TRANSIT MOVES FORT WORTH

Transit Strategies

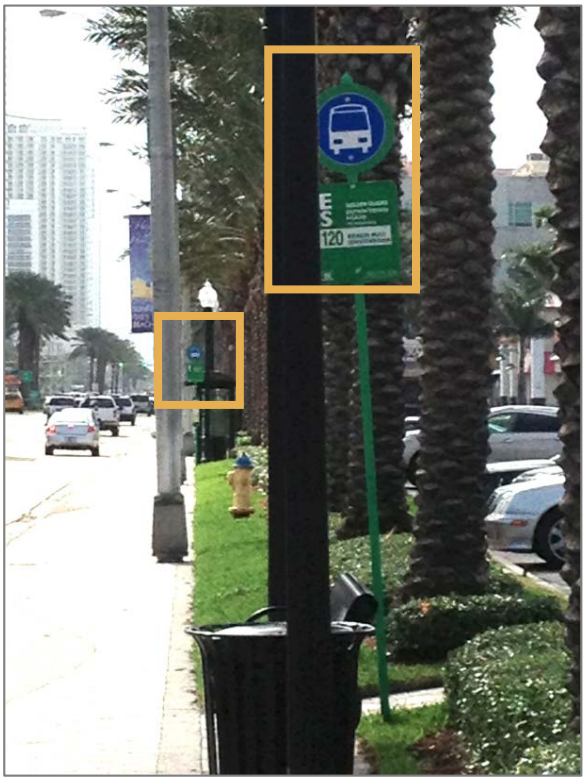
Stop Optimization

The best service balances travel times with access. Stops that are closely spaced reduce the distances that people have to walk to and from bus stops but make service slow. More widely spaced stops can provide both reasonably short walk distances and make service faster and more reliable. With fewer stops, it is also easier to provide better facilities and amenities.

Transit stops are the places where people access transit service, and those stops impact many elements of passengers' transit experiences. They are typically thought of largely as a place to wait for the bus or the train. However, bus stops are one of the most significant reasons that transit service is slower than automobile travel. The spacing and placement of stops greatly impact transit travel times and reliability, as well as the types of facilities and amenities that can be provided. With more stops, it is easier for passengers to get to and from transit, but too many stops also slow service and degrade reliability. Most transit riders want short walks to and from stops coupled with fast service. However, few think of the link between the two. The major reason that buses are slower than driving is that the bus needs to stop to pick-up and drop-off passengers along the way. More stops make service slower and fewer stops make service faster.

With fewer stops, it takes some passengers longer to get to and from the stop, but service is faster and more reliable. Most riders want service that balances convenience and speed, and the number and location of stops is a key component of determining that balance. Moreover, as the success with Bus Rapid Transit (BRT) and other forms of enhanced bus have shown, most passengers prefer a greater emphasis on faster service than on shorter walks. Stop consolidation done right makes service faster and more attractive while maintaining convenient access.

Close Stops in Miami Beach, FL



Close Stops in Downtown Kansas City, MO

Most transit systems, including Trinity Metro, have too many stops. This is usually due to an accumulation of stops over time, as transit agencies receive and grant requests for new stops on the basis that "one more stop" won't significantly degrade service. However, over time, "one more stop" becomes many more stops and makes service slower and unattractive for those with other choices. To make Trinity Metro service more attractive to more people, it will be essential to achieve a better balance between walk distances to stops and overall travel times.

Benefits of Stop Optimization

Stop optimization, or the consolidation of stops to slightly increase walk distances, is one of the most effective ways to:

- **Make service faster**
- **Make service more reliable**
- **Make the on-board experience more comfortable**
- **Provide better stop facilities and amenities**
- **Improve accessibility at stops**
- **Increase operator satisfaction**

