

# SERVICE IMPROVEMENT TOOLBOX: Bus Crowding

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Office of Performance Management & Innovation



# Overview

- The Service Delivery Policy sets the measures the MBTA uses to evaluate service and performance targets
- The MBTA has a tactical toolbox for improving service
- In-depth analysis of the performance data can help inform what tools are best suited
- Bus crowding is an example of where multiple tools are needed to address the problem
- Service planning is one of the tools, but operational improvements and municipal partnerships are also critical

# Tactical toolbox for bus service improvements

## *Operational Changes*

- All door boarding and faster fare collection
- Improved dispatching tools and procedures

## *Partnerships with municipalities*

- Bus lanes
- Signal priority and queue jumps

## *Private sector partnerships*

## *Capital Projects*

- Fleet facilities
- Additional buses

## *Service Changes*

- Route alignment and stop spacing
- Frequency and span changes



# DEFINING THE PROBLEM

- Bus Crowding



# Customer Experience Interviews

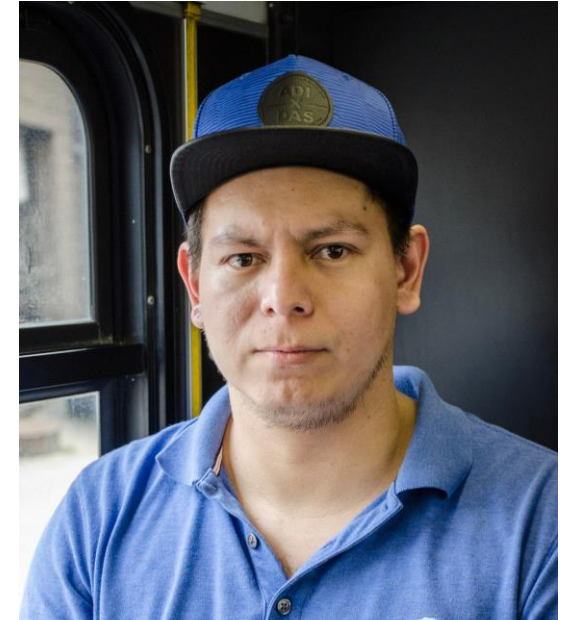
OPMI interviewed riders on the 7, 111, 66 and 57 bus routes with high crowding, this is what they said...

"I normally take the 111 bus seven days a week and it is usually very full. Sometimes it is so full that **I have to wait for two or three buses to pass**, and will have to wait up to 10-20 minutes for another bus.

-Edwin , 111 Rider

"Yo uso este bus normalmente todos los días, siete días a la semana. Si me vengo en el bus de las 5 PM o por la mañana, a veces **tengo que esperar 2-3 buses que pasen** e esperar unos 10-12 minutos para poder entrar a otro bus. Durante la mañana normalmente hay mucha gente, en un bus con capacidad de 40 personas, esto se llena entre 60-90 personas.

