

An aerial night photograph of a city, likely Tokyo, showing a dense urban landscape with numerous skyscrapers and residential buildings. A multi-lane highway runs through the center of the image, with long-exposure light trails from vehicles creating bright, streaky patterns. The sky is dark with some clouds, and the city lights are visible in the background.

DB<sub>4</sub>IoT

**Making Traffic Data Accessible**

**Millions of moving objects**  
**Hundreds of millions of measurements**  
*per second*



An aerial night photograph of a city, likely Dubai, showing a dense urban landscape with numerous skyscrapers and a prominent highway with light trails from traffic. The image is in a blue-toned, high-contrast style.

DB<sub>4</sub>IoT

A Database Engine

Purpose-built  
for the *Internet of Moving Things*  
(IoMT)



# DB<sub>4</sub>IoT

## IoMT Data Isn't Big Data, It's Bigger Data

### TriMet Example

- One month, 662 buses, 5-second interval
- 30,000 bus log files, 250 million records
- 20+GB in PostgreSQL
- 4GB in DB4IoT
- 20-80 millisecond seek times
- Visualize on Maps 5x per second





## IoMT Data Isn't Big Data, It's Bigger Data

### Vehicle Movement

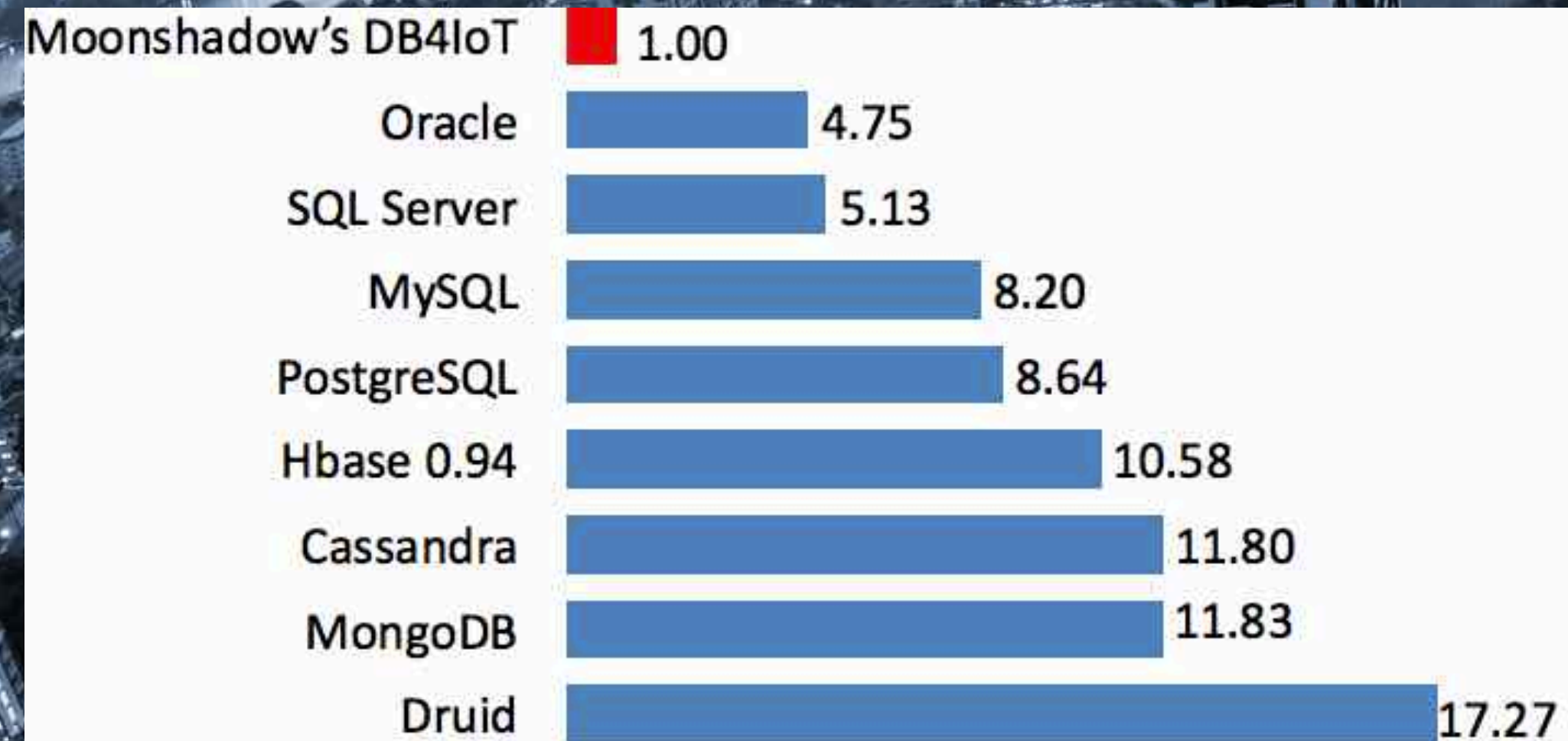
- 60 MPH = 1 mile/minute = 27 meters/second
- For <1 meter movement resolution, you need 50 measurements/second
- Now TriMet's one-month bus movement database is 60 Billion Records
- 1 Month of TriMet Bus Data = 1TB in DB4IoT
- That is for only 662 Buses