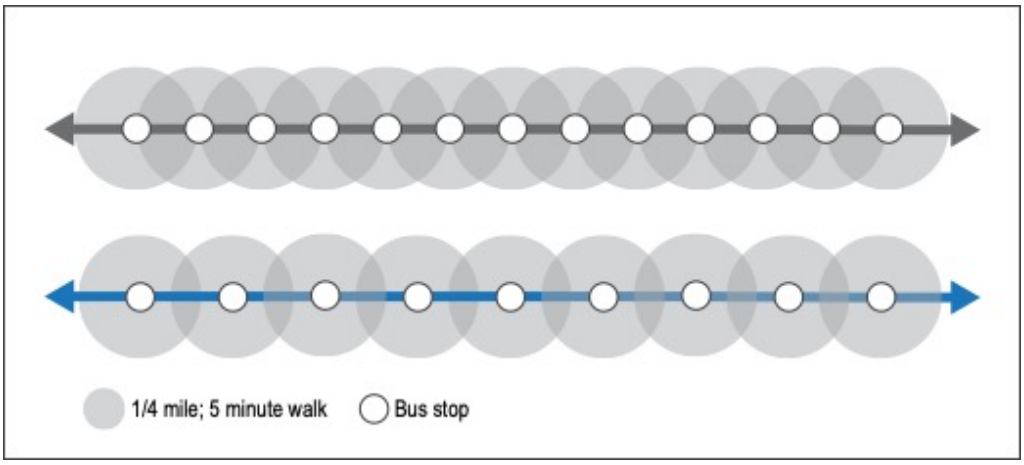
Faster Service

Each time a bus stops, it must slow down, stop and wait for passengers to board and alight, often wait to pull back into traffic, and then accelerate up to speed. On average, it takes a bus about 15 to 20 seconds to slow down, stop and pick up a passenger, and accelerate back up to speed. Thus, a consolidation from nine stops per mile to six can save one minute per mile, or five minutes on a five-mile trip.

Stop Times and Potential Savings

Furthermore, reducing the number of stops generally should not impact convenient pedestrian access. Most transit riders are willing to walk up to five minutes to access a local bus stop, and many stops are placed so close together that many stops are within a five minute walk. While some riders may have a slightly longer walk after stop consolidation, it is often no longer than around 300 feet, or the equivalent of the length of an aisle in a store. The graphic below displays how closely spaced stops provide duplication in service.

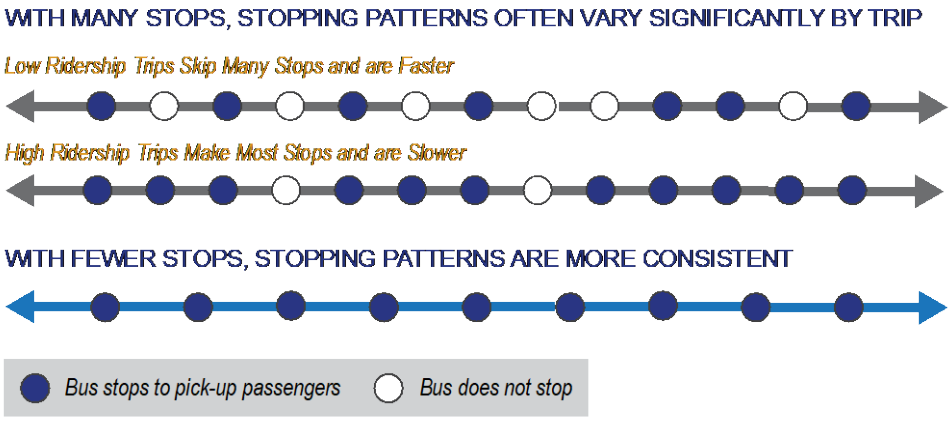
Coverage with Closely Spaced Stops Versus Optimized Stops



More Reliable Service

As the number of stops on a transit line increases, the probability that the bus will pick up passengers at a given stop decreases. On some trips, a bus might pick up passengers at 90% of stops. On another trip, a bus on that same route might only stop at 30% of stops. This variance generally results in agencies padding schedules, which means riders cannot expect the same trip to take the same amount of time at different times of day. It also means that the busiest trips are the slowest, since more riders means a higher chance that each stop will have boardings and alightings. The consolidation of stops makes service more reliable by increasing the chance that the bus stops at every stop during every trip.

Impact of Stop Spacing on Travel Times



More Comfortable Service

Stop and go operation, no matter the mode, is uncomfortable. Fewer stops translates to greater ride comfort.

