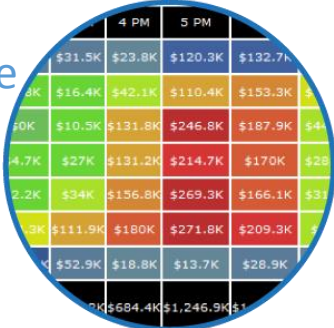


Communicating Effectively in the Modern World

Visual Analytics for knowledge discovery and story telling



Performance Measures



Planning



Operations



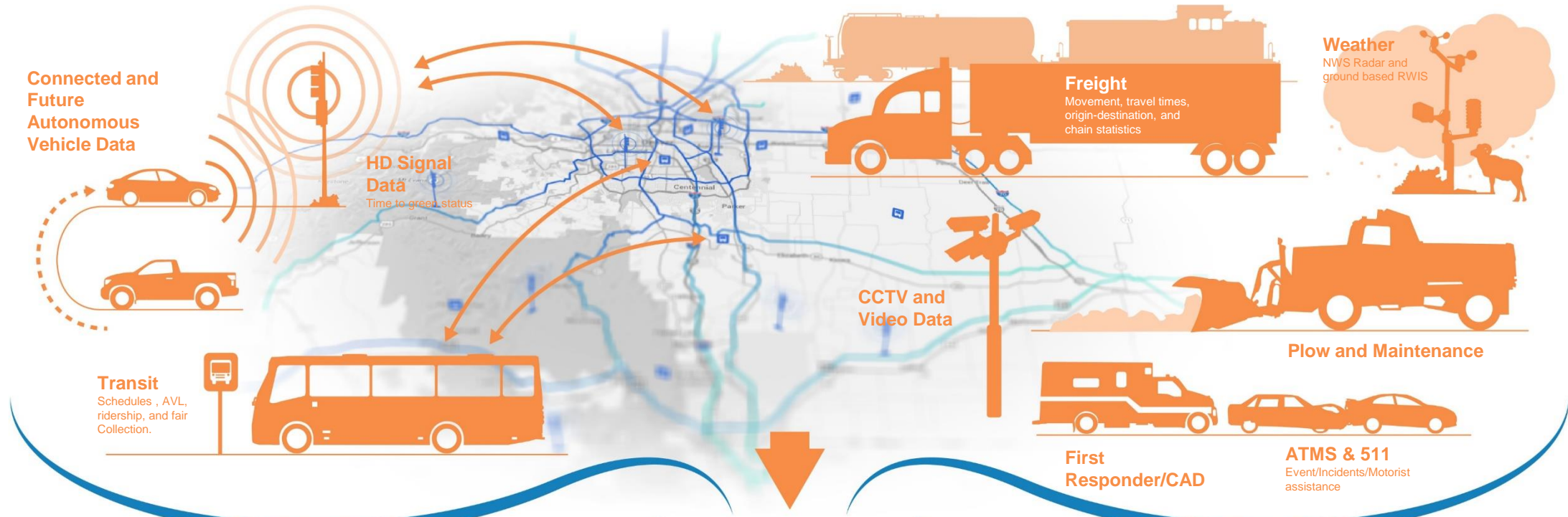
Communications



Enabling Decision Making & Effective Communication

Data Data Everywhere!





RITIS
Transportation
Data Platform

Operations



Communications



Planning



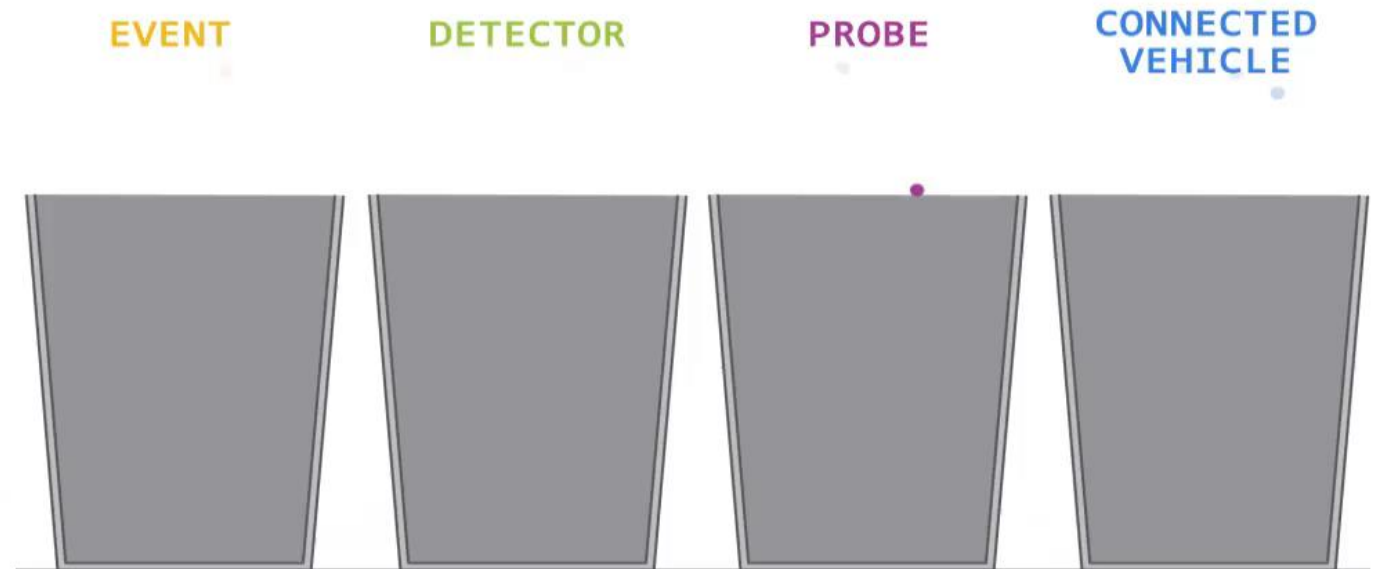
Performance Measures

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12P
Wed 12/31	\$0.00	\$0.1K	\$0.4K	\$0
Thu 1/01	\$0.00	\$28.92	\$81.47	\$0
	\$0.00	\$0.1K	\$0.4K	\$0
	\$0.00	\$17.71	\$0.3K	\$0
	\$0.00	\$0.2K	\$0.9K	\$0
	\$0.00	\$0.4K	\$0.8K	\$0
	\$0.00	\$0.9K	\$2.4K	\$0

How Much Transportation Data in RITIS?

- RITIS System Today:

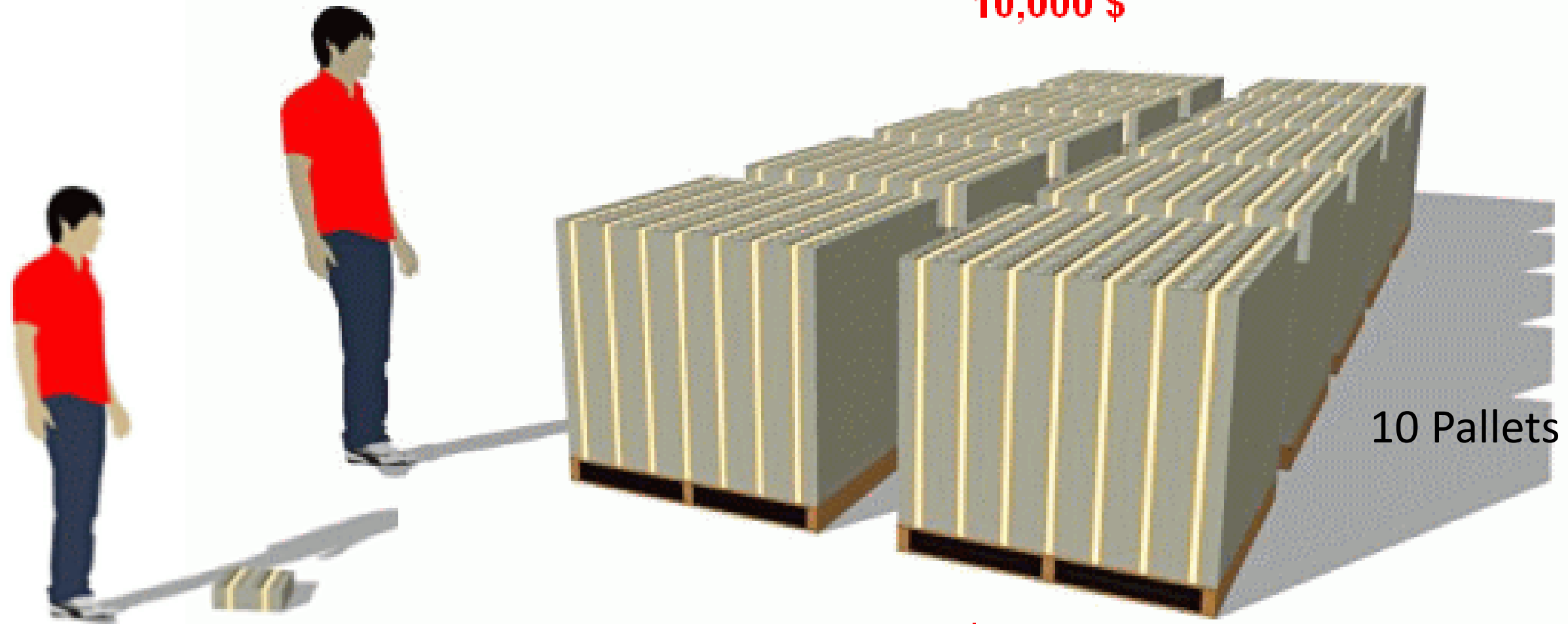
- Traffic accidents: 80,000 records per day: 0.002 Gb/day
- Traffic detectors: 35,000,000 records per day: 5 Gb/day
- Probe vehicle data: 6,300,000,000 records per day: 550 Gb/day (expected to jump to 8 Trillion)
- CCTV, weather, radio, etc: NO,STA,TSK,EPT records per day: ??? Tb/day
- V2X & Automation data: ?,???,???,???,??? records per day: ??? ?b/day (Starting in 1.5 years)



Those are big numbers!!!



10,000 \$



10 Pallets

1 million \$

1 billion \$

\$ 1 TRILLION

\$ 1,000,000,000,000

10,000
pallets



Why Visualization?



- **Visual bandwidth is enormous**

- Human perceptual skills are remarkable
 - Trend, cluster, gap, outlier...
 - Color, size, shape, proximity...
- Human image storage is fast and vast

Visualization is so effective and useful because it utilizes one of the channels to our brain that have the highest bandwidths: our eyes.

- Robert Kosara

An Experiment:

On the next slide, tell me the 3 countries with the largest values beside them.

You have 3-seconds.

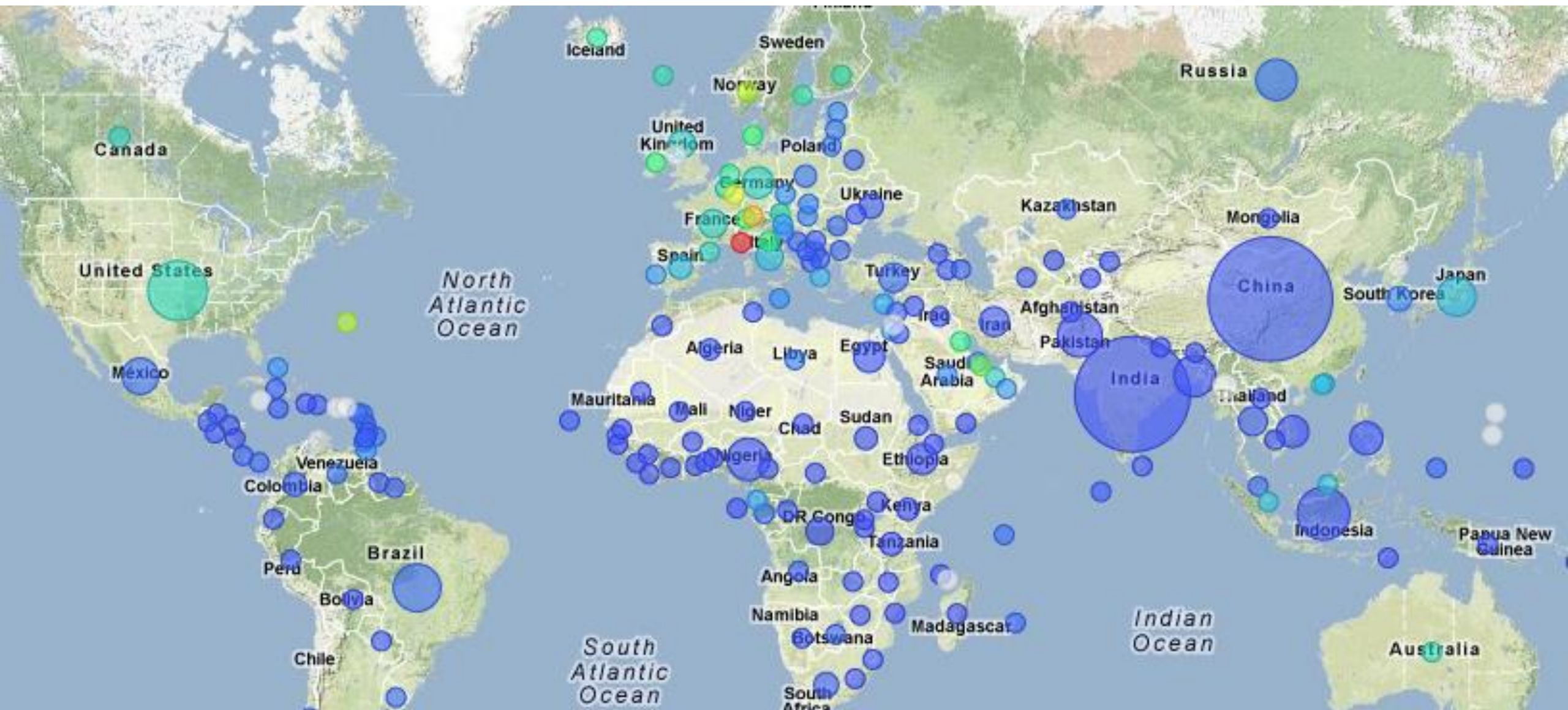
	Road deaths per 100,000 population	Population (millions)	Road deaths
Australia	8.0	20.3	1,627
Austria	9.3	8.2	768
Belgium	10.4	10.4	1,089
Canada	9.1	32.3	2,925
Czech Republic	12.6	10.2	1,286
Denmark	6.1	5.4	331
Finland	7.2	5.2	379
France	8.8	60.6	5,318
Germany	6.5	82.5	5,361
Great Britain	5.5	58.5	3,201
Greece	15.0	11.1	1,658
Hungary	12.7	10.1	1,278
Iceland	6.3	0.3	19
Ireland	9.5	4.2	396
Italy	-	-	-
Japan	6.2	127.8	7,931
Luxembourg	-	-	-
Netherlands	4.6	16.3	750
New Zealand	9.9	4.1	405
Norway	4.9	4.6	224
Poland	14.3	38.2	5,444
Portugal	11.8	10.6	1,247
Slovakia	-	-	-
Slovenia	12.9	2.0	258
South Korea	13.2	48.3	6,376
Spain	10.2	43.5	4,442
Sweden	4.9	9.0	440
Switzerland	5.5	7.4	409
Turkey	-	-	-
United States of America	14.7	306.4	43,443
OECD median	9.5		

What did you see?

Same Experiment:

On the next slide, find me the 3 countries with the largest values over them.

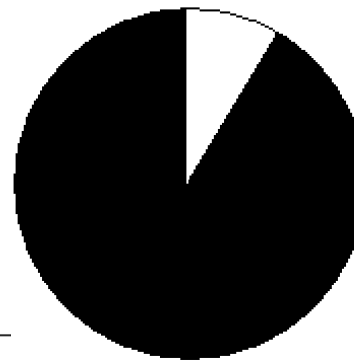
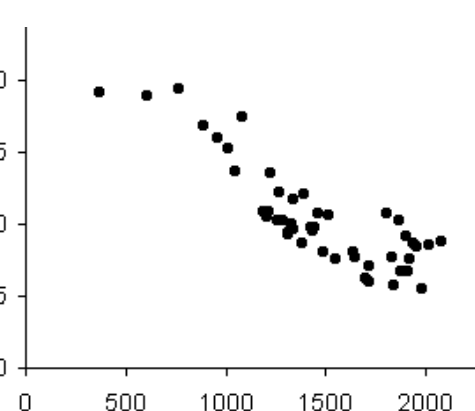
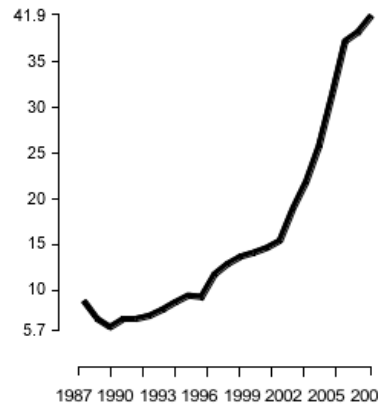
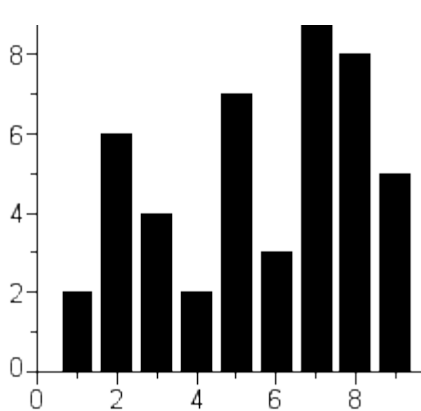
You have 3-seconds.



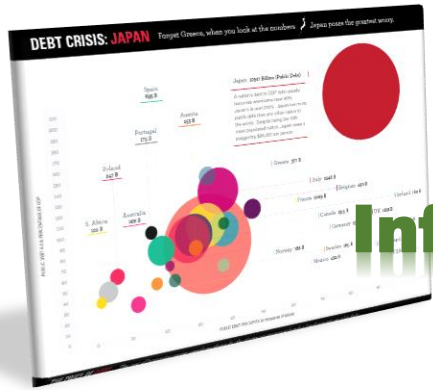
What did you see?

Basic visualizations

- The basics are familiar
- Low barrier to entry
- But they don't always tell the story *how* you want to tell it



Beyond the Basics



InfoGraphics

InfoVids



Serious Gaming



Visual Analytics



Augmented Reality

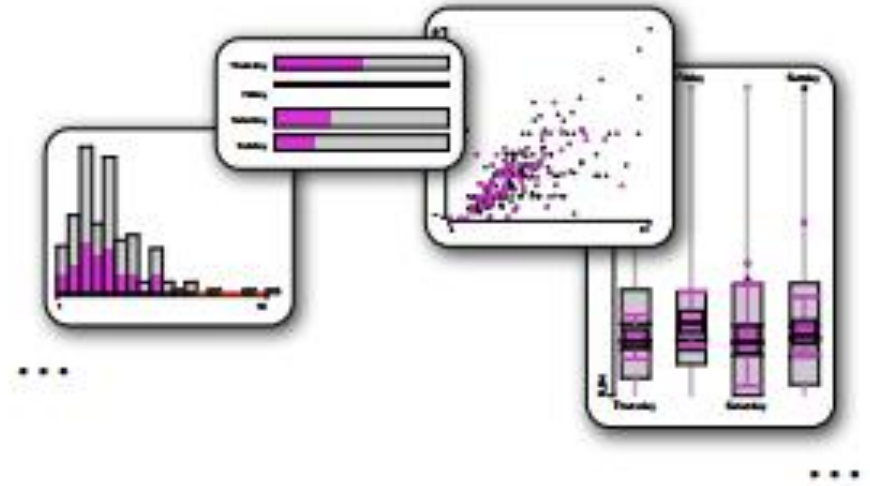


Presentation vs. Visual Analytics



Presentation

Vs.



Exploration

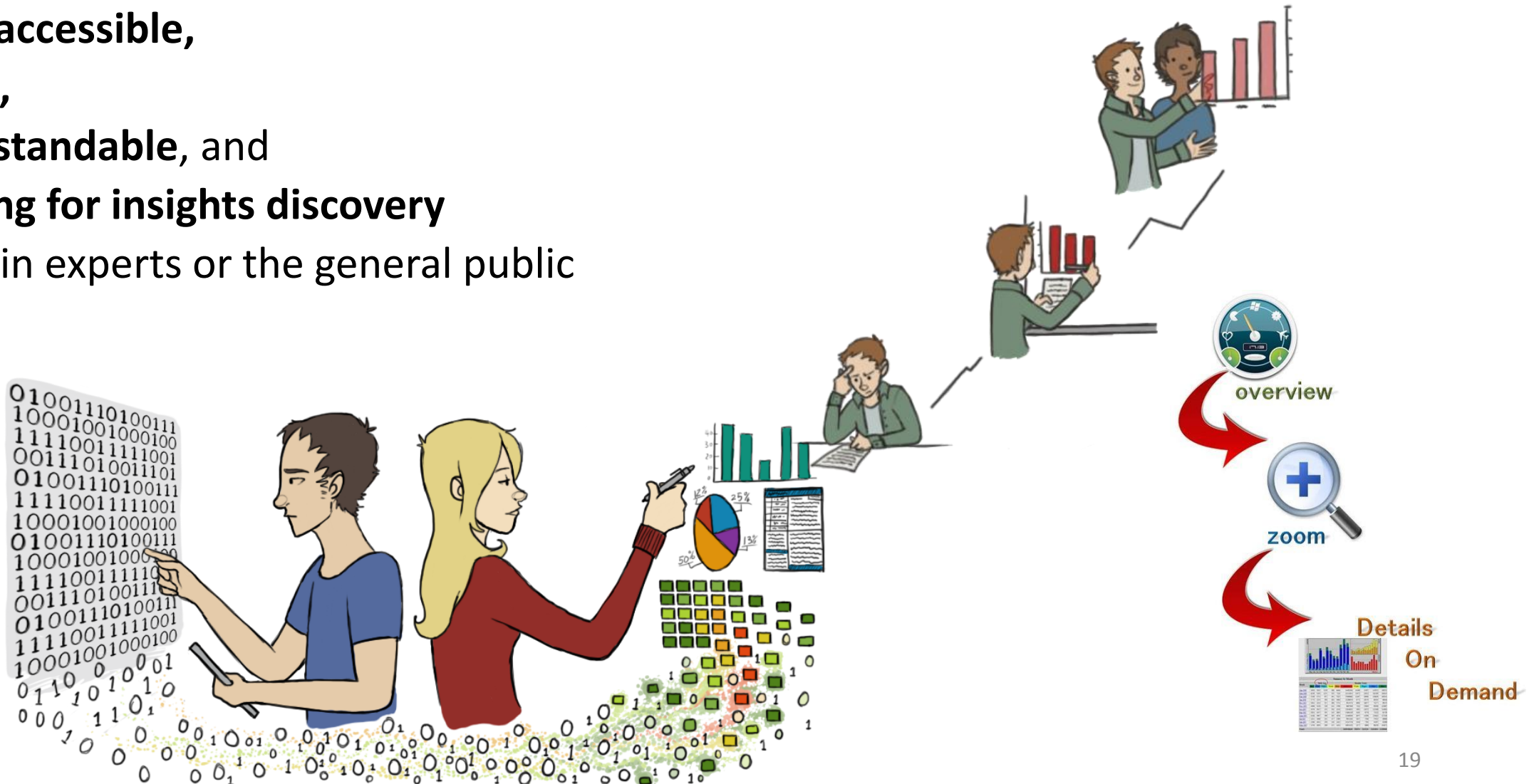
Visual Analytics

- Not just about pics and graphs...
- Visual Analytics provide the freedom to:
 - Explore data in new ways
 - Ask meaningful questions that you wouldn't have normally thought to ask
 - Develop new hypothesis
 - and realize new solutions



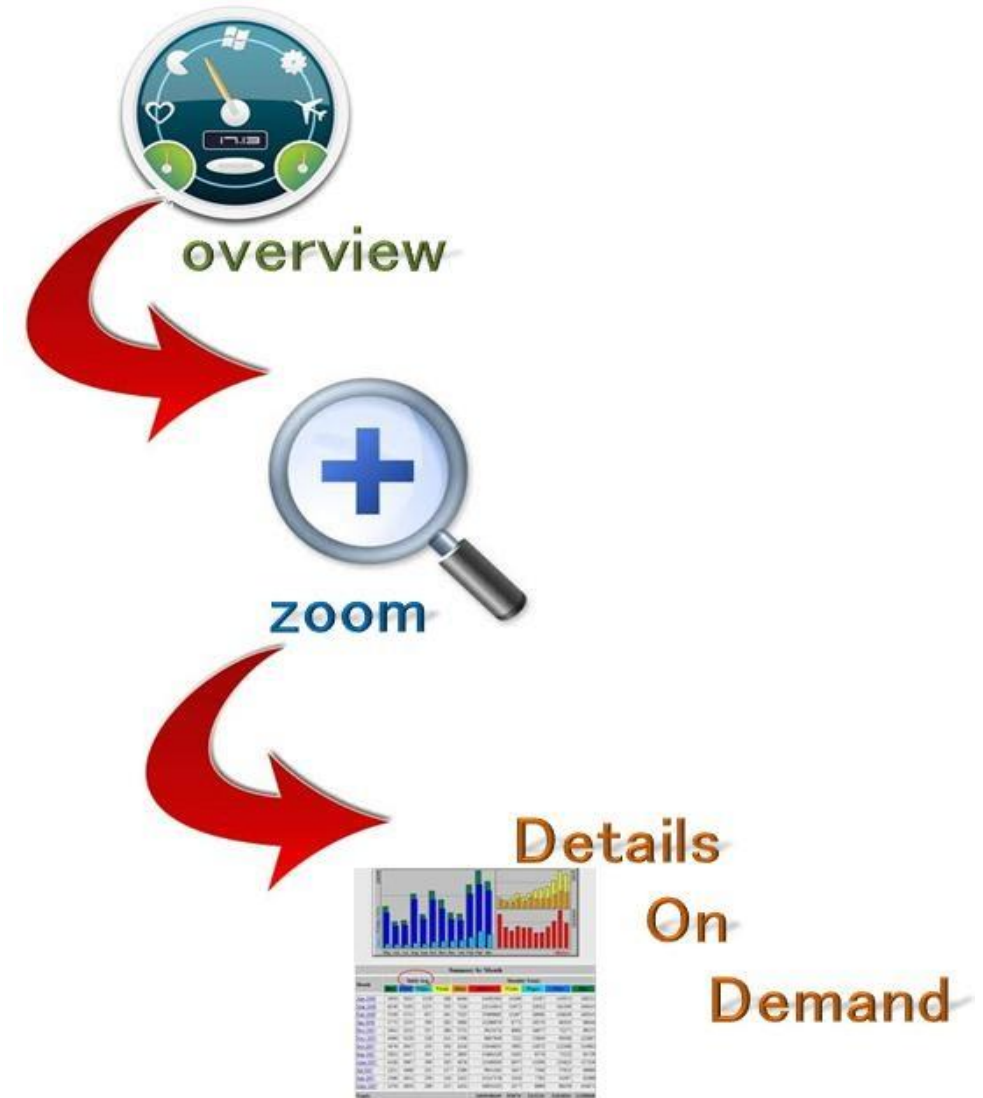
The Visual Analytics Goal

- Provide tools to make data
 - easily accessible,
 - usable,
 - Understandable, and
 - allowing for insights discoveryTo domain experts or the general public



The Visual Analytics Design Mantra

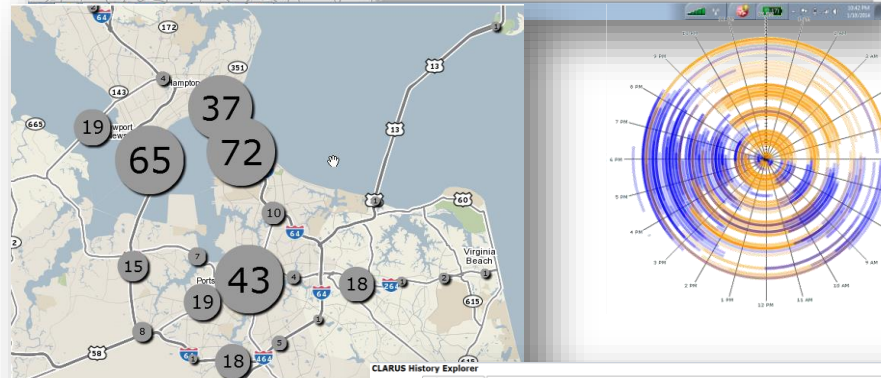
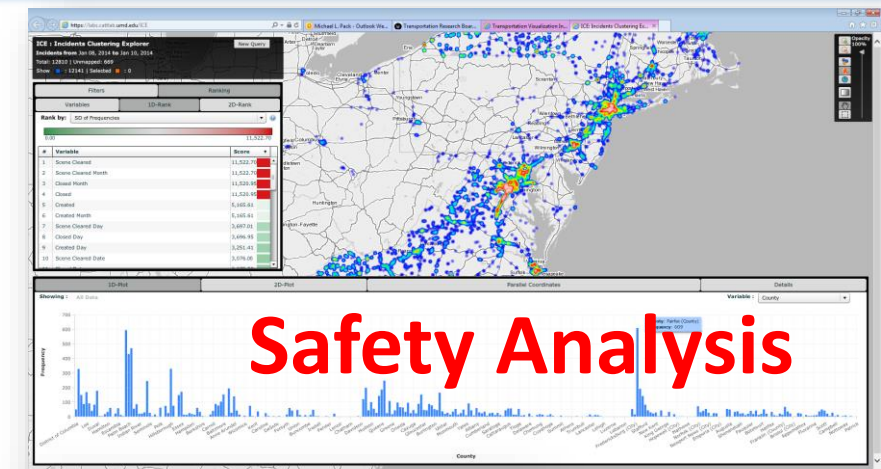
- Overview, zoom & filter, details on demand
- Overview, zoom & filter, details on demand
- Overview, zoom & filter, details on demand
- Overview, zoom & filter, details on demand
- Overview, zoom & filter, details on demand
- Overview, zoom & filter, details on demand
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- Overview, zoom & filter, details on demand



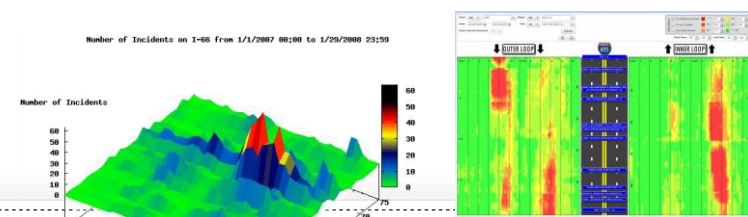
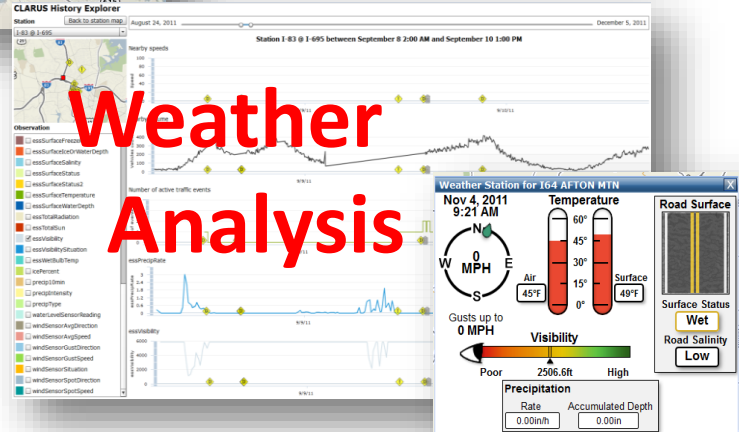
Real-world Example time!

Congestion Analysis

Safety Analysis



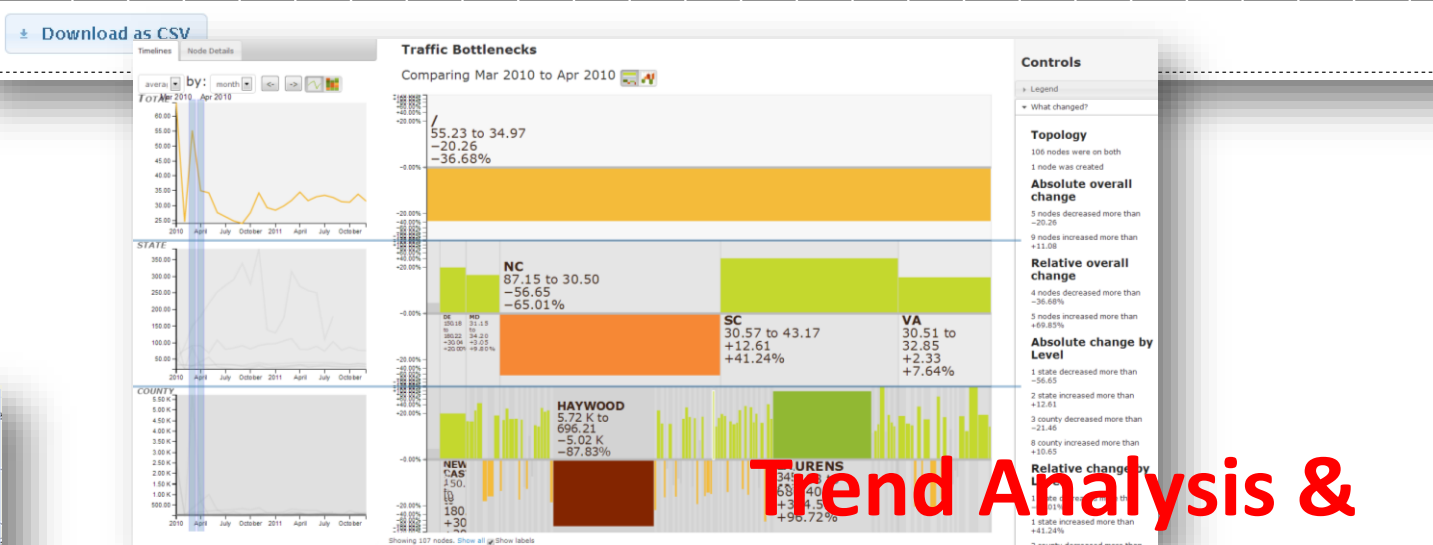
Weather Analysis



Combined passenger and commercial delay (Sands of dollars)

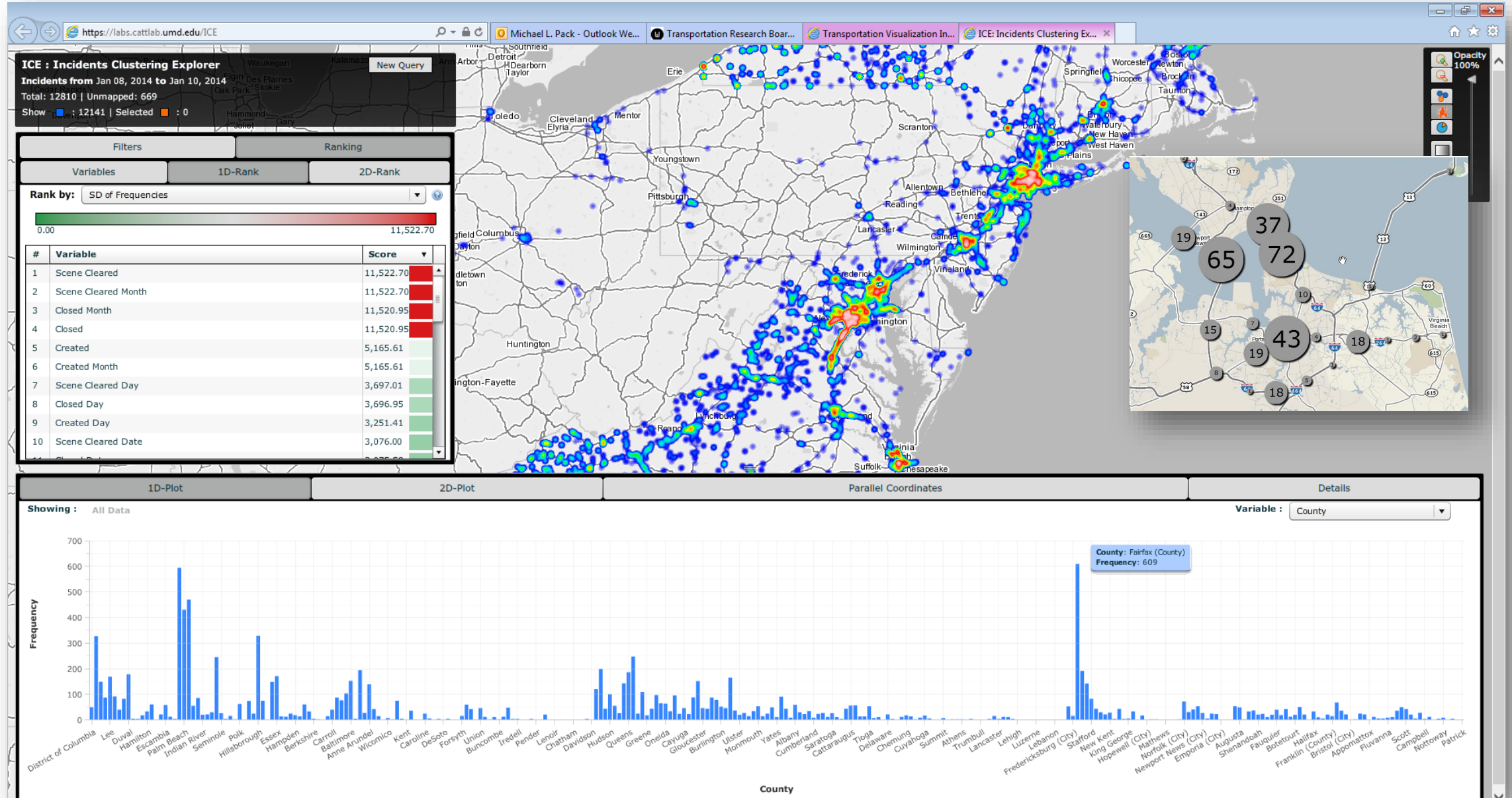
	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	D To
1/14/13	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.2K	\$11.9K	\$16.2K	\$2.7K	\$0.5K	\$0.2K	\$0.1K	\$0.2K	\$0.1K	\$1.4K	\$7.7K	\$10K	\$1K	\$0.1K	\$0.1K	\$0.1K	\$0.3K	\$0.1K	\$5
1/15/13	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.4K	\$12.9K	\$17.6K	\$2.7K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.2K	\$5.8K	\$12.9K	\$21K	\$8.5K	\$3.1K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$8
1/16/13	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$12.1K	\$14.4K	\$0.9K	\$0.1K	\$0.1K	\$0K	\$0K	\$0.6K	\$4.4K	\$14.9K	\$21.4K	\$6.5K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$7
1/17/13	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$12.2K	\$14.8K	\$2.1K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$8
1/18/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$9K	\$7K	\$0.2K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$14.8K	\$0.9K	\$0.1K	\$0K	\$0K	\$0.6K	\$0.1K	\$5	
1/19/13	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$0K	\$2
1/20/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$1
Hourly Totals	\$0.5K	\$0.5K	\$0.6K	\$0.3K	\$0.4K	\$0.2K	\$1.1K	\$8.4K	\$70.2K	\$8.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$93K	\$23.5K	\$3.6K	\$0.4K	\$0.4K	\$1.2K	\$0.5K	\$0.5K	\$35

Delay cost:
 Total: \$25,751.51
 Per user: \$9.22
Hours of delay:
 Total: 1,176.45 hours
 Per user: 0.35 hours
Data validity: 96.67%
[Click the table cell to see links to congestion scans](#)

