TRANSIT STRATEGIES

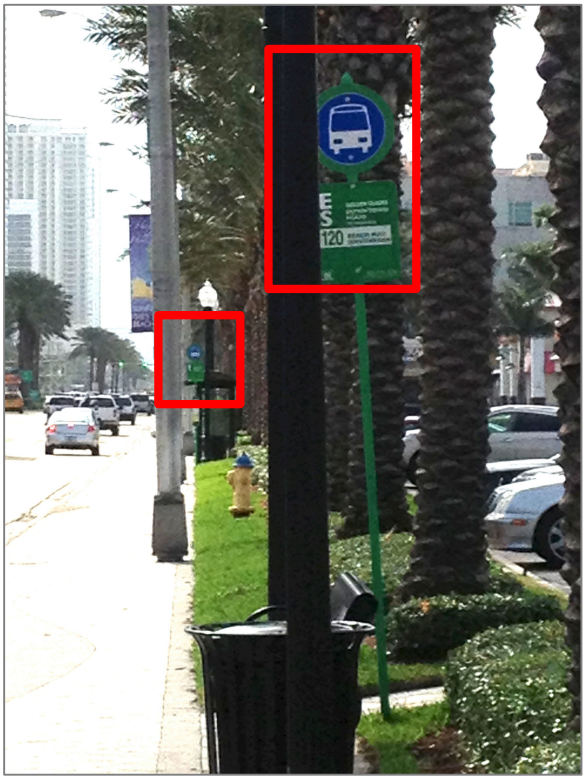
STOP CONSOLIDATION

Transit stops are the places where people access transit service, and greatly 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, and often accessibility. With more stops, it is easier for passengers to get to and from transit, but many stops also slow service and degrade reliability.

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.

Many transit systems, including the Nashville MTA, 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" makes service slower and unattractive for those with other choices. To make MTA service more attractive to more people, it will be essential to achieve a better balance between walk distances to stops and overall travel times.

CLOSE STOPS IN MIAMI BEACH, FL



CLOSE STOPS IN DOWNTOWN KANSAS CITY, MO

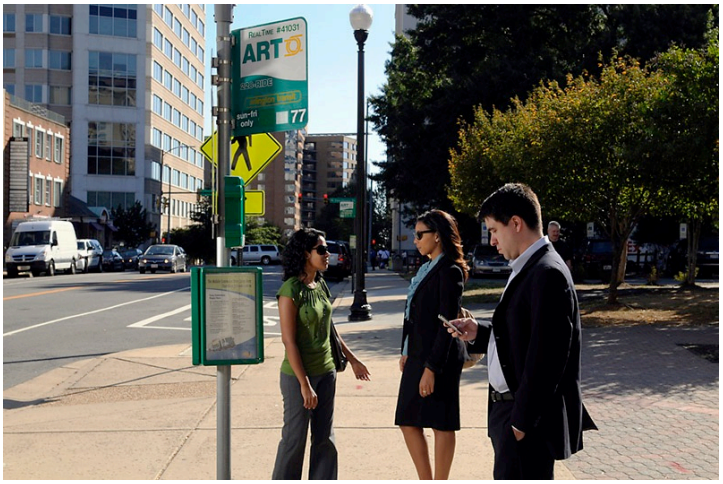
BENEFITS OF STOP CONSOLIDATION

The consolidation of stops to provide a better balance between access and egress distances and travel times is one of the lowest cost and most effective ways to provide:

- ***Faster service***
- ***More reliable service***
- ***More comfortable service***
- ***Additional service***
- ***Better stop facilities and amenities***
- ***Better accessibility***

FASTER SERVICE

On average, it takes a bus about 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.



MORE RELIABLE SERVICE

As the number of stops on a transit route 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 60% of stops. As a result, the addition of stops makes travels time more variable, while the consolidation of stops makes service more reliable.

MORE COMFORTABLE SERVICE

Stop-and-go operation, no matter the mode, is frustrating and uncomfortable. More stops make service less comfortable. It also often produces the perception that transit is slower than it is. Conversely, fewer stops make the ride more comfortable.

ADDITIONAL SERVICE

When travel times vary significantly, transit systems must pad schedules to account for the variability, and in some cases, this requires that an additional bus be deployed on a route. With less variable travel times, that bus can be instead used to provide more frequent service or to provide service elsewhere.

BETTER STOP FACILITIES AND AMENITIES

Transit riders want stops to be comfortable places to wait, and riders' perceptions of transit is in part related to the quality of their local bus stop. The need to be fiscally responsible means that transit systems cannot afford to provide high quality facilities and amenities at low ridership stops. Consolidating stops also means consolidating passengers,

and in doing so, transit systems can more easily provide high quality facilities and amenities at a fewer number of stops.

