## Visualizing GTFS-realtime data: process and challenges of designing a transit performance dashboard



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# Can we leverage open data from GTFS-realtime to analyze and visualize transit performance?



Introduction to IBI Group

TRANSIT-performance system

Approach to designing a dashboard

TRANSIT-dashboard

Questions?



Multi-disciplinary professional services firm

2,500+ staff / 75+ offices including Boston and Seattle

Core expertise in transit / rail service planning and operations analysis

Extensive experience in Transit Technology

Increasing focus on Transit Data



IBI's Transit Data practice focuses on helping transit agencies:

Manage their data end-to-end

Provide high-quality information to passengers

Analyze and measure the quality of service provided to and experienced by customers

### Systems Integrator / Solutions:



### **TRANSIT-realtime**

Aggregate, manage and disseminate realtime locations and predictions

### **TRANSIT-alerts**

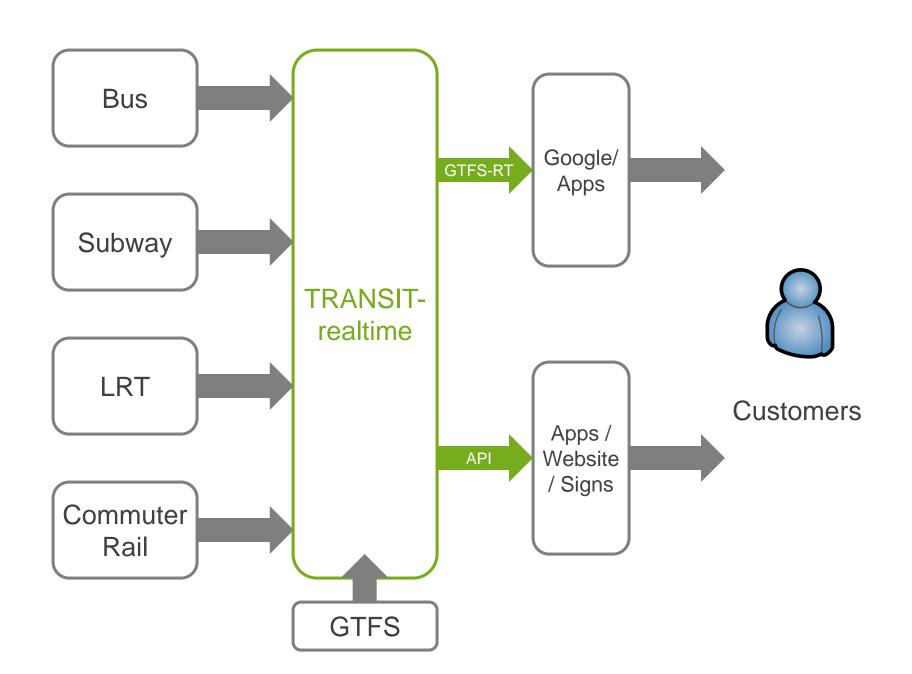
Enter, manage, and disseminate service alerts