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## Solution: Make Big Data Small

### Data Footprint Size



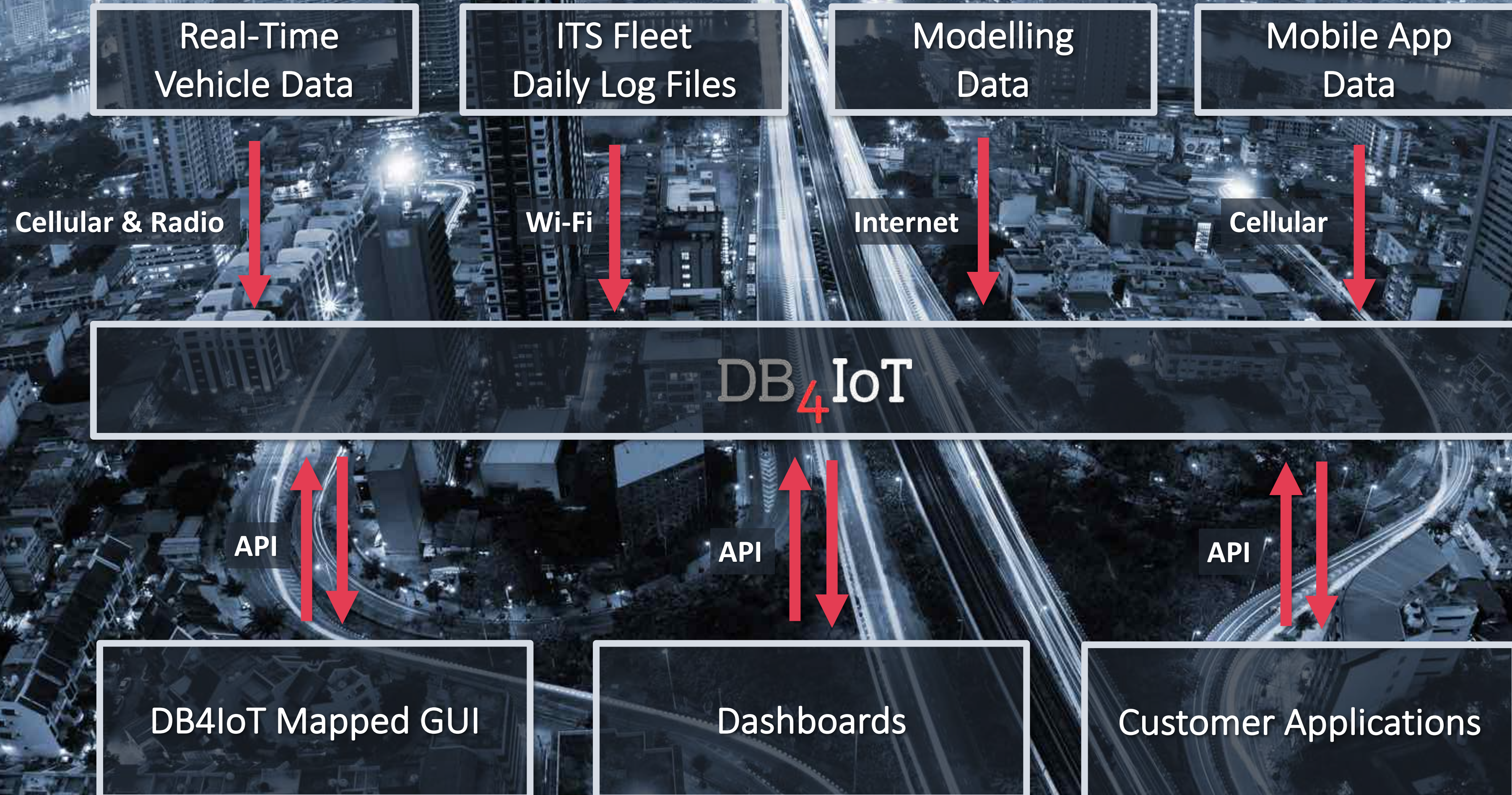
### Data Row Overhead Size





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## Storing & Retrieving Data





## Customer Example: TriMet Portland

### TriMet

- 700 Buses
- 145 Light rail
- 300,000 Weekday Trips
- 100 Million Trips/Year
- 400,000 Daily Stops





