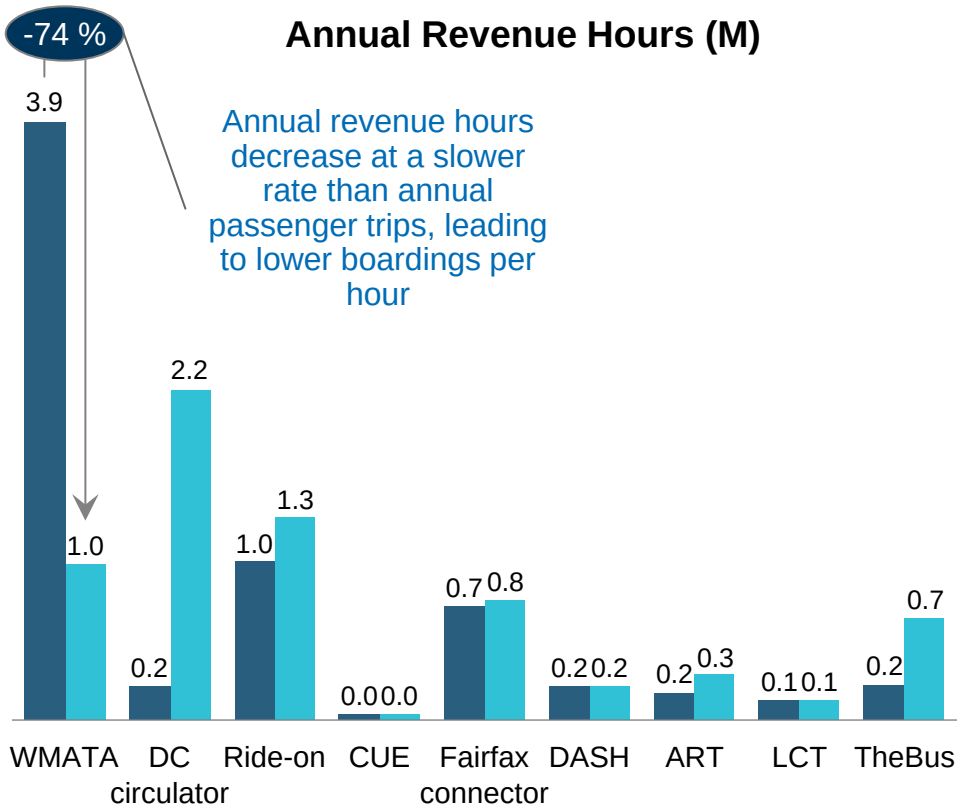


1. Inter-jurisdictional routes defined as traveling more than half a mile into two or more jurisdictions. Based on this definition, of the 259 Metrobus routes, 72 are inter-jurisdictional Source: Foursquare Analysis

For illustrative purposes only

However, focusing operations on only inter-jurisdictional routes would result in lower productivity





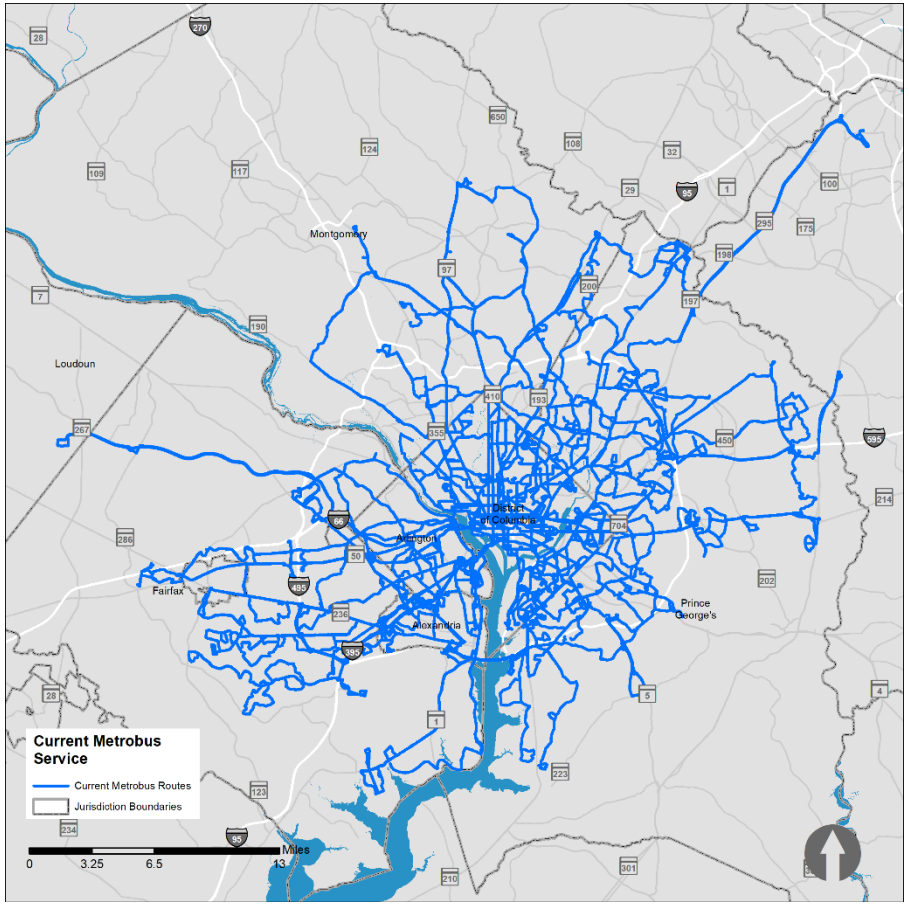
Boardings per hour would decrease by 13% from ~30 to ~26

