Transit Priority in Cambridge

Cambridge Transit Advisory Committee: January 13, 2022

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Agenda

• Background and Overview
  • Overview of Transit Signal Priority
  • City Priorities and Funding

• Implementation Considerations
  • Consideration #1: Working with 50+ Munis
  • Consideration #2: Data Collection Methods
  • Consideration #3: Stop Bar Arrival Time Estimates

• Next Steps for Cambridge and MBTA Collaboration
Delivering bus priority projects is different:
While MBTA operates the service . . .
we rely on municipality-owned signals, streets, and curbs for every trip.
Every project is a collaboration to improve travel time and reliability.
Transit Priority Vision

Data-driven

Founding based on successful pilots and on Prioritization of Dedicated Bus Lanes Report (CTPS, 2016)

Collaborative

Four dedicated staff working with many, many internal and external stakeholders

Implementation Focus

Collaborating with stakeholders to deliver projects that improve travel time and reliability for buses*

*and light rail TSP for at-grade signalized intersections.
Transit Signal Priority History at MBTA

- **Silver Line TSP** 2002
- **Green Line TSP** 2016
- **Local Bus TSP** 2017 onward
- **NextGen TSP Spec** 2021 onward

- **Consultant-managed backend technology**
- **MBTA CTD-managed backend technology**
- **TSP Coordinator hired to advance program**

We knew that we want to expand TSP, that the current system’s effectiveness is unclear, and that better technology is available.
Transit Signal Priority reduces the time buses and Green Line wait at traffic lights.

- **Green Extension**
  *Extend the green phase*

- **Red Truncation**
  *Shorten conflicting red phases to get green light sooner*

- Other, less common methods
Strategizing NextGen TSP

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
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</thead>
<tbody>
<tr>
<td>What signal technology to choose?</td>
<td>Issued Request for Information (RFI)</td>
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<tr>
<td>How to measure TSP operations?</td>
<td>Developing metrics and collecting better data</td>
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<tr>
<td>Stop bar arrival predictions are cumbersome to calculate</td>
<td>Implement ‘learning’ technology</td>
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<td>TSP recommendations based on 2015 specification</td>
<td>Developing updated specification</td>
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**Goals:**
- Measure TSP benefits at the intersection level
- Identify issues without manual measurement
- Calibrate operations remotely
- Provide updated specifications for TSP equipment to jurisdictions
- Better operationalize implementation and evaluation for TSP
## Comparison of TSP Approaches

<table>
<thead>
<tr>
<th>Generation</th>
<th>Activation</th>
<th>Prediction</th>
<th>Evaluation</th>
<th>Result</th>
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<tbody>
<tr>
<td>Legacy Bus</td>
<td>Single zone</td>
<td>Manually estimated and field verified</td>
<td>Field observation; AVL (not TSP-specific)</td>
<td>Unable to clearly measure results and system success</td>
</tr>
<tr>
<td>Current Bus</td>
<td>Multiple zone</td>
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<tr>
<td>NextGen</td>
<td>AVL-based and/or intersection detection</td>
<td>Can improve automatically over time; Context-sensitive</td>
<td>Semi-automated; Data feed returned from intersection</td>
<td>Adaptive timing and measurable results</td>
</tr>
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Consideration #1: Working with 50+ municipalities

- Variability across region
  - Centralized vs Decentralized
  - Signal Technology and Condition of Existing Equipment
  - Political Structure, Internal Processes and Traffic Signal “Business Rules”
Addressing Consideration #1: Uniform Signal Ecosystem

• Vendor Agnostic and Interoperable

Data Driven Decision Making!
Consideration #2: Data Challenges

- Granularity of AVL data is not sufficient for TSP measurement
- Traditional ATSPM data is not transit-focused
- Existing data collection is labor intensive
Addressing Consideration #2: Developing TSP-specific Insights

- Prospective Metrics
  - Effectiveness KPIs
  - General Travel Impacts
  - Economic and ROI calculations
  - Environmental calculations
  - Passenger benefits
  - System Health

Courtesy: Miovision
Consideration #3: Manual Stop Bar ETA Calculation

• Step 1: Place geofence downstream of nearest upstream intersection
• Step 2: Measure distance between geofence and stop bar
• Step 3: Estimate travel time based on assumptions
Addressing Consideration #3: “Learning” ETA calculation

- Predictive, continually improving
- Start with simple travel time
- test adding factors to improve ETA:
  - Historical ETA
  - Temporal
  - Weather
  - Traffic
  - Dwell Predictions
- Iterate
Current Cambridge TSP Priorities

• City Grants for Participatory Budgeting:
  • Issued: 2016
  • $250,000
  • Location: TBD, but likely Mass Ave

• Community Connections Grant (MPO):
  • Issued 2019
  • $140,000
  • Location: Concord Avenue (9 signals)

• Other Opportunities for Ongoing Implementation
  • MBTA capital funding
  • Bus Network Redesign
  • Discretionary grant programs
Conclusion

• Transit Priority Group Focus
  • Data Driven
  • Collaborative
  • Implementation Focus

• Opportunities for TSP
  • Vendor Agnostic & Interoperability
  • Transit Specific SPMs
  • Predictive and Adaptive Stop Bar ETAs

• MBTA as an Implementation Resource
Thank you!

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