



Transit Priority

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Policy Briefings to
Boston City Council's
Committee on Parks,
Recreation, & Transportation

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What Does Transit Priority Look Like?

Zurich	Near zero traffic delay, impeccable punctuality for trams
The Hague	Bus lane, tram reservations, priority at all traffic lights
Portland	Green wave for light rail station-to-station; priority for buses as well
Salt Lake City	Priority for light rail at all traffic lights
Boston	All (i.e., underground) or Nothing, mostly

Why Transit Priority Makes Sense

1. Transit use benefits society in terms of
 - Air quality, climate impact, sustainability
 - Vibrant, livable communities
 - What is our future?
2. Priority determines whether people are switching *to* transit or *from* transit
 - Priority breaks the vicious cycle

Some More Reasons

3. We're serving people, not vehicles
 - On Huntington Ave @ Parker Hill, only 2% of the vehicles are buses and trolleys, but they carry 50% of the people.
4. Cars can reroute; transit can't
 - So giving preference to transit on selected streets won't hurt cars as much as you might think
5. "All or Nothing" doesn't make sense

Grading our Traffic System:

How Much Does Traffic Congestion Harm Transit?

Route	Passengers (Million/y)	<i>Impact to MBTA Operations</i>		<i>Impact to Riders</i>		Total (\$M/y)	Cost per passenger
		running time impact (\$M/y)	recovery time impact (\$M/y)	riding time impact (\$M/y)	wait + buffer impact (\$M/y)		
1	4.1	0.80	0.41	2.3	3.8	7.3	\$ 1.79
9	1.9	0.36	0.27	0.6	1.1	2.3	\$ 1.26
28	4.4	0.79	0.30	2.4	4.3	7.7	\$ 1.78
9 Routes	25.9	5.91	2.20	15.0	22.3	\$45.4	\$ 1.76

Conclusion: The grade is F.

Why Is This Allowed To Happen?

Silver Line Waterfront at D Street Buses with 60 people wait for up to 60 seconds, sometimes with only 4 or 5 cars going by.

Roxbury Crossing Buses wait for 3 minutes or more to turn left because the left turn green time is too short to clear the queue

Huntington Ave., Mission Hill Green Line & buses move at walking speed, even though they're 70% of the road users.



Anti-Priority on Beacon St, Brookline

How could this happen?

How could it take more than a year to fix this?



Cars have green while Green Line is held
(white bar is horizontal)



15 seconds later, Green Line finally gets
“green” (white bar is vertical)

Mechanisms / Incentives

- MBTA: Measure, advocate, be creative
 - Brussels example
- State: Give incentives for transit priority
- City: Make serving transit well an institutional priority
 - Objectives, measurement, resources, rewards
 - Staffing, interns

Low-Tech Priority

- Signal timing to favor bus flows
 - Especially at left turns, busway intersections, and near terminals
 - Longer maximum green
 - They only use what they need, so it hardly hurts other traffic
 - Reservice
 - Two bus phases per cycle
 - Reserve only when a bus is waiting
 - Coordinate signals for bus movements
 - E.g., Silver Line at Temple & Tremont; Ruggles Station

Low-Tech Priority (cont'd)

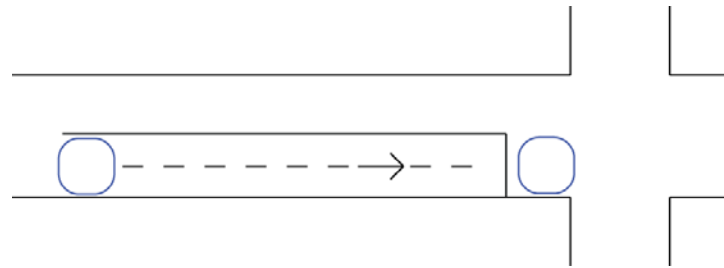
- Peak period parking restriction / bus lanes
 - Everett is doing it on Main Street
- Bus stop improvements
 - Far side instead of near-side
 - Bus bulb-outs with in-line stops
 - Consolidate stops



If you care, you can find a solution

- **Silver Line approaching Dudley Square**
 - 4.4 mph, 2 to 4 minutes delay
 - Bottleneck at downstream signal (Washington & Dudley)
 - Retiming signal: Save 2 minutes for bus, no impact on cars
- **Ruggles Station (96 buses/h, 4 signals)**
 - 80 s average delay
 - Reduce to 40 s with simple timing changes
 - Reduce to 20 s with smart priority measures
- **D Street for Silver Line Waterfront**
 - If all else fails, post a police officer!

How Does Signal Priority Work?

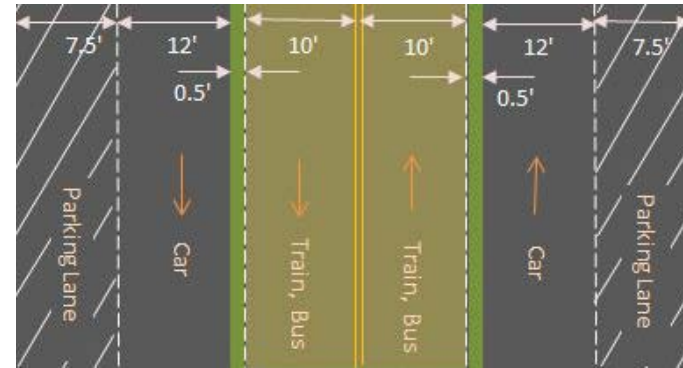


- Check-in detector (can be virtual)
 - Early enough to allow time to respond
 - Late enough to estimate bus arrival time
- Checkout detector to cancel request
 - Avoid wasted green
 - Performance measurement
- If light is green, tell it to stay green (“green extension”)
 - Big benefit, but to few buses

