Stabilizing and Growing Metro Ridership

May 2018

Metro was created to connect the Washington Metropolitan region by moving riders. Steep ridership losses threaten Metro's mission and success as a business – ridership is a measure of value to the region and the primary source of self-generated revenue. This document builds on Back2Good and a growing understanding of ridership drivers and is intended to inform agency priorities and objectives in defining actions to stabilize and grow ridership over the next several years.

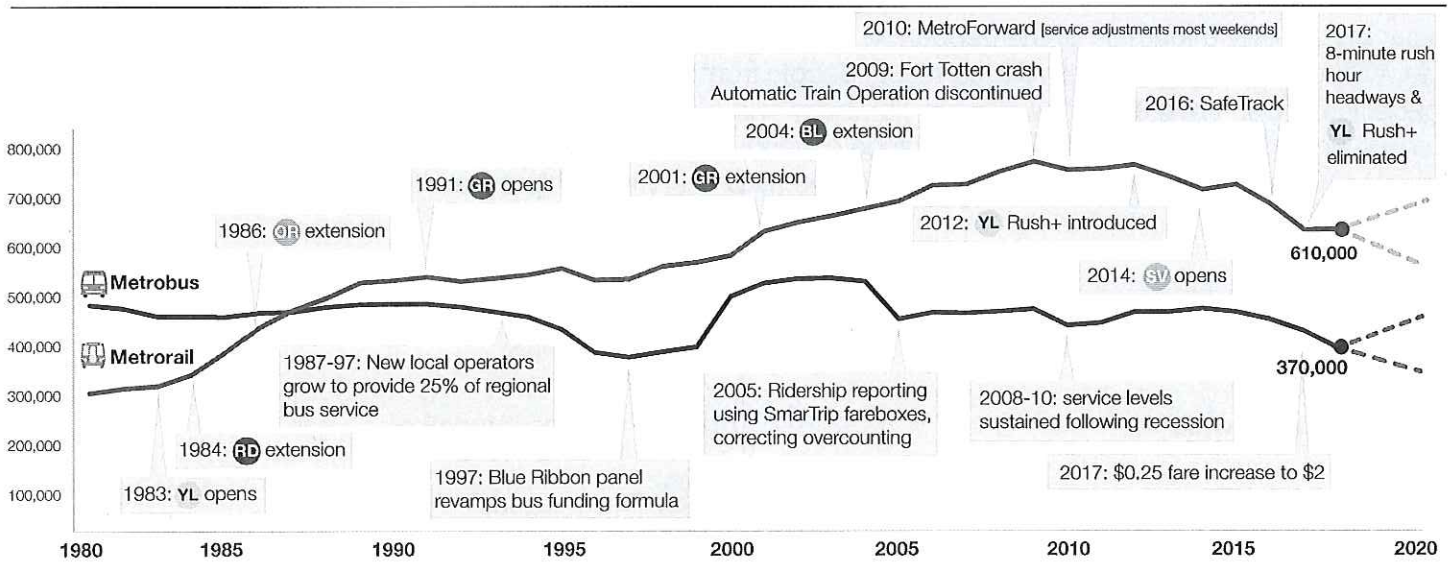
Understanding Ridership

Ridership Trends

Ridership has fallen significantly, and even more than peer agencies

Rail and bus ridership have declined by nearly 20 percent from their peaks despite system expansion.[1] Following more than a decade of sustained growth driven by continued station openings and a strong economy, Metrorail ridership peaked in 2009 and gradually declined for several years before dropping sharply since 2015. Metrorail declines are most pronounced during the off-peak, with loses two to three times larger than peak declines. Metrobus ridership remained steady following the completion of the originally planned rail system[2] and avoided the service cut-driven losses experienced by most American bus systems following the 2008 recession. Since 2016, however, bus ridership has declined significantly, continuing even as rail ridership declines have slowed.

Average Weekday Ridership



[1] Metro's combined rail and bus ridership was 356 million in FY2009 and is forecast to fall to 289 million in FY2018.

[2] Metrobus ridership historically fluctuated as the rail system was expanded with the modification of some routes into feeders of the rail system and the conversion of others to operation by other local operators.

Ridership Trends - continued

Most American transit agencies have recently faced declining ridership, but Metrorail's declines are more significant than most peers, with the difference likely accounted for by factors specific to Metro and the Washington region. Metrobus declines also exceed the median but are more in line with others.

Rail Ridership Benchmarking, 3-year change

Bus Ridership Benchmarking, 3-year change

Source: National Transit Database, FY2015-FY2018; data through January 2018

Drivers of Ridership

The fundamental factors – fares, location, speed, frequency, and reliability – matter most and Metro's recent actions have put downward pressure on ridership

Ridership is largely a function of the frequency, speed, reliability, and affordability of the service provided and how well the region's transit network connects people from where they live to where they want to travel, especially to jobs. Leveraging the rich trip database and external research, Metro has made substantial strides in understanding the relative importance of various drivers of ridership. The analysis informing Metro's new ridership forecast model identified the following as primary ridership drivers for rail and bus:

Metrorail	**Metrobus**
People and jobs near stations[3]	Fare Levels[7]
Frequency of service[4]	Frequency of service[4]
Out of town visitors[5]	Travel speeds[8]
Service reliability and delays[6]	People and jobs near stops[9]

In addition, the customer experience, including the ease of use, perception of safety, comfort and cleanliness, and the availability of alternatives is known to drive ridership.

[3] For every 10 percent increase in population within a half-mile of stations, ridership is expected to increase by 2.4 to 3.1 percent.

[4] For every 10 percent increase in the number of trains serving a station, ridership is expected to increase by 0.3 to 0.9 percent.

[5] Ridership is sensitive to the number of out of town visitors, represented by number of hotel rooms sold.

[6] The frequency of delays, especially significant delays.

[7] Bus passengers are more sensitive, on average, to fare increases than rail passengers. For every 10 percent increase in fares, we expect bus ridership to decline by 3.4 to 5.5 percent.

[8] For every 10 percent increase in average bus speeds on a corridor, ridership is expected to increase by 3.9 to 9.9 percent.

[9] Bus ridership is driven by the concentration of people and jobs within a quarter mile of bus corridors, whereas rail ridership has a larger radius walkshed of a half mile or more.

Drivers of Ridership - continued

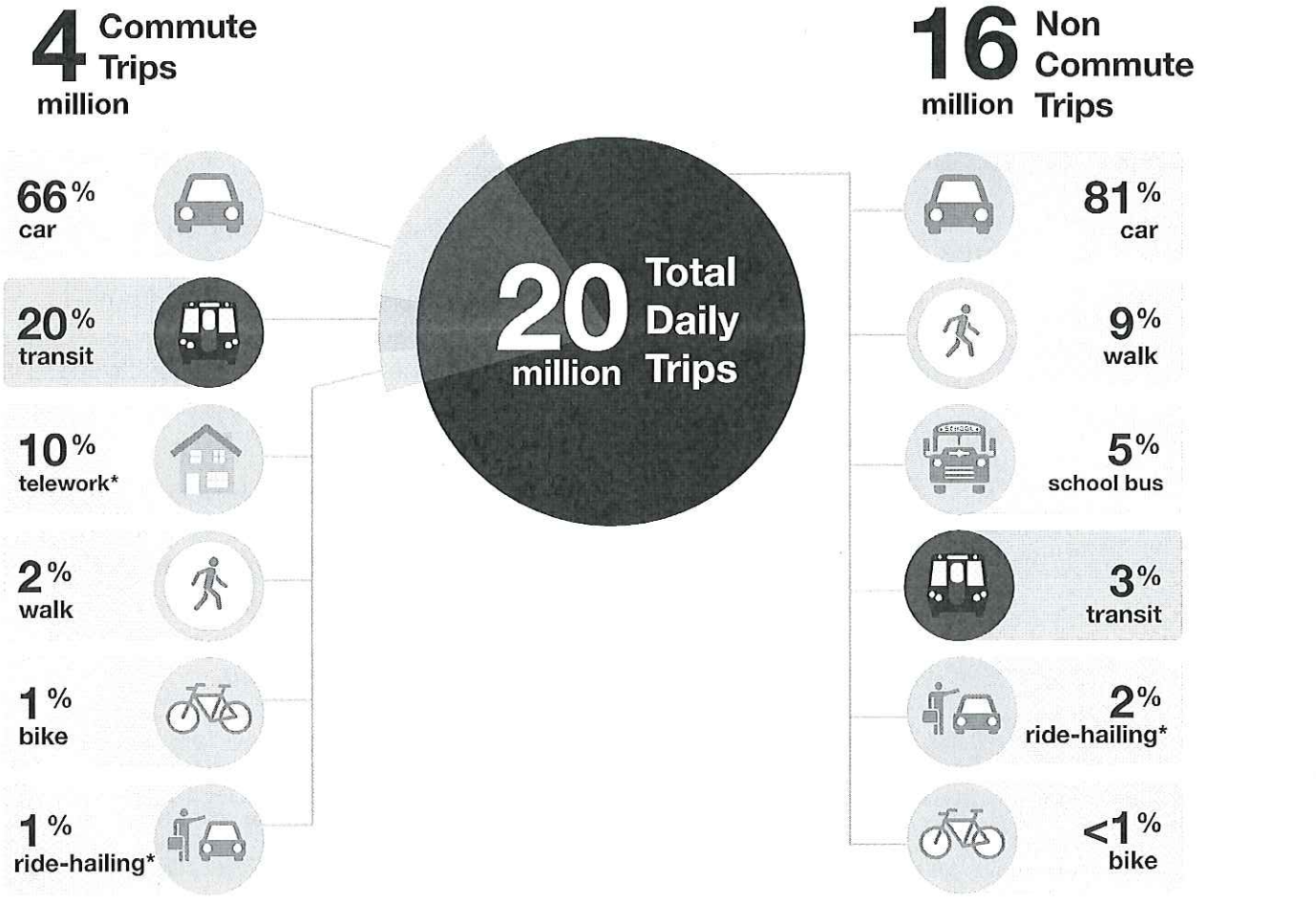
Metro has correctly focused on prioritizing safety, preventive maintenance, and rebuilding or replacing decaying assets. Continued cost growth has also put substantial pressure on the operating budget, forcing hard choices. Overall, while Metro has made real reliability improvements, the balance of actions are expected to make Metro less competitive in the areas that riders care most about.

