MBTA RAILROAD OPERATIONS

Commuter Rail

Massachusetts Bay Transportation Authority

New England Railroad Club
November 1, 2018

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MBTA/MassDOT

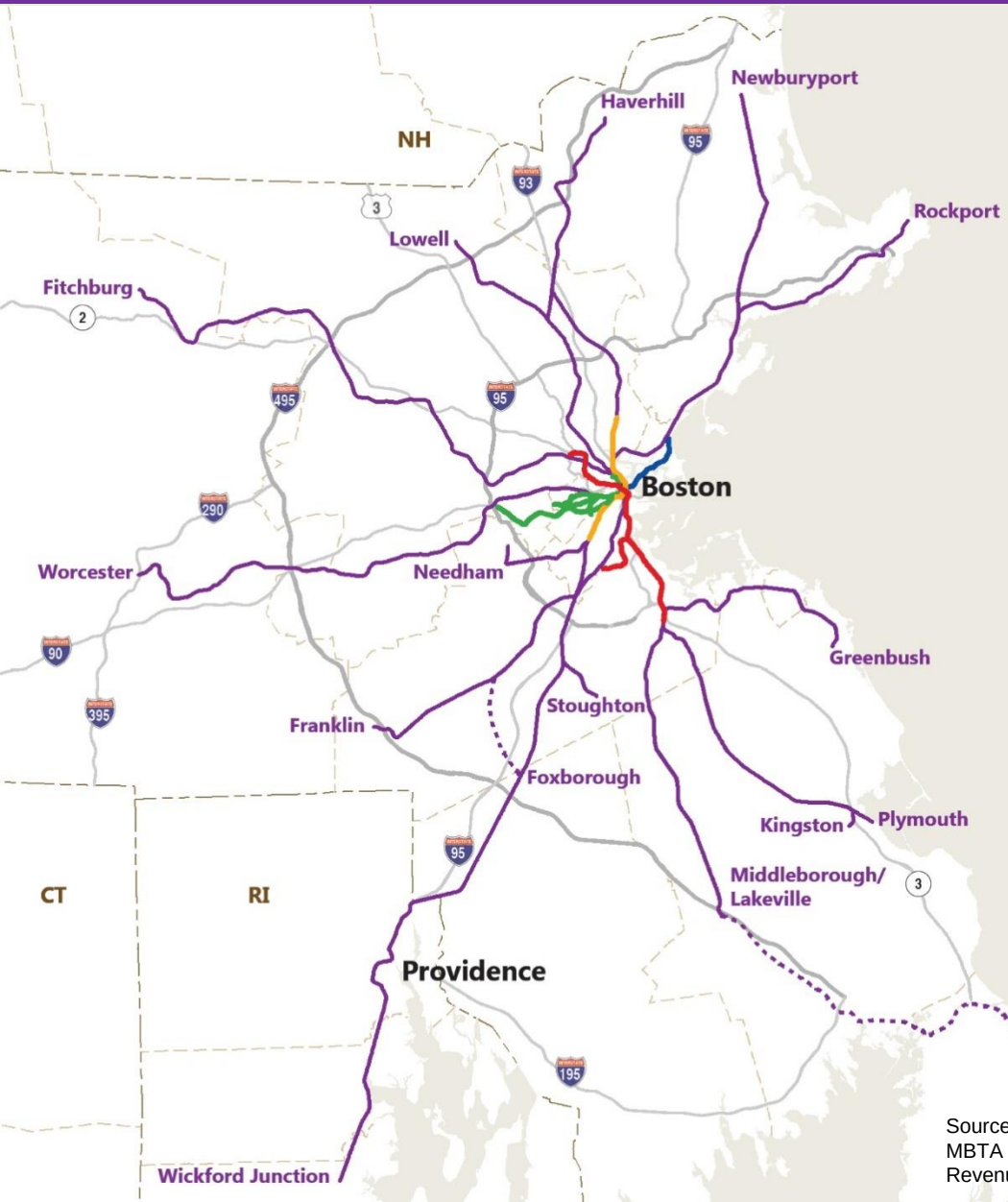
Topics for Discussion

Massachusetts Bay Transportation Authority

- State of the System
  - Existing Conditions
  - Ridership
  - Fleet
  - Operations
  - Costs
- Challenges
- Opportunities
- Round the Room Discussion

Commuter Rail at a Glance

Massachusetts Bay Transportation Authority



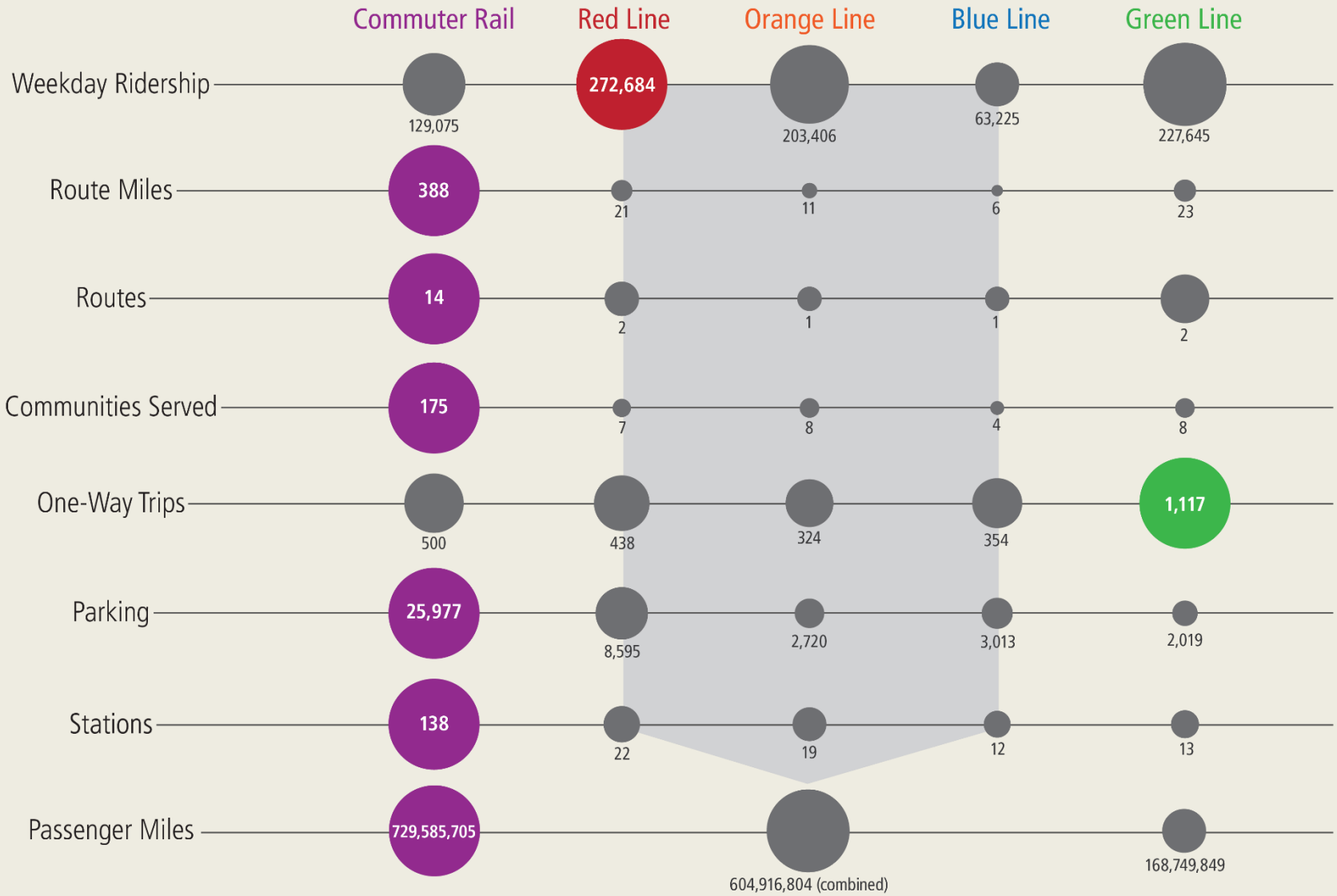
Commuter Rail Routes	14
5 North Side	
9 South Side	
Route Miles	388
Stations	138
Parking Spaces	39,246
12,174 North Side	
27,072 South Side	
Weekday Boardings	129,075
Annual Ridership	35 million
Revenue Fleet	
90 Locomotives	
420 Coaches	
Maintenance Facilities	3
Layover/Storage Facilities	14

Source: MBTA Ridership and Service Statistics, 2014.
MBTA parking data based on http://www.mbta.com/riding_the_t/parking/.
Revenue Fleet info based on Draft FY 2016-2030 Commuter Rail Fleet Management Plan.