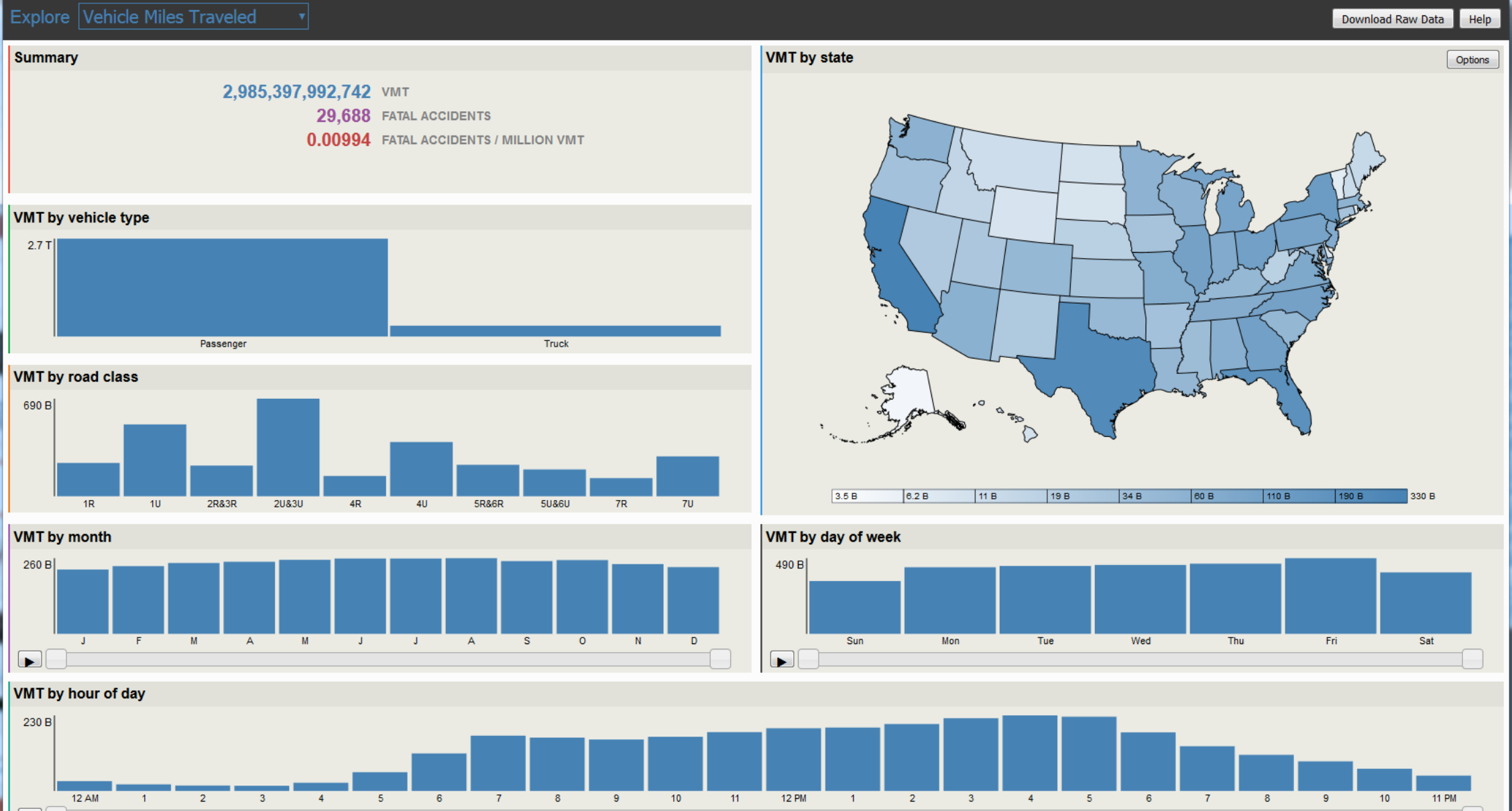


Trend Analysis & MAP-21 Reporting

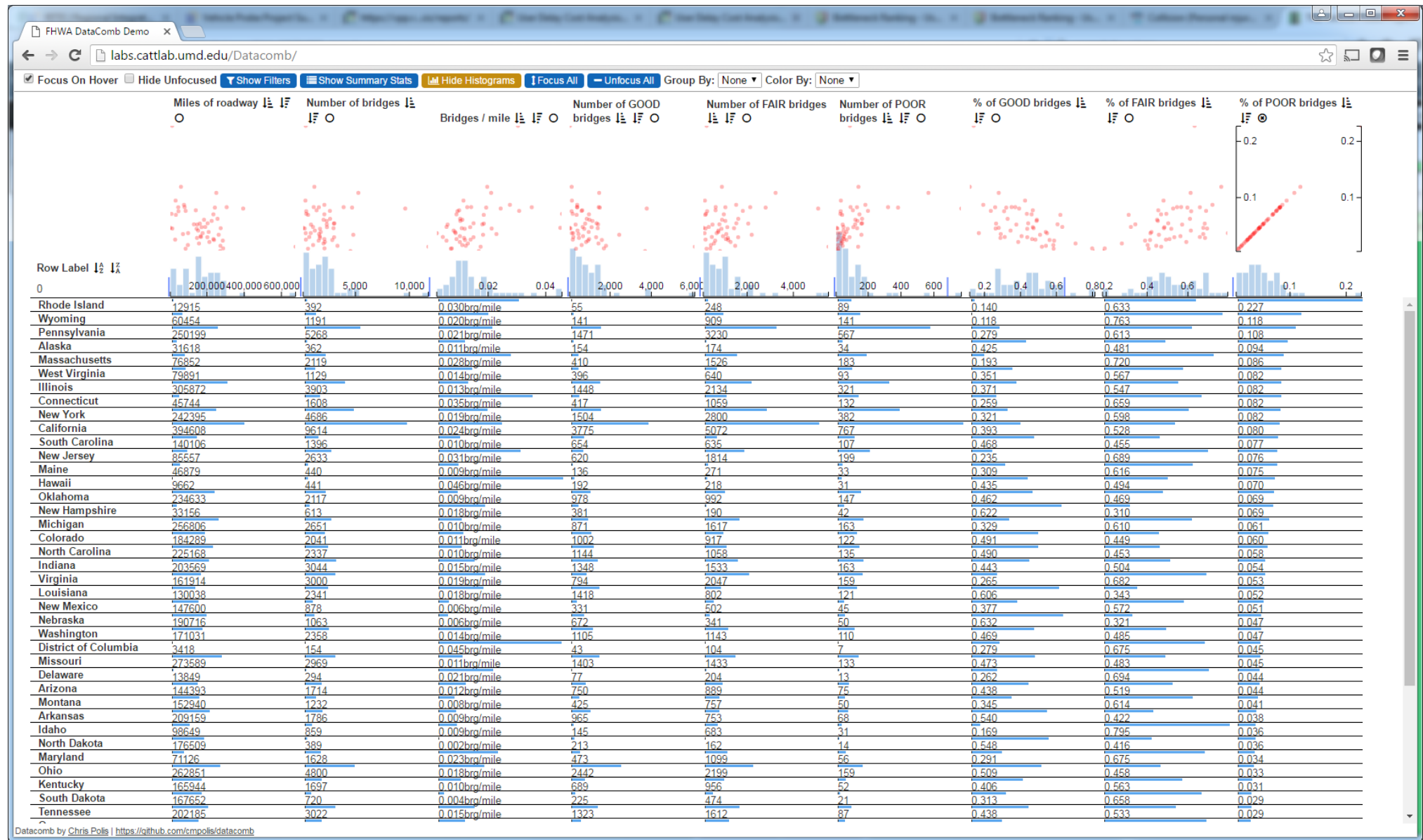
Incident Clustering Explorer



VMT & Fatalities

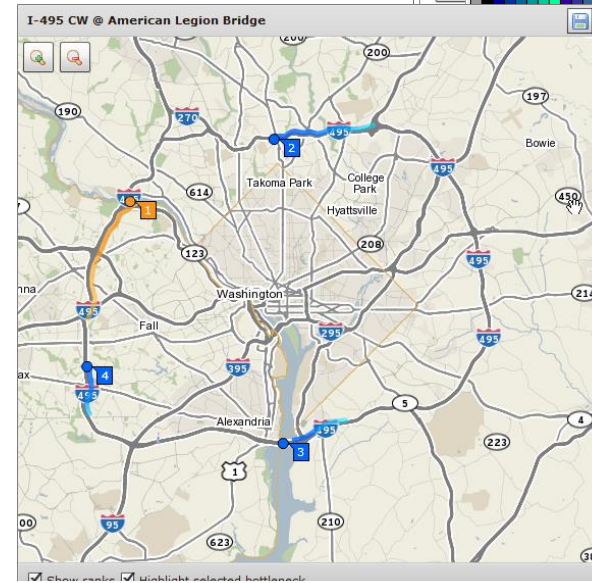
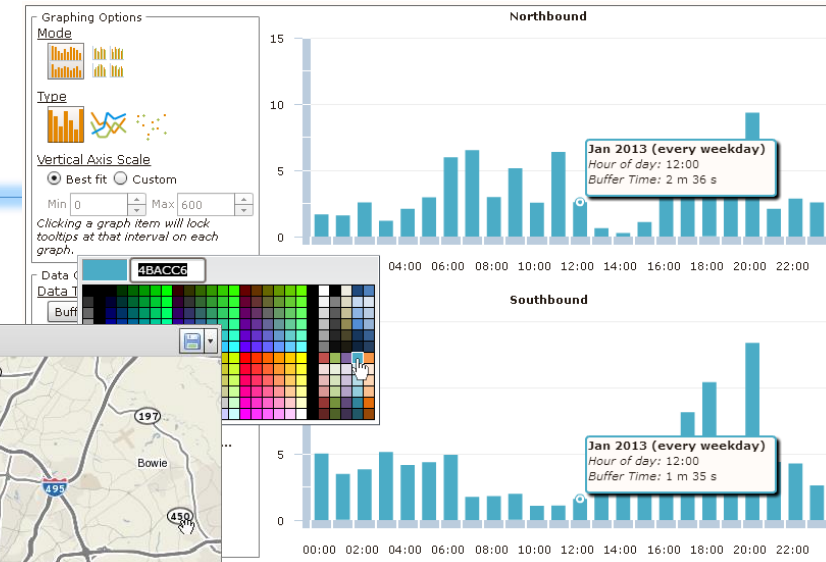


Bridge Conditions



Congestion Reporting Examples

- System Performance Reporting
- Problem Identification
- Project Prioritization
- After Action Incident Review
- Before & After Studies
- Operations
- Travel Time Analysis
- Work Zone Monitoring



Combined passenger and commercial delay costs (in thousands of dollars)

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Totals
1/14/13	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.2K	\$11.9K	\$16.2K	\$2.7K	\$0.5K	\$0.2K	\$0.1K	\$0.2K	\$0.1K	\$1.4K	\$7.7K	\$10K	\$1K	\$0.1K	\$0.1K	\$0.1K	\$0.3K	\$0.1K	\$53.7K
1/15/13	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0.4K	\$12.9K	\$17.6K	\$2.7K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.2K	\$5.8K	\$12.9K	\$21K	\$8.5K	\$3.1K	\$0K	\$0.1K	\$0.1K	\$0K	\$86.1K
1/16/13	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$12.1K	\$14.4K	\$0.9K	\$0.1K	\$0.1K	\$0K	\$0K	\$0.6K	\$4.4K	\$14.9K	\$21.4K	\$6.5K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$75.9K
1/17/13	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$0.3K	\$12.2K	\$14.8K	\$2.1K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$86.5K
1/18/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$9K	\$7K	\$0.2K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$14.8K	\$0.9K	\$0.1K	\$0K	\$0K	\$0.6K	\$0.1K	\$0K	\$51.3K
1/19/13	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$0.2K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$2.2K
1/20/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$1.7K
Hourly Totals	\$0.5K	\$0.5K	\$0.6K	\$0.3K	\$0.4K	\$0.2K	\$1.1K	\$58.4K	\$70.2K	\$8.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$93K	\$23.5K	\$3.6K	\$0.4K	\$0.4K	\$1.2K	\$0.5K	\$0.5K	Grand Total \$357,444

Delay cost:
 Total: \$25,751.51
 Per user: \$9.22

Hours of delay:
 Total: 1,176.45 hours
 Per user: 0.35 hours

Data validity: 96.67%

Click the table cell to see links to congestion scans

Download as CSV

Project Identification & Prioritization

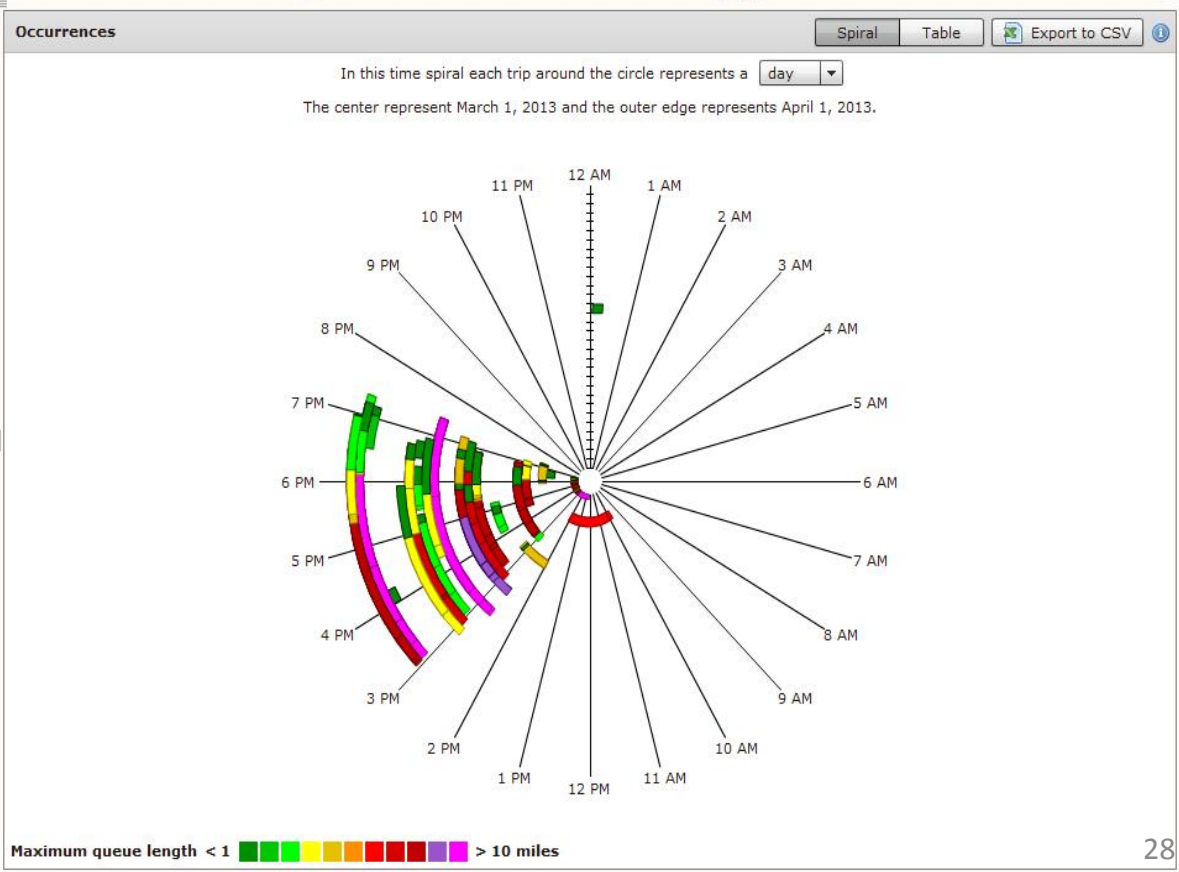
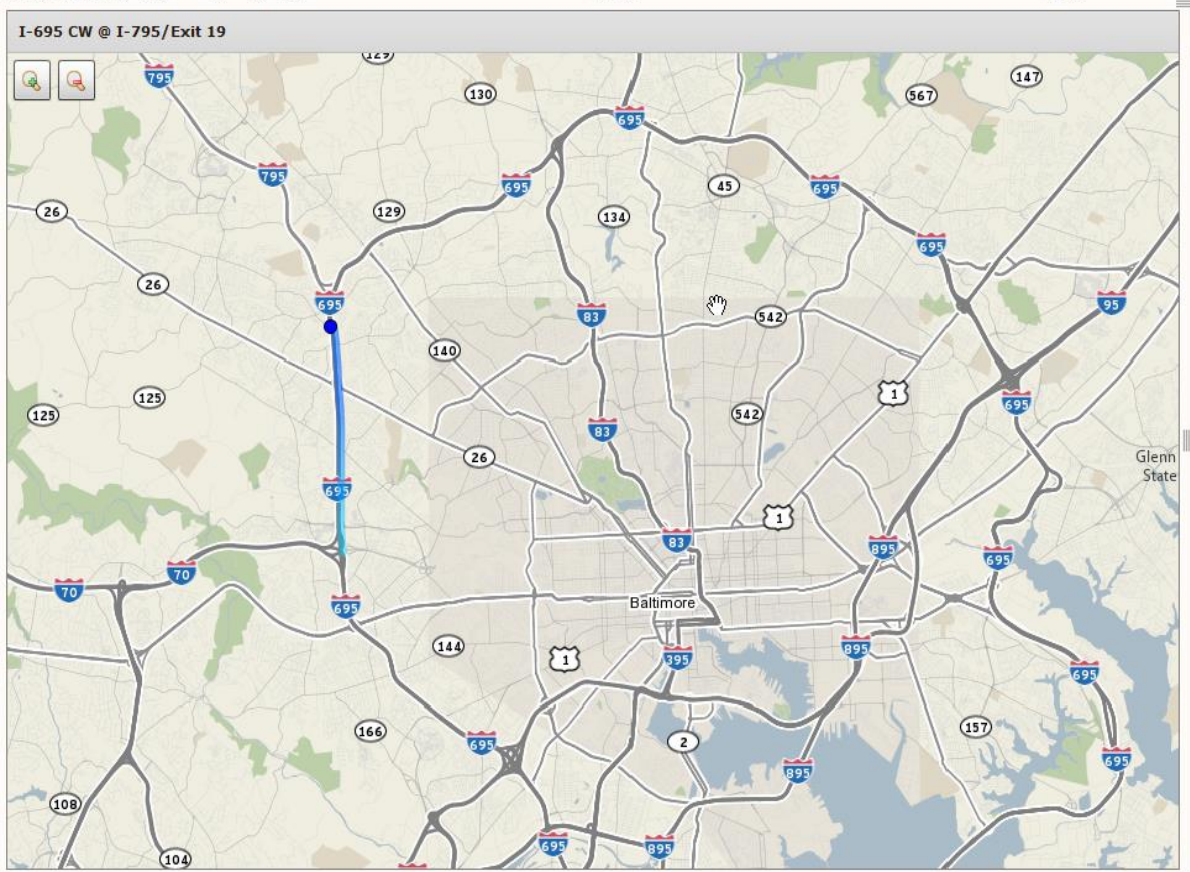
Statewide Reporting

- You've been asked to provide a monthly state-wide congestion report to the Secretary. This report only needs to cover the interstates, but it needs to highlight where the worst congestion occurred (top 10 locations) and some basic stats about the severity of the congestion at each of these locations. You also need to let the Secretary know if the congestion is about the same, better, or worse than the previous 2-weeks. What do you do?

Bottleneck Ranking

Bottleneck locations on Maryland Interstates between March 1, 2013 and March 31, 2013 (702 total) Export to CSV

Location	Average duration	Average max length (miles)	Occurrences	Impact factor
I-95 N @ MD-100/Exit 43	2 h 6 m	10.74	39	52,769
I-495 CCW @ MD-185/Connecticut Ave/Exit 33	2 h 33 m	8.07	32	39,499
I-695 CCW @ MD-144/Frederick Rd/Exit 13	1 h 51 m	16.55	19	34,898
I-695 CW @ MD-147/Harford Rd/Exit 31	2 h 25 m	9.73	24	33,852
I-695 CW @ I-795/Exit 19	2 h 5 m	5.37	49	32,893
I-270 N @ I-70/US-40	1 h 29 m	8.71	40	31,009
I-270 N @ Middlebrook Rd/Exit 13	1 h 43 m	6.77	43	29,964



System Performance Reporting (MAP-21)

Performance Measures & the NPRM



Performance Measures & the NPRM



Sys Performance for the NPRM

The image shows a two-step process for configuring a widget. On the left, an 'Add widget' dialog box displays a grid of widget options. The 'MAP-21' widget is highlighted with a red arrow. On the right, the configuration panel for the 'MAP-21' widget is shown, detailing the steps for selecting geography, measures, year, data source, and visualization options.

Add widget

Widget Types

- Speed and Travel Time Table**
Compare current and historic speed and travel time data along corridors of interest.
- Ranked Bottleneck Table**
Display a ranked list of bottlenecks for a selected geography.
- MAP-21**
Produce a family of regional performance measures widgets that conform to MAP-21 specifications.
- Coming Soon**
Performance Comparison
- Coming Soon**
Reliability Chart
- Coming Soon**
Accidents & Events

MAP-21

- Select geography:**
Select a state or urban area...
- Select measures:**
 - System Travel Time Reliability ⓘ
Set target to at least 90 %
 - System Peak Hour Travel Time ⓘ
Set target to at least 90 %
- Select year:**
2016
- Select data source:**
 - NPMRDS (Passenger vehicles)
 - NPMRDS (Trucks and passenger vehicles)
 - NPMRDS (Trucks)
- Show data as:**
 - Graph ⓘ
 - Map ⓘ
- Name MAP-21 widget(s):**

Creating a MAP-21 Dashboard (Query Screen)

The completed **Query Form** and associated **Reference Map**:

Map-21 Test Case

MAP-21

- Select geography:
New Jersey
- Select measures:
 System Travel Time Reliability
Set target to at least 90 %
 System Peak Hour Travel Time
Set target to at least 90 %
- Select year:
2015
- Select data source:
 NPMRDS (Passenger vehicles)
 NPMRDS (Trucks and passenger vehicles)
 NPMRDS (Trucks)
- Show data as:
 Graph
 Map
- Name MAP-21 widget(s):
2015 MAP-21 System Travel Time Reliability for New Jersey
2015 MAP-21 System Peak Hour Travel Time for New Jersey

+ Add 4 widgets

When satisfied with your query, click the **+ Add widgets** button...

Trenton, NJ

★ The inset shows how an Urban Area - such as the City of Trenton – would appear on the Reference Map.

Maps, Graphs, and Exports

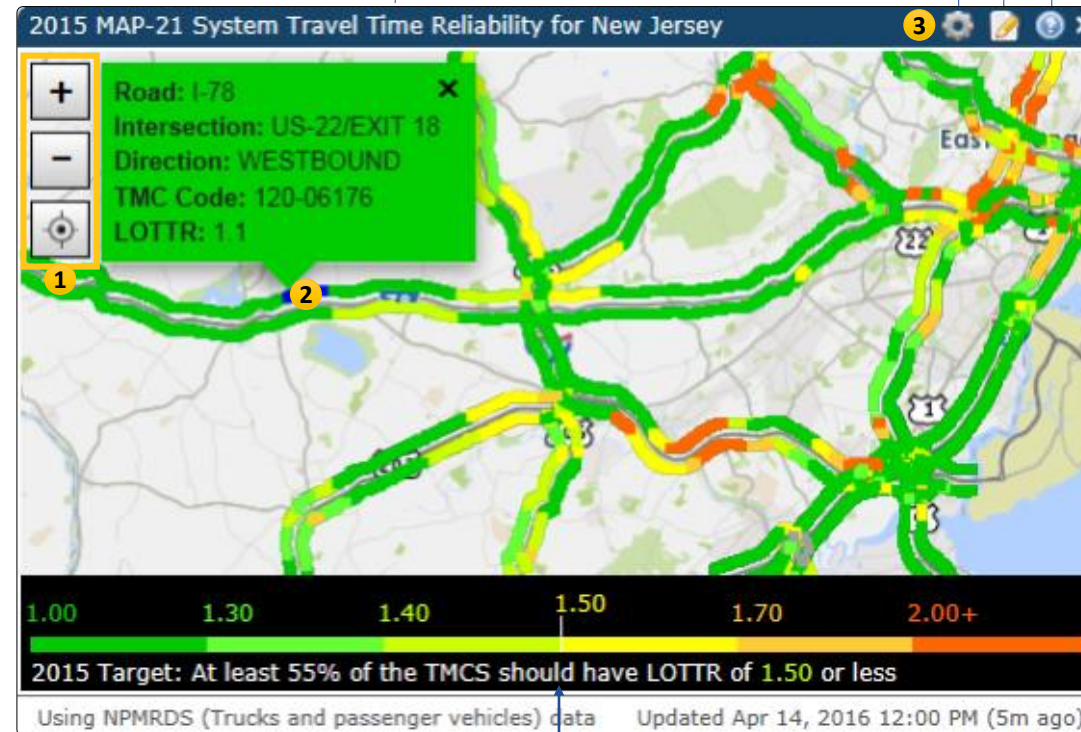


MAP-21 Dashboard (Map Widget Anatomy)

Here's a rundown of the features and query results for your **map** widget:

Your MAP-21 widget's **Name** (to change, click the **Edit** button)

- 1 These **Map Controls** allow you to zoom in or out and re-center the map on your selected geography.
- 2 Click on any reporting segment on the map to see a tooltip with detailed information.



Your selected **Data source**

The **Legend Bar** shows the value range color scale for each reporting segment on the map, as well as a definition of your target

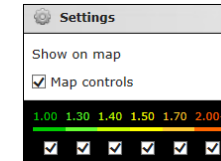
The last time your widget was **Updated**

Use **Settings** to show or hide **Map Controls** or turn the segment colors on/off for each value range (see 3)

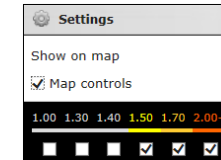
Edit your query

Go to MAP-21 Dashboard **Help**

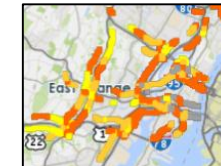
- 3 Clicking on **Settings** opens the menu:



Uncheck reporting segment ranges you wish to hide:



The Map will update to show only those ranges still checked:



[Note: map screenshot exports are not supported at this time. Use your PrtScn button to save screenshots of maps]

MAP-21 Dashboard (Graph Widget Anatomy)

Here's a rundown of the features and query results for your **Graph** widget:

Your MAP-21 widget's **Name** (to change, click the **Edit** button)

Edit your query

Save as an Excel file or Screenshot

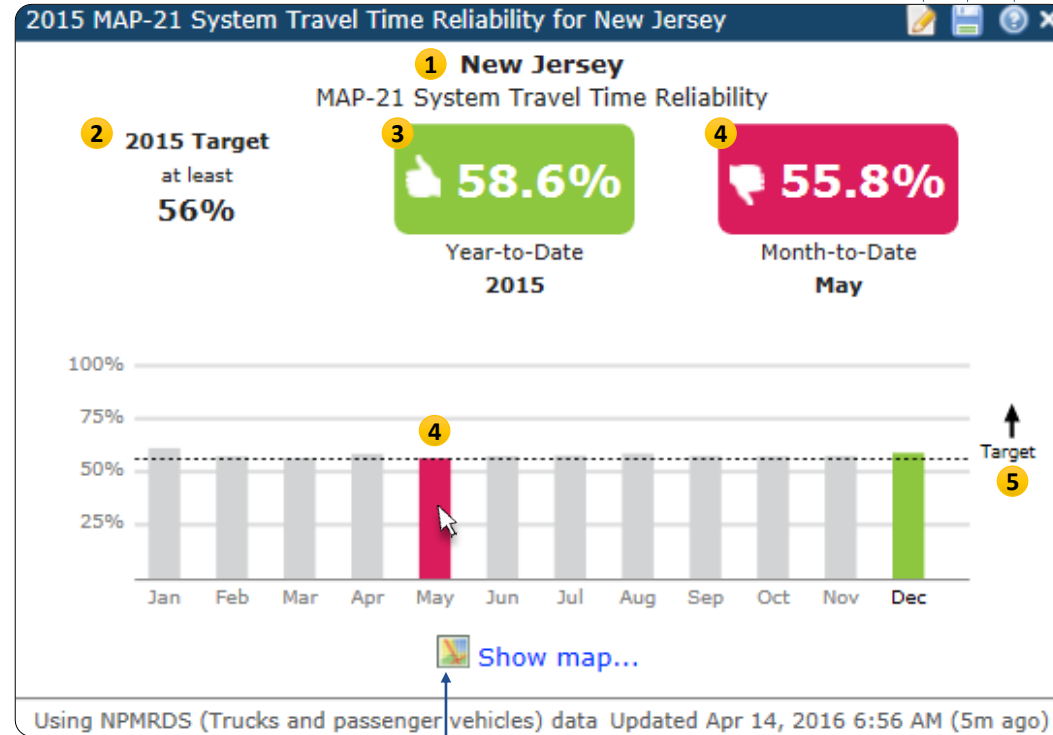
Go to MAP-21 Dashboard **Help**

1 Your Geographic Area & MAP-21 Performance Measure

2 Your analysis year **Target** threshold (at least **56%** of your System provides acceptable travel time reliability).

3 The selected year (**2015**) **System Travel Time Reliability** measure for your defined geography, showing **58.6%** of your System provides acceptable travel time reliability.

A green box and "thumbs up" is used to indicate this percentage is better than your target or at least 56%.



4 Hovering over each bar in the graph updates the **Month** box with that month's measure. Click on a bar will make it the selected month.

In this example, for May 2015 **55.8%** of the System provided acceptable travel time reliability.

A red box with a "thumbs down" is used to indicate this percentage is worse than your target.

5 A dotted reference line across the graph indicates the minimum **Target** threshold.

The direction of the arrow indicates the measure's desired trend.

Click here to **show** or **hide** the reference map



Your selected **Data source**

The last time your widget was **Updated**

We're here to help: cattlab.umd.edu/map-21

Are you ready for MAP-21?

- Explore the NPMRDS
- Work with other data sources
- Give guidance and feedback
- Test hypothesis/alternatives
- A forum for discussion
- A place to ask question
- How to provide us your volume and speed data
- What else can we do for you?

The CATT Lab is!
And we are ready to help you.

This website will be updated within one week of the start of Proposed Rulemaking (NPRM). Check back often for updates on calculating your MAP-21 systems performance metrics.

Until then, [click here](#) to register for your free RITIS account from your region (if your agency has given it to us).

We're here to help: cattlab.umd.edu/map-21

← → ↻ www.cattlab.umd.edu/MAP-21/ 🔍 ☆

Are you ready for MAP-21?

The CATT Lab Can Help You!

This page includes a number of resources to:

- Help you [understand](#) the proposed rule
- Use [free tools](#) to see how your State, MPO, and/or Urban Area are performing
- Use [free tools to experiment](#) with variations to the proposed rule such as:
 - Imputation methods other than using speed limits
 - Arithmetic mean vs. harmonic mean
 - NPMRDS vs. other 3rd Party Data Sources (HERE, INRIX, and TomTom)
 - Experiment with target setting
 - *Send us your own suggestion*
- [Provide us](#) your volume and/or speed limit data for use in our free tools
- Learn to [compute the measures yourself](#) using sample data sets
- Link to [FHWA webinars and other resources](#)
- Discuss the rule, ask questions, request support, and collaborate in an [open forum](#)
- Learn [about us](#)

Our goal is to enable MPOs and DOTs to evaluate the proposed measures, assess their impact, experiment with alternatives, and respond to the docket. Comments on the latest Systems Performance NPRM are currently due by **August 20**.

Understanding the Notice of Proposed Rule Making (*coming soon*)

FHWA's [MAP-21 NPRM Website](#) has a lot of good information about the rule, but here is our quick and dirty interpretation of what is being asked, how it will affect you, and how complicated it's going to be. (*Coming soon.*)

Free MAP-21 Performance Calculation Tools

The CATT Lab has developed some free tools that are available to states, MPOs, and consultants working on behalf of an agency to better explore the National Performance Management Research Data Set (NPMRDS) data (one of the datasets that FHWA suggests using for computing performance). Within this suite of tools is a MAP-21 widget that allows you to quickly and easily calculate your region's performance as described in the NPRM subparts [E](#), [F](#), [G](#), and [H](#).

The tool outputs the systems performance measures as charts, maps, and data files that can be used to report up to FHWA or to simply understand your agency's performance.

The tool can be found at npmrds.ritis.org

Detailed tutorials will be added soon, so please check back often.

How do I see these tools?

- ▶ If you already use RITIS tools, your [existing login](#) is all you need to access the NPMRDS analytics tools.
- ▶ If you do not have a RITIS account, click now to [request a login](#). Most accounts will be ready within 1 business day.

Any users experiencing issues with access or login should email support@ritis.org

Our databases already include everything needed to calculate Level of Travel-Time Reliability (LOTR) across all states and MPOs nationwide. However, we do not have all data needed to calculate all measures for all areas. We can work with you to load your data for immediate analysis of additional parameters such as speed limits and traffic volume.

Experimenting with the Rule (*coming soon*)

Many who read the NPRM may question the algorithms, methods, data, etc. Our goal is to modify our free tools described above to allow your agency to experiment with variations to the proposed rule to see how those variations might impact both your performance and the intent of the rule. We encourage you to email us (or post to the forum) your questions and/or requests for what you'd like us to experiment with. Time permitting, we will attempt to add options to the tools to allow you to test each possibility (or combination of possibilities). Examples could include things like:

- Testing of Imputation methods other than just filling gaps with speed limits
- Arithmetic mean vs. harmonic mean
- NPMRDS vs. other 3rd Party Data Sources (HERE, INRIX, and TomTom)

 Speed and Travel Time Table Compare current and historic speed and travel time data along corridors of interest.	 Ranked Bottleneck Table Display a ranked list of bottlenecks for a selected geography.	 MAP-21 Produce a family of regional performance measures widgets that conform to MAP-21 specifications.
 Performance Comparison Coming Soon	 Reliability Chart Coming Soon	 Accidents & Events Coming Soon

Understanding Responder Actions and Implications

A bad day...

- A high level manager in your department just arrived at work and complained about an accident that occurred along his commute this morning around 7:00 AM. The media and some public officials are calling the office, too, to try to get more information about what happened.
- This manager wants you to find out the details about this incident, but specifically, to figure out how long the bottleneck grew, and how long the delays lasted. Any additional info you can glean would make his day (which isn't off to a good start.)

Historic Analysis

Vehicle Probe Project Suite Dashboard

Welcome, packml@umd.edu | FAQs | Screenscasts | Logout

Data exports Settings Help

Nest bottlenecks and events

Congestion Bottlenecks Traffic events

Collision

Location	I-495 WEST AT EXIT 35 I 270
Started	May 15, 2012 6:44 AM
Ended	May 15, 2012 7:11 AM
Duration	26 m 40 s

Timeline

Updated May 15, 2012 7:11 AM

I-495 CCW @ MD-355/Wisconsin Ave/Exit 34

Road	I-495 Counterclockwise
Starting point	MD-355/Wisconsin Ave/Exit 34
Began	May 15, 2012 6:21 AM
Ended	May 15, 2012 11:42 AM
Duration	5 h 21 m
Queue length	10.50 miles
Average queue length	5.09 miles

Travel Time Index Over Time

What time would you like to see data for?

Right now, and keep the data up to date in real-time

A previous point in time

05/15/2012 07:07

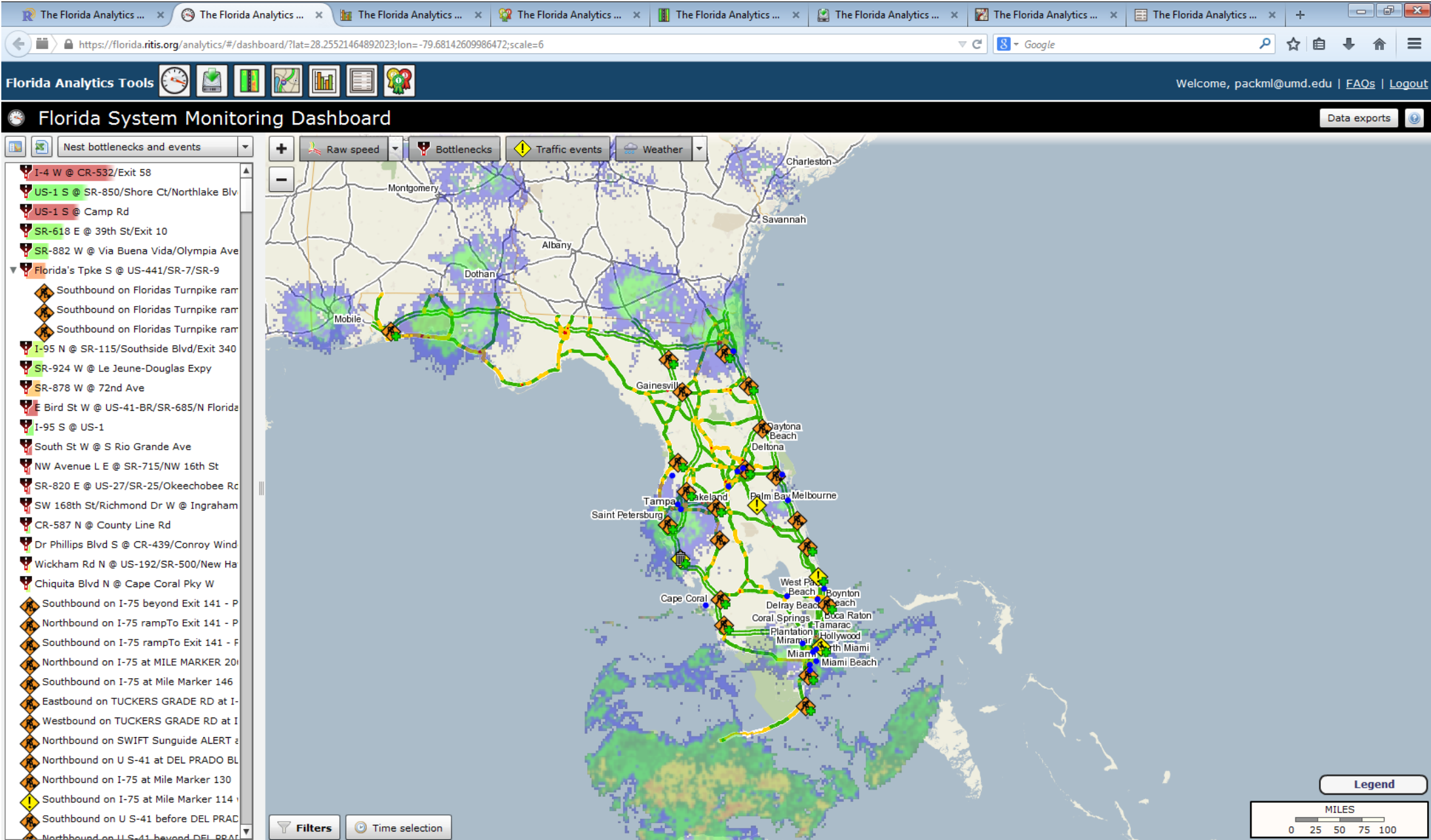
Done

Filters Time selection

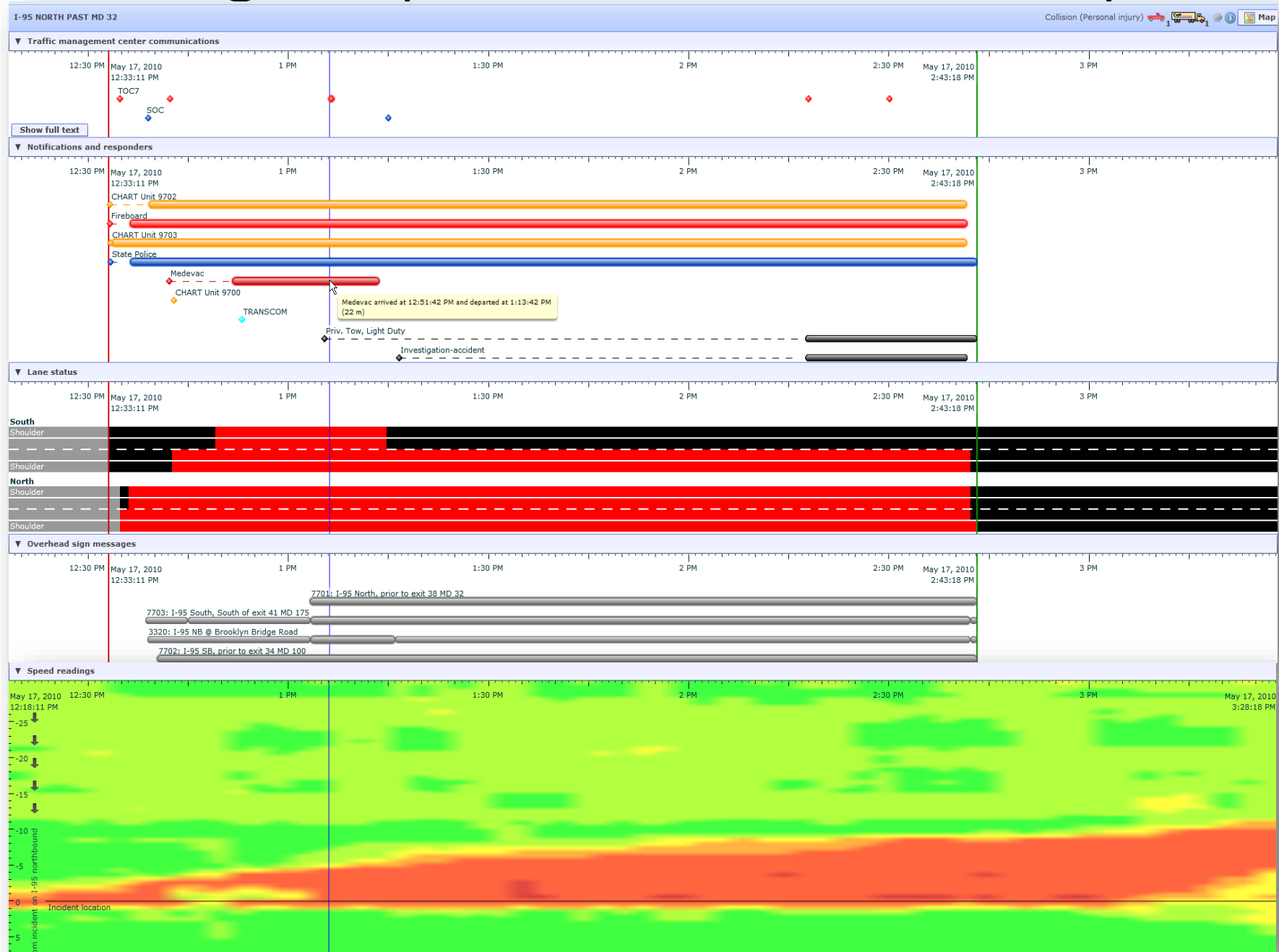
Legend

You're looking at data from May 15, 2012 @ 7:07 AM. Bottlenecks are shown at their maximum length. There are 1060 bottlenecks and 11980 events.

