

## TRANSIT STRATEGIES

# STREETCAR SERVICE

Streetcars have been used for transportation for more than 200 years. After largely abandoning streetcars in the mid-20th century, cities across the country have recently redeployed streetcar systems to drive both urban connectivity and economic development. This is in large part because streetcars can carry a certain status that makes them more appealing than bus service. Streetcars also provide a significantly smoother ride and more capacity than buses. Streetcar networks can generally be built much more quickly and cheaply than light rail.

Both modern and historic systems typically operate on embedded rails in mixed-traffic lanes. As such, travel speeds tend to be lower than transit that operates in exclusive right-of-way, including some bus rapid transit (BRT) and most light rail. Certain design and operational features—such as level boarding stations, prepayment, exclusive right-of-way, and center-lane alignments—can allow streetcars to match or even exceed speeds found in some light rail and BRT systems.

## DEVELOPMENT OF STREETCAR SYSTEMS

Once drawn by horse through muddy streets, streetcars were electrified in mid-19th century England, quickly spread throughout Europe and the Americas, and eventually found popularity in cities around the world. The mark of the bright-futured American city as late as the 1920s, rising labor and capital costs, government limits on fare increases, and the rise of the automobile squeezed streetcars to near extinction by the 1950s.

Rampant congestion, struggling downtowns, and financial constraints all led American municipalities to reconsider the streetcar as the 20th century drew to a close. Politicians and transit officials sought an affordable alternative to light rail that could draw choice riders and tourists alike while spurring development. The first so-called heritage systems, largely geared toward tourists, came online in the 1980s. The 2001 launch of the modern Portland Streetcar—with its robust ridership numbers and seemingly unparalleled role in neighborhood revitalization—elevated interest to new levels.

In the years since the launch of Portland Streetcar, another five modern streetcars have opened in the United States, joining eight existing or new heritage lines geared toward daily transit users.

### Streetcar Examples

Dallas Streetcar (Dallas, TX)



Portland Streetcar (Portland, OR)



MATA Trolley (Memphis, TN)



## CHARACTERISTICS OF STREETCAR SERVICE

Streetcars fall into three different categories based on their infrastructure configurations and the markets they serve: streetcar urban circulators, streetcar local transit, and streetcar rapid transit.

- ➔ **Urban Circulators feature local service and operate along lively streets with many stops.**
- ➔ **Streetcar Local Transit features higher speeds and can operate along arterial streets.**
- ➔ **Streetcar Rapid Transit provides wider stop spacing and use of exclusive travel lanes and signal priority.**

An **urban circulator** primarily operates in mixed traffic at low speeds and may or may not have signal priority. This type of service has been affectionately called a “pedestrian accelerator,” as it serves to move people on foot more easily. Memphis, TN operates a downtown circulator with historic vehicles that has been extended twice since opening in 1993.

**Streetcar local transit** runs on arterial streets and provides local service with wider stop spacing than a circulator. Dallas Area Rapid Transit (DART) operates the Dallas Streetcar, which is a 1.6-mile line that provides access for commuters in Oak Cliff to rail connections at Union Station in Dallas. The line serves a variety of downtown Dallas and Oak Cliff destinations, including the convention center and two parks. Many streetcars operate in and around the downtown core, with stops every two or three blocks.

**Streetcar rapid transit** features some elements similar to light rail: wider stop spacing, more extensive use of exclusive travel lanes, faster speeds, and traffic signal priority. The Portland Streetcar is composed of two lines for a total length of 7.2 miles. The system is given signal priority in some intersections and largely operates in mixed-traffic. The Tilikum Crossing transit bridge over the Willamette River, opened in 2015, connects the two lines to complete a loop. The bridge features transit-exclusive lanes along with space for cyclists and pedestrians.