Overview of the System

Comparison to Other Services

Massachusetts Bay Transportation Authority

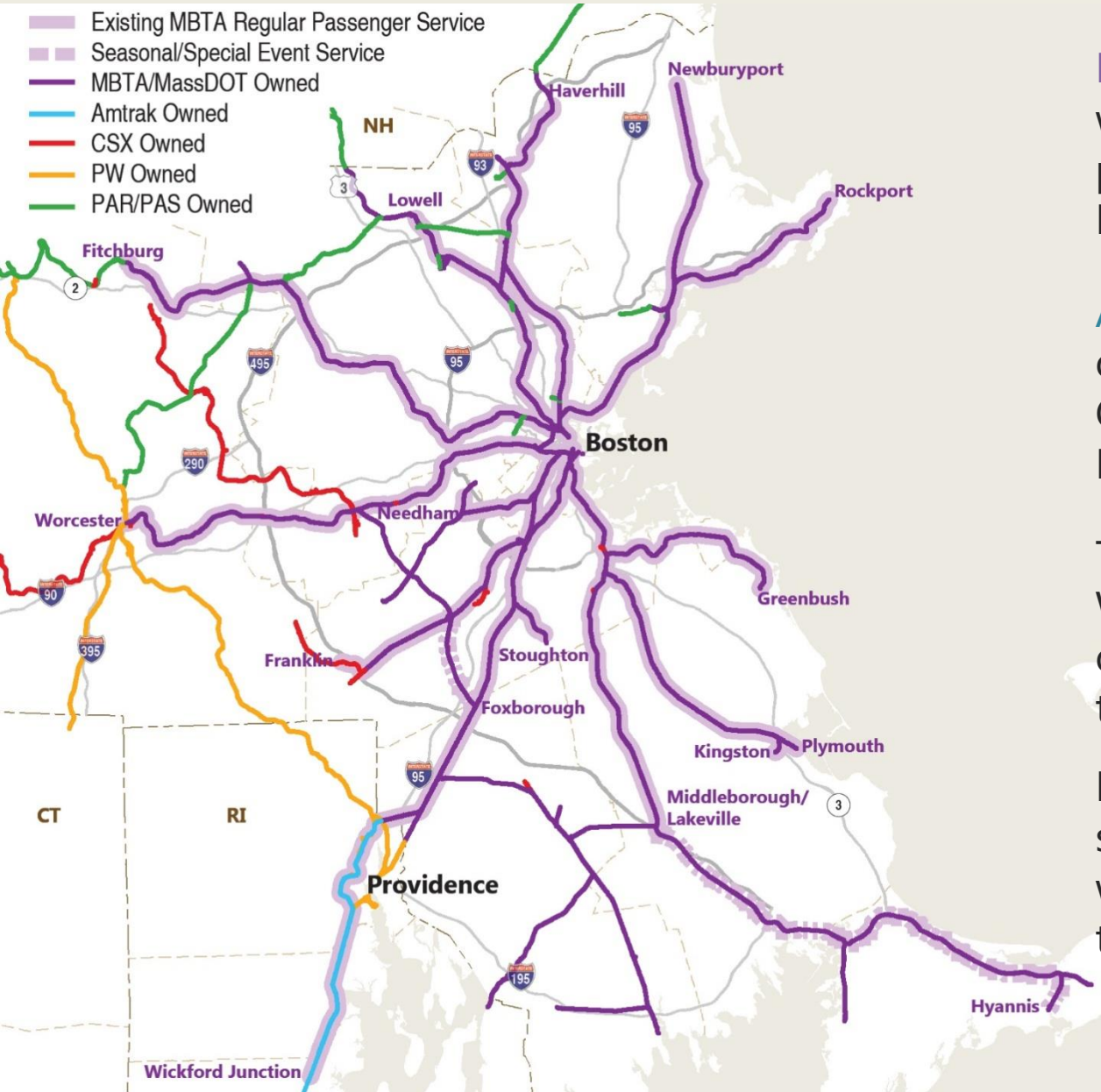


Source: MBTA Ridership and Service Statistics, 2014.
National Transit Database: 2013 Transit Profiles.

Overview of the System

Ownership and Agreements

Massachusetts Bay Transportation Authority



MBTA owns the right of way used for existing passenger service within Massachusetts

Amtrak is the primary owner of the Northeast Corridor outside of Massachusetts

The extension of service to Wachusett Station operates over a segment of Pan Am track

Proposed extension of service beyond Forge Park would operate over CSX track

Overview of the System

Dispatching – North Side

Massachusetts Bay Transportation Authority

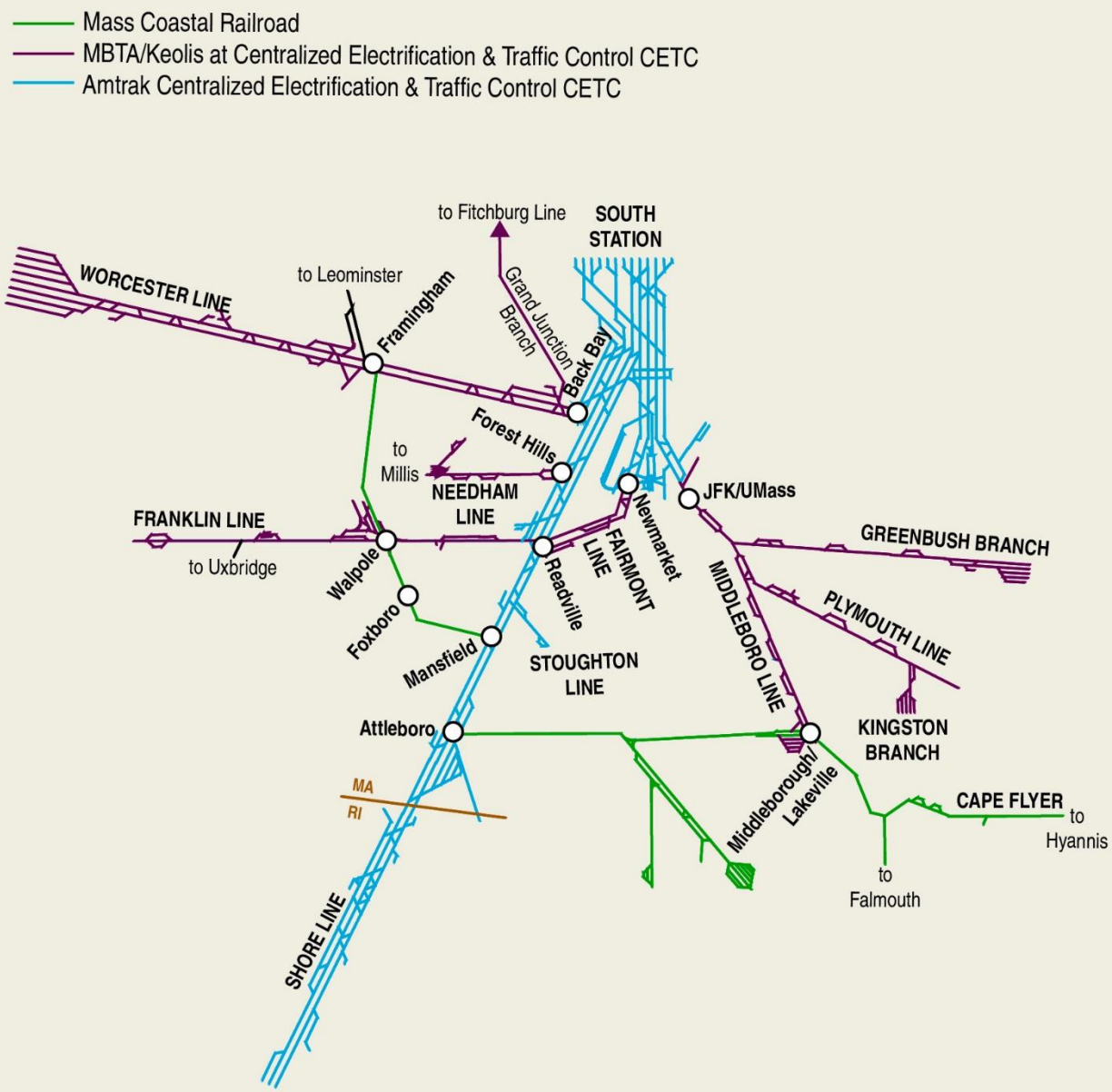
MBTA controls dispatching on much, but not all, of the commuter rail network

Pan Am controls dispatching on segments of the Haverhill, Lowell, and Fitchburg Lines

