

DKS

DB₄IoT

Moonshadow

Route Analyst

Thousands of moving buses & trains
Millions of measurements
per second

Route Analyst stores this data indefinitely and analyzes it instantly

Route Analyst Uses Moonshadow's DB₄IoT Database Engine

Your CAD/AVL Data Isn't Big Data, It's **Bigger** Data

TriMet Example

- 700 buses
- 145 light rail
- 300,000 weekday trips
- 100 million trips/year
- 400,000 daily stops

One Month of Data

- 200 values per bus
- Measured every five seconds
- Stored in 30,000 daily log files
- Comprising 250 million records
- Containing 50 billion values

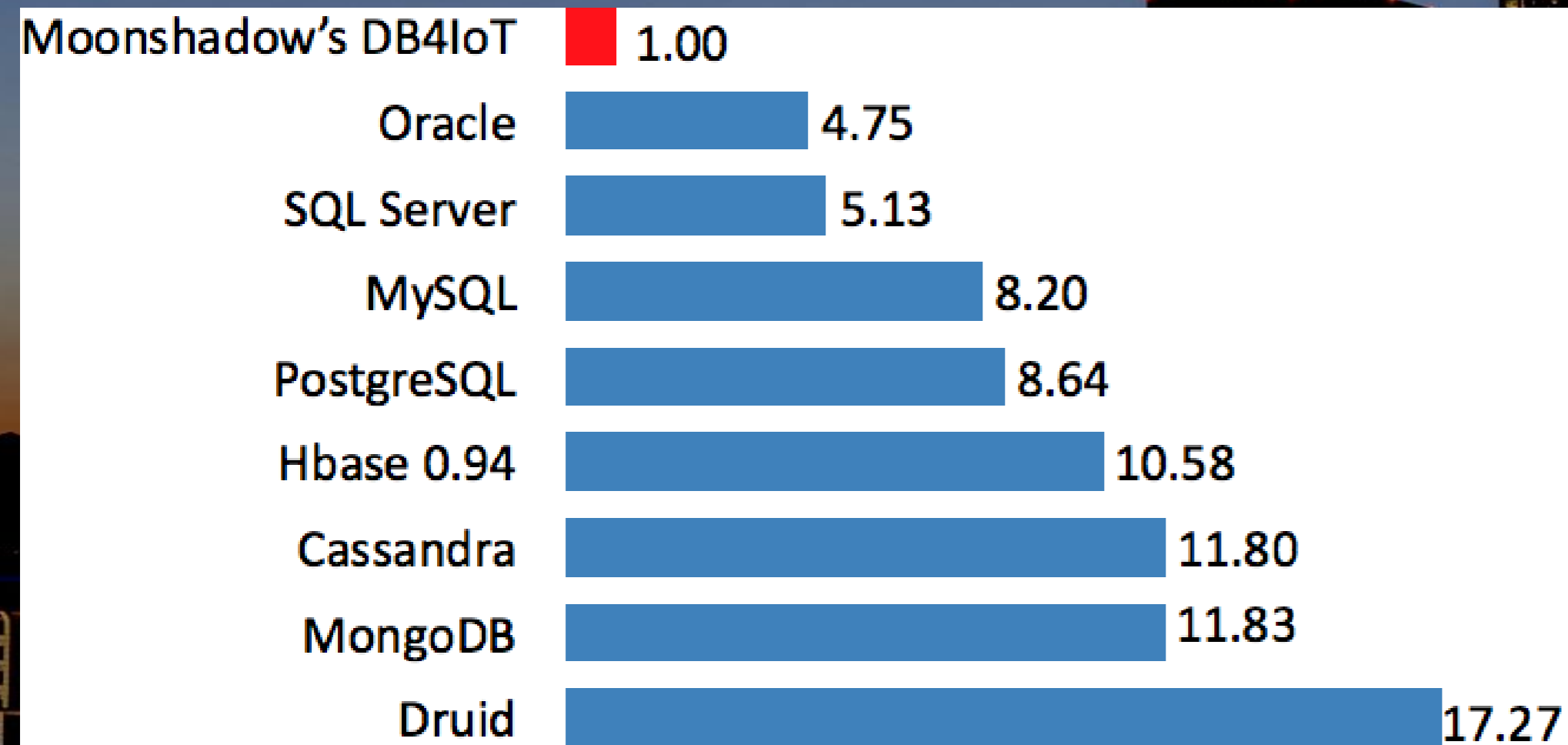
Your CAD/AVL Data Isn't Big Data, It's **Bigger** Data

Vehicle Movement Data

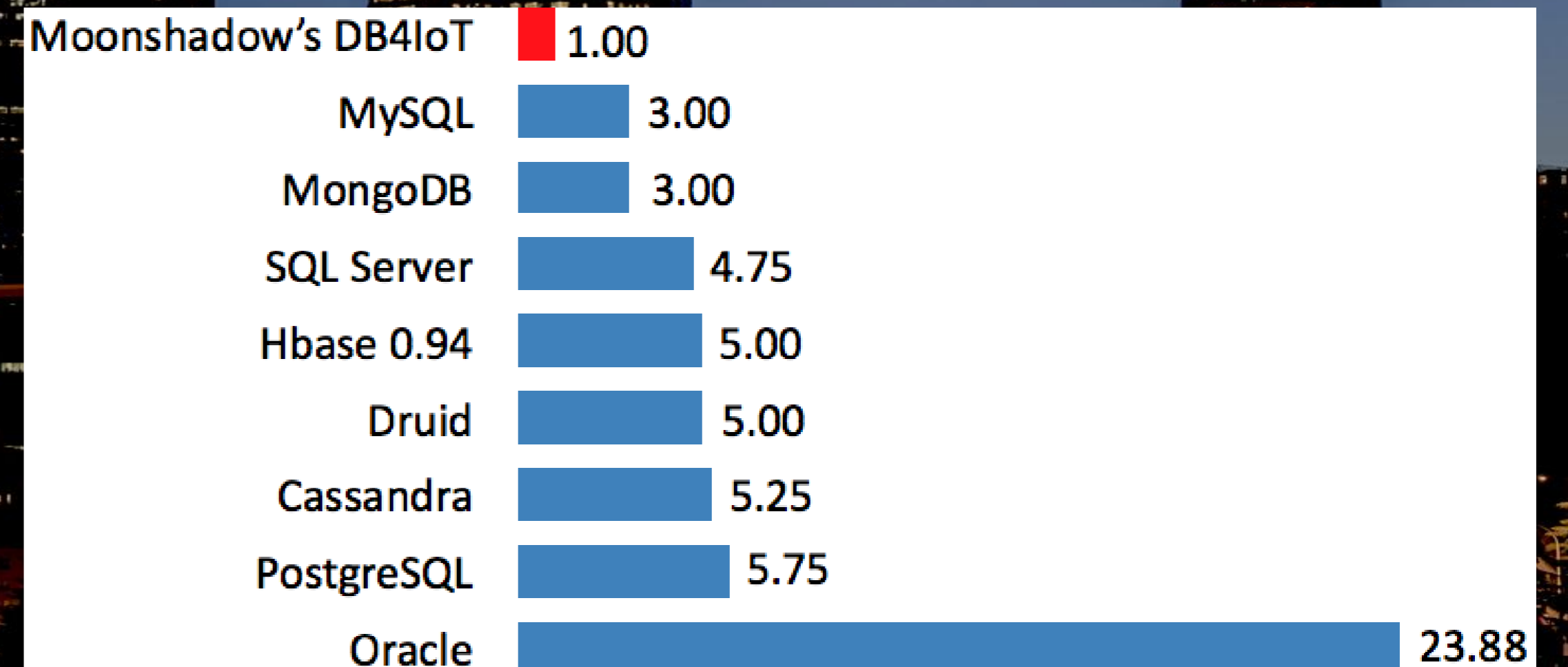
- 60 MPH = 1 mile/minute = 27 meters/second
- For <1 meter movement resolution, you need 50 measurements/second
- Now TriMet's one-month bus movement database is 60 Billion Records
- 1 Month of TriMet Bus Data = 1TB in DB4IoT
- That is for only 845 vehicles

The Data is Too Large for Traditional Database Engines DB4IoT Shrinks the Data Losslessly by 90%

Data Footprint Size



Data Row Overhead Size



Traditional Database Engines Are Too Slow

DB4IoT Speed Advantages

- Fast Ingestion Speed 100k records/second/server
- Low Ingestion Latency <150 ms
- Small Data Footprint <1 byte/value, lossless
- Fast Analytics Speed 200M records/second/cpu
- Instant Maps 200M records 10x per sec
- Software Only Runs on Intel X86 CPUs
- Deployment In-Cloud
- Patents Six issued, four pending