Expected to Increase Ridership	Expected to Decrease Ridership
■ Improved on-time performance [+12% on Rail and +3% on Bus, FY2018]	■ Decreased peak rail service and operating hours
■ Strong regional population growth [+1% per year]	■ Increased disruptions for scheduled maintenance and extended weekday shutdowns
	■ Significant fare increase [+15% on Bus]
	■ Reduced bus speeds [-0.5% per year]

Competitive Landscape

People have more choices for their trips, forcing Metro to compete not only with cars but ride-hailing services and other driving alternatives

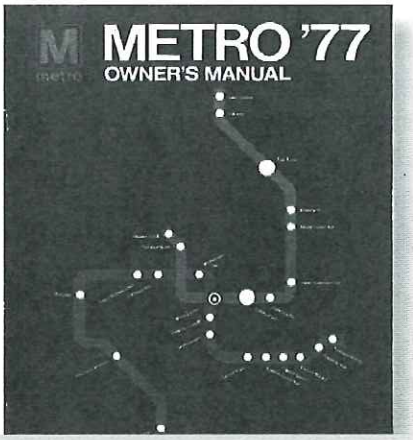
Overall Washington Region Trip Landscape, average weekday



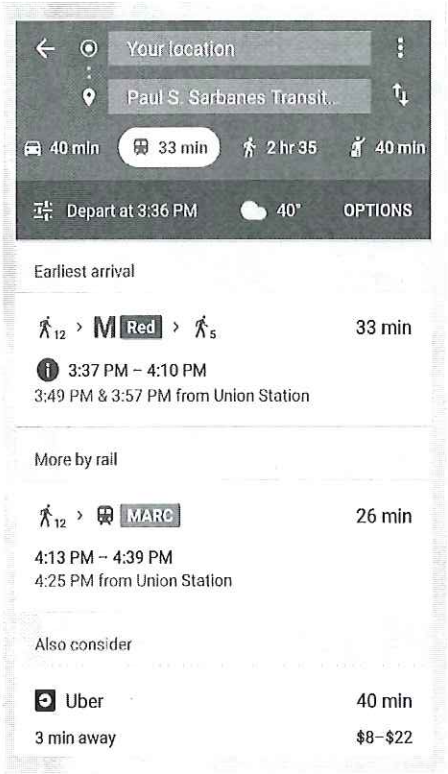
Sources: Transportation Planning Board Travel Forecasting Model, 2012; 2007/2008 Household Travel Survey; 2016 State of the Commute Survey
*Ride-hailing numbers are estimated; Telework numbers are included in total commute trip figure, but are foregone trips

On a typical day, the Washington region's visitors and 5.5 million residents take 20 million trips—4 million commute trips[10] and 16 million for other reasons.

Next to the car, Metro is top choice for commuters, capturing 20 percent of the market share. Metro has always competed with personal cars, which continue to be the region's dominant transportation mode and the default choice for most car-owning households.[11] This is nothing new. The rail system was expressly designed to provide a rapid, comfortable ride to compete effectively. While car-free or car-light households are more likely to use transit, these customers have more options than ever before. In recent years, telework has eaten into Metro's market share for commute trips. Four-day-a-week commuters now out number five-day-a-week commuters, as more of our region's residents pursue alternate work schedules or work from home one or more days per week, saving money and time.



"The rapid growth of Metro will bring many benefits to citizens throughout the region. It will reduce travel time for many commuters, students, and shoppers. Metro travels at an average speed of 35 mph – and sometimes up to 75. The average speed of auto traffic in rush hour is 8 mph. Most Metro trips take only a few minutes."



For non-commute trips, Metro is neck-and-neck with ride-hailing firms for market share.[12] These firms, as well as bike share, target much of the same population that is most likely to use transit – people living in or traveling to dense parts of the metro area. Ride-hailing firms, such as Uber and Lyft, now carry approximately 300,000 passengers per day, approaching the scale of Metrorail's 610,000 and Metrobus's 370,000 average weekday passenger trips.

A recent analysis found Metrorail is faster than Uber for 59 percent of trips analyzed during the evening rush hour and cheaper for all trips. It concluded that "Metro is especially efficient for longer trips from downtown to the suburbs that do not require transfers." Conversely, short trips requiring transfers favored Uber the most. Time competitiveness is also sensitive to wait times, however, and Uber is faster for most trips during periods with longer wait times on Metrorail.[13]

As smartphones and apps have become commonplace in the last several years, comparisons between modes on travel time and price have become easier and customers are increasingly weighing alternatives for every trip they make. Ride-hailing firms have also raised the bar in terms of customer expectations about usability, ease of payment, and real-time information—key aspects of the customer experience.

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[10] Approximately half the region's residents (52.8 percent) are employed with children and seniors constituting the largest share of non-working residents. More than a quarter of residents (28.7 percent) attend school full- or part-time. 2007/2008 Household Travel Survey, Metropolitan Washington Council of Governments (2008).

[11] The current period of low fuel prices encourages car ownership and higher usage of existing cars. If car owners use transit, it is most likely to be for commuting at standard work hours. In the Washington region, this market segment is especially likely to have access to telework or alternative work schedules. As these work arrangements have become more prevalent, these customers – Metrorail's traditional suburban base – are taking fewer and fewer trips on Metro. In addition, there are indications (from California) that low-income and immigrant households are buying and driving cars more frequently. If this trend is indeed true in the DC region, it would account for the erosion of a key part of the transit market.

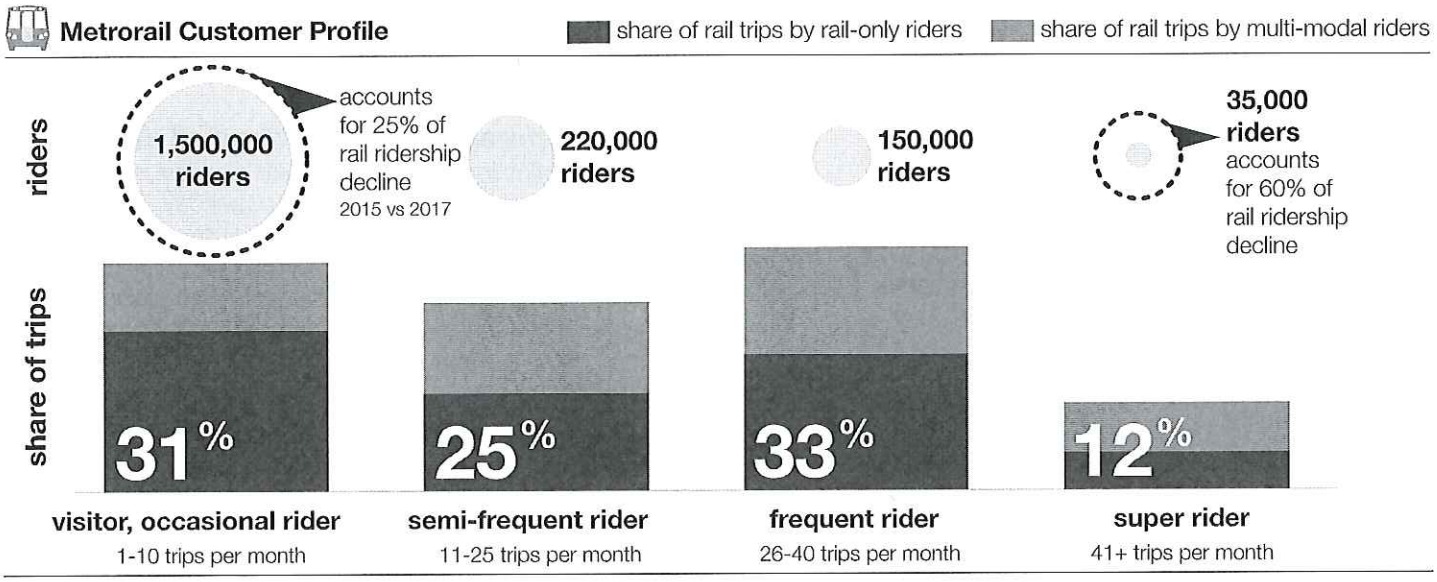
[12] Every mode but transit, bikes, and telework have higher shares of non-commute trips than commute trips. In the most recently completed regional household travel survey, conducted during 2007 and 2008, the largest non-work purpose categories were shopping or meals (30%), personal business (13%), socializing or recreation (12%), pick up (11%), and school (8%). 2007/2008 Household Travel Survey, Metropolitan Washington Council of Governments (2008).

[13] District of Columbia's Office of Revenue Analysis, "Metrorail vs. Uber: Travel Time and Cost," October 11, 2017, https://districtmeasured.com/2017/10/11/metrorail-vs-uber-travel-time-and-cost/.

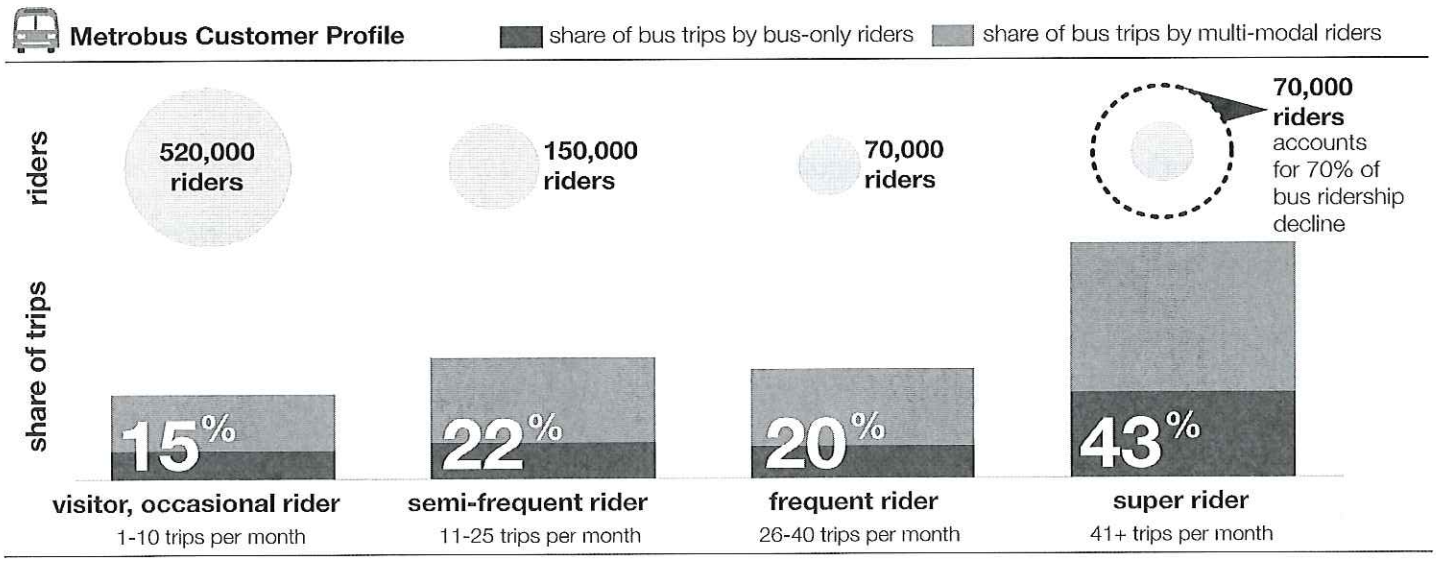
Customer Profile

Rail and bus trip patterns differ but a drop in super riders accounts for most recent ridership decline

Rail and bus customer profiles roughly follow the 80/20 rule with relatively small shares of regular riders accounting for the bulk of trips, but each mode looks different up close.[14] Rail's largest share of trips is accounted for by frequent riders traveling at commuter frequencies, but it also has a much broader base of riders, including more than a million occasional users or visitors using the system per month. Since 2015, the number of super riders dropped by half, accounting for nearly 60 percent of the ridership decline. Decreases in occasional riders account for another quarter of the overall drop.[15]



On bus, super riders, traveling nearly every day, account for by far the largest share of bus trips. This group also accounts for approximately 70 percent of the bus ridership decline since 2015.