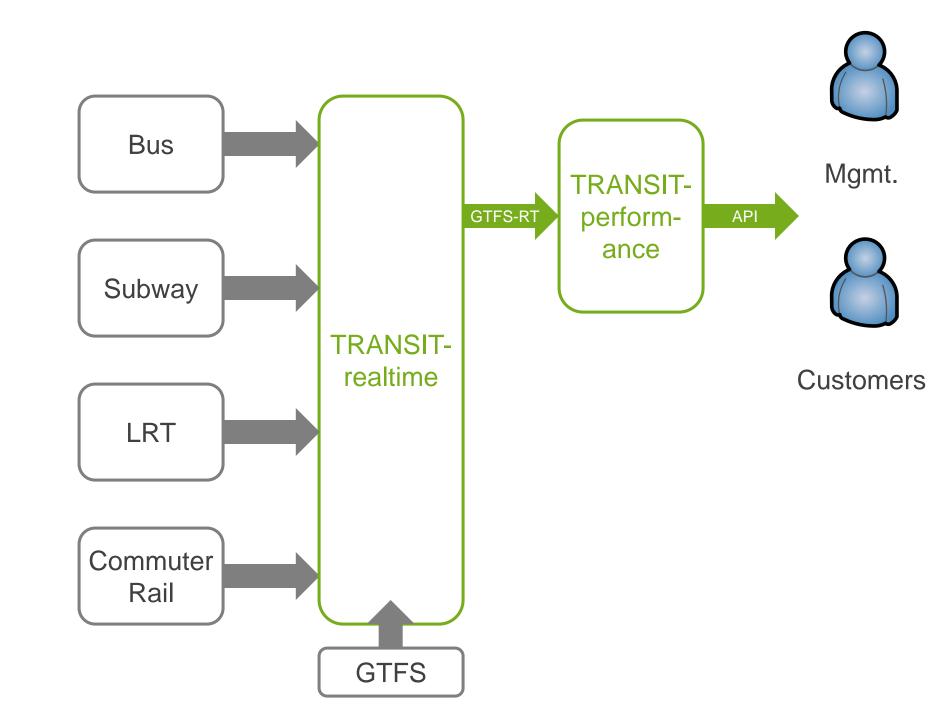
### TRANSIT-performance

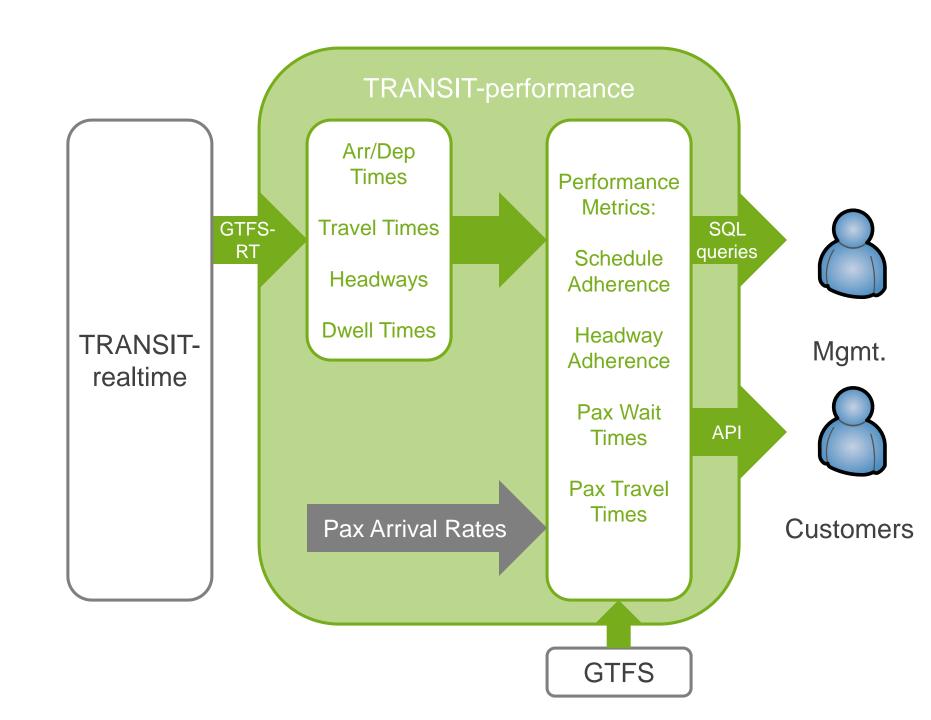
Analyze service and measure performance in real-time

All are based on open data – GTFS and GTFS-realtime

### TRANSIT-performance system









Actual arrival and departure times

Actual dwell times

Actual travel times

Actual headways

For all routes at a stop

For same route at a stop

For all routes serving an o-d pair

Actual schedule adherence

Percentage of trips that meet or exceed a set threshold

Percentage of people adversely affected beyond a set threshold



**Travel Times** 

**Headways** 

**Dwell Times** 

Schedule Adherence (in test)