## How TriMet Collects Data

### Sensors

- Time, Location, Delay
- Acceleration, Speed
- Breaking, Lane Changes
- Passenger Counts
- Engine Diagnostics

### Gateway

- Some data is transmitted from the buses in real time via a radio or cellular connection

### Computer

- Most of the data is stored on a computer located in the bus and uploaded once per day





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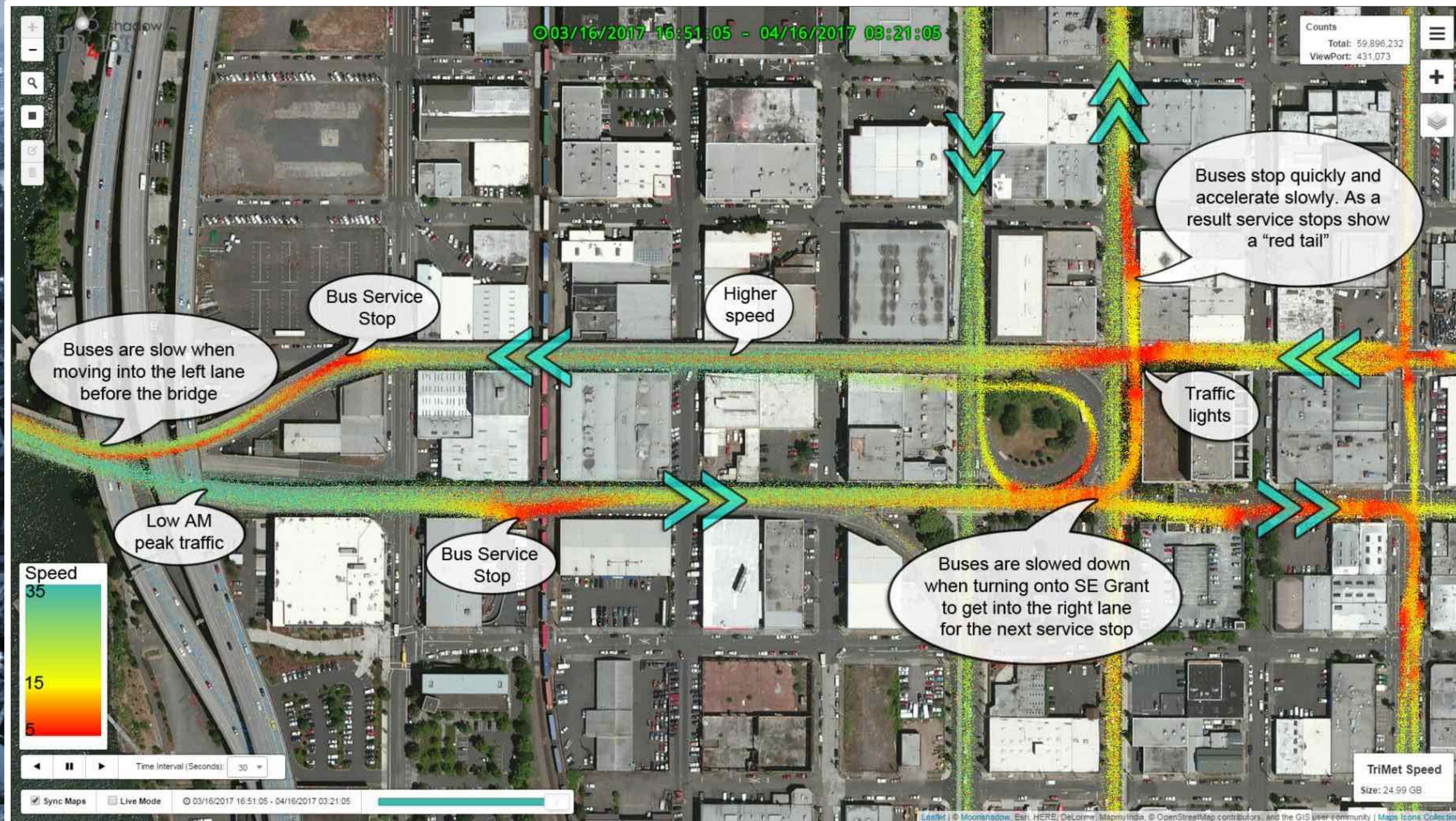
## Vehicle Speed Recordings