Going forward, implementing initiatives targeted at the most important ridership drivers is necessary to stem the recent ridership decline and open a path to restored ridership growth. The remainder of this document outlines the elements of a ridership action plan.

[14] For both rail and bus, the 20 percent most frequent riders account for 65 to 70 percent of total trips.

[15] Both of these groups frequently travel during off-peak times, where service frequency is lowest and track work disrupts normal schedules.

Metro Ridership Action Plan

May 2018

	Stabilize Ridership Optimize existing resources to stem decline	Grow Ridership Invest in returning to ridership growth
I. Improve rail & bus service quality	**Continue to improve reliability** Sustain and grow on-time performance gains through preventive maintenance and improving operating practices, including restoration of automatic train operation (ATO). **Provide quality service in an era of perpetual maintenance** Develop service playbook to operate service around work zones and improve off-peak service. We must strive to execute work efficiently, maximizing planning and preparation, to reduce the length of outages. **Speed up buses** by implementing leading practices to board customers faster, reduce traffic signal delays, and expand and improve bus lanes to move buses more swiftly and reliably on the roadway. [10% increase >> 15,000 to 35,000 additional trips]	**Extend Yellow Line to Greenbelt** to improve frequency and relieve crowding on the upper Green Line. Shaw, U Street, Columbia Heights, and Georgia Avenue currently have higher off-peak frequencies than during rush hour. [1,000 to 3,000 additional trips, $1.5 to $3 million net cost] **Operate peak headways all day** Maintain consistent 8-minute headways during midday and until 9pm each weekday rather than shifting to 12-minutes to make Metrorail more competitive and maximize our service offerings during periods not disrupted by scheduled maintenance. [10,000 to 20,000 additional trips, $10 to $30 million net cost] **Deploy 100% 8-car trains** to add capacity, improve customer comfort, and relieve crowding. **Transform the bus network** to grow ridership by delivering faster and more reliable service on an optimized network, incorporating leading operational practices. [Bus Network Study]
II. Provide a seamless customer experience	**Convert customers to pass holders** Once a customer buys a pass, each trip has a marginal cost of zero. Customers with the option to ride for free tend to ride more. **Improve customer interactions through all steps of the journey** [10,000 to 30,000 additional trips] ▪ Provide customers with real-time information to plan trips ▪ Make it easier to pay fares and resolve issues ▪ Turn station managers into customer service ambassadors ▪ Allow strollers on buses and bikes on rail at all times **Support transit-oriented development** through projects on Metro-owned land and advocacy for high intensity land use planning near transit in the jurisdictions. [10% increase >> 30,000 to 70,000 additional trips]	**Implement 'free' rail-bus transfers** by crediting the full bus fare on rail-bus transfers. [10,000 to 35,000 additional trips, $20 to $40 million net cost] **Subsidize fares for low income customers** to make using Metro more affordable and improve fare compliance. Partner with jurisdictions to fund the subsidies. [20,000 to 35,000 additional trips, $15 to $35 million net cost]

Note: additional trip numbers reflect average weekday

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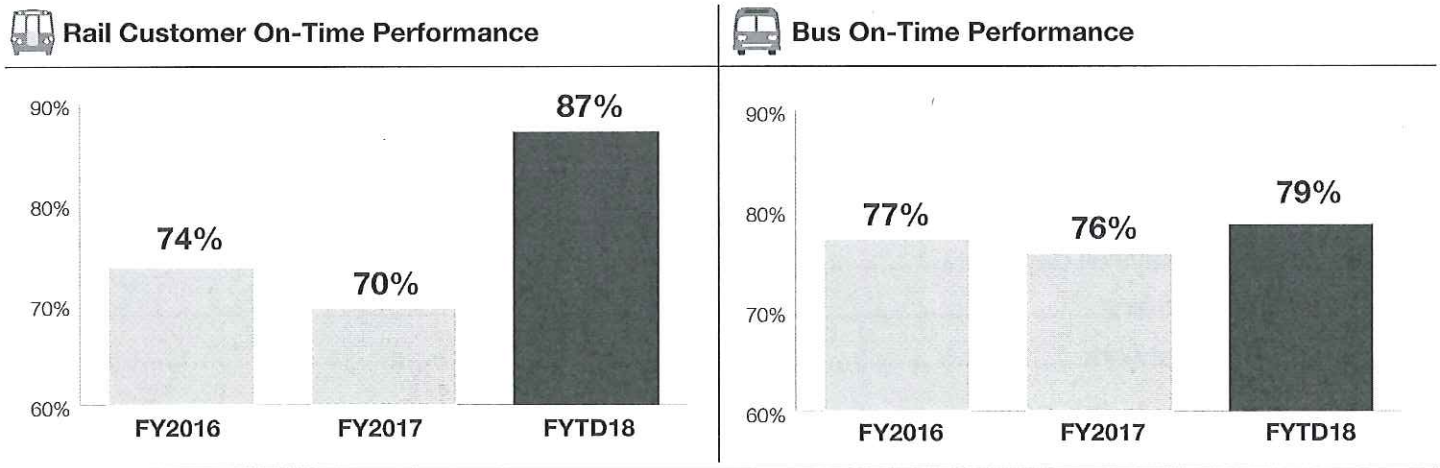
Continue to improve reliability and on-time performance

Reliable service is a baseline expectation of customers. Along with frequency and speed, reliability is a fundamental measure of quality that drives customer decision making. Metro Rush Hour Promise is an important commitment to customers that Metro holds itself accountable for providing reliable service.



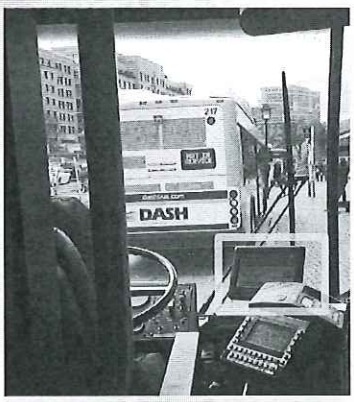
FYTD18 performance as of March 2018

Actions

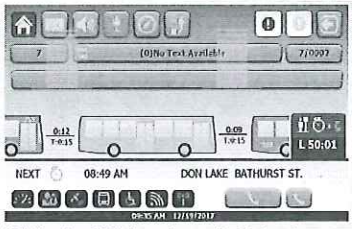
- Shift to forward-looking asset maintenance – reduce delays and other customer impacts by catching failures before they happen and extending the useful life of assets. This includes improved maintenance planning supporting a robust preventive maintenance program, increasing track access efficiency, and better parts management.
- Restore automatic train operation (ATO) during peak periods, beginning with automatic door operation and then full operations. ATO is expected to result in a 5 percent increase in headway adherence, provide a smoother ride for customers, and support more frequent service – 2-3 minute headways, or 20-26 trains per hour.
- Provide bus operators with real-time feedback on schedule and headway adherence through on-board systems and complete deployment of SmartYard division management system to improve efficiency of dispatches at bus garages.

Metrobus: Transit Control Head (TCH) provides real-time schedule-adherence information, but is placed out of operator's line of sight, only allowing for use while bus is fully secured

Fairfax Connector: TCH provides real-time schedule adherence information to operator and is located within operator's line of sight, allowing for use while stopped at a bus stop or redlight



DASH: TCH provides real-time schedule adherence information to operator and is located within operator's line of sight, allowing for easy use while stopped at a bus stop or redlight



While the TCHs onboard Fairfax & DASH buses display schedule-adherence information, Clever Devices has recently released a software upgrade for diplaying headway information

Strive to provide high quality service in an era of perpetual maintenance

At 40 years old, many of Metro's rail infrastructure assets require rehabilitation or replacement. Metro has identified over $15.5 billion in capital investment needs over the next 10 years. These investments must be made to bring the system into a state of good repair and ensure that it remains safe for customers. Given Metro's two-track system and limited non-revenue hours, delivering this program has and will continue to require disruptions to regularly scheduled service.

Work locations change each week, requiring customers to frequently consult wmata.com or other notifications when planning trips. The default for many customers is to assume that weekend track work has disrupted their travel plans and not even consider Metro as a viable option. For example, in February 2018, trains single-tracked around crews executing capital work in three locations every evening – beginning at 10pm – and on all weekends.

Overall, the reduction in evening and weekend service directly costs Metro 150,000 trips each week and $20 million in lost revenue each year – and that does not factor in the longer-term erosion of weekend ridership as track work-related disruptions have become more common in the last decade.

No longer in a temporary situation, as with Safetrack, Metro has to develop longer-term solutions for the new reality, balancing the requirements of wayside work and the ridership impacts of service disruptions. In the past, Metro deferred maintenance and rebuilding due to limited funds and track time. Now, there is sufficient funding and Metro is committed to doing the work required to achieve a state of good repair. The question is how to do that amount of work in a way that best manages disruptions for customers.

Actions

To provide high quality service in this era of perpetual maintenance, Metro needs to continue to improve maintenance planning and explore opportunities to provide better service around work zones as well as provide customers with clear, accurate information about disruptions.