**Daily Metrics** 



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"travel_times": [
 "route id": "Red",
"direction": "1",
 "dep_dt": "1457453963",
 "arr_dt": "1457454099",
 "travel_time_sec": "136",
 "benchmark_travel_time_sec": "180"
"route_id": "Red",
 "direction": "1",
 "dep_dt": "1457454401",
 "arr_dt": "1457454546",
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 "route_id": "Red",
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 "arr dt": "1457455016",
 "travel_time_sec": "141",
 "benchmark_travel_time_sec": "180"
```

How do we visualize the TRANSIT-performance data into something meaningful for management, service planners, and customers?

How do we develop a tool to understand and improve transit service?

## Thinking About the Design of a Dashboard

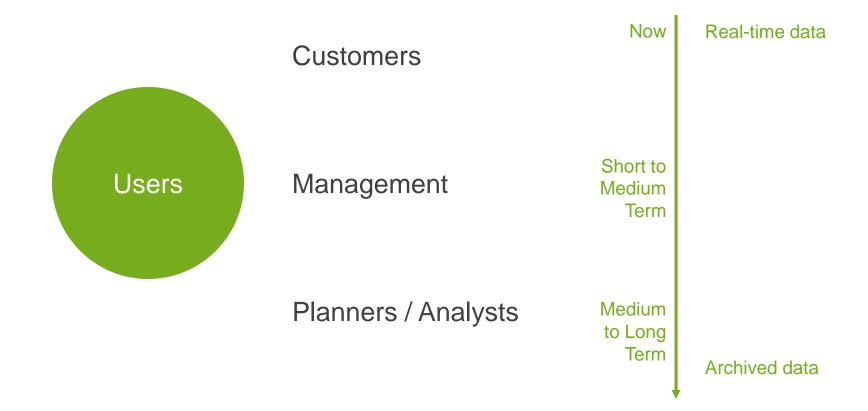


Determine requirements of functionalities

Select platform for visualizing the data