..and what about the weather? (looking back)time



Understanding Responder Actions & Implications

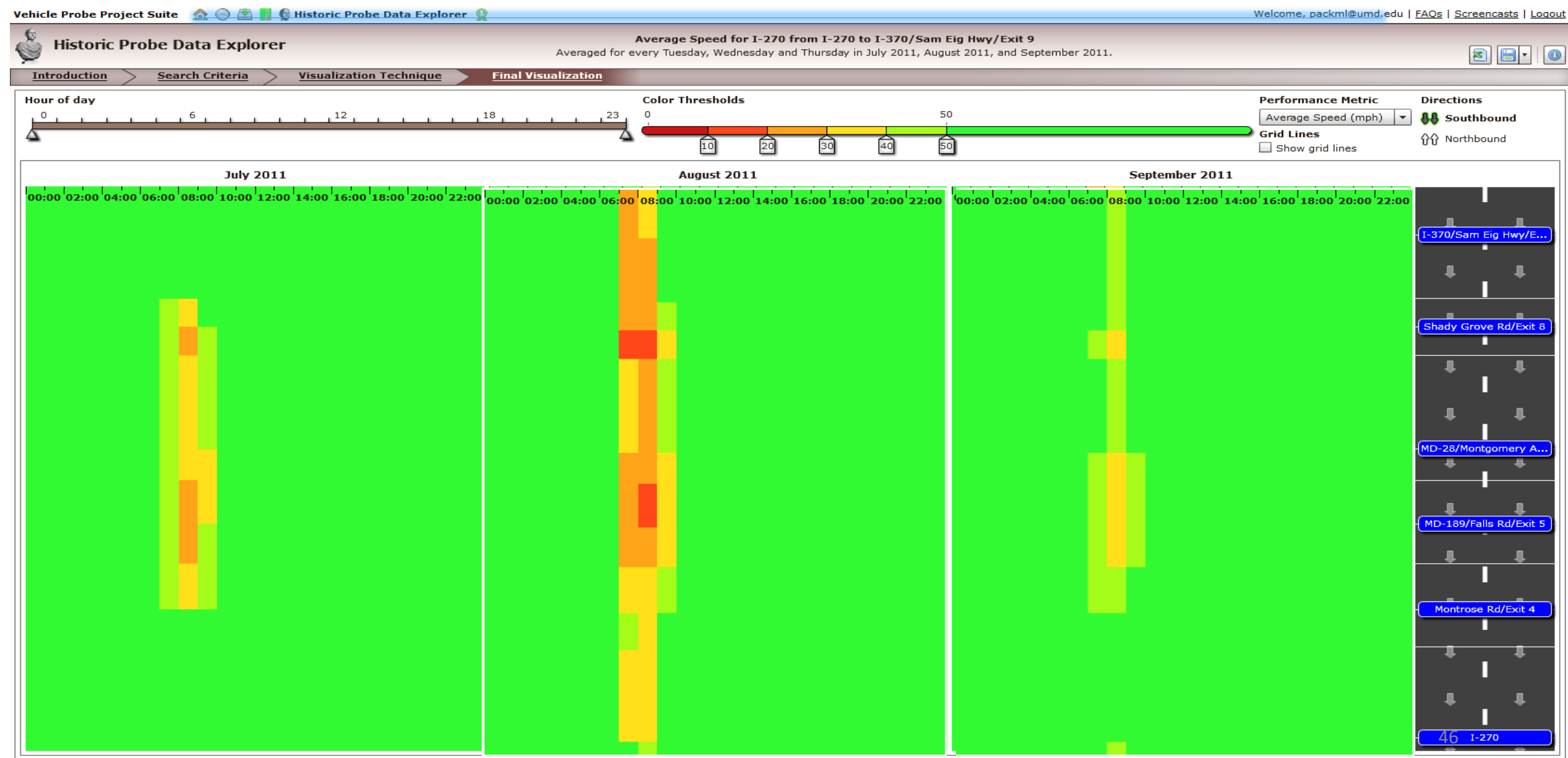


Before & After Studies

I just spend \$200M, and all I got was this...

- You just spent \$200M on a 6-month major road widening project along that corridor you (and everybody else) hate. Some commuters are now complaining that things haven't improved---in fact, they claim things have gotten worse. You can see the headlines now: "\$200M fattens road, shrinks commuter patience!"
- What can you produce to show the true impact of this recent investment (positive or negative).

Answer #1: better or worse?



Answer #2: show me the money

Combined view Split view

Combined passenger and commercial delay costs

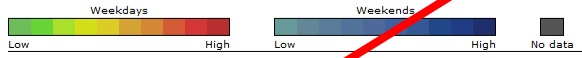
	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Total
6/18/12	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0	\$3.7K	\$3.3K	\$0.7K	\$0.3K	\$0.6K	\$0.4K	\$4.3K	\$1.3K	\$0.6K	\$7.8K	\$6.7K	\$3.8K	\$0	\$0	\$0	\$1.1K	\$0	\$35.3K
6/19/12	\$0	\$0	\$0	\$0.3K	\$0	\$0	\$0	\$1.1K	\$1.6K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0	\$0	\$0.9K	\$6.7K	\$0.7K	\$0	\$0.1K	\$0	\$0.2K	\$0	\$13.2K
6/20/12	\$0.3K	\$0.3K	\$0	\$0	\$0.2K	\$0	\$0	\$0.6K	\$1.2K	\$0.3K	\$0.3K	\$0	\$0	\$0.3K	\$0.4K	\$0	\$0.4K	\$3.8K	\$1.1K	\$0	\$0	\$0.2K	\$0.3K	\$0.6K	\$10.2K
6/21/12	\$1.1K	\$1.0K	\$0.1K	\$0	\$0.1K	\$0.1K	\$0	\$3.5K	\$26.2K	\$3.1K	\$0.9K	\$1	\$0.3K	\$0	\$0.5K	\$0.5K	\$0.5K	\$7.4K	\$4.8K	\$0.6K	\$0	\$0.8K	\$0.1K	\$0	\$53.3K
6/22/12	\$0.1K	\$0.6K	\$0.1K	\$0.3K	\$0.3K	\$0	\$0	\$0	\$0	\$0.3K	\$0.3K	\$0	\$0	\$0	\$0	\$0.5K	\$21.9K	\$69.3K	\$19.0K	\$0	\$0	\$0.2K	\$0.5K	\$0.1K	\$113.8K
Hourly Totals	\$1.7K	\$1.9K	\$0.4K	\$0.9K	\$0.7K	\$0.3K	\$0	\$8.8K	\$32.3K	\$4.4K	\$2.0K	\$2.9K	\$1.1K	\$5.1K	\$2.1K	\$1.5K	\$31.6K	\$94.0K	\$29.4K	\$0.6K	\$0.1K	\$1.2K	\$2.2K	\$0.7K	Total: \$225.8K

Download as CSV

Notes

- All displayed costs are rounded to the closest hundredth value.
- Costs shown in the tooltips are the actual values.
- Delay metrics are displayed for every hour of every day within the selected time range.
- The totals for every hour are shown in the bottom row while the totals for every day are shown in the rightmost column.
- The grand total for the entire time period is shown at the bottom right corner. This grand total only applies to the table it is associated with.

Legend



This mobility report was created by the [CATT Lab](#) for private use within the Michigan Department of Transportation system. [Need help?](#)

3 PM	4 PM	5 PM	6 PM
\$0.6K	\$7.8K	\$6.7K	\$3.8K
\$0	\$0.9K	\$6.7K	\$0.7K
\$0	\$0.4K	\$3.8K	\$1.1K
\$0.5K	\$0.5K	\$7.4K	\$4.8K
\$0.5K	\$21.9K	\$69.3K	\$19.0K
\$1.5K	\$31.6K	\$94.0K	\$29.4K

10 PM	11 PM	Daily Totals
\$1.1K	\$0	\$35.3K
\$0.2K	\$0	\$13.2K
\$0.3K	\$0.6K	\$10.2K
\$0.1K	\$0	\$53.3K
\$0.5K	\$0.1K	\$113.8K
\$2.2K	\$0.7K	Total: \$225.8K

Report parameters

- Passenger: 94% of the traffic volume at \$17.09 per vehicle.
- Commercial: 6% of the traffic volume at \$30.14 per vehicle.
- Delay is calculated for segments whose speeds fall below 60 mph.

Display:

- Total cost
 Cost per user
 Total delay
 Delay per user
 Coverage

Grouping options:

- All vehicles
 Only passenger vehicles
 Only commercial vehicles

Combined passenger and commercial delay costs (in thousands of dollars)

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Totals
1/14/13	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.2K	\$11.9K	\$16.2K	\$2.7K	\$0.5K	\$0.2K	\$0.1K	\$0.2K	\$0.1K	\$1.4K	\$7.7K	\$10K	\$1K	\$0.1K	\$0.1K	\$0.1K	\$0.3K	\$0.1K	\$53.7K
1/15/13	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0.4K	\$12.9K	\$17.6K	\$2.7K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.2K	\$5.8K	\$12.9K	\$21K	\$8.5K	\$3.1K	\$0K	\$0.1K	\$0.1K	\$0K	\$86.1K
1/16/13	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$12.1K	\$14.4K	\$0.9K	\$0.1K	\$0.1K	\$0K	\$0K	\$0.6K	\$4.4K	\$14.9K	\$21.4K	\$6.5K	\$0.1K	\$0K	\$0.1K	\$0K	\$0K	\$75.9K
1/17/13	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$12.2K	\$14.8K	\$2.1K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$86.5K
1/18/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$9K	\$7K	\$0.2K	\$0K	\$0.4K	\$0.1K	\$0K	\$0.2K	\$4.3K	\$19.6K	\$25.8K	\$6.5K	\$0.1K	\$0.1K	\$0K	\$0.6K	\$0.1K	\$51.3K
1/19/13	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$0.2K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.1K	\$2.2K
1/20/13	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$1.7K
Hourly Totals	\$0.5K	\$0.5K	\$0.6K	\$0.3K	\$0.4K	\$0.2K	\$1.1K	\$58.4K	\$70.2K	\$8.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	\$0.8K	Grand Total \$357,444

Thu Jan 17 2013 17:00:00

Delay cost:
 Total: \$25,751.51
 Per user: \$9.22

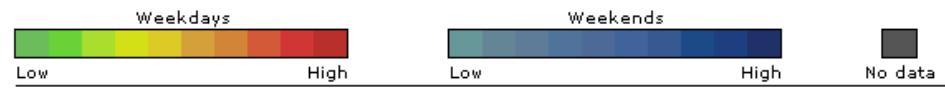
Hours of delay:
 Total: 1,176.45 hours
 Per user: 0.35 hours

Data validity: 96.67%
 Click the table cell to see links to congestion scans

[Download as CSV](#)

Notes

- Only the values in the 'Total cost' display mode are rounded to the nearest hundredth and displayed in thousands. All other display modes show the actual values.
- The range of values for the colored backgrounds of each cell are based on the data of the selected display mode.
- Delay metrics are displayed for every hour of every day within the selected time range.
- The totals for every hour are shown in the bottom row while the totals for every day are shown in the rightmost column.
- The grand total for the entire time period is shown as the actual value and displayed at the bottom right corner.

Legend


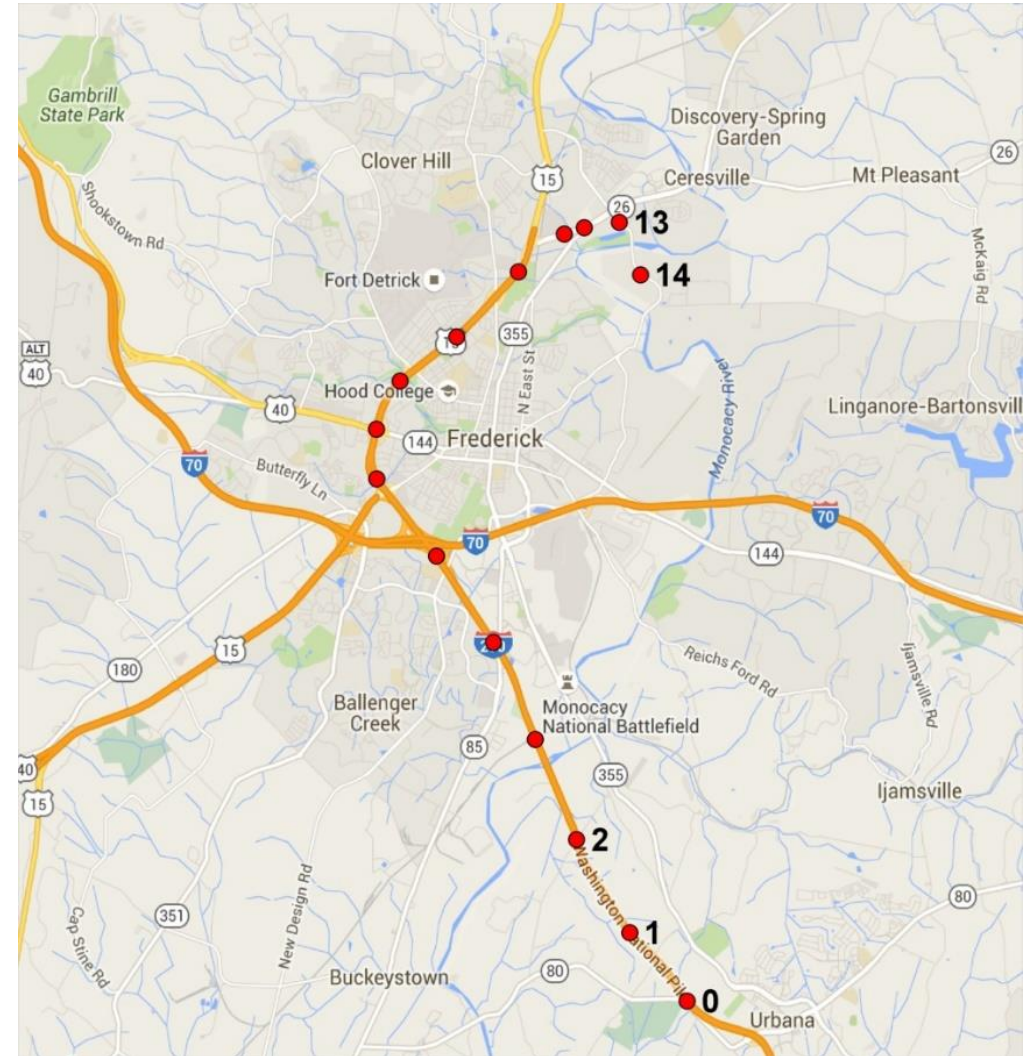
Origin-Destination Data Analysis

INRIX O-D Data Analysis

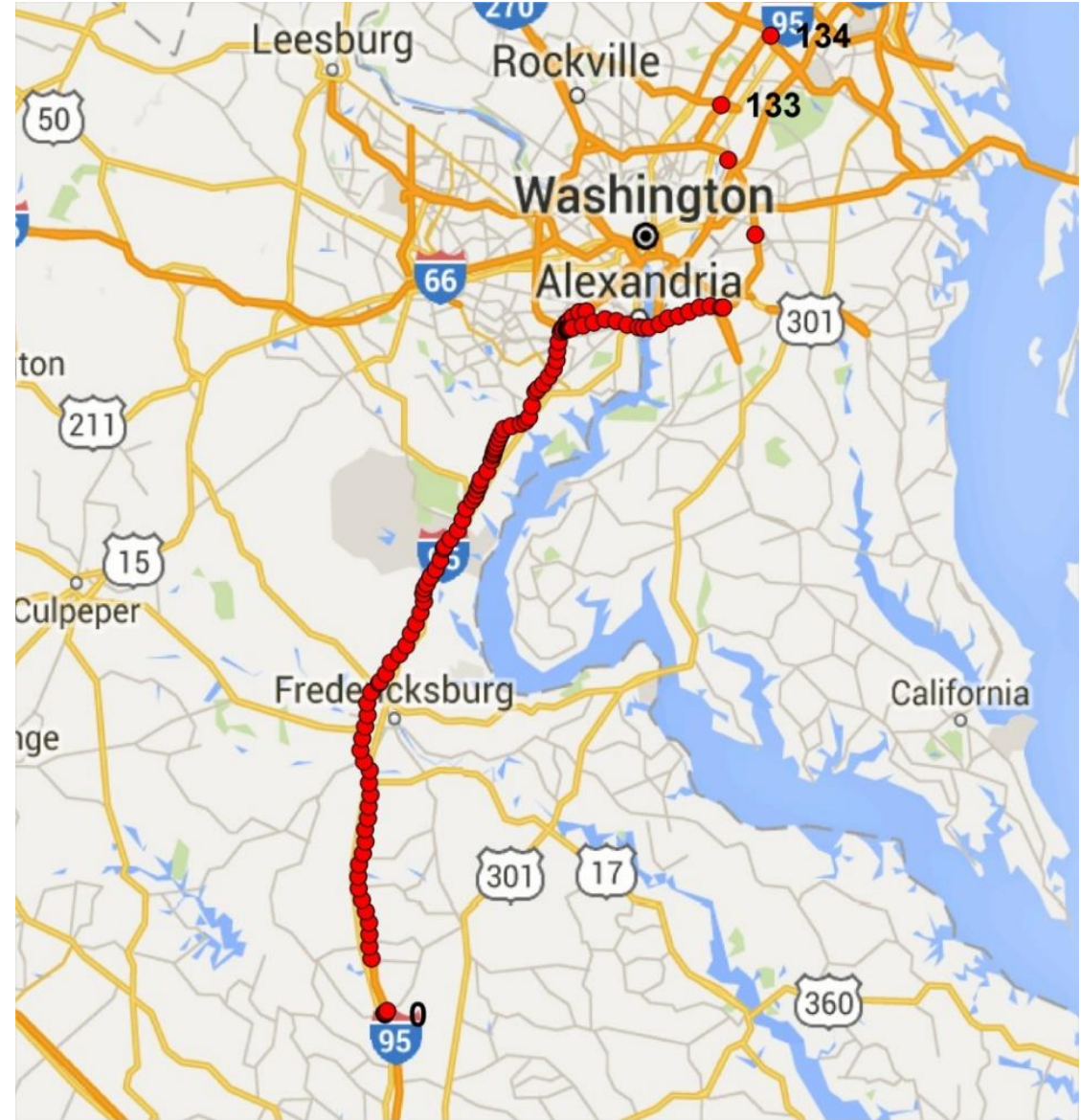
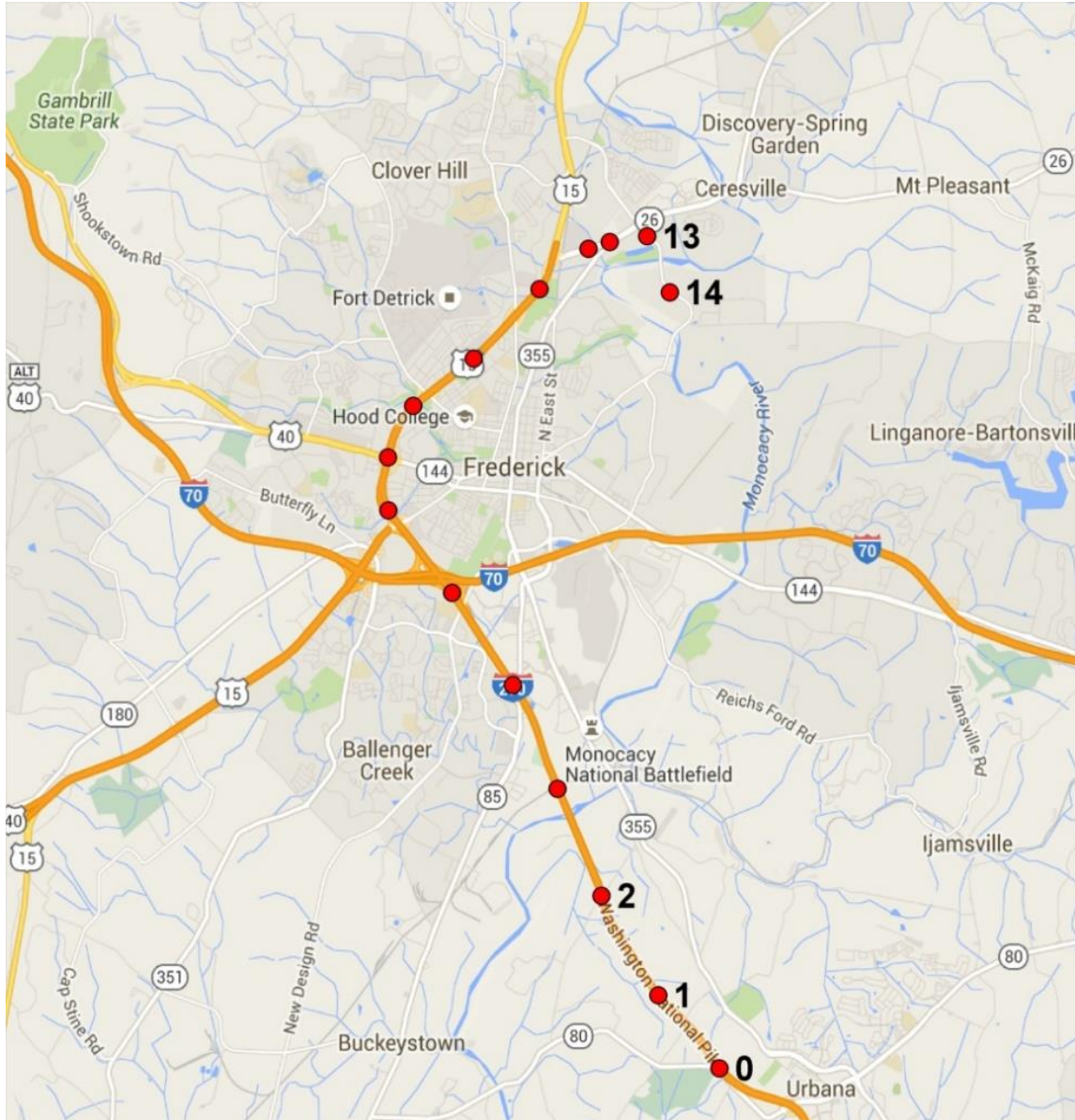
- MD SHA has purchased 4-months of trip Origin-destination data for exploration
- We've been playing with it for a few weeks now.

Each waypoint has:

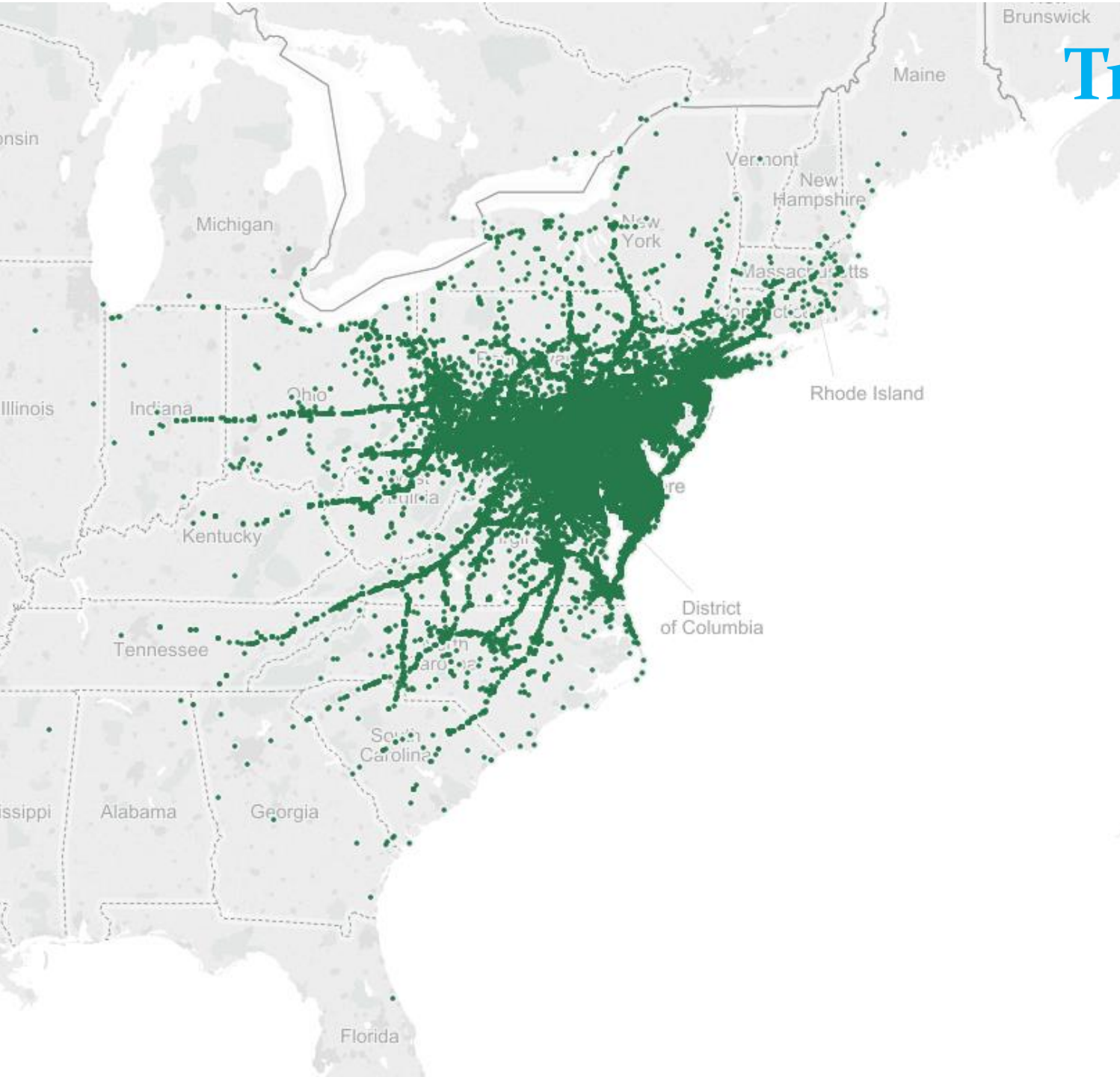
- Order ID (0, 1, ..., n)
- Latitude and Longitude
- Time stamp (with sec)



Waypoints for a Single Trip



Trip records (July 2015)



4.9 M trips (1 GB)

- Average distance: 14 miles
- Average duration: 29 min
- Average waypoints: 20

Trip Waypoints (July 2015)

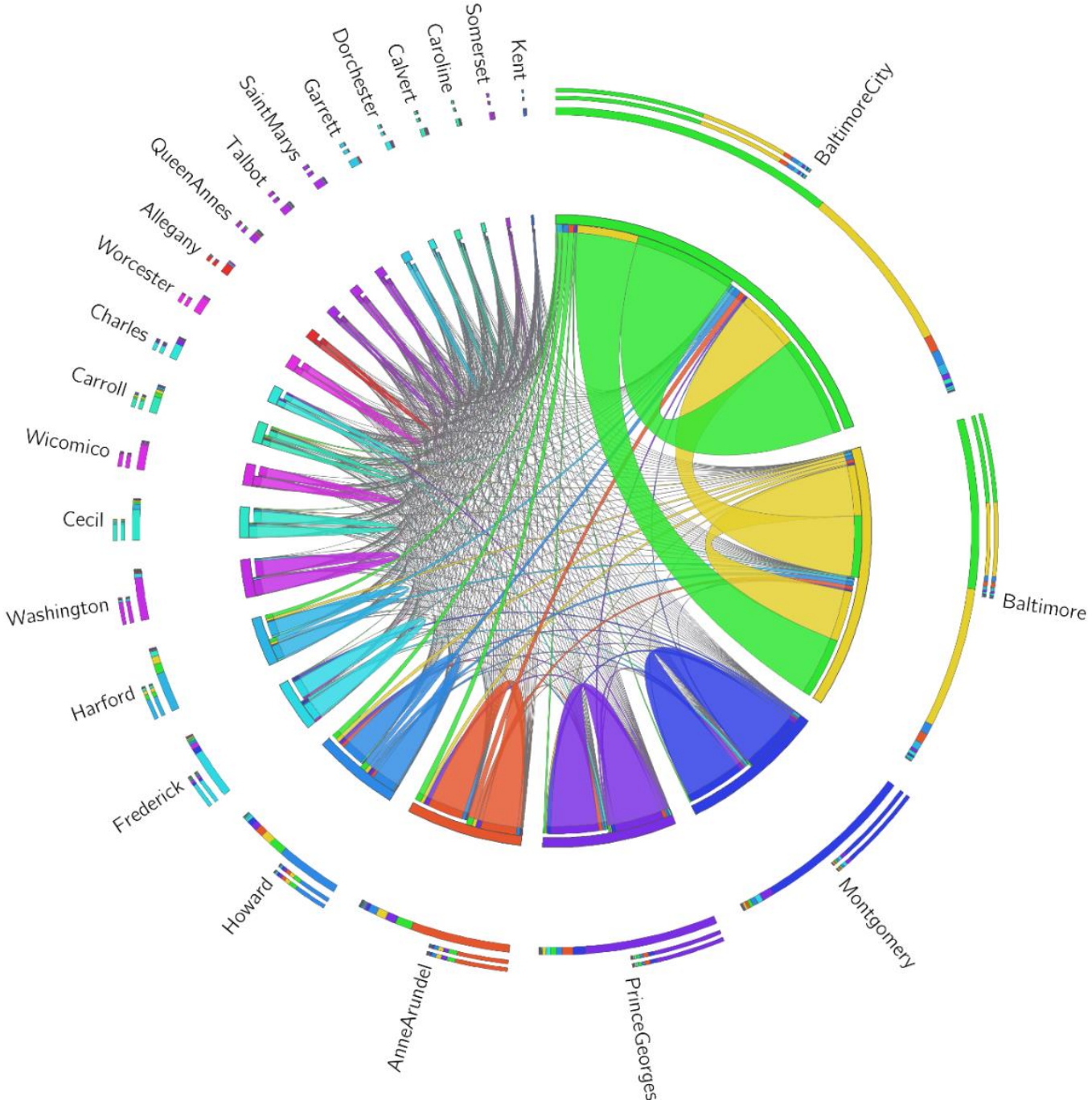


Waypoint Locations

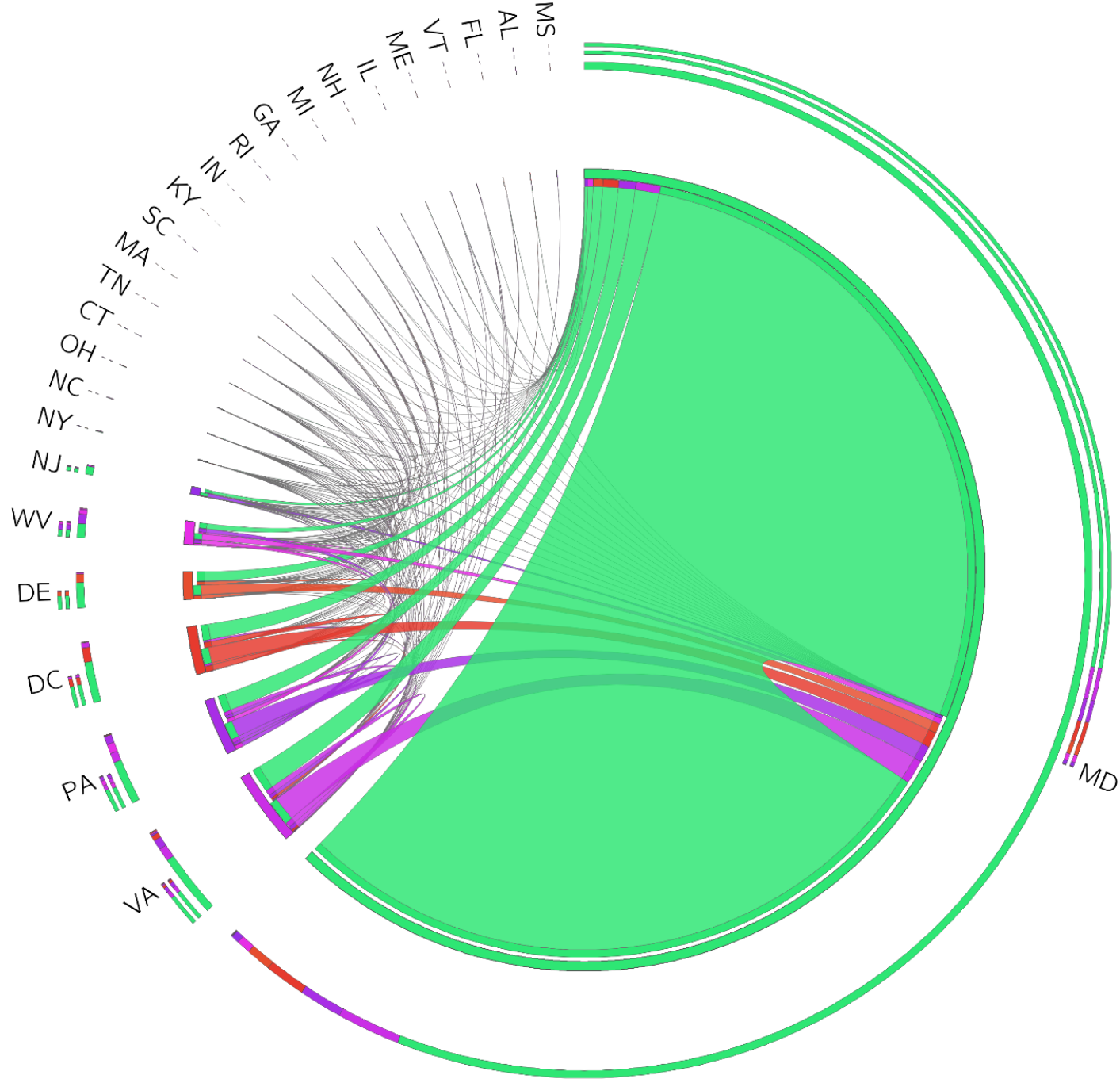
100 M waypoints (7 GB)

- Average distance: 0.9 miles
- Average duration: ~1.5 min

County OD matrix for MD-MD trips (July 2015)

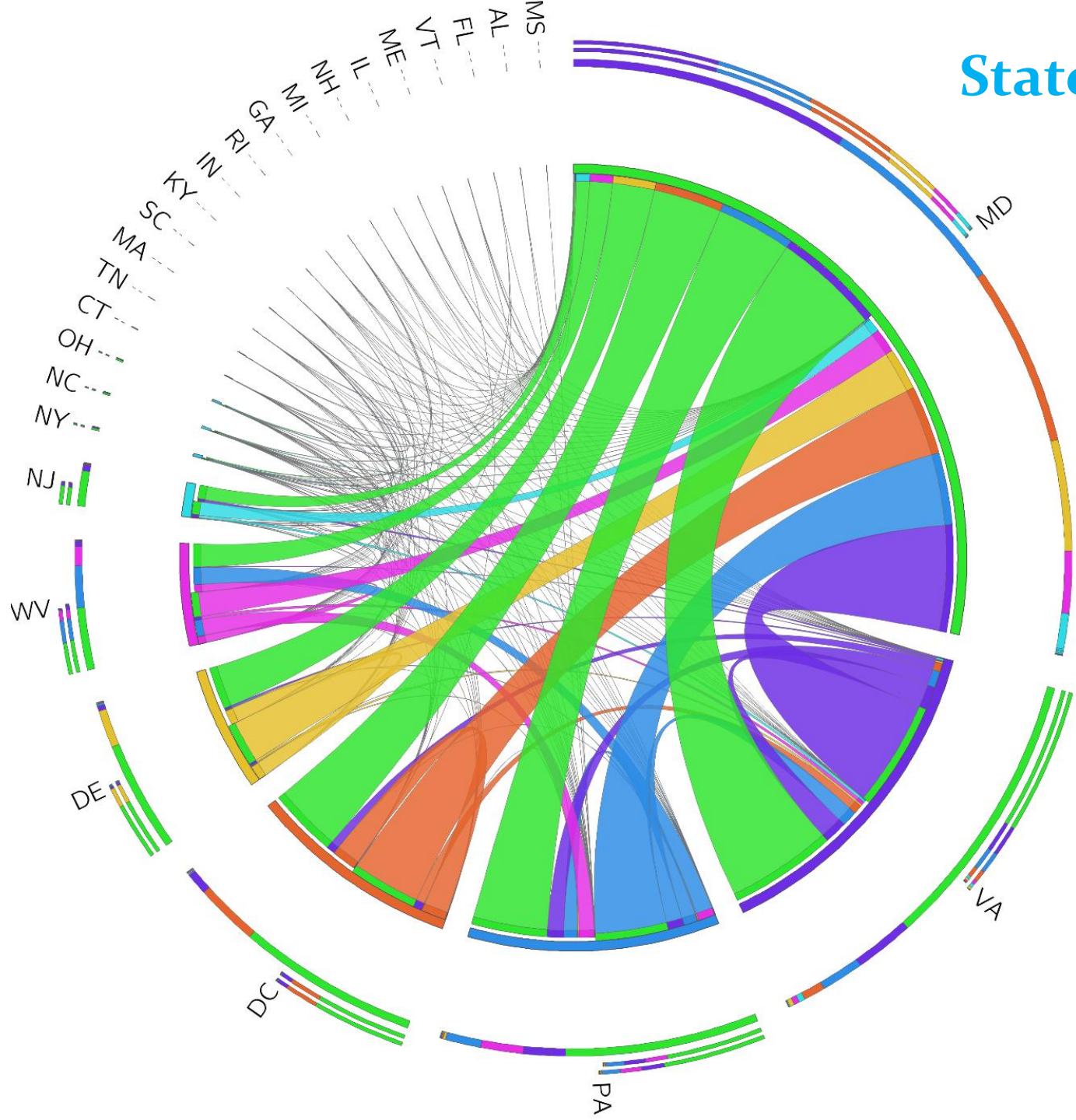


- Focus: OD of trips that originate and end in MD
- Most trips are within the same county



