

## TRANSIT STRATEGIES

# BUS RAPID TRANSIT (BRT)

Since the late 1990s, nearly 200 cities throughout the world have developed Bus Rapid Transit (BRT) services that have made bus service much more attractive and greatly increased ridership. The popularity of BRT is that it can provide light rail-like service without the high costs associated with rail infrastructure. Compared to light rail transit (LRT), BRT typically has much lower capital and operating costs than LRT. And compared to regular buses, BRT is faster, more reliable, and more easily identifiable.

## BRT BENEFITS

BRT has become popular for many reasons:

- **Service Quality:** BRT is faster, more convenient, more comfortable, and more attractive than regular bus service.
  - **Higher Ridership:** Because it is more attractive, BRT can significantly increase ridership. A 2012 General Accounting Office (GAO) study reported that over half of the BRT systems that it examined increased ridership by over 30% in their first year of operation.<sup>1</sup> Many BRT lines, such as Boston's Washington Street Silver Line and Cleveland's HealthLine, produced much greater ridership increases.
  - **Affordable:** The cost to construct a full-featured BRT system is typically less than half of the cost of light rail, and operating costs are not significantly higher than for regular bus service.
  - **Image:** Well-branded BRT services attract favorable attention to themselves and to other available transit services.
- BRT provides a middle ground between rail and regular bus service
- "Full" BRT provides rail-like service
- All BRT provides significant improvements over regular bus service

### Best Practice: Integrated Transportation Network Curitiba, Brazil

Curitiba, Brazil is generally credited with inventing modern "full" BRT that operates essentially the same as light rail. Curitiba's BRT service, which began in the mid-1970s, provides frequent service with long bi-articulated (three section) buses that operate within exclusive bus lanes. The buses serve high-platform, tube-shaped stations that provide fare prepayment machines, enclosed waiting areas, and level boarding. The system is used by over 2 million passengers per day and was the inspiration for most full BRT services developed since that time (the closest U.S. equivalent to Curitiba's BRT service is Cleveland's HealthLine).



Source: [nexus.unm.edu](http://nexus.unm.edu)



Source: [Wikimedia Commons](https://commons.wikimedia.org/wiki/File:Curitiba_BRT_station.jpg)

<sup>1</sup> General Accounting Office, "Bus Rapid Transit Projects Improve Transit Service and Can Contribute to Economic Development," July 2012

## BRT SERVICE

BRT is popular with passengers for a number of reasons, the most important of which is that service is fast, frequent, direct, and operates from early morning to late night. These attributes make service more convenient—much more convenient than regular bus service—and more competitive with travel by automobile. Characteristics of BRT service include:

- ➔ **Frequent service, typically every 10 minutes or less**
- ➔ **Long span of service, often 18 hours a day or more**
- ➔ **Fast service, similar to light rail**
- ➔ **Direct service, operating along major arterials and without deviations**

A key reason that service is fast is that stations are spaced further apart than with local bus service, typically every quarter to half mile. This avoids the delays (and discomfort) due to frequent stops and starts and, similar to light rail, experience has shown that more passengers would rather walk farther to fast service than a shorter distance to slow service.

One major advantage that BRT has over light rail is that service can operate beyond the ends of the BRT facilities. For example, BRT can provide its own “feeder” service by operating locally from beyond the BRT line to the start of the BRT facilities and then operating as BRT.

## BRT ELEMENTS

Beyond the service that is provided, BRT also combines a number of physical elements that work together to produce attractive and compelling service:

- **Unique Identity** to increase the service’s visibility and differentiate it from “regular” bus service.
- **Special Vehicles** that provide greater comfort, reinforce the unique identity, and help differentiate the BRT service from regular bus service.
- **Exclusive Bus Running Ways**—dedicated rights-of-way and reserved lanes on existing roads—to allow buses to avoid the delays experienced in mixed-traffic operations.
- **Transit Signal Priority**, such as signal priority and queue jump lanes, to speed buses through intersections.
- **BRT Stations** that provide similar features, amenities, and levels of passenger comfort as rail stations.
- **Level Boarding** via the use of either high-platform stations or low-floor buses to reduce dwell times and facilitate boardings and alightings by people with disabilities.
- **Pre-Paid Fare Collection** via either pre-paid passes or the sale of tickets from ticket vending machines at stations and stops to eliminate delays associated with on-board fare collection.

### Best Practice: Cleveland HealthLine Cleveland, OH

Cleveland’s HealthLine is arguably the most full-featured BRT service in the United States. The line runs for 6.8 miles from East Cleveland to downtown Cleveland via the city’s Medical District, with distinctive full-featured stations and exclusive bus lanes.