- **Increase flexibility in scheduling high levels of service around track work, more narrowly isolating work zones** where possible. A first step is defining customer-focused standards for planned service disruptions including minimum service levels and alternative service provided. To operationalize these standards, Metro should create a new service playbook, and should explore including the following:
  - » Implement additional turnbacks to preserve service frequency for most of the line.
  - » Consider using interlockings/crossovers to turn trains – like is done daily at Fort Totten during the off-peak – enabling 12-minute headways. Using only pocket tracks to turn trains can result in 24 to 30-minute headways because there are fewer of them throughout the system.
  - » Invest in new pocket tracks at key locations to provide more opportunities to quickly turn trains, enabling more frequent service on larger segments of lines.

Strive to provide high quality service in an era of perpetual maintenance – continued

Actions

- » Improve efficiency and planning of bus bridges during shutdown events. Buses should run on a continual loop, allow boarding through all doors, and we should seek opportunities to implement "pop-up" bus-only lanes to speed up service.
- » Develop more flexible staffing options, including ability to augment control center staffing to enable more work zones per ops desk and/or the use of more interlockings for each zone. Currently, each ops desk can only handle one work zone that spans three interlockings, requiring more, longer outages. In addition, seek to build in flexibility for train operators to report to alternate divisions to enable more efficient dispatching patterns during track work.

- **Strive to execute work more efficiently, maximizing planning and preparation, to reduce the length of outages**
  - » Continue to learn from best practices used by peers to stage and execute capital work
  - » Integrate customer impacts into planning of concurrent work locations to minimize overall network disruption and seek opportunities to concentrate work in one location for consecutive weekends to make service changes more predictable for customers

- **Provide tailored information to help customers judgethe severity of disruptions when planning trips**
  - » Accentuate the positive: communicate normal service, not just disruptions, and emphasize more frequent core headways from overlapping service
  - » Use a color-coded rating scale to quickly communicate the severity of disruptions via online and in-station communication channels

Escalator outages

As part of Metro's current capital program, 128 of the system's 618 escalators are being replaced. In some cases, station entrances are closed for the duration of replacements for 6 to 10 months at a time. We have found these closures have significant ridership impacts that continue after the entrances are re-opened.

U Street's west entrance was closed for five months in 2017, decreasing ridership 20 percent. Even after it re-opened, ridership remained down 15 percent. Similarly, the closure of Judiciary Square's east entrance for 4.5 months decreased ridership 20 percent.

Actions

- » Evaluate requiring or incentivizing contractors to complete work at accelerated schedules to reduce outage time, which would provide short- and long-term ridership benefits

Speed up the buses

10 percent increase >> 15,000 to 35,000 additional weekday trips

Bus speeds have slowed by an average of 0.5 percent annually in recent years. Route run times are regularly lengthened to compensate, requiring additional buses to provide the same service in many cases. For example, starting in June 2018, Georgia Avenue's 79 route will include an additional 6 minutes of average run time on top of the previously scheduled 47 minute average during peak hours.

Improving bus speeds increases ridership – a 10 percent increase in speeds has been shown to increase ridership by 4 to 10 percent. Faster service also makes more efficient use of Metro's bus fleet and operators. For example, if the running time on a route can be improved by 20 percent, those resources can be used in one of two ways:

- The route can operate at the same frequency with 20 percent fewer buses, saving on operating costs, or
- Service frequency can be increased by 20 percent with the same fleet allocation – a bus every 12 minutes instead of every 15, for example – driving further ridership increases.

Actions

Speed up the buses by implementing leading practices to decrease the time buses spend at bus stops and red lights, and provide opportunities for vehicles to avoid congestion.

Bus Run Time Components & Levers to Increase Bus Speeds

Stopped at Bus Stops 20-25%	Stopped at Red Lights 20-25%	Moving on the Roadway / Delayed by Congestion 50-60%
Optimized Stop Spacing – Decreasing the number of bus stops & expanding limited stop service cuts bus stop time nearly proportionally to the share of stops consolidated* **Faster Boarding** – Implement all-door boarding to decrease the per-passenger boarding/de-boarding time by increasing throughput capacity – Reduce or eliminate cash payments to decrease passenger transaction time – Move payment off-board to speed per-passenger loading time	**Transit Signal Priority** – Hold or activate green lights for buses to reduce time stopped at traffic signals	**Dedicated Lanes for Buses** – Give buses full dedicated lanes to avoid congestion delays – Implement queue jump lanes to move buses ahead of congestion at stops **Congestion Management** Through pricing and other restrictions

*Optimal stop spacing reduces customer travel times by reducing on-the-bus time more than it increases walk times

Implementing actions to improve bus speeds requires a two-pronged approach:

- First, move forward with things within Metro's control: boarding and fare payment procedures, stop spacing, headway management, and active street supervision on frequent routes.
- Second, work with jurisdictional partners to implement treatments on roadways outside of Metro's control: dedicated lanes, queue jump lanes, and transit signal priority, plus smaller-scale changes to individual intersections and bus stop locations that cause delay.

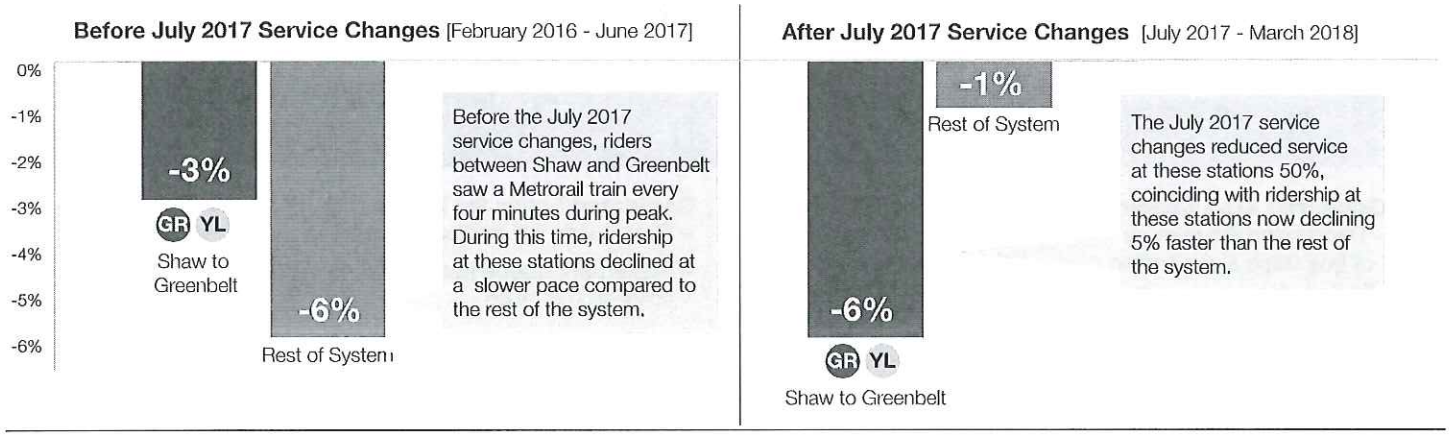
Extend Yellow Line to Greenbelt

1,000 to 3,000 additional weekday trips, $1.5 to $3 million net cost

Metro cut rush-hour rail frequency by 50 percent for riders between Shaw and Greenbelt in summer 2017 with the new rush hour headways and ending of Yellow Rush Plus service. The changes have led to a significant increase in crowding and is contributing to ridership losses. Shaw, U Street, Columbia Heights, and Georgia Avenue currently have higher off-peak frequencies than during rush hour. These stations serve dense, urban neighborhoods where Metro directly competes with bikes and ride-hailing services for riders and are among the few core stations not receiving the shorter 4 minutes or better headways from overlapping service. Evidence suggests that Metro riders are switching to these other modes.

Peak ridership at these stations has fallen 6 percent since the service cut and is declining at a much faster rate than the rest of the system. Crowding on trains at Shaw – the maximum load point – has jumped to 119 passengers per car, which is just barely under the Board-adopted maximum standard of 120. The increase in 8-car trains and additional tripper trains implemented in December 2017 and switch to 100 percent 8-car trains in April 2018 are important steps that have helped relieve crowding but have not improved frequency or travel times by much, and ridership losses remain significant.

Year-Over-Year Change in Ridership: GR YL Shaw to Greenbelt



AM Peak Entries, Average Weekday

Action

Increase ridership and relieve crowding by running more Yellow Line trains to and from Greenbelt at rush hours, increasing frequency to the core Green Line stations. If Metro could reverse the losses seen since July 2017, it could generate over 2,000 peak trips per weekday, or roughly $500,000 in annual fare revenue – the market is roughly 35,000 peak trips/day. The cost of this schedule change would likely be modestly higher than the estimated cost to extend all Red Line trains to Shady Grove.

The addition of Yellow Line service to this area would provide a consistent 4-minute headway –15 trains per hour. Train crowding would drop below 100 passengers per car, allowing plenty of room for ridership growth. And, the additional "tripper" trains that were recently added to the Green Line would no longer be necessary. Greenbelt has handled this level of service previously, routinely dispatching 15 trains per hour between 2014 and 2017. Fort Totten is too constrained for peak use due to the lack of a pocket track.

Operate peak Metrorail headways all day through midday and early evening

10,000 to 20,000 additional weekday trips, $10 to $30 million net cost

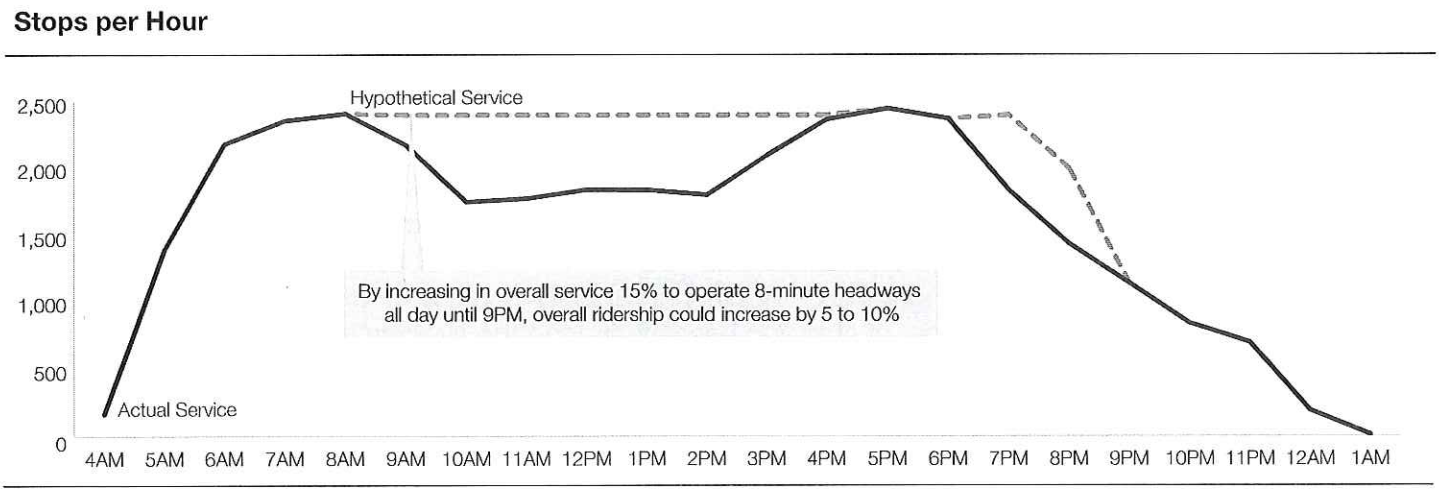
Currently, Metrorail shifts from an 8-minute to a 12-minute headway pattern, with service about twice as frequent in the core, during the midday and evenings, increasing customers' wait times by approximately 30 percent during these periods.