Data Source: TriMet



# Conclusions from the Vehicle Speed Data





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## One Week of Bus Movement Data





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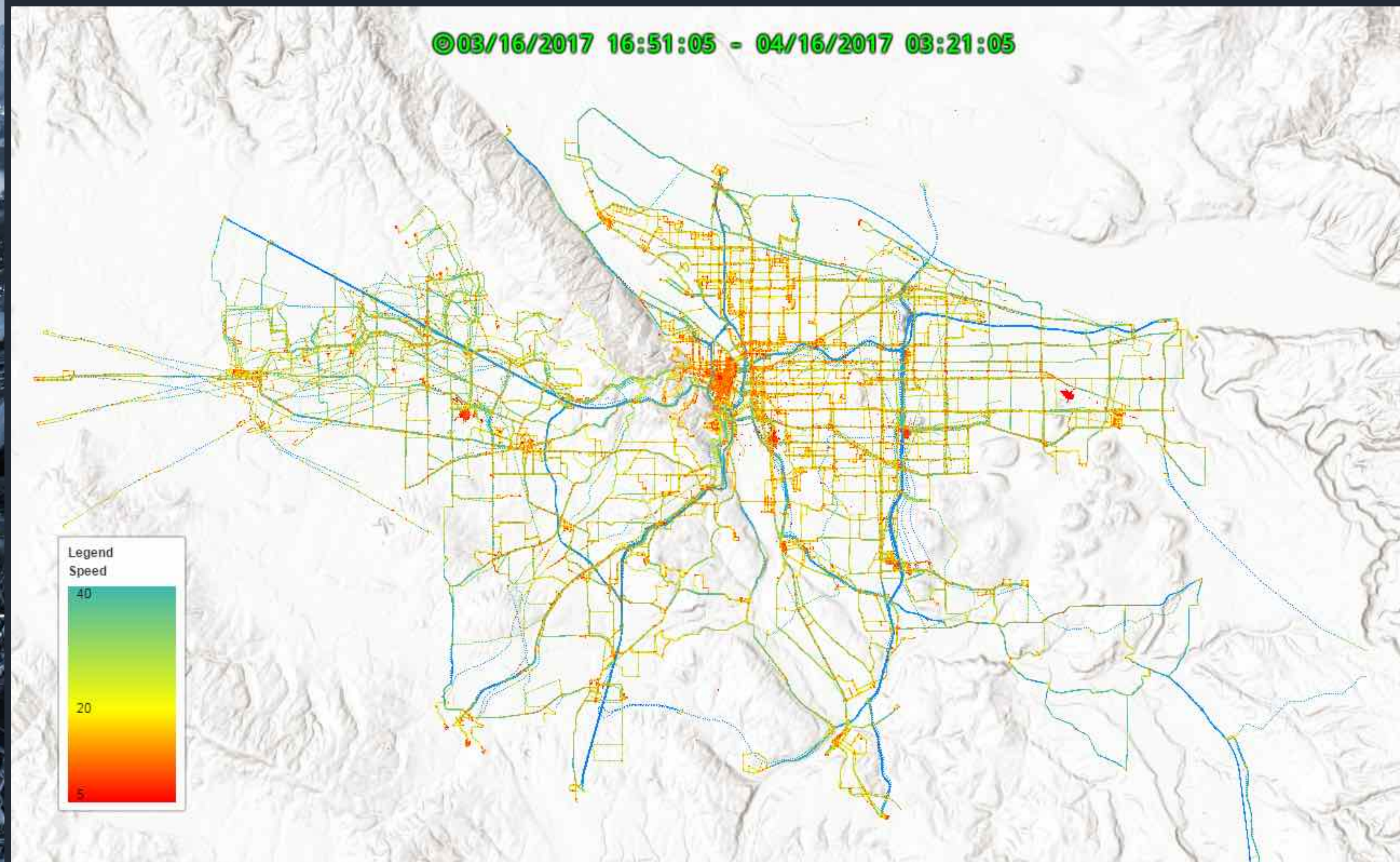
## Comparing Time Periods