Better Stop Facilities and Amenities

Waiting at a stop for the bus is often the most onerous part of a transit trip, and riders' perceptions of their stops often color their overall transit experience. Most transit systems do not have the resources to provide high quality amenities at all stops and focus on those with the highest ridership. The consolidation of stops produces more stops with higher ridership and fewer stops with low ridership. This makes it easier to provide better amenities at more stops.

Better Accessibility to, from, and at Stops

In the same manner that it is easier to provide better amenities when there are fewer stops, more extensive accessibility improvements can also be made. Examples like sidewalks, curb ramps and lighting provide accessibility improvements that increase transit ridership.

Increased Operator Satisfaction

Unreliable and slow service is not just unpleasant for riders, it is also stressful for bus operators. Closely spaced stops mean that operators must constantly be on the lookout for passengers, must pull in and out of traffic more often, and are harder pressed to stay on schedule. Delays also cut into scheduled breaks. Conversely, more consistent and reliable service is less stressful and produces greater operator satisfaction.

Consolidation Strategies

Many transit systems set stop spacing guidelines that consider factors such as customer convenience, service type, the operating environment, pedestrian conditions, and the location of activity centers. In most cases, newly developed guidelines specify fewer stops than currently exist.

When consolidating stops in areas with very frequent stop spacing, the most common approach is simply to eliminate stops. In the Pittsburgh area, where there was one stop per block in many areas, the Port Authority used this approach to eliminate over one-half of its stops. In other cases, rather than simply eliminating stops, stops are often consolidated at new locations – for example, three existing stops are eliminated and two new ones created.

Other factors also come into play. For example, stops directly serving senior centers are rarely removed as part of a consolidation process. Many agencies also evaluate the safety of potential consolidation targets and may remove a higher ridership stop if it is unsafe for passengers. Stops without nearby sidewalks or crosswalks, as well as those located in blind spots for oncoming drivers, are more likely to be viewed as unsafe. Agencies may also maintain stops with improved infrastructure or amenities, especially if the stop location satisfies ADA accessibility mandates.

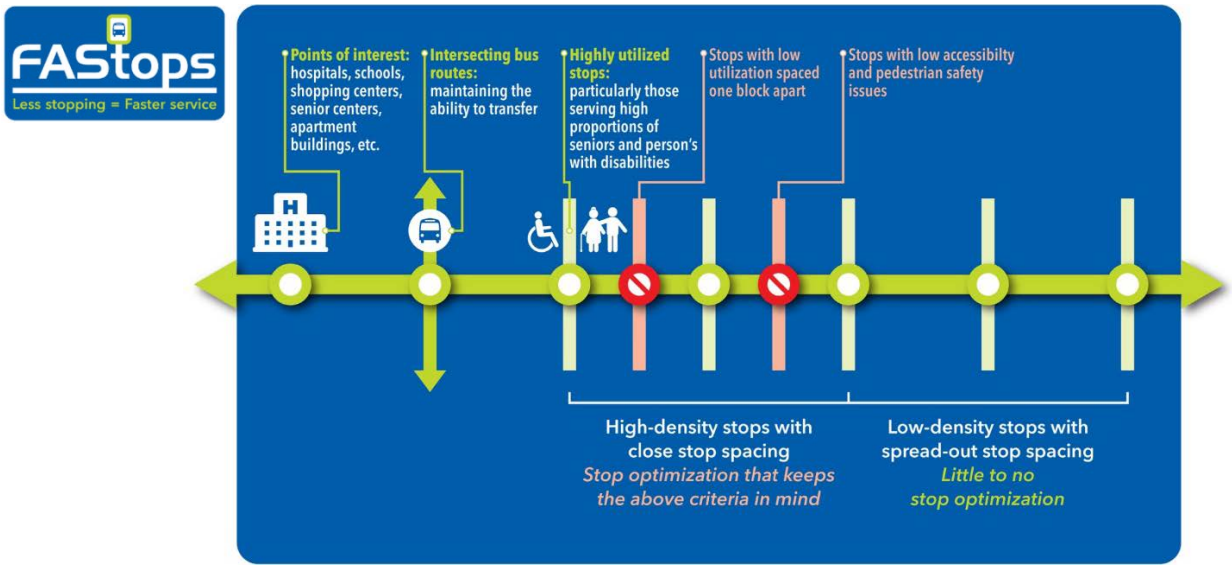
Stops are also frequently removed or relocated as part of a broader stop infrastructure program. For example, an agency might set a goal to place a bench at every stop with 30 or more daily boardings. As stops are consolidated, ridership is concentrated at fewer locations, thus providing justification for adding a bench. The agency is then able to provide a bench at most stops, providing a consistently higher quality experience for passengers for a lesser capital expenditure.