Source: National Transit Database, 2017 data; Foursquare analysis

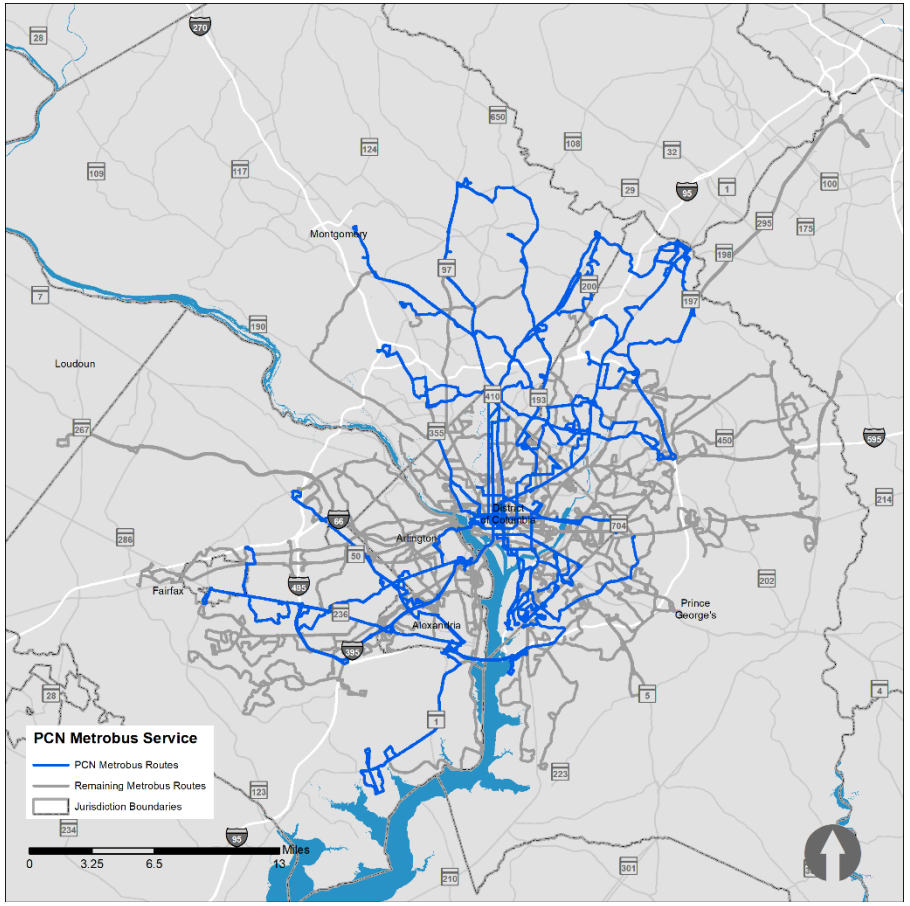
For illustrative purposes only

High-Density Routes: Alternative option to focus network based on service or performance standards

Current Metrobus coverage



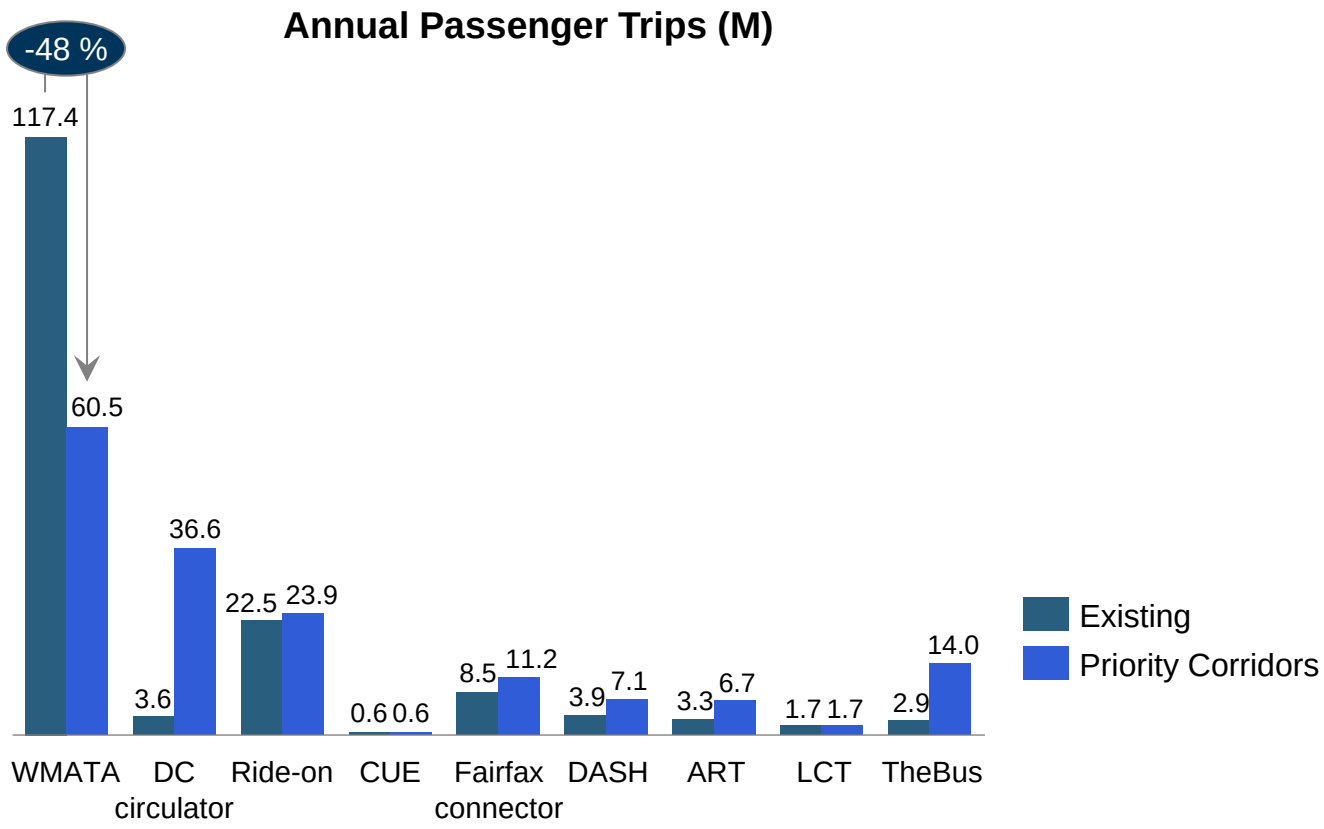
Metrobus' Priority Corridor Network[1] as defined today

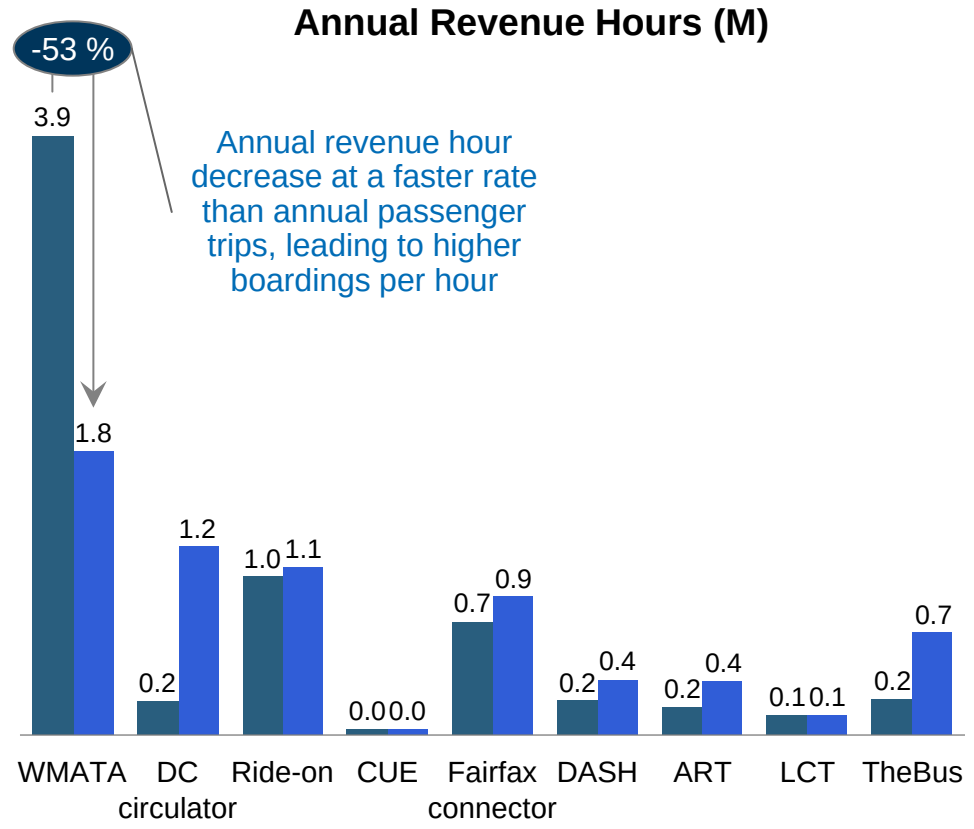


1. The Metrobus Priority Corridor Network (PCN) is a strategy for improving bus service in the Washington region quickly and efficiently. The goal of the PCN is to improve bus service travel times, reliability, capacity, productivity and system access. The plan includes 24 corridors across the region and will impact half of all bus riders in the current Metrobus system. Source: Foursquare Analysis