Overview of the System

Dispatching – South Side

Massachusetts Bay Transportation Authority



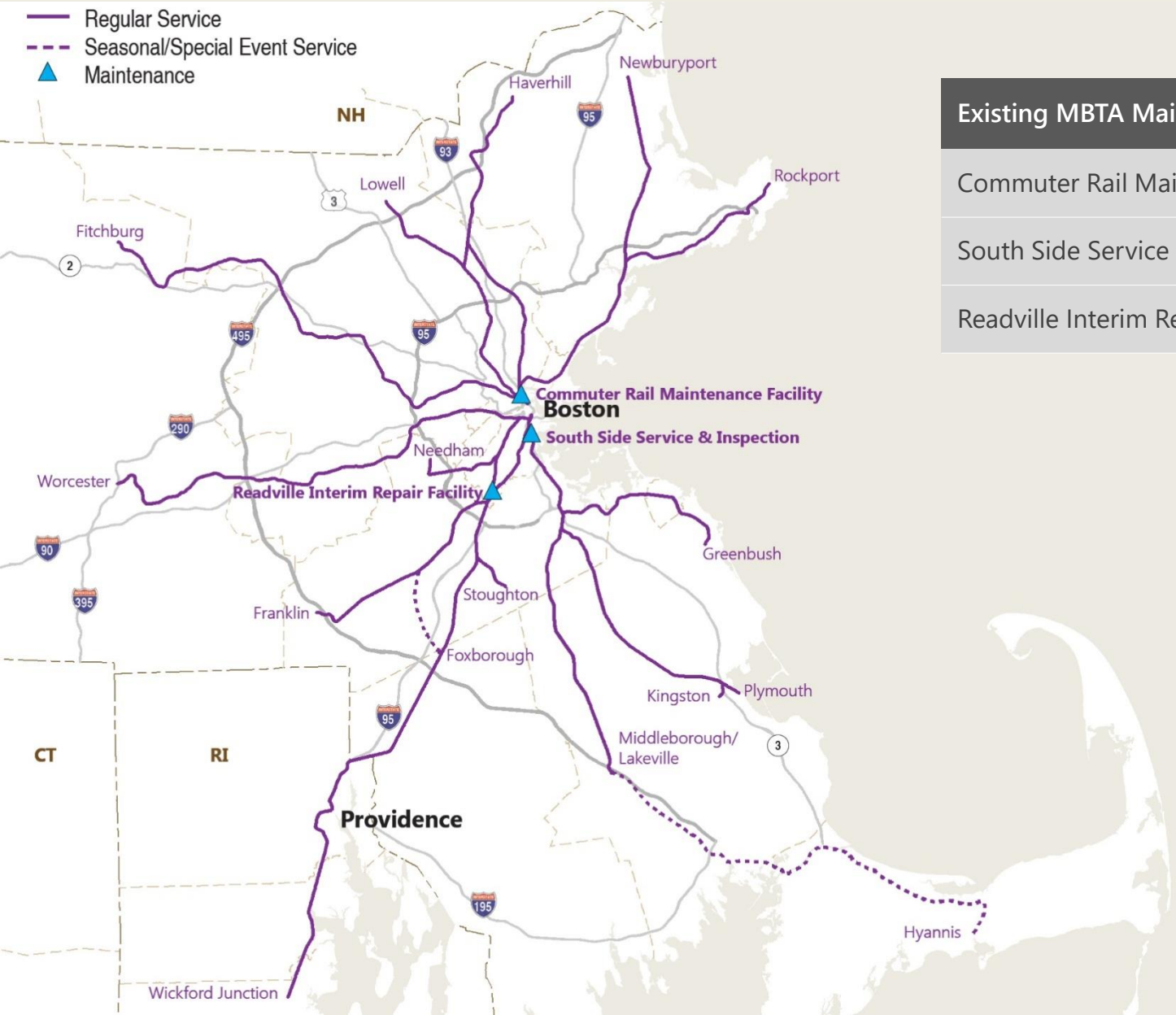
Amtrak controls dispatching along the entire Northeast Corridor, at South Station, and over a small segment of the Dorchester Branch

Mass Coastal controls dispatching along the Framingham Secondary, Middleborough Secondary, and Cape Main Line

Maintenance and Layover Facilities

Maintenance Facilities

Massachusetts Bay Transportation Authority

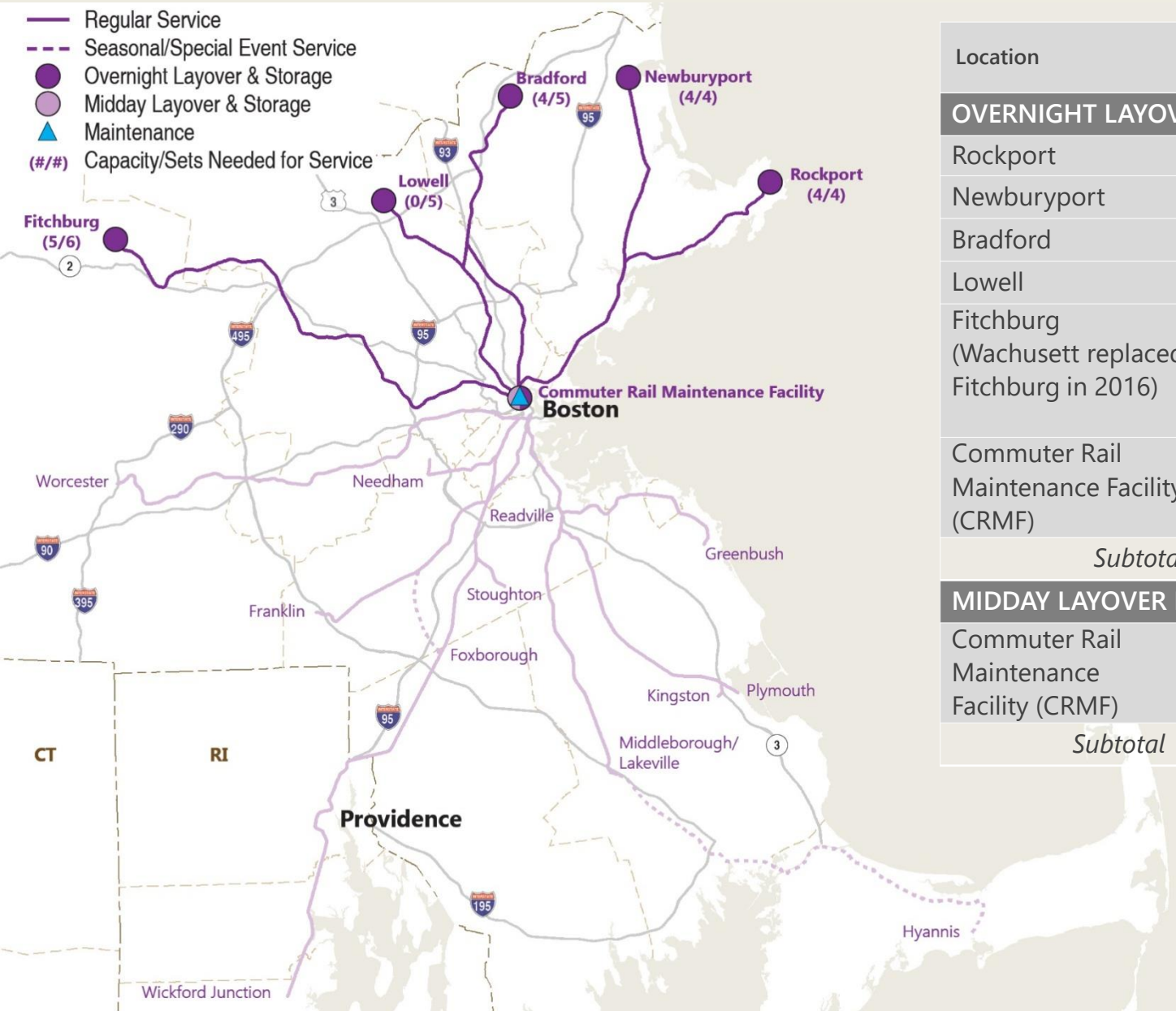


Existing MBTA Maintenance Facilities
Commuter Rail Maintenance Facility (CRMF)
South Side Service & Inspection
Readville Interim Repair Facility