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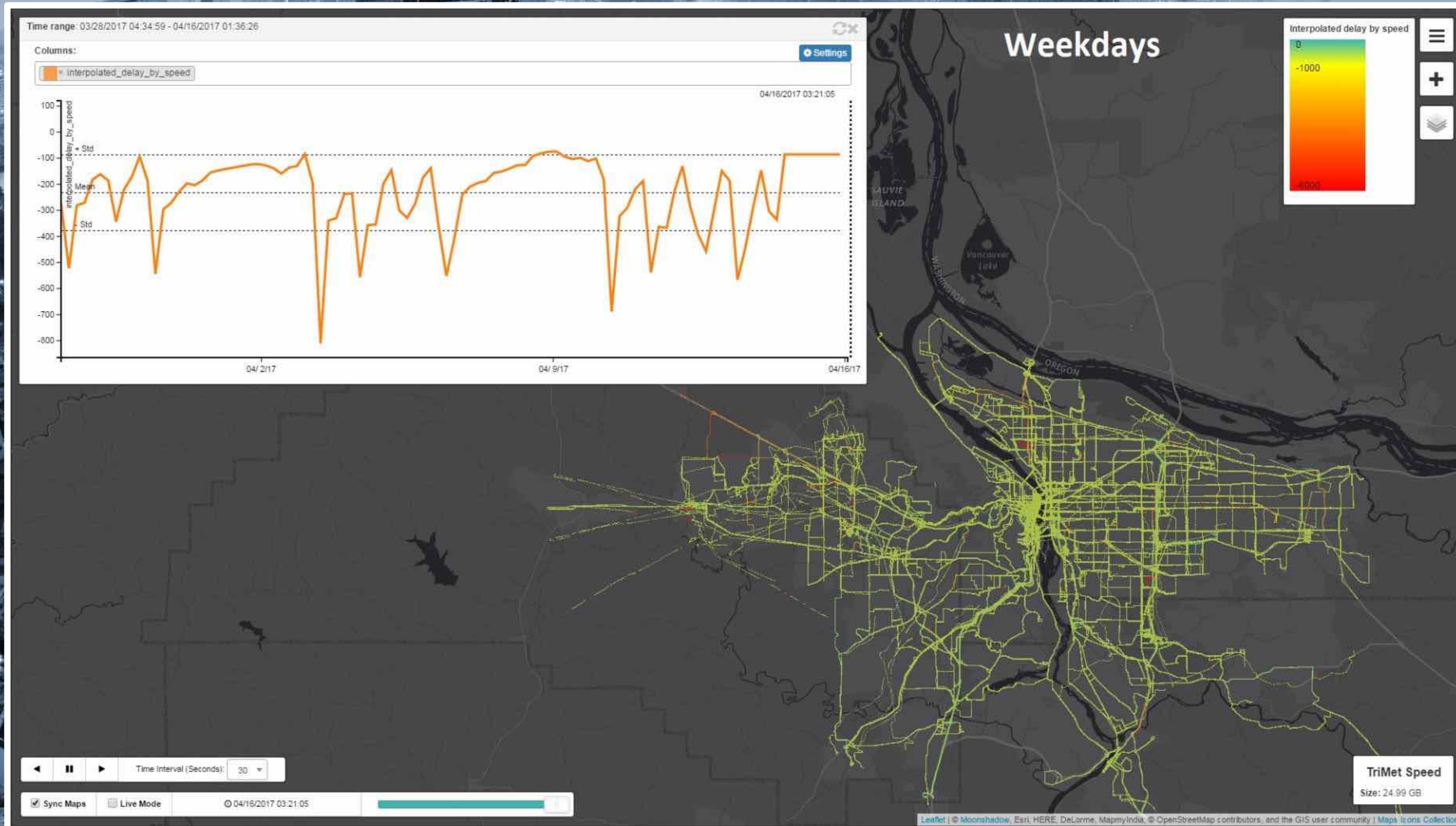
## View Entire Service System