Example Consolidation Programs

Cincinnati, Ohio

SORTA, the transit provider for the Cincinnati area is currently consolidating stops through its FAStops program that is reviewing its 4,500 regular service stops. The program is examining spacing, ridership, safety and other factors through a combination of operator feedback, data analysis, and manual inspection. The purpose of the program is to balance bus stop spacing by assessing stops that are too closely spaced and prioritizing high quality and highly utilized stops and eliminating low ridership and low quality stops.

SORTA FAStops Stop Consolidation Criteria

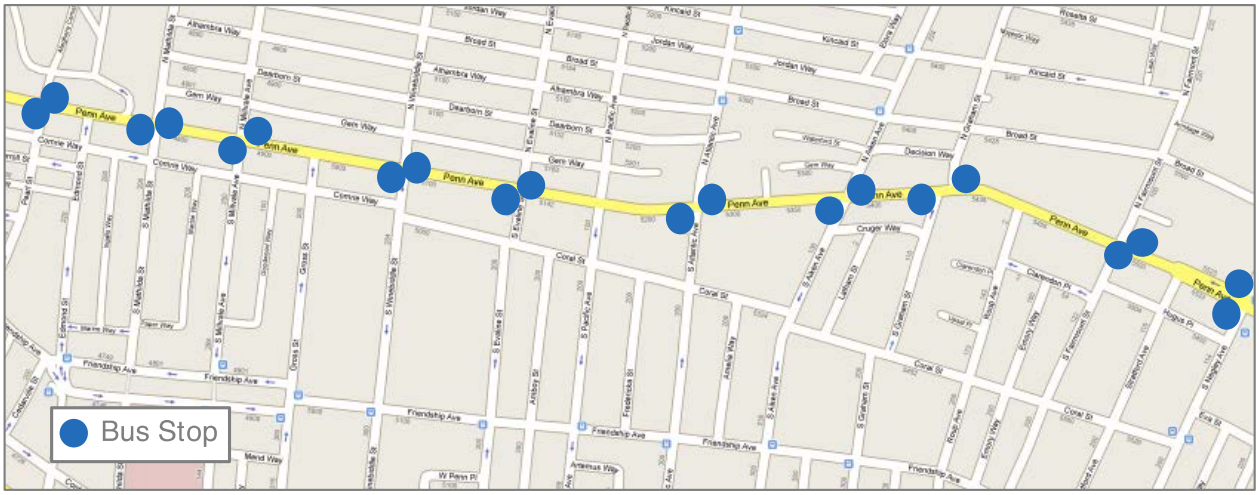


A pilot program is currently underway, where 15 to 25% of stops were removed in four corridors. Members of the public were encouraged to provide feedback before the pilot went into effect. Early pilot results show increased on-time performance, faster travel times, and positive feedback from operators and SORTA plans to expand this program to the rest of the system.

Pittsburgh, Pennsylvania

Prior to its 2009 Transit Development Plan (TDP), the Port Authority of Alleghany County served over 16,000 stops, many of which were only a single block apart. The TDP began a process through which the Port Authority continues to consolidate stops. It began by eliminating stops that had either no or very low ridership, including 13 light rail stops that were very close to others. Since 2010, it has reduced the number of stops that it serves to fewer than 8,000.

Pittsburg, PA: Stops Along Penn Avenue Between East Liberty and Lawrenceville Before Stop Consolidation



The Port Authority's bus stop consolidation program was based on:

- Stop spacing guidelines based on the type of service provided, with more widely spaced stops on higher volume routes and more closely spaced stops on community routes.
- An objective that most riders who used eliminated stops should have to walk more than one or two blocks to another stop.
- Exceptions would be made in cases where walking conditions are particularly problematic or dangerous, or where there are significant topographical challenges