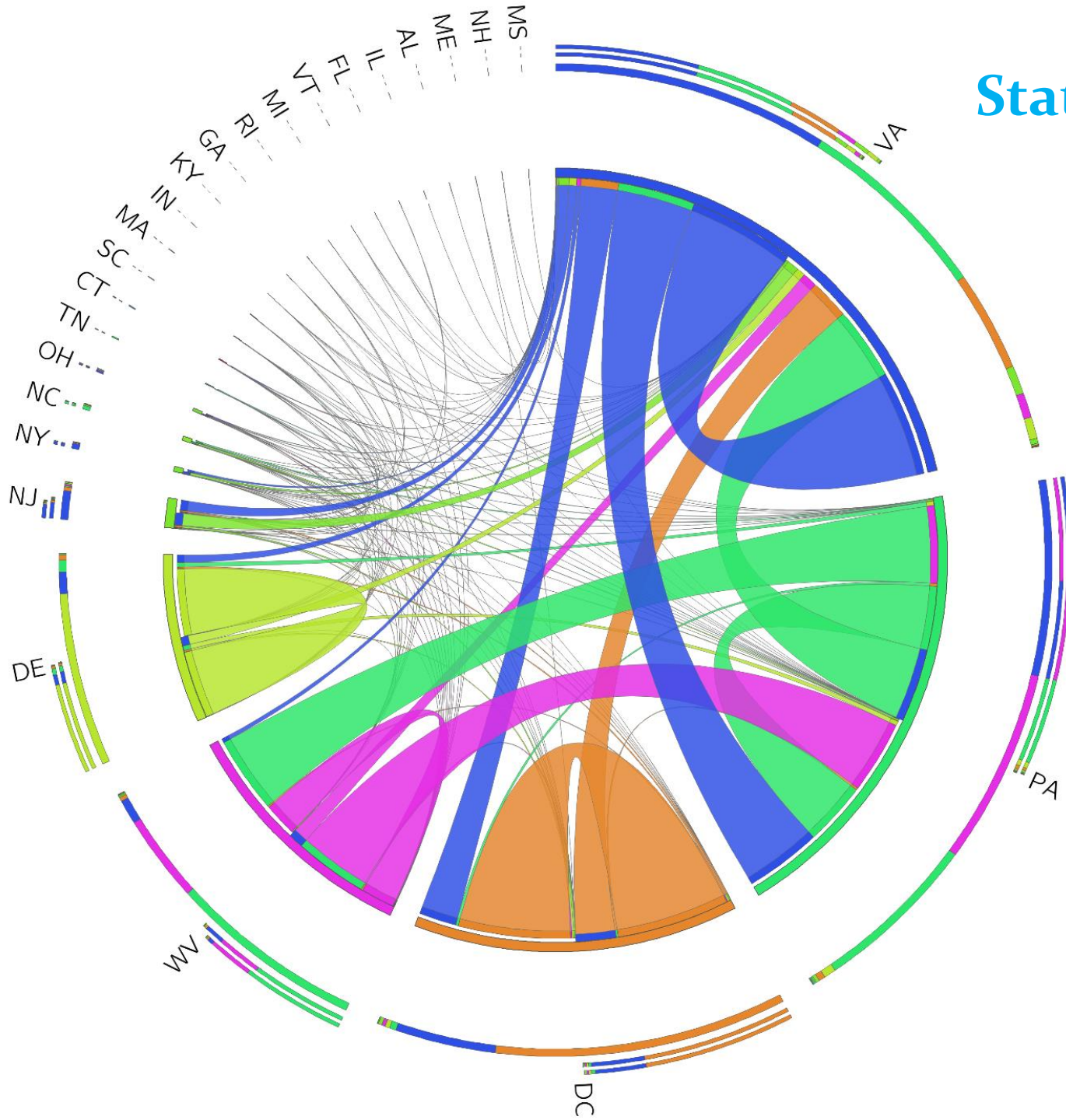
- Most trips originate and end in MD
- Other links are thus less represented

State OD matrix visuals (July 2015)



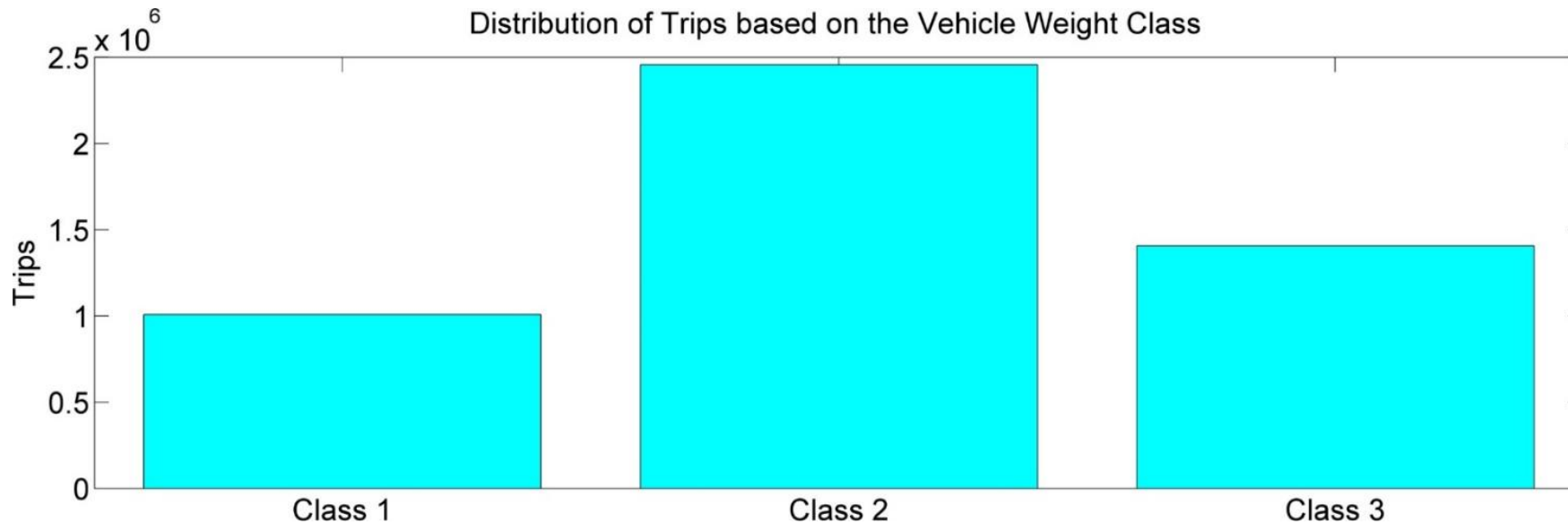
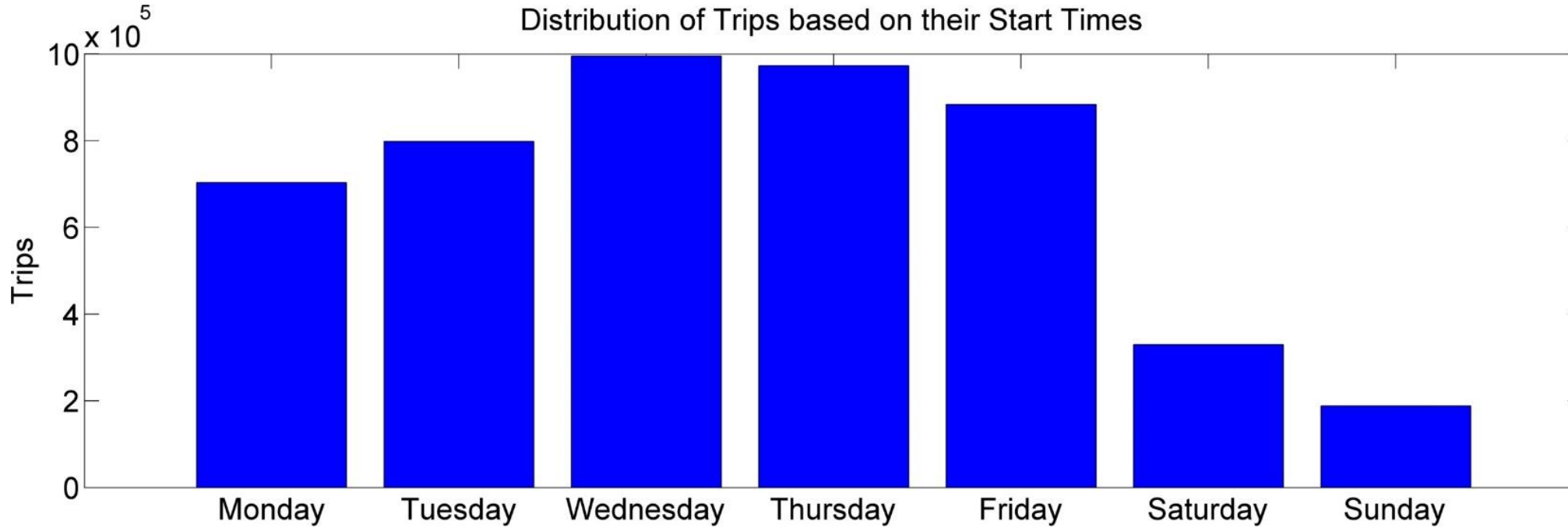
- MD-MD trips are filtered out
- Focus: traffic between MD and other states

State OD matrix visuals (July 2015)



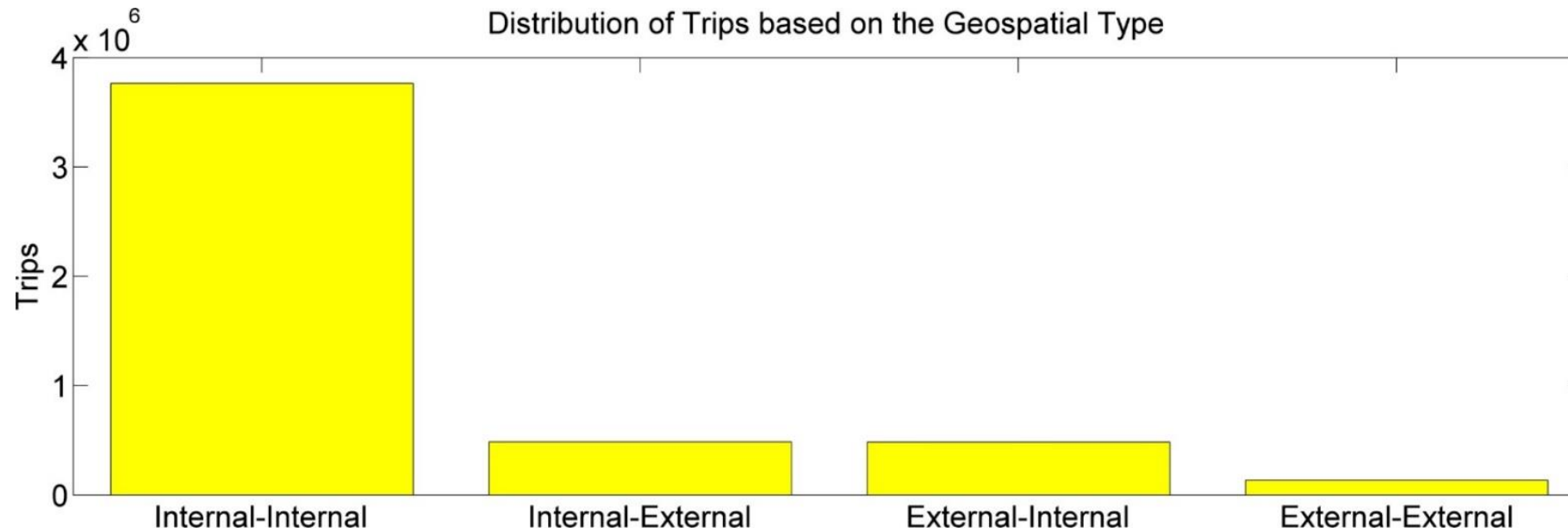
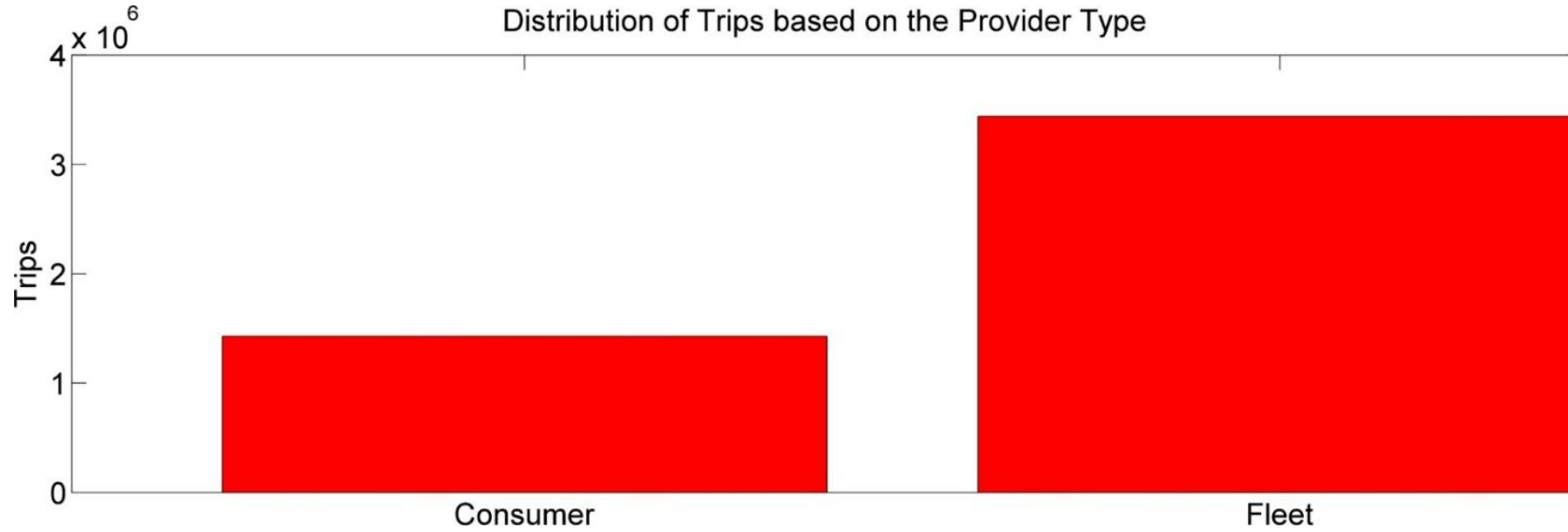
- Trips with origins/destinations in MD are filtered out
- Focus: OD of trips that **traverse MD**

Descriptive statistics (July 2015)



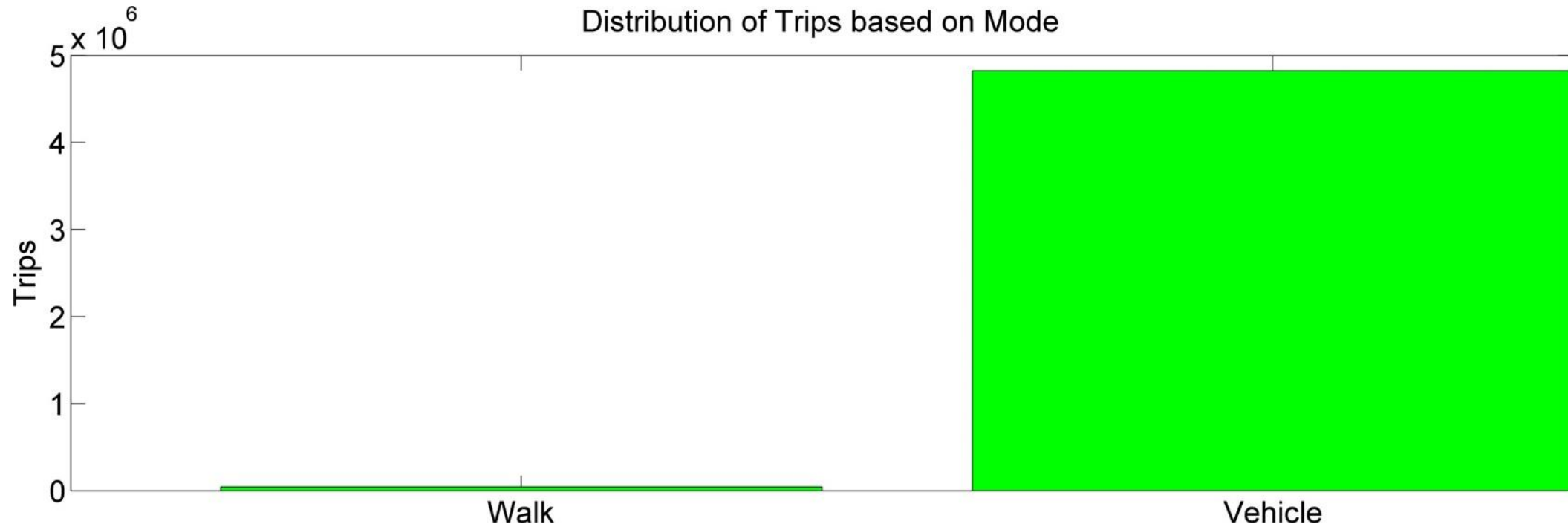
Fewer trips on weekends.

Descriptive statistics (July 2015)



Most trips originate and end in MD.

Descriptive statistics (July 2015)



Next Steps: Interactive, Dynamic, Analytics

Form

Regular Selection Recurrent Selection

2009				2011							2012												
Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.					
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Query

Time Serie Histogram ScatterPlot

Attribute 1: Attribute 2:

Form

Regular Selection Recurrent Selection

2009				2011							2012												
Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.					
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Query

Time Serie Histogram ScatterPlot

Attribute 1: Attribute 2:

Work Zone Analytics

Performance Monitoring

Three disparate audiences and corresponding goals identified:

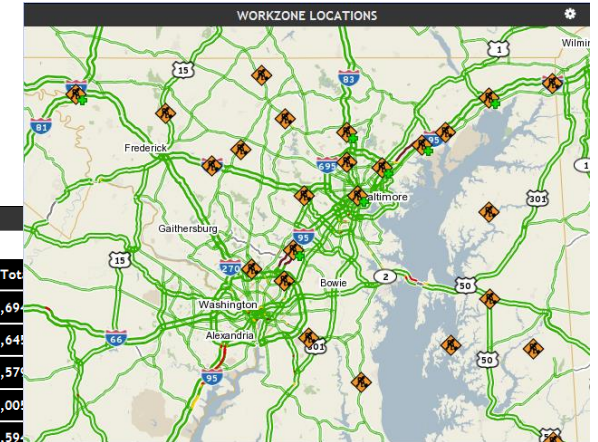
- **Audience:** Project Engineers and Managers
- **Goals:**
 - Real time performance
 - Alerts when thresholds exceeded
 - Potential actions based on identified performance
- **Audience:** Public Relations
- **Goals:**
 - Real time and historical performance
 - Responding to complaints and inquiries
- **Audience:** Planners and Decision Makers
- **Goals:**
 - Closure costs
 - Review of previous performance

USER DELAY COST BY CORRIDOR AND DAY OF WEEK

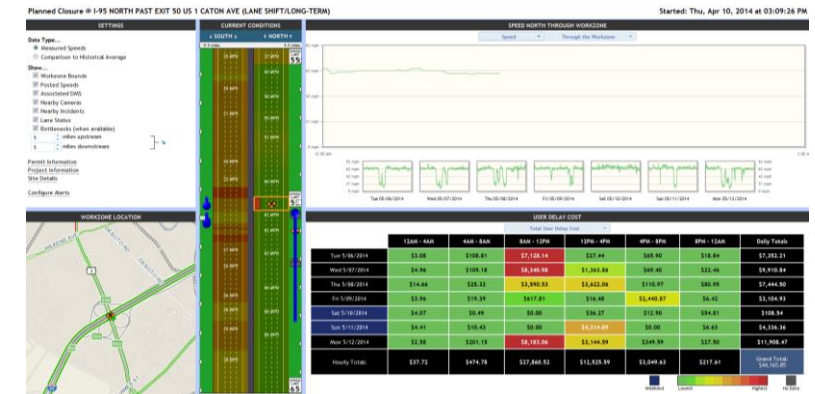
	Total User Delay Cost				
	I-95	I-695	US-50	I-70	Daily Tot
Sun 5/04/2014	\$2,293,148.25	\$27,007.79	\$91,719.43	\$24,818.81	\$2,436,694.28
Mon 5/05/2014	\$2,690,597.77	\$790,679.54	\$245,683.44	\$176,684.45	\$3,903,645.20
Tue 5/06/2014	\$2,615,804.89	\$862,341.67	\$384,208.20	\$48,224.65	\$3,910,579.31
Wed 5/07/2014	\$2,845,013.60	\$884,413.37	\$380,984.89	\$115,593.89	\$4,226,005.65
Thu 5/08/2014	\$1,467,929.80	\$1,655,892.91	\$499,083.14	\$248,688.56	\$3,871,594.41
Fri 5/09/2014	\$1,892,924.58	\$1,144,372.86	\$315,555.14	\$107,486.88	\$3,460,339.47
Sat 5/10/2014	\$3,304,754.54	\$303,579.23	\$121,740.65	\$14,313.28	\$3,744,387.71
Sun 5/11/2014	\$2,435,040.40	\$48,424.94	\$268,858.10	\$6,513.70	\$2,758,837.15
Corridor Totals	\$19,545,213.84	\$5,716,712.31	\$2,307,833.00	\$742,324.22	Grand Total: \$28,312,083.35



Corridor performance



Regional performance



Individual work zone performance

Work Zone Dashboard

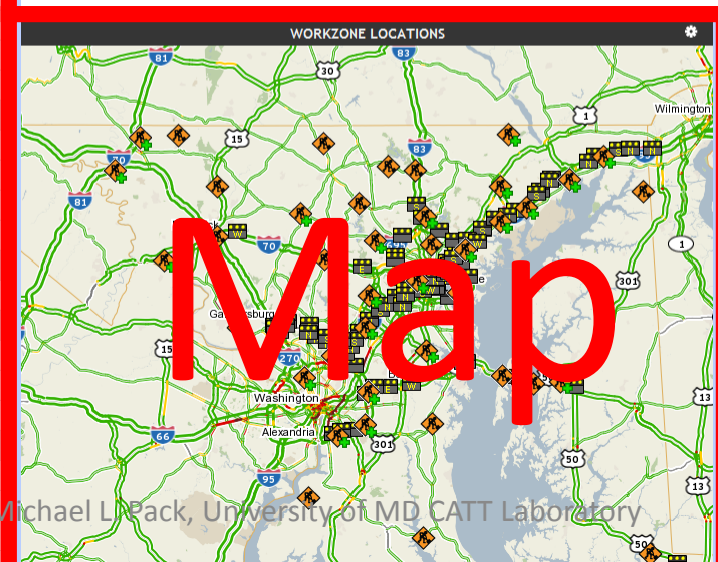
Workzone Dashboard

CURRENT WORKZONES IN MARYLAND				
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Maryland (76)	2043	1.06	\$374,858.00	
▼ Allegany (3)	0	0	\$9,618.00	
1-68 EAST AT PLEASANT VALLEY RD	0	0	\$1,396.00	
US 220 SOUTH SOUTH OF MP 12.75	0	0	\$59.00	
1-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$8,163.00	
▼ Anne Arundel (2)	0	0	\$18,167.00	
MD 198 EAST AT MD 295	0	0	\$8,374.00	
MD 2 NORTH AT MD 255	0	0	\$9,793.00	
▼ Baltimore (15)	197	0.22	\$77,435.00	
MD 26 EAST AT DEER PARK RD	0	0	\$9,738.00	
I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	\$431.00	
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	\$5,942.00	
MD 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	\$9,748.00	
I-895 SOUTH PAST EXIT 4 MD 295 BALTIMORE BELTWAY (LONG TERM & CONTINUOUS)	0	0	\$3,718.00	
MD 45 SOUTH BETWEEN PADONIA RD AND TITANIUM RD	0	0	\$880.00	
I-83 NORTH AT MD 27 MD 27 MOUNT CARMEL	0	0	\$8,648.00	
I-83 NORTH BETWEEN FORGOTTEN AND PERRY MILLS RD	0	0	\$9,028.00	
I-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0	\$5,854.00	
MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.22	\$58.00	
I-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	\$6,995.00	
MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$939.00	
MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$2,107.00	
I-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	\$4,168.00	
MD 45 SOUTH FROM WINDWOOD RD TO DEER PARK RD	0	0	\$9,181.00	
▼ Baltimore City (4)	178	0	\$26,997.00	
I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LONG TERM/SHIFT/SHOULDER)	17	0	\$9,485.00	
I-895 NORTH AT POTEES ST ON POTEES ST	0	0	\$2,945.00	
I-695 INNER LOOP PAST EXIT 1 MD 173 HAVEN POINT RD	0	0	\$9,257.00	
I-895 SOUTH AT EXIT 7 MD 2 POTEES ST (LONG TERM/CONTINUOUS)	161	0	\$5,310.00	
▼ Calvert (1)	0	0	\$324.00	
MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$324.00	
▼ Carroll (3)	1	0	\$18,550.00	
MD 26 WEST AT MP 16.7	0	0	\$7,678.00	
MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0	\$1,092.00	
MD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	\$9,780.00	
▼ Cecil (4)	20	0	\$22,638.00	
US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$5,919.00	
I-95 SOUTH PAST EXIT 100 MD 272 NORTHEAST RD (MM 99.54 -96.73)	19	0	\$7,475.00	
I-95 SOUTH PAST EXIT 93 MD 222 BAINBRIDGE RD (MM92-89)	0	0	\$1,173.00	
I-95 SOUTH PAST EXIT 100 MD 272 NORTHEAST RD (MM 100-98.5)	1	0	\$1,173.00	

TOP CRITICAL WORKZONES				
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
Critical				

Overview

List

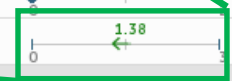
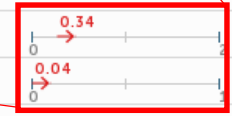
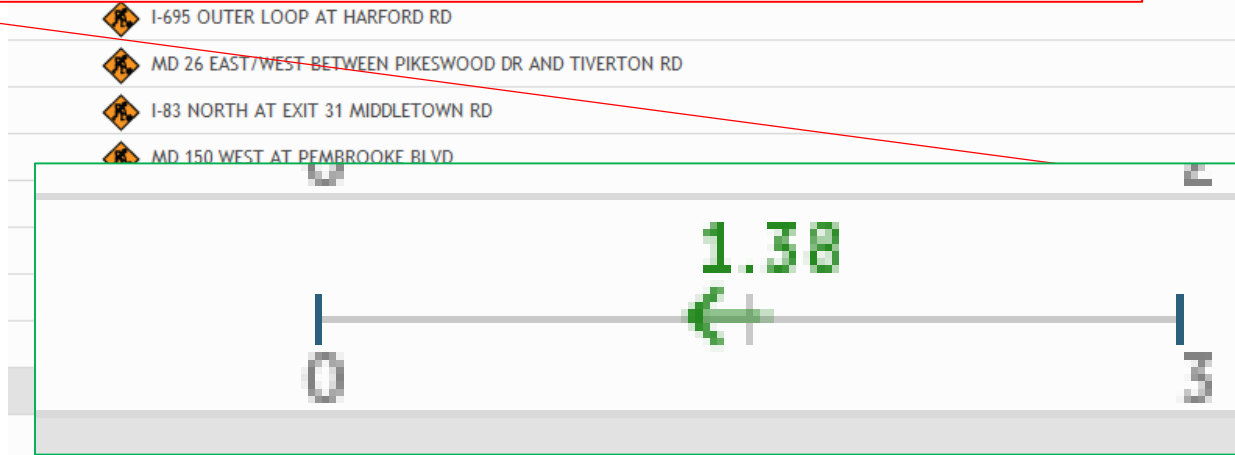
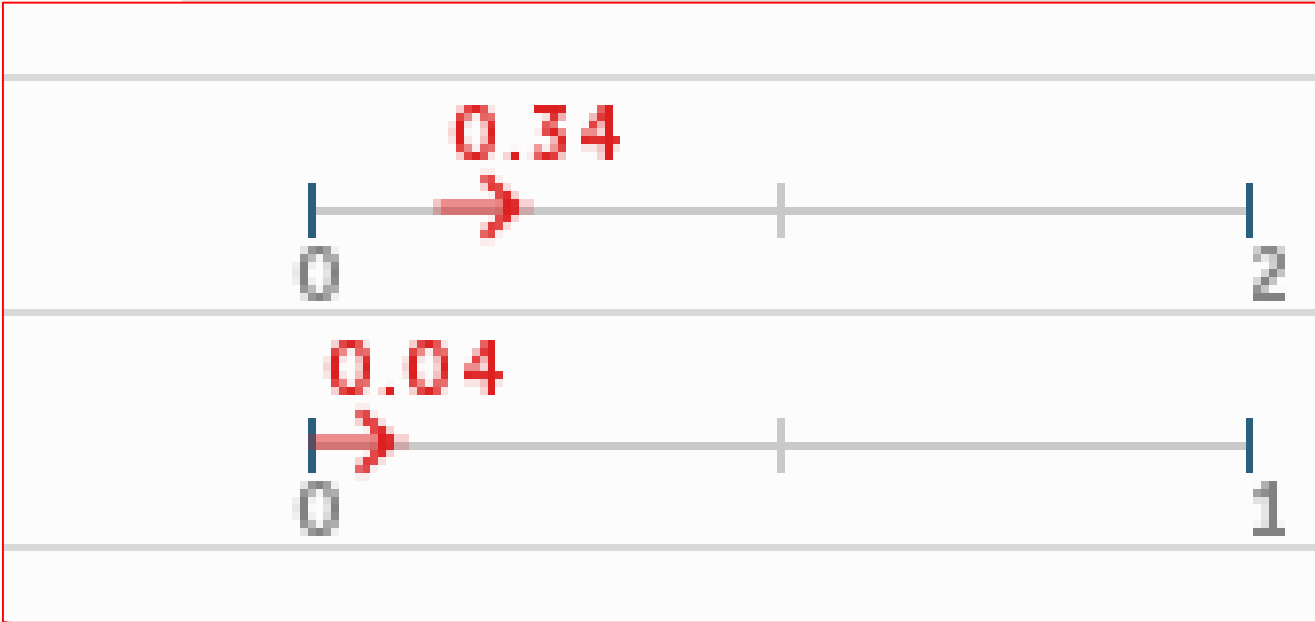


USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	Total User Delay Cost				
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,900,000.00	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,461.00	\$179,000.00	\$107,000.00	\$721.70	\$3,660,917.46
Sun 4/13/2014	\$2,548,281.00	\$83,900.00	\$8,000.00	\$8,000.00	\$2,677,692.82
Mon 4/14/2014	\$2,660,000.00	\$323,977.71	\$190,000.00	\$184,000.00	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,300.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03

Delay

Current Work Zone List

REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
▼ Maryland (55)	527	5.24	\$310,306.00
	0	0	\$6,278.00
	0	0	\$6,278.00
	0	0	\$20,774.00
	0	0	\$9,431.00
	0	0	\$1,364.00
	0	0	\$9,979.00
	87	2.73	\$78,513.00
	0	0	\$8,660.00
	0	0	\$5,553.00
	0	0	\$1,926.00
	86	0	\$6,712.00
	0	2.35	\$4,940.00
	0	0	\$9,900.00
	0	0	\$2,903.00
	0	0	\$4,873.00
	0	0	\$8,583.00
	0	0	\$5,448.00
	0	0	\$2,880.00
	0	0	\$6,473.00
	1	0	\$4,803.00
	0	0	\$4,859.00
	2	1.38	\$14,329.00
	1	0	\$5,945.00
	0	0	\$2,314.00
	1	1.38	\$6,070.00
▼ Calvert (3)	0	0	\$24,014.00



- I-695 OUTER LOOP AT HARFORD RD
- MD 26 EAST/WEST BETWEEN PIKESWOOD DR AND TIVERTON RD
- I-83 NORTH AT EXIT 31 MIDDLETOWN RD
- MD 150 WEST AT PEMBROKE BLVD

- I-695 INNER LOOP AT MP 47.5 (FRANCIS SCOTT KEY BRIDGE)
- I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)

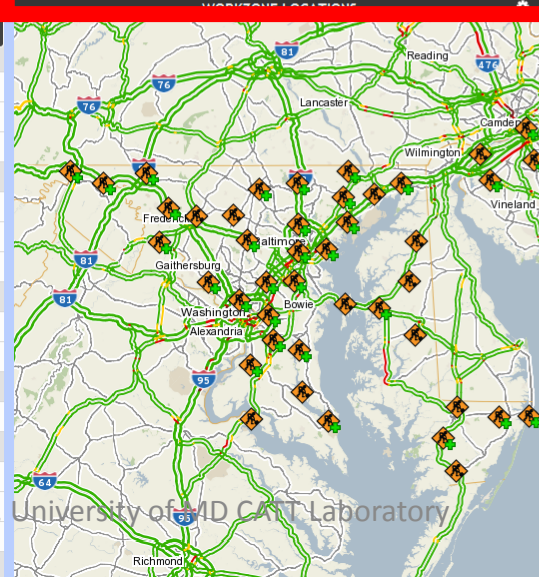
(C) 2015 Michael L. Pack, University of MD CATT Laboratory

Critical Work Zones

Workzone Dashboard





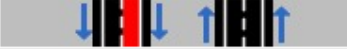




CURRENT WORKZONES IN MARYLAND				
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Maryland (55)	527	5.24	\$310,306.00	
▼ Allegany (1)	0	0	\$6,278.00	
🚧 I-68 EAST AT NEW GEORGES CREEK RD	0	0	\$6,278.00	
▼ Anne Arundel (3)	0	0	\$20,774.00	
🚧 MD 170 SOUTH BETWEEN MIDWAY RD AND ROGERS LA	0	0	\$9,431.00	
🚧 I-97 SOUTH FROM NEW CUT RD TO BRIGHTVIEW DR	0	0	\$1,364.00	
🚧 MD 10 NORTH FROM I-695 TO MD 648	0	0	\$9,979.00	
▼ Baltimore (14)	87	2.73	\$78,513.00	
🚧 MD 128 SOUTH/NORTH BETWEEN FIRST AVE AND HANOVER PIKE	0	0	\$8,660.00	
🚧 LOCH RAVEN BLVD NORTH BETWEEN JOAN AVE AND WHITE OAK AVE	0	0	\$5,553.00	
🚧 I-695 INNER LOOP/OUTER LOOP BETWEEN COVE RD AND NORTH POINT BLVD	0	0	\$1,926.00	
🚧 I-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	86	0	\$6,712.00	
🚧 I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD	0	2.35	\$4,940.00	
🚧 MD 151 SOUTH/NORTH BETWEEN NORTH POINT BLVD AND WISE AVE	0	0	\$9,900.00	
🚧 I-695 OUTER LOOP AT HARFORD RD	0	0	\$2,903.00	
🚧 MD 26 EAST/WEST BETWEEN PIKESWOOD DR AND TIVERTON RD	0	0	\$4,873.00	
🚧 I-83 NORTH AT EXIT 31 MIDDLETOWN RD	0	0	\$8,583.00	
🚧 MD 150 WEST AT PEMBROOKE BLVD	0	0.34	\$5,448.00	
🚧 MD 122 EAST/WEST BETWEEN WHITEHEAD RD AND KERNAN DR	0	0.04	\$2,880.00	
🚧 MD 372 WEST BETWEEN HILLTOP RD AND ROLLING RD	0	0	\$6,473.00	
🚧 MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	1	0	\$4,803.00	
🚧 I-695 INNER LOOP AT EXIT 34 MD 7 PHILADELPHIA RD	0	0	\$4,859.00	
▼ Baltimore City (3)	2	1.38	\$14,329.00	
🚧 I-895 SOUTH PAST EXIT 14 MORAVIA RD[MM,13.5-13.3]	1	0	\$5,945.00	
🚧 I-695 INNER LOOP AT MP 49.3 (FRANCIS SCOTT KEY BRIDGE)	0	0	\$2,314.00	
🚧 I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)	1	1.38	\$6,070.00	
▼ Calvert (3)	0	0	\$24,014.00	
🚧 MD 765 NORTH FROM DOWELL RD TO PATUXENT POINT PKWY	0	0	\$8,400.00	
🚧 MD 231 EAST AT SKIPJACK RD	0	0	\$9,039.00	
🚧 MD 765 NORTH BETWEEN DOWELL RD AND PATUXENT POINT PKWY	0	0	\$6,575.00	
▼ Carroll (2)	0	0	\$12,274.00	
🚧 MD 140 WEST EAST OF DEDE RD	0	0	\$3,308.00	
🚧 MD 27 NORTH BETWEEN BOND ST AND I-70	0	0	\$8,966.00	
▼ Cecil (1)	0	0	\$7,433.00	
🚧 I-95 SOUTH PAST EXIT 109 MD 279 ELKTON NEWARK RD[MM,106.4-105.9]	0	0	\$7,433.00	
▼ Frederick (3)	0	0	\$8,450.00	
🚧 US 15 NORTH PAST ANGLEBERGER RD	0	0	\$4,280.00	
🚧 US 340 WEST AT HORINE RD	0	0	\$980.00	
🚧 US 15 NORTH AT MT ZION RD	0	0	\$980.00	
▼ Garrett (1)	1	0	\$5,685.00	

TOP CRITICAL WORKZONES				
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Critical (1)		2.35	\$7,781.00	
🚧 I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD		2.35	\$7,781.00	
▼ Major (2)		2.51	\$9,527.00	
🚧 RIVERDALE RD WEST BETWEEN 67TH PL AND MD 410		1.01	\$5,507.00	
🚧 I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)		1.5	\$4,020.00	



Total User Delay Cost					
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Thu 4/17/2014	\$1,459,034.41	\$794,467.52	\$322,713.48	\$198,072.22	\$2,774,287.63
Fri 4/18/2014	\$2,576,007.61	\$189,469.57	\$216,524.22	\$56,219.54	\$3,038,220.94
Sat 4/19/2014	\$3,424,527.24	\$21,110.66	\$93,743.13	\$5,851.83	\$3,545,232.86
Sun 4/20/2014	\$2,720,252.20	\$45,957.86	\$65,368.03	\$12,296.07	\$2,843,874.16
Mon 4/21/2014	\$2,823,502.39	\$221,820.43	\$209,331.07	\$25,162.70	\$3,279,816.59
Tue 4/22/2014	\$2,614,767.84	\$781,606.40	\$313,330.28	\$31,596.27	\$3,741,300.78
Wed 4/23/2014	\$2,494,435.45	\$1,022,402.79	\$992,287.48	\$142,072.49	\$4,651,198.21
Corridor Totals	\$21,049,545.30	\$3,577,022.15	\$2,425,984.71	\$554,475.02	Grand Total: \$27,607,027.18

Critical Work Zones

TOP CRITICAL WORKZONES				
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Critical (1)  I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD		2.35	\$7,781.00	
▼ Major (2)  RIVERDALE RD WEST BETWEEN 67TH PL AND MD 410		1.01	\$5,507.00	
 I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)		1.5	\$4,020.00	

Critical Work Zone Parameters

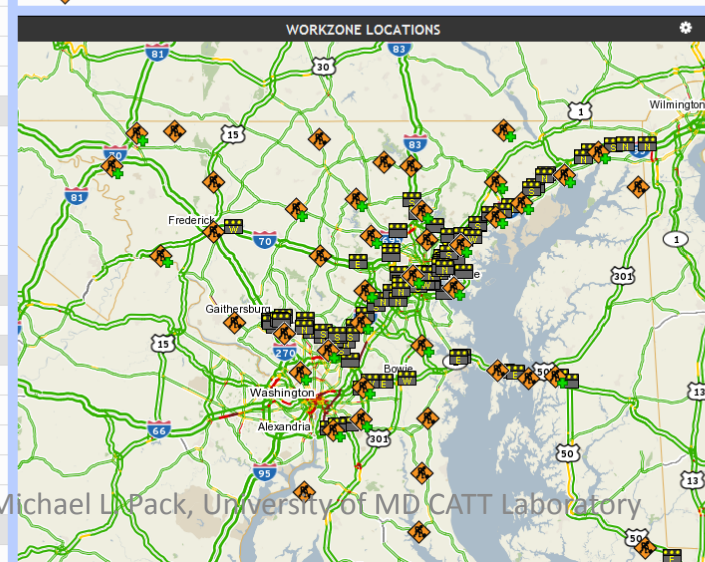
TOP CRITICAL WORKZONES		TOP CRITICAL RANGE	
SEVERITY/EVENT		0	5
Major (80)		0 miles	5 miles
MD 216 EAST/WEST BETWEEN I-95 AND US 29			0 \$3,450.00
MD 26 WEST AT MP 16.7			0 \$3,907.00
MD 26 EAST AT DEER PARK RD			0 \$9,925.00
MD 528 NORTH FROM 56TH ST TO 72ND ST			0 \$6,555.00
I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)			0 \$9,027.00
I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]			1.28 \$8,780.00
I-95 OUTER LOOP AT ARDWICK ARDMORE RD			0 \$9,742.00
MD 191 EAST AT LELAND ST			0 \$3,318.00
I-81 SOUTH FROM MP 0.84 TO MP 3.13			0 \$9,515.00
US 40 EAST/WEST FROM WASHINGTON ST TO I-81			0 \$3,772.00
MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180			0.02 \$6,082.00
I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)			0 \$2,558.00
MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA			0 \$4,539.00
MD 193 SOUTH/NORTH AT CAPITAL BELTWAY			0 \$3,138.00
US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD			0 \$9,216.00
MD 136 SOUTH/NORTH AT KERR RD			0 \$3,103.00
I-895 NORTH AT POTEER ST ON POTEER ST			0 \$1,843.00
MD 64 EAST FROM FRANKS RUN RD TO MD 418			0 \$5,726.00
MD 68 EAST/WEST AT MD 63			0 \$4,761.00
MD 97 SOUTH/NORTH AT I-70			