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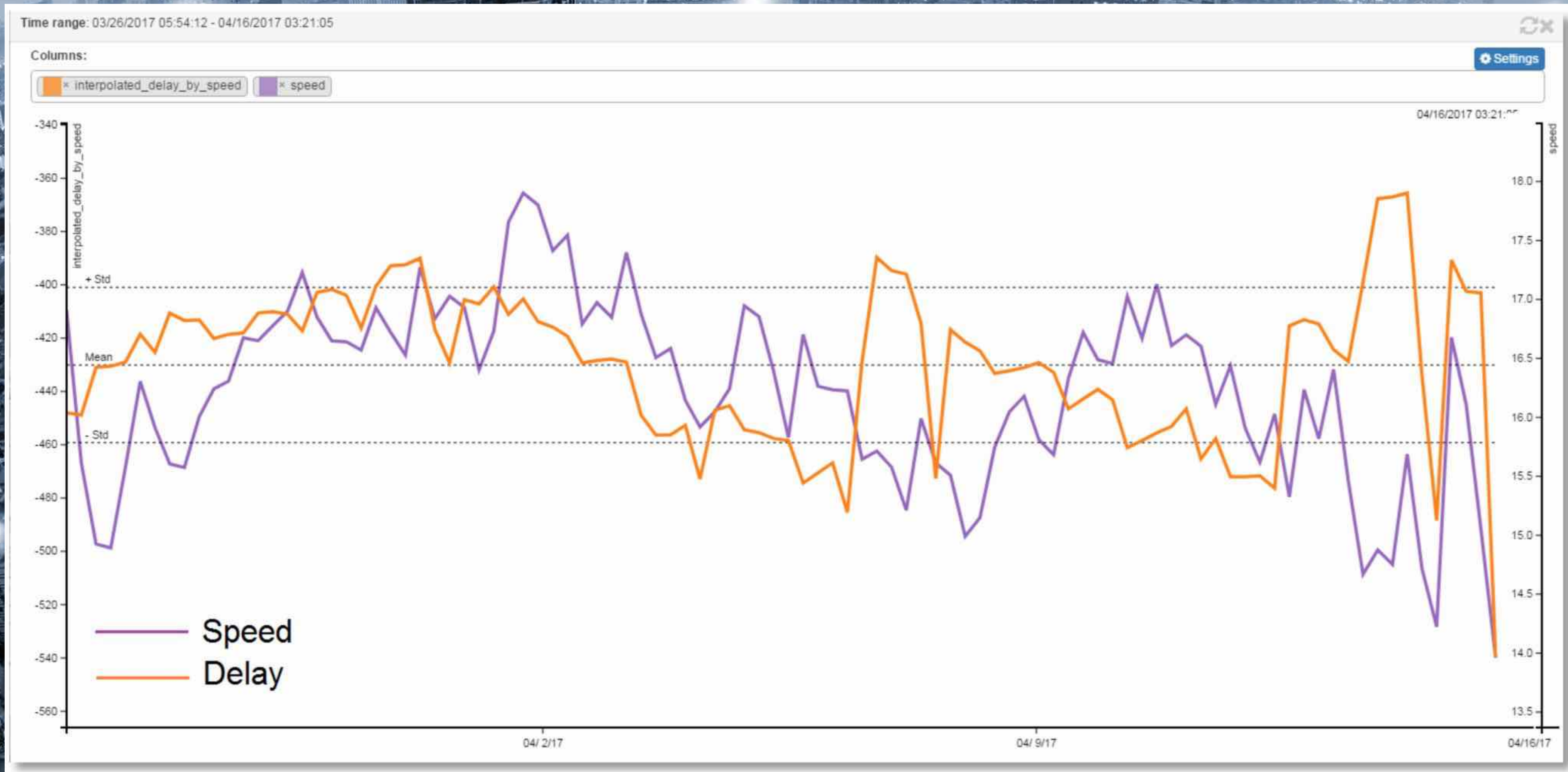
## Visualize Any Variable: Delay