For illustrative purposes only

High-density routes yield higher productivity for Metrobus with a 9% increase in boardings per hour





Boardings per hour would increase by 9% from ~30 to ~33

Source: National Transit Database, 2017 data; Foursquare analysis

Key considerations if local operators ran all bus services in the region

Benefits

- **Reduces costs for Metrobus:** Reduces operating and capital costs for Metrobus if they no longer have to operate and maintain vehicles
- **Increased control for jurisdictions:** Local operators have more control over level of service provided to customers in their jurisdictions
- **Sharpens Metrobus focus:** Eliminating frontline bus operations would allow Metrobus to focus on other important functions that could drive value for bus system as a whole (e.g., procurement, marketing, fare payment systems management)

Challenges

- **Need to identify providers for inter-jurisdictional routes:** Local operators will have to determine how to operate and fund inter-jurisdictional routes that Metrobus currently serves
- **Complicated rider experience**: Moving from Metrobus to new inter-jurisdictional operator / set of operators could make trip planning / travel experience more confusing for riders without strong regional coordination
- **Local operator organization**: Local transit agencies are not currently staffed appropriately to take on expansion in service
- **Capital costs:** New providers taking over Metrobus coverage areas may incur capital costs associated with setting up required infrastructure (e.g., new bus stop, facilities) or facilities/asset transfers
- **Operating costs:** With a broader coverage area, local operators would also have increased operating costs (without the benefits of scale enjoyed by Metrobus)

Backup: How were the coverage scenarios assessed?

Assessment: Each scenario assessed 1) impact of coverage change for Metrobus and other local bus operators and 2) change in productivity for Metrobus. Productivity calculated as benefit / cost. Revenue hours were used as a proxy for the operating cost of a system while passenger trips were a proxy for the benefit of the service.

Key assumptions: Each of the service scenarios assumes that routes will be transferred between Metrobus and the local bus providers without any change to route schedule, design or ridership.

Inter-jurisdictional routes were considered to be any route that stopped at a location ½ mile within two or more jurisdictions.

Inter-jurisdictional routes include:
1A, 1B, 1C, 2A, 3A, 3Y, 5A, 7A, 7F, 7M, 7W, 7Y, 8W, 8Z, 10A, 10B, 10E, 11Y, 15K, 16A, 16B, 16E, 16J, 16L, 16P, 16X, 16Y, 17B, 17G, 17H, 17K, 17L, 17M, 18G, 18H, 18J, 18P, 21A, 21D, 23A, 23T, 25B, 28A, 29C, 29G, 29K, 29N, 29W, 38B, B29, B30, B9, C2, C4, C8, D5, F4, F6, J4, K6, K9, L2, Metroway, NH2, R1, R2, R4, REX, T14, T18, Z7, 83, 86

Priority corridor network routes include:
16A, 16B, 16E, 16G, 16H, 16J, 16K, 16L, 16P, 16X, 16Y, 28A, 28F, 28G, 29C, 29G, 29K, 29N, 29W, 30N, 30S, 89M, A2, A4, A6, A7, A8, A9, C2, C4, F4, F6, G8, G9, J1, J2, J3, J4, K6, K9, MW1, NH1, NH2, P12, Q1, Q2, Q4, Q5, Q6, REX, S1, S2, S4, S9, W5, W9, X1, X2, X3, X9, Y2, Y7, Y8, Z11, Z2, Z6, Z7, Z8, 31, 32, 33, 34, 36, 37, 39, 52, 54, 59, 70, 74, 79, 80, 83, 86, 87, 89, 90, 92

Source: Information on the productivity of local bus operators was taken from the 2017 National Transit Database. Productivity information for Metrobus was calculated by route based on the Fall 2017 APC counts.

PRELIMINARY

What services should Metrobus operate?

Metrobus operates all routes across region

Current state of Metrobus

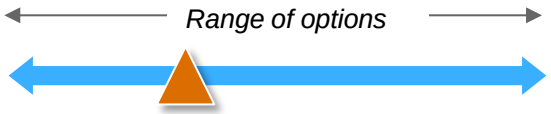
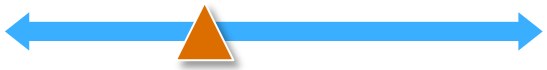
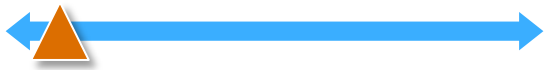
Metrobus operates no routes (no buses say "Metrobus"); all routes operated by other bus operators

- Consist service levels across region
- Ease of trip planning and payment for riders
- Reduced burden on jurisdictions to manage local operations

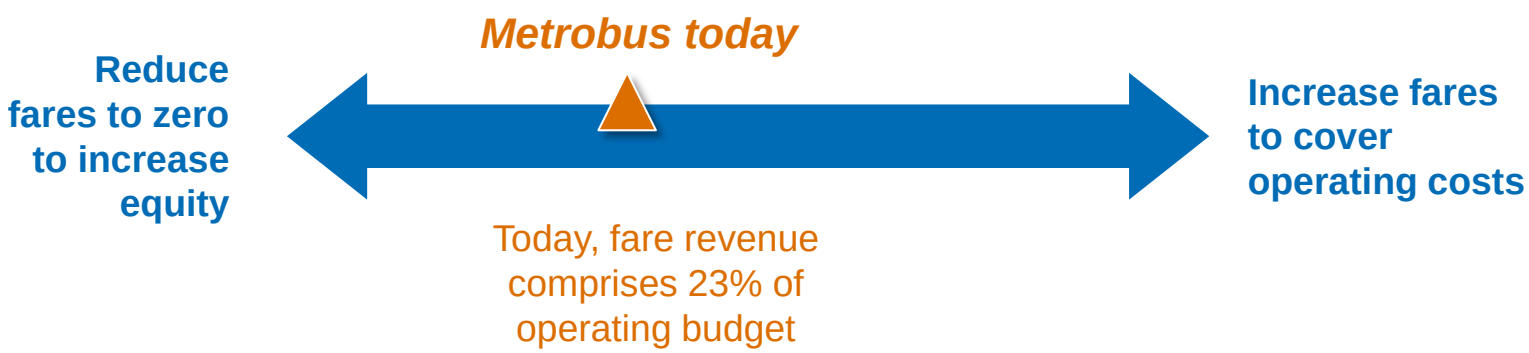
- Metrobus can focus on supporting bus operations in other value-add ways (e.g. support-as-a-service)
- Reduced operating costs for Metrobus (but not necessarily for region as a whole)

Consideration #6: How should Metrobus operate?