Metrorail has been losing ridership fastest at off-peak times in recent years, especially in the evenings. Evening ridership is down 20 to 40 percent at many stations, and overall weekday off-peak ridership is down 20 percent compared to 2014 levels – due in part to Uber, Lyft, Bikeshare, and others who are more competitive on a travel-time basis at off-peak times.

Customers now have better options than Metro's off-peak headways and better frequencies could bring them back. As ongoing maintenance and capital investment will continue to put pressure on weekend ridership, weekday off peak is potentially the most promising period we can realistically hope to win back riders with increased service.

Action

Operate peak frequencies until 9 pm each weekday, increasing ridership and revenue by making Metrorail more competitive at off-peak times when it is directly competing with ride-hailing firms and bikeshare for customers.



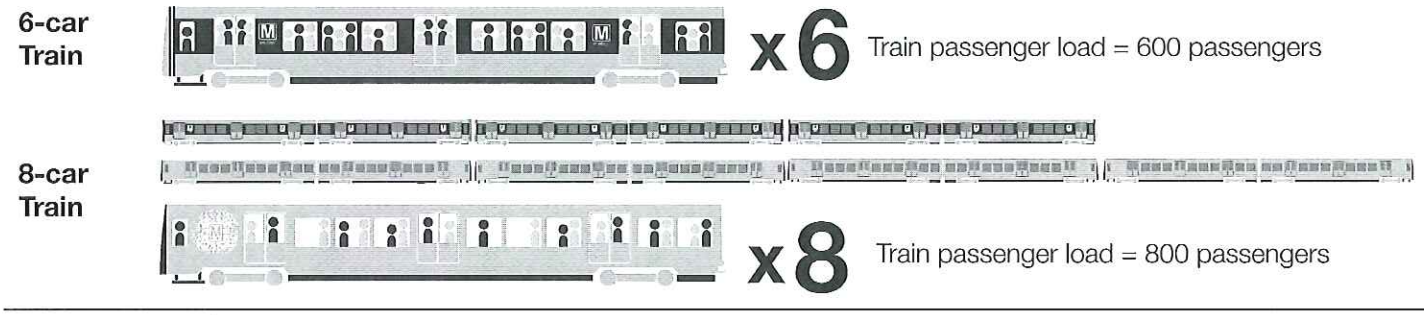
Running peak service as in the chart above increases overall service provision only by about 10 to 15 percent over the course of the day as a significant portion of our costs such as station managers and escalators would remain unchanged. Metro might even save additional costs by scheduling operators to work continuous shifts, rather than premium "split" shifts.

This schedule change would not conflict with most track work, as "early-out" single-tracking events typically start at 10 pm during the week. Midday single-tracking is not normally scheduled on Metrorail.

Deploy 100 percent 8-car trains to add capacity, improving customer comfort and relieving crowding

Providing 100 percent eight-car trains on all Metrorail lines maximizes the capacity of the existing Metrorail system, accommodates future growth across the region, and helps to improve the customer experience by reducing crowding and allowing more customers to have seats, especially important on longer trips. Additionally, operating the longest trains possible will allow the station platforms to be fully utilized, reducing crowding in stations.

6-car Train vs. 8-car Train



During the busiest morning and evening rush hours, with reduced rush hour frequencies, passengers experience uncomfortable crowding on many lines as trains move through the core. Some customers are unable to board trains, delaying their trips, and others may opt not to ride altogether. 100 percent 8-car trains increases Metro's capacity by 14 percent compared to the baseline share of 50 percent 8-car trains, enough to provide relief without increasing headways.[1]

Crowding is also an important driver of customer satisfaction. On this subjective level, customers have different tolerances with older and mobility-impaired passengers more likely to limit usage based on crowding levels, such as no seats available, which may be tolerable to younger, fully able-bodied passengers. Customers also have lower tolerance for crowding on longer trips.[2] Additional capacity increases the share of customers who are able to get seats, reducing the number of standing passengers and the average length of time standing.

Actions

- Deploy available car capacity to progressively increase share of 8-car trains in service.[3]
- Incorporate options into the 8000-series railcar procurement to acquire enough cars to deploy 100 percent 8-car trains.

[1] "The greatest opportunity for Metrorail capacity expansion in terms of passengers per hour (but not trains per hour) is conversion of all remaining peak period 6-car trains to 8-car trains. Support of 100 percent 8-car train operation during peak periods requires traction power upgrades, currently in progress, and fleet expansion, which could be implemented through a future 8000-series fleet and capacity expansion program. "Metrorail Capacity White Paper" (2015), https://planitmetro.com/wp-content/uploads/2016/12/C3788_WMATA-Core-Capacity_20151130.pdf.

[2] "[E]xperiencing crowding leads to increased dissatisfaction (e.g., stress and less privacy) during traveling. ...[T]he marginal disutility is both a function of the level of crowding . . . and the amount of time in public transport." Zheng Li and David A. Hensher, "Crowding in Public Transport: A Review of Objective and Subjective Measures," Journal of Public Transportation, Vol. 16, No. 2 (2013), http://www.nctr.usf.edu/wp-content/uploads/2013/07/16.2_hensher.pdf.

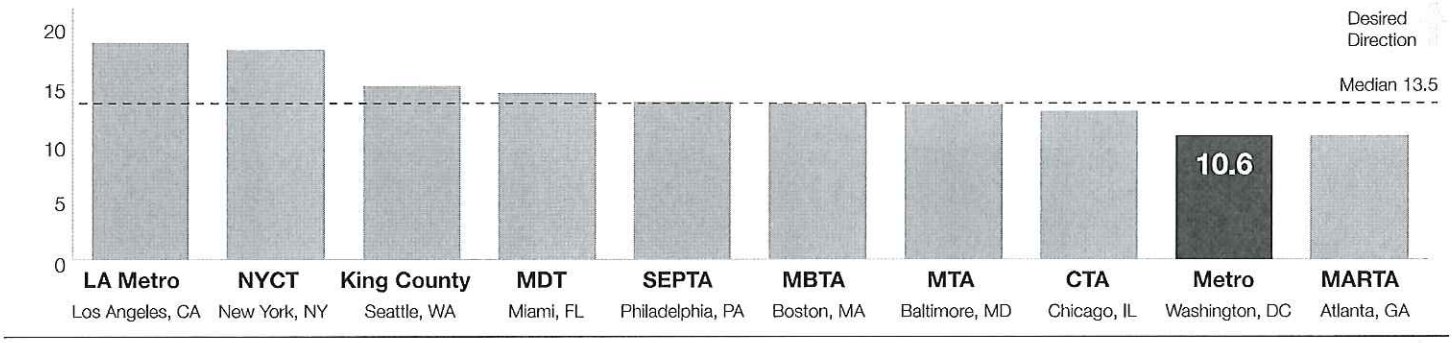
[3] In addition, we should explore opportunities to reduce our spare ratio to increase railcars available for service. Among 34 Community of Metros members, the median spare ratio is 17 percent, below Metro's current 20 percent. At that level, an additional 35 railcars would be available for daily service at our current fleet size.

Transform the bus network to grow ridership by delivering faster and more reliable service on an optimized network, incorporating leading operational practices

Bus Network Study

Metro's bus subsidy has grown substantially in recent years to cover growing costs amid flat and declining ridership. Compared to peers, Metro is generating less ridership for the amount of total service provided, suggesting opportunities to rebalance the network and adopt leading operational practices to increase productivity. As Metro launches a system-wide bus network study, there is opportunity to grow ridership given the amount of resources expended.

Average Bus Loads, 3-year average passengers per bus



Source: National Transit Database, 2014-2016; Passenger Miles Traveled / Vehicle Revenue Miles

Actions

- **Optimize the network to increase the share of service on high-demand corridors, matching service with demand.** Only approximately 60 percent of Metrobus's routes are ridership-focused compared to 70 to 80 percent at many peer agencies. This means Metro allocates a larger share of resources to lower productivity, coverage-focused routes than many of our peers. This ridership versus coverage split is even true within priority corridors where slower, local service with frequent stops accounts for a much larger share of service hours than the faster, limited stop MetroExtra lines.[4]

- **Incorporate best practices to improve customer travel times with faster buses.** Every 1 percent increase in bus speeds is expected to increase ridership 0.4 to 1 percent. Of course, faster buses are cheaper to operate and enable higher frequency, creating a virtuous cycle of service improvement and higher ridership. Many of the highest return tactics, such as optimizing stop spacing, are contentious and best addressed in a large-scale bus study where the tradeoffs can be debated and clear system-wide standards adopted. Engagement with the region also has the potential to advance high-value priority treatments at traffic signals and dedicated lanes that require commitment and action from jurisdictional partners.