Select platform for overarching framework

Develop dashboard



### Functional Requirements:



Customizable views

Modular

**Export options** 

User interaction with charts

High quality visualizations



### Technical Requirements:

Use existing performance API calls

Flexibility to visualize multiple types of data, including geo-spatial

Easy to build and customize

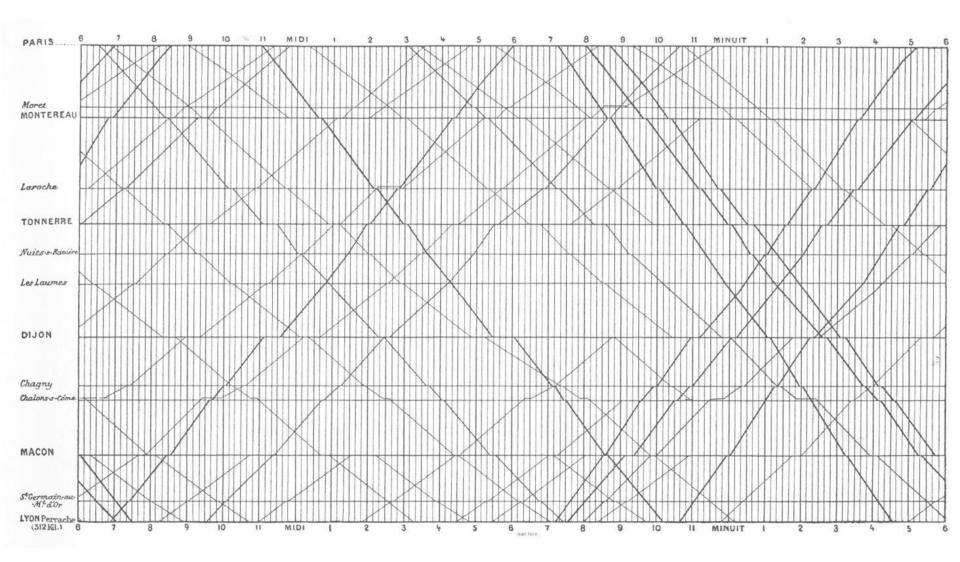
## Selection visualization platform



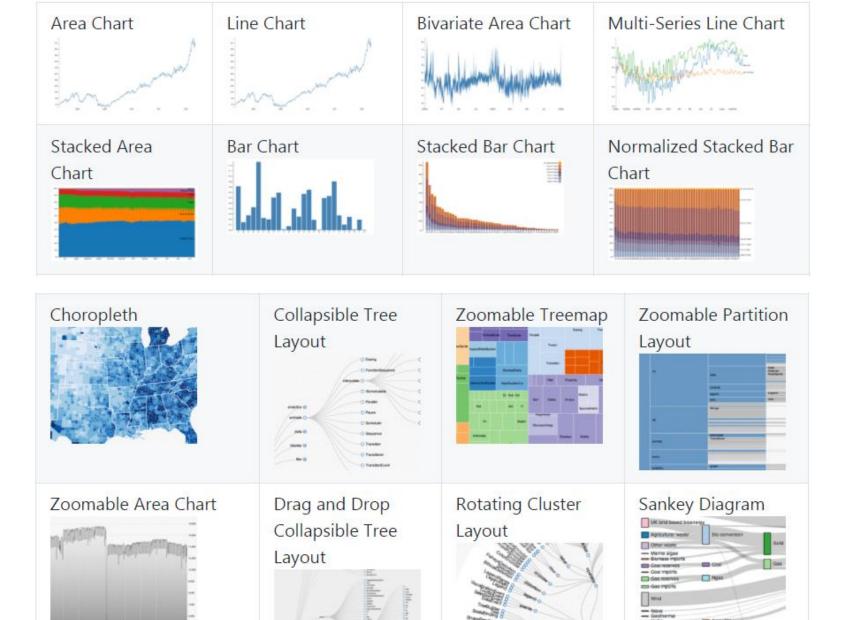
#### **Visual Index**



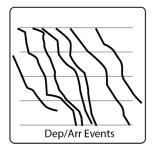
D3: an open-sourced library of data visualization scripts

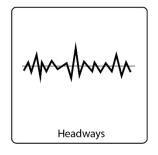


Graphic Train Schedule, E.J. Marey (1885)



Modules



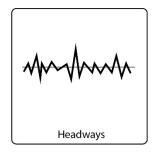




Selection of Framework

Modules

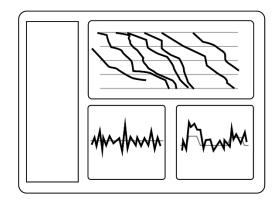


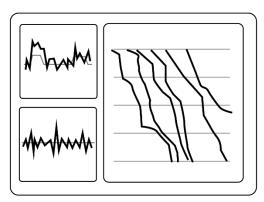


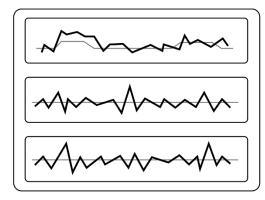