Executive summary: How should Metrobus operate?

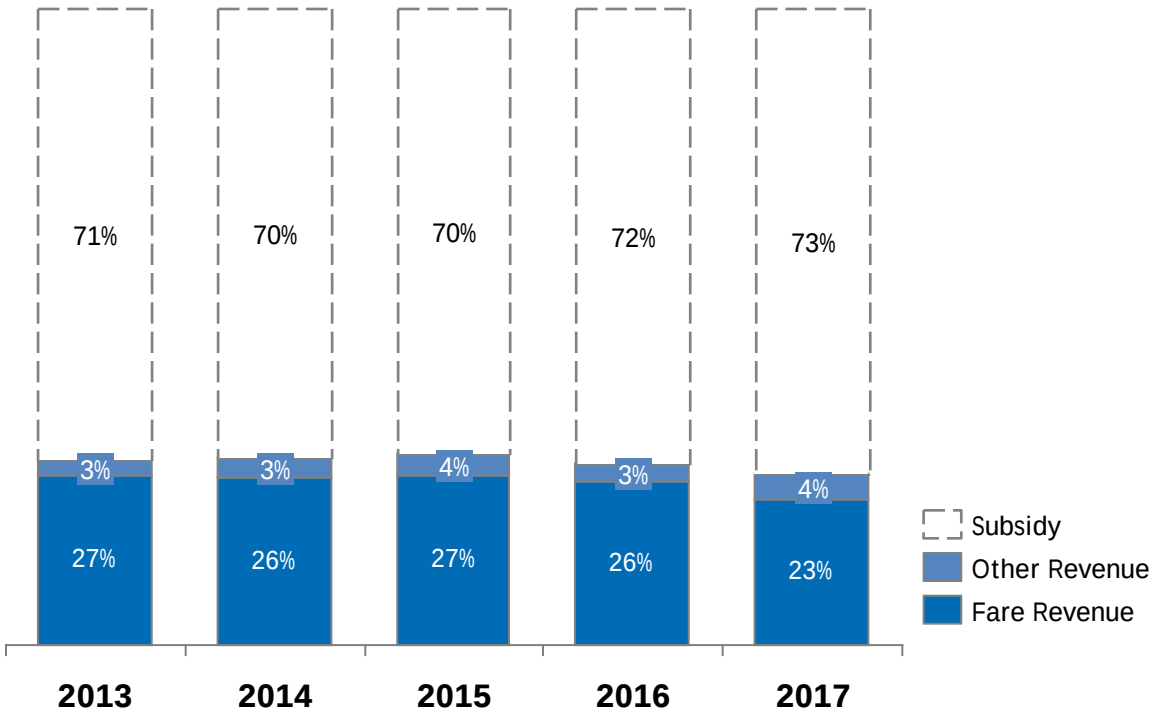
		Choices		
1	**Level of fares**: What should be the level of fares?	Reduce fares to zero to increase equity		Increase fares to cover operating costs
2	**Service flexibility**: Should Metrobus incorporate any on-demand services?	A	Maintain status quo: Fixed schedules and fixed routes	
		B	Introduce on-demand services in select areas	
3	**Fare integration with rail:** How integrated should bus and rail fares be?	No discounts for transfers between bus and rail		Free transfers between bus and rail
4	**Integration with other transportation modes:** How to partner with other transportation providers or modes such as TNCs, bike/scooter-shares, etc.?	No partnership with other transportation providers		Full integration with other transportation providers as part of Metrobus offering
5	**Innovation**: How should Metrobus approach technological innovation (e.g., automated mobility, electric vehicles)?	A	Innovator: Be among the first transit systems to pilot and adopt new technologies	
		B	Late adopter: Wait for proof of concept of new technologies (e.g., results from other transit system pilots) before implementing them	

Operational choice #1: Level of fares

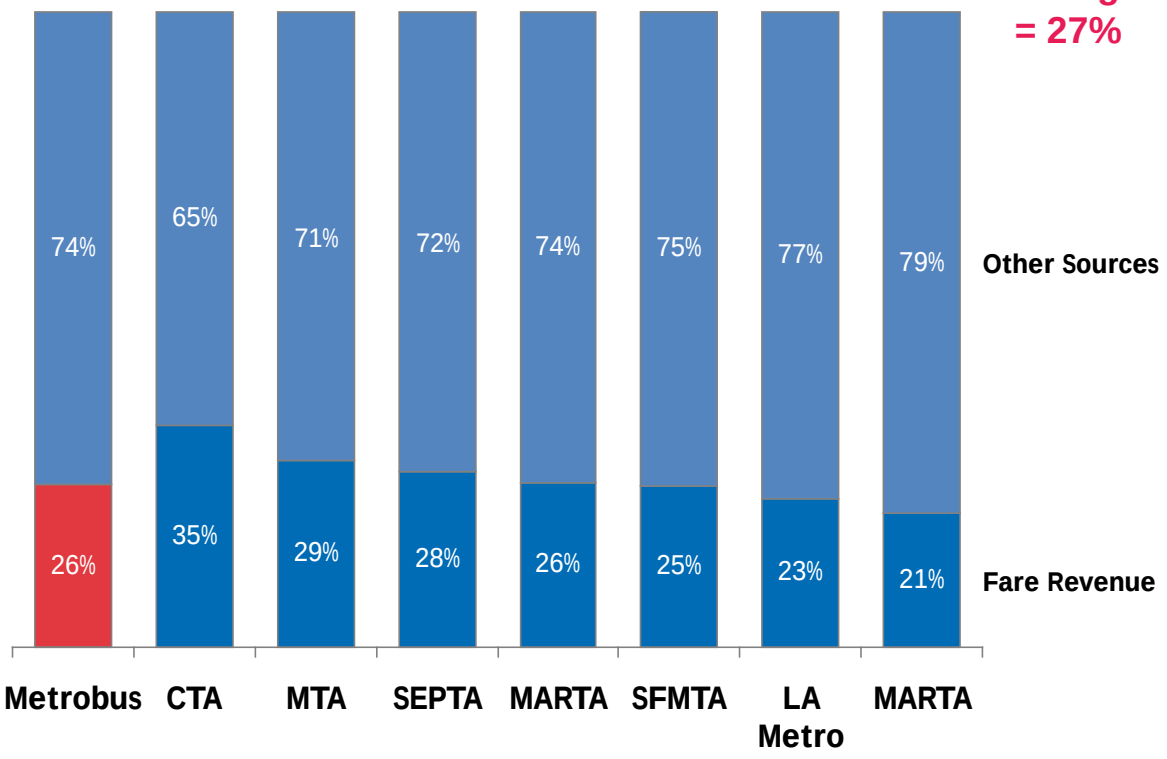


Today, Metrobus fare revenue covers 23% of operating costs – slightly below average of peer bus systems