-Rosa Maria, 111 Rider



# Customer Experience Interviews



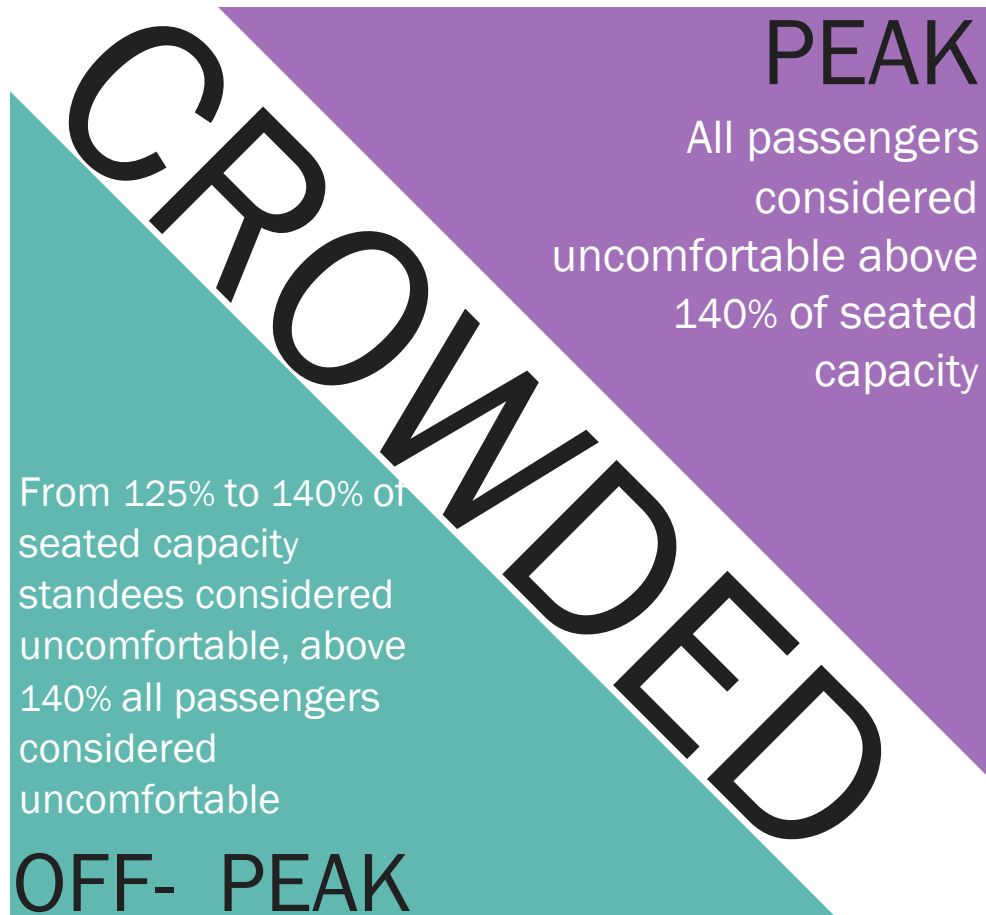
"I usually take this bus to get to work every week day. Usually it is very crowded. Usually the buses will be back to back, and sometimes there will be a bus loading people here and around the corner you would have another bus loading more people up, when they are not already full. So earlier, at like 8:45, usually the bus would be really crowded and there would be a line around the corner."

- Sean, 7 Rider



"I usually ride the 7 bus every day to go to work. **I am left behind every day** because the buses are too crowded. I often take other forms of transportation, Yesterday I took Uber, because I didn't feel like waiting for 3 buses until I could get on. - Kate, 7 Rider

# How do we define crowded?



## MAGNITUDE

Measure amount of passenger time that is uncomfortable.

## PROPORTION

Percent of passenger time that is comfortable

*The target is for bus routes to have over 96% of passenger minutes in comfortable conditions.*



# What does crowded look like?



**150% of seated capacity**

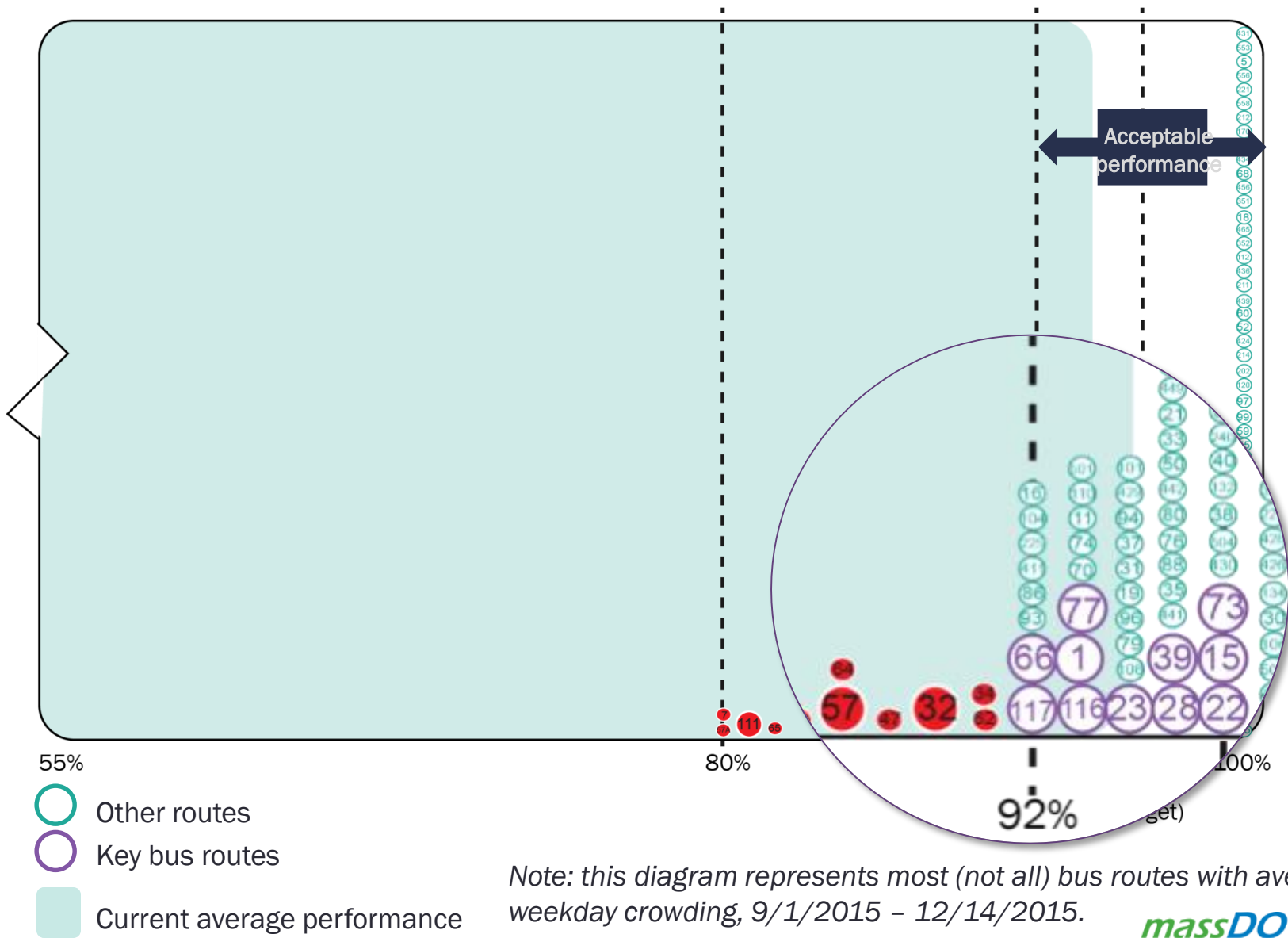
*Above 140% of seated capacity, all passengers are considered uncomfortable*