DB₄IoT

CAD/AVL Systems

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

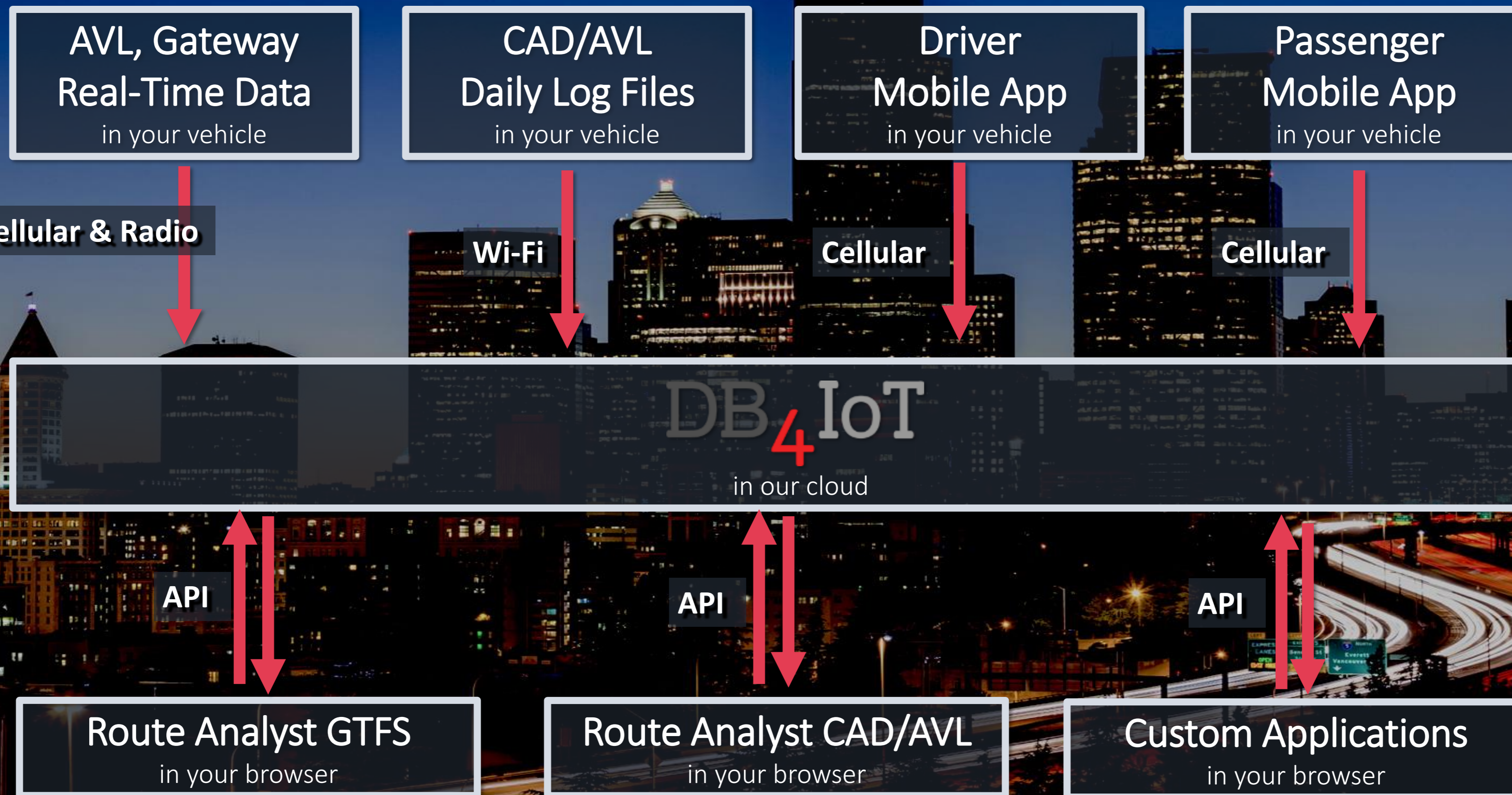
Computer

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



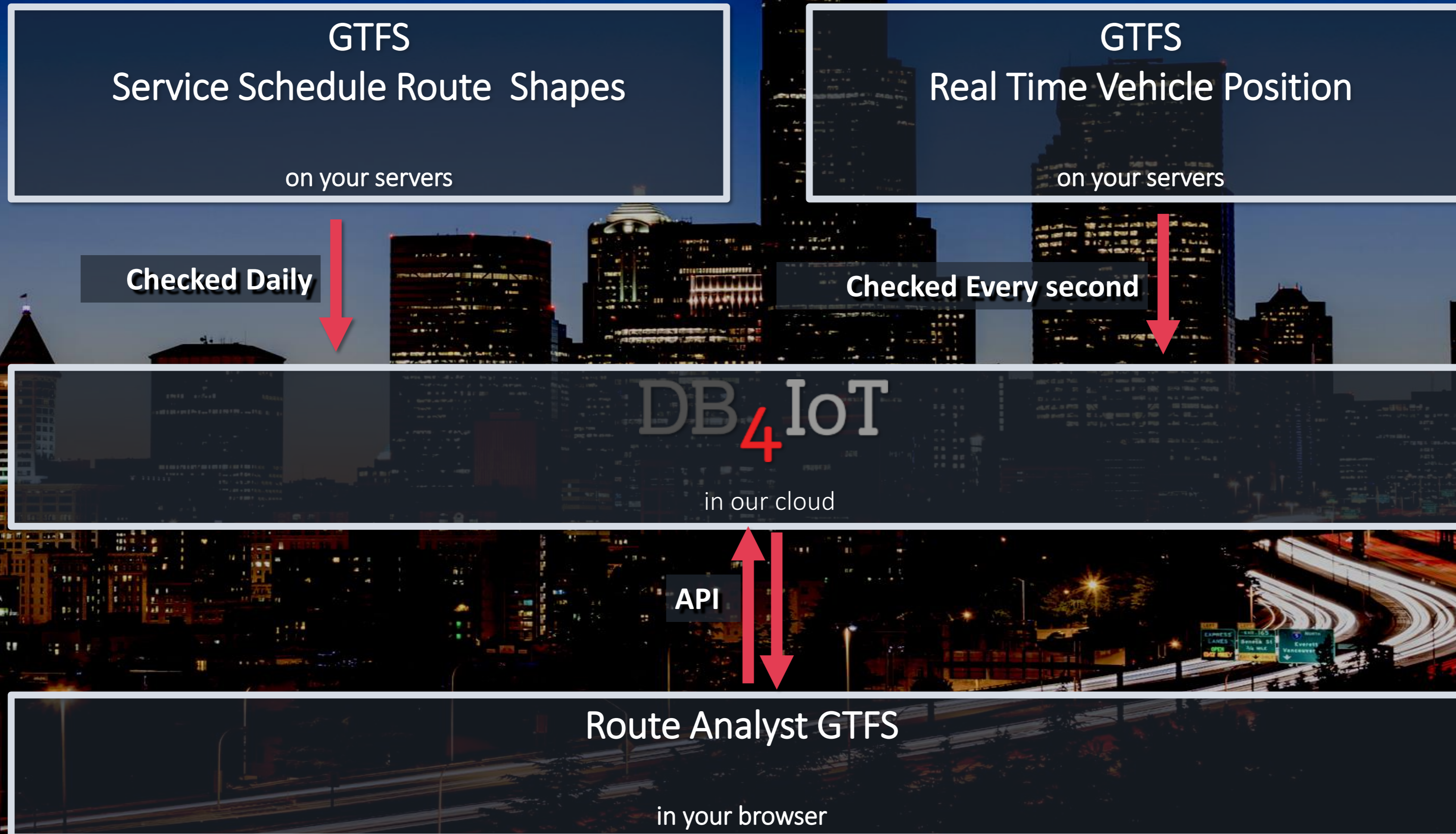
DB₄IoT

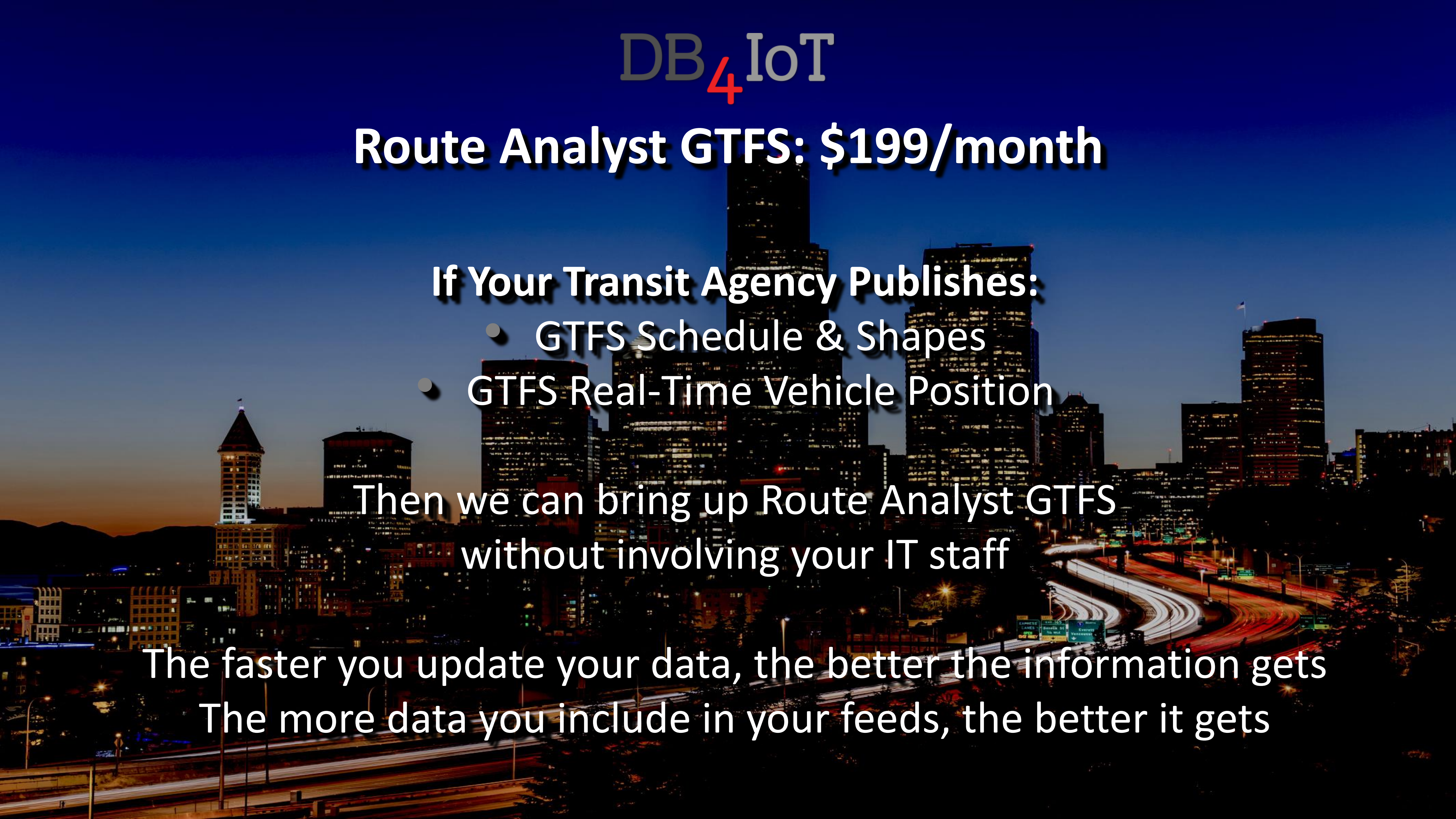
Route Analyst Data Flow



DB₄IoT

Route Analyst GTFS: from \$199/month





DB₄IoT

Route Analyst GTFS: \$199/month

If Your Transit Agency Publishes:

- GTFS Schedule & Shapes
- GTFS Real-Time Vehicle Position

Then we can bring up Route Analyst GTFS
without involving your IT staff

The faster you update your data, the better the information gets
The more data you include in your feeds, the better it gets

Route Analyst GTFS is currently available for:

TransLink, Vancouver, BC
King Country Metro, Seattle, WA
WA State Ferries, Seattle, WA
Pierce Transit, Lakewood, WA
TriMet, Portland, OR
AC Transit, Oakland, CA
RTD, Denver, CO

DB₄IoT

Route Analyst GTFS Use Cases

Analyze Route Performance

Movement Playback

Find Data Errors

Grant Application Visuals

OpenGov: Publish Transit Data

Route Performance: Delay per Route Direction

Delay calculated - Headway - Headway deviation - Meters per second - Time traveled on shape - Direction id - Route id - time_weighted_Mean - time_weighted_Standard Deviation - Analytics Csv

Show 25 entries Search:

direction_id	route_id	delay_calculated_time_weighted_mean	delay_calculated_time_weighted_sdev	headway_time_weighted_mean	headway_time_weighted_sdev	headway_deviation_time_weighted_mean	headway_deviation_time_weighted_sdev	meters_per_second_time_weighted_mean	meters_per_second_time_weighted_sdev	time_t
1	100288	-300	30.5	2953.5	662.6	-2220.1	581.1	3.977	0.819	456E
1	100351	-272.3	51.4	4481.3	147.9	-2422.3	55.5	3.051	0.507	281E
0	100182	-236	126.3	2996.3	2286.6	-1536.3	1187.4	5.405	5.775	1704
0	102573	-194.9	133.4	509.1	283.4	-153.8	286.5	2.795	1.231	3712
1	100041	-193.3	192.1	2031.2	3580.8	-799.9	1284.1	5.101	4.272	347E
0	100258	-192.7	86.1	3116.5	1151.3	-2199.1	1377.6	2.095	1.826	1994
1	100284	-189.7	94.9	1294.2	939.1	-1210.3	779.2	5.063	2.569	274E
1	100099	-188	84.2	3503.4	2807.5	-1165	773	5.421	6.568	174E
1	100287	-185.8	131.7	2261.1	1431.8	-1039.6	459.2	1.48	1.215	4204
1	100178	-184.5	135.6	2044.4	457.1	-1401.2	761	5.336	2.377	297E
1	100077	-183.6	171.4	4233	1914.6	-2560.5	1001.8	7.977	5.083	321E
1	100023	-182.7	141.9	2106.3	2433.6	-902.2	1048.7	4.558	3.278	227E
1	100341	-180.5	34.7	2561.1	17.1	-2513.5	268.8	3.151	1.437	1564
1	102623	-179.5	206.1	2350.3	702.9	-1112.3	841.5	3.345	2.358	204E
0	100082	-177	167.4	1630.2	1071.7	-1523.3	1168	7.787	5.895	3331
0	102644	-169.1	89.3	1195.7	415.3	-595.3	529.4	7.335	1.463	457E
1	100051	-166.9	145.8	1746.3	645	-581	683.2	5.817	3.275	4127
1	100195	-165.8	99.8	4134	1950.2	-921.9	1505.4	3.359	2.893	131E
1	100128	-165.3	142	3434.5	2779.2	-1491.4	1113.7	4.552	2.964	2457
1	100082	-164.4	177.6	915.1	1012.8	-444.5	799.1	5.378	3.616	3961
0	100242	-157.6	120.4	1203.3	696.2	-662.7	870.8	3.523	3.341	206E
1	100104	-156.2	132	2158.4	2453.4	-849	1129.7	9.27	6.764	2801
0	102554	-155.5	102.1	1827.7	3148.6	-424.5	1046.6	2.381	2.902	309E
0	100459	-155.4	165.5	1183.2	1086.2	-560.8	844.6	3.742	4.192	295E

Showing 1 to 25 of 366 entries

Previous 1 2 3 4 5 ... 15 Next

Route Analyst Gtfs eimar.boesjes

King County Metro

Analysis Tools

Analytics Csv

Columns:

- Acceleration
- Bearing
- Current stop sequence
- Delay calculated
- Headway
- Headway deviation
- Headway scheduled
- Meters from shape
- Meters per second
- Meters traveled on shape

Group By:

- Direction id
- Holiday
- Month of the year
- Occupancy status
- Percent shape completed
- Route id

Aggregate Types:

- Count
- Mean
- Standard Deviation
- Sum

Pie Chart

Timeseries Line Chart

Analytics Line Chart

Histograms

Heat Chart

Map Views

Markers

Marker Limit: 500

Warning! Increasing might degrade browser performance.

Color By: Delay calculated

Marker Type:

Time Interval (Seconds): 30

Route Performance: Weekday Headway Deviation

Delay calculated - Headway - Headway deviation - Time traveled on shape - Direction id - Route id - time_weighted_Mean - time_weighted_Standard Deviation - Analytics Csv

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0	100001	-61.3	150.6	2354.3	2001.3	-1441.2	1131.2	1687.9	878.6
0	100002	-115.7	162.8	1550.9	1819.9	-846.5	1002.8	1560.1	836.4
0	100003	-47.7	217.8	1885.1	2964.9	-733.3	1027.9	3775	976.9
0	100004	-122.4	135	1929.7	572.3	-65.2	486.8	1123.2	588.5
0	100005	-94.4	168.8	2782.8	3851.9	-1210.6	1087.6	3036.1	1321
0	100006	-122.9	138.6	3058.8	3953.3	-733	1066.4	2733.9	1559.7
0	100009	-129.9	169	1836.3	1091.6	-1084.3	1121	1897.1	990.6
0	100011	-45.5	122.3	1600.2	1135.8	-758.6	1108.9	3571.7	1822.8
0	100012	-121.6	114.3	2141.3	1402.5	-1646.8	1533.5	3206.8	1121.1
0	100013	-58.5	120.9	1829.1	1126.8	-955.1	833.3	2739.5	1347.7
0	100014	-85.8	99.1	2309.9	905.6	-1307.8	498.3	2894.3	1110
0	100016	-97.1	143.6	3456.8	1678.8	-542.1	1047.1	1967.9	1331.5
0	100017	32.9	190.8	4471	2761.3	-1814.5	1166.3	2574.5	1355.3
0	100018	-57.3	161.9	2860.7	6055.5	-1035.2	936.7	1693.2	1092.6
0	100019	-105.3	142.5	1492.6	1055	-724.3	957.3	2522	1106.9
0	100020	-62	133	2336.4	1215.8	-1292.4	986.7	2574.1	1003
0	100021	-72.5	192.3	1395.7	775.9	-680.9	749.5	2655.8	1065.7
0	100022	-144.9	196.8	1585.5	1078.6	-900.4	1064.5	2948.3	1122.9
0	100023	-111.7	176.8	2886.8	3030.9	-1032.9	1166.5	2084.8	1076.1
0	100024	-71.7	133.6	2700.3	3188	-1476.6	1182.3	1469	946.2
0	100026	-22.6	196.1	2655	3655.3	-1240.1	1254	3274.6	1811.2
0	100028	-122.2	153.7	1807.1	1097.8	-1322.4	1062.7	1940.5	1166.8
0	100030	-109.4	153.5	2663.7	2850.8	-1042.9	1186.6	1729.6	1110.2
0	100031	-138.3	137.1	3041.1	4259.7	-1096.1	1199.1	1719	1207