UDC Information

Workzone Dashboard

CURRENT WORKZONES IN MARYLAND				
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Maryland (80)	2043	1.87	\$397,617.00	
▼ Allegany (3)	0	0	\$9,455.00	
◆ I-68 EAST AT PLEASANT VALLEY RD	0	0	\$4,399.00	
◆ US 220 SOUTH SOUTH OF MP 12.75	0	0	\$2,976.00	
◆ I-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$2,080.00	
▼ Anne Arundel (2)	0	0	\$13,780.00	
◆ MD 198 EAST AT MD 295	0	0	\$5,041.00	
◆ MD 2 NORTH AT MD 255	0	0	\$8,739.00	
▼ Baltimore (15)	197	0.31	\$63,495.00	
◆ MD 26 EAST AT DEER PARK RD	0	0	\$1,311.00	
◆ I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	\$4,992.00	
◆ MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	\$4,551.00	
◆ I-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	\$9,897.00	
◆ I-895 SOUTH PRIOR TO EXIT 4 MD 295 BALTIMORE WASHINGTON PARKWAY (LONG-TERM & CONTINUOUS)	113	0	\$3,087.00	
◆ MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	0	0	\$9,205.00	
◆ I-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD	0	0	\$7,528.00	
◆ US 1 NORTH BETWEEN FORGE RD AND PERRY HALL RD	0	0	\$6,892.00	
◆ I-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0	\$1,148.00	
◆ MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.31	\$5,985.00	
◆ I-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	\$1,407.00	
◆ MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$689.00	
◆ MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$2,268.00	
◆ I-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	\$774.00	
◆ MD 45 SOUTH FROM WINDWOOD RD TO DUNKIRK RD	0	0	\$3,761.00	
▼ Baltimore City (5)	178	0.02	\$23,704.00	
◆ I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	17	0	\$9,872.00	
◆ I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	0	0.02	\$6,813.00	
◆ I-895 NORTH AT POTEES ST ON POTEES ST	0	0	\$2,675.00	
◆ I-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0	0	\$2,545.00	
◆ I-895 SOUTH AT EXIT 7 MD 2 POTEES ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161	0	\$1,799.00	
▼ Calvert (1)	0	0	\$8,668.00	
◆ MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$8,668.00	
▼ Carroll (5)	1	0	\$35,102.00	
◆ MD 26 WEST AT MP 16.7	0	0	\$6,858.00	
◆ MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0	\$8,380.00	
◆ MD 140 EAST PAST DEDE RD	0	0	\$3,528.00	
◆ MD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	\$7,660.00	
◆ MD 140 WEST PRIOR TO OLD WESTMINSTER PIKE	0	0	\$9,984.00	
▼ Cecil (4)	20	0	\$16,022.00	
◆ US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$1,670.00	

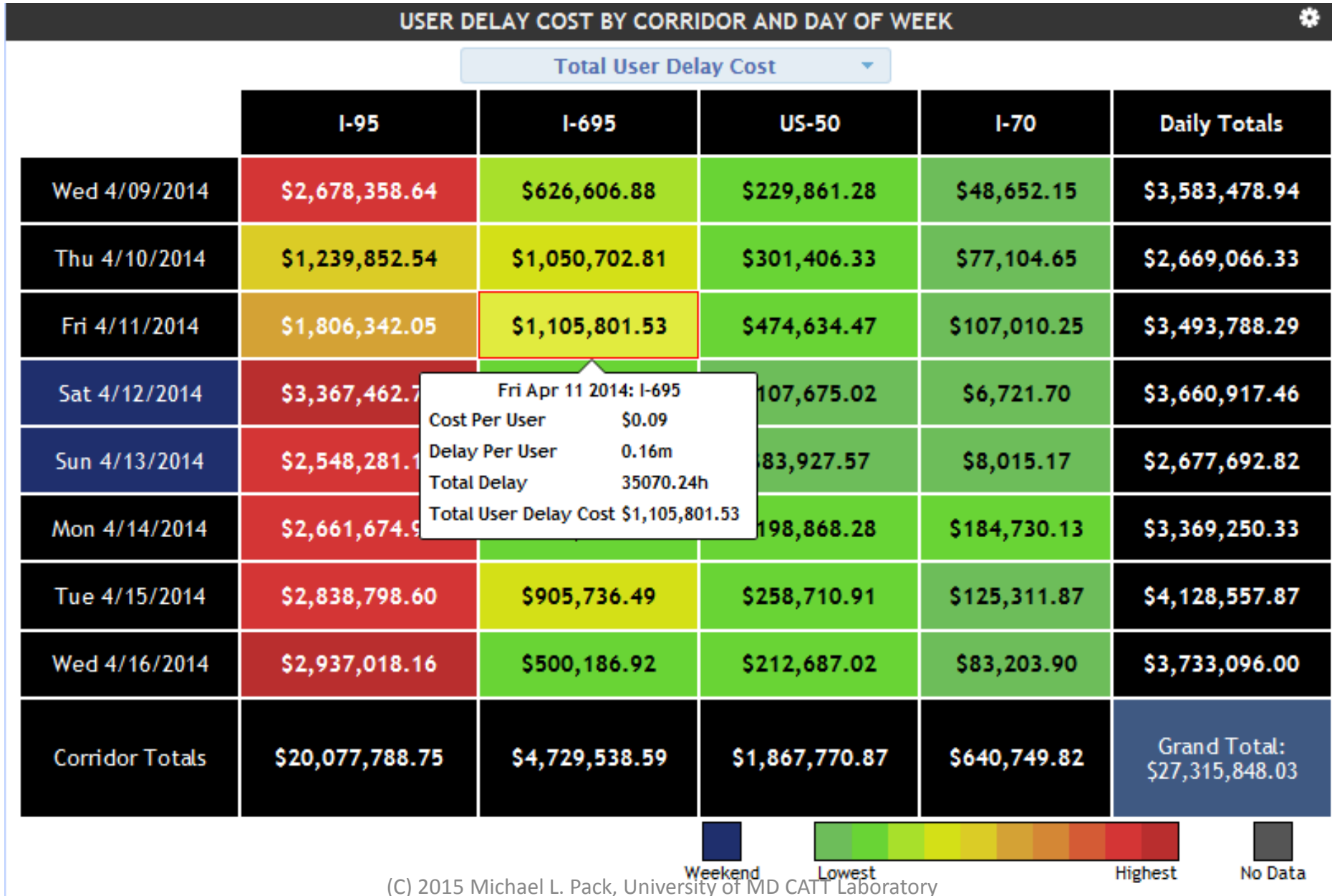
TOP CRITICAL WORKZONES				
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Major (80)		2.1	\$378,117.00	
◆ MD 216 EAST/WEST BETWEEN I-95 AND US 29	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$8,105.00	
◆ MD 26 WEST AT MP 16.7	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$1,569.00	
◆ MD 26 EAST AT DEER PARK RD	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$878.00	
◆ MD 528 NORTH FROM 56TH ST TO 72ND ST	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$8,353.00	
◆ I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$3,225.00	
◆ I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$4,445.00	
◆ I-95 OUTER LOOP AT ARDWICK ARDMORE RD	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	1.39	\$3,830.00	
◆ MD 191 EAST AT LELAND ST	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$9,752.00	
◆ I-81 SOUTH FROM MP 0.84 TO MP 3.13	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$1,319.00	
◆ US 40 EAST/WEST FROM WASHINGTON ST TO I-81	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$3,944.00	
◆ MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$4,691.00	
◆ I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0.02	\$7,457.00	
◆ MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$119.00	
◆ MD 193 SOUTH/NORTH AT CAPITAL BELTWAY	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$6,196.00	
◆ US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$982.00	
◆ MD 136 SOUTH/NORTH AT KERR RD	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$9,531.00	
◆ I-895 NORTH AT POTEES ST ON POTEES ST	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$286.00	
◆ MD 64 EAST FROM FRANKS RUN RD TO MD 418	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$8,750.00	
◆ MD 68 EAST/WEST AT MD 63	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$6,968.00	
◆ MD 97 SOUTH/NORTH AT I-70	↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ ↑	0	\$7,749.00	



USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	Total User Delay Cost				
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,806,342.05	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,462.7	\$0.09	\$107,675.02	\$6,721.70	\$3,660,917.46
Sun 4/13/2014	\$2,548,281.1	\$0.16m	\$83,927.57	\$8,015.17	\$2,677,692.82
Mon 4/14/2014	\$2,661,674.5	\$3570.24h	\$198,868.28	\$184,730.13	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,311.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03

Weekend Lowest Highest No Data

UDC Information



UDC Options and Corridor Selection

USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	I-95	Total User Delay Cost			
		Total User Delay Cost	Cost Per User	Total Delay	Delay Per User
Wed 4/09/2014	\$2,678,358.64			\$48,	
Thu 4/10/2014	\$1,239,852.54			\$77,	
Fri 4/11/2014	\$1,806,342.05	\$1,105,801.53	\$474,634.47	\$107	
Sat 4/12/2014	\$3,367,462.75	\$179,057.99	\$107,675.02	\$6,	
Sun 4/13/2014	\$2,548,281.10	\$37,468.98	\$83,927.57	\$8,015.17	\$2,677,692.82
Mon 4/14/2014	\$2,661,674.91	\$323,977.01	\$198,868.28	\$184,730.13	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,311.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03

SELECT CORRIDORS

Available Corridors ▼

Selected

-  I-95 ✕
-  I-695 ✕
-  US-50 ✕
-  I-70 ✕

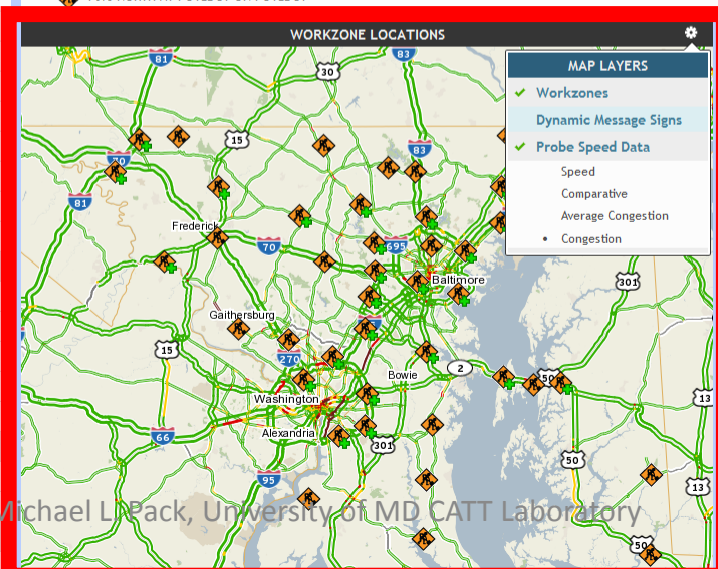


Map Layers and Options

Workzone Dashboard

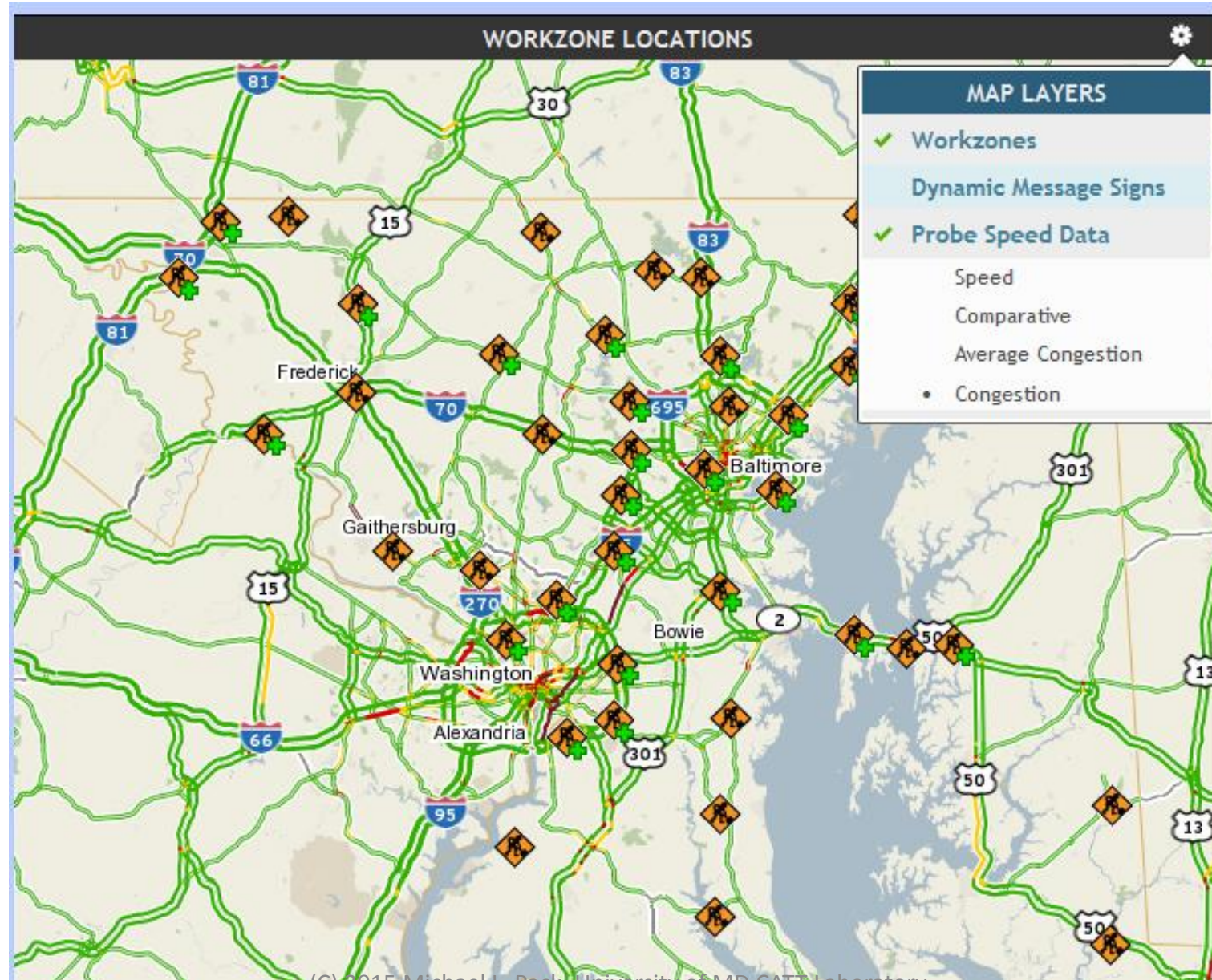
CURRENT WORKZONES IN MARYLAND			
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
▼ Maryland (91)	2044	3.02	\$462,013.00
▼ Allegany (3)	0	0	\$13,314.00
🚧 I-68 EAST AT PLEASANT VALLEY RD	0	0	\$8,013.00
🚧 US 220 SOUTH SOUTH OF MP 12.75	0	0	\$1,376.00
🚧 I-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$3,925.00
▼ Anne Arundel (2)	0	0	\$13,240.00
🚧 MD 198 EAST AT MD 295	0	0	\$4,726.00
🚧 MD 2 NORTH AT MD 255	0	0	\$8,514.00
▼ Baltimore (20)	197	0.37	\$101,808.00
🚧 MD 26 EAST AT DEER PARK RD	0	0	\$5,111.00
🚧 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	\$1,969.00
🚧 I-695 INNER LOOP BETWEEN I-895 AND I-95	0	0	\$5,685.00
🚧 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	\$5,717.00
🚧 US 40 WEST BETWEEN MOHRS LA AND REAMES RD	0	0	\$8,830.00
🚧 I-895 NORTH PAST 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	\$3,804.00
🚧 I-895 SOUTH PRIOR TO EXIT 4 MD 295 BALTIMORE WASHINGTON PARKWAY (LONG-TERM & CONTINUOUS)	113	0	\$4,489.00
🚧 MD 145 EAST FROM OLD YORK RD TO FOX RUN CT	0	0	\$1,271.00
🚧 MD 45 SOUTH BETWEEN PADONIA RD AND TIMONIUM RD	0	0	\$277.00
🚧 I-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD	0	0	\$6,547.00
🚧 US 1 NORTH BETWEEN FORGE RD AND PERRY HALL RD	0	0	\$5,404.00
🚧 I-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0	\$5,649.00
🚧 I-95 SOUTH PRIOR TO EXIT 67 MD 43 WHITE MARSH BLVD (MM69.8-69.0)	0	0	\$2,108.00
🚧 MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.31	\$2,100.00
🚧 I-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	\$7,797.00
🚧 MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$3,476.00
🚧 MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$4,924.00
🚧 I-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	\$8,981.00
🚧 MD 45 SOUTH FROM WINDWOOD RD TO DUNKIRK RD	0	0.06	\$9,879.00
🚧 I-695 INNER LOOP AT EXIT 13 MD 144 FREDERICK RD	0	0	\$7,790.00
▼ Baltimore City (5)	178	0	\$27,750.00
🚧 I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	17	0	\$6,833.00
🚧 I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	0	0	\$8,463.00
🚧 I-895 NORTH AT POTEE ST ON POTEE ST	0	0	\$2,659.00
🚧 I-695 INNER LOOP PAST EXIT 1 MD 173 HAWKINS POINT RD	0	0	\$7,959.00
🚧 I-895 SOUTH AT EXIT 7 MD 2 POTEE ST (LONG TERM-CONTINUOUS 1/02/14-06/31/14)	161	0	\$1,836.00
▼ Calvert (2)	0	0	\$10,262.00
🚧 MD 4 NORTH AT BRISCOE TURN RD	0	0	\$4,844.00
🚧 MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$0.00
▼ Carroll (5)	1	0	\$29,218.00
🚧 MD 26 WEST AT MP 16.7	0	0	\$1,174.00

TOP CRITICAL WORKZONES			
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
▼ Major (91)		2.96	\$416,082.00
🚧 MD 216 EAST/WEST BETWEEN I-95 AND US 29	🚧	0	\$4,967.00
🚧 MD 26 WEST AT MP 16.7	🚧	0	\$3,376.00
🚧 US 220 EAST AT DEER PARK RD	🚧	0	\$2,342.00
🚧 MD 528 NORTH FROM 56TH ST TO 72ND ST	🚧	0	\$4,038.00
🚧 I-95 NORTH PAST EXIT 50 US 1 CATON AVE (LANE SHIFT/LONG-TERM)	🚧	0	\$9,976.00
🚧 US 15 NORTH AT AUBURN RD	🚧	0	\$5,332.00
🚧 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	🚧	0	\$1,835.00
🚧 I-95 OUTER LOOP AT ARDWICK ARDMORE RD	🚧	1.45	\$9,969.00
🚧 MD 191 EAST AT LELAND ST	🚧	0	\$5,525.00
🚧 I-81 SOUTH FROM MP 0.84 TO MP 3.13	🚧	0	\$9,672.00
🚧 US 40 EAST/WEST FROM WASHINGTON ST TO I-81	🚧	0	\$1,266.00
🚧 I-695 INNER LOOP BETWEEN I-895 AND I-95	🚧	0	\$9,064.00
🚧 MD 79 SOUTH/NORTH BETWEEN MD 17 AND MD 180	🚧	0	\$8,418.00
🚧 MD 4 NORTH AT BRISCOE TURN RD	🚧	0	\$8,220.00
🚧 I-695 INNER LOOP PAST MP 48.2 (TOLL PLAZA)	🚧	0	\$7,187.00
🚧 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	🚧	0	\$469.00
🚧 MD 193 SOUTH/NORTH AT CAPITAL BELTWAY	🚧	0.09	\$6,685.00
🚧 US 40 EAST/WEST BETWEEN I-70 AND BLENTLINGER RD	🚧	0	\$9,315.00
🚧 MD 136 SOUTH/NORTH AT KERR RD	🚧	0	\$1,671.00
🚧 I-895 NORTH AT POTEE ST ON POTEE ST	🚧	0	\$6,166.00



USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	Total User Delay Cost				
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,806,342.05	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,462.75	\$179,057.99	\$107,675.02	\$6,721.70	\$3,660,917.46
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Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,311.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03

Map Layers and Options



Individual Work Zone Profile

Planned Closure @ I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

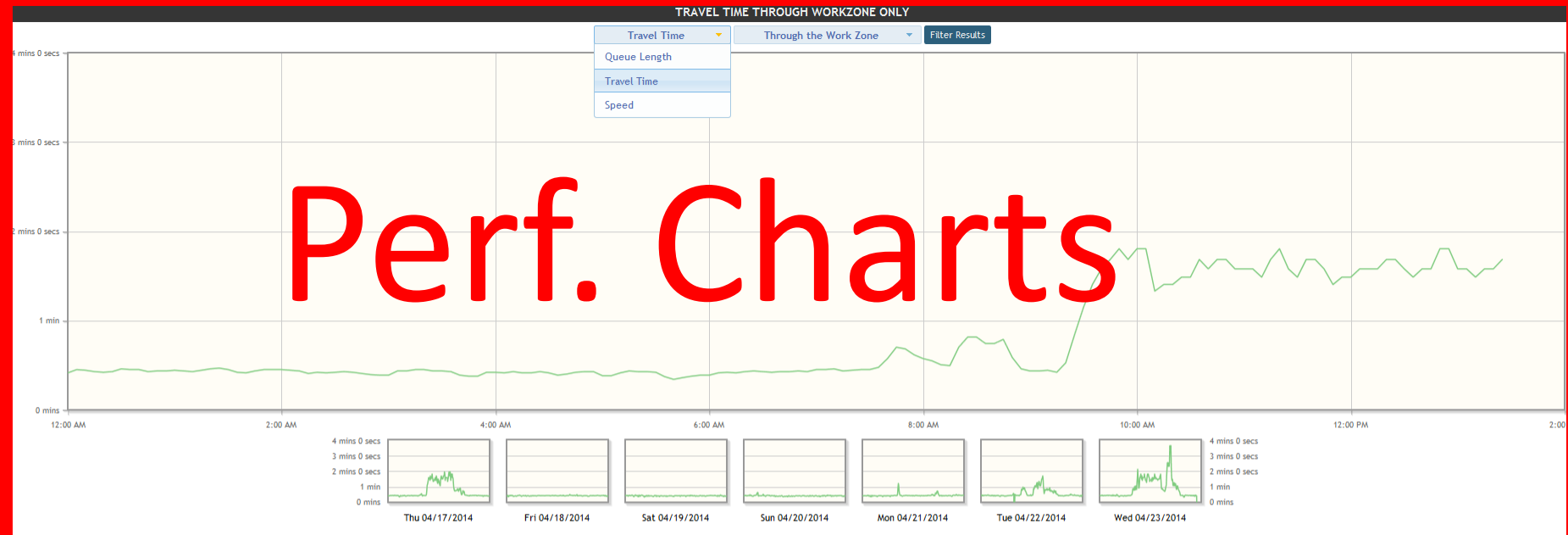
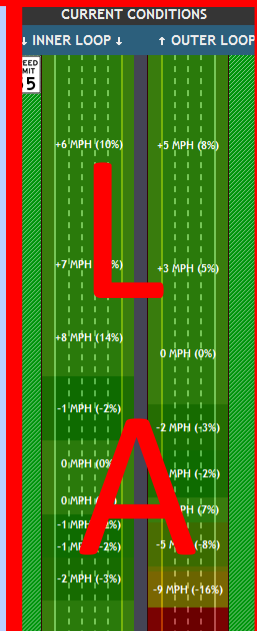
SETTINGS

Data Type...
 Measured Speeds
 Comparison to Historical Average

Show...
 Work Zone Bounds
 Posted Speeds
 Associated MS
 Nearby Cameras
 Nearby Incidents
 Lane Status
 Bottlenecks (when available)
 5 miles upstream
 5 miles downstream

Permit Information
 Project Information
 Site Details
 Configure Alerts

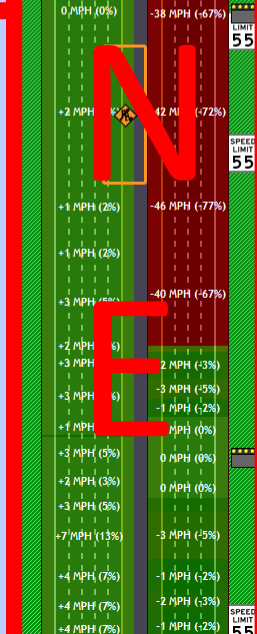
Settings



Perf. Charts



Map



USER DELAY COST

Total User Delay Cost

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/17/2014	\$11.52	\$183.00	\$9,306.97	\$16,405.23	\$2,958.90	\$67.58	\$28,933.20
Fri 4/18/2014	\$6.17	\$29.46	\$82.00	\$221.35	\$127.06	\$50.00	\$516.04
Sat 4/19/2014	\$27.17	\$7.65	\$3.12	\$22.42	\$17.28	\$46.01	\$123.66
Sun 4/20/2014	\$39.81	\$24.66	\$22.22	\$6.45	\$26.78	\$18.42	\$115.80
Mon 4/21/2014	\$2.46	\$48.75	\$2.23	\$2.10	\$899.54	\$131.35	\$1,973.63
Tue 4/22/2014	\$25.38	\$264.46	\$1,819.65	\$8,771.39	\$2,675.70	\$189.00	\$13,745.58
Wed 4/23/2014	\$20.52	\$477.24	\$12,525.82	\$13,993.07	\$16,213.27	\$80.23	\$43,310.14
Hourly Totals	\$133.04	\$1,035.22	\$24,525.89	\$39,522.78	\$22,918.53	\$582.59	Grand Total: \$88,718.06

Delay

Individual Work Zone Profile

Planned Closure @ US 29 SOUTH AT INDUSTRIAL PKW

SETTINGS

Data Type...

- Measured Speeds
- Comparison to Historical Average

Show...

- Work Zone Bounds
- Posted Speeds
- Associated DMS
- Nearby Cameras
- Nearby Incidents
- Lane Status
- Bottlenecks (when available)

5 miles upstream }
5 miles downstream }

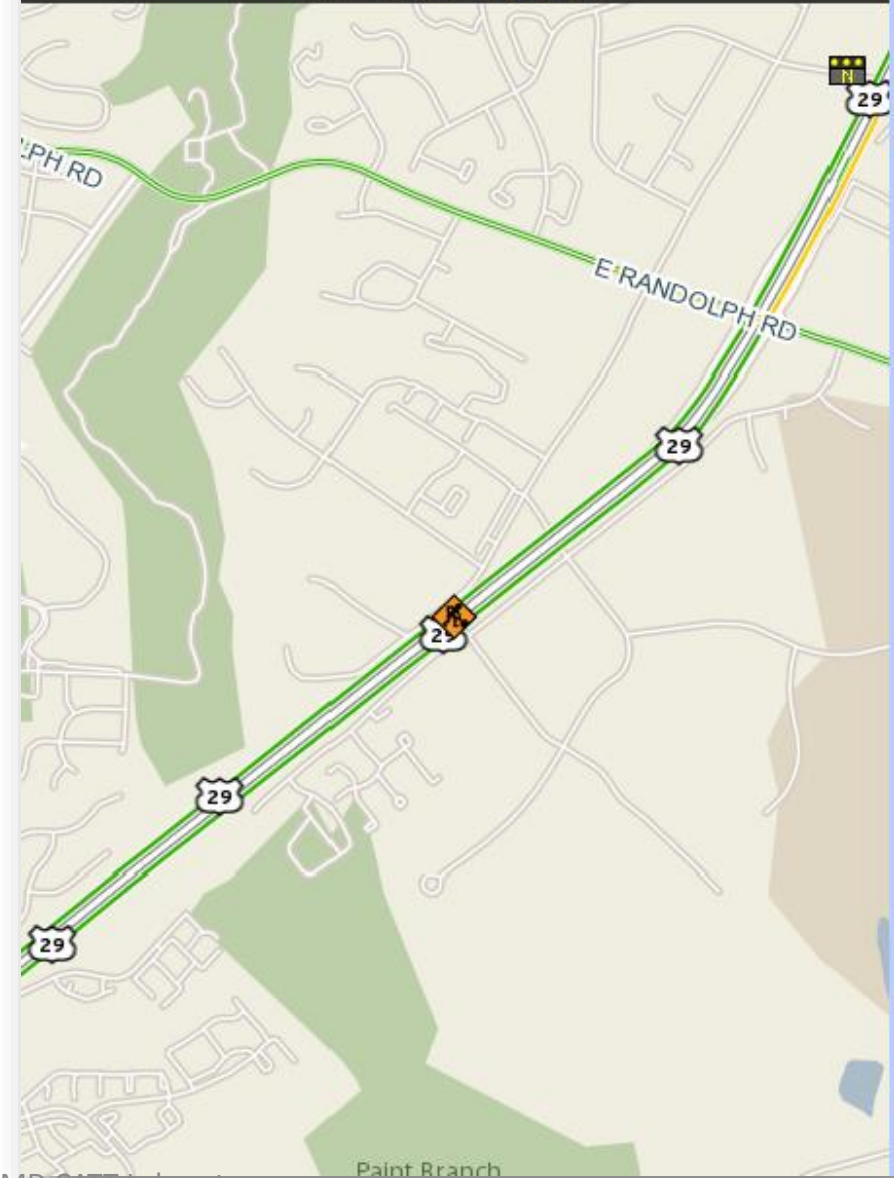
[Permit Information](#)

[Project Information](#)

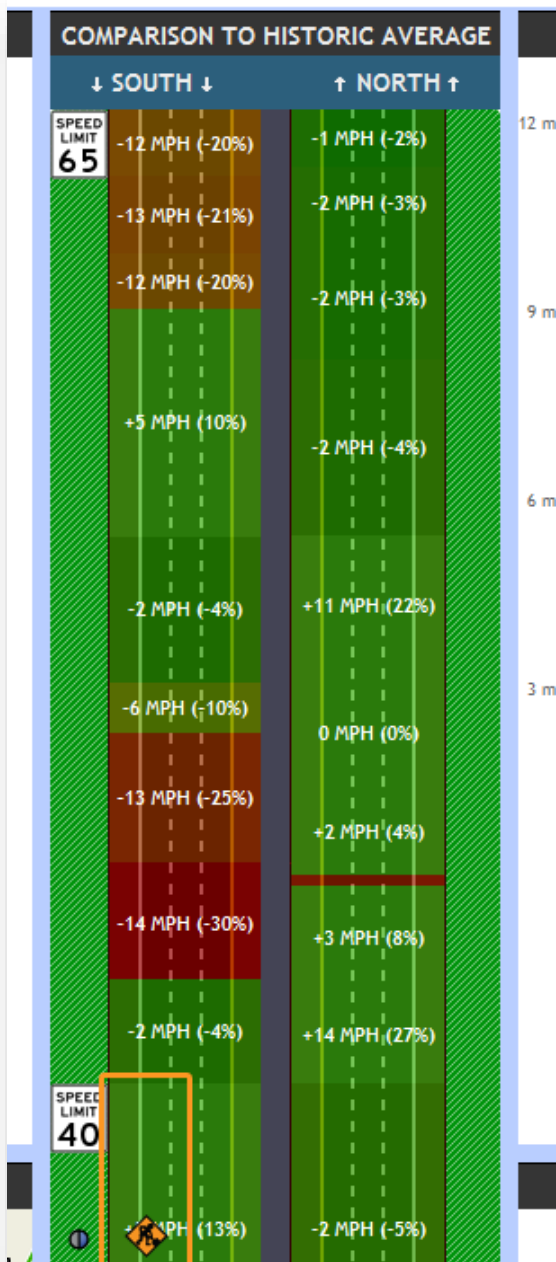
[Site Details](#)

[Configure Alerts](#)

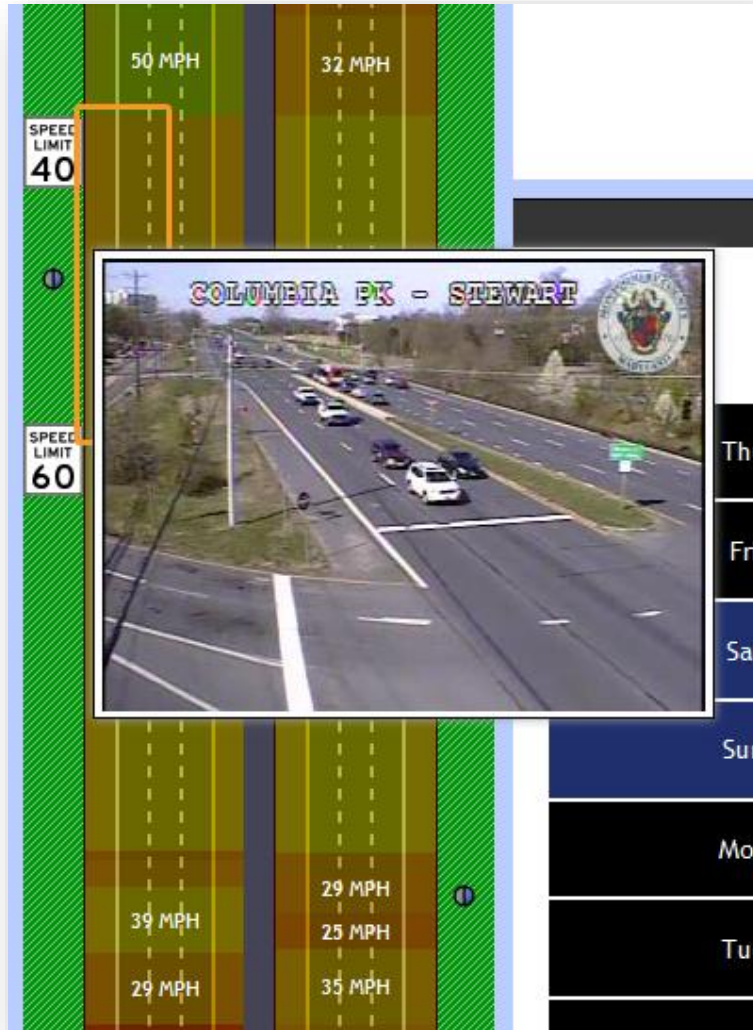
WORK ZONE LOCATION



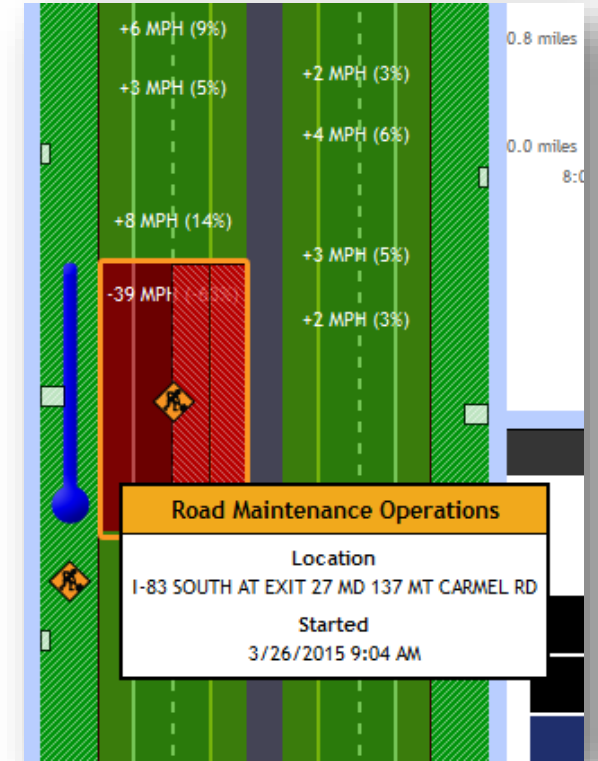
Lane Profile Interaction



Segment Speeds



Live CCTV & DMS



Bottlenecks & Nearby Events

Individual Work Zone Profile

Planned Closure @ US 29 SOUTH AT INDUSTRIAL PKWY

Started: Thu, Apr 17, 2014 at 09:16:31 AM

SETTINGS

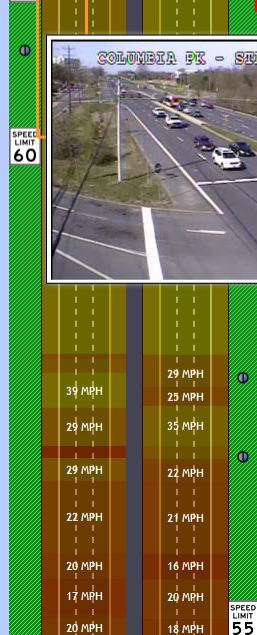
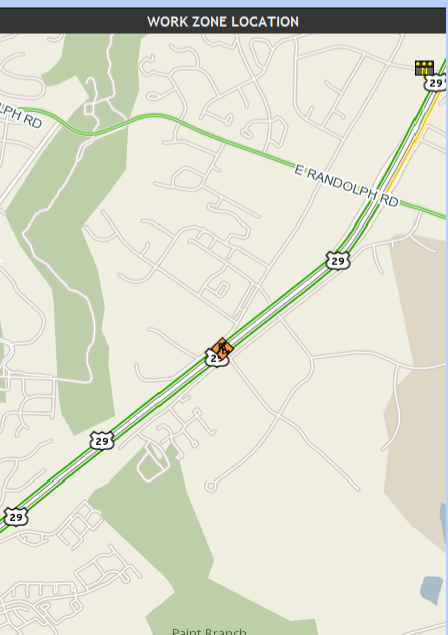
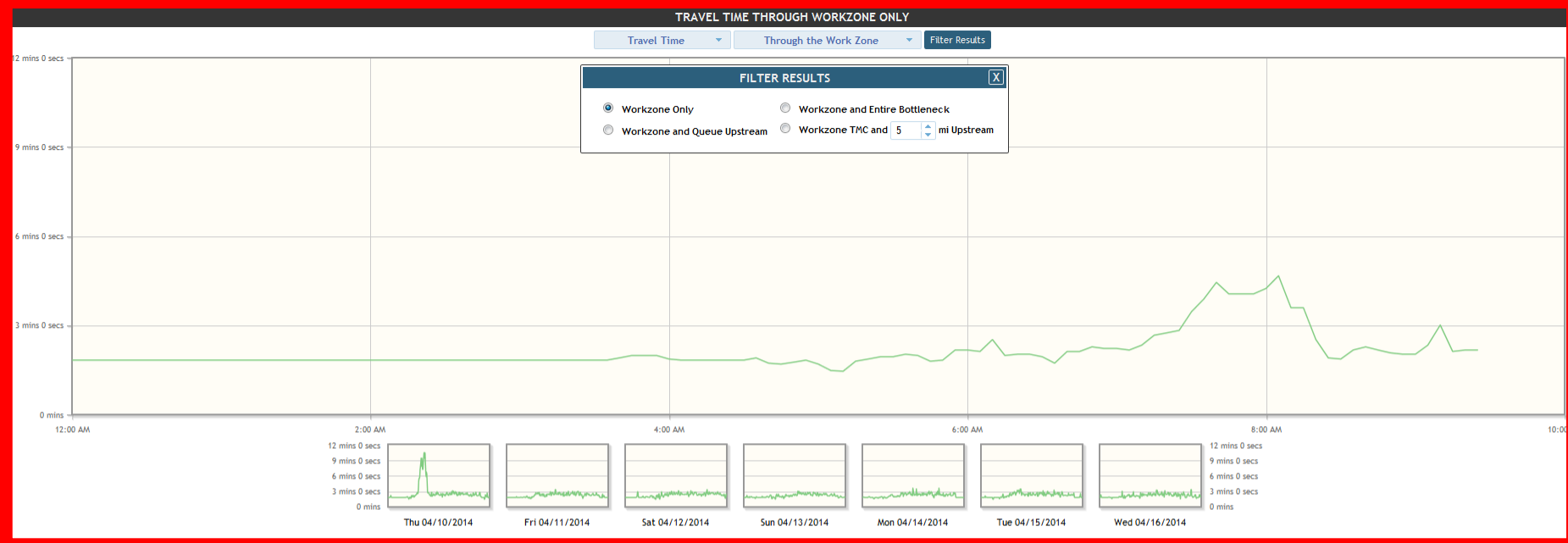
Data Type...
 Measured Speeds
 Comparison to Historical Average

Show...
 Work Zone Bounds
 Posted Speeds
 Associated DMS
 Nearby Cameras
 Nearby Incidents
 Lane Status
 Bottlenecks (when available)
 5 miles upstream
 5 miles downstream

Permit Information
 Project Information
 Site Details
 Configure Alerts

CURRENT CONDITIONS

	↓ SOUTH ↓	↑ NORTH ↑
SPEED LIMIT 60	71 MPH	64 MPH
	74 MPH	64 MPH
	72 MPH	61 MPH
	45 MPH	50 MPH
	58 MPH	40 MPH
	60 MPH	58 MPH
	60 MPH	44 MPH
	56 MPH	27 MPH
	50 MPH	32 MPH
SPEED LIMIT 40		
SPEED LIMIT 60		
	29 MPH	29 MPH
	39 MPH	25 MPH
	29 MPH	34 MPH
	29 MPH	22 MPH
	22 MPH	21 MPH
	20 MPH	16 MPH
	17 MPH	20 MPH
	20 MPH	18 MPH
SPEED LIMIT 55		