Metrobus funding by source



Funding by source in other bus systems (2016)



Note: Other sources of funding for regional bus systems not specified.
Source: WMATA FY12-17 P&L Expense by Category; National Transit Database, Agency Profiles 2016 Data based on bus fare revenue and operating expenses

Estonia introduces free fares to increase customer satisfaction and ridership

Context

Fare-free policy was introduced in January 2013 and makes Tallinn the largest urban free-fare transit system for buses, trolleys and trams

Policy was prompted by a survey in which 49% of respondents indicated dissatisfaction with public transport fares

The city introduced a popular referendum on a Free Fare Public Transport policy that passed

At the time, ticket sales only made up 33% of the system's revenue

Approach

To be eligible for free fares in Tallinn, you must be registered as a resident of the city and purchase a one-time 2 euro "Green Card"

The city believed that they would make up for fare revenue loss through an increase in city tax revenues as more people would register as residents

The municipality earns 1,000 euros per resident in taxes each year

Outcome

3% ridership increase in the first year of the program

As of 2016, an additional 25,000 people have registered as residents in the city, increasing tax revenue for Tallinn

Longer-term impacts are still being assessed

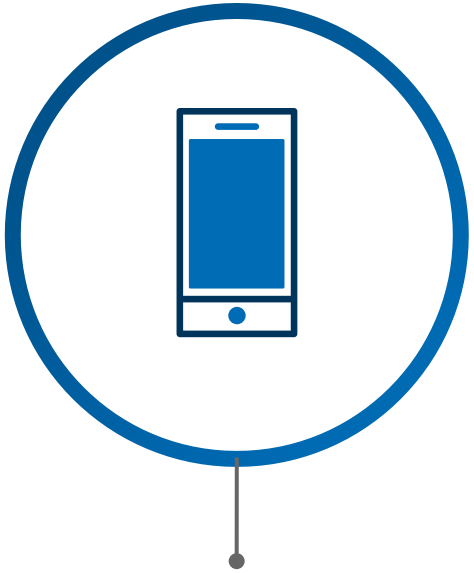
Source: Centre for Transport Studies; The Guardian; Visit Tallinn: Tallinn City Website

Operational choice #2: Should Metrobus incorporate any on-demand services?

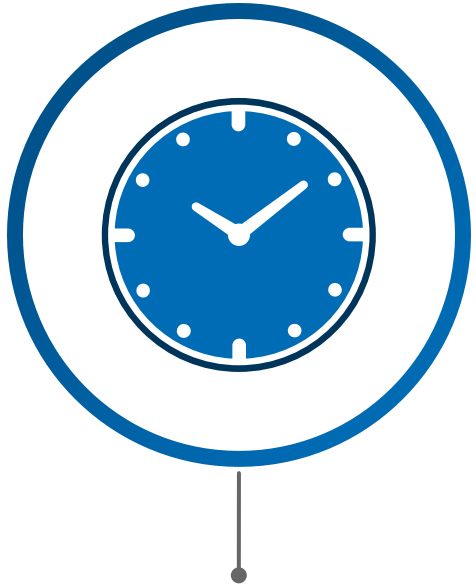
A Maintain status quo: Fixed schedules and fixed routes

B Introduce on-demand services in select areas

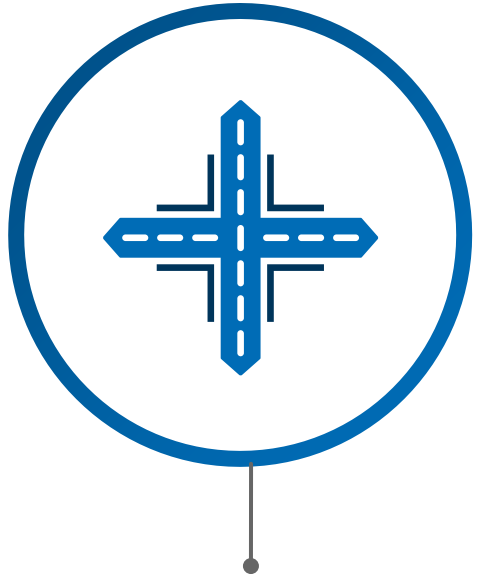
What does on-demand service mean for bus?



On-demand ordering
via app or phone



Flexible timing,
with limited wait time



Dynamic or flexible routes,
usually within a pre-defined service area

Key considerations for offering on-demand services

Benefits

- **Increased access:** Allows customers to get service when and where they need it, which increases buses' competitiveness with other mobility modes, such as Transportation Network Companies (e.g., Uber, Lyft)
- **Flexibility for operators**: On-demand service creates more flexibility for operators – they are no longer beholden to static routes that may be unproductive; instead, they can operate based on demand, thereby increasing efficiency
- **Operating costs**: Offering on-demand services in lieu of under-utilized fixed routes may reduce overall operating costs

Downsides

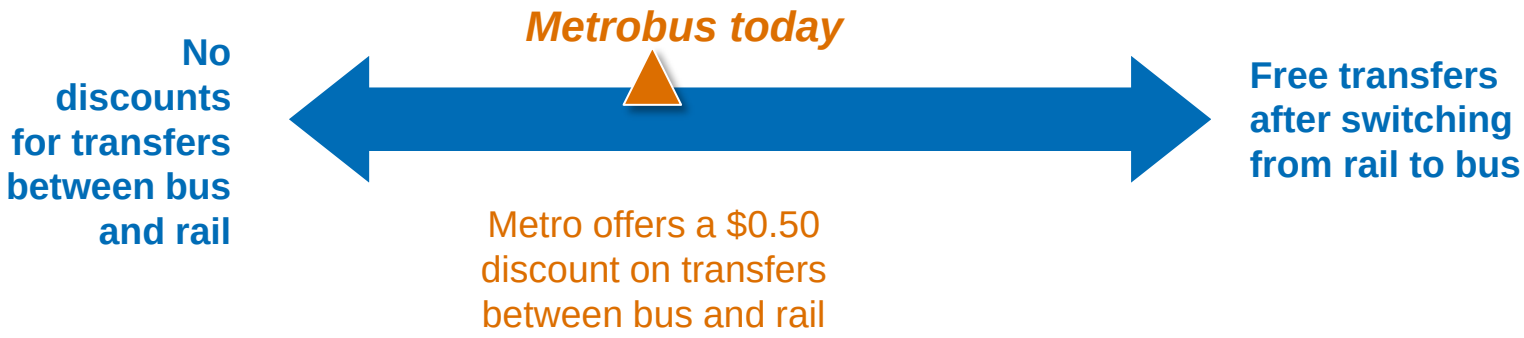
- **Difficult to scale:** To date, on-demand services for transit typically occur at the micro-transit level (i.e. using minibus vehicles / vans); even at this level, there is difficulty scaling up on-demand services due to limited ridership and farebox recovery
- **Matching labor to demand needs:** The flexible nature of the service may not align with current labor agreements / structure
- **Potential access limitation:** Those without smartphones may not be able to access on-demand services