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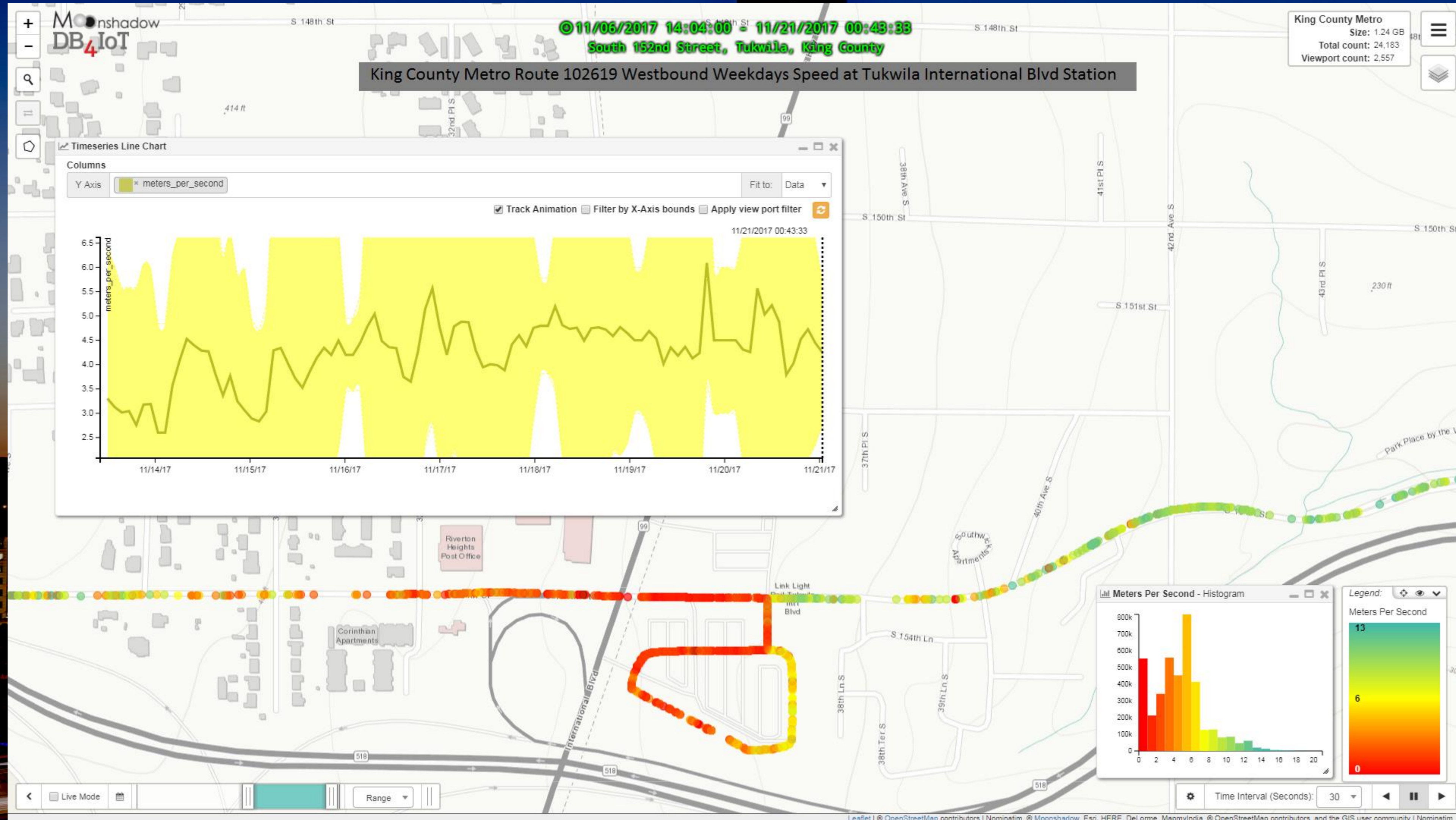
Route Performance: Weekday Delay by Time & Distance



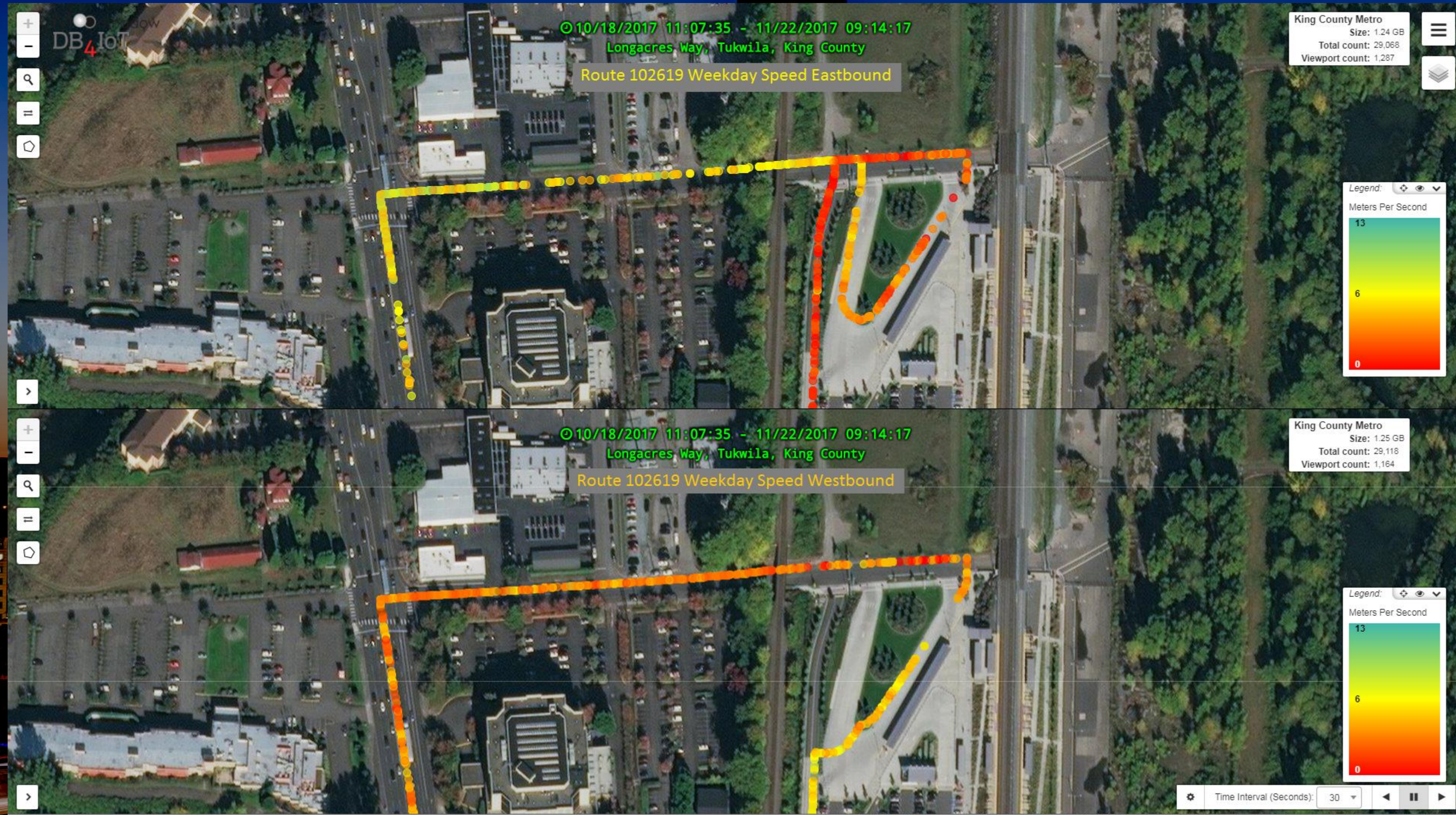
Route Performance: Evening Peak Speed Comparison



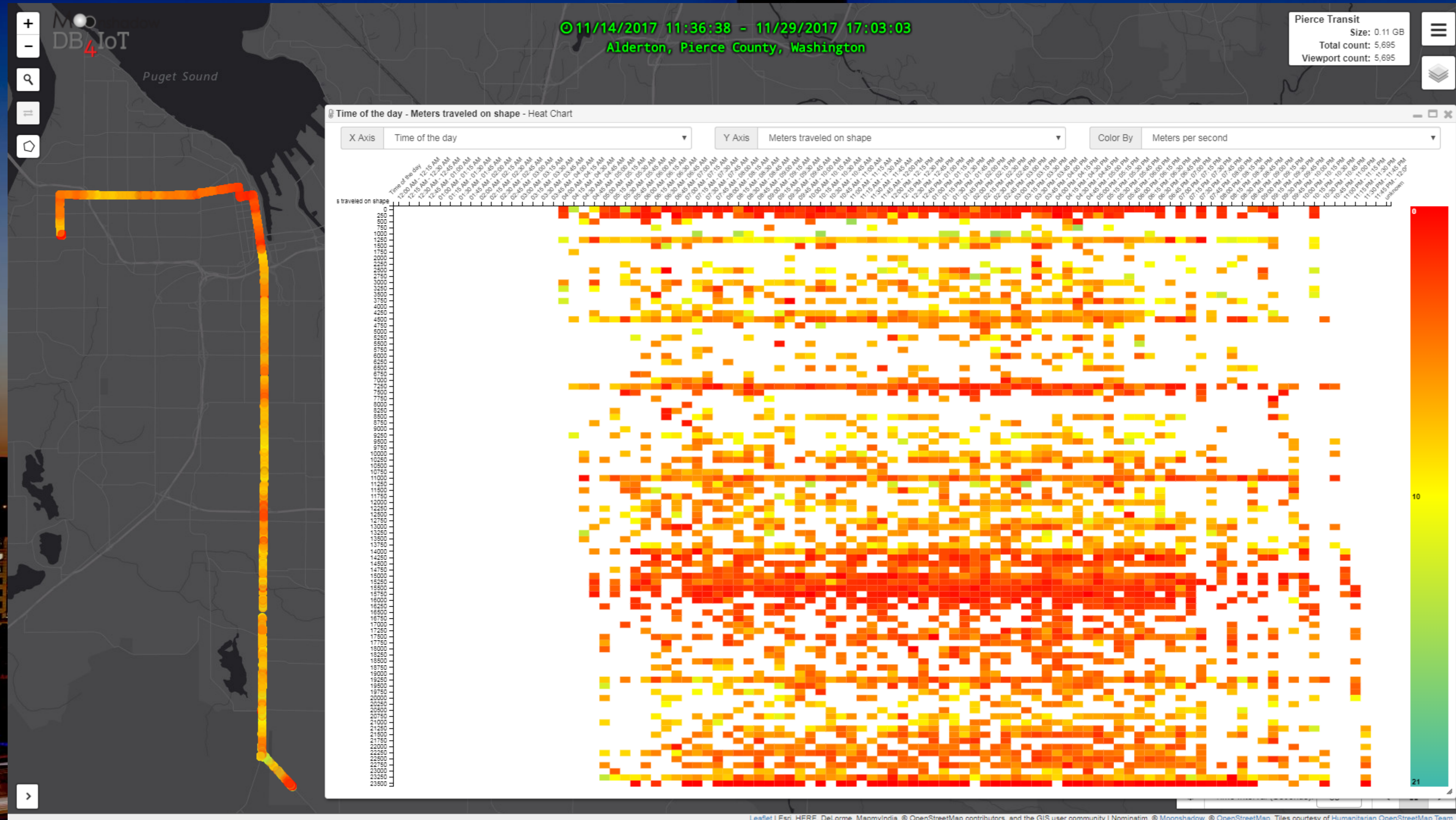
Route Performance: Detailed Speed Comparison



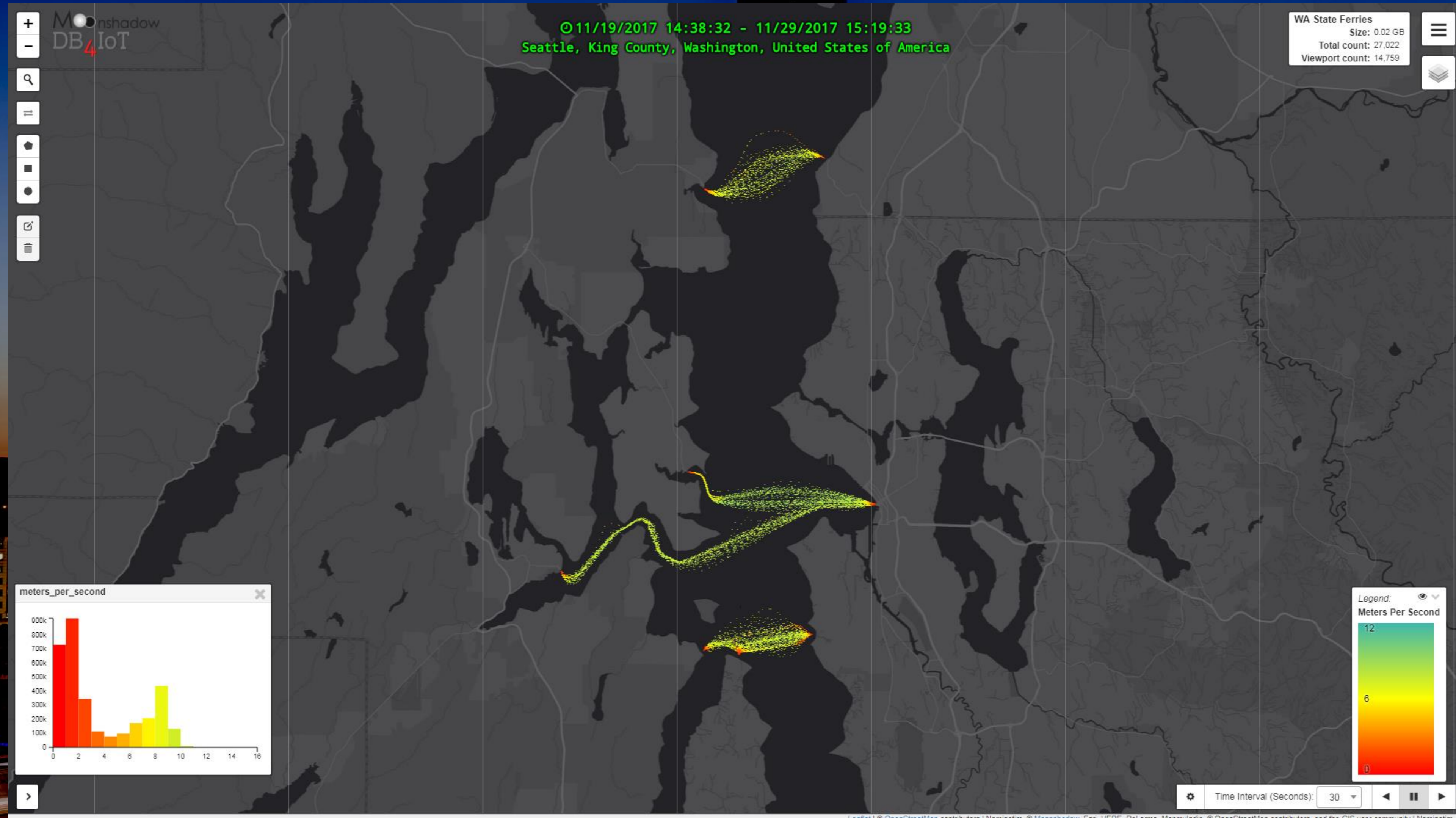
Route Performance: Detailed Speed Comparison