Port Authority of Allegheny County Stop Spacing Guidelines

	Rapid Service Routes	Frequent Service Routes	Key Corridor Routes	Commuter Routes	Lifeline Routes
Minimum Stop Spacing (feet)					
Moderate to High Density Areas	900	700	700	900	500
Low Density Areas	1,300	1,000	700	1,000	500
Stops per Mile					
Moderate to High Density Areas	6	8	8	6	10
Low Density Areas	4	5	8	5	10

Providence, Rhode Island

As part of its 2013 Comprehensive Operations Analysis, Providence's RIPTA developed new stop spacing guidelines that were intended to make service faster and more reliable. RIPTA developed stop spacing guidelines using a similar approach as in Pittsburgh in that they consider both service area density and service type. However, RIPTA's desirable stop spacings are, in general, longer than the Port Authority's.

RIPTA Bus Stop Spacing Guidelines

	Rapid Bus	Key Corridor	Urban Radial	Non-Urban/ Suburban/ Crosstown	Regional	Express/ Commuter	Flex
Minimum Stop Spacing (ft)							
Moderate to High Density Areas	1,100	900	900	660	900	900	n/a
Low Density Areas	1,300	1,300	1,300	1,100	1,100	1,100	n/a
Maximum Stops per Mile							
Moderate to High Density Areas	5	6	6	8	6	6	n/a
Low Density Areas	4	4	4	5	5	5	n/a

Note: Moderate to high density = greater than or equal to 4,000 persons per square mile; low density = less than 4,000 persons per square mile.

Exceptions to the guidelines are intended to be made only in locations where walking conditions are particularly dangerous, significant topographical challenges impede pedestrian access, and factors compromise safe bus operations and dwelling. In the same manner as in Pittsburgh, most passengers should not be required to walk more than one or two blocks farther to access service.

Following development of the guidelines, RIPTA assessed stops along all routes, and reduced the number of stops from over 5,300 to approximately 3,500, or a 34% reduction over a four year period. The program has resulted in speed and reliability improvements and increased operator satisfaction due to smoother rides and less weaving in and out of traffic.

Denver RTD, Denver, CO

RTD is systemically analyzing bus stops by route based on usage and spacing with the goal to prioritize bus stop locations with enhanced safety features, and remove underutilized bus stops or stops close to other stops in an effort to improve service make making service faster.

RTD's goal is to consolidate bus stops to meet industry guidelines, which would space bus stops every ¼ - mile. Bus stops will still be located near key intersections, major activity generators and areas to accommodate people with disabilities. In total, RTD is planning to reduce the number of stops by 20%, and to do this is using a model that considers walking distance, passenger boardings and alightings, passenger loads, dwell times, land use, infrastructure, and population density. The model balances time to access a stop with time spend on the bus for all riders.

Like many other transit systems, RTD is using a video produced by TransitCenter to describe the benefits of "bus stop balancing," which can be viewed at: https://vimeo.com/240382367

TransitCenter Bus Stop Balancing Video

Massachusetts Bay Transportation Authority (Boston, MA)

As part of its Key Bus Route Improvement Program in 2014, the Massachusetts Bay Transportation Authority (MBTA) upgraded the service of its 15 busiest routes. Several key elements of this project were to optimize bus stop locations for safety, efficiency, and accessibility and increase service reliability and reduce bus bunching. The project resulted in eliminating over 20% of bus stops that were closely spaced and/or served few riders. The number of stops along the routes meeting ADA requirements increased from around 50% to over 95%. Travel times and on-time performance immediately improved along all 15 routes. The project also included increased amenities: 70 new shelters, 180 new benches, and 200 trash barrels and solar recycling bins.

Potential Fort Worth Consolidation Program

At the present time, Trinity Metro has relatively closely spaced stops. For example, along Vickery Boulevard south of downtown, stops are spaced less than every two blocks. These stop spacings are very close, and much closer than at systems that have explicitly set stop spacings. Even with five stops per mile, nearly all existing riders would still be within a one-quarter mile/five minute walk of a stop.

Stop Spacing along Vickery Boulevard

Moving forward, Trinity Metro could develop explicit stop spacing guidelines and consolidate stops with an emphasis on improving speeds while maintaining convenient access. Based on what other transit systems have done, there are significant opportunities to make service faster. Furthermore, with fewer stops, Trinity Metro will be better able to improve stop facilities and amenities, provide more reliable and comfortable service, and make resources available for additional service improvements.