Several cities have experimented with on-demand, micro-transit to increase ridership

	1 Sacramento Regional Transit District (SacRT)	2 Santa Clara County's Valley Transportation Authority (VTA)	3 Alameda-Contra Costa Transit District (AC Transit)
Description	• **On-demand, flexible route** services within neighborhoods (3 total) • Integrated existing "Dial-a-ride" service with private company and Ford subsidiary, TransLoc, to enable the service to be accessed via **smartphone application** • Offered at $2.75 per trip using standard SaCRT fare media	• **On-demand, dynamic route** services within a 3.25 square mile service area with predefined pick-ups and drop-offs based on an algorithm • 26-passenger buses were converted to support this **smartphone app enabled** service • Offered at $3.00 during peak hours	• **On-demand, flexible route** rides within a designated service area • Temporarily replaced bus line in a low-density area, identified as the lowest performing bus route • Utilizes existing employees as operators and previously owned, but unused shuttles • Riders use AC Transit's website or call ahead to reserve the service, except for at BART Stations
Outcome	• **Limited Ridership:** Average 36 boardings per day • Pilot secured $12M in additional funding to expand the service to 3 neighborhoods in total	• **Low Farebox Recovery/ High Operating Costs:** Average 41 boardings per day (0.4 boardings per revenue hour vs VTA minimum of 15) • 6-month pilot discontinued in July 2016	• **High productivity during peak hours:** Matches fixed-route at 7 boardings per revenue hour • **Cost-neutral:** Operation and maintenance cost savings generated from eliminating two diesel buses offset fixed costs (eg, hardware, software)
Challenges		• **Maximizing capacity** was not included as a factor in the algorithm, thus shuttles were never full • **Labor did not match flexible nature of service**: Due to labor contract, ultimately overstaffed drivers	

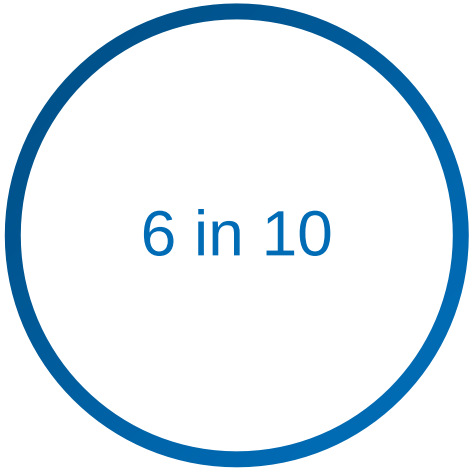
Source: Metro website 2018; Curbed website (2018); Eno: Exploring Microtransit in the United States (2018); Eno: Exploring Microtransit in the United States (2018); Sacrt website (2018)

Operational Choice #3: Level of integration with rail



Today, Metro offers a $0.50 discount on rail and bus transfers using SmarTrip cards

*Over half of Metrobus passengers use **multiple modes of transit** to get to their destinations*

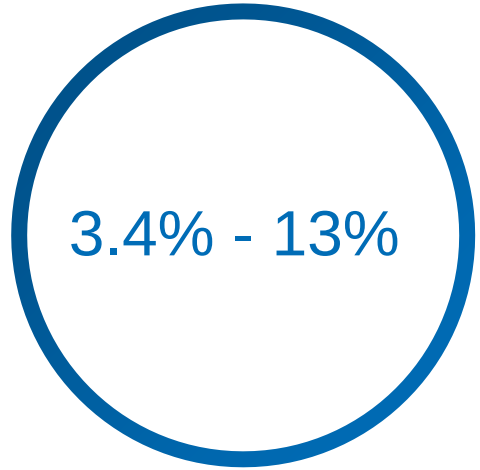


Metrobus trips start with another mode of public transportation[1]

*Today, WMATA offers **transfers between bus and rail at a $0.50 discount if using SmarTrip card***

Combined cost of bus and rail per trip[2]

*For bus riders with low-incomes, combined bus and rail trips represent a **significant cost***



of annual median salary ($29,180) for bus riders or $1,875 - $3,750 per year[3]

1. Metrorail, commuter rail or regional bus provider. Based on 2014 Metrobus Passenger Survey 2. Incorporates $0.50 transfer between bus and rail, $2.00 bus fare and minimum ($2.25) and maximum ($6.00) rail fare 3. Based on 2014 Metrobus Passenger Survey. Estimates assumes 250 travel days per year with two trips per day.
Source: WMATA Website; 2014 Metrobus Passenger Survey Results

Key considerations for implementing free transfers between bus and rail

Benefits

- **Improve affordability:** Implementing free transfers between rail and bus could significantly improve the affordability of transit for multi-modal users
- **Increase ridership**: Free transfers could also generate incremental ridership as it would remove an affordability barrier for riders that could benefit from using both bus and rail, but don't due to the cost of dual fares

Downsides

- **Decrease in fare revenue**: Fare revenues for Metrobus would decrease with free transfers from rail to bus
- **May require re-allocation of operating budget between Metrorail and Metrobus:** Determining how free transfers are funded will require re-visiting how the WMATA operating budget is allocated between Metrorail and Metrobus

Compared to cities with high transit usage, the DC region has the most expensive transfers

	City/Agency	Bus fare	Bus fare after rail
1	Boston – MBTA	$1.70	FREE
2	Los Angeles – LA Metro	$1.75	FREE
3	Atlanta – MARTA	$2.50	FREE
4	San Francisco – MUNI	$2.50	FREE
5	New York – MTA	$2.75	FREE
6	Chicago – CTA	$2.00	$0.25
7	Philadelphia – SEPTA	$2.00	$1.00
8	Washington – WMATA	$2.00	$1.50

Note: All fares assume using Smart Cards, which typically come with discounted fares for users.
Source: Greater Greater Washington Website (2018)

DC area example

However, Metro's SelectPass is opportunity to reduce the cost of transfers

What is it?

Originally introduced as a pilot in March 2016 and then made permanent, SelectPass is a monthly unlimited pass for frequent Metro users available at different price points based on a user's typical daily travel cost on Metrorail

SelectPass can be used for frequent dual rail and bus users to reduce the cost of transferring between the two modes

How does it work?