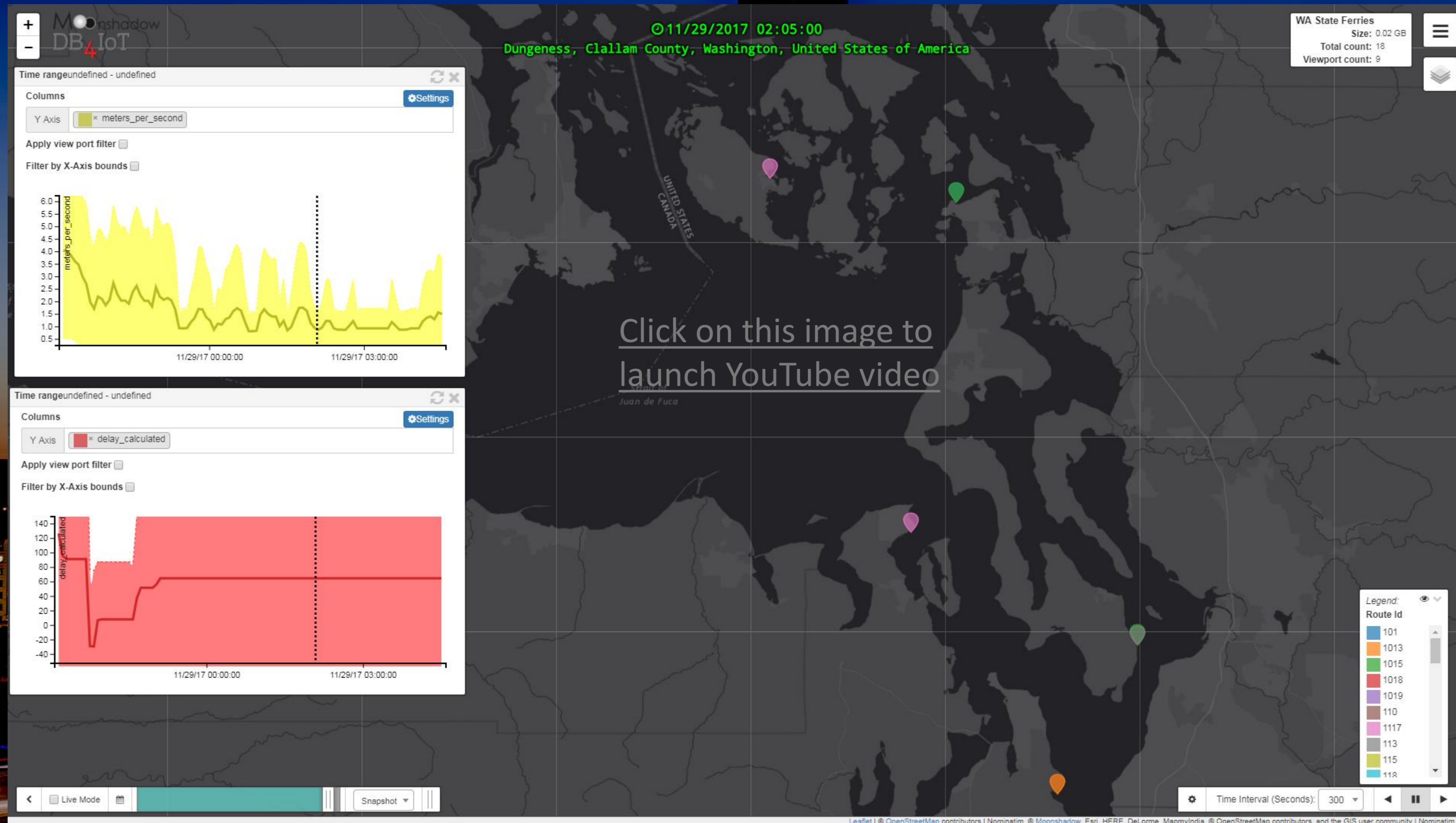
Route Performance: Speed Map & Chart



Movement: WA State Ferry Movement

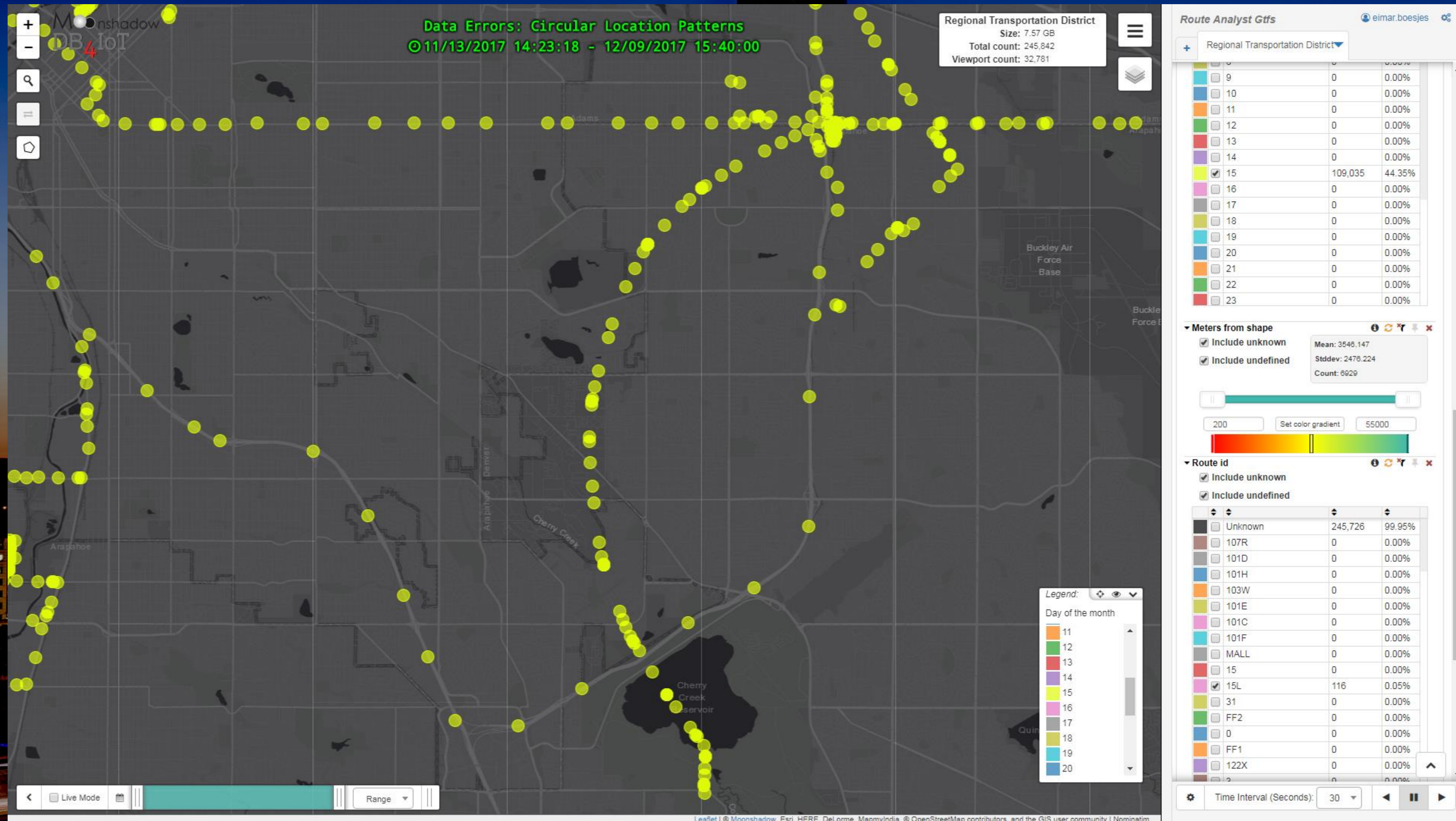


Movement Playback: State Ferry Movement



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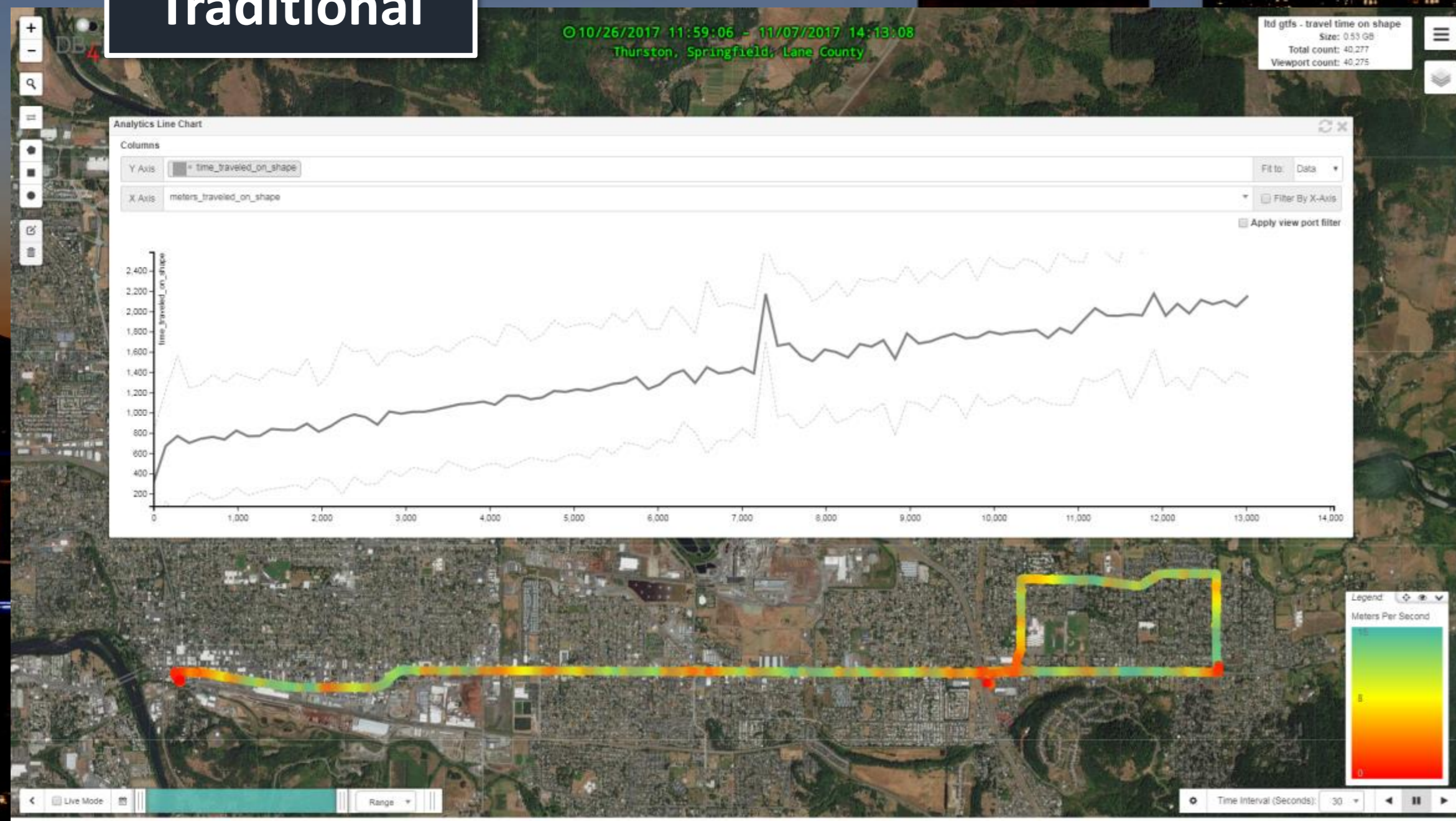
Find Data Errors