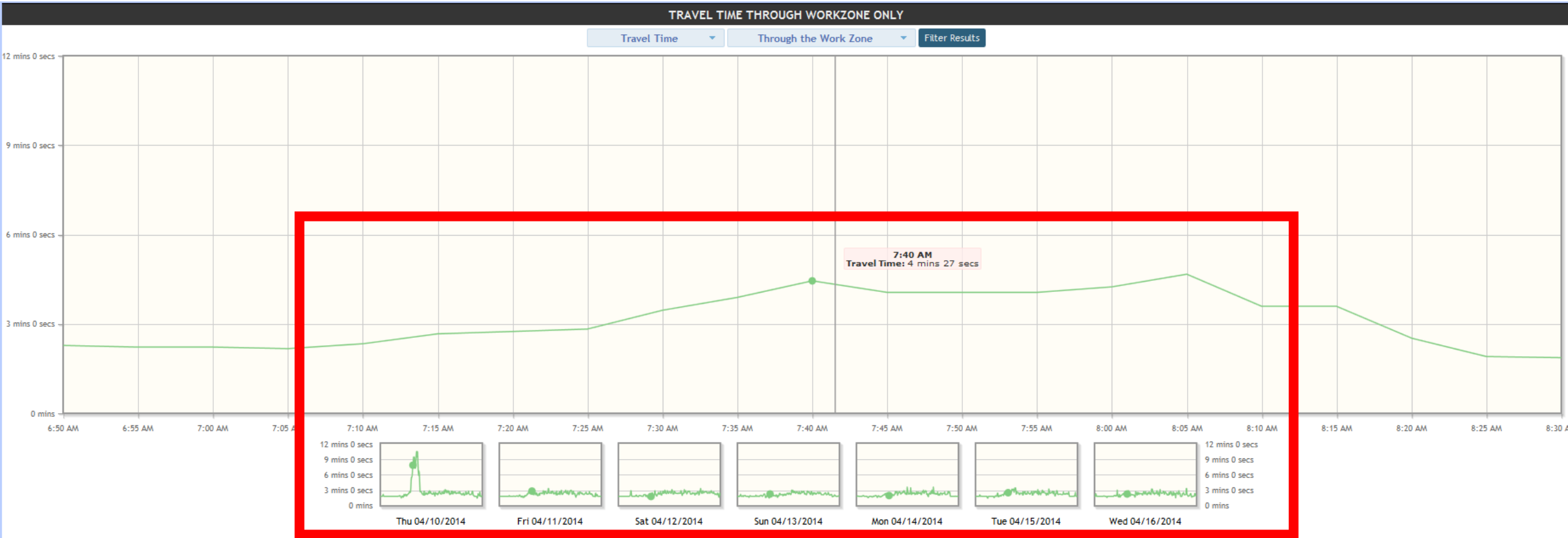
USER DELAY COST

Total User Delay Cost

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/10/2014	\$5.78	\$6,873.19	\$12,665.11	\$3,206.89	\$2,729.29	\$727.68	\$26,207.94
Fri 4/11/2014	\$1.43	\$1,659.88	\$2,890.60	\$3,409.59	\$2,672.82	\$725.83	\$11,360.16
Sat 4/12/2014	\$28.72	\$157.52	\$2,128.63	\$3,515.62	\$2,832.64	\$1,460.89	\$10,124.02
Sun 4/13/2014	\$26.27	\$130.17	\$903.41	\$3,146.27	\$2,241.61	\$563.40	\$7,011.13
Mon 4/14/2014	\$6.28	\$745.76	\$2,621.76	\$3,140.43	\$2,590.54	\$687.18	\$9,791.94
Tue 4/15/2014	\$4.02	\$1,656.16	\$3,762.04	\$3,180.66	\$2,815.89	\$621.03	\$12,039.80
Wed 4/16/2014	\$13.48	\$999.74	\$1,930.41	\$3,092.66	\$2,405.12	\$598.21	\$9,039.62
Hourly Totals	\$85.97	\$12,222.42	\$26,901.96	\$22,692.12	\$18,287.90	\$5,384.23	Grand Total: \$85,574.60

Performance Charts: Interactivity

Started: Thu, Apr 17, 2014 at 09:16:31 AM



Adjusting Parameters

EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

TRAVEL TIME THROUGH WORKZONE ONLY

Travel Time ▼ South Through the Work Zone ▼ Filter Results

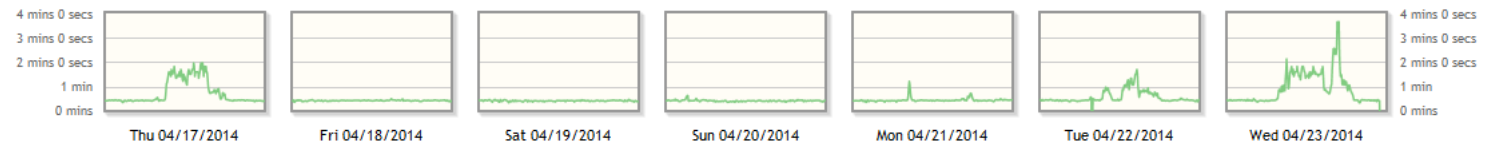
Queue Length

Travel Time

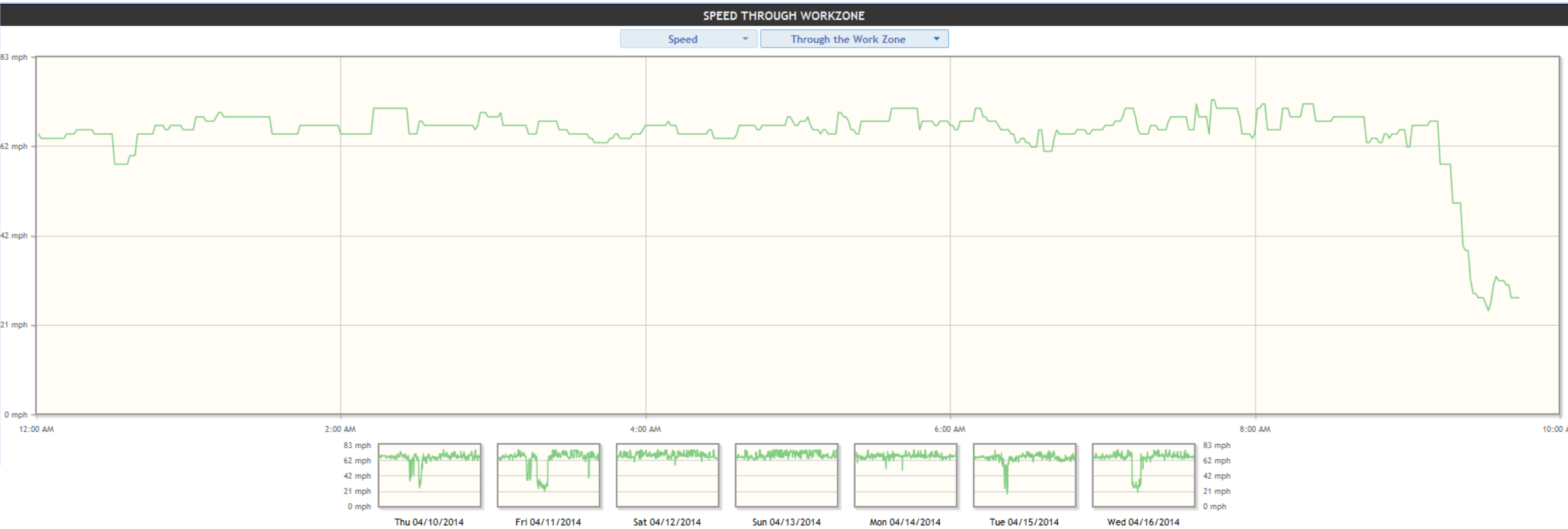
Speed

South Through the Work Zone

North Opposite the Work Zone



Individual Work Zone Profile



Individual Work Zone Profile: Filtering

Started: Thu, Apr 17, 2014 at 09:16:31 AM

TRAVEL TIME THROUGH WORKZONE ONLY

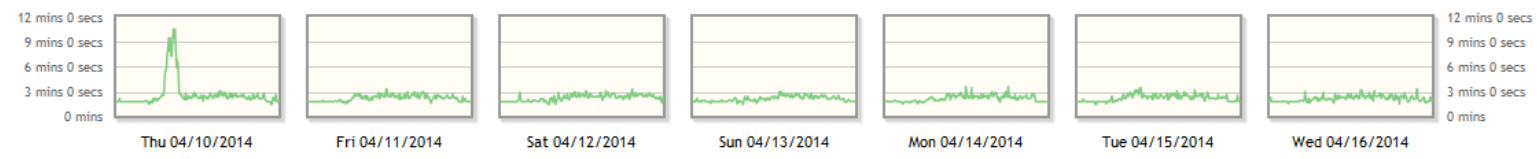
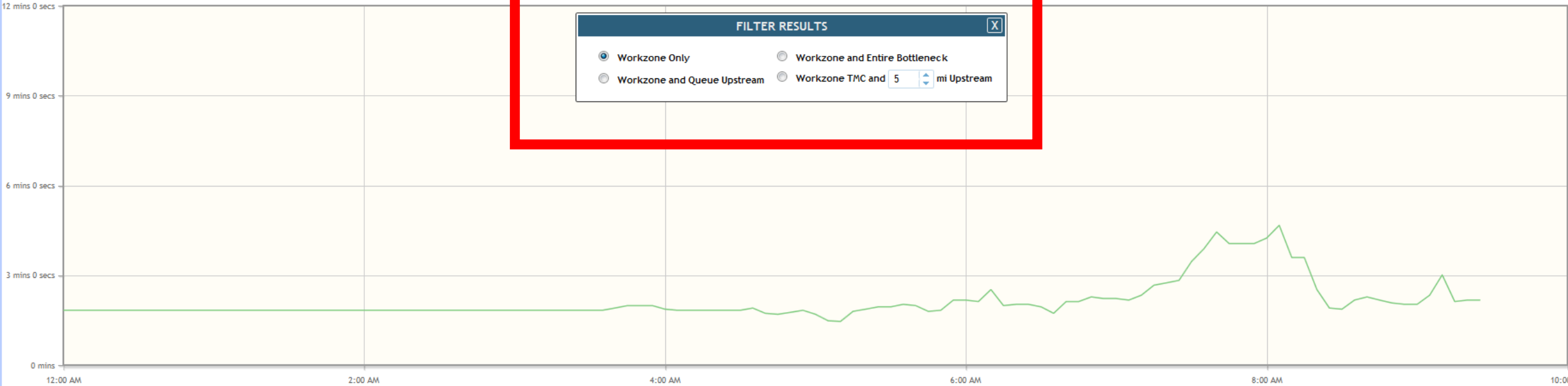
Travel Time

Through the Work Zone

Filter Results

FILTER RESULTS

- Workzone Only
- Workzone and Entire Bottleneck
- Workzone and Queue Upstream
- Workzone TMC and 5 mi Upstream



Individual Work Zone Profile: UDC

Total User Delay Cost							
	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/17/2014	\$11.52	\$183.00	\$9,306.97	\$16,405.23	\$2,958.90	\$67.58	\$28,933.20
Fri 4/18/2014	\$6.17	\$29.46	\$82.00	\$221.35	\$127.06	\$50.00	\$516.04
Sat 4/19/2014	\$27.17	\$7.65	\$3.12	\$22.42	\$17.28	\$46.01	\$123.66
Sun 4/20/2014	\$39.81	\$24.66	\$0.00	\$6.13	\$26.78	\$18.42	\$115.80
Mon 4/21/2014	\$2.46	\$48.75	\$788.33	\$103.20	\$899.54	\$131.35	\$1,973.63
Tue 4/22/2014	\$25.38	\$264.46	\$1,819.65	\$8,771.39	\$2,675.70	\$189.00	\$13,745.58
Wed 4/23/2014	\$20.52	\$477.24	\$12,525.82	\$13,993.07	\$16,213.27	\$80.23	\$43,310.14
Hourly Totals	\$133.04	\$1,035.22	\$24,525.89	\$39,522.78	\$22,918.53	\$582.59	Grand Total: \$88,718.06

■ Weekend
 ■ Lowest
 ■
 ■
 ■ Highest
 ■ No Data

**I don't have time to watch the
Dashboard all day long!**

Can't you just tell me where the
problems are?

Work Zone Alerts

CREATE AN ALERT FOR THIS WORK ZONE ✕

Fill out each section to set up an alert for this work zone.

1. Alert me if...

- An accident happens near this work zone.
- There is a bottleneck that's head or queue includes this work zone.
- Speeds in the work zone fall below or exceed a certain range.

2. Alert me by...

- Send me an email
- Send me a text message

3. Alert me when...

Time zone

US/Eastern ▼

Time period

Select days of week

Sun	Mon	Tue	Wed	Thu	Fri	Sat
-----	-----	-----	-----	-----	-----	-----

Select hours of day

12 AM 6 AM 12 PM 6 PM 12 AM

+ Add time period

Create alert

(C) 2015 Michael L. Pack, University of MD CATT Laboratory

Work Zone Alerts

CREATE AN ALERT FOR THIS WORK ZONE

Fill out each section to set up an alert for this work zone.

1. Alert me if...

An accident happens near this work zone.
Within mile(s) upstream or mile(s) downstream

There is a bottleneck that's head or queue includes this work zone.
Keep in mind [the formula for determining bottleneck conditions](#).

Alert me only when the queue upstream from the work zone exceeds mile(s)

Speeds in the work zone fall below or exceed a certain range.

When speeds fall below mph

When speeds rise above mph

Alert me when speed is out of range for longer than minute(s)

Alert me when speed returns within range for longer than minute(s)

2. Alert me by...

Send me an email
Alert will be sent to your account email: *ivanovn@umd.edu*

Send me a text message
Enter your phone number

3. Alert me when...

Time zone

Time period
1.

Select day of week

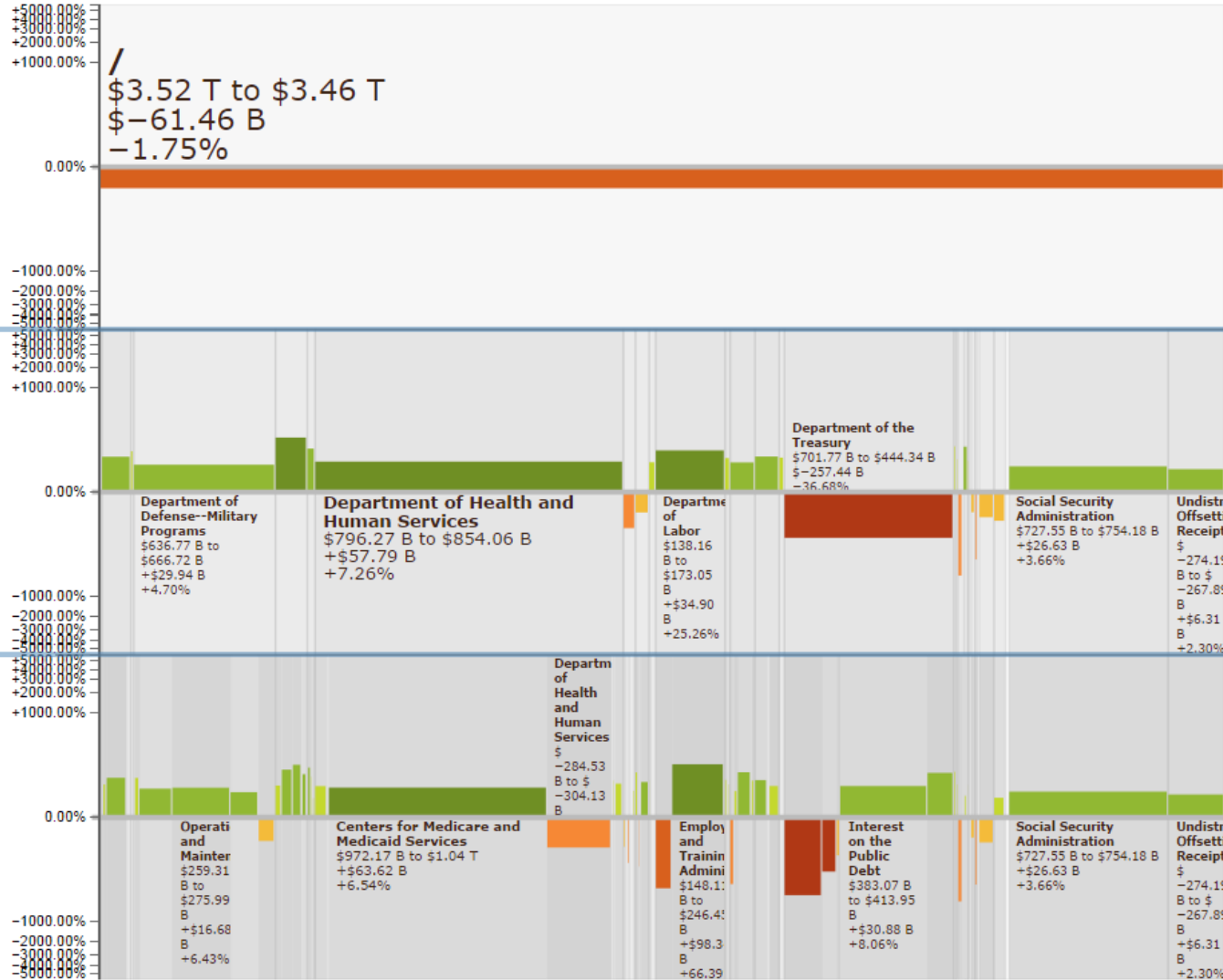
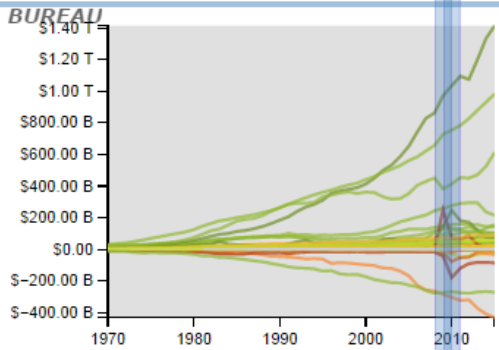
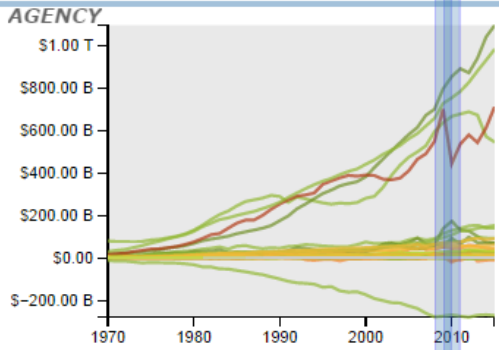
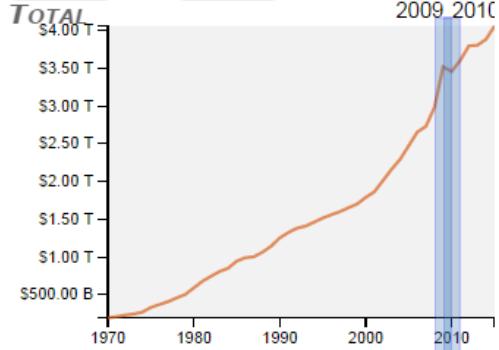
Hierarchical Data Analysis (airline passengers)

Timelines Node Details

US Federal Budget

Comparing 2009 to 2010

by: year



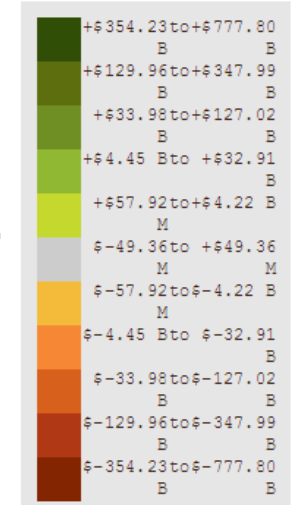
Showing 467 nodes. Show all Show labels

Controls

Legend

Color by:

budget Differ 4rt?



Height by:

budget Perce 4rt?



Sort by:

Name

Width by:

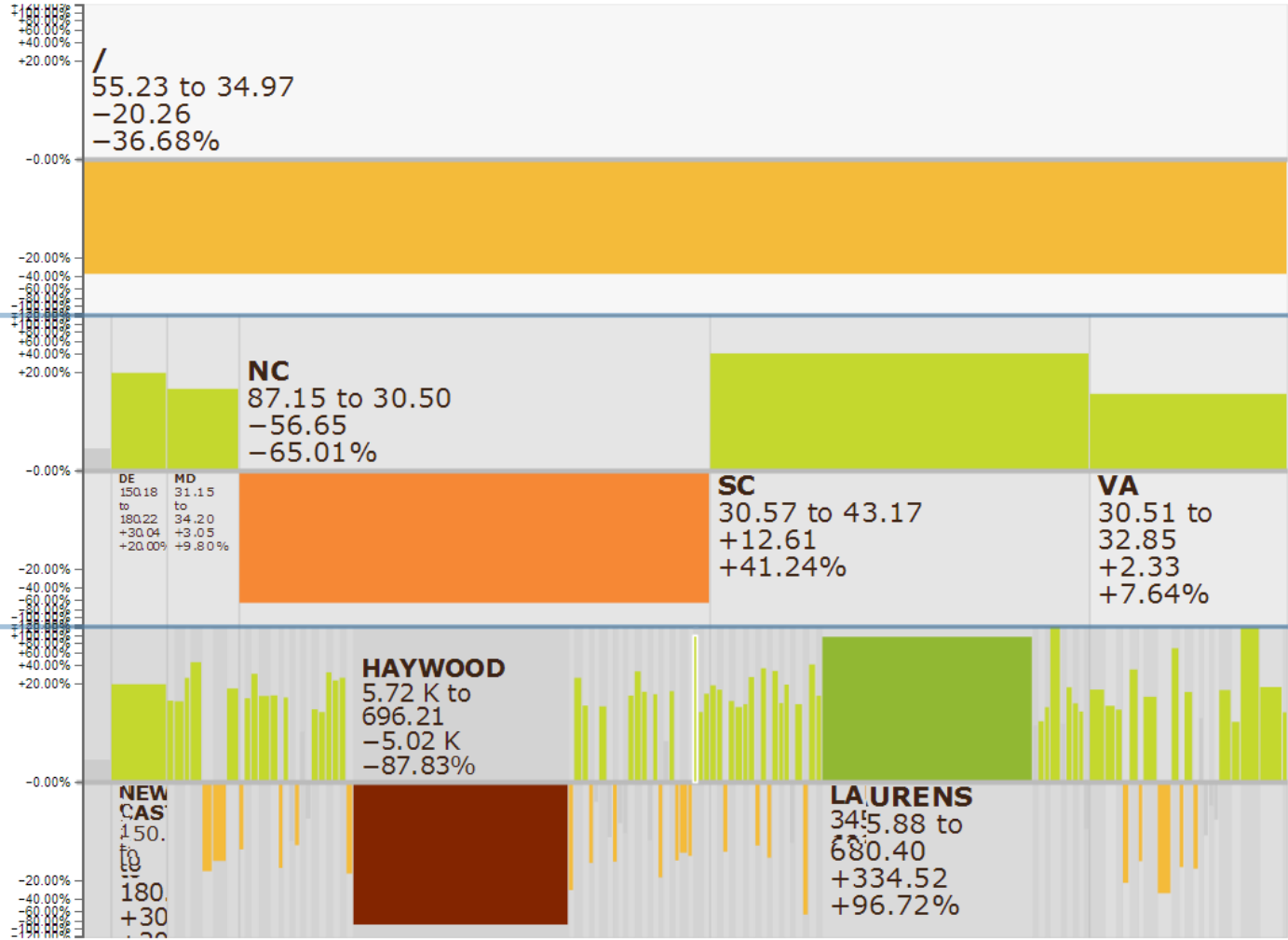
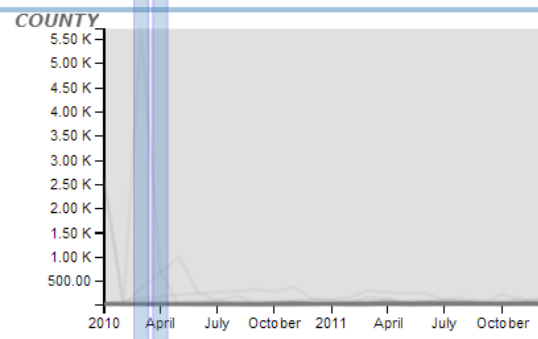
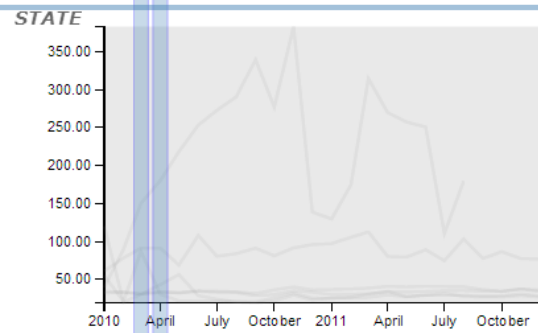
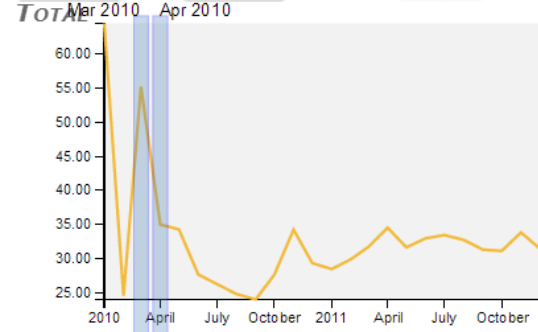
budget Endin 87

Timelines Node Details

Traffic Bottlenecks

Comparing Mar 2010 to Apr 2010 

average by: month 



Showing 107 nodes. [Show all](#) Show labels

Controls

Legend

What changed?

Topology

- 106 nodes were on both
- 1 node was created

Absolute overall change

- 5 nodes decreased more than -20.26
- 9 nodes increased more than +11.08

Relative overall change

- 4 nodes decreased more than -36.68%
- 5 nodes increased more than +69.85%

Absolute change by Level

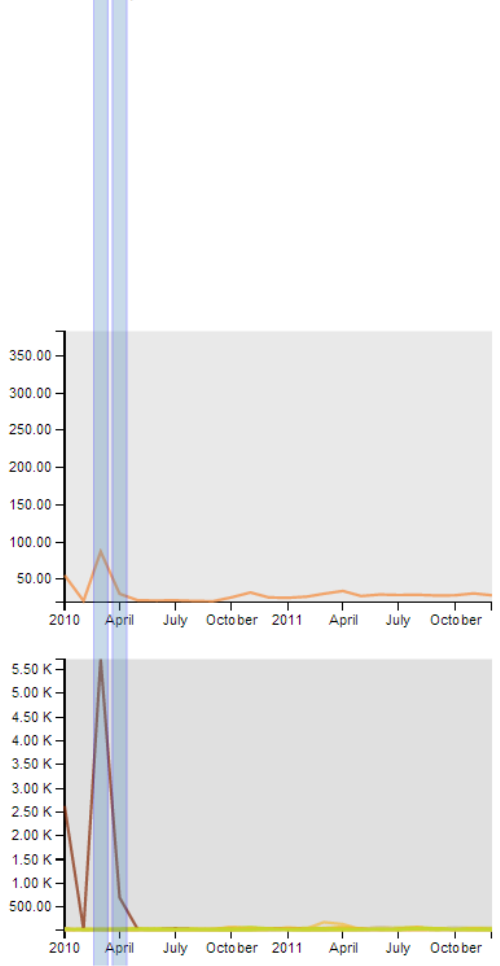
- 1 state decreased more than -56.65
- 2 state increased more than +12.61
- 3 county decreased more than -21.46
- 8 county increased more than +10.65

Relative change by Level

- 1 state decreased more than -65.01%
- 1 state increased more than +41.24%
- 2 county decreased more than -65.60%

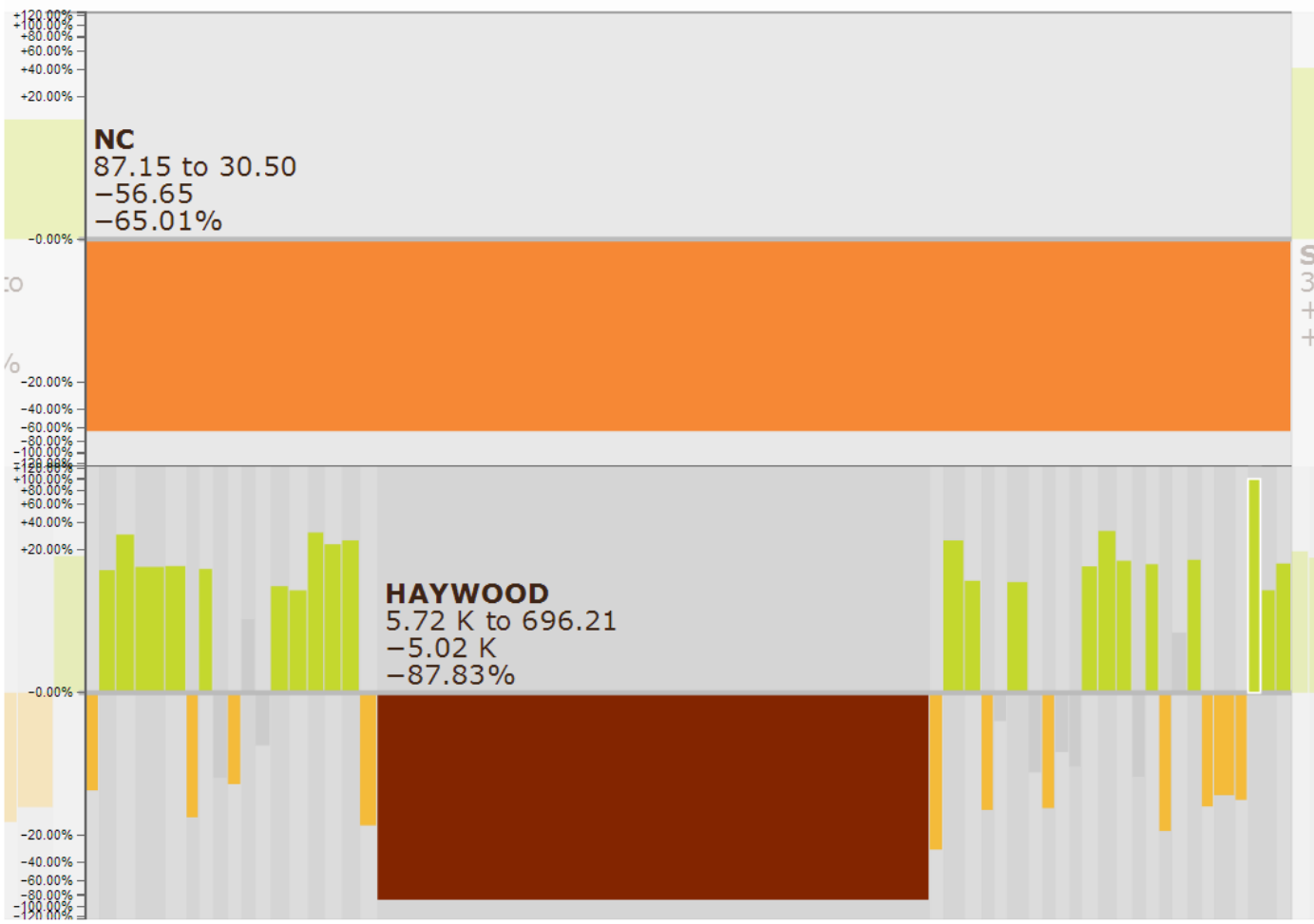
Timelines Node Details

average by: month Mar 2010 Apr 2010



Traffic Bottlenecks

Comparing Mar 2010 to Apr 2010



Showing 107 nodes. [Show all](#) Show labels

Controls

Legend

What changed?

Topology
106 nodes were on both
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3 county decreased more than -21.46
8 county increased more than +10.65

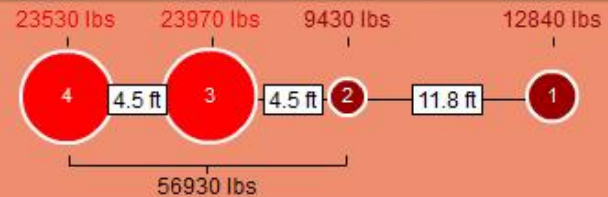
Relative change by Level
1 state decreased more than -65.01%
1 state increased more than +41.24%
2 county decreased more than -65.60%

Virtual Weigh Stations

Virtual Weigh Station

Lock selection to newest vehicle

- 11:30:38 AM | Class 7
- 11:29:51 AM | Class 5
- 11:28:56 AM | Class 9
- 11:25:43 AM | Class 7**
- 11:24:30 AM | Class 9



Shorten my commute...

- Your DOT is starting an innovative campaign to encourage commuters to be flexible in their working hours to shift demand on a heavily congested corridor in your region. As part of your campaign, you've been asked to choose a small corridor and compare travel times during the AM commute each day to show how much of a shift in your commute start can impact your average travel time on that corridor.



Historic Probe Data Explorer

Travel Time for I-270 from I-270 to I-370/Sam Eig Hwy/Exit 9
 Averaged for every Tuesday, Wednesday and Thursday in January 2011.



- [Introduction](#)
- [Search Criteria](#)
- [Visualization Technique](#)
- [Final Visualization](#)



Graphing Options

Mode

Type

Vertical Axis Scale
 Best fit Custom
 Min Max

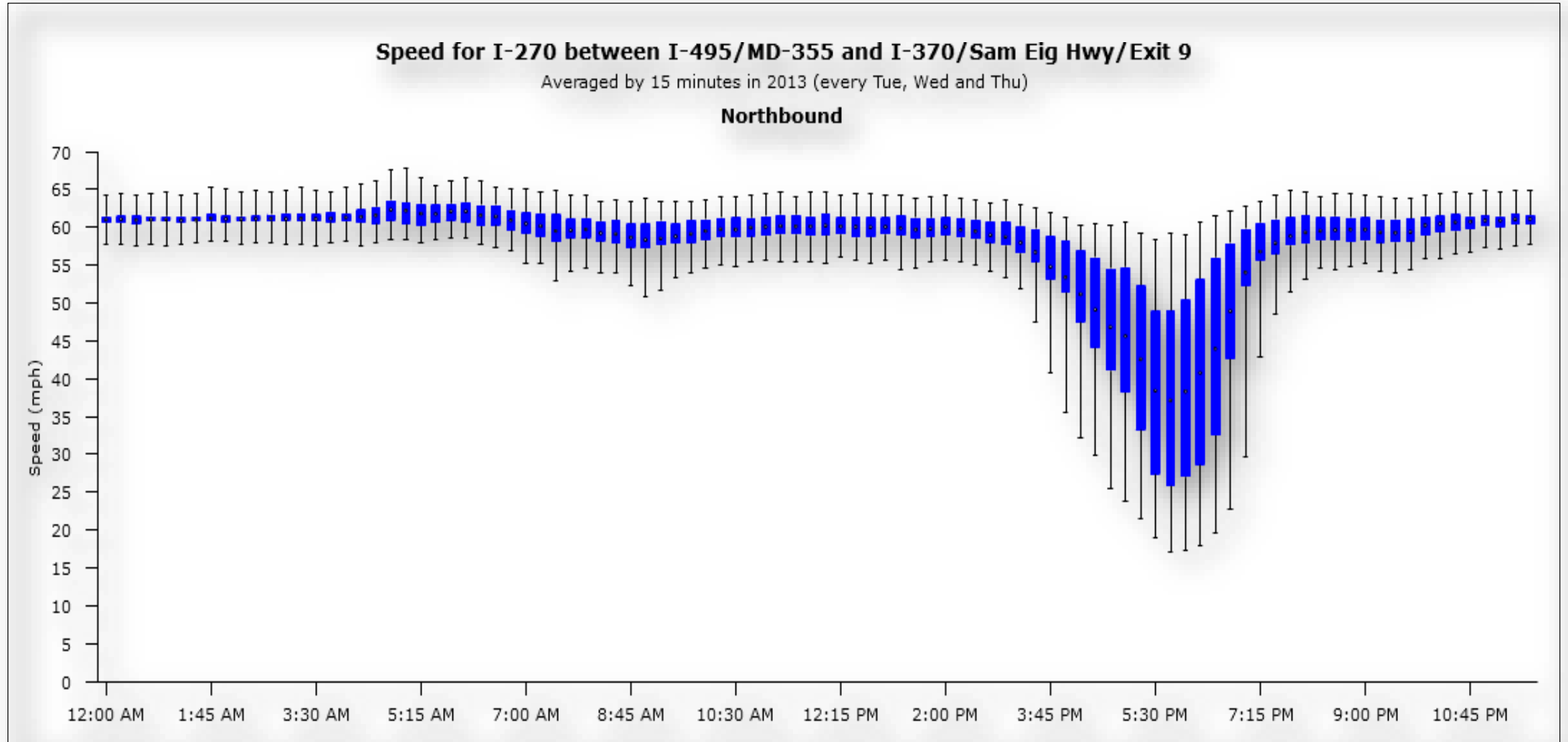
Data Options

Data Type
 Travel Time (minutes)

Toggle Graphs
 Southbound
 Northbound

Graph Data
 January 2011

What is the annual weekday speed (or travel time) variability on that Corridor?



Resources (give me your card or send me an email)

- List of Visualization Research Labs
- 21 Visualization Blogs and Review Websites
- Tools (both free and not-so-free)
- Job Descriptions for InfoGraphics and Visualization Experts

give me your card or send me an email
PackML@umd.edu

Break

- After the AVAILabs Presents their work, we will return with another presentation on:
 - Ethics in Data Visualization
 - How to communicate to the public and elected officials using visualization

Thank you!

- Michael L. Pack

PackML@umd.edu

301.405.0722

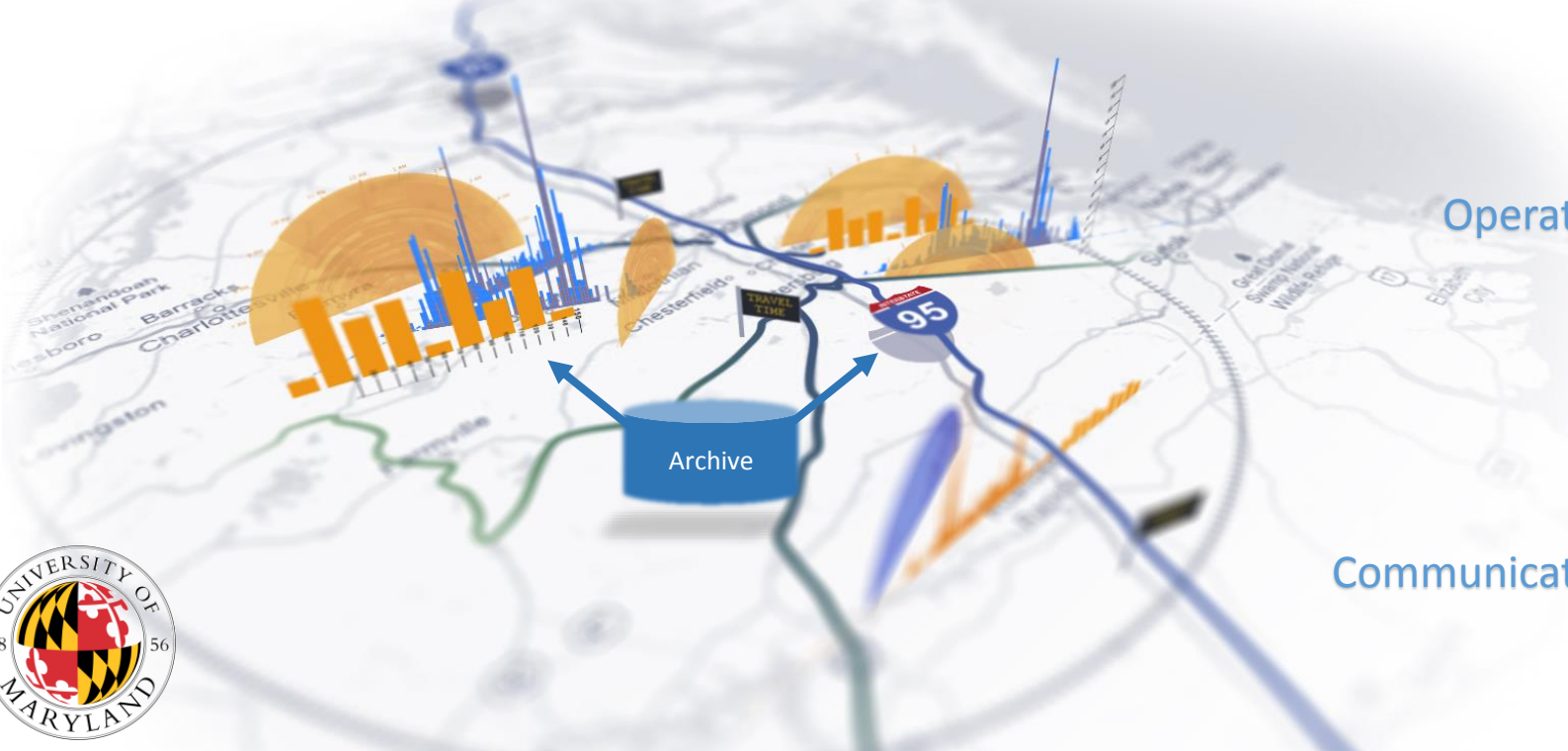


NATMEC Vis Workshop Part 2

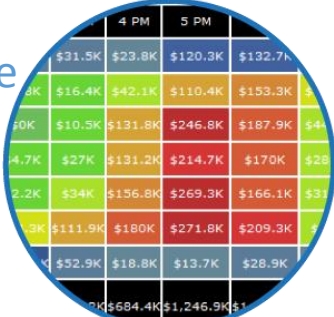
Communicating Effectively in the Modern World

Visual Analytics for knowledge discovery and story telling

Presentation Part 2: Effective Story Telling and Ethics



Performance Measures



Planning



Operations



Communications



Enabling Decision Making & Effective Communication

Effective Story Telling & Ethics



Guess the story

A broken family is reunited after the children enlist in the military, unaware that their father is a high ranking official within the enemy force.