LOW RIDERSHIP STOP

HIGH RIDERSHIP STOP

BETTER ACCESSIBILITY

Similar to facilities and amenities, with fewer stops that serve more passengers, transit systems have a greater ability to work with local jurisdictions to make accessibility improvements that go beyond the immediate stop area, such as providing sidewalks and safe crossings within several blocks of a major transit stop or providing an accessible access point to a local bus stop (see photos below). Reducing the number of stops can expand the reach of pedestrian improvements can help to provide convenient and accessible connections to more transit stops and their surrounding areas.

BUS STOP ACCESSIBILITY IMPROVEMENTS

CONSOLIDATION STRATEGIES AND EXAMPLES

Most transit systems that have undertaken stop consolidation efforts start with the development of guidelines that are based on distance to the next stop and boarding levels. Then, when two stops are spaced too closely, one of stops will

be eliminated or the two stops will be consolidated to a new location that best serves the existing riders of the original stops.

Most agencies also use additional criteria related to considerations such as special needs and safety. 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 less safe for passengers than the nearby lower ridership stop. 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. Many transit agencies also provide preference to stops with improved infrastructure or amenities, especially if the stop location satisfies ADA accessibility mandates.

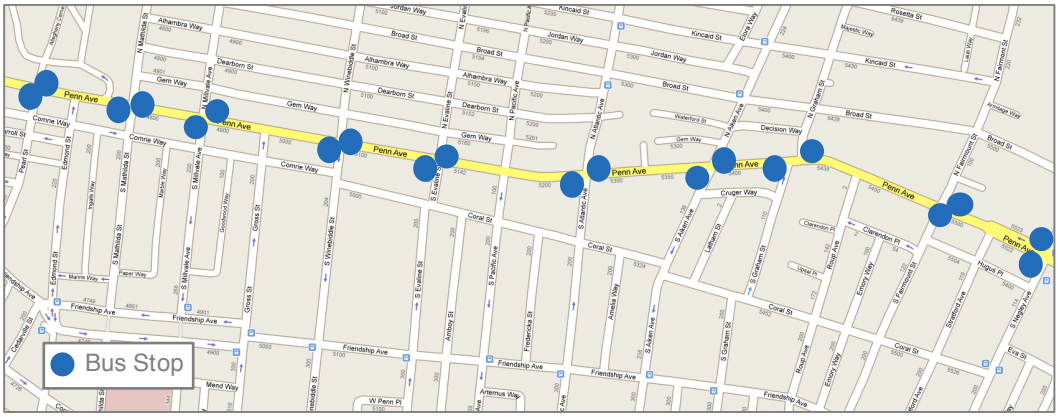
While many agencies pursue consolidation as an independent strategy, stops are also frequently removed or relocated as part of a broader stop infrastructure program. For example, an agency might set a goal of place a bench at every stop with 30 or more daily boardings. As the infrastructure program gains funding, the agency identifies stops without benches and evaluates the benefits of removing or relocating each stop. 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.

Transit systems that have pursued stop consolidation generally report significant operational improvements. Drivers are more consistently able to meet schedules, and find that they are able to provide a smoother ride experience for passengers. Most agencies have seen increases in service reliability and several have been able to decrease scheduled running times on affected routes. Despite initial concerns that riders would respond negatively to stop consolidation, most agencies have not had to reinstate removed stops due to customer complaints.

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. Most recently, in June 2015, the Port Authority eliminated more than 400 bus stops. 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 ALLEGHANY COUNTY CURRENT 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

COLUMBUS, OHIO

Columbus' COTA began a stop consolidation program in 2010 that was designed to:

- Decrease passenger travel times
- Increase average speeds
- Improve service frequencies
- Increase ridership

Similar to the Port Authority's program, COTA's bus stop consolidation program set stop spacing guidelines based on density. However, it did not set different guidelines based on service type.

COTA CURRENT STOP SPACING GUIDELINES

Population and Employment Density	
Stop Spacing (feet)	
High Density, Central Business District (CBD), Shopping (>20 persons/acre)	500-700
Fully Developed Residential Area (3-10 persons/acre)	900-1,300
Rural or Express Bus Service (<3 persons/acre)	1,500-2,500
Stops per Mile	
High Density, CBD, Shopping (>20 persons/acre)	8-10
Fully Developed Residential Area (3-10 persons/acre)	4-6
Rural or Express Bus Service (<3 persons/acre)	2-4

In terms of placement, COTA's program also considers:

- Block lengths and physical elements
- Bus dwell time
- Onboard passenger travel time
- Transfer opportunities
- Transit Oriented Development (TOD)
- Future developments (one to three years out)
- Accessibility (sidewalks, waiting areas, roadway speeds, etc.)
- Special consideration (persons with disabilities or high volume of seniors using stop)

PORTLAND, OREGON

In the early 2000s, TriMet initiated an effort, known as the Streamline program, which worked to improve the quality and efficiency of its local bus services. A major part of this effort was bus stop consolidation and location optimization. On most routes that were evaluated during the Streamline program, TriMet removed between 5 and 10% of its bus stops, and relocated several others. Post evaluations found that stop consolidation, along with other operational improvements, resulted in decreases in running times on Streamline routes without effecting ridership.