Selection of Framework

#### Framework









Compatible with D3

Add and drop charts into a single space

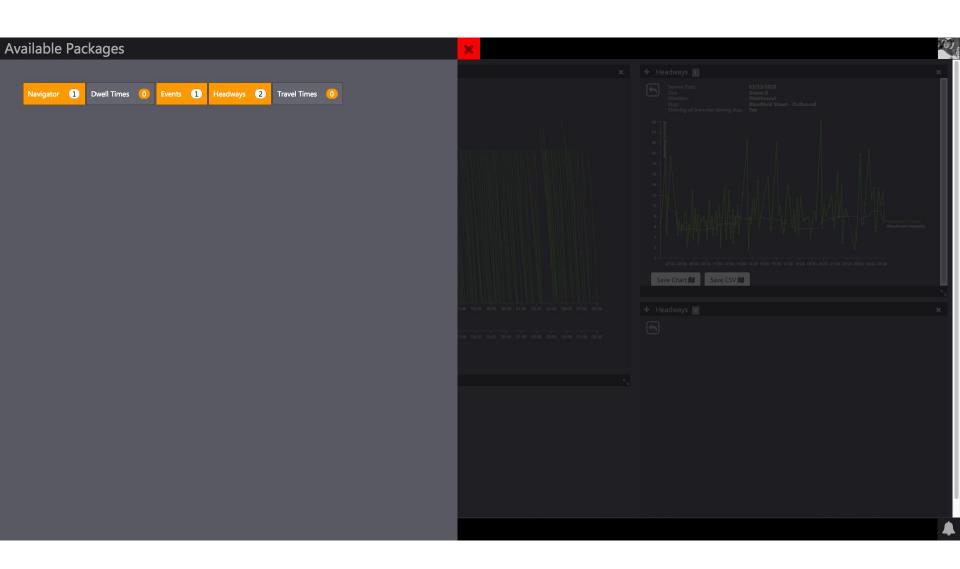
Flexibility to customize the layout of charts

Modular

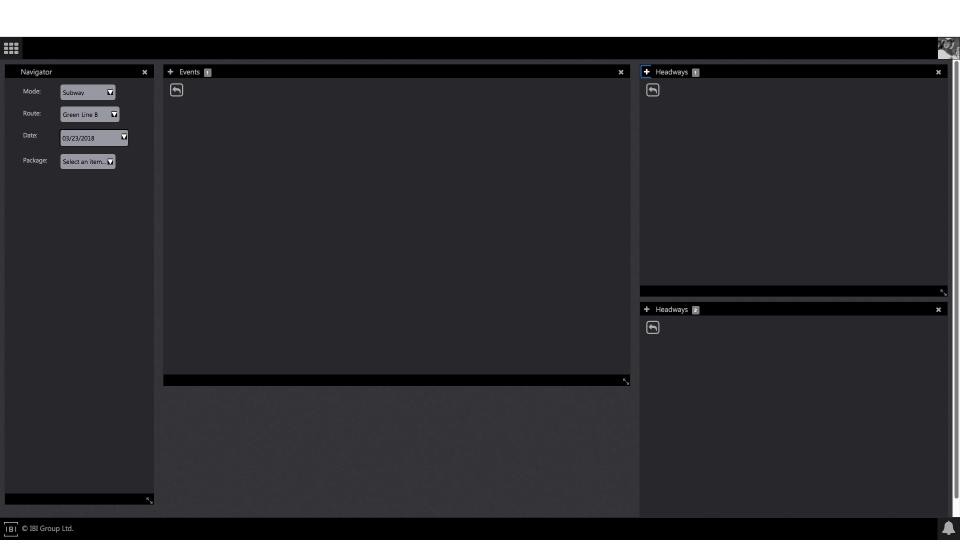


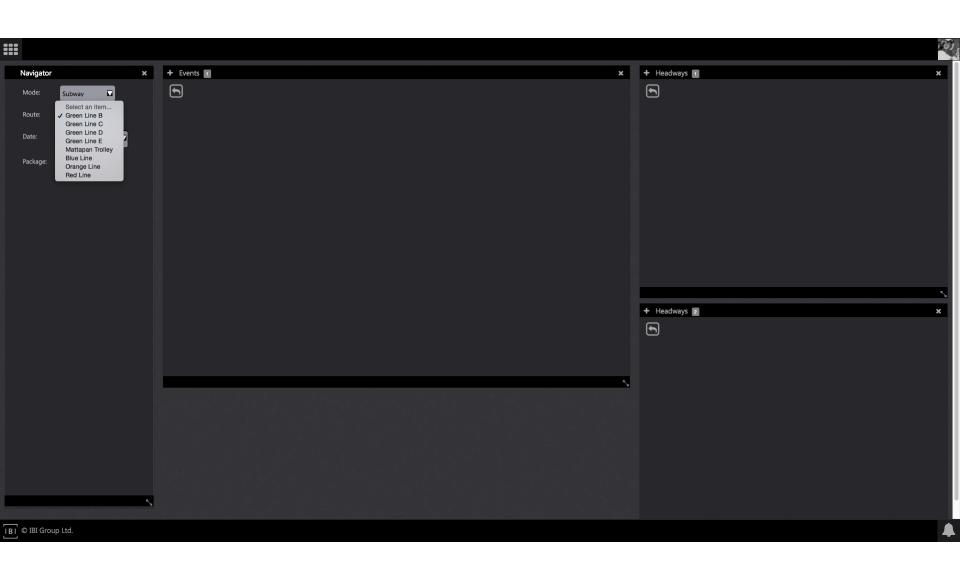
IBI Group-developed dashboard satisfied the requirements

### TRANSIT-dashboards

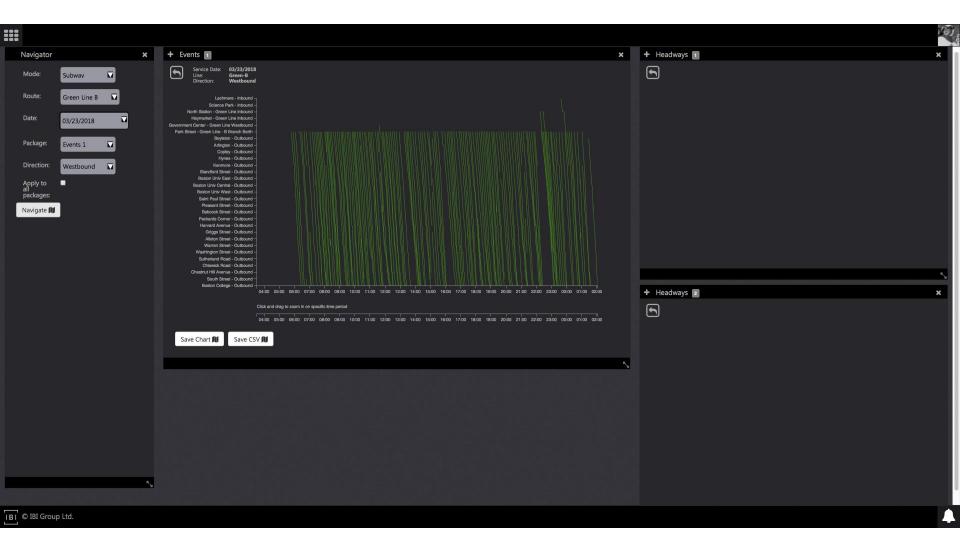


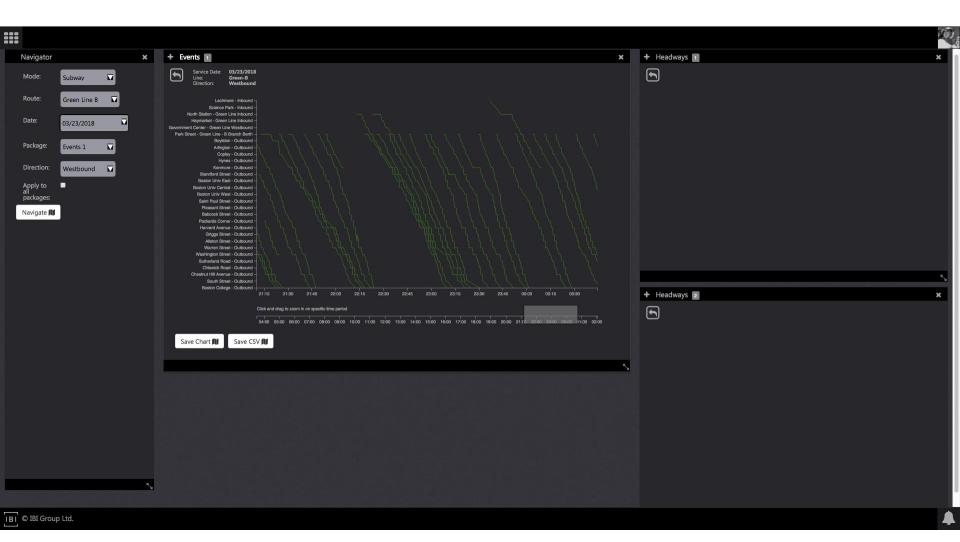


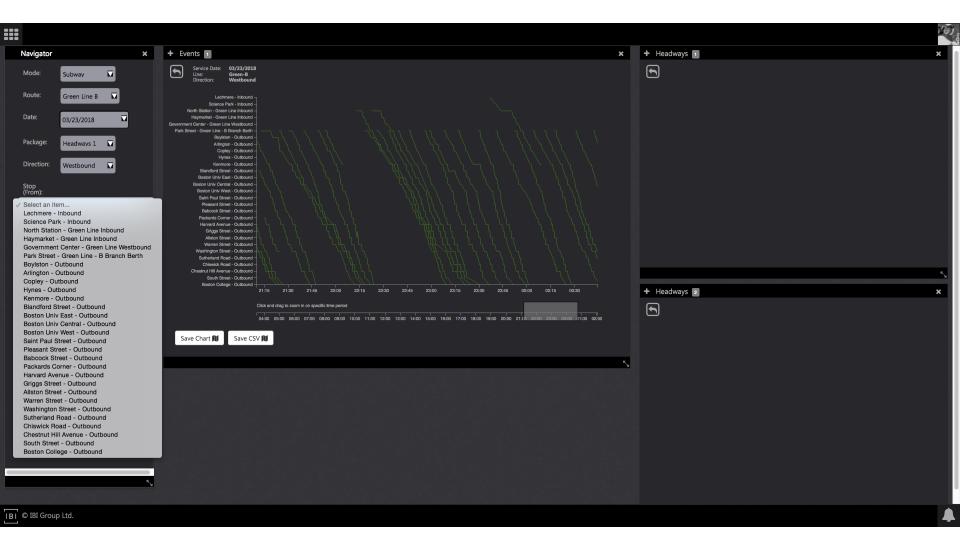




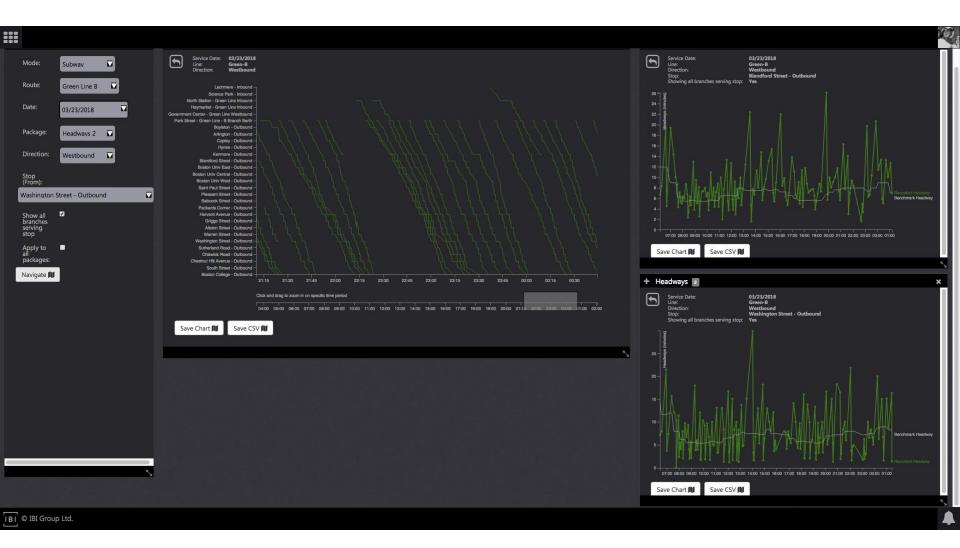




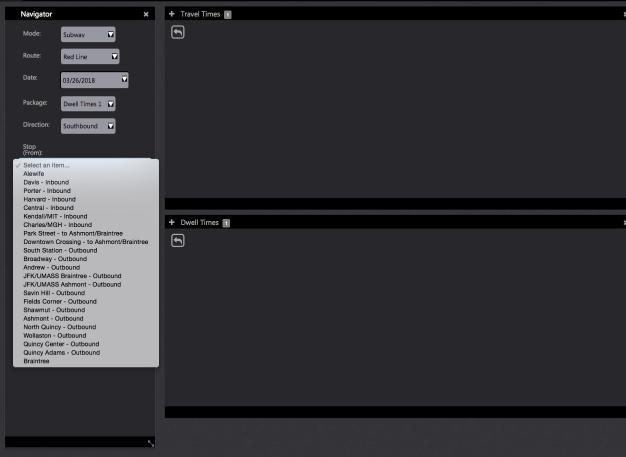
























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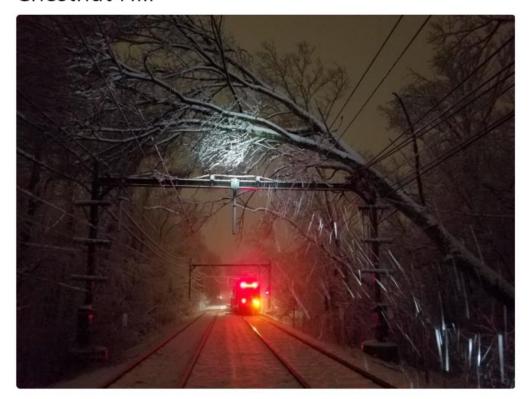


Visualize service disruptions and its effects on the line





#MBTA #GreenLine D branch Reminder: Bus shuttles btwn Riverside - Reservoir until further notice due to extensive wire damage caused by an earlier downed tree near Chestnut Hill