**154% of seated capacity**





# Current Performance by Route



Note: this diagram represents most (not all) bus routes with average weekday crowding, 9/1/2015 - 12/14/2015.

# CROWDING ANALYSIS

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# Multiple types of analysis

## Temporal

When is crowding occurring by route

## Spatial

Where is crowding occurring by route

Where is crowding occurring by street segment (for municipal partners)

## Causes of crowding

By route by time of day

*Research conducted in partnership with the MIT Transit Lab*

# Route by Route Tool

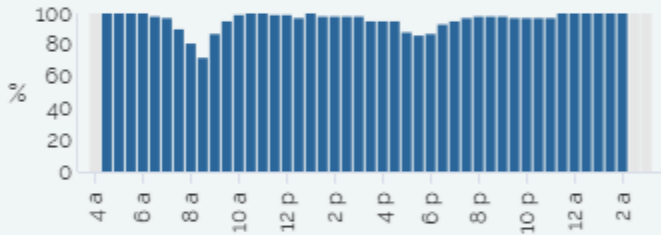
1 ▾ Route #      1 ▾ UPT      Route      CF: 93%      UPT: 185.8 h

Inbound       Outbound      Direction      CF: 93%      UPT: 87.6 h

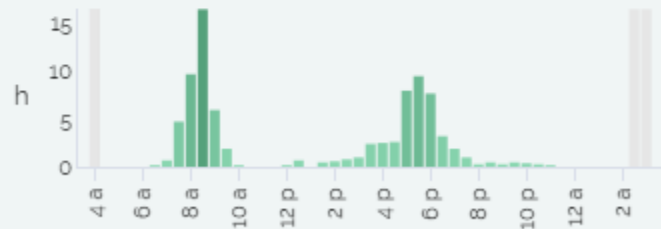
Daily sum       1/2 h period      Period      CF: n/a%      UPT: n/a h

Showing values for *inbound* passengers.  
*All periods* selected.