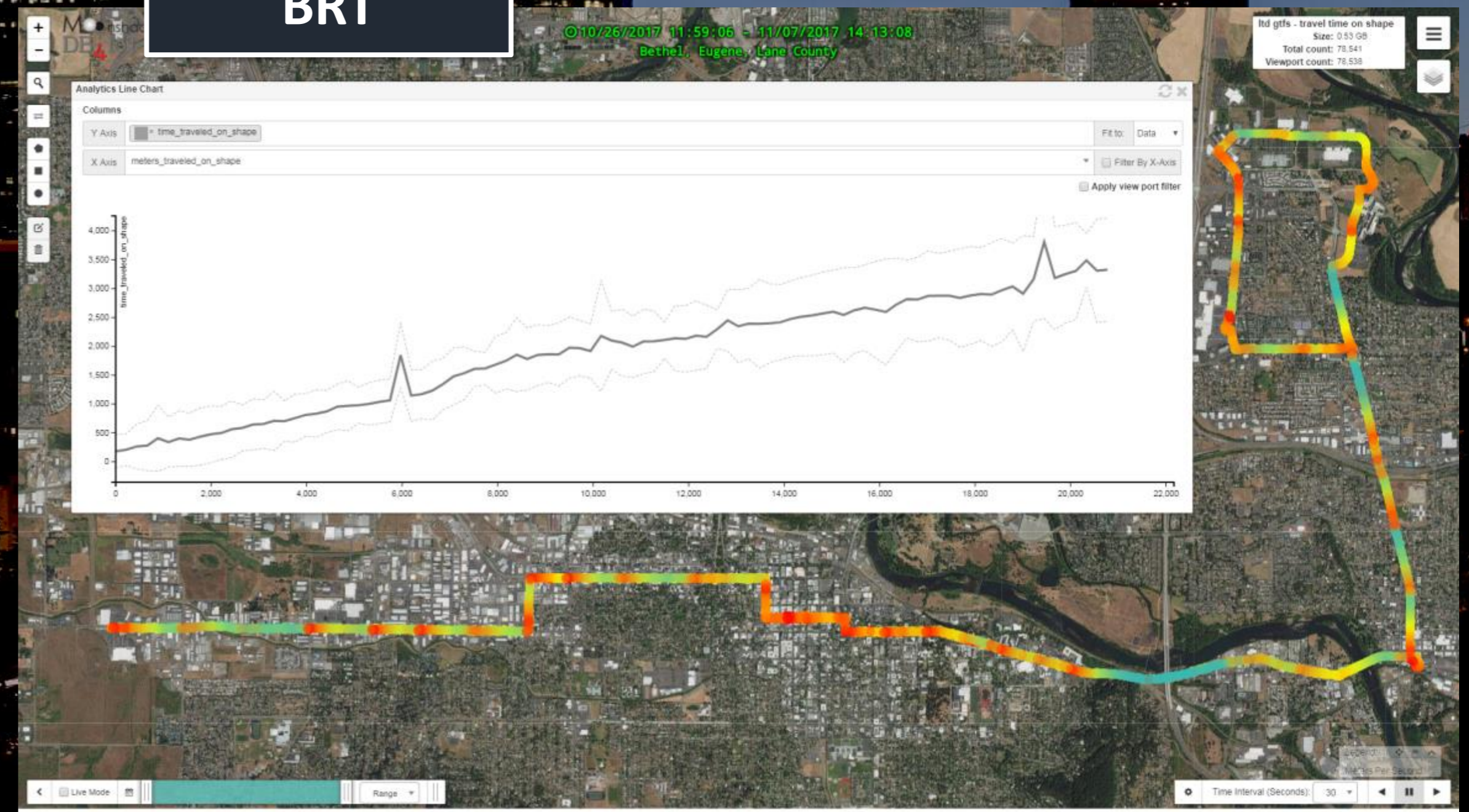
Grant Application Visuals: BRT Reliability Improvement

Dotted line = Standard Deviation = Reliability

Traditional

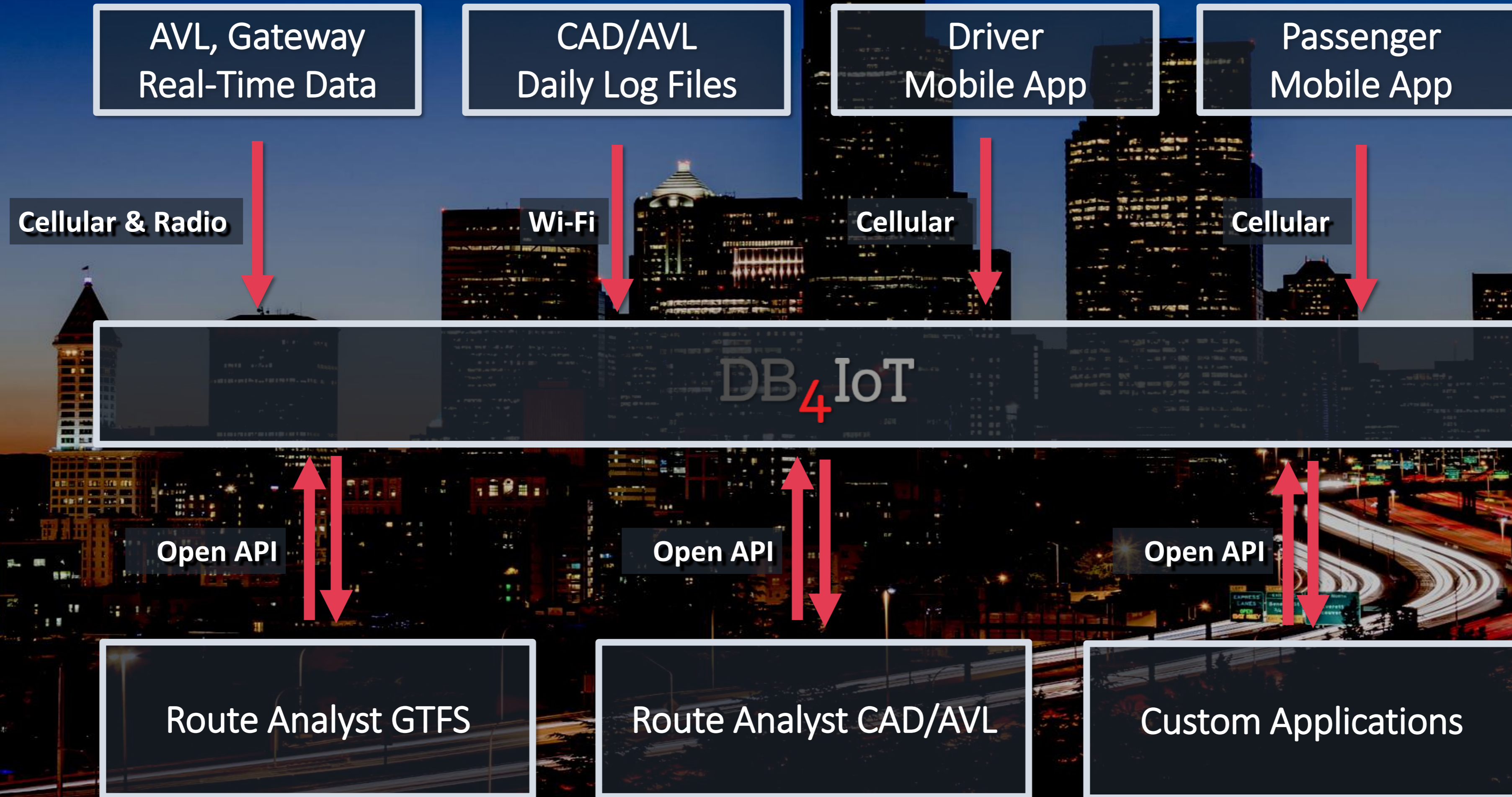


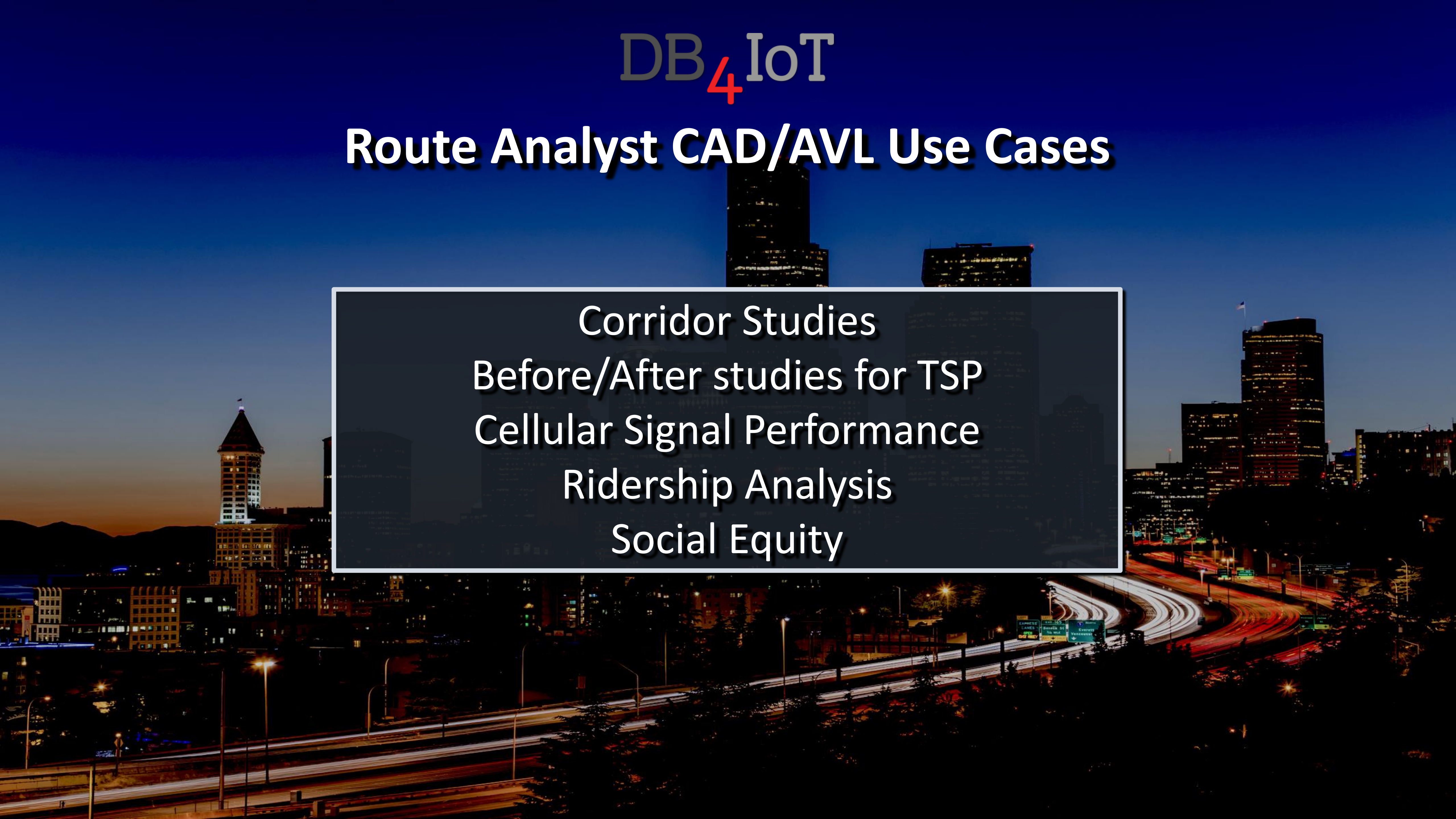
BRT



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OpenGov: Publish Transit Data



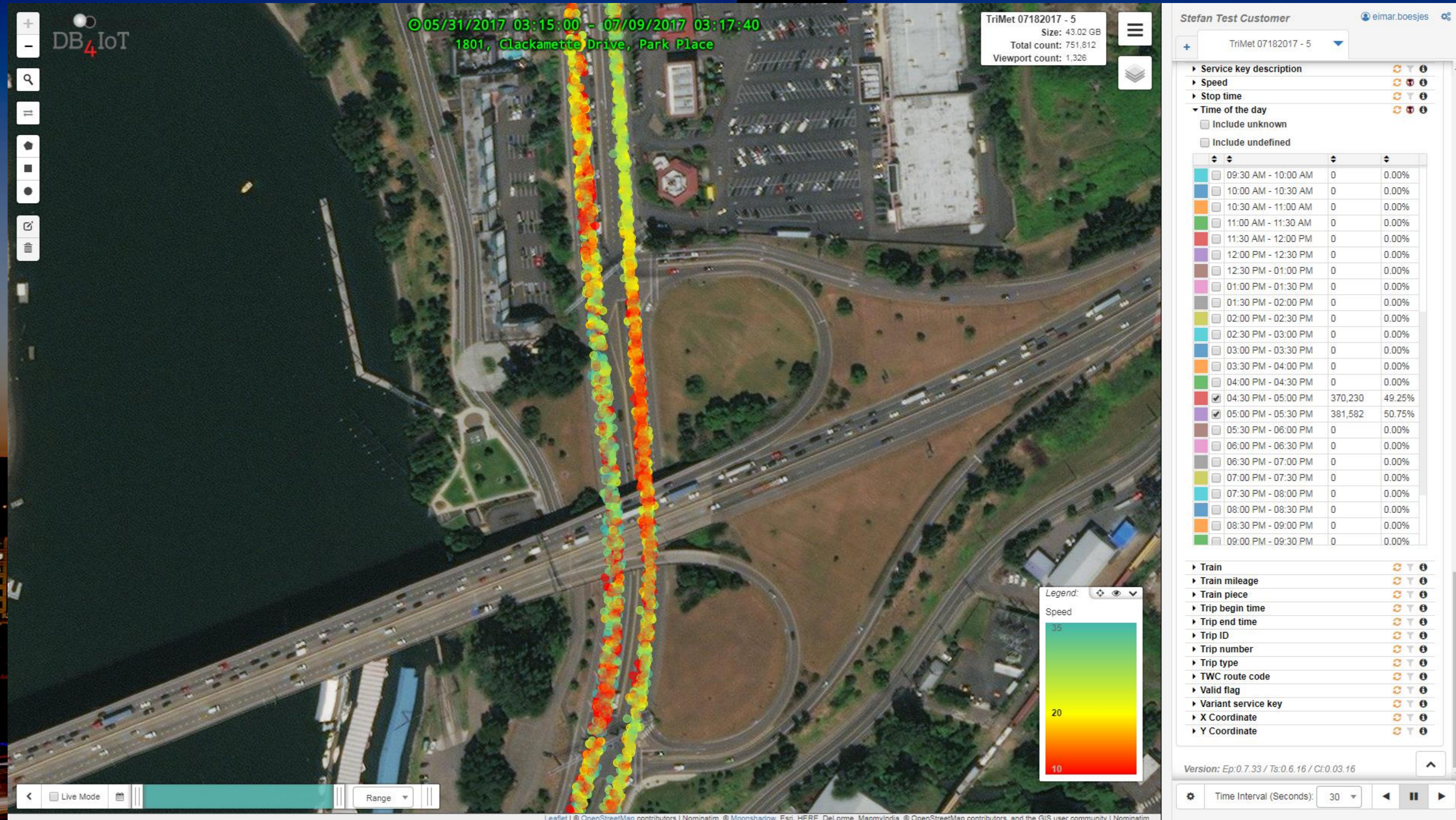
A nighttime cityscape with a multi-lane highway in the foreground. Light trails from cars are visible on the road. In the background, several skyscrapers are lit up against a dark blue sky. The overall scene is a vibrant urban environment at night.