SelectPass has pricing options available for rail-only users or dual rail and bus users

The price ranges based on level of fares for Metrorail. For dual rail and bus riders there are two price points available: $135 and $189 per month

Impact

As of September 2017, SelectPass generated the following results:

- 6,500 passes sold a month compared to 400-1,000 a month for the previous unlimited rail pass
- $2 – 3.5M in additional fare revenue since program inception
- 73 percent of SelectPass users traveled more after buying the pass – for rail, the average user took 14 more trips in the month after they bought the pass

The program has the potential for further expansion, particularly for bus and rail integration

Source: WMATA Office of Planning; Metro Select Pass;Greater Greater Washington: Metro's "pick your own price" pass will become permanent. Here are 3 ways it can continue to grow (2016); Greater Greater Washington: How could Metro improve its unlimited passes? (2017)

New York MTA's introduction of free bus and rail transfers led to 2% transit ridership growth

Context

In July 1997, MTA introduced free transfers between the bus and subway along with other fare incentives

The objective was to target riders who utilized both modes of transit and increase affordability

Approach

MTA offers free transfers between the bus and subway up to two hours of first boarding

Other fare incentives such as passes and bonuses were introduced, which today include:

- 7-day and 30-day passes for unlimited rides on the bus and subway for $32 and $121 respectively
- 7-day Express Bus Plus Metrocard for unlimited express bus, local bus, and subway rides for $59.50
- A 5% fare bonus added for every $5.50 added to the Metrocard

Impact

Free transfers alone contributed 2% incremental growth to total transit ridership (bus and subway) for the MTA

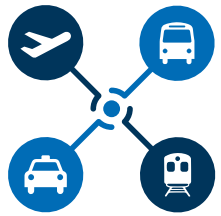
Transit riders indicated using the bus for the first time ever initially due to the free transfers, and further incentivized to do so with the unlimited passes

Source: Transalt (2002); MTA website

Operational Choice #4: Level of integration with other transportation providers or modes

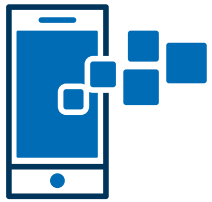
What could partnerships with other transportation providers or modes look like?

Sample options for partnership…



Other transportation providers or modes could include…

- Transportation Network Companies (TNCs, e.g. Uber/Lyft)
- Taxi companies
- Bike or scooter-share services (e.g. Capital Bikeshare)
- Car-share services (e.g. Zipcar, Car2Go)



Mobile app integration to create a seamless user experience

- Sharing of real-time bus data with other transportation providers to allow riders to optimize their trip planning across modes
- Integrated payment system via app technology
- Single app interface for multi-modal trips, e.g., Dallas Area Rapid Transit (DART) app "Go-Pass" integrates with Lyft and future release to include bike-share

Complementary service to fulfill first/last mile need

- Using other transportation providers/modes as a complementary service to Metrobus services
- Metrobus subsidizes TNC, bike-share, and scooter trips for transit passengers

Key considerations for partnering or integrating with other transportation providers or modes

Benefits

- **Improve first/last mile connections:** Other transportation modes (e.g., TNCs) may be able to provide better connectivity between bus stops and riders' origins or destinations than bus
- **Seamless rider experience:** For multi-modal transportation users, an integrated app between modes could make trip planning and fare payment easier
- **Cost-effectiveness:** Partnering with other transportation providers (e.g., TNCs) to offer first/last mile service and subsidizing those rides may be more cost-effective for bus than operating a micro-transit / bus line on a route with limited ridership
- **Informed decision-making**: Providing integrated information about all mode options (including costs and impacts like carbon emissions) can help travelers make informed decisions and may highlight the benefits of using transit

Challenges

- **Requires agreement on equitable outcomes:** Emerging mobility providers are not subject to the Federal Transit Administration's Title VI or American Disabilities Act (ADA) requirements, so agency would need to ensure partnerships result in equitable access
- **Data-sharing:** Many transportation providers, specifically TNCs, have been reluctant to share ride data unless obligated to by transit agencies, which may pose a challenge to technology integration
- **Potential cannibalization**: Increasing bus integration with other transportation modes via an app or services may reduce bus ridership if not carefully structured

Pinellas Suncoast Transit Authority in Tampa Bay partners with TNCs for first/last mile

Context

Pinellas Suncoast Transit Authority (PSTA) had been providing over 13.4 million rides per year across 38 bus and trolley routes

PSTA faced two key challenges:

- Failed sales tax proposal in 2014 to fund bus services
- 11% decline in bus ridership in 2016

In response, PSTA eliminated some existing bus routes and launched its "Direct Connect" pilot program in February 2016. The program was a partnership between PSTA, Uber and a local taxi company to provide subsidized rides to and from bus stops.

The pilot was successful, and later expanded to all of Pinellas County

Approach

As part of the expanded roll-out, PSTA is subsidizing Uber, Lyft or local taxi company rides to/from 24 eligible PSTA locations

On average, users pay $1 for the ride, with PSTA subsidizing up to $5 of the fare and most trips are under 3 miles

Riders can hail a ride from Uber or Lyft app and the PSTA discount will pop up if they're already at a bus stop. If on the way to a stop, the PSTA fare appears as would the "Uber X" option

Outcomes & insights

Initial shared results from PSTA:

- Nearly 1,000 rides per month as of August 2017 as part of the Direct Connect program
- Cost-per-ride for PSTA has decreased

Lessons learned:

- Outreach: Campaigns were necessary to inform users of the program and how to use the app
- Minimize non-transit users: Some users benefitted from discount without using transit; in the expansion, locations were changed to minimize this effect. Opportunity for an integrated payment method without limiting the locations

Sources: City lab 2018; Greenlight Pinellas mass transit initiative fails; Tampa Bay Times 2018; The last mile

Altamonte Springs, Florida conducts pilot with Uber to connect riders to rail

Context

In 2016, Altamonte Springs partnered with Uber to provide subsidized rides to app users within the city limits (9.4 square miles)

The objective was to increase ridership of the newly built local commuter rail by offering transit options to connect to the stations

After failing to gain support from state and transit authorities to provide a public solution, the City Manager forged a partnership with Uber

Approach

With an initial annual budget of $500,000 for the pilot program, the city subsidized 20% of any Uber ride that began and ended in the city, and 25% of rides that began or ended at the SunRail light rail station

Outcome

Results have not been published

Source: Curbed – Best cities ; Curbed Uber Transportation ; Uber Website

Helsinki, Finland integrates bike-share with its public transit network

Context

In an effort to promote cycling, Helsinki introduced a public bike-share program in May 2016 fully integrated with its public transit network. Helsinki's public transportation system includes a subway, streetcars, commuter train, buses, ferries and now, bike share on a seasonal basis.

While owned by Helsinki City Transport, the public transport provider, City Bike Finland (a private joint venture) has a 10-year contract to operate Helsinki City Bikes.

The program launched with 500 three-speed, adult bikes across 50 docking stations and in 2017, expanded to 1,400 bikes across 140 stations.

Approach

Key features of the program include:

- **Online or on-site registration:** Users can register online or at select dock stations for a day (€5), week (€10) or full season (€30) for unlimited free 30-minute rides, with overage fee for incremental time
- **App integration:** "Journey Planner" app finds optimal routes using all transportation modes. Also indicates location of dock stations and real-time information on bike availability
- **Payment integration**: Helsinki Travel Card, a transit smartcard, can be used across all modes
- **Use of renewable energy**: Docking stations use solar energy to charge bikes

Outcome

During the program's first season from May to October 2016, the following results were observed:

- 10,000 users registered for the whole season and 13,500 for a day or week pass (out of city population of 635,000)
- Total of 410,000 rides were taken and 460,000 miles ridden
- The average trip was 1.2 miles and took 20 minutes
- 60% of users combined bike with other transport modes, typically using bike for the first or last part of their journey

Source: Marketwired is now part of west; City of Helsinki 2017; City bikes

Operational choice #5: How should Metrobus approach technological innovation?