Comfort Fraction (CF)



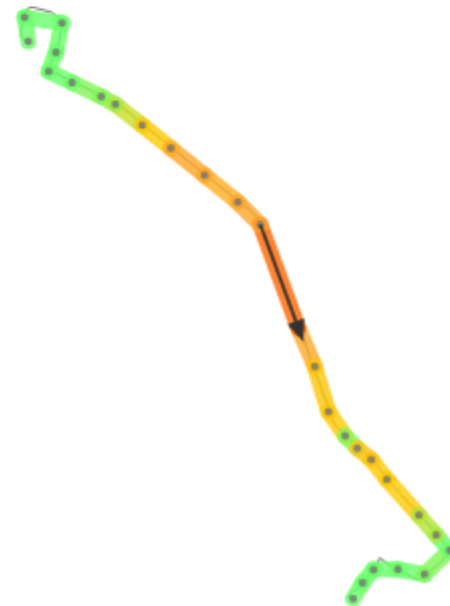
Uncomfortable Passenger Time (UPT)



best in system      worst in system

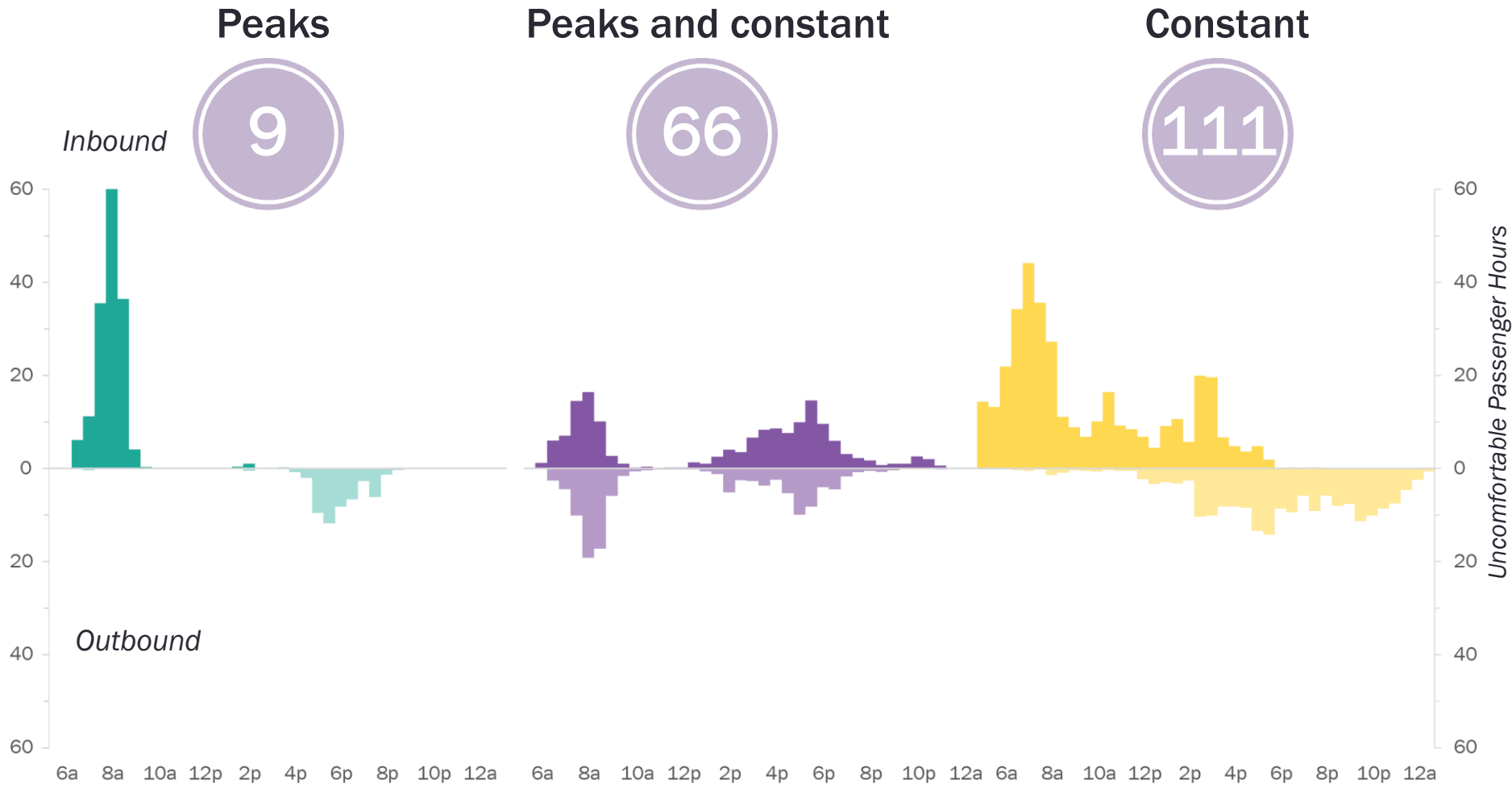
Segment      CF: 82%      UPT: 30.8 h  
 Beg. Stop      84 Massachusetts Ave (ID: 75)

Uncomfortable passenger time by *segment* for inbound trips and *all periods*. Select a single period using the slider or bar chart.