Finally, ideal stop spacing is inherently related to the service type and characteristics of each transit route. Trinity Metro could therefore develop stop spacing standards and implement stop consolidation using a family of services framework. Specific stop standards should be tailored to the goals for each type of transit service:

- **High Capacity Transit Services:** High capacity transit services such as light rail, BRT, and Rapid Bus are intended to move a large volume of passengers at high speeds and typically have from two to five stops per mile, depending upon the operating environment and whether or not local services are provided in the same corridor. The SPUR, which is the closest that Trinity Metro has to a high capacity route, has approximately four stops per mile.
- **Frequent Routes:** Most transit riders are willing to walk a farther distance to access bus lines with higher frequencies. These routes should generally have stop spacings that range from two to six stops per mile, again depending upon the operating environment.
- **Local Routes and Lifeline Services:** Local bus and lifeline services designed to serve markets with special needs provide access to and from neighborhoods with less transit demand. These routes operate at lower frequencies and are often the only transit option in their service area. Local bus stops must be placed close enough to maintain transit access, but far enough apart to ensure higher speed and reliable service and generally have five to eight stops per mile.

Example stop spacing guidelines from other transit systems are shown on the next page.

Finally, it should be noted that stop consolidation can be difficult. While it provides benefits to an overwhelming majority of riders, some riders – and in particular, some seniors – would prefer to walk shorter distances and are less concerned with travel times. These riders often oppose stop consolidation, and when they are seniors or persons with disabilities, typically receive a more sympathetic ear than those who support stop consolidation. Stop consolidation done right should not impoose any signficant difficulties for any riders and none should have to travel more than one to two additional blocks to a stop. The City and Trinity Metro can partner together to ensure that this is the case.

Example Stop Spacing Guidelines

	Feet Between Stops	Stops per Mile
AC Transit (SF Bay Area)	500-1300	4-11
Local Service		
High Density Areas (>20,000 persons/square mile)	300-700	8-18
Medium Density Areas (2,000-4000 persons/acre)	500-1,000	5-10
Low Density Areas (<2,000 persons/acre)	500-1,300	4-10
Rapid Bus		
High Density Areas (>20,000 persons/square mile)	750-1,500	4-7
Medium Density Areas (2,000-4000 persons/acre)	1500-4,000	1-4
Low Density Areas (<2,000 persons/acre)	2600-5,300	1-2
Express		
High Density Areas (>20,000 persons/square mile)	750-1,250	4-7
Medium Density Areas (2000-4000 persons/acre)	1000-1,500	4-5
Low Density Areas (<2,000 persons/acre)	1300-2,600	2-4
Delaware DOT	750-1,000	5-7
Local Bus		
High Density Areas (>3,000 persons/square mile	750	7
Medium Density Areas (900-3,000 persons/square mile)	1000	5
Low Density Areas (<900 persons/square mile)	Activity Centers	
Grand Valley Transit (Grand Junction, CO)		
Major Commercial Areas	500-800	7-10
Urban Areas	700-1,000	5-8
Suburban Areas	1000-1,500	4-5
New Orleans RTA		
Residential	600-1,000	5-9
Retail, Commercial, Industrial Areas	750	7
TriMet (Portland, OR)		
High Density Areas	700-850	6-8
Low Density Areas	1000-1,200	4-5
Pace (Suburban Chicago)		
High Density Areas (>4,000 persons/square mile)	660	8
Medium Density Areas (2,000-40,00 persons/square mile)	1320	4
Low Density Areas (<2,000 persons/square mile)	flag stop	
Port Authority (Pittsburgh)		
Rapid Service Routes	900 - 1,300	4 - 6
Frequent Service Routes	700 – 1,000	5 - 8
Key Corridor Routes	700	8
Commuter Routes	900 – 1,000	5 - 6
Lifeline Routes	500	10
RIPTA (Providence, RI)		
Rapid Bus	1,100 – 1,300	4 - 5
Key Corridor	900 – 1,300	4 - 6
Urban Radial	900 – 1,300	4 - 6
Non-Urban/Suburban/Crosstown	660 – 1,100	5 - 8
Regional	900 – 1,100	5 - 6
Express/Commuter	900 – 1,100	5 - 6