## DIFFERENCES BETWEEN STREETCAR AND LIGHT RAIL

Rail systems are characterized by the locations and the markets that they serve, their infrastructure configuration, vehicle type, and operation. Streetcar systems can include a wide range of vehicles, passenger amenities, and right-of-way treatments. The line separating streetcars from light rail is thus often fuzzy: a modern rapid streetcar system closely resembles leaner light rail, but certain design elements and operational tendencies are associated with each mode.

### NORTA Historic Streetcar Lines New Orleans, Louisiana

The oldest component of the New Orleans Regional Transit Authority streetcar network is the St. Charles Route 12 streetcar line, which began in 1835 and remains the longest continuously operating street railway in the U.S. Its impressive age notwithstanding, Route 12 continues to be very popular with riders. In 2010 Route 12 accounted for 22% of total NORTA ridership and over 50% of streetcar ridership. On the 13.2-mile track runs 35 arch-roofed, steel-bodied streetcars, which have been used since 1923. Route 12 runs primarily in the central median along St. Charles Avenue and then follows Carrollton Avenue until Claiborne Avenue. Route 12 offers travelers a historic ride along a vibrant corridor.



Source: Wikimedia Commons, MusikAnimal



Source: Wikimedia Commons, Dan Soto



Service Element	Streetcar	Light Rail
Vehicles	Modern or historic streetcar	Modern light rail vehicle
Train Length	One	Two to three
Line Length	Shorter	Longer
Running Way	Mixed traffic	Dedicated right-of-way
Fare Collection	On station platform or on vehicle	On station platform
Stations	Short platforms; modest facilities	Long platforms; significant facilities
Station Spacing	2 to 3 blocks	½ to 1 mile
Speed	Slower	Faster
Development Benefits	Along line	Around stations
Construction Impacts	Minor to moderate	Major

## STREETCAR BENEFITS

The development of streetcar service has become popular for many reasons:

- **Catalyze Redevelopment:** Streetcars support smart growth principles such as transit-oriented development and neighborhoods that are walk- and bike-friendly. In many cities, streetcars have shown significant economic development benefits.
- **Service Quality:** Streetcars tend to be implemented in compact, urban areas where rail can provide high-quality service. The convenience of frequent stops can attract casual riders or those who have other travel options.
- **Ride Quality/Comfort:** Streetcars tend to be more comfortable than buses and other road vehicles due to smooth acceleration that reduces lurching and fixed wheels that reduce swaying.
- **Green Transit:** Streetcars are powered by electricity, eliminating vehicle emissions and providing quieter operations than diesel buses.
- **Lower Cost and Less Impact:** Streetcars are cheaper to build than light rail, have fewer construction impacts, and fit into an urban setting more easily than other forms of rail transit.

NEW CONSTRUCTION ALONG WESTLAKE AVENUE, SEATTLE



## ECONOMIC DEVELOPMENT IMPACTS

One major reason for streetcar's recent popularity is the mode's ability to stimulate economic development. In Portland, OR, which was the first city to implement modern streetcar service, it is estimated that over \$3.5 billion of investment has occurred within two blocks of streetcar service. In Seattle, new development is occurring along much of Westlake Avenue which is served by the South Lake Union Streetcar; a significant amount of that growth is driven by Amazon, which has

been locating in the area due to the streetcar line. In Tucson, Sun Link is credited with \$1 billion in new development. And in Kansas City, the Ride KC Streetcar has also been credited with \$1 billion in new or planned development, even though it is still under construction.

## STREETCAR ELEMENTS

Streetcars combine a number of elements that work together to produce attractive and compelling service:

- **Vehicles** provide greater comfort, run on electricity (with overhead catenary wires and poles), and have a greater carrying capacity than buses.
- **Mixed Traffic Operations** allow for easy integration into a neighborhood and current streetscape.
- **A Unique Identity** can increase the service's visibility and attract new riders and visitors.
- **Streetcar Stations** provide more features, amenities, and levels of passenger comfort than a bus stop but are more minimalist than a light rail or heavy rail station.
- **Level Boarding** reduces dwell times and facilitates boardings and alightings by people with disabilities.
- **Fare Collection** via pre-paid passes or tickets eliminates delays associated with collecting fares as people board.
- **Real Time Passenger Information** lets passengers know when the streetcar will actually arrive or depart from stations, reducing much of the uncertainty associated with transit service.
- **Effective Connections** with other transit and surrounding areas can increase urban mobility.