0.0    0.6    15.4    30.8 h

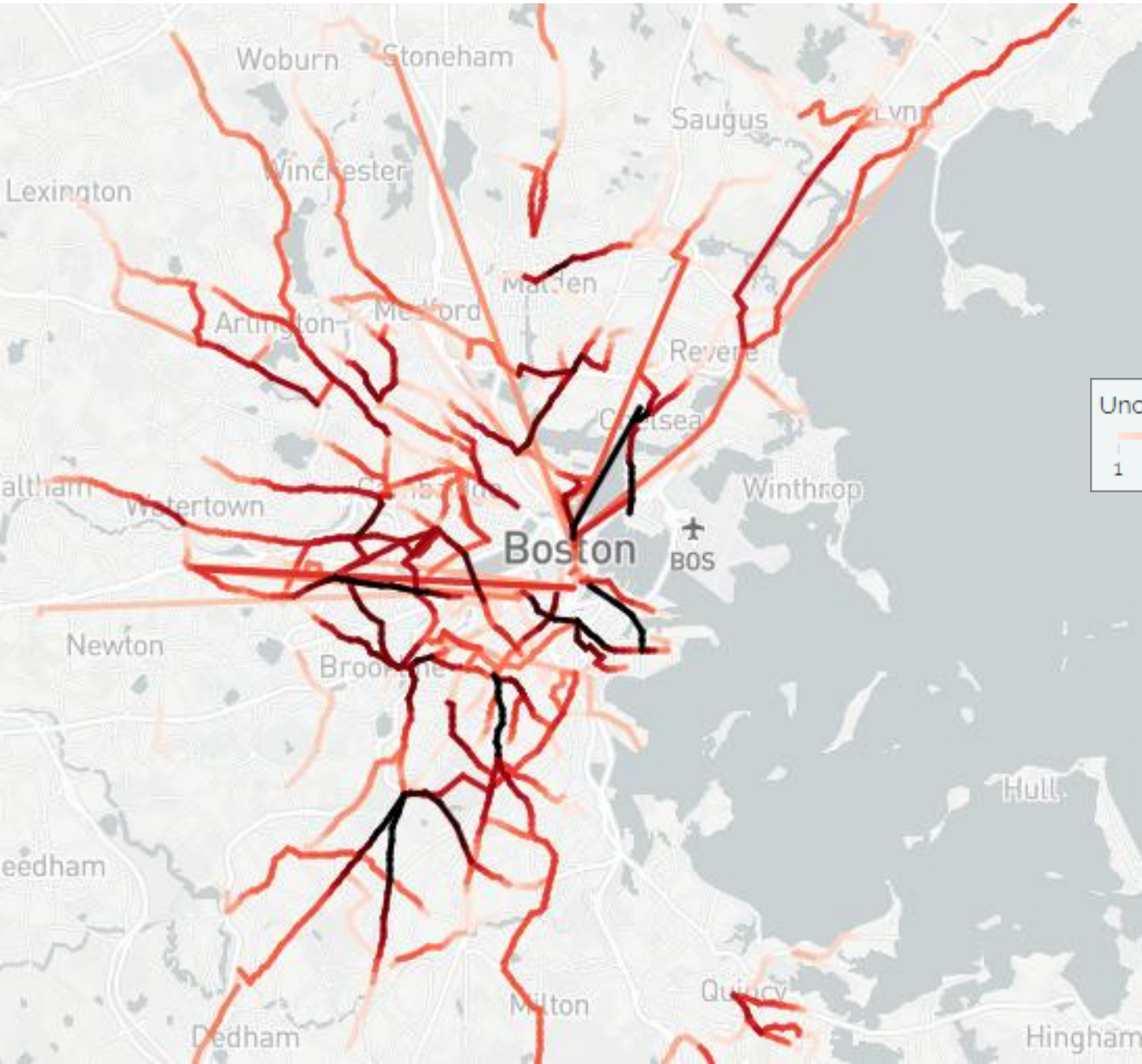
# Temporal Patterns



Data reflects an average weekday in Fall 2015.



# Most crowded street segments



This map shows how many passengers experience crowding on inbound trips, totaled across all bus routes that use each street.



Long straight lines represent express buses that use highways without stopping.