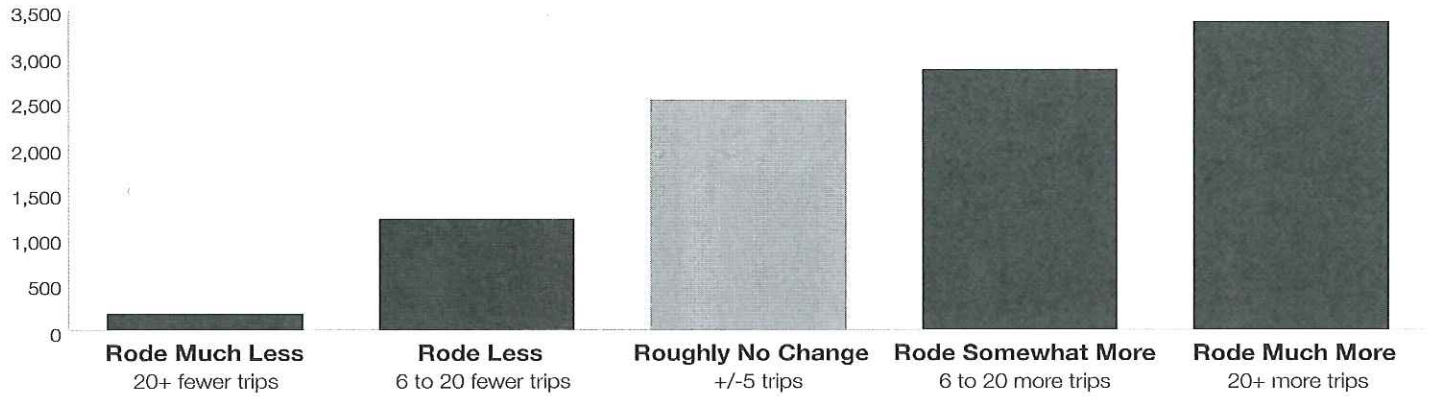
- **Improve reliability, safety, and usability.** Metro has an opportunity to adopt the leading practice of offering an easy-to-understand network of high-frequency routes, such as the 10 minute or better networks that have proven successful in Toronto and Seattle. This eliminates the need for customers to rely on timetables and encourages more ridership by building customer confidence that bus service will be there when they want to use it – the freedom to show up and ride. Concentrated service also enables more investment in customer amenities and improved security.

[4] In contrast, Seattle's RapidRide routes are implemented as an upgraded replacement to pre-existing service rather than an overlay running parallel to slower service, improving the overall efficiency of the corridors and allowing for high frequency levels on its premier service.

Convert customers to pass holders by making it easy to understand and buy an enhanced set of pass offerings

Passes have demonstrated the ability to increase both ridership and revenue. The vast majority of Metro customers pay-as-they-go using stored value. This means that Metro is competing with alternative modes on price for each and every trip. Once a customer buys a pass, each trip has a marginal cost of zero. As expected, customers tend to ride more and generate higher revenue after switching to monthly passes.[5] Metro should make a number of changes to existing offerings to increase pass adoption.[6]

One-Month Change in Metrorail Ridership from Customers After Purchasing SelectPass



n=10,160 customers who bought SelectPass for the first time March 2016 - August 2017

Actions

- **Offer shorter-term Metro passes.** Metro's largest category of customers – by number of people – are occasional or short-term users. Including attractive single and multiday passes is important to encourage these customers to "lock-in" and commit to Metro for one or more days, making their experience more seamless and inducing additional trips.
- **Make all passes multimodal**. Allow pass-holders to transfer freely between rail and bus to improve the value proposition and attract customers who alternate between modes. In addition, integrate trips on regional bus operators into Metro's pass products to enhance the cohesiveness of "transit" as a product and boost its competitiveness.
- **Fully integrate monthly passes into SmartBenefits.** SmartBenefits is Metro's monthly subscription program for commuters, accounting for more than 30 percent of fare revenue, and its enrollees are the most important group of potential pass customers.[7] Currently, buying a monthly pass requires a complicated set of steps and many customers are not given the option to buy a pass at all. Notably, monthly passes are not offered at all to federal government employees, accounting for the largest category of SmartBenefits enrollees. Shifting large numbers of customers to passes requires building pass products into SmartBenefits as the primary or default option and ensuring they are available through all employers participating in the program.[8]

[5] 73 percent of customers ride and spend more after they buy a pass, taking an extra 0.5 rail trips per day on average.

[6] In addition, Metro should continue to expand successful targeted offerings such as UPass for university students.

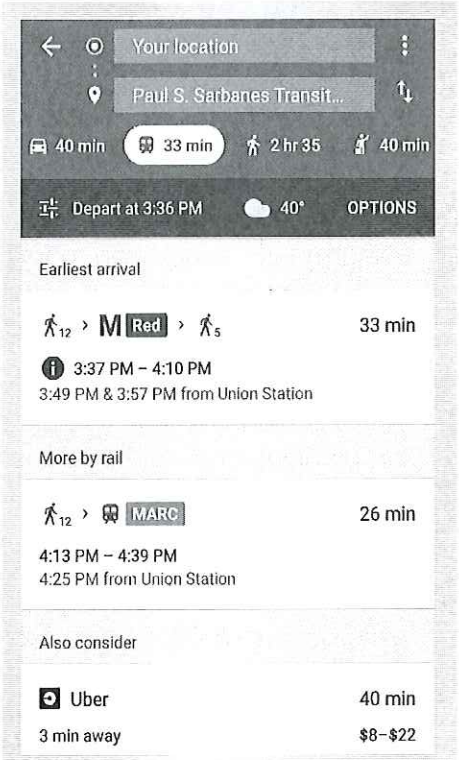
[7] SmartBenefits enrollees already sign up for monthly subscriptions and generally travel at commuter frequencies – people likely to be attracted to the consistency and predictability provided by a monthly pass and, for some, the perk of free non-commute trips.

[8] In Boston, the MBTA's employer-subscription program is called Corporate Pass and offers only monthly passes. https://passprogram.mbta.com.

Improve customer interactions through all steps of the journey

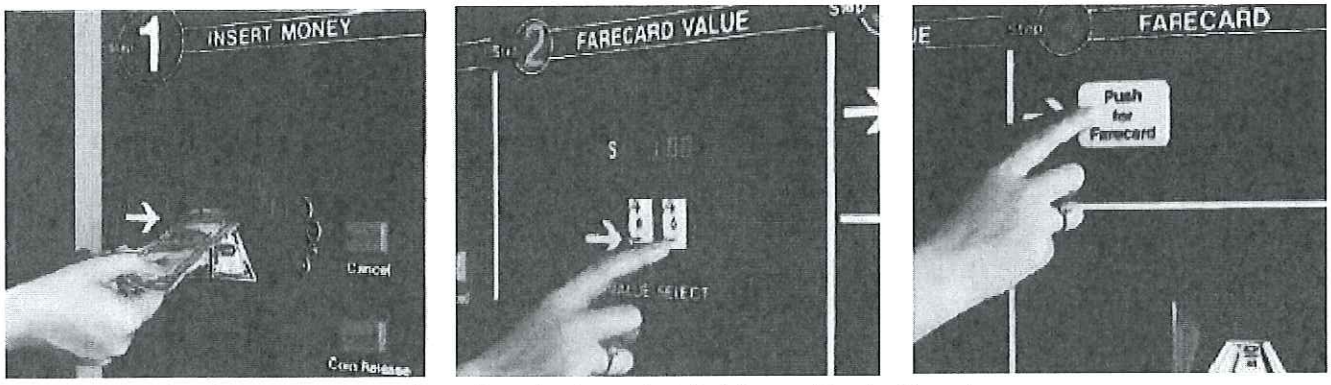
10,000 to 30,000 additional weekday trips

Metro's customer research shows that while overall travel time is foremost in a customer's decision to ride Metro, accurate information, ease of payment, comfort, and ease of access are also key drivers of satisfaction. In 2017, customer research found that 60 percent of Metro's riders use apps to plan their travel. The current app market is robust, with over 20 different options available that draw from schedule and real-time train and bus position data via Metro's Application Programming Interfaces (API). However, quality of apps vary and few integrate fare information or provide detailed instructions to help customers navigate their way through stations. The most popular apps, including Google and Apple Maps, also lack real-time arrival information because Metro does not release its real-time data in the standard General Transit Feed Specification (GTFS) format.



Currrently, Metro's train arrrival times on Google Maps is reflective of schedule, not real-time

The use of apps has also raised customer expectations for ease of paying fares. Ride-hailing apps for Uber and Lyft allow customers to pay instantly with their credit cards. Paying for a ride is a click of a button on your phone compared to the 5 to 6 steps to purchase or add value to a SmarTrip® card, the need to have exact change on buses, or the need to wait several hours for fares added online to be available for use. Fare payment is currently a pain point for customers: about 14 percent of customer complaints relate to fares, and 18 percent of customers each month experience a fare card problem that requires Station Managers' help to resolve. Addressing these issues requires Station Managers to return to the kiosk, which can limit his or her ability to resolve other customer issues quickly. For the large share of Metrorail customers that are tourists or occasional riders, fare vending machines often require Station Manager assistance to navigate and explain Metro's distance-based fare system.



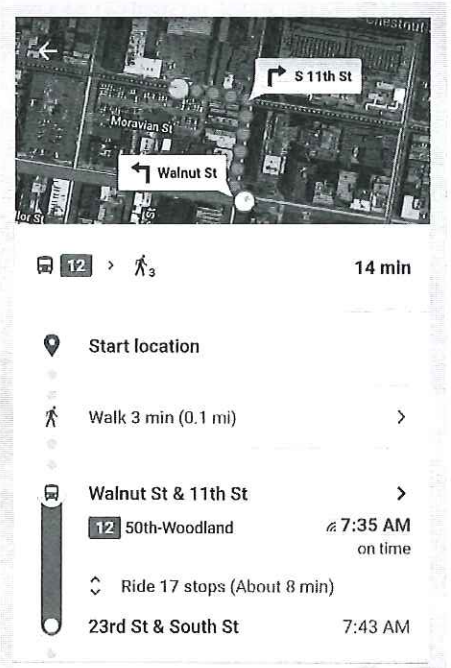
Metro's user experience has grown more complex as the system has evolved. Early fare machines had three steps.

Finally, Metro policies discourage parents with small children and bicyclists from riding the system by not allowing children in strollers on buses and limiting bicycles on trains to off-peak times. Both of these policies are designed to ensure that enough space remains in vehicles to accommodate customers during periods of crowding and persons with disabilities in priority seating areas. However, both drive potential customers to other modes of transportation and should be revisited during this time of declining ridership.

Improve customer interactions through all steps of the journey – continued

Actions

- **Enable real-time information on the apps most customers use by upgrading data feeds to current standard (GTFS-Real Time).** An app is only as good as the information and functionality it offers, so staff need to accelerate efforts to improve Metro's real-time data by bringing it in line with most current standards (GTFS-Real Time). Google and Apple Maps, and other third-party offerings, continue to be where the largest numbers of customers turn for information – we need to make sure up-to-date information is available on the channels our customers are using most.[9] In addition, continue to improve real-time information in stations and at bus stops with the replacement of Passenger Information Displays (PID) and expansion of bus arrival screens to more stops.