These measures work together to make service enjoyable, convenient, and comfortable, and to catalyze development along the streetcar line. More in-depth discussion of each of these elements is provided below.

## STREETCAR VEHICLES

Streetcar systems can feature a wide range of vehicles and passenger amenities. Streetcar vehicles are generally single-car trains that operate primarily in a shared right-of-way with general traffic.

Modern streetcars share most of their technical characteristics with modern light rail vehicles. However, there are some exceptions. Modern streetcar vehicles are sometimes narrower and are usually limited to a single car length (often articulated), unlike light rail or heavy systems that couple as many as eight cars together. Streetcars are also designed for lower maximum speeds.

SALT LAKE CITY'S SUGAR HOUSE STREETCAR



SEATTLE'S MODERN STREETCAR INTERIOR



Vintage or historic trolleys dating from the early- to mid-20th century operate in several U.S. cities. Vintage trolleys require a high platform and usually have narrow aisles, meaning that they are not universally accessible. Additionally, historic systems often lack real-time passenger information, climate control, and other transit vehicle amenities.



Because of these limitations, historic systems are often tourist attractions rather than day-to-day transit service for residents. The St. Charles Route 12 in New Orleans is an example of a historic line that circulates both local residents and visitors in a vibrant corridor (see feature box on second page).

## MIXED TRAFFIC OPERATIONS

Streetcars generally run in mixed traffic, which greatly reduces initial capital costs and is significantly less disruptive than typical light rail systems, but also tends to lead to lower vehicle speeds. However, streetcars can also operate in dedicated rights-of-way.

DC STREETCAR OPERATES IN MIXED TRAFFIC



PORTLAND STREETCAR WITH IN-STREET PLATFORM



## UNIQUE IDENTITY

Whether employing historic or modern vehicles, transit agencies can use distinctive branding to increase the service's visibility and to attract new riders and visitors.

TUCSON'S SUN LINK HAS A DISTINCT COLOR SCHEME AND BRAND



NEW ORLEANS' HISTORIC STREETCARS ARE A UNIQUE BRAND



## STREETCAR STATIONS

Streetcar stations are generally similar to minimalist light rail stations. Specific design features vary depending upon passenger volumes, location, type of facility, and available space. Streetcar stations are often less elaborate and have shorter platforms than light rail stations due to shorter train lengths.

NEW ORLEANS LOYOLA STREETCAR STATION



ATLANTA STREETCAR STATION



## LEVEL BOARDING

Modern streetcar systems are typically designed to support level boardings. This is accomplished by using high-platform stations. Level boarding allows passengers to board and alight faster, greatly reducing dwell times. Level boarding also makes it much easier for people with disabilities to use the system and eliminates the need to use lifts.

### LEVEL BOARDING ON DALLAS' STREETCAR MAKES BOARDING EASY FOR PEOPLE WITH DISABILITIES AND CYCLISTS



## FARE COLLECTION

Off-board fare collection can significantly reduce dwell times at stations by eliminating the need 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 streetcar. Some systems feature on-board payment as well.



## ON-BOARD FARE COLLECTION



## OFF-BOARD STREETCAR TICKET VENDING MACHINE



## REAL-TIME PASSENGER INFORMATION

Real-time passenger information at stations lets riders know when the streetcar will actually arrive, reducing some of the uncertainty often associated with transit service.

### REAL-TIME SCHEDULE INFORMATION ON SEATTLE'S SOUTH LAKE UNION STREETCAR



## EFFECTIVE CONNECTIONS

Effective streetcar systems should be well connected to other transit services and the surrounding environment. Successful streetcar lines become a transit system circulator with connections to other routes. Like all transit services, most passengers will access streetcar lines by walking: effective pedestrian connections between streetcar lines and the areas they serve are critical. Comfortable pedestrian access becomes even more important when streetcars operate along fast and wide arterials.