*Data reflects an average weekday in Fall 2015. Routes SL1, SL2, SLW, 71, and some Limited Service routes are excluded due to insufficient data.*

# Causes of bus crowding

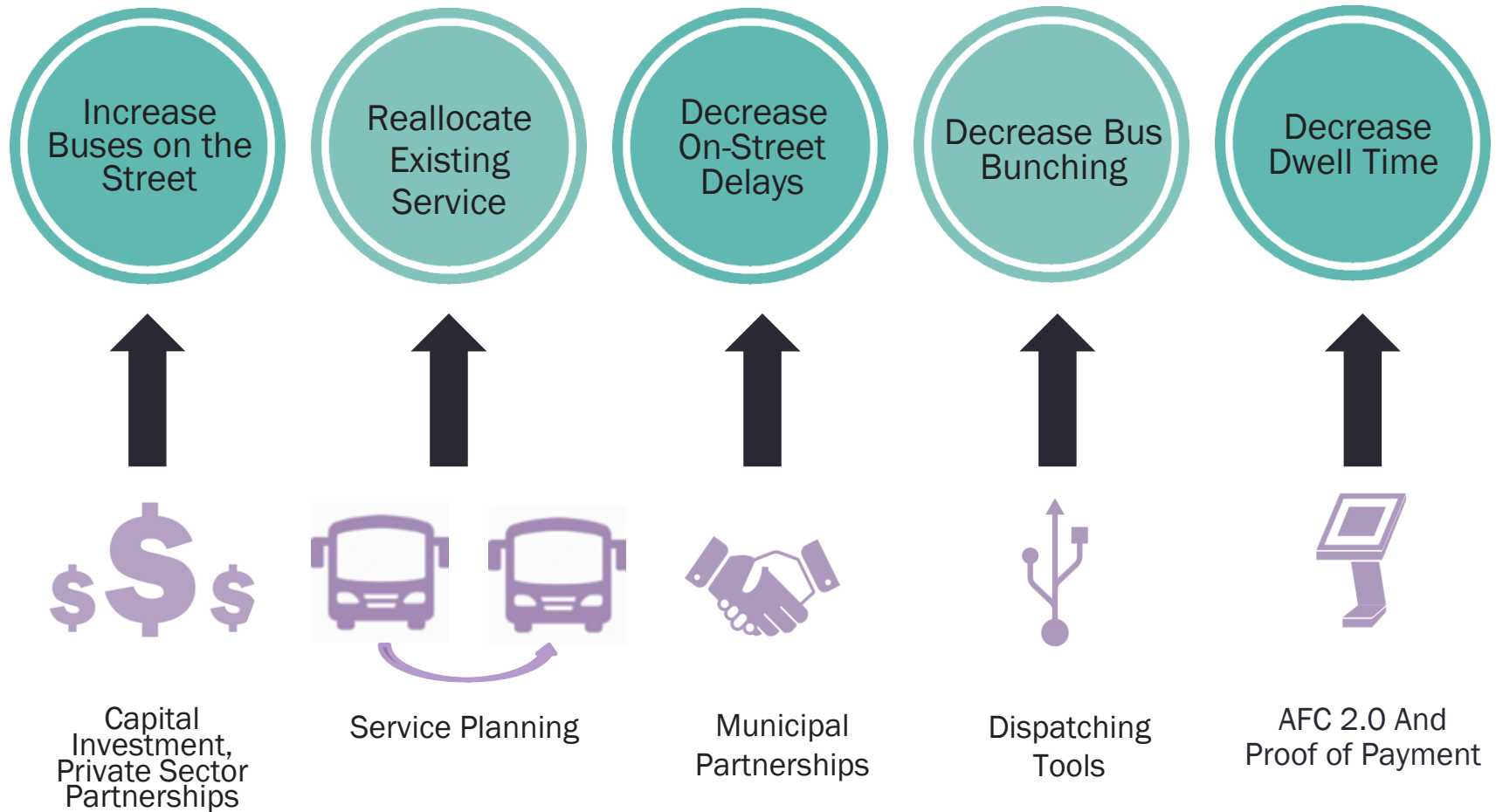
Crowding caused by:

- **Headway Variability**
- **Demand variability within a day** (uneven demand within 30 min periods)
- **Dropped trips**
- **Demand variability between days**
- **Planned frequency** (not enough service if demand uniform)



Data reflects an average weekday in Fall 2015.

# What tools can we use to address crowding?





# QUESTIONS

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