In Transportation, our stories are usually about performance...

Good performance measures are like a really good movie

- They (1) tell a compelling story from beginning to end (2) about a compelling issue, and they (3) make important discoveries/observations along the way.
- There is no single number that can do this!
- You need several key measures that, when combined, point out the state of your system in a meaningful, and easily understood way.



Performance Measures =
Story Telling

Who is your audience?

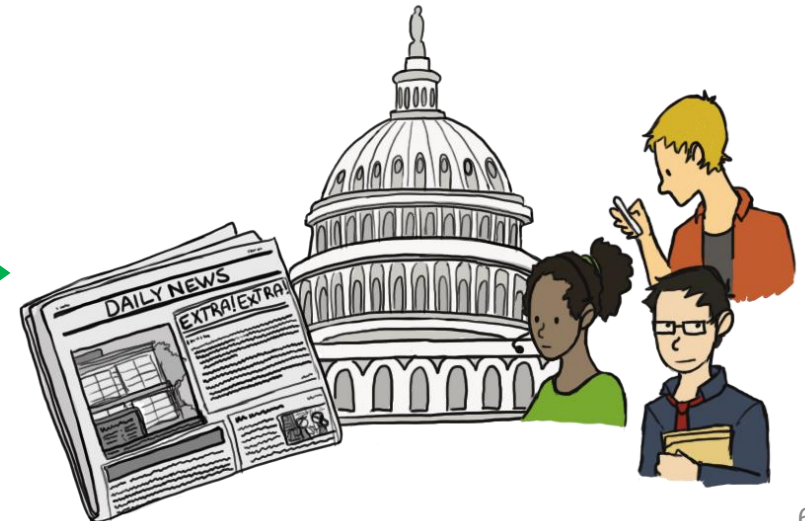


- Engineers
- Planners
- Operators

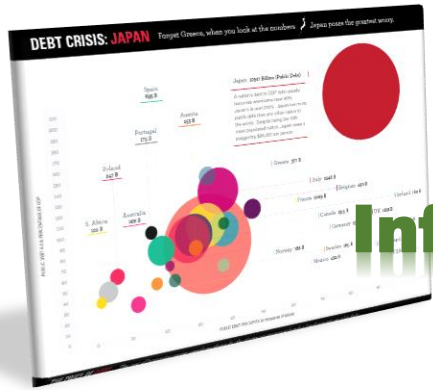


Vs.

- Legislators
- Media
- Decision Makers
- Public



Remember this from earlier?



InfoGraphics

InfoVids



Animations & Serious Gaming

Visual Analytics



Augmented Reality



InfoGraphics

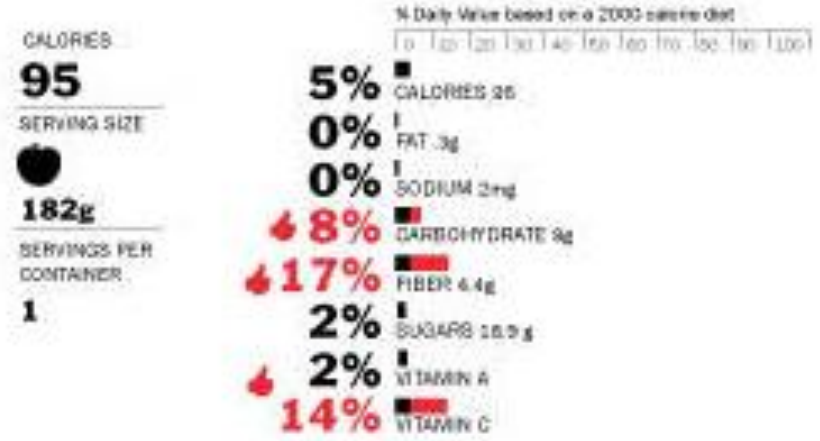
Nutrition Labels

Macaroni and Cheese			
Nutrition Facts			
Serving Size 1 cup (228g)			
Servings Per Container 2			
Amount Per Serving			
Calories 250		Calories from Fat 110	
		% Daily Value*	
Total Fat 12g			18%
Saturated Fat 3g			15%
Cholesterol 30mg			10%
Sodium 470mg			20%
Total Carbohydrate 31g			10%
Dietary Fiber 0g			0%
Sugars 5g			
Protein 5g			
Vitamin A			4%
Vitamin C			2%
Calcium			20%
Iron			4%
* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:			
	Calories:	2,000	2,500
Total Fat	Less than	65g	60g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Rethinking Nutrition Labels



PRODUCT **FRESH FRUIT** AMOUNT OF INGREDIENTS **1**



PRODUCT **MACARONI & CHEESE, BOX** AMOUNT OF INGREDIENTS **20**





The STATE of TRANSPORTATION in COLORADO

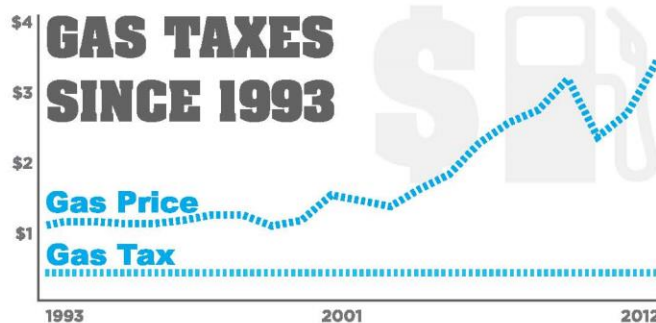
Transportation and mobility are key contributors to quality of life and economic growth in Colorado.



For example, a 10% decrease in traffic congestion, results in a 1% increase in economic productivity.



Gas tax funding has not evolved to account for more hybrid/electric & fuel-efficient vehicles traveling our highways. Since these don't need as much gas, funding for roads is decreasing.



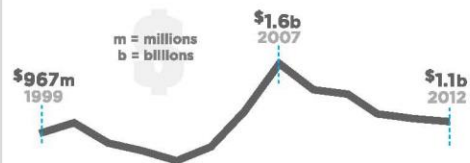
Gas taxes are the main source of funding for Colorado's roads. The price of gas has increased, but the tax collected per gallon—18.4¢ federal + 22¢ state—has remained the same since the early 1990's.



52% of STATE HIGHWAYS in POOR CONDITION

and over the next 10 years, the forecasted budget will fall short of the amount needed to maintain current conditions by over \$150 million each year.

CDOT REVENUES



Budget fluctuations plus rising construction/material costs make it hard for CDOT to deliver the same level of service as it did in the past.

THE NEXT 20 YEARS



+48%

7.4 MILLION COLORADANS



+64%

44.9 BILLION MILES TRAVELED



+50%

17 MINUTES BECOMES 34

Avg. Traffic Delay

These factors will greatly impact our transportation system.

CDOT BUILDS & MAINTAINS

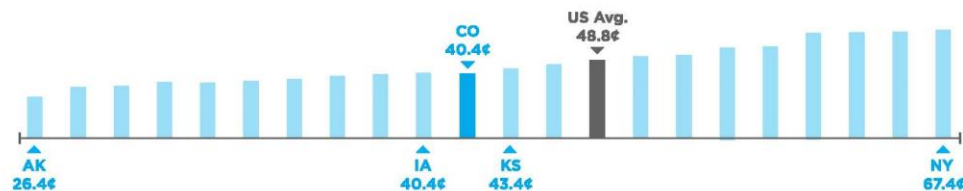
Colorado and US highways & interstates.



AT ITS CURRENT FUNDING CDOT'S MUST FOCUS ON MAINTAINING ASSETS THERE'S NO \$ TO EXPAND FOR THE FUTURE



GAS TAX COMPARED TO OTHER STATES

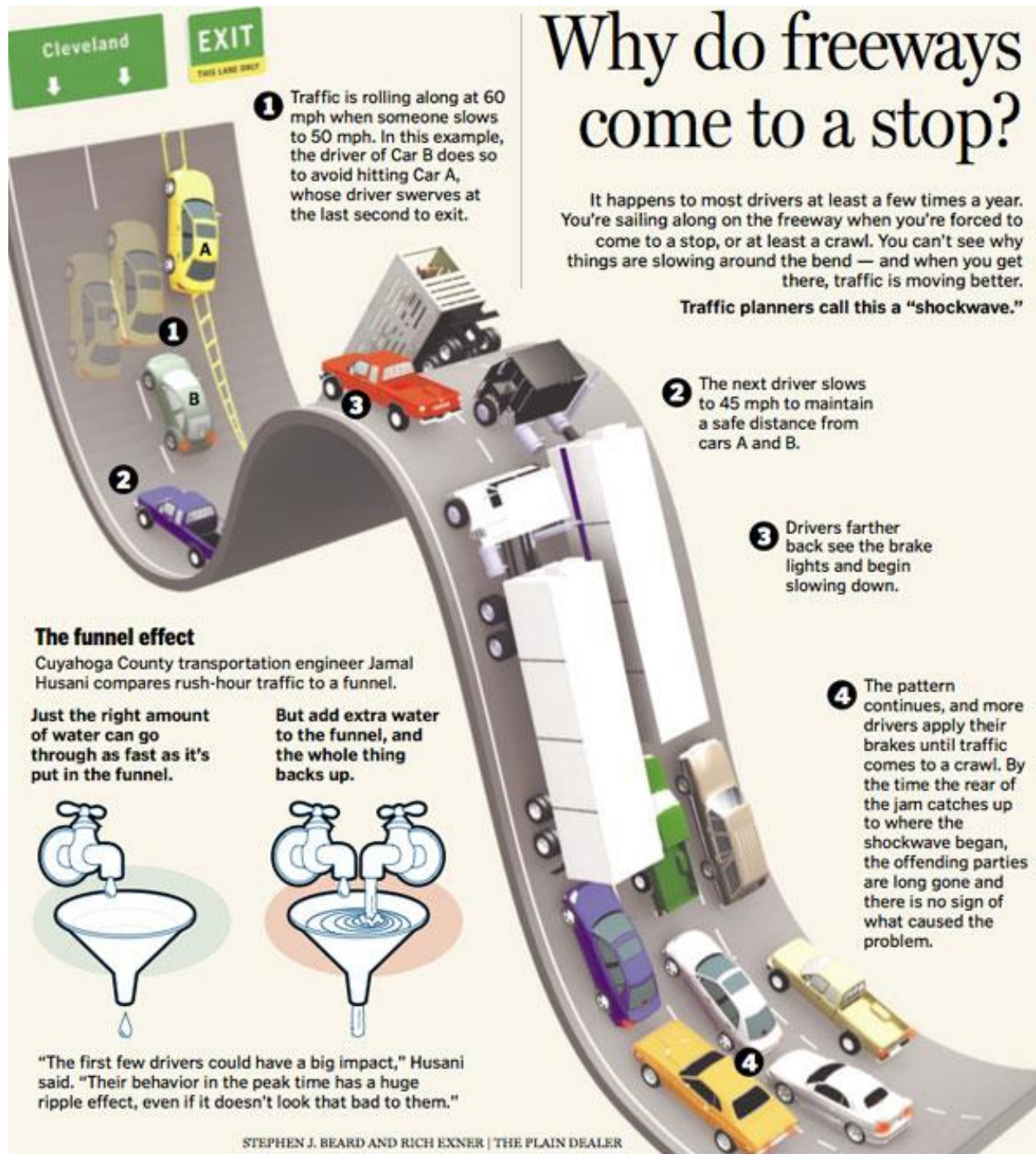


Colorado ranks 33rd in the US for gas tax per gallon. Despite costly maintenance due to mountain terrain and extreme weather—our tax is below average. We pay less than Kansas, the same as Iowa.

Why do freeways come to a stop?

It happens to most drivers at least a few times a year. You're sailing along on the freeway when you're forced to come to a stop, or at least a crawl. You can't see why things are slowing around the bend — and when you get there, traffic is moving better.

Traffic planners call this a "shockwave."



1 Traffic is rolling along at 60 mph when someone slows to 50 mph. In this example, the driver of Car B does so to avoid hitting Car A, whose driver swerves at the last second to exit.

2 The next driver slows to 45 mph to maintain a safe distance from cars A and B.

3 Drivers farther back see the brake lights and begin slowing down.

4 The pattern continues, and more drivers apply their brakes until traffic comes to a crawl. By the time the rear of the jam catches up to where the shockwave began, the offending parties are long gone and there is no sign of what caused the problem.

The funnel effect

Cuyahoga County transportation engineer Jamal Husani compares rush-hour traffic to a funnel.

Just the right amount of water can go through as fast as it's put in the funnel.



But add extra water to the funnel, and the whole thing backs up.



"The first few drivers could have a big impact," Husani said. "Their behavior in the peak time has a huge ripple effect, even if it doesn't look that bad to them."

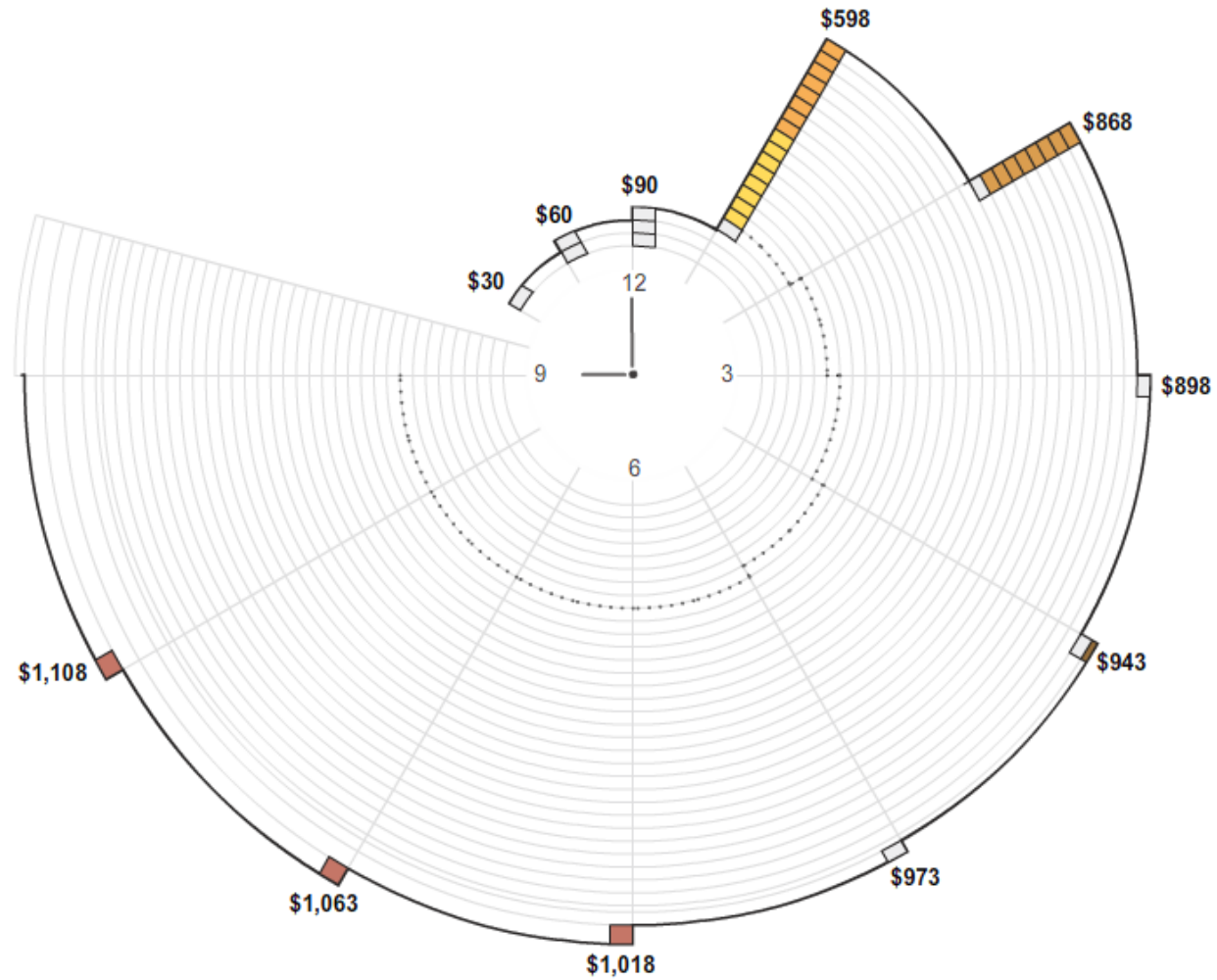
InfoVids

Four day's pay, for one day's work...

Nicholas Phillips explains how one L.I.R.R. engineer, Edward J. Koerber, did it.



0:54 / 1:20



Olympic Records

One Race, Every Medalist Ever

Usain Bolt's 9.63 set an Olympic record in the 100.
So how far ahead of every Olympic medalist is he?

By KEVIN QUEALY and GRAHAM ROBERTS

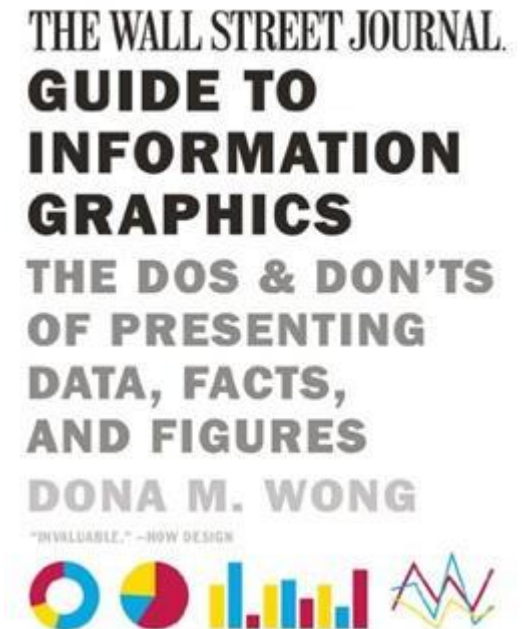
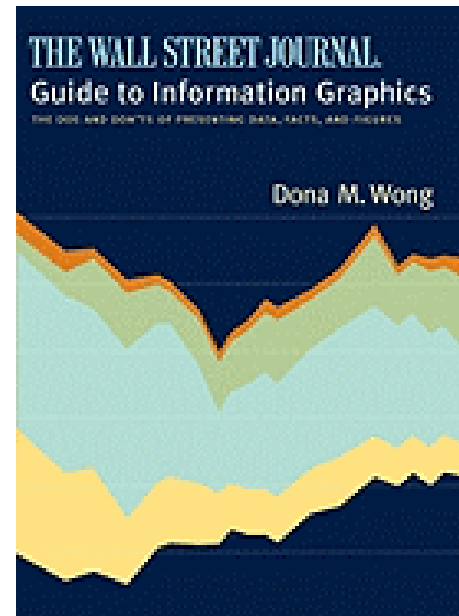


Ethics in Data Viz

Ethics in InfoViz

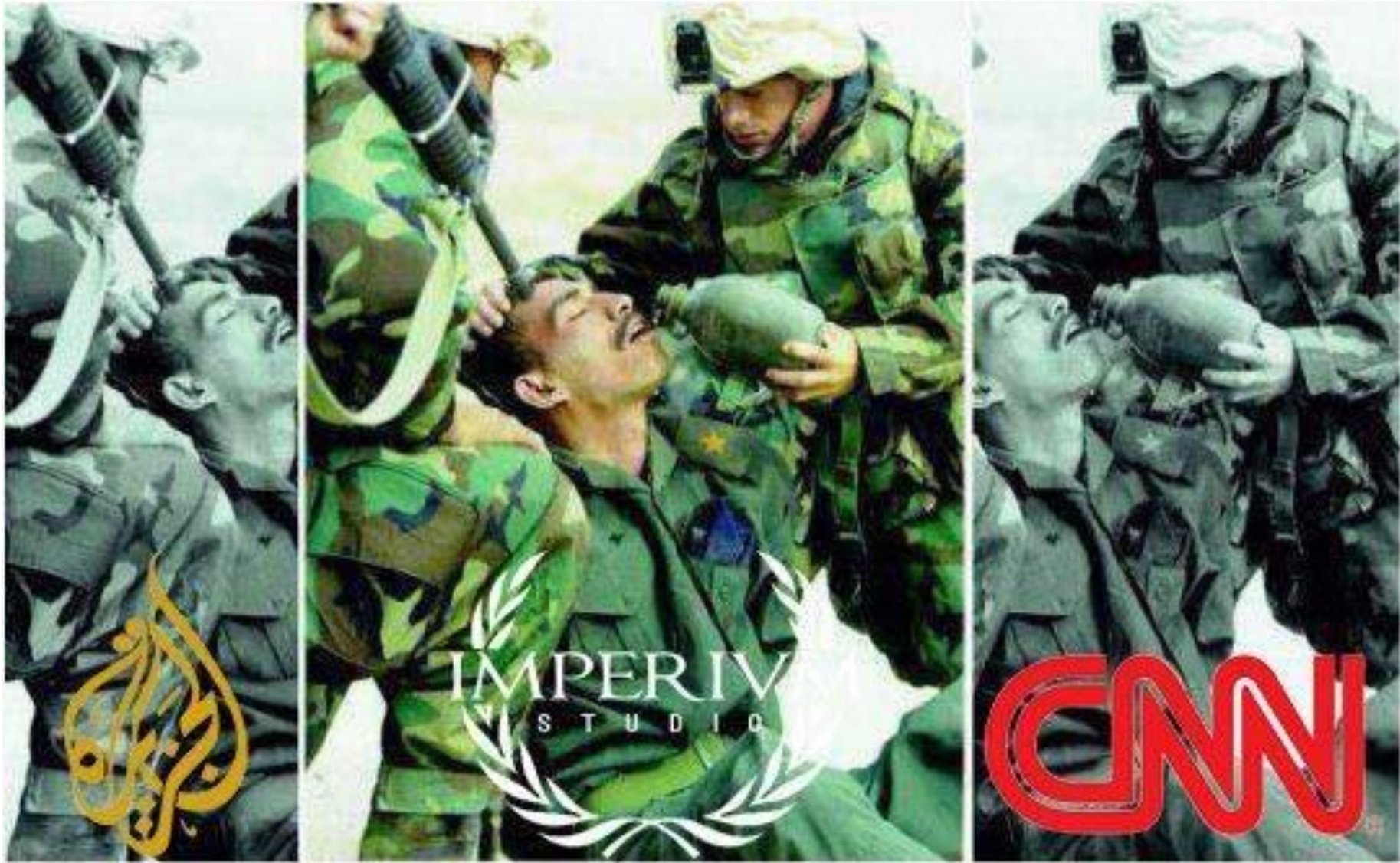
- Graphics are powerful, but they can be misused!
- Colors matter, fonts matter, location matters, size matters (no matter what she says)
- Cold War example.

Great Resource!!! →







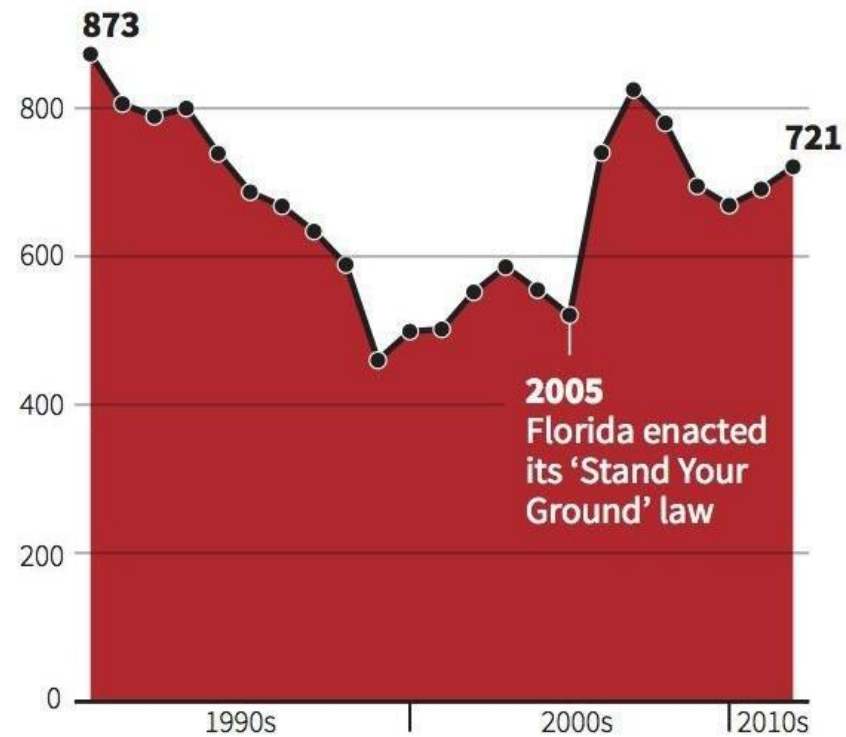


How the Media can manipulate our viewpoint

Don't break expectations

Gun deaths in Florida

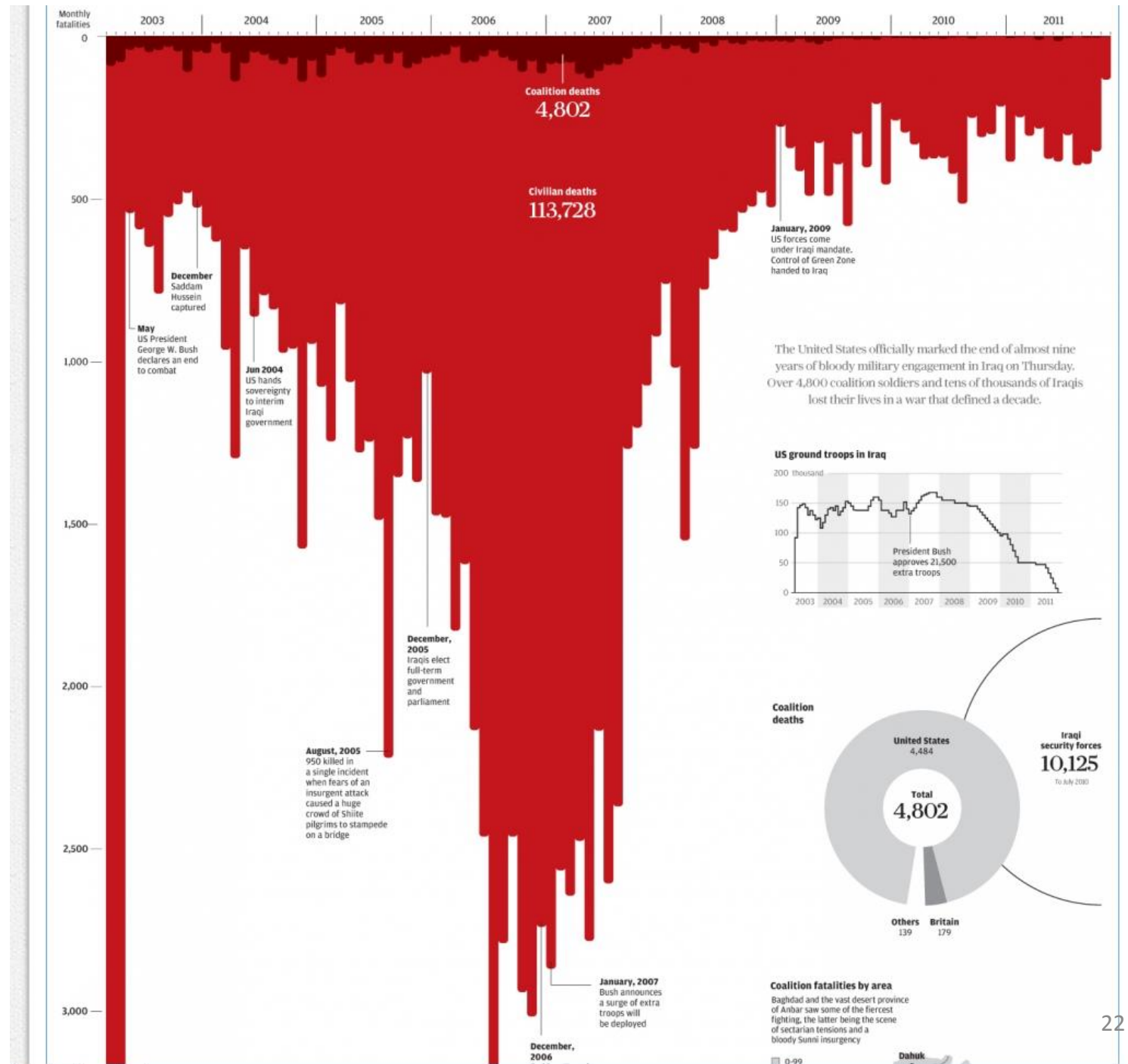
Number of murders committed using firearms



Source: Florida Department of Law Enforcement

[http://www.businessinsider.com/gun-deaths-in-florida-increased-with-stand-your-ground-2014-](http://www.businessinsider.com/gun-deaths-in-florida-increased-with-stand-your-ground-2014-2)

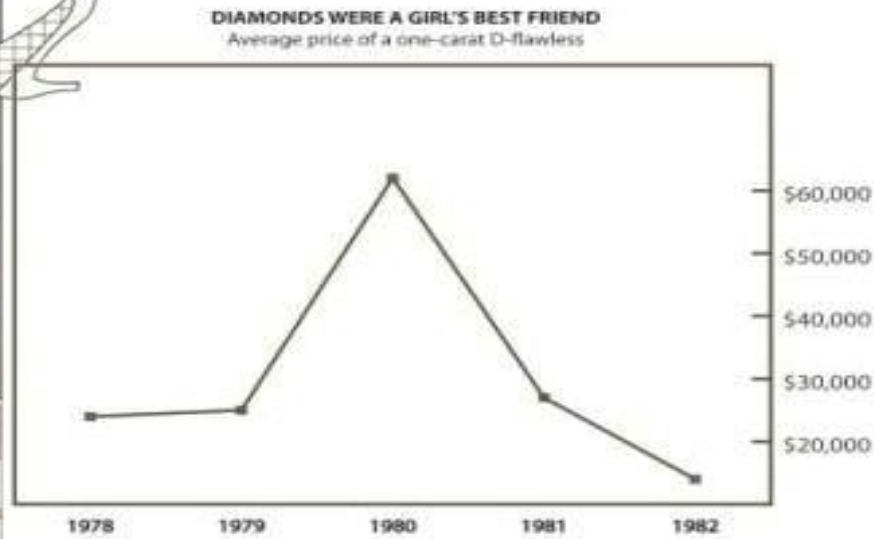
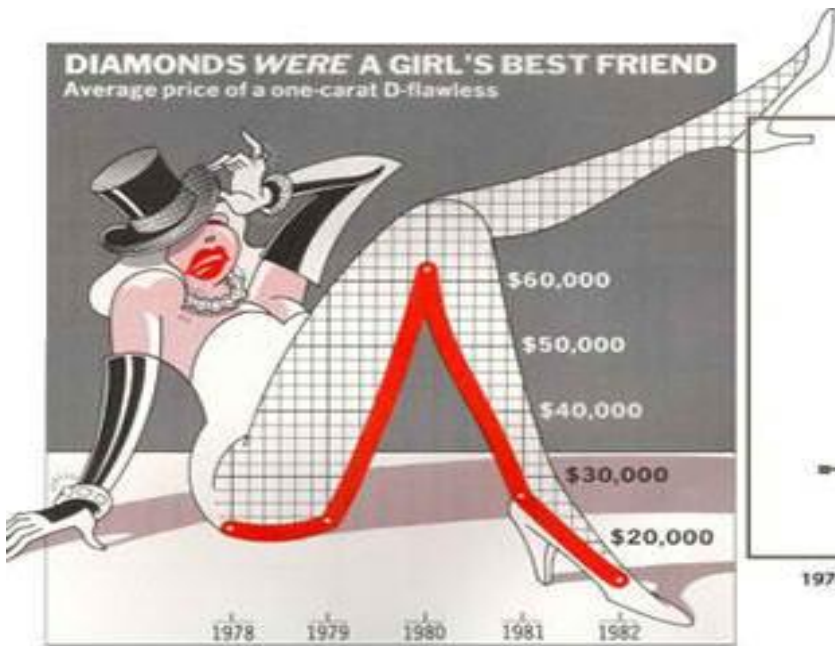
Iraq's Bloody Toll



Avoid These Common Mistakes

Chart junk

- Pros
 - Enhances memory (if done right)
- Cons
 - Distracting
 - Can obscure data



Presentation guidelines

- Avoid
 - 3D when not useful
 - Axis label rotation
 - Clashing colors
 - Using *ALL* the options

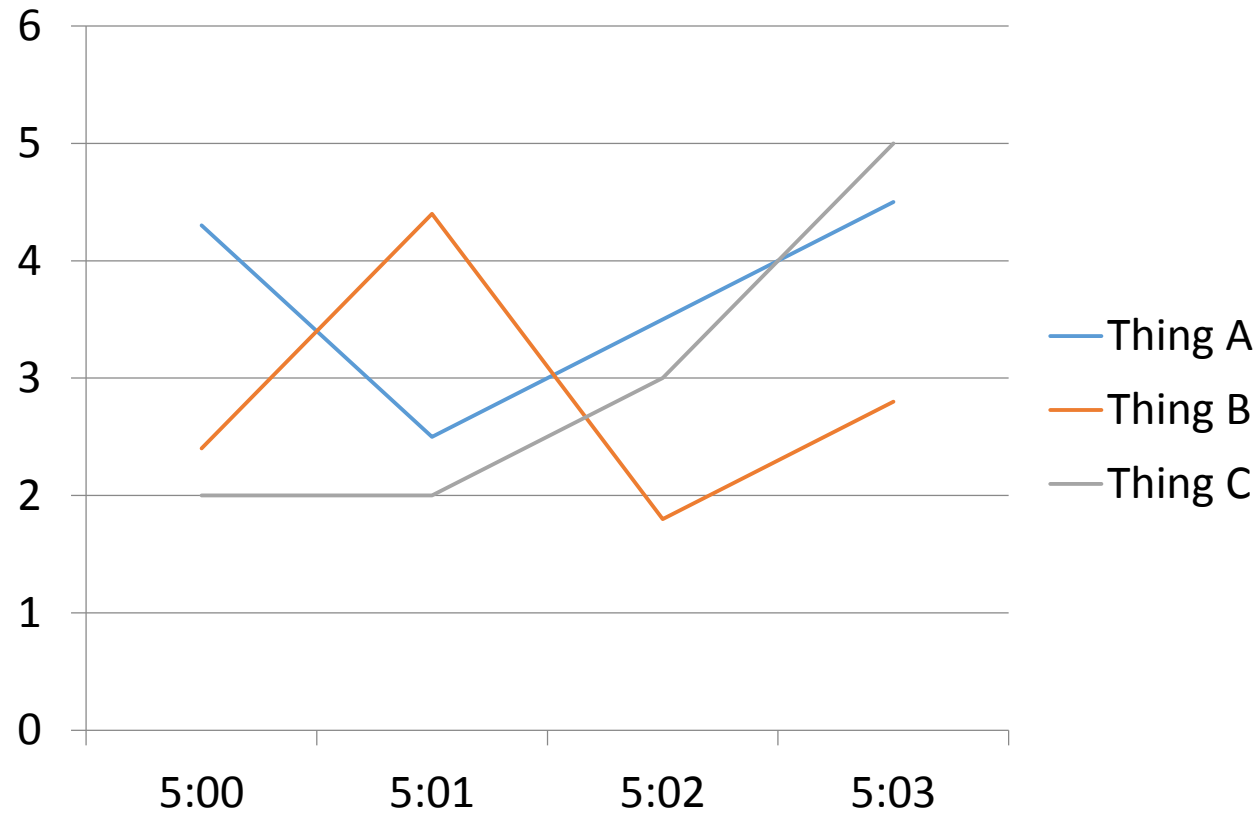
GreenSpace & 3D



Population Density (NY)

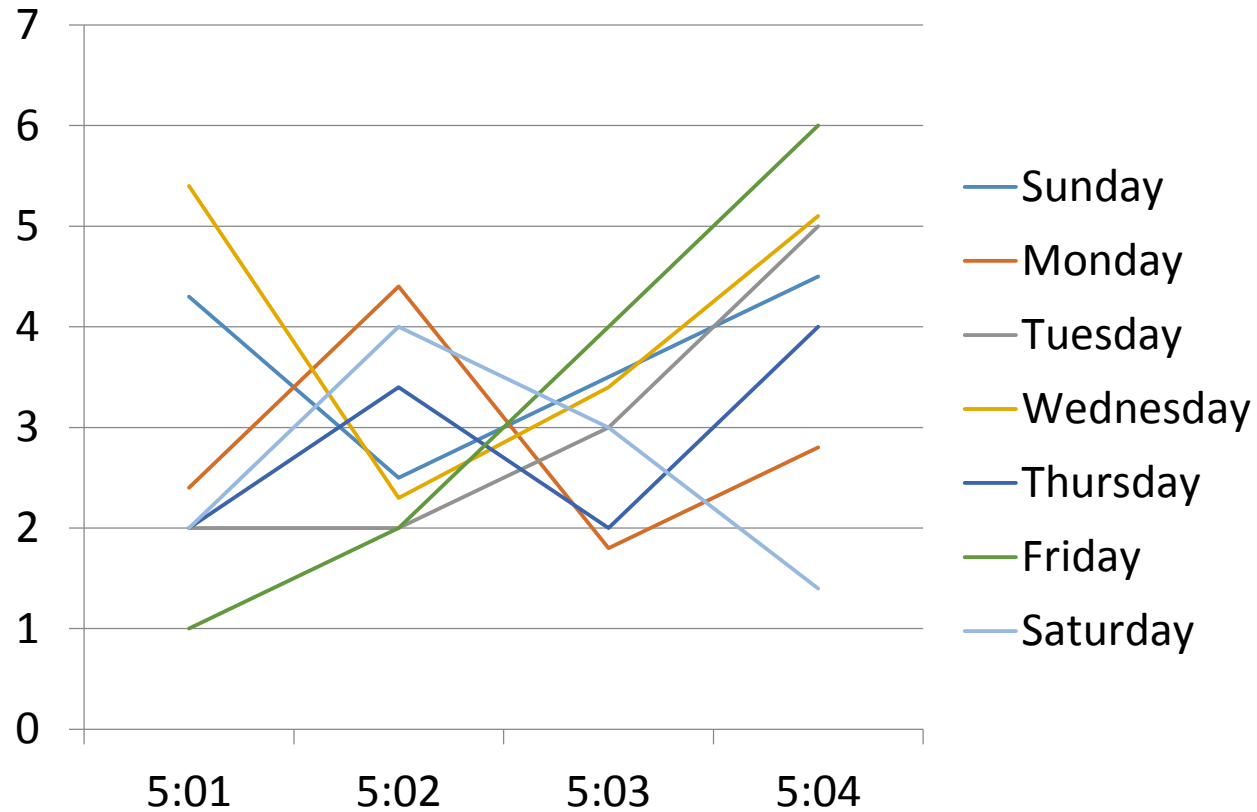


Multiple time series



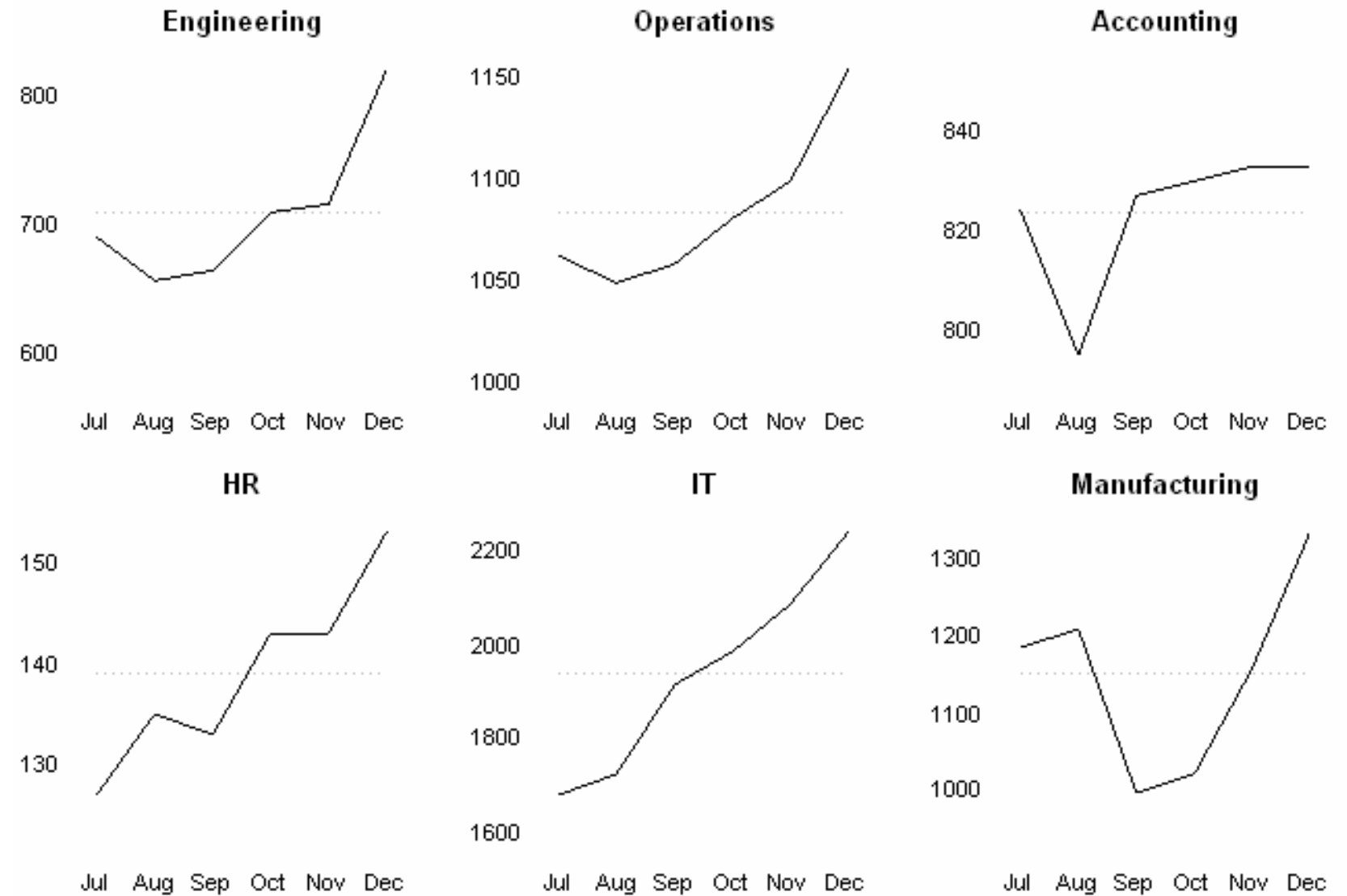
A small number of time series can be plotted on the same chart

Too many time series!