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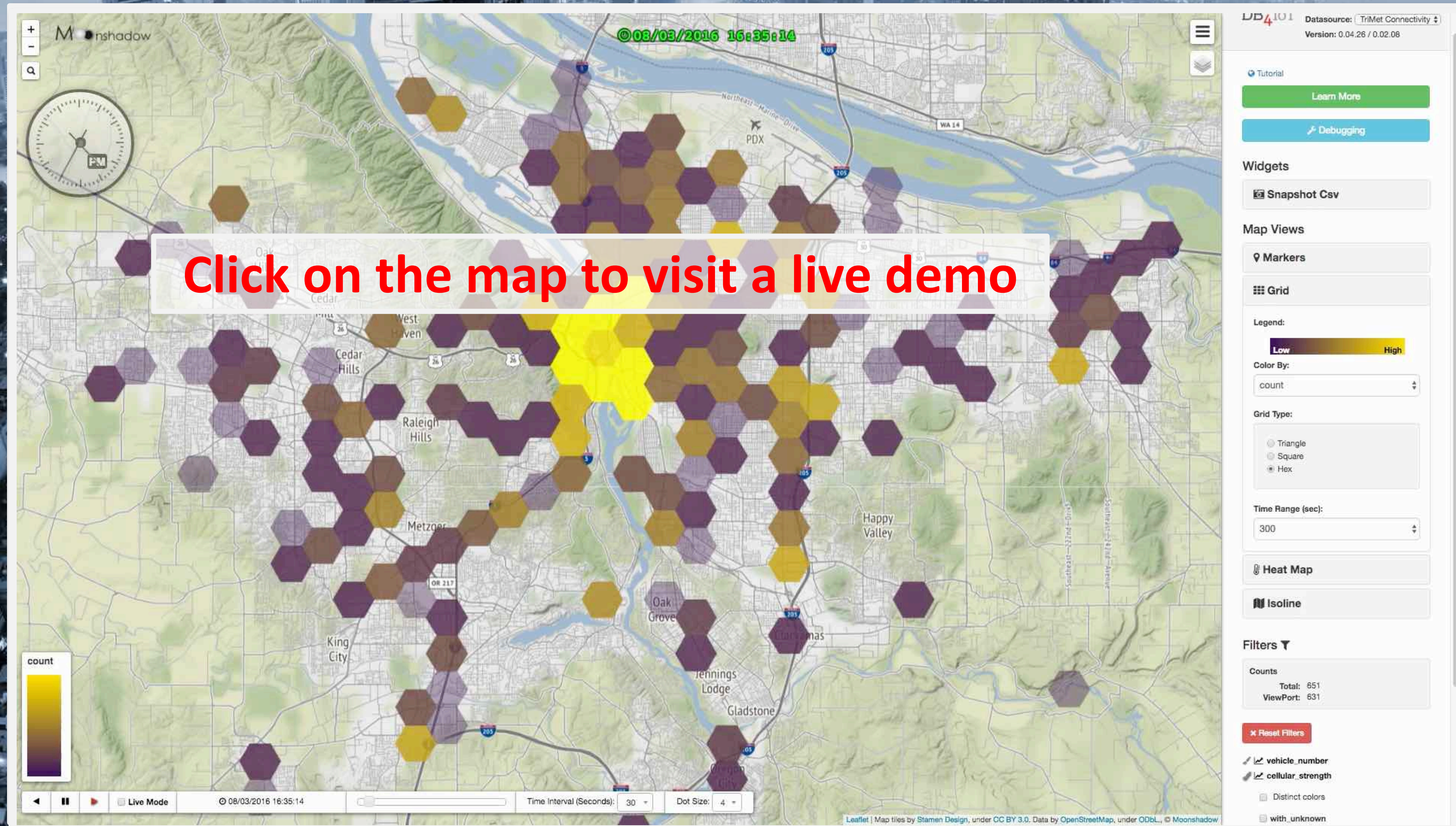
## Correlate Variables