Construction of the BRT line, which cost \$50 million, was accompanied by \$150 million in streetscape and other corridor improvements as part of an overall effort to improve transit service and revitalize Cleveland’s Euclid Avenue corridor. This effort was successful on both counts. HealthLine service is 12 minutes, or 34%, faster than the local service it replaced, and ridership increased by over 60%. Even more impressive is that the project has attracted over \$5.8 billion in transit-oriented development, or \$115 for every \$1 of transit capital cost.



- **Real Time Passenger Information** to inform passengers when buses will actually arrive or depart from stations, which reduces much of the uncertainty that is associated with bus service.
- **Intelligent Transportation System Technologies** such as automatic vehicle location, which can be used to maintain consistent spacing between buses to keep them on schedule.
- **Effective Connections** with other transit and surrounding areas.

These measures work together to make service fast and reliable, to make it convenient and comfortable service, and to establish a strong image and identity for service.

## UNIQUE IDENTITY

Rail lines typically have a very strong identity that helps to increase ridership. BRT branding similarly provides BRT service with a distinct identity that produces clear and positive public recognition. The most typical strategy is to distinguish BRT through a stylized vehicle design. Other common elements include distinct names, logos, color schemes, typography, station signage, and marketing materials. Examples include Boston's Silver Line BRT services, with the Silver Line name used to relate BRT services to the MBTA's color-named rail lines rather than other bus service; Cleveland's "HealthLine;" and Eugene, Oregon's EmX.

BOSTON SILVER LINE BRANDING



EUGENE, OR SWIFT BRANDING



## BRT VEHICLES

Virtually any type of vehicle can be used for BRT service, ranging from standard transit buses to specially designed vehicles. However, features commonly found on BRT vehicles include low-floor boarding and/or raised platforms for level boarding and wide doors, both of which allow for faster boarding and alighting. Seating is often comparable to that provided for rail service.

## BUS RUNNING WAYS

A key element of BRT is for service to operate in exclusive rights-of-way, which can be:

- **Grade Separated Busways** in which BRT service operates in a completely exclusive right-of-way, often in a former rail right-of-way. Examples include the East, West, and South Busways in Pittsburgh; the Miami-Dade Busway; the Orange Line in Los Angeles; and the soon-to-open CT Fastrak in Hartford, CT.



PITTSBURGH EAST BUSWAY



CT FASTRAK EXCLUSIVE BUSWAY (HARTFORD, CT)



- **Exclusive Bus Lanes on Arterial Streets**, which can be in either the center of streets or in curb lanes. Where exclusive bus lanes are provided, curb lanes are the most common approach. Exclusive bus lanes can be separated from general traffic by physical elements, such as curbs, or by striping.

CENTER BUS LANES (RICHMOND, CA)



CURB BUS LANE (NEW YORK CITY)



In many cases, bus lanes are also shared with other uses, for example, taxis. In some areas, curb lanes are used as bus lanes during peak periods and for parking during off-peak periods. Bus lane options can be “mixed and matched” along the length of a BRT system.

## TRANSIT SIGNAL PRIORITY

Signal priority modifies normal traffic signal operation to facilitate the movement of transit vehicles by changing the signal to green early or by extending the green signal until the bus passes through. This significantly reduces signal delays and can reduce bus travel times by 5% to more than 20%. Signal priority is typically implemented in conjunction with exclusive bus lanes.

## BRT STATIONS

BRT systems generally have stations that are similar to light rail stations, with specific design features varying depending upon passenger volumes, location, type of facility, and available space. BRT stations frequently include parking and local transit connections.

BRISBANE BRT STATION



CLEVELAND HEALTHLINE STATION



## LEVEL BOARDING

In manner similar to rail service, BRT service can be designed to support level boardings. This is typically accomplished through the use of high-level platforms or the use of low-floor buses. Level boarding allows passengers to board and alight faster, which greatly reduces dwell times. Level boarding also makes it much easier for passengers with disabilities to board and alight and eliminates the need to use lifts.

LEVEL BOARDING (LANE COUNTY TRANSIT EMX, EUGENE, OR)



## FARE COLLECTION

Off-board fare collection can significantly reduce dwell times at stations by eliminating the time involved for passengers to pay fares as they board vehicles. Ticket vending machines at stops and stations allow passengers to purchase a ticket before boarding the bus.

## REAL-TIME PASSENGER INFORMATION

Real-time passenger information at stations informs passengers when buses will actually arrive or depart from stations, which reduces some of the uncertainty that is often associated with bus service.



TICKET VENDING MACHINES (NEW YORK CITY SELECT BUS)



REAL-TIME SCHEDULE INFORMATION (SEATTLE RAPIDRIDE)



## INTELLIGENT TRANSPORTATION SYSTEMS

Reductions in waiting time and more reliable service can make service much more attractive. Automatic vehicle location (AVL) systems can be used to manage bus service to regularize the intervals between buses, thereby minimizing passenger waiting time. AVL can also be used to provide real-time bus status information, which can reduce customer anxiety while waiting.