Maintenance and Layover Facilities

Overnight and Midday Layover Facilities – North Side

Massachusetts Bay Transportation Authority

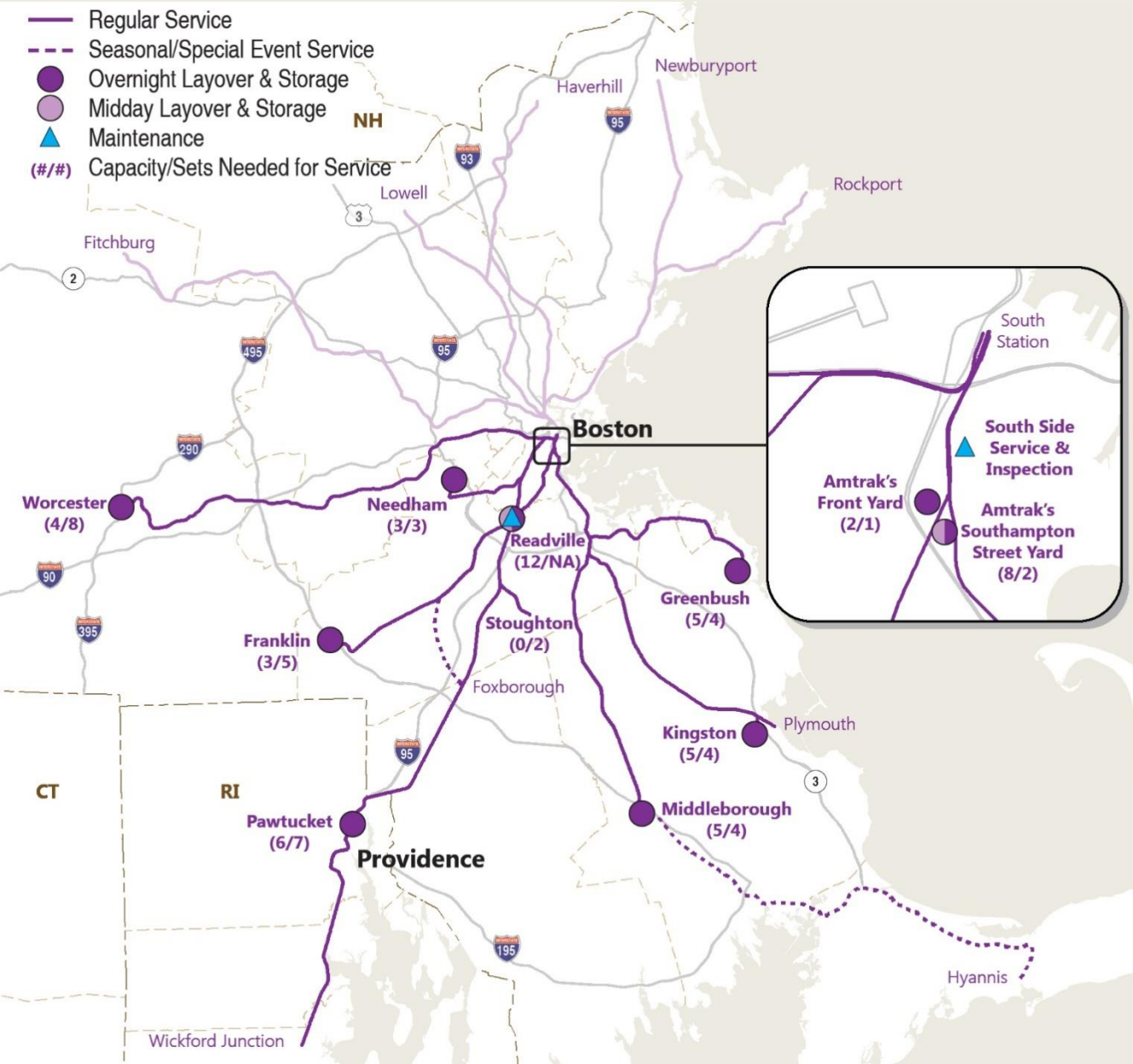


Location	Consist Capacity	Sets Needed for Service
OVERNIGHT LAYOVER FACILITIES		
Rockport	4	4
Newburyport	4	4
Bradford	4	5
Lowell	0	5
Fitchburg (Wachusett replaced Fitchburg in 2016)	5 (6)	6
Commuter Rail Maintenance Facility (CRMF)	12	1 (spare)
Subtotal	*29 (30)*	*25*
MIDDAY LAYOVER FACILITIES		
Commuter Rail Maintenance Facility (CRMF)	12	
Subtotal	*12*	

Maintenance and Layover Facilities

Overnight and Midday Layover Facilities – South Side

Massachusetts Bay Transportation Authority



Location	Consist Capacity	Sets Needed for Service
OVERNIGHT LAYOVER FACILITIES		
Worcester	4	8
Needham	3	3
Franklin	3	5
Pawtucket	6	7
Stoughton	0	2
Boston (Readville)	12	N/A
Middleborough	5	4
Kingston	5	4
Greenbush	5	4
Boston (Amtrak SHSY)	8	2 (Fairmount)
Boston (Amtrak Front Yard)	2	1 (spare)
Subtotal	*53*	*40*
MIDDAY LAYOVER FACILITIES		
Boston (Readville)	12	
Boston (Amtrak SHSY)	8	
Subtotal	*20*	

Assets
Systemwide Summary

Massachusetts Bay Transportation Authority

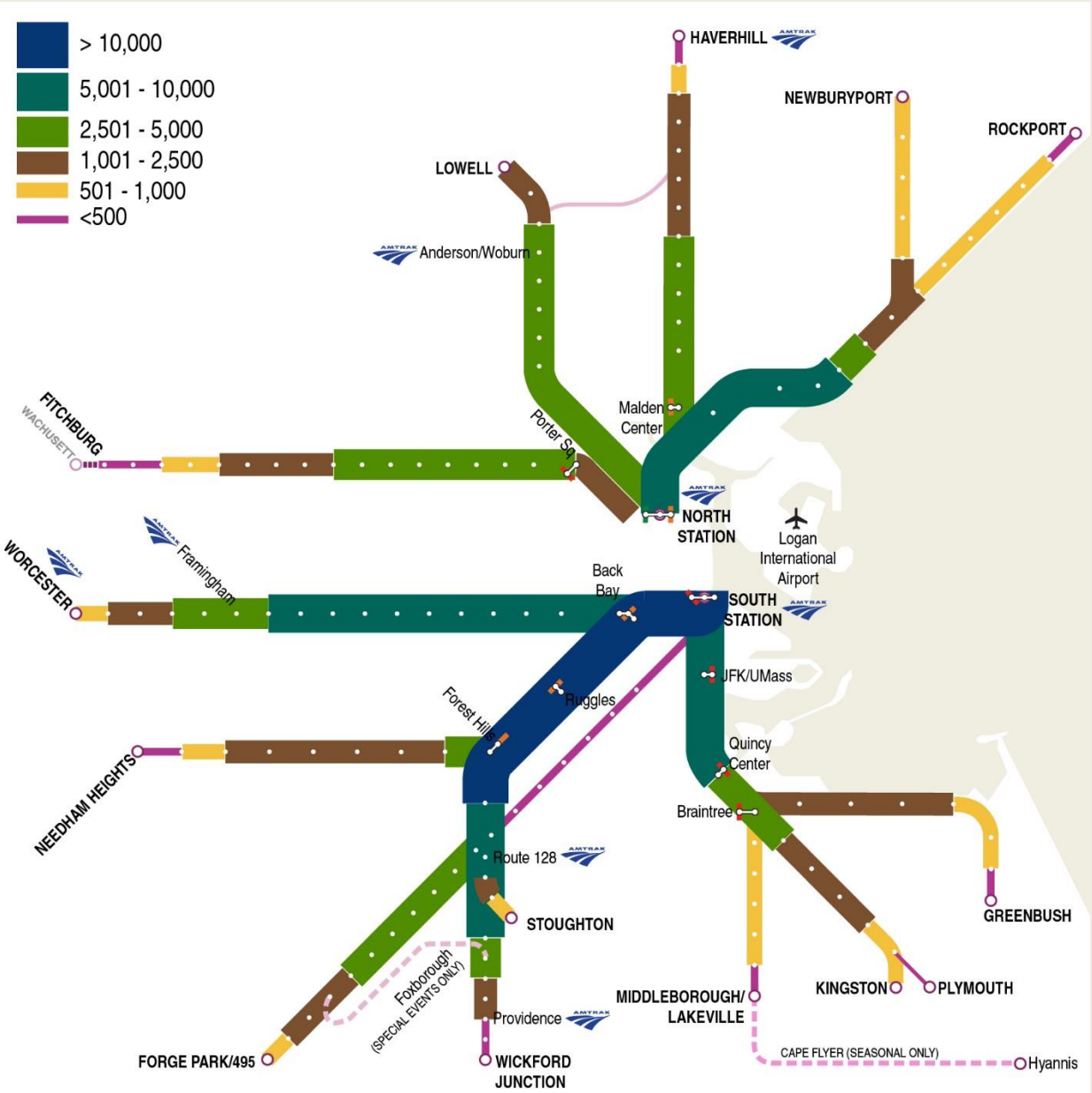
ASSET CATEGORY	NORTH SIDE	SOUTH SIDE	TOTAL
Total Track Miles	**327.82**	**410.12**	737.44
Revenue Track Miles	297.27	342.90	**640.17**
Layover Track Miles	11.87	12.79	**24.66**
Non-Revenue Track Miles	18.18	54.43	**72.61**
Single Track Miles	45.07	133.69	**178.76**
Grade Crossings	**169**	**187**	356
Culverts	**176**	**129**	305
Undergrade Bridges	**139**	**216**	355
Interlockings	**61**	**84**	145
Switches	**386**	**431**	817
Hand Throw Switches	165	197	**362**
Power Switches	221	234	**455**

Source: MBTA 2016 Engineering Track Charts

Ridership

Passenger Volume Flow

Massachusetts Bay Transportation Authority



Line	Riders
NORTH SIDE TYPICAL WEEKDAY RIDERSHIP	
Newburyport/Rockport	16,254
Haverhill	8,843
Lowell	11,965
Fitchburg	9,556
North Side Typical Weekday Ridership	**46,618**
SOUTH SIDE TYPICAL WEEKDAY RIDERSHIP	
Framingham/Worcester	16,293
Needham	6,972
Franklin	12,480
Providence/Stoughton	26,465
Fairmount	1,038
Middleborough/Lakeville	7,182
Kingston/Plymouth	6,560
Greenbush	5,411
South Side Typical Weekday Ridership	**82,401**
TOTAL TYPICAL WEEKDAY COMMUTER RAIL RIDERSHIP	**129,019**

Source: MBTA, Ridership and Service Statistics, 2014. CTPS MBTA Commuter Rail Passenger Count Results, 2012

Commuter Rail Stations

Station Accessibility

Massachusetts Bay Transportation Authority

143 total stations
(includes Foxboro, seasonal stations, and stations under construction)