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## Instant Visualizations Over Interactive Maps





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**Click on the map to watch the video**

The logo for DB4IoT, featuring the letters 'DB' in large black font, a red '4' in the center, and 'IoT' in large grey font, all set against a background of a stylized map with blue water and green land.

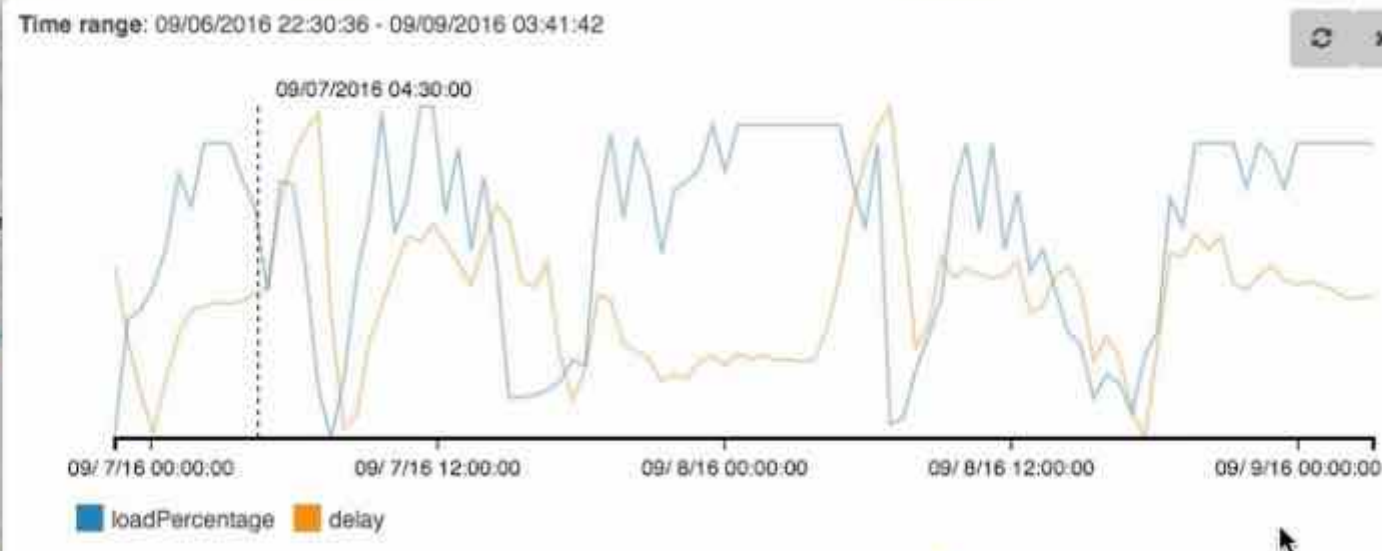
# A Day In The Life Of TriMet

TriMet provides bus, light rail and commuter rail transit services in the Portland, Oregon, metro area.

## 24 Hours:

09/07/2016 03:30 am

09/08/2016 03:30 am



Leaflet | Tiles courtesy of OpenStreetMap Sweden – Map data © OpenStreetMap, © Moonshado



An aerial night photograph of a city, likely Dubai, showing a multi-lane highway with long-exposure light trails from cars. The city skyline is visible in the background with many lit-up skyscrapers.

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## Thank You!

**M**oonshadow

Moonshadow Mobile, Inc.

Eimar Boesjes – CEO

[eimar@moonshadowmobile.com](mailto:eimar@moonshadowmobile.com)

541-343-4281

[moonshadowmobile.com](http://moonshadowmobile.com)

[db4iot.com](http://db4iot.com)