Real-time SEPTA information on Google Maps

- **Launch customer mobile app for trip planning and fare payment.** Metro is planning to introduce its own mobile app in December 2018 with trip planning and real-time bus and train arrival information. In 2019, the app will be expanded to include a virtualized SmarTrip® card that allows customers to pay directly with their phones and immediately add value to their accounts. In order to maximize the value of the app to customers and differentiate it from third-party apps on the market, work to expand features to include: personalized MyTripTime results for rail riders, gamification to encourage customers to ride more,[10] station accessibility and wayfinding, a mechanism to gather customer feedback,[11] and suggestions about nearby alternative bus routes that have shorter wait times.[12]


Transport for London

- **Install new fare gates and fare vending machines to streamline the customer experience.** New fare gates and secure swing gates should reduce opportunities for farecard malfunctions and both intentional and unintentional fare evasion by giving customers prominent visual and audible feedback of paid fare and making it harder to bypass the gates without tapping. New fare vending machines, planned for 2021, should offer a simplified user experience, especially when combined with the opportunities for self-service through the mobile app.

- **Better equip station managers to help customers with introduction of tablets.** Several other North American transit agencies, such as Toronto, Atlanta, and New York City, are transitioning station staff to customer service agent roles where they spend most of their time out of kiosks helping customers. Metro can move in this direction by equipping station managers with tablets to resolve SmarTrip issues and enable them to spend more time away from the kiosk.

[9] Metro releases rail and bus real-time information through an "API console" but not in the GTFS-real time standard most mainstream apps use.

[10] Options include points for number of rides, number of stations visited, or number of different bus lines taken. The points could be redeemed for free merchandise at the Metro store, or for products at partnering businesses (e.g., free coffee).

[11] For example, several Florida transit agencies are using an extension of OneBusAway, which Metrobus already uses, to enable customers to provide feedback.

[12] Customer research from San Francisco showed customers were 2 to 3 times more likely to take transit when alternative options were shown that reduced wait times.

Improve customer interactions through all steps of the journey – continued

Actions

- **Adopt customer-friendly policies for parents and bicyclists.** Many other transit agencies allow or have recently loosened restrictions against strollers and bikes. Making these customer-friendly changes carries no costs to Metro and could encourage families and bike commuters to ride more.

  - **Allow children in strollers on Metrobus,** by implementing a priority-seating policy similar to DC Circulator, allowing open strollers in accessible seating areas when they are not occupied by wheelchairs or persons with disabilities. Chicago, Boston, Seattle, San Francisco (SFMUNI), Houston, and the DC Circulator allow open (i.e, non-collapsed) strollers on buses at all times and Philadelphia began allowing open strollers during off-peak hours in January 2018. The DC Circulator allows open strollers but asks customers to observe a priority seating policy, deferring to the highest priority users[13]:
    - First priority: people using wheelchairs and motorized mobility aids
    - Second priority: people with walkers
    - Third priority: children in strollers

Children in strollers are welcome on the DC Circulator

  - **Explore allowing bikes on Metrorail at all times,** modeling BART's or New York's policies of asking cyclists to yield to other passengers and refrain from taking bikes on crowded railcars.[14] Bike advocates have requested Metro explore changes to peak period bike restrictions for years, building on the success of allowing bikes during off peak hours. San Francisco's BART recently allowed bikes on trains at all times,[15] joining the New York MTA[16] and Atlanta.[17]

Currently, bicycles are only permitted on Metrorail – limited to two per car – weekdays during non-peak times [5AM to 7AM, 10AM to 4PM, and after 7PM].

[13] "Strollers on Bus," http://www.dccirculator.com/bus-basics/strollers-on-bus/.

[14] Other opportunities to grow ridership from bicyclists include installing pop-up bike lines on Metro-owned roadways, such as Fort Totten, Franconia-Springfield, and Greenbelt, to make it easier for bicyclists to access rail stations.

[15] "Although bikes are allowed on all trains at all times, [bikes] are never allowed on crowded cars (there must be enough room to comfortably accommodate you and your bicycle)," "Bikes on BART," https://www.bart.gov/guide/bikes.

[16] "Bicycles are permitted on Subway trains at all times. However, we strongly recommend that cyclists avoid boarding crowded rush hour trains. Be courteous to your fellow passengers by standing with your bike, moving it so others can pass, and not blocking doors." "MTA Bike&Ride," http://web.mta.info/bike/.

[17] "[O]ur trains offer plenty of room for both you and your bike...[but] [a]void boarding trains that are already full," "Take Your Bike for a Ride," MARTA, http://www.itsmarta.com/bring-your-bike.aspx.

Support transit-oriented development

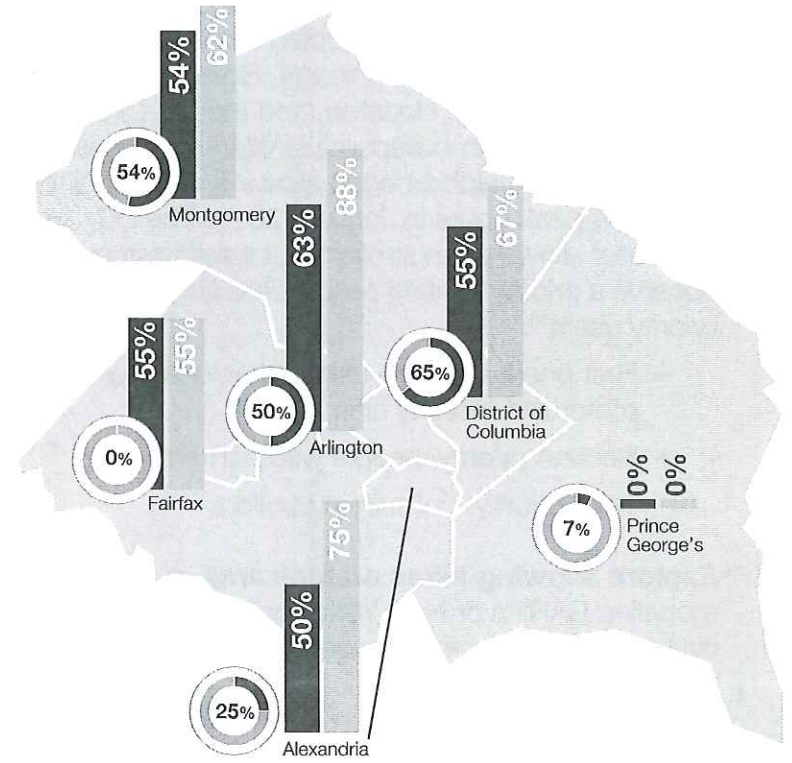
10% increase >> 30,000 to 70,000 additional weekday trips

People who live or work near transit are the core of Metro's potential customer base. The majority of Metrorail customers walk to Metro and an even larger share walk to bus stops. Accordingly, the most effective way to increase the number of potential riders is intensifying land uses within walking distance of transit. In this way, Metro and local jurisdictions can build the long-term ridership base that is critical to Metro's future.

Over the past 40 years, Metro stations have anchored transit-oriented growth across the region. In addition to supporting local economies, the growth of these communities has created sustainable generators of rail ridership. However, many station areas remain underutilized. Local jurisdictions have the power to foster transit-oriented development that supports and protects their ongoing investment in Metro. In addition, jurisdictions can help Metro realize more ridership by ensuring station areas are walkable. People are deterred from using Metro if walking to the station is inconvenient, unsafe or impossible due to poor sidewalk or street networks.

The map to the right indicates how well local jurisdictions are supporting station-area growth by the share of stations meeting context-appropriate targets for walkability, the amount of the walkshed for each station that is actually reachable by foot,[18] and employment and household density.

Walkability & Growth Near Transit



Source: Office of Planning

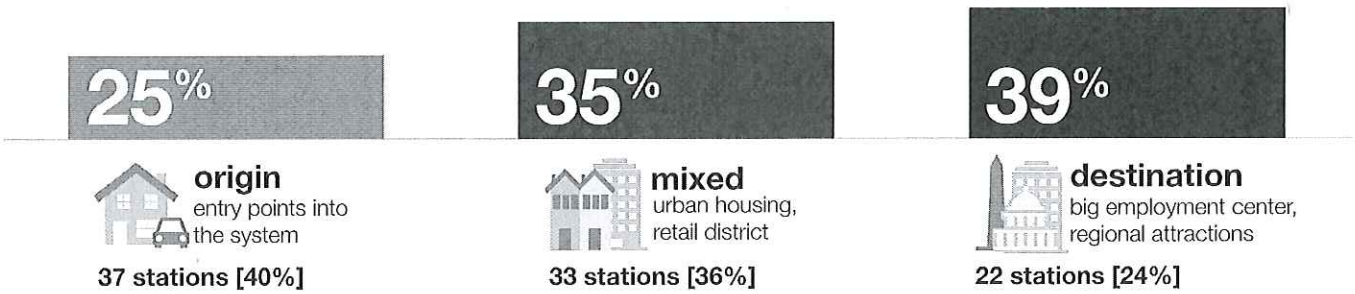
At many suburban stations, the dominance of low-density residential land use ensures that most customers limit trips to morning entries and evening exits during the week. This skewed demand forces Metro to run trains that are packed in one direction but empty in the other during rush hour. In addition, as teleworking reduces the market for commuting trips, park and ride stations in low-density residential suburbs may become even less cost-effective in their ability to attract riders.

[18] Using the Metropolitan Washington Council of Government's Cooperative Forecast data, which is informed by each jurisdiction's land use plans, the Office of Planning assessed which stations meet these density targets (for jobs and/or households) today and in 2040 under current projections. The figures indicate, for each jurisdiction, the percentage of stations that meet these density targets. The walkability calculation is based on the actual pedestrian network within the station area, rather than the typical ½ mile circle shown to represent the station planning area. To quantify the potential ridership gains, this measure calculates a walkshed coverage ratio for each station that represents the percent of the area within ½ mile of a station that is actually accessible by foot, indicating stations that can improve ridership by improvements to the surrounding pedestrian network.

Support transit-oriented development – continued

Walkable, mixed-use communities of sufficient density provide sustainable ridership throughout the day, and do not depend on costly garages or feeder transit services to attract customers. Unlike a conventional Park & Ride station, a transit-oriented development station does not have its demand capped by the capacity of its parking lot. Mixed use stations are similar in number to suburban, origin stations but account for 10 percent more trips.