A **Innovator:** Be among the first transit systems to pilot and adopt new technologies (e.g., autonomous vehicles, fully-electric vehicles)

B **Late adopter:** Wait for proof of concept of new technologies (e.g., results from other transit system pilots) before implementing them

American Automobile Association partners with Las Vegas to pilot autonomous shuttle

Context

In November 2017, AAA (American Automobile Association) launched a pilot in Downtown Las Vegas to demonstrate an autonomous vehicle for public use integrated with live traffic

Aligned with AAA's commitment to improving road safety, the project enables AAA to familiarize users with the advanced technology and survey their reactions to the experience

Approach

AAA's partners in this initiative include the City of Las Vegas, the Regional Transportation Commission of Southern Nevada (RTC), Navya (manufacturer) and Keolis

Keolis operates and manages the self-driving shuttle service in conjunction with the City and RTC to integrate the shuttle into the street infrastructure and traffic

The 8-passenger shuttle runs on a 0.6 mile fixed route across 3 stops, Tuesday through Sunday, 11am-8pm, free of charge to riders

Outcome

While results are still being assessed, the project set out a goal to carry 250,000 residents and visitors within the first year. As of April 2018, the pilot carried 10,000 passengers

If successful, this pilot will be an important proof of concept for incorporating autonomous vehicles into the future of urban transit and mobility

Sources: AAA Hop On Las Vegas; Las Vegas Sun: "How does downtown's autonomous bus work?" (2018)

Cities globally are committing to electric bus fleets and others are piloting the technology

C40 Fossil-Fuel Free Streets Declaration

In 2017, twelve cities signed the C40 Fossil-Fuel Free Streets Declaration, committing to only procuring electric buses from 2025 onwards (more cities have signed the Declaration since 2017)

US Transit Agencies Committing to 100% Electric Bus Fleets

Los Angeles, San Francisco and New York announced that they would transition to a 100% electric bus fleet by 2030, 2035 and 2040 respectively[1]

Cities piloting electric

Many cities have started piloting or transitioning to fully-electric vehicles; examples include Dallas (seven electric buses) and DC Circulator (14 electric buses)

1. Current bus fleet size: Los Angeles (2,300 buses), San Francisco (1,100 buses) and New York(5,700 buses) Source: C40, https://www.c40.org/press_releases/mayors-of-12-pioneering-cities-commit-to-create-green-and-healthy-streets; Forbes, https://www.forbes.com/sites/energyinnovation/2018/05/21/electric-buses-can-save-americas-local-governments-billions-chinas-showing-us-how-its-done/#5f9ed3795f78; Clean Technica, https://cleantechnica.com/2018/04/29/no-need-to-wait-electric-buses-are-cost-competitive-transit-buses-today/; Smart & Resilient Cities, https://www.smartresilient.com/electric-bus-fleet-rolls-dallas

VI. Appendix

ILLUSTRATIVE / DIRECTIONAL only - may not be realized in practice

Guiding our assessment of operational choices is an understanding of demand elasticities

	Elasticity Range	Base Case	Scenario	Impact on annual ridership FY17 annual ridership: 123M	Change in Annual Revenue FY17 annual revenue: $246.8M
Price	**-0.36 to -0.45**	$2.00[1]	Reduce fares by $0.25 to $1.75	↑ 5.5 – 7.0M *Increase of 4.5 – 5.6%*	↓ $19 – 21M *Decrease of 8 - 9%*
Speed *As measured by travel time*	**-0.45 to -0.63**	19 minutes[2]	Decrease trip time by 2 minutes	↑ 3.0 – 4.2M *Increase of 2.5 – 3.5%*	↑ $6.1 -$8.5M *Increase of 2.5 – 3.5%*
Frequency *As measured by headway, time between buses*	**-0.26 to -0.28**	15 minutes[3]	Decrease headway by 3 minutes	↑ 6.4 – 6.9M *Increase of 5.2 – 5.6%*	↑ $13 – 14M *Increase of 5.2 – 5.6%*

1. Based on current fare for regular routes. 2.See appendix slide for estimation of travel time base case. 3. Using assumption of 15 minute headways. Note: For elasticity ranges, see appendix slide on data inputs.

Back-up: Data inputs for elasticity measures

Measure	Description	Source	Year	Elasticity	Sample Size
Price	Average bus fare elasticity from 20 metropolitan areas with a population over 1M	APTA	1991	-0.361	20 cities
	Effect of fares on the UK bus demand (in the short run and in the long run)	White Rose Research and the Institute of Transport Studies (UK)	Studies conducted between 1951-2002	-0.36	903 observations from 104 studies conducted in Britain (1951-2002)
	Average bus fare elasticity in the UK (short-run)	Transport Research Foundation (UK)	Studies conducted between 1979-2000	-0.42	33 studies
	Effect of fares on the UK bus demand in the short-run	Mark Wardman, "Journal of Transport Economics and Policy", cited in Rand Europe and Systra (UK)	Studies between 1968 and 2010	-0.45	83 observations
Speed	Travel time elasticity for urban bus passengers	Victoria Transport Policy Institute	Study from 1999	-0.6	N/A
	Effect of IVT (in vehicle time) on the UK bus demand	Mark Wardman, "Journal of Transport Economics and Policy", cited in Rand Europe and Systra (UK)	Studies between 1977-2010	-0.63	16 observations from 69 studies
Frequency	Estimation of disaggregate headway ridership elasticity at more than 11,000 bus stops in Chicago, ranging from medium to long-term	Transportation Research Board Journal of the Transportation Research Board	2013*(observation period was in 2010)*	-0.263 to -0.277	Study observed elasticities across 11,000 bus stops
	Average headway elasticity based on peak hours in cities with a high level of services (less than 10-minute headway)	Journal of Transport Economics and Policy	1981	-0.27	Study based on two cases

Sources: Effects of Fare changes on bus ridership; TRL the future of transport; ResearchGate; Lago, A., Mayworm, P., & McEnroe, J. (1981). Transit Service Elasticities: Evidence from Demonstrations and Demand Models. Journal of Transport Economics and Policy, 15(2), 99-119. Retrieved from Transit service elasties

Back-up: Estimate for travel time as a proxy for speed

Avg Travel Time = Avg Trip Distance / Avg Bus Speed	=	3.12 miles / 9.84[1] mph	=	19 minutes
Avg. Trip Distance = Annual Passenger Miles / Annual Unlinked Trips	=	399M[2] / 127.7M[3]	=	3.12 miles

1. Average bus speeds for both regional and non-regional routes from WMATA FY2019 Subsidy Allocation based on December 2017 schedules. 2. Annual passenger miles in 2016 based on NTD Database 3. Annual unlinked trips in 2016 from NTD Database. Source: WMATA 2016 Agency Profile, NTD Database, Washington Metropolitan Area Transit Authority 2016