51 fully accessible stations, including 2 stations under construction

57 partially accessible stations with “mini-high” platforms

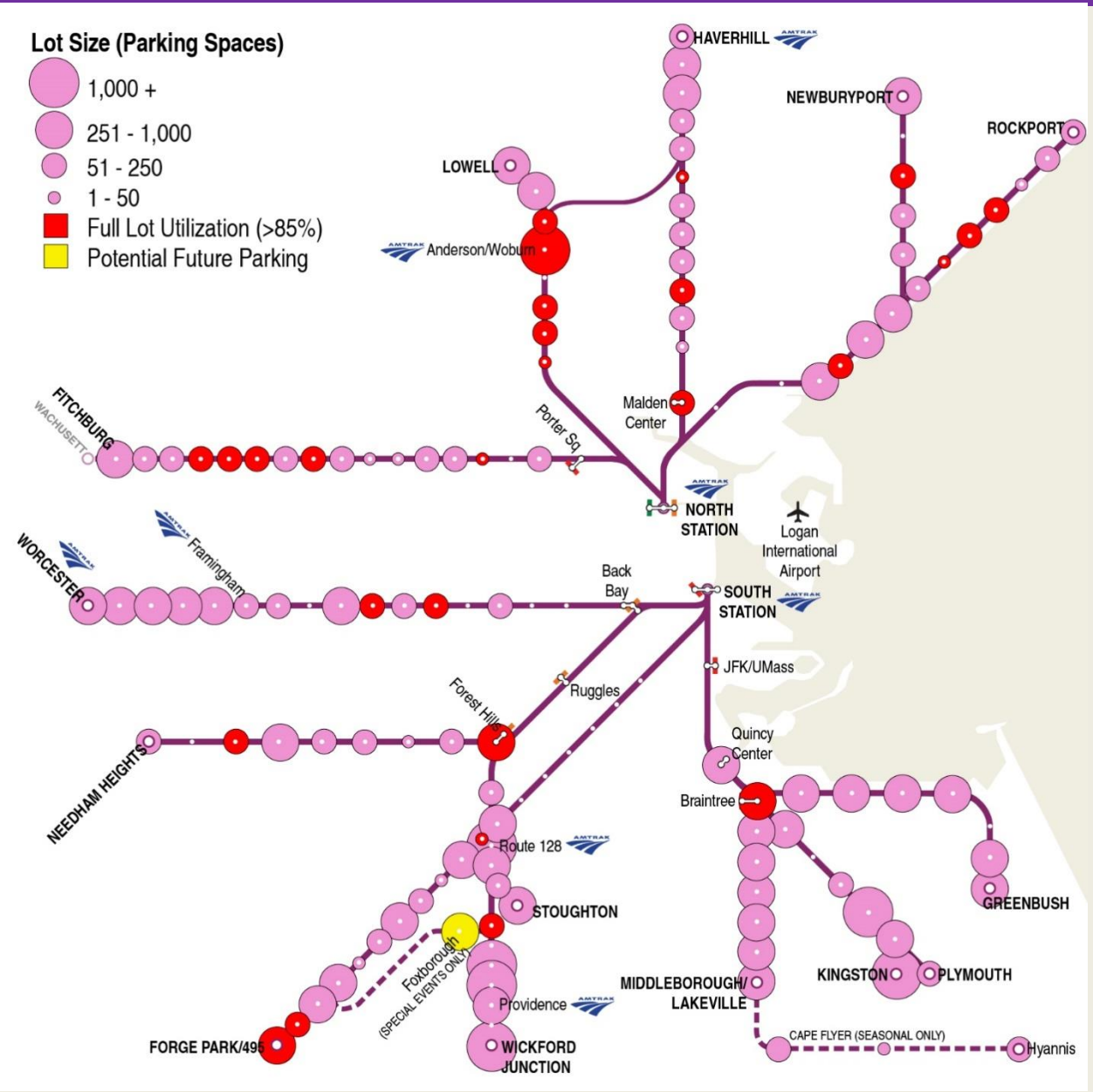
34 stations not accessible

Back Bay is fully accessible, except for Worcester Line platform with “mini-high”

Commuter Rail Stations

Parking Supply and Utilization

Massachusetts Bay Transportation Authority



Parking is provided at **114** of the total 138 Commuter Rail stations

Of the 39,246 total commuter rail spaces, **25,977 are owned** by the MBTA

- **4,639** North Side
- **21,338** South Side

Parking is a revenue generator

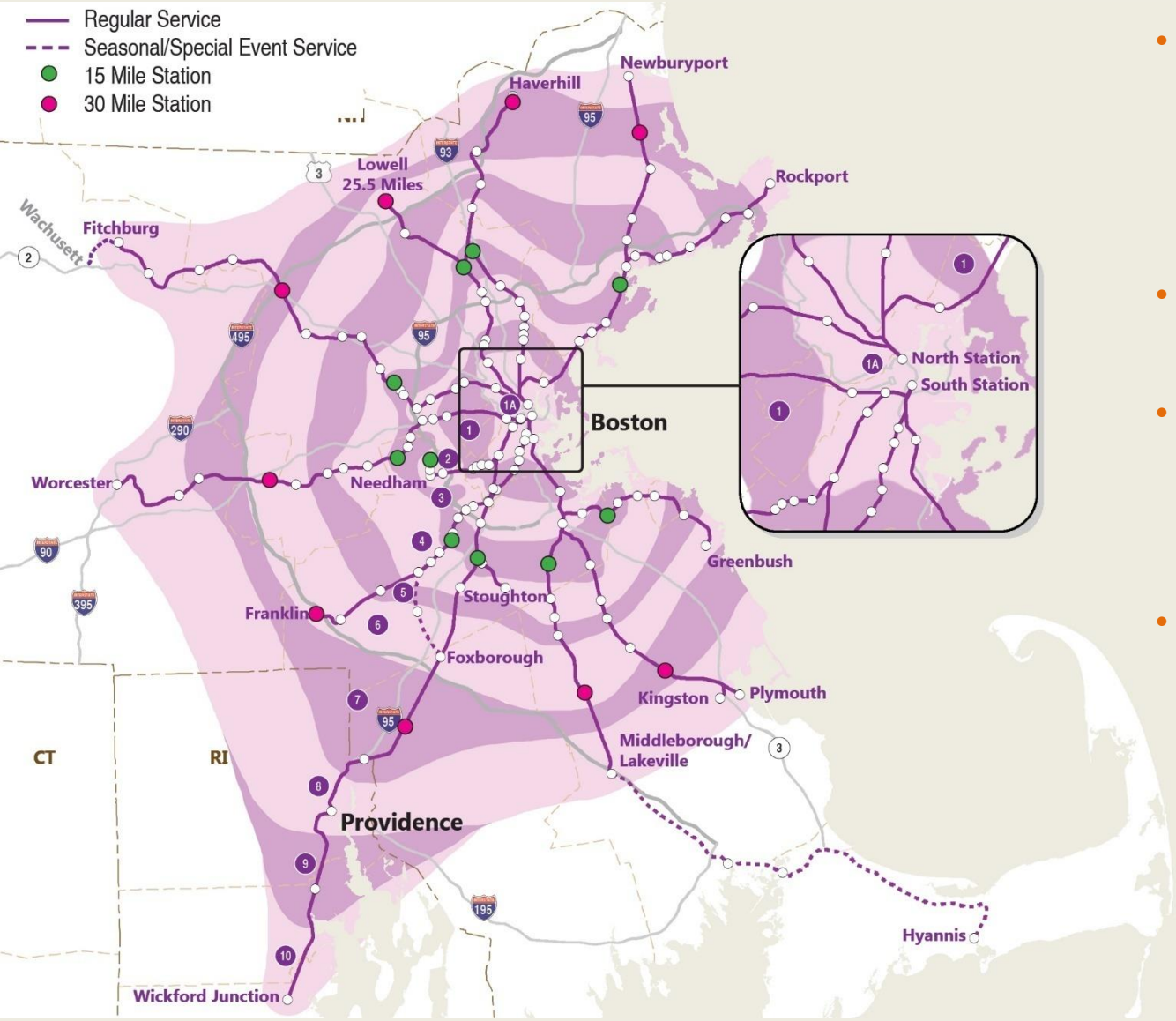
Daily rates between **$4-$7** per day

Source: CTPS Park-and-Ride Capacity and Utilization (commuter rail only), 2013.
MBTA Parking Facilities Utilization, FY 2016.
www.mbta.com.
www.capeflyer.com.