## EFFECTIVE CONNECTIONS

Effective BRT services should be well connected to other transit services and the surrounding environment. Major BRT lines, like rail lines, become a transit system backbone with connections to other routes. Like all transit services, most passengers will access BRT lines by walking; therefore, effective pedestrian connections between BRT lines and the areas they serve are critical. Comfortable pedestrian access becomes even more important when BRT service operates along fast and wide arterials, which many BRT lines do.

Bicycles can extend the reach of BRT services, and external bicycle racks are now commonly included on buses. To make bicycle and transit trips even more convenient, bicycles can also be accommodated inside of BRT vehicles in a similar manner as light rail vehicles. Bike share stations at BRT stations can provide additional opportunities.

BIKES ON BRT BUS (COMMUNITY TRANSIT SWIFT)



BIKE SHARE AT BRT STATION (ASPEN, CO VELOCIRFTA)



## FLEXIBILITY

A key advantage of BRT is flexibility. While light rail, for obvious reasons, must have rails along its entire length, BRT can operate for most of its length in bus lanes and then operate in mixed traffic in areas where there is no room for bus lanes. Thus, BRT can often be implemented in areas where rail is infeasible.

At the same time, flexibility is often BRT's Achilles heel. To minimize costs and respond to other issues, most American BRT systems are implemented without the complete range of amenities that provide full BRT. The Institute for Transportation and Development Policy (ITDP) has developed a BRT rating standard in which BRT projects are rated as Gold, Silver, Bronze, or Basic. In the United States, no BRT services are rated as Gold or Silver, and only five are rated as Bronze (Cleveland's HealthLine, Los Angeles's Orange Line, Pittsburgh's East Busway, Eugene's EmX, and Las Vegas's SDX). Most of the services in the United States that are billed as BRT are rated by ITDP as "not BRT."

## KEYS TO SUCCESSFUL BRT

The development of successful BRT consists of packaging the elements described above to provide service that is **Convenient**, **Comfortable**, **Memorable**, and **Connected**.

What?	How?
<b>CONVENIENT</b> Fast Direct Frequent Long hours Real-time passenger information	<ul style="list-style-type: none"> <li>• Attractive service plan</li> <li>• Minimize compromises</li> <li>• Limited stops</li> <li>• Bus lanes/queue jump lanes</li> <li>• Transit signal priority</li> <li>• Self-service fare collection</li> <li>• Web and station-based real-time information</li> </ul>
<b>COMFORTABLE</b> Enhanced on-board experience Attractive and secure waiting environment	<ul style="list-style-type: none"> <li>• Specialized buses</li> <li>• Stations and stops with high quality amenities</li> <li>• Stations as mobility hubs</li> </ul>
<b>MEMORABLE</b> Highly visible Easy to recognize Easy to understand	<ul style="list-style-type: none"> <li>• Branded buses</li> <li>• Branded stations/stops</li> <li>• Simple service structure</li> <li>• Clockface schedules</li> </ul>
<b>CONNECTED</b> To other transit With other modes With surrounding environment	<ul style="list-style-type: none"> <li>• Bus/rail connections</li> <li>• Comfortable pedestrian access/street crossings</li> <li>• Bicycle connections/bike share</li> <li>• Complete streets approach</li> </ul>

## POTENTIAL NASHVILLE BRT SERVICES

Nashville MTA has already begun to develop BRT service. In the late 2000s, MTA launched "BRT Lite" service in the Gallatin and Murfreesboro corridors; in 2015, BRT Lite service was implemented in the Charlotte corridor. The BRT Lite services include some, but not most, BRT elements. Until late 2014, MTA was planning for Nashville's first full-featured BRT line (the AMP), which was to provide service between East Nashville and West Nashville. The AMP was planned as one of the most ambitious BRT services in the United States but was stalled by controversy in West Nashville due to concerns about traffic and parking impacts and a belief among some that improved transit and increased expenditures were not needed or warranted.

However, beyond the recent controversy surrounding the AMP, there is a strong desire within the business community and among residents for better transit service. The 2014 Vital Signs report produced by the Nashville Area Chamber of Commerce and the Nashville Area Metropolitan Planning Organization stated, “The ability of our residents to move around the region in their cars is quickly deteriorating and will continue to do so unless we provide better transit options.” This sentiment was supported by the NashvilleNext planning effort, in which improving transit was cited by stakeholders as their second highest priority. In a Rockefeller survey, a large majority of Millennials in Nashville responded that they want better transit options so that “they do not have to rely on cars.”

To date, the development of better transit service has lagged behind the city’s growth and residents’ demands for improved service. The development of new BRT services, including upgrades to existing BRT Lite services, provides an important opportunity to significantly improve transit in the short to medium term. However, as the controversy surrounding the AMP indicates, this will need to be done with a great deal of community involvement and in a context-sensitive manner.