Visualize service delays and passenger experienced headways



MBTA • @MBTA · Mar 17

#MBTA #GreenLine E branch - Update: 10 to 15 minute delays in eastbound service due to a disabled train with a power problem at Heath Street.

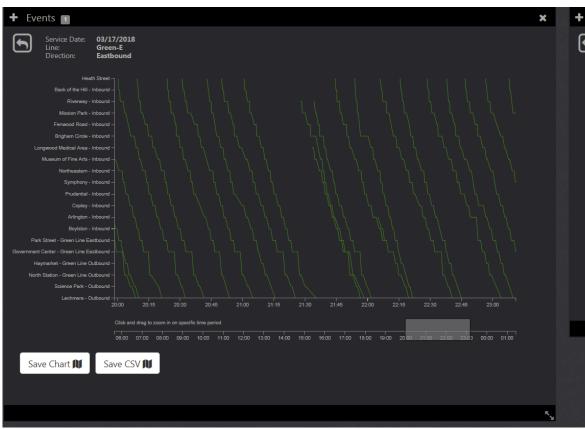
Green Line officials split the cars & continued in service. A train will be crossed from the WB to the EB to supplement EB service.



MBTA • @MBTA · Mar 17

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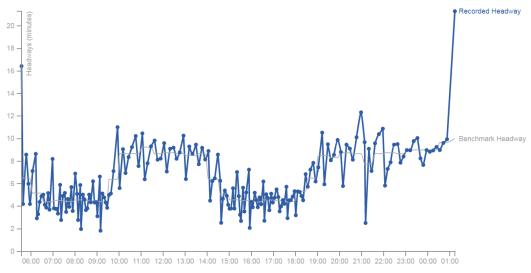
Visualize crowding and effects on dwell time





Export data from TRANSIT-performance

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Α	В	С	D	Е	F	G	н	I	J
	prev route				headway time	benchmark headway	threshold	threshold	
route i		direction	current dep dt	previous dep dt	sec	time sec	flag 1	flag 2	
Blue	Blue		3/19/2018 5:34	3/19/2018 5:18	986			threshold	id 02