Fares

Zone Structure and Travel Times

Massachusetts Bay Transportation Authority



- There are 11 commuter rail zones (Zone 1a through Zone 10) with one-way fares between $2.10 and $11.50
- There are 14 stations[1] in Zone 1a alone
- The Needham and Fairmount Lines are entirely within Zones 1 and 2
- The Providence Line is the only one extending beyond Zone 8, with one station (T.F. Green) in Zone 9 and one (Wickford Junction) in Zone 10

[1] Including North Station and South Station

Source: www.mbta.com

Ridership
Performance facts

Massachusetts Bay Transportation Authority

Reliability

Almost 2/3 of the commuter rail lines operated at 92% on-time performance or greater over the last 12 months

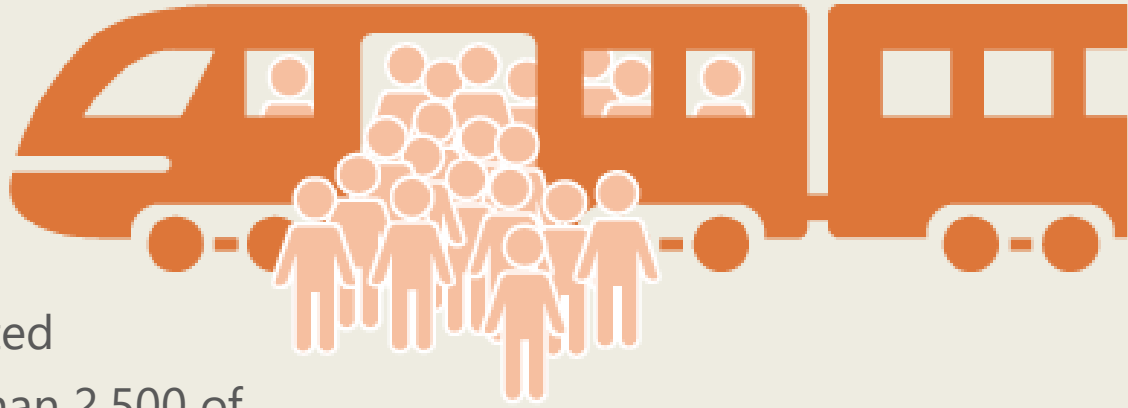
Coverage Area

More than 60% (86) of all commuter rail stations are greater than a 30 minute travel time from North or South Station.

Train Frequency

Each weekday, commuter rail operates over 500 trains, of one-way distances between 10 and 63 miles

Massachusetts Bay Transportation Authority



Train Seating Capacity

Over the last year, MBTA operated over 140,000 trains. Less than 2,500 of them, or only 1.67%, were over capacity. That means that 98% of commuter rail trains had a seat for every passenger.

Ridership

Characteristics of High Ridership Stations

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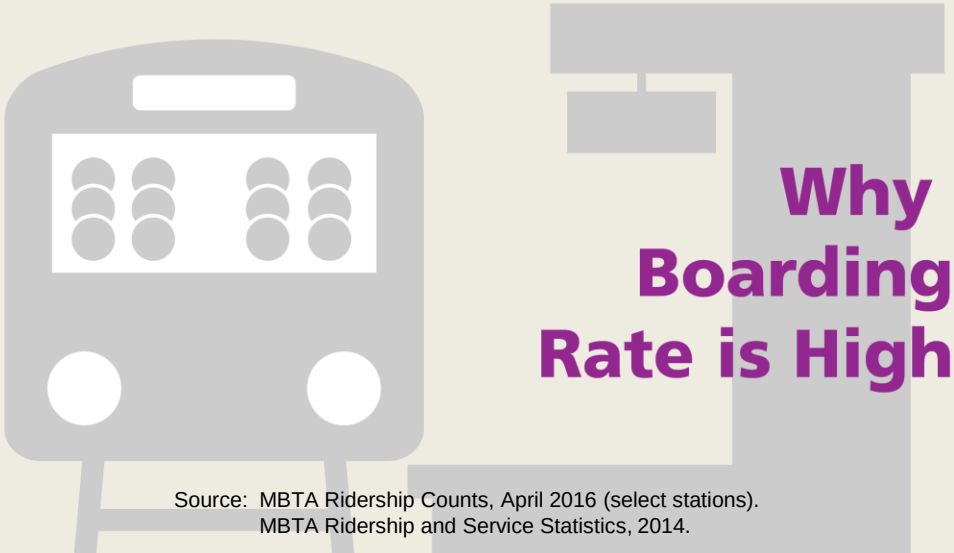
2,389	2,077	1,770	1,681	1,665
Salem	Mansfield	Lowell	Beverly	Attleboro
1,604	1,502	1,475	1,462	1,341
Route 128	Anderson	Worcester	South Attleboro	Providence



Why Boarding Rate is High

- More frequent service
- Higher density land use and mix of uses
- Located at the end of the line
- Ample parking supply and highway access
- Higher train speeds are allowed
- Stations are fully or partially accessible

Source: MBTA Ridership Counts, April 2016 (select stations).
MBTA Ridership and Service Statistics, 2014.

Ridership Counts

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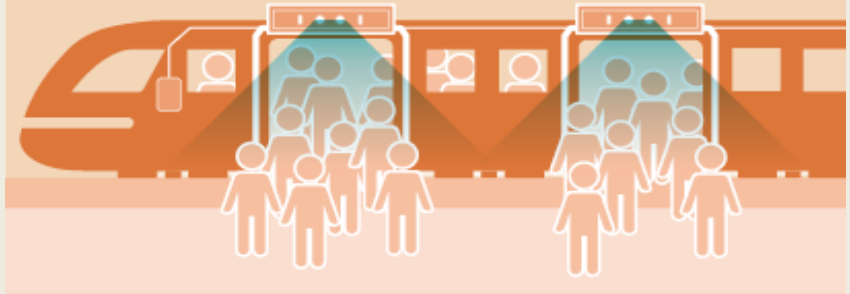
CURRENT

- Manual Ridership Reports
  - Ridership as reported by conductors
  - On-board only, no station-level breakdown
  - Conductors must multi-task; focus is on safety
  - No incentive to improve accuracy
- Bi-Annual Peak Passenger Counts
  - Platform counts at Boston terminals
  - Peak period only
  - On-board only, no station-level breakdown
  - Primary purpose is to determine equipment and staffing needs – not to collect accurate ridership
- Comprehensive Count Audits
  - Focused on capturing ridership at all stations
  - Expensive and time consuming
  - Last done in 2012
  - Conducted again by CTPS in 2018

POTENTIAL

- Automated Passenger Counters
  - On-board for each commuter rail coach
  - Pilot car is being tested now – successful
  - Wider rollout possible



- Automated Fare Collection 2.0
  - Pay with phone (no app), contactless credit card, Charlie2 issued card
  - No cash on-board vehicle
  - Readers added at all rail stations and on platforms at South Station North Station / Back Bay
  - Automatically captures ridership from the tap made at each station (on, off)

Automated Passenger Counters (APC)

Massachusetts Bay Transportation Authority

- APCs currently installed on 38 commuter rail coaches
- Keolis and MBTA now installing APCs on the entire coach fleet

- Device detects and counts passengers moving in 4 different directions
  - Uses a camera and captures movement entering and exiting coaches
  - Can determine if a passenger is between coaches or left the train
  - Counts passengers in each coach and then totals up the entire train.
- Other features include:
  - Ambient temperature sensing
  - Onboard PA system recording, quality control
  - Real time GPS tracking
  - Accelerometer and vibration sensors measure ride quality and passenger comfort
  - Door sensors record number of doors open at stations

RailSales – Onboard Mobile Point of Sales

Massachusetts Bay Transportation Authority

- Keolis developed a new hand-held ticketing device for conductors to accept credit cards onboard trains, a frequent passenger request.
- CR historically had cash-only sales on board trains. Easy to use device with a card reader attached to the conductors' existing iPhones combined with a small belt printer.
- Conductors started using the device in Feb. 2018, with full implementation completed in September
- ~14% of sales are being made by card with steady increase month on month.

On-Time Performance

The Importance of Residual Delays

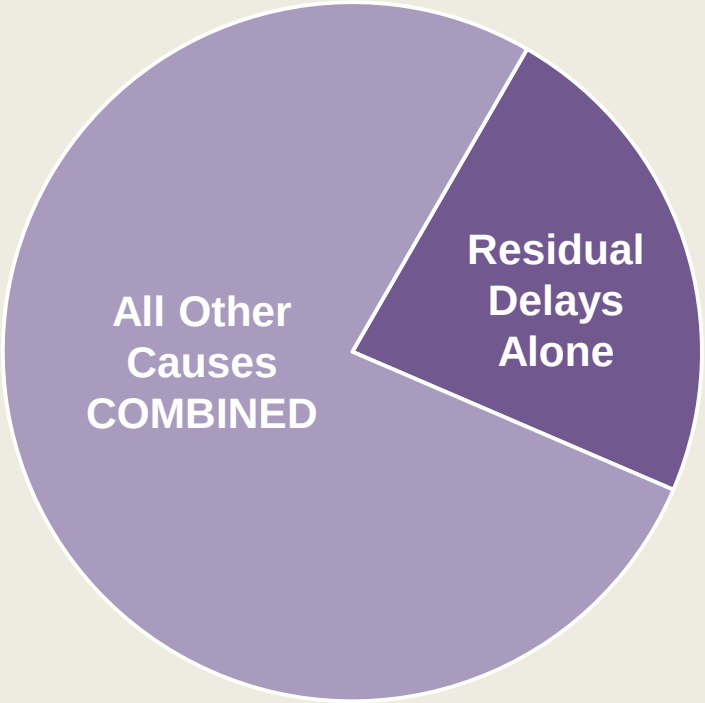
Massachusetts Bay Transportation Authority

Residual Delays

One initial incident can create a ripple effect of delay, as several commuter rail trains are impacted downstream, and sometimes on multiple lines