Bicycles can extend the reach of streetcar services, and bicycle parking is now commonly included at many rail stations. To make bicycle and transit trips even more convenient, bicycles can also be accommodated inside streetcar vehicles. Bike share stations at streetcar stations and nearby destinations can provide additional opportunities to increase mobility.

BIKE PARKING AT WESTLAKE STATION, SEATTLE



BIKES ON BOARD TORONTO'S STREETCAR



## STREETCAR SYSTEMS IN THE UNITED STATES

Six modern streetcar systems have been built since 2001 (Portland, Salt Lake City, Seattle, Atlanta, Dallas, and Tucson), four more are under construction (Washington, D.C., Cincinnati, Detroit, and Kansas City), and more than 10 are in various stages of planning. There are also eight heritage lines that provide regular transit service and not merely performing limited tourist duties. Streetcars have become increasingly popular in cities that are current or aspirational peers for Nashville and the Middle Tennessee region.

### SOUTH LAKE UNION STREETCAR (SEATTLE, WA)

Opened in 2007, the 1.3-mile South Lake Union Streetcar line connects a waterfront park and museum, the booming South Lake Union neighborhood (home to Amazon headquarters), a major medical campus, the Westlake Shopping Center, and the downtown transit tunnel (serving local and regional buses as well as Link light rail). Built for \$56 million, nearly half of the initial capital costs were provided by adjacent property owners through a Local Improvement District. The remaining funding was provided through a combination of local, state, and federal dollars.

The streetcar carries 2,000 riders per day, a modest number that is nonetheless more than double the city's initial predictions. Envisioned as a showcase piece to demonstrate the speed and affordability of an eventual streetcar network, the line proved valuable enough to employers along the route that they have voluntarily provided funds to reduce afternoon peak headways from 15 minutes to 10 minutes. Earlier this year the city's transportation department also announced plans to provide dedicated transit right-of-way for a portion of the route.

Outside of 10-minute peak service, trains run every 15 minutes from 6:00 a.m. to 7:00 p.m., 9:00 p.m., or 11:00 p.m., depending on the day of the week. Adult fares are \$2.25, either deducted from a preloaded transit card or paid at a ticket vending machine.

A second streetcar line is currently under construction in Seattle's First Hill neighborhood, and a third line—the Center City Connector—to link the two lines through the heart of downtown is in final planning stages. The Connector's plans also call for prioritization improvements to the existing South Lake Union line that are expected to significantly reduce trip times. Combined ridership for the three lines is estimated in the tens of thousands.





**SOUTH LAKE UNION STREETCAR**



**MINIMALIST STREETCAR STOP AND SHELTER**



## SUN LINK (TUCSON, AZ)

Opened in 2014, the 3.9-mile Sun Link line connects the Tucson Convention Center with downtown Tucson, prime shopping and restaurant districts, the University of Arizona, and a major medical center. Retail business owners along the route have also credited the line with an increase in sales. The local transit agency attributes more than \$1 billion in development to the new streetcar.

Trains run every 10 to 15 minutes on weekdays and every 15 to 30 minutes on weekends. Late night service on Thursdays, Fridays, and Saturdays runs every 30 minutes from midnight until 2:00 a.m. The train primarily runs in mixed traffic, with limited segments running through transit-only lanes.

Funding for the \$196 million line was primarily provided by a voter-approved, countywide transportation plan, as well as \$70 million in federal grants. The Pima (County) Association of Governments has identified several possible corridors for Sun Link expansion, although plans are still at a concept stage.

**SUN LINK OPERATES IN MIXED TRAFFIC**



**SUN LINK STREETCAR ROUTE**



## PORTLAND STREETCAR (PORTLAND, OR)

The first of the modern streetcar lines, Portland Streetcar serves 20,000 riders a day on a two-line, seven mile system. The lines generally serve each of their combined 76 stops at 12-minute headways through much of the day, with less frequent service late at night and on weekends.