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Route Analyst CAD/AVL Use Cases

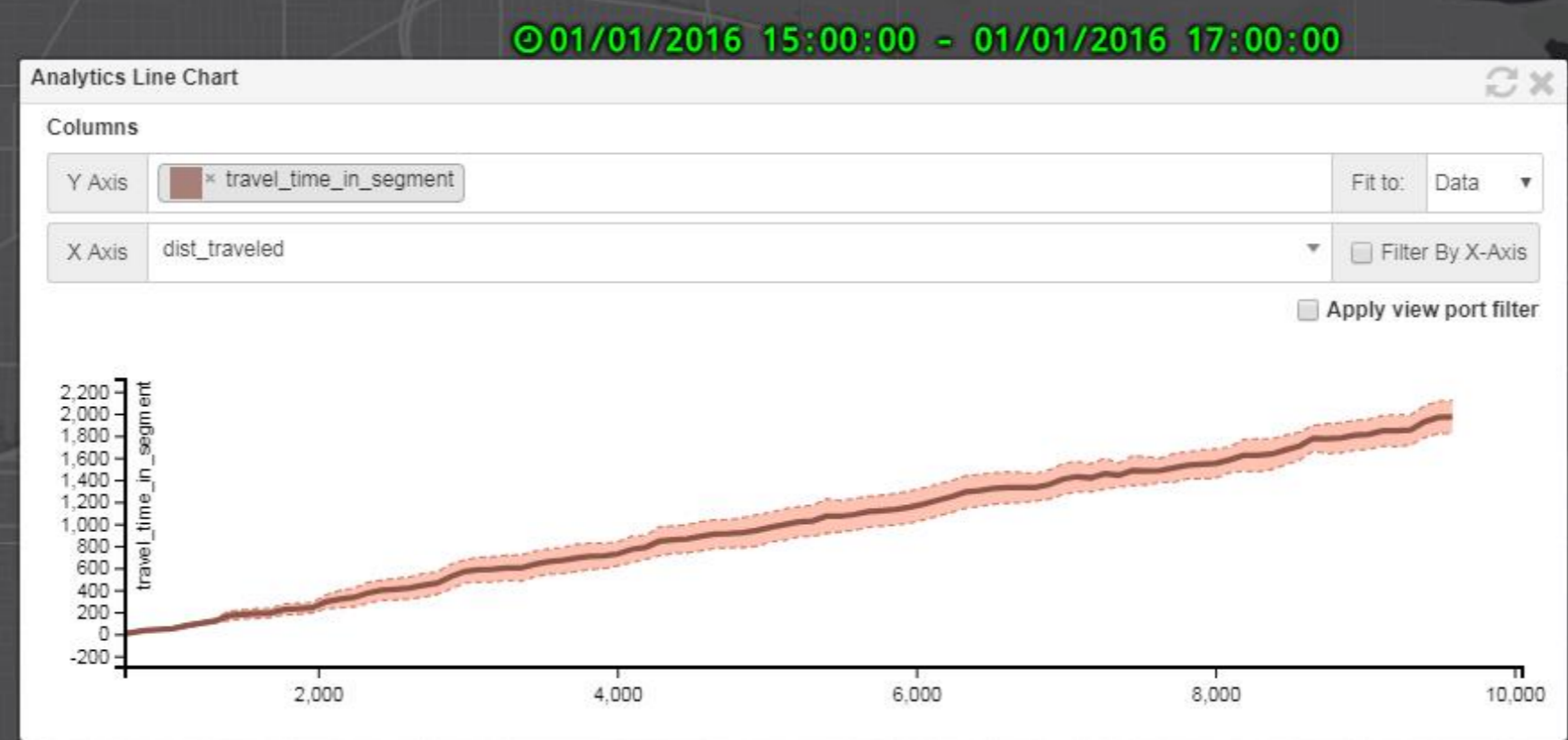
Corridor Studies
Before/After studies for TSP
Cellular Signal Performance
Ridership Analysis
Social Equity

Corridor Studies: Peak Speed Analysis

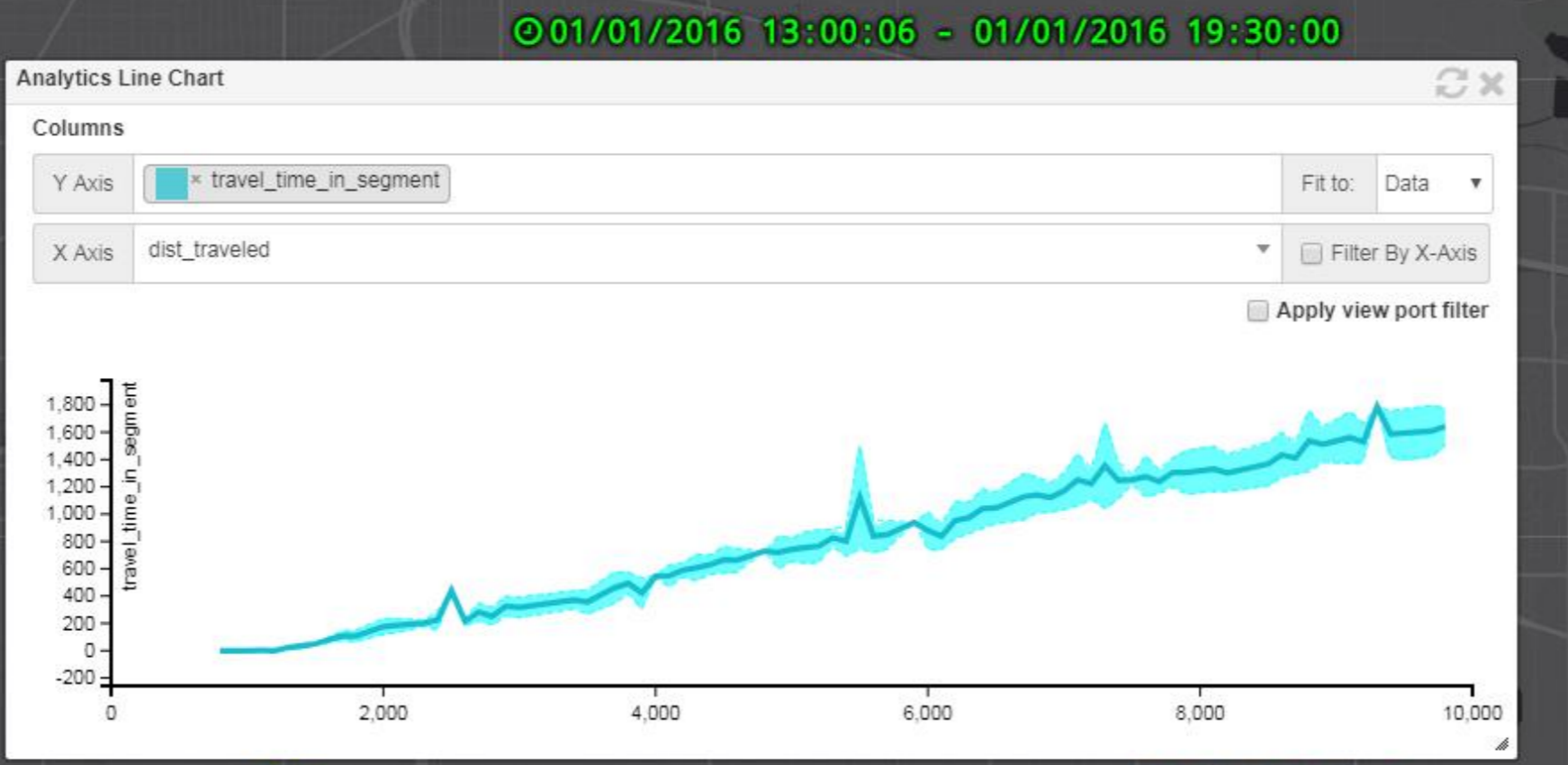


Corridor Studies: Model Calibration

NoBuild Vissim Model
Travel Times (Graph)
Speeds (Map)



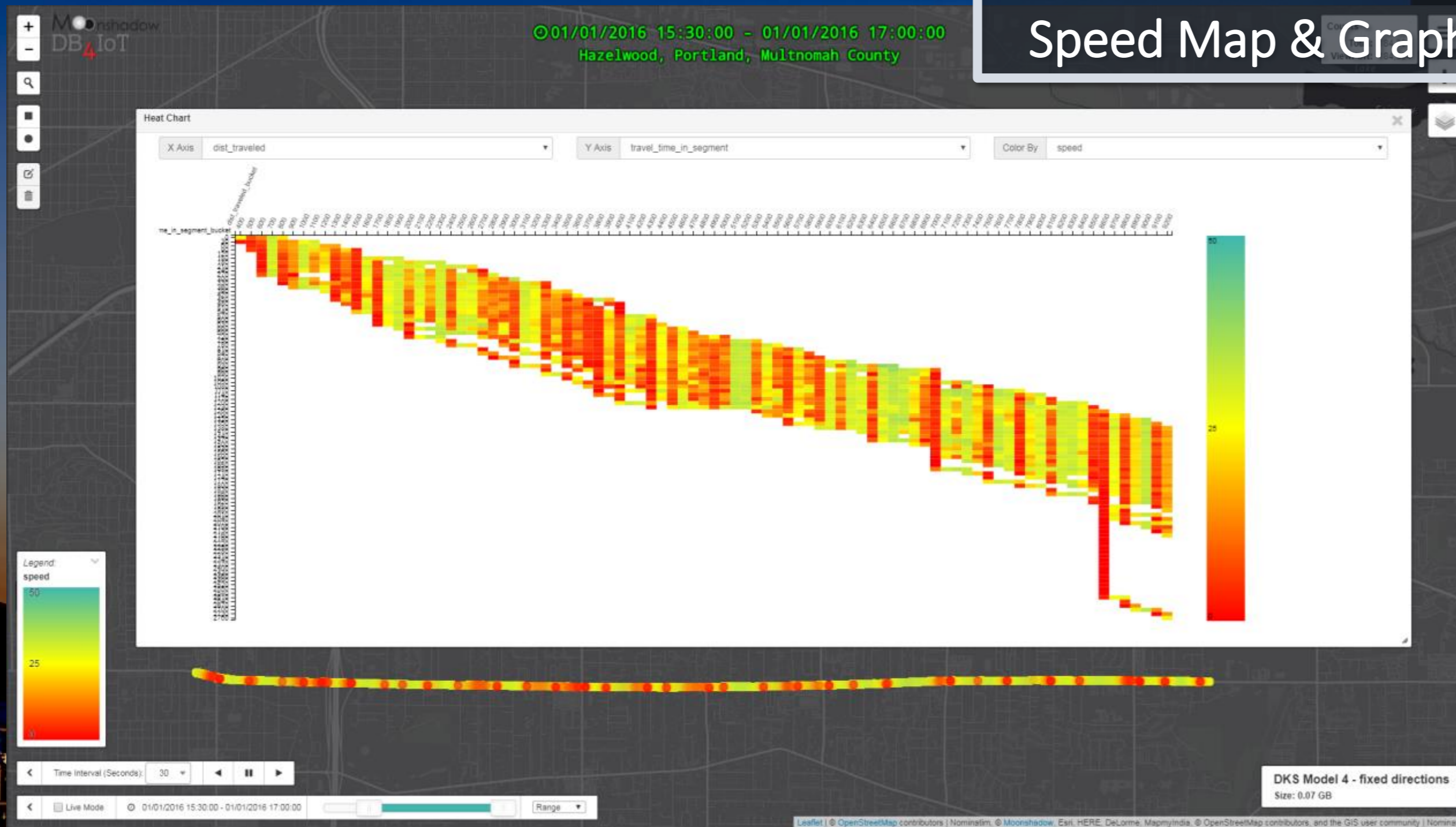
Actual Measurements
Travel Times (Graph)
Speeds (Map)



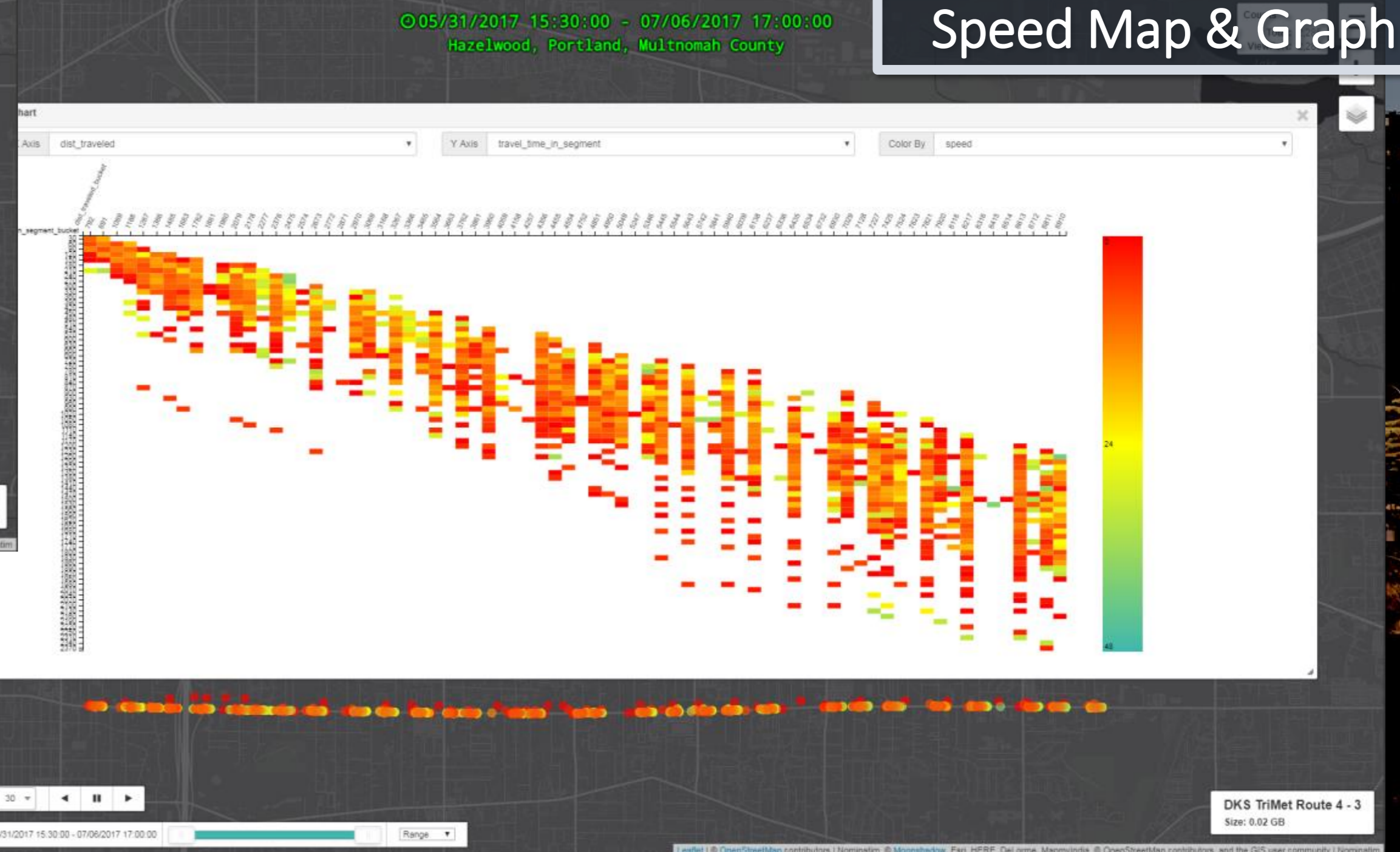
The background of the image shows a GIS interface with a map of a city street corridor. The map displays a color-coded speed profile along the corridor, with a legend on the right indicating speed values from 0 to 50. The interface includes a search bar, a live mode toggle, and a time range selector. The bottom of the interface shows a time interval of 30 seconds and navigation controls.