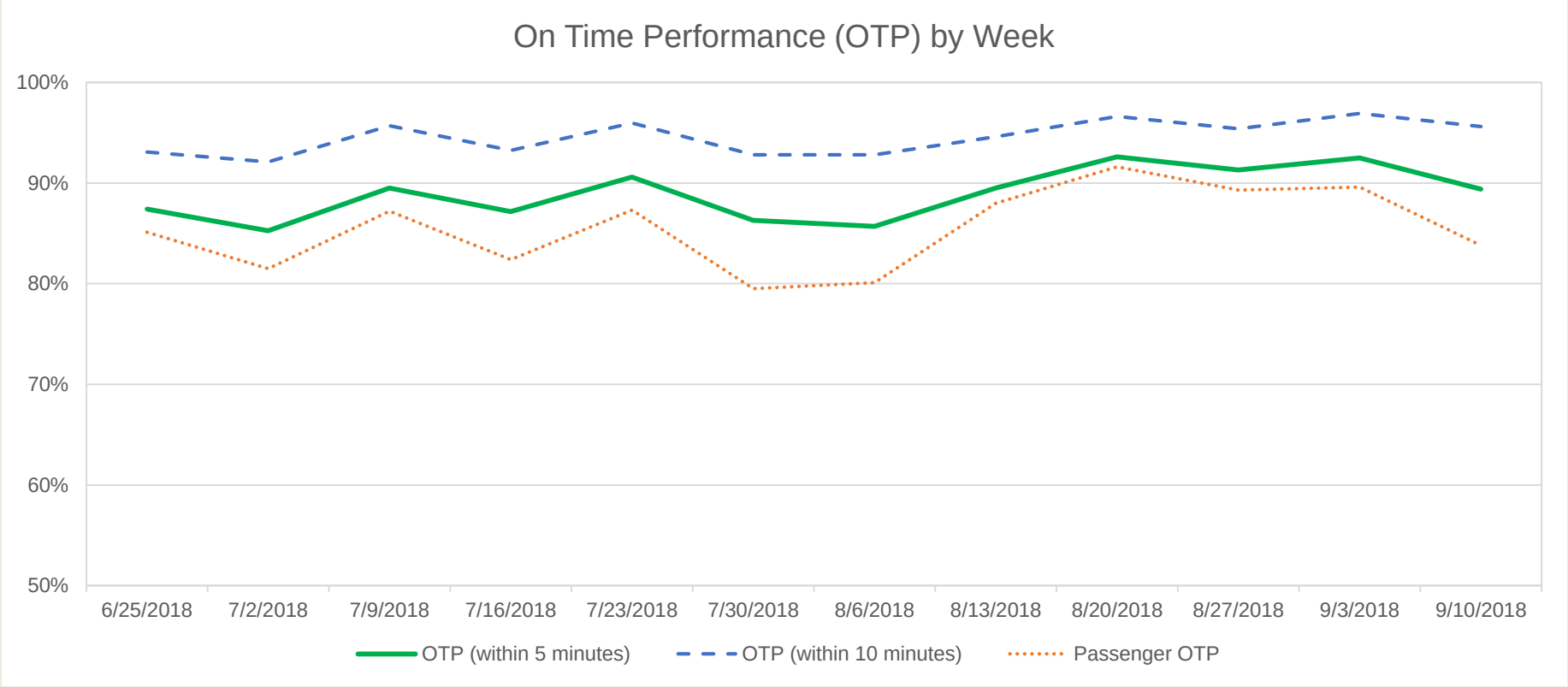
Within the Last 12 Months…

Residual delays comprised 30% of the number of incidents causing delay, compared to all other causes combined



On Time Performance

Massachusetts Bay Transportation Authority



Date

OTP to 5 minutes

Massachusetts Bay Transportation Authority

	September 2017	October 2017	November 2017	December 2017	January 2018	February 2018	March 2018	April 2018	May 2018	June 2018	July 2018	August 2018	September 2018	Trailing Year Average
Fairmount	97.5%	98.0%	96.6%	97.9%	92.9%	96.8%	96.4%	97.9%	97.9%	95.3%	96.8%	95.2%	94.1%	96.4%
Fitchburg	91.3%	79.9%	70.8%	84.6%	76.0%	91.7%	87.5%	86.7%	84.9%	87.0%	85.5%	88.0%	88.1%	84.7%
Franklin	88.6%	82.5%	85.4%	87.3%	82.5%	91.8%	88.6%	89.2%	82.5%	84.9%	77.8%	80.2%	84.8%	85.0%
Greenbush	95.6%	85.3%	95.2%	95.3%	90.7%	94.5%	85.7%	98.0%	94.6%	95.4%	93.5%	93.7%	94.7%	93.2%
Haverhill	81.3%	74.7%	78.3%	86.9%	82.7%	88.9%	82.4%	90.6%	93.9%	93.0%	92.3%	92.6%	92.5%	87.1%
Kingston/Plymouth	95.3%	84.2%	91.8%	95.0%	88.7%	93.8%	84.8%	94.0%	93.0%	90.1%	90.2%	91.6%	92.7%	91.1%
Lowell	89.1%	88.1%	85.7%	89.9%	80.1%	91.4%	84.9%	90.9%	89.2%	92.7%	91.8%	93.0%	90.6%	88.9%
Middleboro	90.8%	83.2%	88.9%	91.9%	91.3%	89.7%	85.6%	95.7%	90.3%	89.4%	88.1%	88.5%	91.8%	89.6%
Needham	92.0%	90.0%	91.0%	91.4%	87.6%	95.3%	90.0%	91.4%	90.2%	92.0%	88.8%	91.6%	94.6%	91.2%
Newburyport	89.1%	88.5%	89.3%	88.7%	76.1%	93.1%	85.8%	92.2%	92.7%	92.7%	91.9%	89.8%	92.6%	89.4%
Providence	89.2%	86.6%	87.7%	88.9%	83.0%	92.2%	88.1%	86.5%	87.8%	87.1%	81.4%	86.6%	84.0%	86.8%
Rockport	83.6%	86.7%	88.5%	87.5%	76.6%	92.4%	85.5%	92.7%	93.8%	92.2%	93.4%	90.1%	93.4%	88.9%
Stoughton	89.8%	84.8%	85.9%	86.9%	83.0%	89.7%	86.5%	86.9%	87.1%	88.7%	81.1%	82.7%	84.3%	85.9%
Worcester	74.4%	79.5%	89.5%	93.9%	86.7%	92.0%	89.6%	90.8%	88.0%	83.0%	78.9%	88.5%	93.3%	86.8%
Grand Total	**88.4%**	**85.1%**	**87.3%**	**90.4%**	**83.9%**	**92.4%**	**87.5%**	**91.4%**	**90.3%**	**90.0%**	**87.8%**	**89.4%**	**90.8%**	**88.8%**

OTP to 10 minutes

Massachusetts Bay Transportation Authority

	September 2017	October 2017	November 2017	December 2017	January 2018	February 2018	March 2018	April 2018	May 2018	June 2018	July 2018	August 2018	September 2018	Trailing Year Average
Fairmount	99.0%	98.8%	98.6%	99.3%	95.1%	98.8%	98.4%	99.3%	99.5%	97.8%	98.8%	97.2%	97.2%	98.3%
Fitchburg	96.4%	90.7%	85.7%	91.9%	84.2%	96.2%	93.1%	93.1%	93.2%	92.9%	93.0%	94.4%	93.7%	92.1%
Franklin	95.5%	91.4%	92.4%	94.8%	89.6%	96.2%	94.4%	95.5%	91.9%	93.1%	87.5%	89.2%	92.2%	92.5%
Greenbush	98.1%	95.4%	97.5%	97.6%	93.8%	97.3%	89.5%	98.9%	97.3%	97.8%	95.8%	96.8%	96.5%	96.3%
Haverhill	90.0%	87.1%	88.4%	92.7%	89.1%	95.3%	89.8%	96.2%	96.5%	97.0%	96.5%	96.0%	96.5%	93.2%
Kingston/Plymouth	98.8%	95.4%	96.5%	98.8%	92.5%	97.8%	89.3%	98.0%	96.6%	96.0%	95.8%	96.0%	96.2%	95.9%
Lowell	97.5%	95.3%	95.4%	95.4%	90.0%	97.4%	92.1%	96.9%	96.7%	97.4%	97.0%	97.4%	96.5%	95.7%
Middleboro	95.0%	96.3%	96.0%	95.4%	94.3%	95.3%	91.1%	98.3%	95.4%	95.2%	94.0%	92.2%	95.1%	94.9%
Needham	96.6%	96.4%	94.6%	96.8%	93.5%	98.9%	96.2%	96.8%	95.1%	96.7%	94.9%	96.6%	98.7%	96.2%
Newburyport	95.0%	95.0%	96.3%	96.2%	82.6%	97.3%	91.2%	97.1%	97.2%	96.2%	98.2%	96.1%	97.6%	95.1%
Providence	95.1%	93.4%	94.5%	93.7%	89.4%	96.9%	92.9%	94.0%	94.1%	94.3%	90.8%	93.9%	92.5%	93.5%
Rockport	92.4%	92.6%	94.4%	94.3%	81.5%	96.1%	90.6%	96.4%	97.2%	97.4%	97.0%	94.6%	98.1%	94.0%
Stoughton	95.3%	92.9%	95.9%	94.3%	90.9%	94.9%	94.0%	94.7%	94.4%	94.2%	89.9%	90.3%	92.8%	93.4%
Worcester	87.6%	90.8%	95.3%	97.3%	91.8%	96.1%	93.9%	96.2%	94.7%	90.2%	88.1%	93.7%	96.5%	93.3%
Grand Total	**94.8%**	**93.5%**	**94.3%**	**95.5%**	**89.8%**	**96.8%**	**92.8%**	**96.4%**	**95.7%**	**95.3%**	**94.0%**	**94.6%**	**95.7%**	**94.5%**