A \$2 fare is good for unlimited streetcar rides for two-and-a-half hours, while a \$5 day pass is accepted on the streetcar as well as the region's light rail and bus systems. Payment is randomly inspected, allowing passengers to board through all doors. Payment can be made before boarding or at vending machines on vehicles. Real-time information is provided at every station.

The original 4.8-mile loop was almost entirely funded locally. An FTA Small Starts grant funded \$75 million of the second line, a 3-mile extension that opened in 2012 at a cost of \$147 million.

In 2008, city transportation department officials indicated \$3.5 billion in development had occurred within two blocks of the streetcar line. The system is widely credited with helping revitalize the famous Pearl District neighborhood.

STREETCAR IN PORTLAND'S PEARL DISTRICT



STREETCAR USES THE NEW TILIKUM CROSSING

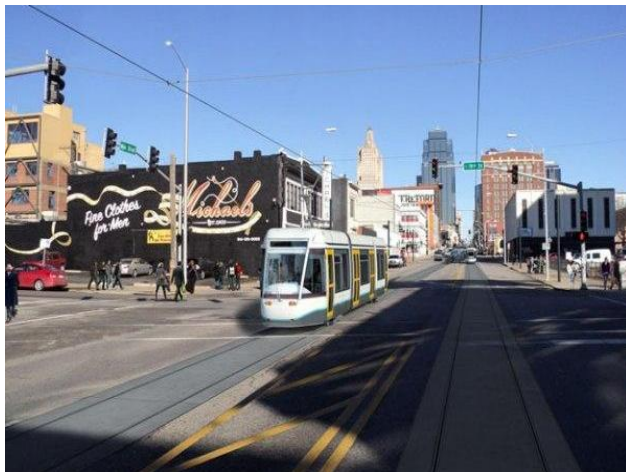


## RIDE KC STREETCAR (KANSAS CITY, MO)

Construction on this two-mile, 16 stop, single-line system is scheduled for completion in spring 2016. The line will run between the River Market area north of downtown, through downtown, the Power and Light District and the emerging Crossroads District to Crown Center, which anchors the southern end of Kansas City's downtown corridor.

Roughly 60% of the funding for the \$102 million line came through local bonds. A TIGER grant and other federal dollars covered another \$35 million. To date, the new line, although not yet in service, has generated approximately \$1 billion in new economic development along the line.

RENDERING OF FUTURE RIDE KC STREETCAR



INSTALLATION OF THE CITY MARKET STOP





## POTENTIAL NASHVILLE STREETCAR SERVICES

Two recent efforts in Nashville have considered streetcar service, although no network planning has been done prior to nMotion. The Nashville Area MPO's 2035 Regional Transportation Plan (RTP) highlights characteristics and examples of streetcar in the "Return of the Urban Streetcar" section. The RTP describes a concept for streetcar from downtown Nashville to West End, based largely on a previous assessment about the potential for Nashville streetcar. Additionally, the alternatives analysis conducted for the Amp considered streetcar in both mixed traffic and dedicated guideway as potential alternatives prior to selecting BRT.

As described above, most of the new streetcar lines that have recently been developed or that are now being planned start with a single relatively short line (two to three miles) that operates to and from downtown. Most of these "starter lines" serve an emerging corridor where dense development is appropriate and desired or a corridor that is already established but where there is the potential for new development. In Nashville, there are two corridors with clear potential:

1. East Nashville – Downtown Nashville
2. West End/Vanderbilt – Downtown Nashville

There are a number of ways in which streetcar service could be routed, including those shown on the following page. In addition to these options, there are other potential services and alignments. These include a line through downtown, a north-south line from North Nashville linked with new development, and potentially along Charlotte Avenue.

# POTENTIAL EAST NASHVILLE AND WEST END STREETCAR ALIGNMENTS