Good Performance Isn't Automatic

- Silver Line, Washington Street experience
 - Minor intersections with priority – almost no benefit
 - Major intersections: Priority is suspended
 - Potential on Tremont St (Temple, West, Avery)
 - Requires “smart” detection and response
- Off-the-shelf priority measures are often weak
 - Often 2-3 s per intersection benefit
 - Good performance requires careful thinking, refining (e.g., Zurich)

Sometimes Buses Need Priority is Space as well as in Time



Option A: No change in curbs, no bike accommodation

Huntington Avenue, Mission Hill Section



Option B: Shift curbs and provide cycle tracks as well

Traffic Delay Impacts, with 20% of Through Traffic Diverted (minutes)

	Outbound			Inbound		
	Bus	Train	Car	Bus	Train	Car
Existing	6.3	7.7	7.0	1.2	2.2	1.4
New	1.5	1.8	2.1	0.5	1.0	1.2

- Peak direction buses & trains save 4 to 6 minutes!

Priority-Friendly Traffic Signals

- Standard signal mode in Boston, “coordinated-actuated,” is transit-unfriendly
 - Long cycles (meaning long red periods)
 - Inflexible
 - No possibility of “compensation,” a prerequisite for aggressive priority
- Less emphasis on arterial coordination, more on short cycles

Smart & Flexible Signals

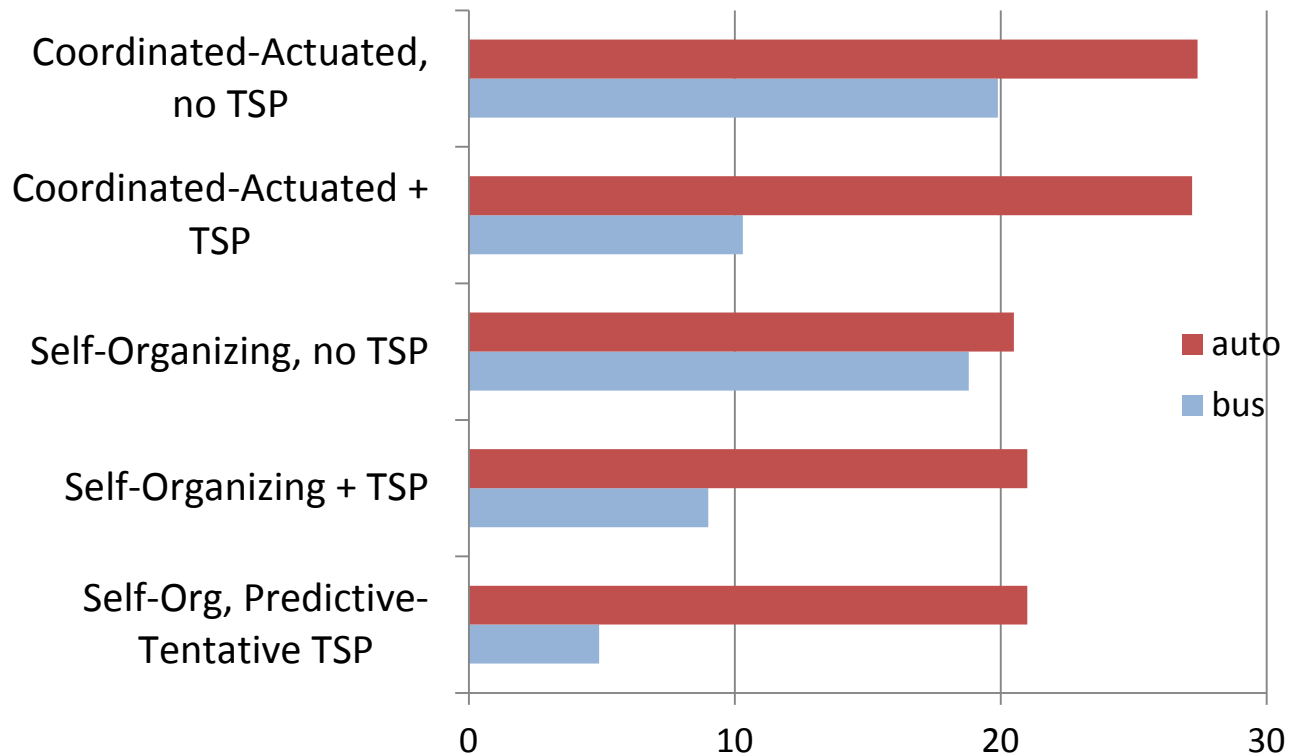
“Self-organizing signals” – coordination is organic, not fixed, and is self-healing, allowing transit interruptions

Simulation tests on Beacon Street, Brookline

	Coordinated - Actuated		Self-Organizing	
	No TSP	TSP	No TSP	TSP
Average Network Delay (s/vehicle)	68.4	74.0	58.6	67.1
Train Delay per intersection (s)	20.2	13.7	21.2	7.1

Simulation Test on an Arterial in Phoenix

Average Intersection Delay (s), Auto and Bus



Conclusions

- Taking responsibility
- Goals, performance measures, rewards
 - Mechanisms, incentives
 - Staffing
- Technology
 - We can do a lot low-tech
 - With clever solutions, we can do even more with our existing signals
 - Work toward having smart, flexible signal control