Metrorail Station Profile, share of total trips

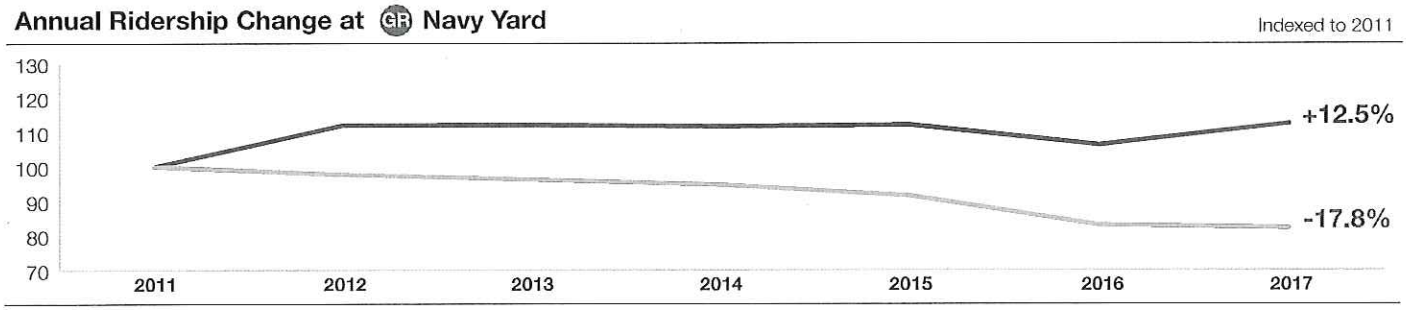


Source: July 2017 Rail Ridership Data

Transit-Oriented Development Success Story: Navy Yard Neighborhood

One of the region's most prominent transit-oriented development success stories is the Navy Yard neighborhood in Washington. A decade ago, the opening of Nationals Park and the new headquarters of the U.S. Department of Transportation fueled a 200 percent increase in weekday ridership at Navy Yard station.

Annual Ridership Change at Navy Yard



As the neighborhood has continued to grow into a vibrant mix of homes, offices, retail, and entertainment, ridership has continued to grow. Furthermore, this growth is rooted in a broad mix of trips spread throughout the day. This type of growth, much of which can be traced to the growing base of residents who are intentionally choosing a transit-oriented lifestyle, has proved resilient in the face of Metro's recent challenges. Since 2011, total annual rail ridership has declined by 18 percent. Over the same period, Navy Yard ridership has grown by 12.5 percent.

Support transit-oriented development – continued

Actions

- **Encourage jurisdictional partners to update local zoning codes and ordinances to enhance transit-oriented development around Metrorail stations and along major bus corridors.** In those areas, Metro supports higher density development, mixed uses, economic development incentives, context-sensitive parking requirements, and increased investment in pedestrian and bicycle infrastructure.
- **Invest in improving pedestrian and bicycle access.** Successful transit-oriented development depends on seamless and safe access to transit. More than 60% of Metrorail's current riders walk to their Metrorail station. Metro supports investment in pedestrian and bicycle access improvements that maximizes quantity of safe walking and biking connections to Metrorail stations and major bus corridors.
- **Promote transit-oriented development in less developed areas.** Metro encourages daytime employment centers, commercial, retail, and other uses that draw riders to suburban Metrorail stations. This action plan also supports Metro's Board adopted priority action of generating counter-commuting riders.

Implement 'free' rail-bus transfers

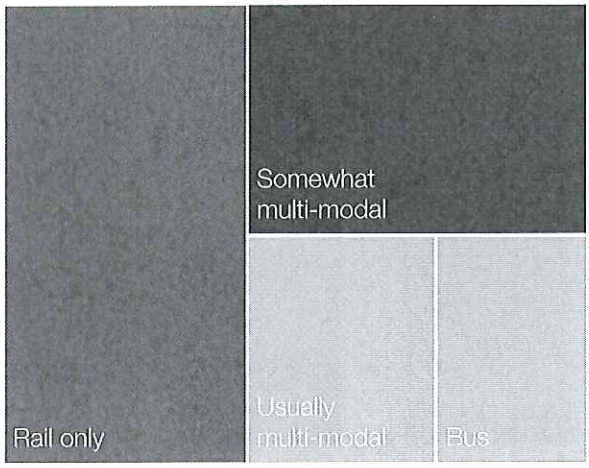
10,000 to 35,000 additional weekday trips; $20-$40 million net cost

Metro has a large share of riders who sometimes take combined rail and bus trips and a smaller number – accounting for nearly 100,000 average weekday trips – that do it regularly. Making rail and bus transfers "free" increases ridership by decreasing the high cost of taking linked rail-bus trips and encouraging customers to use the most convenient mode for their trip. It also furthers the objective of connecting the region by making the rail and bus systems operate more like a seamless, integrated network.

Actions

- Implement "free" rail-bus transfers by raising the transfer discount to the level of the bus fare, currently $2.00.
- Integrate regional operators into pass products, including the forthcoming Purple Line, and work to bring commuter rail operators into the SmarTrip ecosystem as Metro upgrades its fare payment systems.

Mode Breakdown of Metro Customers ≥ 3 trips per month



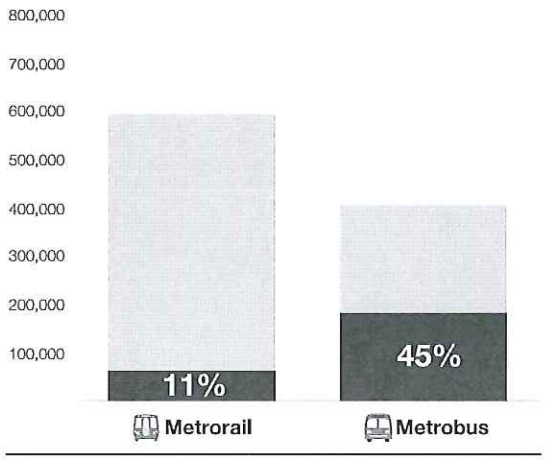
Source: Customer Travel Analytics Platform (CTAP) Ridership data, August 2017

Subsidize fares for low income customers

20,000 to 35,000 additional trips, $15 to $35 million net cost

Low-income individuals are the most likely to be burdened by the costs of using public transit, the most likely to forego using transit due to cost, and the least likely to have alternative travel options. Low income Metro riders are especially price sensitive and would be expected to ride more if able to do so at lower cost. Metro's new ridership forecast model found Metrobus ridership, where 45 percent of passengers are low income, was more sensitive to fare levels than industry average price elasticity formulas would suggest. In addition, rates of fare evasion show some correlation with income and are plausibly linked, in part, to riders' ability to pay.

Low Income Share of Ridership

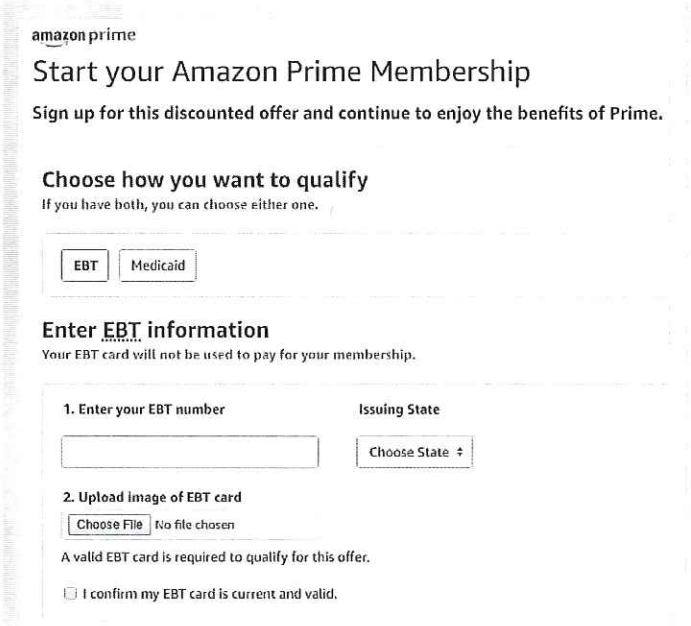


Source: 2016 Rail Passenger Survey & 2014 Bus Passenger Survey

While many middle and high earners receive employer-subsidized transit and can pay a premium to live closer to employment and amenities, the same benefits do not accrue to low-income individuals who receive a disproportionately low share of transit benefits currently available.[19] For example, over 66 percent of Metrorail customers in the highest income segment receive a transit subsidy through employer-sponsored programs, while only 10 percent of the lowest income rail customers and 5 percent of bus customers receive similar subsidies. While some government programs and non-profits provide transit subsidies, there is no universally-available fare product for low-income residents.

Action

- **Pilot a low income fare product subsidized by one or more jurisdictions to reduce fares for low income customers, making Metro more affordable, increasing ridership, and improving fare compliance.** One option is a fare capping product, where the customer pays for a set value or number of trips and once those trips have been taken, the rest of the trips during that time period are free. This would allow lower income customers to benefit from the free "extra trips" dynamic of pass products without as much required upfront lump sum payment, which can be prohibitive. It also encourages fare compliance allowing customers to earn free additional trips by paying for an initial set of trips.



Using secondary income verification, checking enrollment status in means-tested programs rather than verifying income directly, streamlines enrollment. Amazon offers discounts on Prime membership for holders of Medicaid and Electronic Benefits Transfer (EBT) cards.

[19] Nelson, P, A Baglino, W Harrington, E Safirova, and A Lipman. "Transit in Washington, DC: Current Benefits and Optimal Level of Provision." Journal of Urban Economics, September 2007.

As Metro seeks to stabilize and grow ridership, Metro needs to continue to improve it's understanding of why the system is losing ridership. Metro understands a good deal about the big-picture drivers of ridership: development patterns, the economy, reliability, frequency of service, and fares. Metro could better understand the recent disruptive trends in demands for our services, and the relative value tradeoffs our customers think about when deciding whether to ride Metro.

A sustained investigation, based on analysis of SmarTrip® data and targeted customer research, could help answer the following questions:

- From what kinds of riders is Metro losing trips? Are some trip purposes disappearing? In which cases are customers being lost to to other modes? What factors could steer them in favor of Metro?
- To what extent are the alternative travel methods complements to Metro (e.g., customers who drive to and from the Metro station) versus substitutes (e.g., customers who drive instead of taking Metro)?
- How has Metro's customer base changed over time? Are changes more pronounced in certain rider categories?
- What are long-term trends in riders' consistency and frequency of riding? Are riders becoming less consistent? (e.g., one-way trips, evidence of telework or multiple work locations)