In a similar manner as COTA, TriMet's current bus stop spacing guidelines are based on density, without differentiations by service type.

TRIMET CURRENT STOP SPACING GUIDELINES

Population and Employment Density	Stop Spacing
Stop Spacing (feet)	
High Density (>22 dwelling units/acre)	3 blocks/780 feet
Medium Density (4-22 dwelling unites/acre)	4 blocks/1000 feet
Low Density (<4 dwelling units or 10 persons/acre)	No more than every 1000 feet
Stops per Mile	
High Density (>22 dwelling units/acre)	7
Medium Density (4-22 dwelling unites/acre)	5
Low Density (<4 dwelling units or 10 persons/acre)	No more than 5 per mile

LONG BEACH, CALIFORNIA

Long Beach Transit (LBT) recently began a bus stop consolidation program that focuses on its local bus routes. Before starting the program, LBT conducted a systemwide bus stop evaluation. As part of this process, LBT developed a rating for each bus stop. Initial criteria primarily focused on ridership and transfer opportunities. Stops with higher ridership, or where riders can transfer between services, received a higher ranking. Lower ranked stops will be targeted for consolidation or relocation. LBT plans to add additional criteria to its evaluation system, including neighborhood demographic data. In addition to bus stop consolidation, the rating system will be used to identify stops that should receive enhanced amenities.

NORTHERN KENTUCKY (CINCINATTI AREA)

In early 2014, Transit Authority of Northern Kentucky (TANK), which provides service in Cincinnati's southern suburbs, removed bus stops from its highest ridership bus route. The consolidation program resulted in decreased running times and significantly improved on-time performance. TANK bus operators and riders also reacted positively to the service changes, noting that consolidation reduced the discomfort associated with the stop-and-go nature of many bus services. TANK initiated the consolidation program as the first phase of a wider transit enhancement program. In future phases, the agency will install additional stop amenities and a signal priority system.

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. Providence's stop spacing guidelines were developed 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 CURRENT BUS STOP SPACING GUIDELINES

	Rapid Bus	Key Corridor	Urban Radial	Non-Urban/ Suburban/ Crosstown	Regional	Express/ Commuter	Flex
Minimum Stop Spacing (feet)							
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.

NASHVILLE STOP CONSOLIDATION

The values exercise conducted at the beginning of nMotion 2015 clearly demonstrated that current riders and potential riders desire faster and more reliable service. One important way to do this will be to consolidate stops to achieve a better balance between walk distances and travel times.

At the present time, Nashville MTA does have bus stop spacing guidelines, and these are based on a combination of service area and service type. However, they have not been systematically applied. The guidelines, which are shown on the following page, are also based on minimum, maximum, and target spacings. The minimum spacings are very close – up to 18 stops per mile – meaning that even though the MTA's stops very close, most meet the guidelines.

FOUR INBOUND STOPS ON FOUR BLOCKS OF MAIN STREET IN EAST NASHVILLE

CURRENT NASHVILLE MTA BUS STOP SPACING GUIDELINES

	Minimum	Maximum	Target
Stop Spacing			
Central Business District	300 ft	1,000 ft	400-800 ft
Urban Areas and Major Arterials	500 ft	1,500 ft	600-1,000 ft
Suburban Aras and Feeder Lines	600 ft	2,000 ft	800-1,500 ft
Rural, Low Density Areas	650 ft	No Maximum	No Target
Bus Rapid Transit without Overlapping Local Service	¼ mile	1 mile	½ mile
Bus Rapid Transit with Overlapping Local Service	½ mile	1 mile	¾ mile
Maximum Stops per Mile			
Central Business District	5	18	7-13
Urban Areas and Major Arterials	4	10	4-7
Suburban Aras and Feeder Lines	3	9	4-7
Rural, Low Density Areas	No minimum	8	No Target
Bus Rapid Transit without Overlapping Local Service	1	4	2
Bus Rapid Transit with Overlapping Local Service	Based on Demand	2	1.3

Moving forward, Nashville MTA should reassess these guidelines and revise them in a manner that will allow stops to be consolidated 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, the MTA will be better able to improve stop facilities and amenities, make them more accessible to pedestrians and persons with disabilities, provide more reliable and comfortable service, and make resources available for additional service improvements.

AREA WITHIN A FIVE MINUTE WALK WITH EIGHT STOPS PER MILE VERSUS FIVE STOPS PER MILE