Costs to Operate Commuter Rail

Massachusetts Bay Transportation Authority

FIXED PRICE
$320M

OTHER COSTS: $77M

SERVICES
$47M

FUEL
$30M

* Costs rounded to nearest Million $

TOTAL ANNUAL COST TO OPERATE COMMUTER RAIL= $397M

NTD-Reported Farebox Recovery 50%

Farebox Recovery Considering Non-Operating Revenues 72%

Revenues from Commuter Rail

Massachusetts Bay Transportation Authority

OPERATING REVENUES
$215M

NON-OPERATING REVENUES: $70M

PARKING
$17M

ADVERTISING
$6M

RETAIL SPACE + OTHER LEASES
$3M

REVENUE ASSESSMENTS (10% TOWNS WITH SUBWAY AND BUS)
$14M

REAL ESTATE
$12M

REVENUE ASSESSMENTS (TOWNS WITH CR ONLY)
$12M

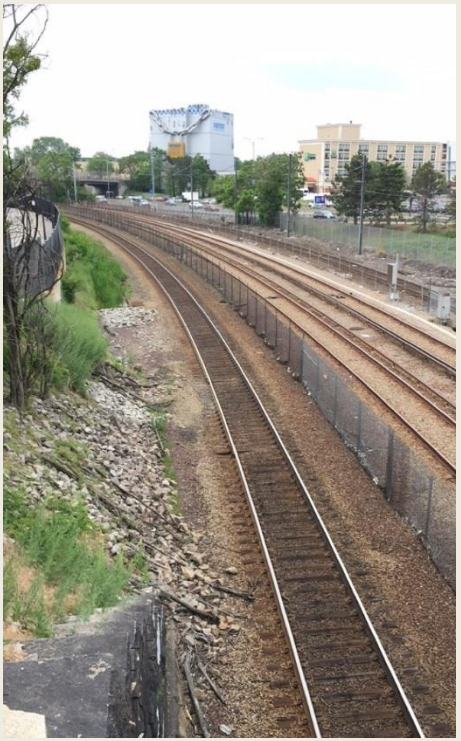
UTILITIES & TELECOMM
$6M

TOTAL ANNUAL REVENUE GENERATED BY COMMUTER RAIL= $285M

* Rounded to nearest million/Annual Revenue Generated
Source: CTPS MBTA Revenue Report, Fiscal Year 2015.
MBTA Ridership and Service Statistics, 2014.

Systemwide Challenges

Massachusetts Bay Transportation Authority



Single track constraints and limited right-of-way

- Newburyport Line, between North Beverly and Newburyport
- Haverhill Line, between Reading and Andover
- Old Colony Main Line, between Boston and Braintree
- Worcester Line, adjacent to the Massachusetts Turnpike

Drawbridge rehabilitation/ replacement

- Gloucester Draw- Ongoing
- Beverly Draw- Completed in 2017
- Saugus Draw- In design
- Draw 1 (North Station)- In design

Parking constraints

- 25 commuter rail stations are at or over parking capacity

Systemwide Challenges

Massachusetts Bay Transportation Authority

Station accessibility

- 34 stations are not accessible
- Challenges with upgrading to fully accessible stations in corridors that require special freight clearances

Maintenance/layover facility capacity

- Overnight layover constraints on the North Side (Rockport, Bradford, Lowell, Fitchburg)
- Overnight layover constraints on the South Side (Worcester, Needham, Franklin, Stoughton)
- Midday layover constraint on the South Side

Coach capacity

- Of 420 coaches in the active fleet, 203 or approximately 50% are single-level

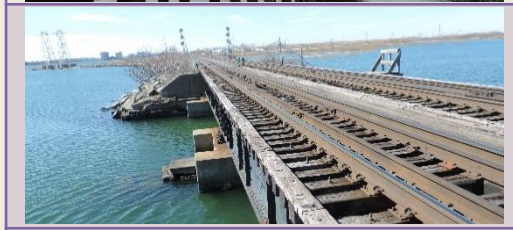
PTC construction

Source: FY 2016 – 2030 MBTA Commuter Rail Fleet Management Plan - DRAFT.

Systemwide Challenges (Continued)

Drawbridges

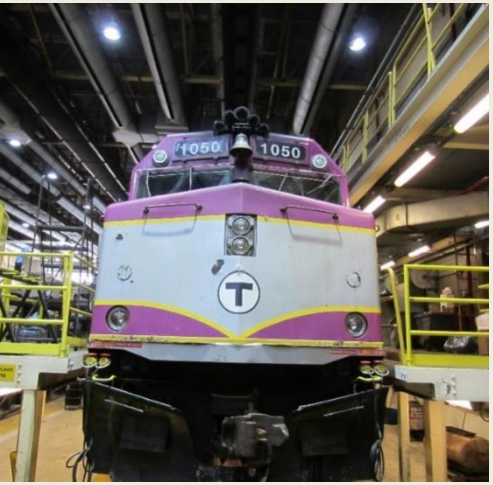
Massachusetts Bay Transportation Authority

Drawbridge		Condition	Replacement Cost	Year Built
	Gloucester	Structurally Deficient – Replacement Underway	$60M	1911
	Beverly	Structurally Deficient – Replaced 2017	$56M	1885
	Saugus	Structurally Deficient – In Design	$60M	1911
	Manchester	Structurally Adequate	N/A	1944
	Tower A	Structurally Deficient – To Be Replaced	$121M	1931

Commuter Rail Vehicle Fleet

Statistics about the Vehicle Fleet

Massachusetts Bay Transportation Authority



- 92 switching, MOW, and wreck response vehicles in support fleet
- 500 active locomotives and coaches in revenue fleet
- Minimum target service life is 25 years
- 240 revenue vehicles at/beyond 25-year service life
- 37 locomotives are beyond their 25-year service life, with another 13 approaching their 25-year service life within the next six years

	Active	At/Beyond 25-Year Service Life
Coaches	420	203
Locomotives	90	37

Source: Support fleet data from MBTA Commuter Rail Operating Agreement, dated February 5, 2014, and MBTA Commuter Rail Operations.
Revenue fleet data from FY 2016 – 2030 MBTA Commuter Rail Fleet Management Plan - DRAFT.

Fleet Investments
Locomotives

Massachusetts Bay Transportation Authority

- Invest in existing locomotives
  - Replace major components on 10 active locomotives (UTEX)
    - 2 year process
    - Focus on reliability improvements
  - Rehab 10 active locomotives
    - Life extending – 10 to 15 years
    - Currently ongoing at Motive Power Industries in Boise, Idaho.
    - First unit expected back end of 2018.

- Possible procurement of new locomotives
  - Will be addressed in Fleet Plan
  - Typical 7 year procurement until final acceptance of fleet

Fleet Investments
Coaches

Massachusetts Bay Transportation Authority

- Invest in existing coaches
  - Kawasaki rebuild program
    - 118 coaches undergoing rebuild
    - Life extending – 10 to 15 years

- Possible procurement of new coaches
  - Coach for coach replacement
    - Single levels replaced by bi-levels

Capital Needs
Infrastructure

Massachusetts Bay Transportation Authority

Structures

- Draw 1/Tower A at North Station
- East Street Bridge
- Bacon Street Bridge

Stations

- Blue Hill Avenue Station- Open early 2019.
- Ruggles Station Platform Track 2
- Upgrades to Ballardvale and Andover Stations
- Design and plan for accessibility improvements at Winchester, Auburndale, Natick Center, Mansfield, South Attleboro Stations

South Station Expansion

- South Station is at capacity today
- Provides ability to grow on South Side
- Addresses need for midday layover

South Coast Rail

- Expands service to New Bedford/ Fall River region

Systemwide Track & Signal Upgrades

- Replace jointed rail with CWR
- Restore double track
- Modernize signal system

Upcoming Projects in FY 2019

Massachusetts Bay Transportation Authority

- Continuation of PTC installation, programming, and testing
- Installation of additional switch heaters for winter resiliency
- Franklin double track
- Study of third track from Framingham to Auburndale
- System-wide tie replacement – 51,000 ties
- Continue Worcester Line rail replacement
- Upgrade signal system between Framingham and Boston
- Continue station brightening program
- South Station pit lighting
- Stations at Natick Center and Wellesley Square in design
- Bridges at Bacon St in Wellesley and Intervale Rd in Weston being rebuilt
- Installation of “smart coach” devices
- Additional locomotive overhauls

Massachusetts Bay Transportation Authority

QUESTIONS?

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