Corridor Studies: Model Calibration

NoBuild Vissim Model
Speed Map & Graph

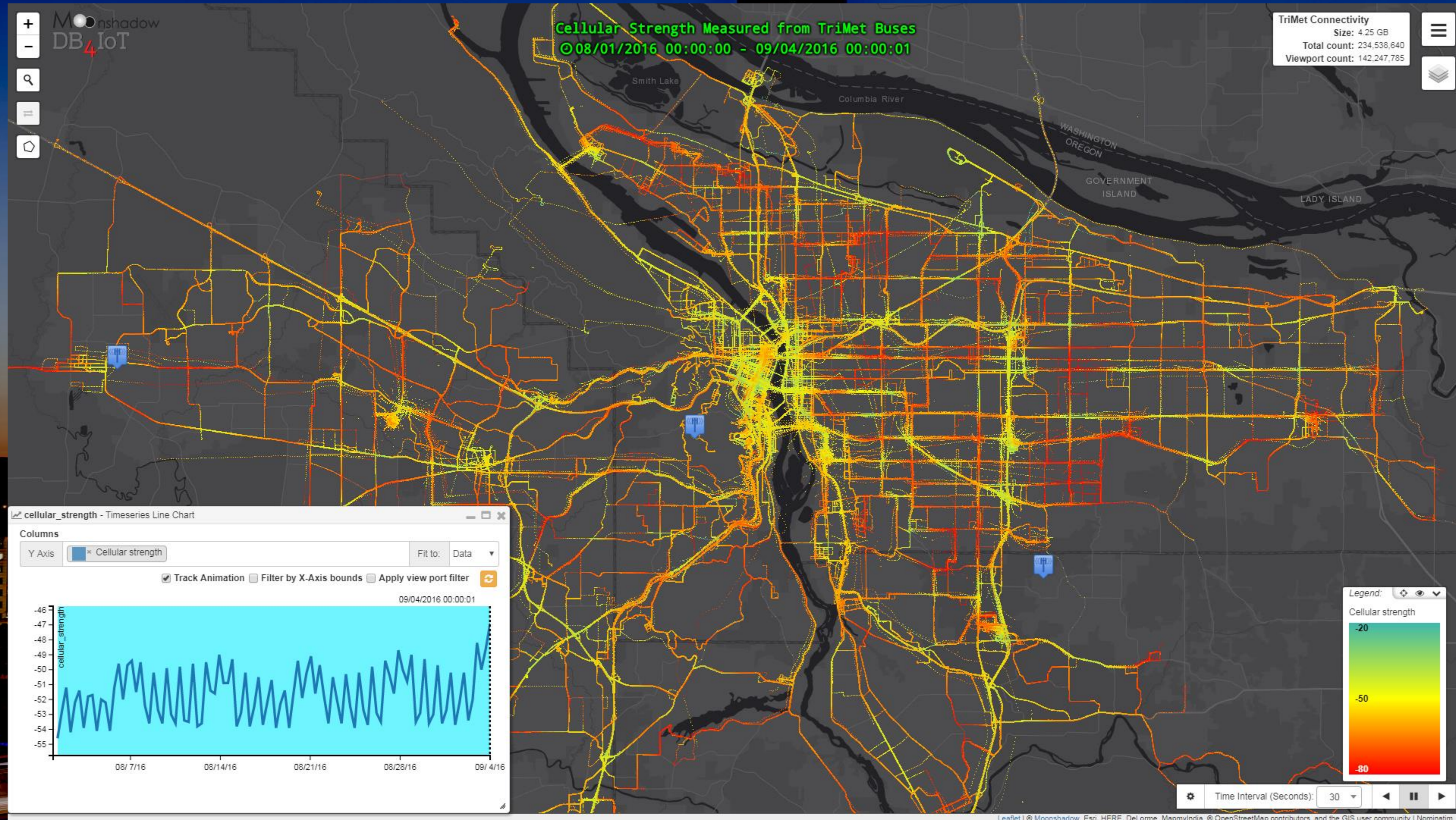


Actual Measurements
Speed Map & Graph



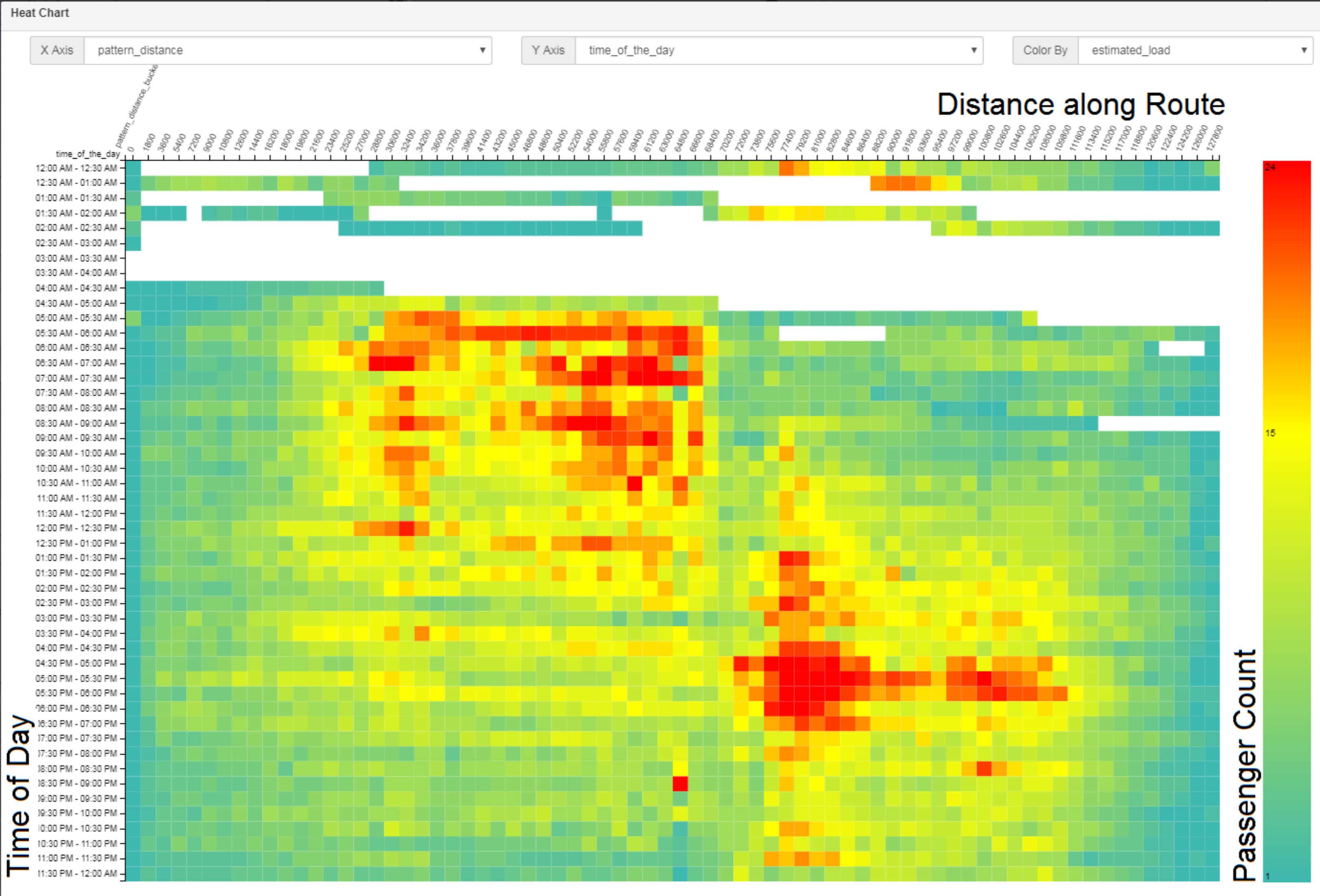
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Cellular Signal Performance