Blue	Blue		3/19/2018 5:38	3/19/2018 5:34	252				_
Blue	Blue		3/19/2018 5:47	3/19/2018 5:38	515	390	threshold	id_01	
Blue	Blue	1	3/19/2018 5:53	3/19/2018 5:47	360	390			
Blue	Blue	1	3/19/2018 5:57	3/19/2018 5:53	252	390			
Blue	Blue	1	3/19/2018 6:04	3/19/2018 5:57	428	310	threshold	id_01	
Blue	Blue	1	3/19/2018 6:13	3/19/2018 6:04	519	310	threshold	threshold	id_02
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Blue	Blue	1	3/19/2018 6:23	3/19/2018 6:19	263	310			
Blue	Blue	1	3/19/2018 6:28	3/19/2018 6:23	294	310			
Blue	Blue	1	3/19/2018 6:33	3/19/2018 6:28	302	265	threshold_	_id_01	
Blue	Blue	1	3/19/2018 6:37	3/19/2018 6:33	248	265			
Blue	Blue	1	3/19/2018 6:41	3/19/2018 6:37	233	265			
Blue	Blue		3/19/2018 6:47	3/19/2018 6:41	310		threshold_	_id_01	
Blue	Blue		3/19/2018 6:50	3/19/2018 6:47	222				
Blue	Blue		3/19/2018 6:58	3/19/2018 6:50	492			threshold	_id02
Blue	Blue		3/19/2018 7:02	3/19/2018 6:58	229				
Blue	Blue		3/19/2018 7:06	3/19/2018 7:02	227				
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Blue	Blue		3/19/2018 7:13	3/19/2018 7:10	201				
Blue	Blue		3/19/2018 7:19	3/19/2018 7:13	354		threshold_	_id_01	
Blue	Blue		3/19/2018 7:22	3/19/2018 7:19	167				
Blue	Blue		3/19/2018 7:27	3/19/2018 7:22	295		threshold		
Blue	Blue		3/19/2018 7:32	3/19/2018 7:27	311		threshold_	_id_U1	
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Blue	Blue		3/19/2018 7:44	3/19/2018 7:40	237			11.04	
Blue	Blue		3/19/2018 7:50 iderland 03	3/19/2018 7:44	342	265	threshold_	_IQ_U1	





## Current modules:

Headways

Dwell times

Travel times

Departure/arrival events

## Modules in development:

Prediction quality metrics

Aggregate performance metrics

Past alerts

## Future modules could include:

Automatic passenger counts (APC)

Thank You,

Questions?

IBI

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