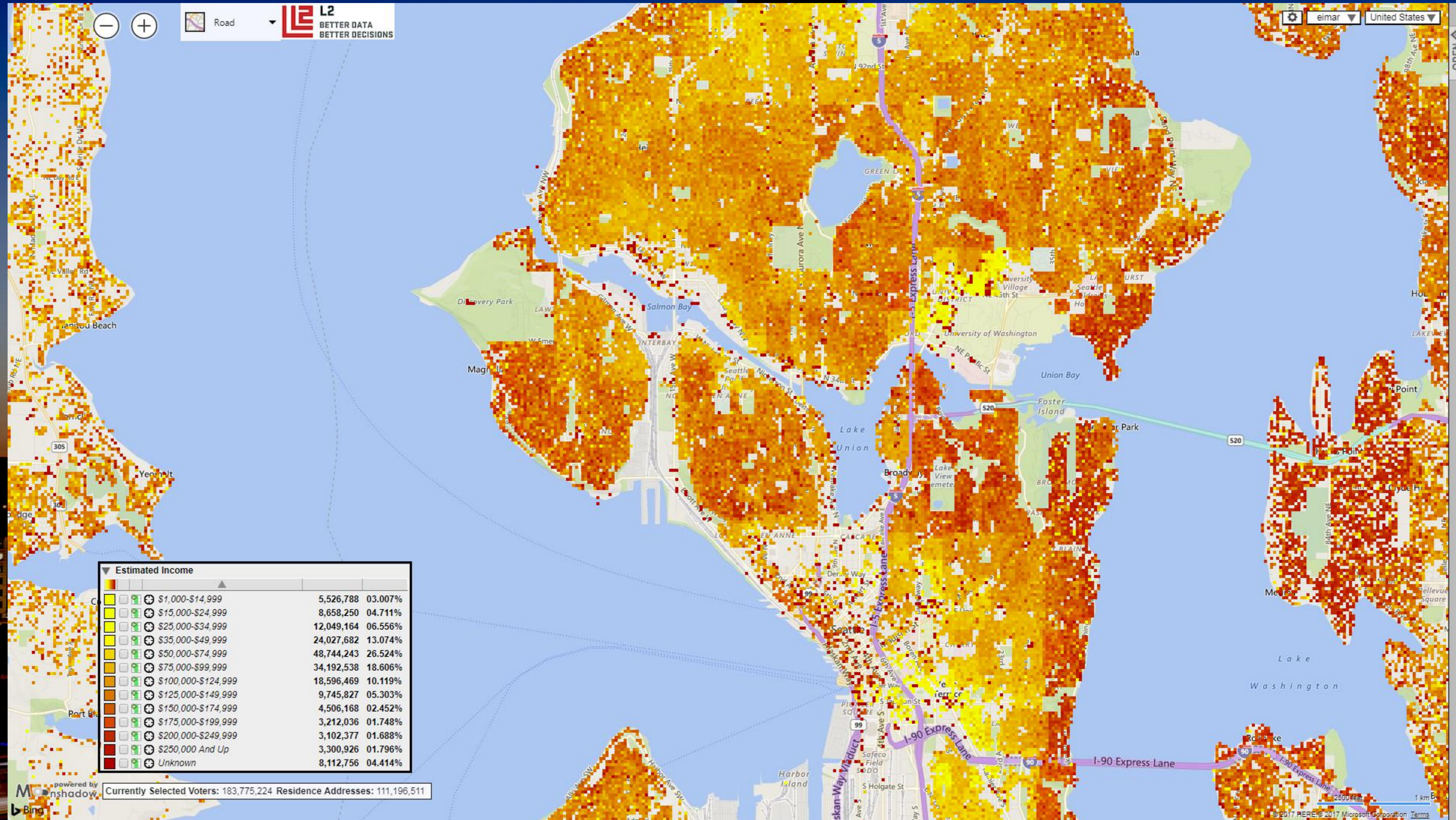


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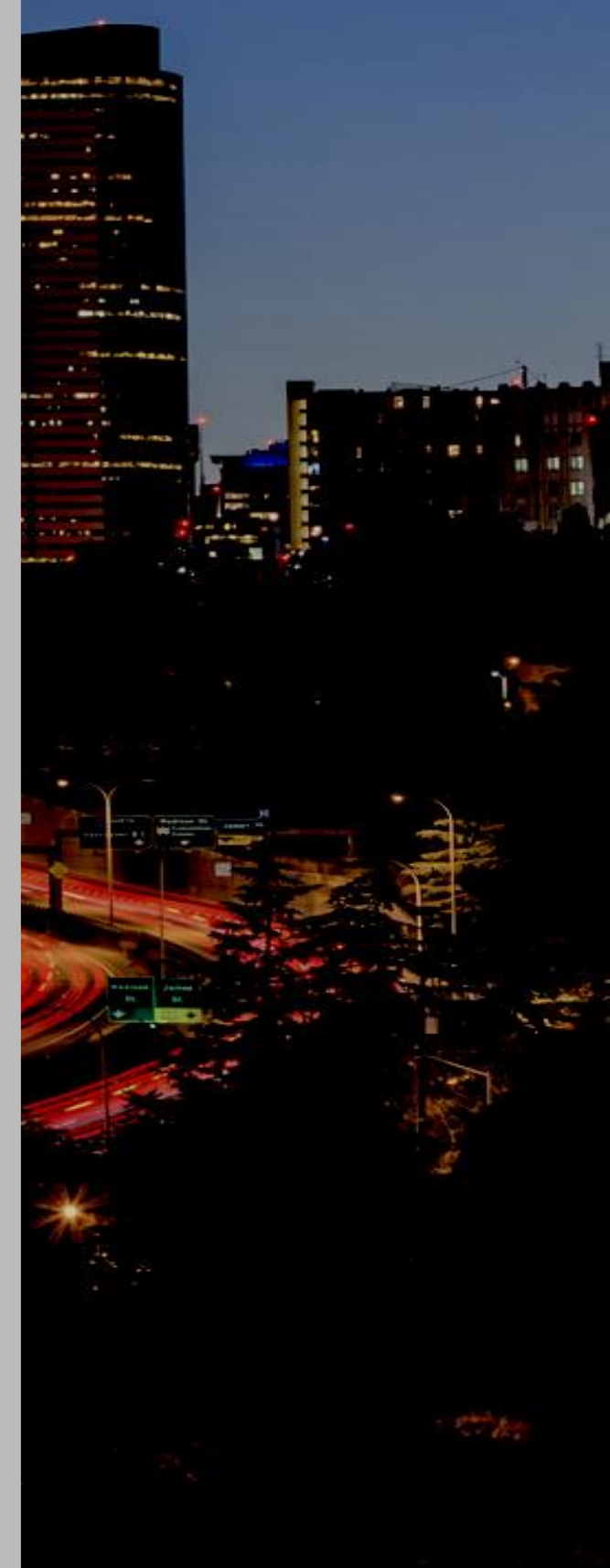
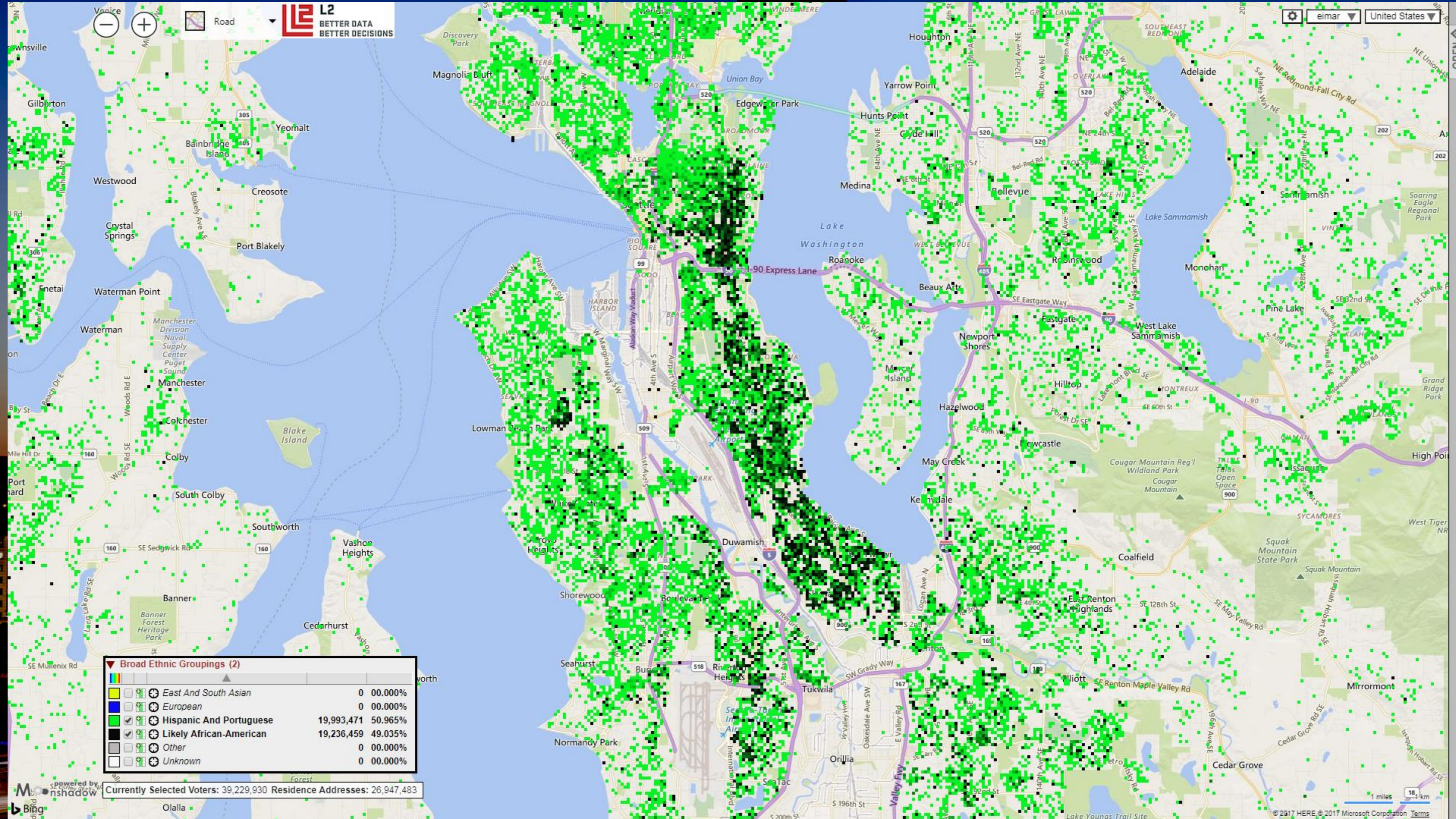
Ridership Analysis



Social Equity: Income Distribution

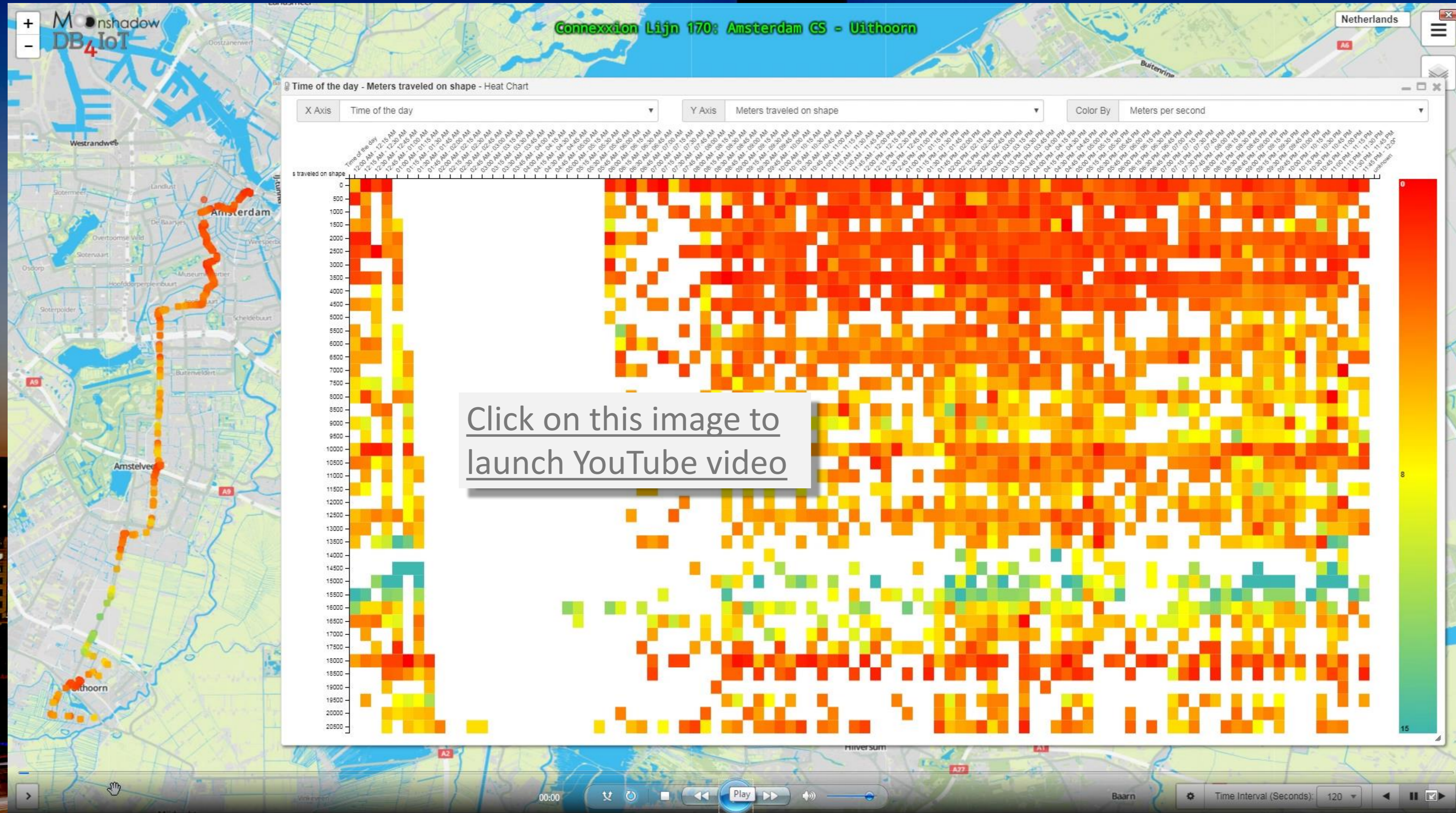


Social Equity: Minority Distribution



DB₄IoT

Route Analyst is Fast & Easy to Use



DB₄IoT

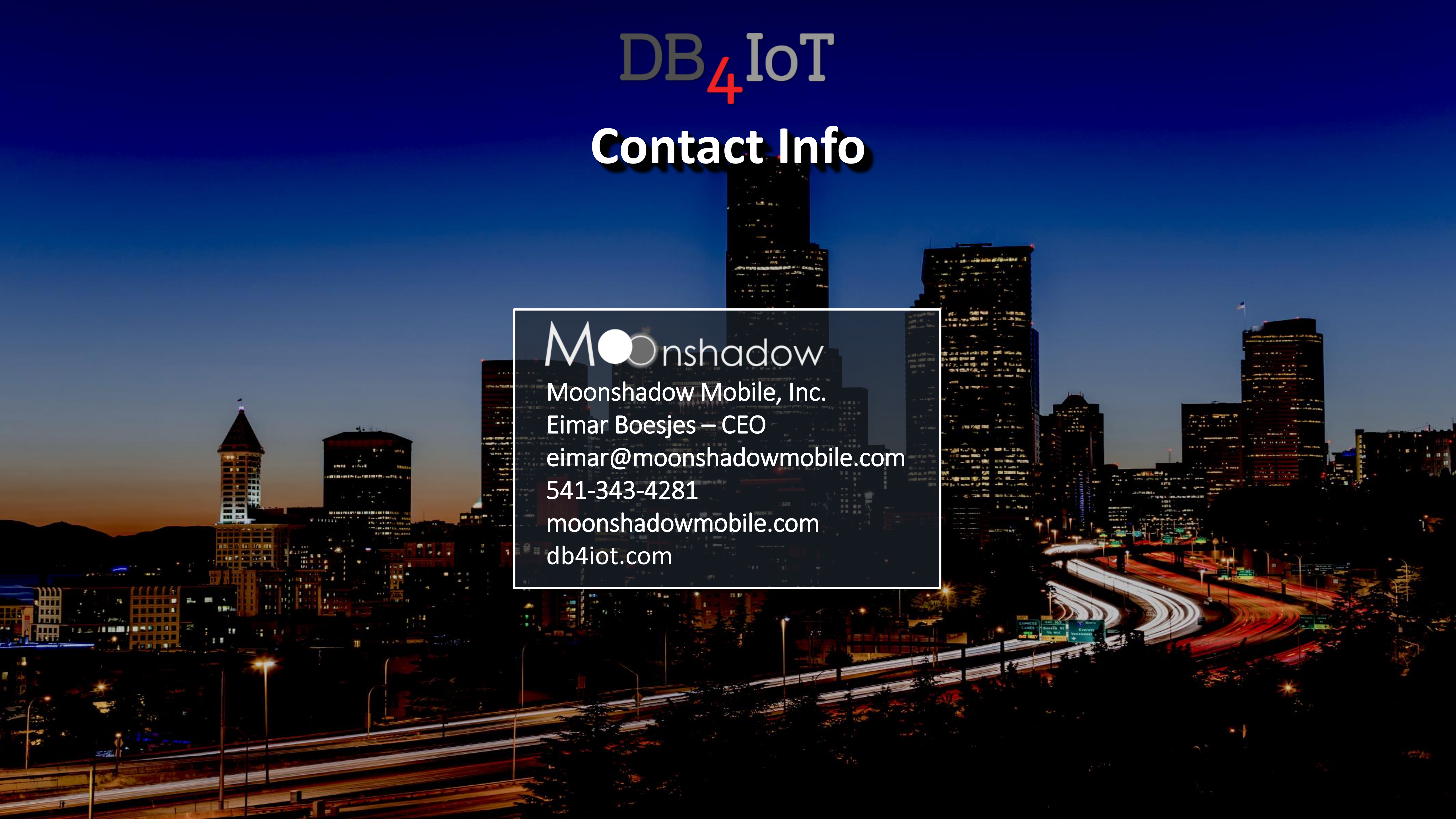
Thanks!

Route Analyst was developed by Moonshadow Mobile
in close cooperation with
consultants from DKS Associates
& data engineers from TriMet

Moonshadow

DKS

TRIMET



DB₄IoT

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