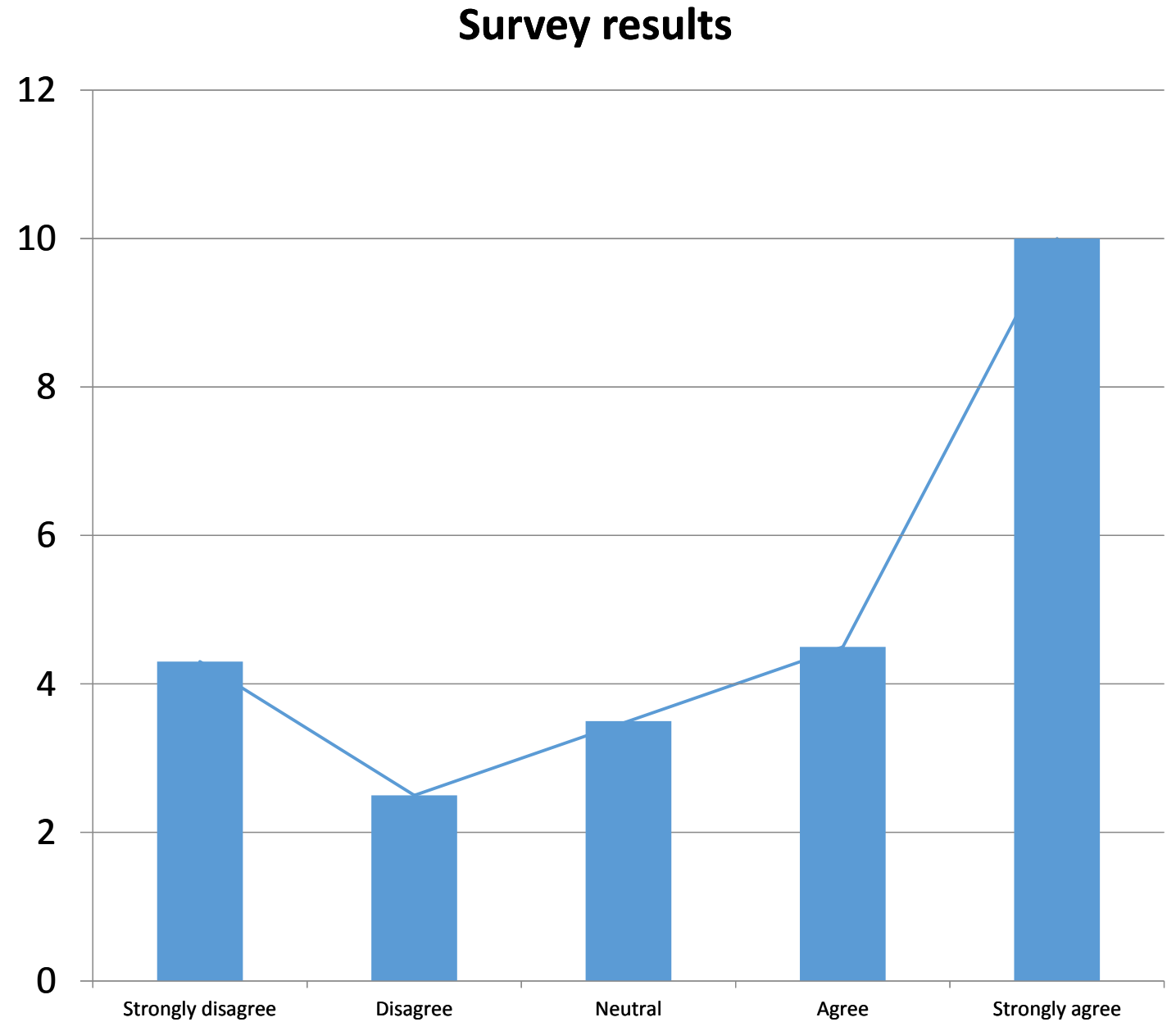
This is not a good solution...

Small multiples



A series of related charts can be more powerful than one dense chart

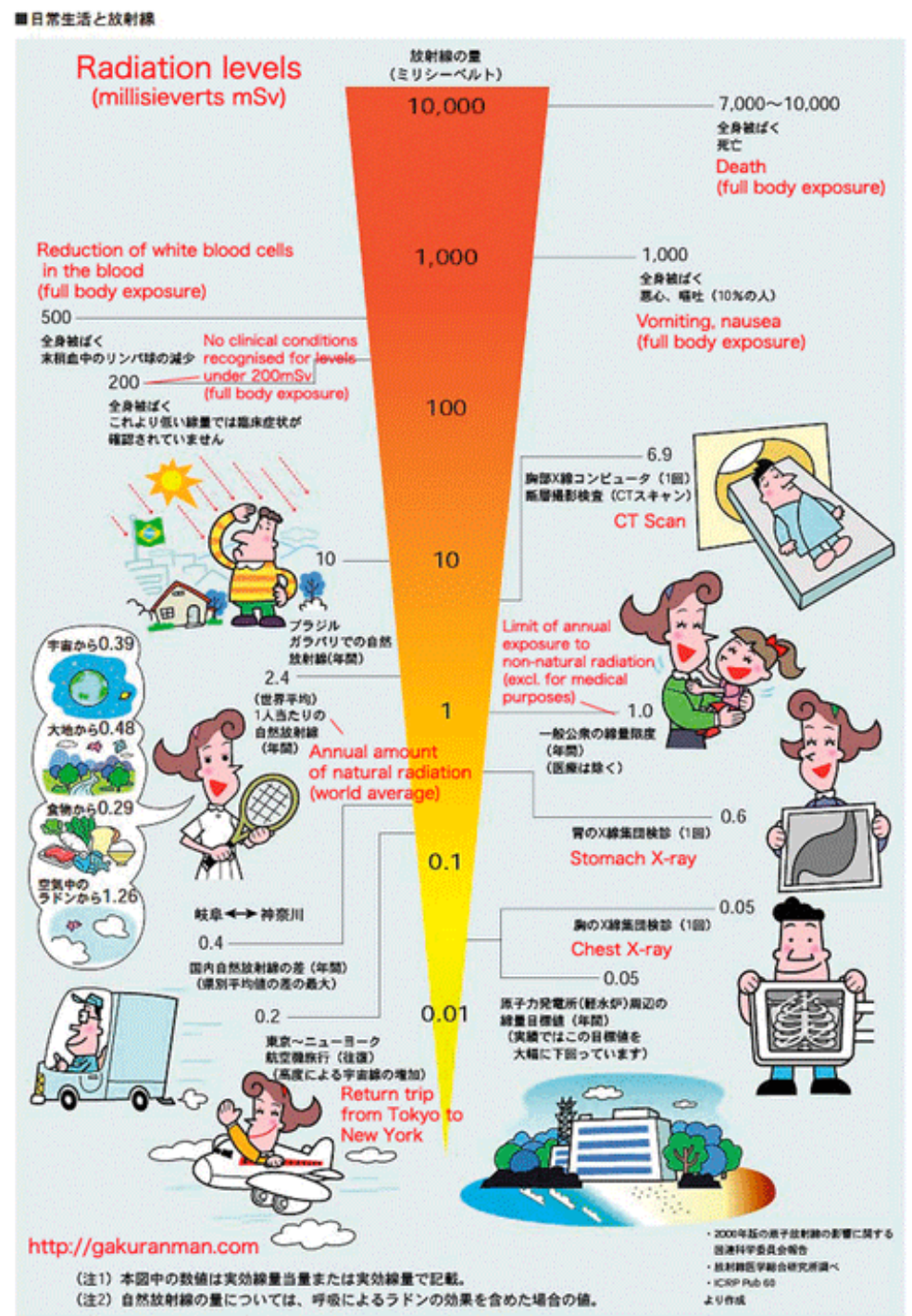
Things not to
do with
categorical data



Don't treat ordinal data as continuous!

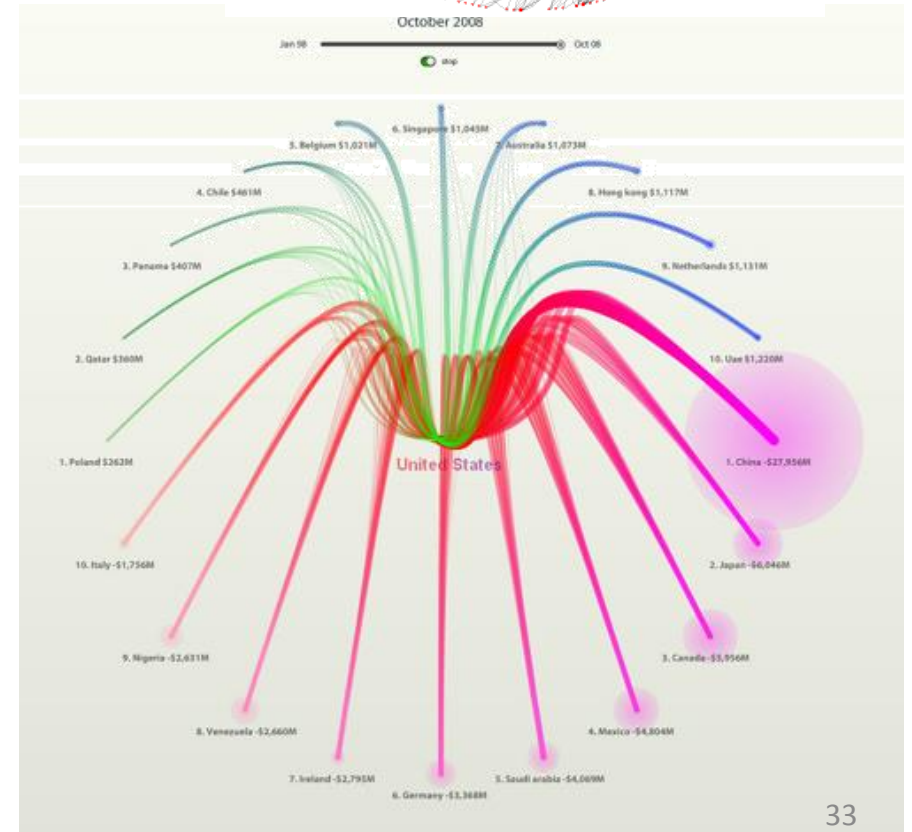
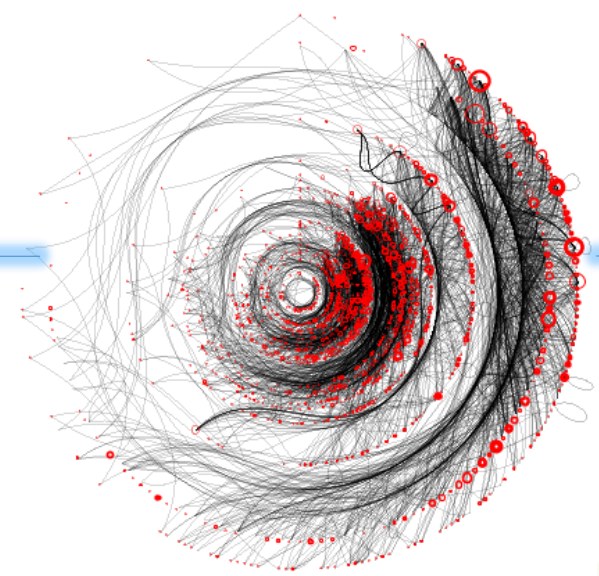
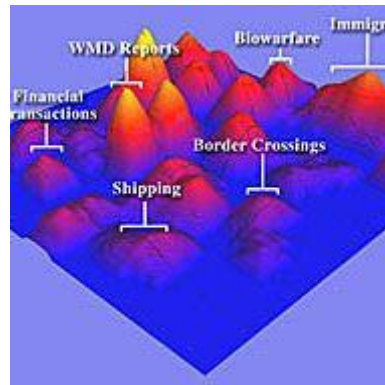
Do Provide context

- Explain unfamiliar data ranges



Visualization & Infosthetics

- Complexity is your enemy!
- Great visualizations are
 - easy to use & understand!
 - Are powerful because they tell a story or explain a difficult concept.
 - Don't require a PhD to use them.



Let's get into some examples!!!!

Integrating Output into Reports to “tell your story”

- Elevator Pitch Brochures



Project Assessment Summary

July 16, 2012

Technical Toolbox

Vehicle Probe Project Suite

The VPP Suite is a Flash-based web site that supports operations, planning, analysis, research & performance measure generation using probe data.

NJ OpenReach

NJ OpenReach is a web-based, multi-modal regional (NY/NJ/CT) tool that integrates incidents, construction, travel times and video.

Google™ Earth

Google™ Earth is a virtual globe and geographical information program that maps the Earth using superimposition of satellite imagery, aerial photography and GIS 3D.

NJ Department of Transportation

This Summary incorporates data, analyses and reports by various NJDOT Units, such as: Data Development, Safety, Mobility and Systems Engineering, Project Management and Systems Planning.



I-80/Squirrelwood Road

Highway Operational Improvement

Interchange #56; MP 56.76 – 57.47

West Paterson, Passaic County

Start Date: June 8, 2007

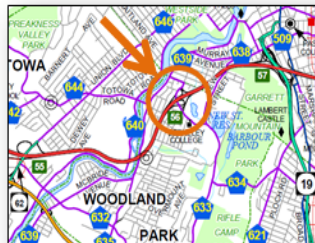
Completion Date: March 3, 2008

Construction Cost: \$1,282,304

Geographic Context

Route I-80 is a vital east-west interstate facility in northern New Jersey. It provides a continuous route between the Delaware Water Gap (at the PA border) and the George Washington Bridge (at the NY border) and is essential in serving the bedroom communities of northeast NJ and New York City, goods movement (local, regional and national) and recreational areas, such as the Pocono Mountains and Delaware Water Gap National Recreation Area.

Squirrelwood Road is classified as a urban minor arterial (County Route 636) and is accessed from I-80 at Interchange 56. This road serves the densely populated municipalities of Paterson and West Paterson in Passaic County.



Project Area Location Map

Project Background

In March, 1990, the I-80/Squirrelwood Road interchange was entered into the NJDOT's Pipeline Process via a Problem Statement generated by Township officials.

According to the Problem Statement, inadequate capacity at the unsignalized intersection of the WB exit ramp of I-80 with Squirrelwood Road causes traffic to backup on the ramp and into the I-80 mainline, creating safety and operational problems. There is also a secondary capacity constraint at the intersection of Squirrelwood Road and Glover Avenue that may contribute to this problem.

In June, 1992, a Needs Assessment report was prepared by the Bureau of Transportation and Corridor Analysis. This report described the existing conditions, general characteristics of the surrounding region, traffic analyses and proposed improvement concepts.

Subsequently, a Tier II Screening Report was completed in February, 2005, that presented accident history, revised traffic analyses and proposed traffic control and geometric improvements.

Project Detail

The project will eliminate the bottleneck occurring at the intersection of Squirrelwood Road and the WB I-80 off ramp, that causes traffic to queue back down the ramp and deceleration lane into the I-80 through lanes, by:

► Signaling the intersection of the WB off-ramp and Squirrelwood Road (to reduce left turn delays and queues)

► Widening the ramp to 2 lanes (for extra storage capacity and to remove the conflict of left turning vehicles blocking right turning vehicles)

► Extending the deceleration lane leading to the WB I-80 off ramp (for extra storage capacity)

There are no right-of-way issues with widening the ramp or extending the deceleration lane on I-80.

Project Element Location Map



1. Signalize the Squirrelwood Rd/I-80 WB off-ramp intersection
2. Widen the off-ramp from 1 to 2 lanes
3. Extend the deceleration lane

Highway Capacity Software Intersection Analysis

Location		Volume	Level of Service		Avg. Queue (ft.)	
Approach	Movement		No Signal	Signal	No Signal	Signal
Squirrelwood Road						
Eastbound	Through	250	A	A	0	38
Westbound	Through	1020	A	B	0	145
Route I-80 Exit 56 Ramp						
Northbound	Left	250	F	C	209	72
	Right	570	D	See note	65	0

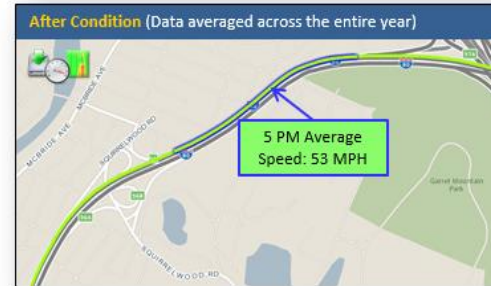
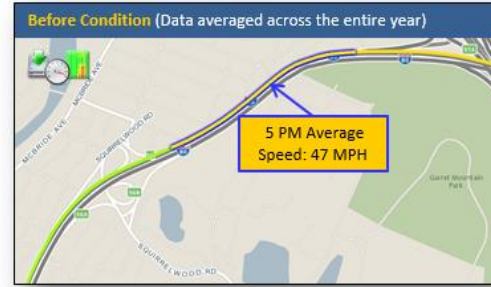
Location		Volume	Level of Service		Avg. Queue (ft.)	
Approach	Movement		No Signal	Signal	No Signal	Signal
Squirrelwood Road						
Eastbound	Through	490	A	B	57	98
Westbound	Through	800	A	B	0	162
Route I-80 Exit 56 Ramp						
Northbound	Left	340	F	C	386	116
	Right	600	F	See note	424*	424*

HCS analysis indicates a substantial LOS and Avg. Queue improvement on the ramp approach of the intersection with only a slight LOS degradation on the Squirrelwood Rd. approaches.

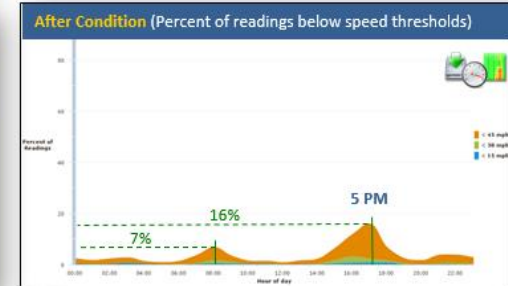
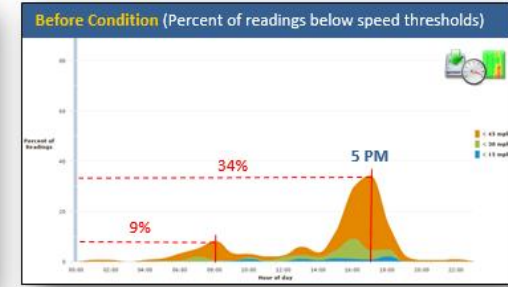
* This queue represents the available storage on the ramp. Observed queue extends as far back as 1,500' on the I-80 WB mainline.

Note: LOS under signalized conditions is not provided for channelized right turn. Results would be similar to un-signalized analysis.

Average Speed Change



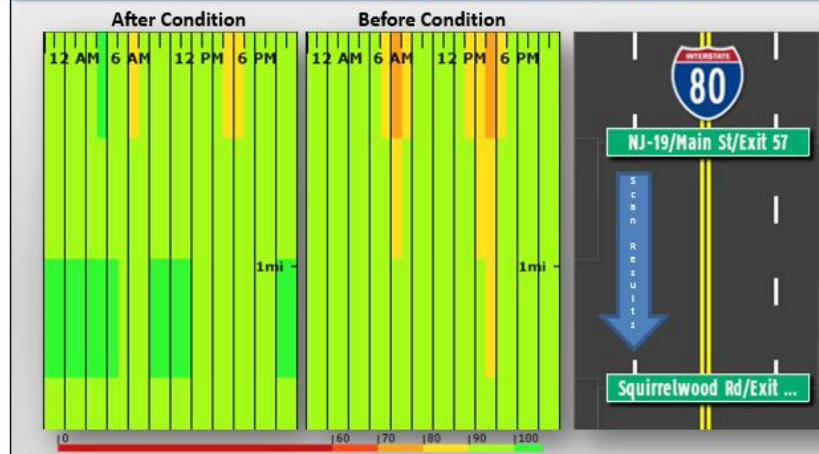
Speed Threshold Change



During the PM Peak Hour (5:00 PM), there has been a **13% increase in speed** along the section of WB I-80 approaching the Squirrelwood Road interchange (blue highlight) since the implementation (and "shake-out" period) of the project. (the AM Peak Hour showed a **4% increase in speed**).

There has been a substantial improvement in speeds that fall below 45 MPH (a threshold indicating the beginning of congested conditions). In the "Before" condition, PM Peak Hour (5:00 PM), 34% of readings were < 45 MPH. In the "After", the percentage of readings dropped to 16%, **an overall decrease of 53%**.

Congestion Comparison



Using a VPP congestion scan, comparisons between the before & after condition show improvement in congestion intensity and duration in the 5 PM WB direction of I-80, prior to the Squirrelwood Rd Interchange.

Reliability

The project was evaluated for changes in **Reliability** using the VPP Suite **Performance Summaries** module:

- **Travel Time** – the time it takes to drive along a stretch of road
- **Buffer Time** – the **extra** time you must add to your average trip to ensure on time arrival
- **Planning Time** – the **total** time you should allow to ensure on time arrival

User Delay Cost

The project was further evaluated for changes in **Delay Cost** (total, per vehicle and per person) and **Hours of Delay** (person-hours, vehicle-hours and per vehicle) using the VPP Suite **User Delay Cost Analysis** module.

Reliability Comparison

Before Condition

	Buffer time (minutes)	Planning time (minutes)	Travel time (minutes)
	5:00 PM - 6:00 PM	5:00 PM - 6:00 PM	5:00 PM - 6:00 PM
Monday	1.12	4.88	3.81
Tuesday	1.76	5.56	3.91
Wednesday	1.17	4.91	3.87
Thursday	1.12	4.88	3.82
Friday	1.47	5.23	3.9
Saturday	1.07	4.62	3.64
Sunday	0.58	4.09	3.55
Weekends	1.78	5.23	3.72
Weekdays	2.69	6.14	4.23
All Days	2.35	5.8	4.06

After Condition

	Buffer time (minutes)	Planning time (minutes)	Travel time (minutes)
	5:00 PM - 6:00 PM	5:00 PM - 6:00 PM	5:00 PM - 6:00 PM
Monday	1.1	4.85	3.72
Tuesday	0.62	4.42	3.7
Wednesday	0.61	4.35	3.66
Thursday	1	4.76	3.71
Friday	0.52	4.28	3.64
Saturday	0.41	3.96	3.43
Sunday	0.57	4.08	3.48
Weekends	1.07	4.53	3.61
Weekdays	2.03	5.48	3.85
All Days	1.57	5.03	3.76

25% ↓ (Weekdays) 11% ↓ (Weekdays) 9% ↓ (Weekdays)

Comparisons of changes in **Travel, Buffer and Planning Times** show favorable reductions in the After condition that can be attributed to the improved flow in the WB lanes of I-80 prior to the Squirrelwood Road off-ramp.

User Delay Cost Comparison

Before Condition

5 PM
Delay cost:
 Total: \$4,903,322.13
 Per vehicle: \$1,151.86
 Per person: \$969.98
Hours of delay:
 Person-hours: 155,492.15 hours
 Vehicle-hours: 130,940.76 hours
 Per vehicle: 30.76 hours
Data validity: 88.08%

After Condition

5 PM
Delay cost:
 Total: \$902,379.14
 Per vehicle: \$192.3
 Per person: \$161.94
Hours of delay:
 Person-hours: 28,719.9 hours
 Vehicle-hours: 24,185.18 hours
 Per vehicle: 5.15 hours
Data validity: 95.89%

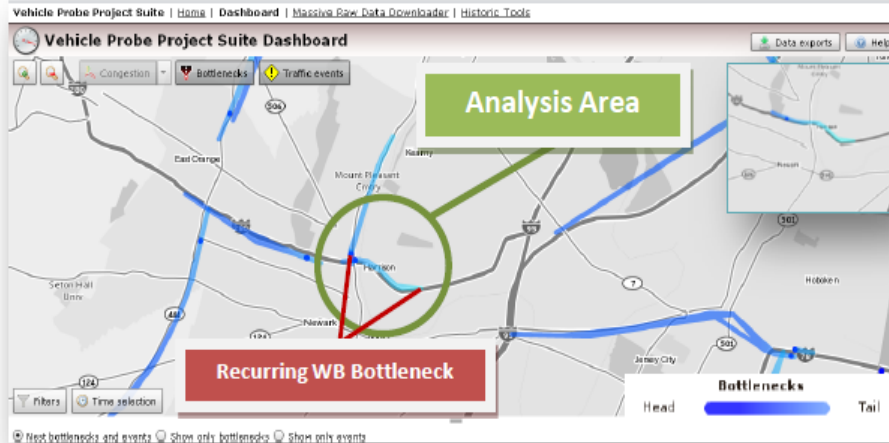
Comparisons of changes in **User Delay Cost** show **substantial** reductions in cost and hours of delay in the After condition, across all categories.

Project Briefing Docs/Slides



I-280 (from MP 14.7 to 15.9) Harrison Town, Hudson County -- VPP Suite* Bottleneck & Congestion Scan Analysis

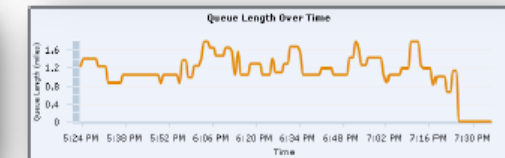
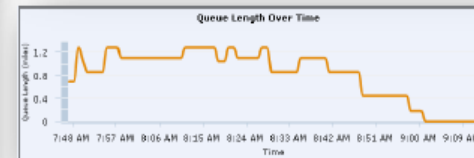
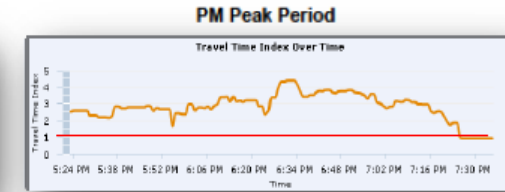
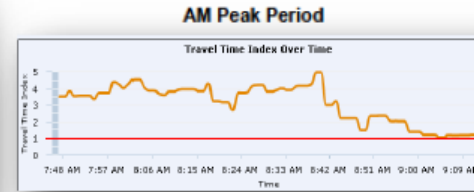
Using the Vehicle Probe Project (VPP) Suite, information was gathered on *bottleneck conditions and associated travel times, queue lengths and congested speeds* for this section of I-280.



Bottleneck conditions on June 21, 2011 typical commuter day, non-holiday @ 8:00 AM (see ▶ Inset above for conditions @ 6:30 PM)



* The Vehicle Probe Project (VPP) Suite is being developed by the University of Maryland for the I-95 Corridor Coalition



Assessment

VPP Bottleneck & Congestion Scan analysis for this segment of WB I-280 can be summarized as follows:

- ▶ **Travel Time Indices** show TTIs of 2-5 for most of the AM peak period, and 2-4 for the PM peak period, indicating that travel within this section is taking 2 to 5 times longer than under free-flow conditions during these periods
- ▶ **Queue Lengths** generally range between 1.0 and 1.2 miles during the same AM & PM peak periods
- ▶ **Congestion Scan** results show severely slow speeds (indicated by the circled dark red areas) between 5th Street and Cleveland Ave., from approximately 8:00-8:20 AM, and 6:15-7:00 PM. Excessively slow speeds (indicated by the red areas) occur between 5th Street and NJ Route 21, from approximately 7:45-8:30 AM and 5:30-7:00 PM
- ▶ A 5-day average congestion scan (June 20th – June 24th, 2011) showed slightly better speed conditions during the WB peak periods. There are no apparent excessive to severe congestion problems in the EB direction

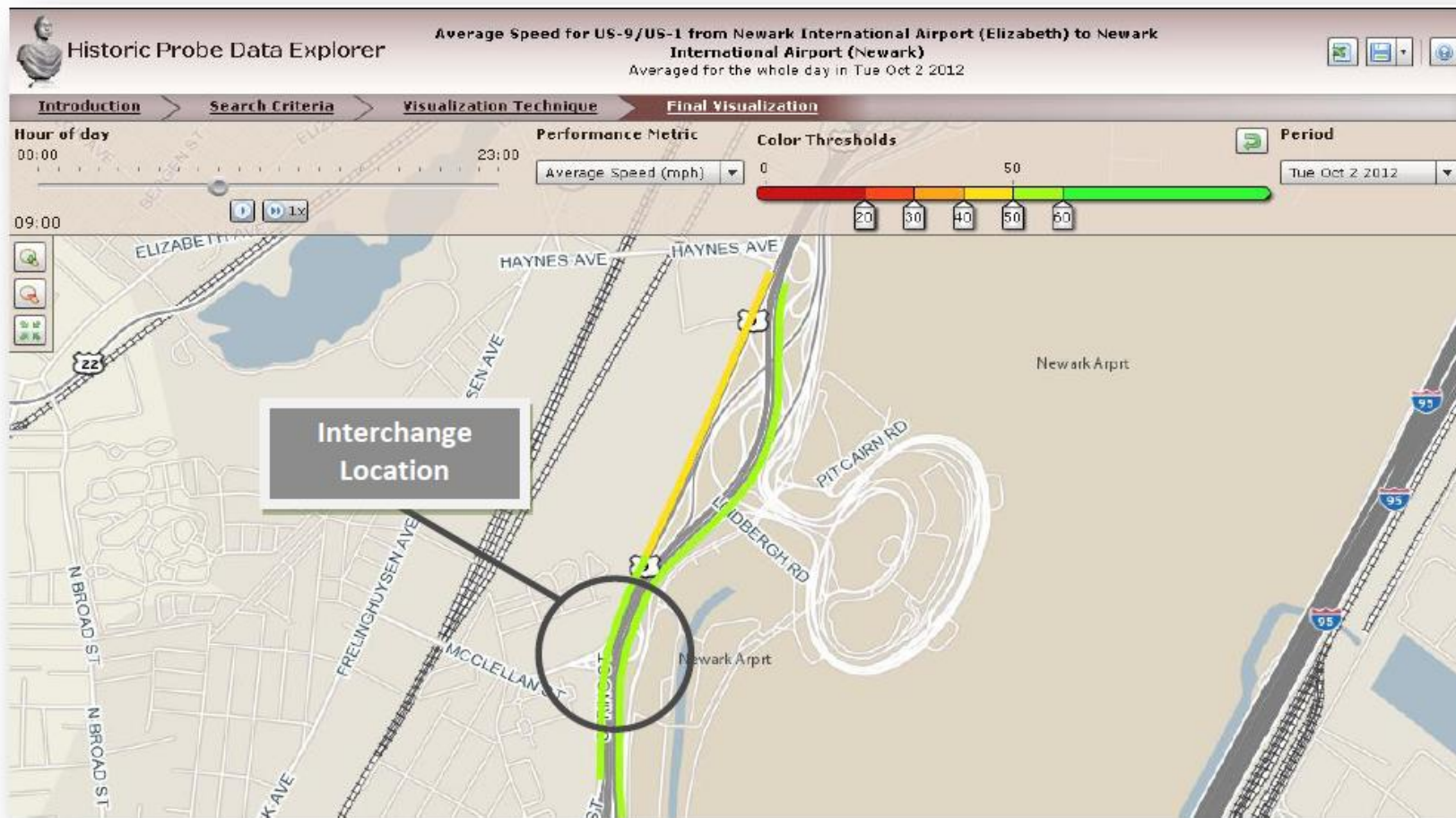
Created on 07.08.11

Technical Analysis Unit, Bureau of Systems Planning



Average Speed for US-9/US-1 from Newark International Airport (Elizabeth) to Newark International Airport (Newark)

Tues Oct 2 2012; AM Peak Period



NJ OpenReach 511 Cameras (Looking SB towards McClellan Street)



NAME	MILES	AM Peak Period (Southbound) (Average Speed per time period)				
		05:00	06:00	07:00	08:00	09:00
Newark International Airport (Newark)	0.098492	48	51	47	48	47
Newark International Airport (Newark)	0.60717	46	50	50	50	49
McClellan St	0.145905	51	53	52	50	51
McClellan St	0.106259	51	52	51	50	50
Newark International Airport (Elizabeth)	0.339471	53	54	54	52	53

NAME	MILES	AM Peak Period (Northbound) (Average Speed per time period)				
		05:00	06:00	07:00	08:00	09:00
Newark International Airport (Elizabeth)	0.092029	51	53	51	50	50
McClellan St	0.376631	54	56	55	54	57
McClellan St	0.170077	55	55	55	54	56
Newark International Airport (Newark)	0.176664	54	54	54	53	56
Newark International Airport (Newark)	0.146899	52	52	53	53	55

Press Releases


- after incident review
- Pre-holiday notices

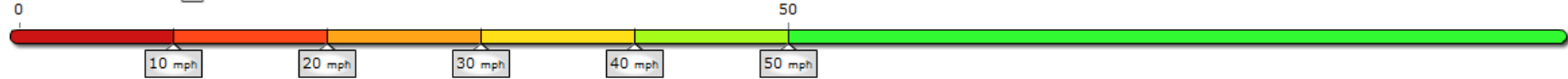
Winter Weather Worries

- Snowmageddon 2011. There's been a request from the Governor's office to produce some examples that depict how bad traffic was during the January 26th, 2011 snow storm compared to normal weekday traffic. What can you show in just a few minutes?

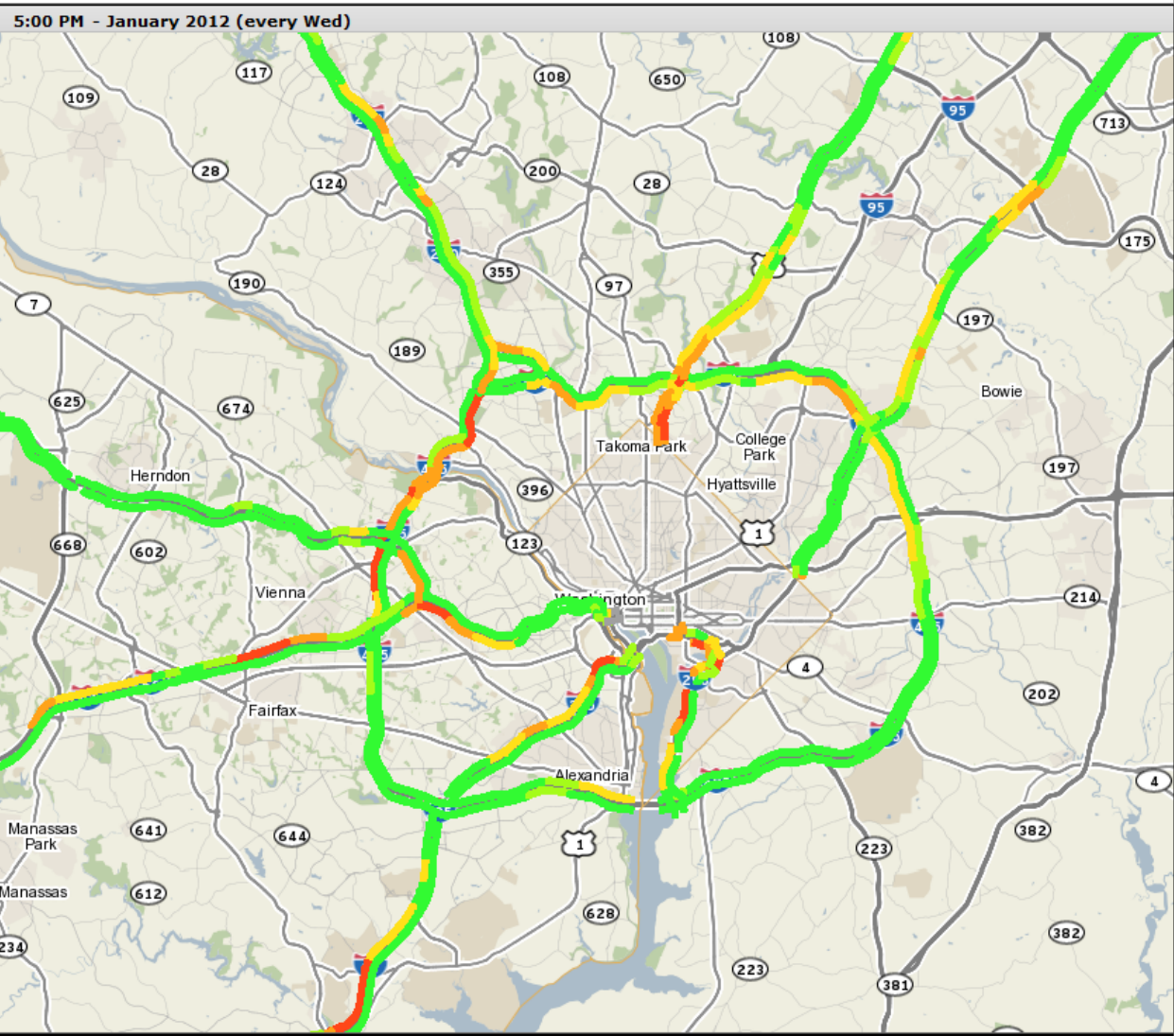
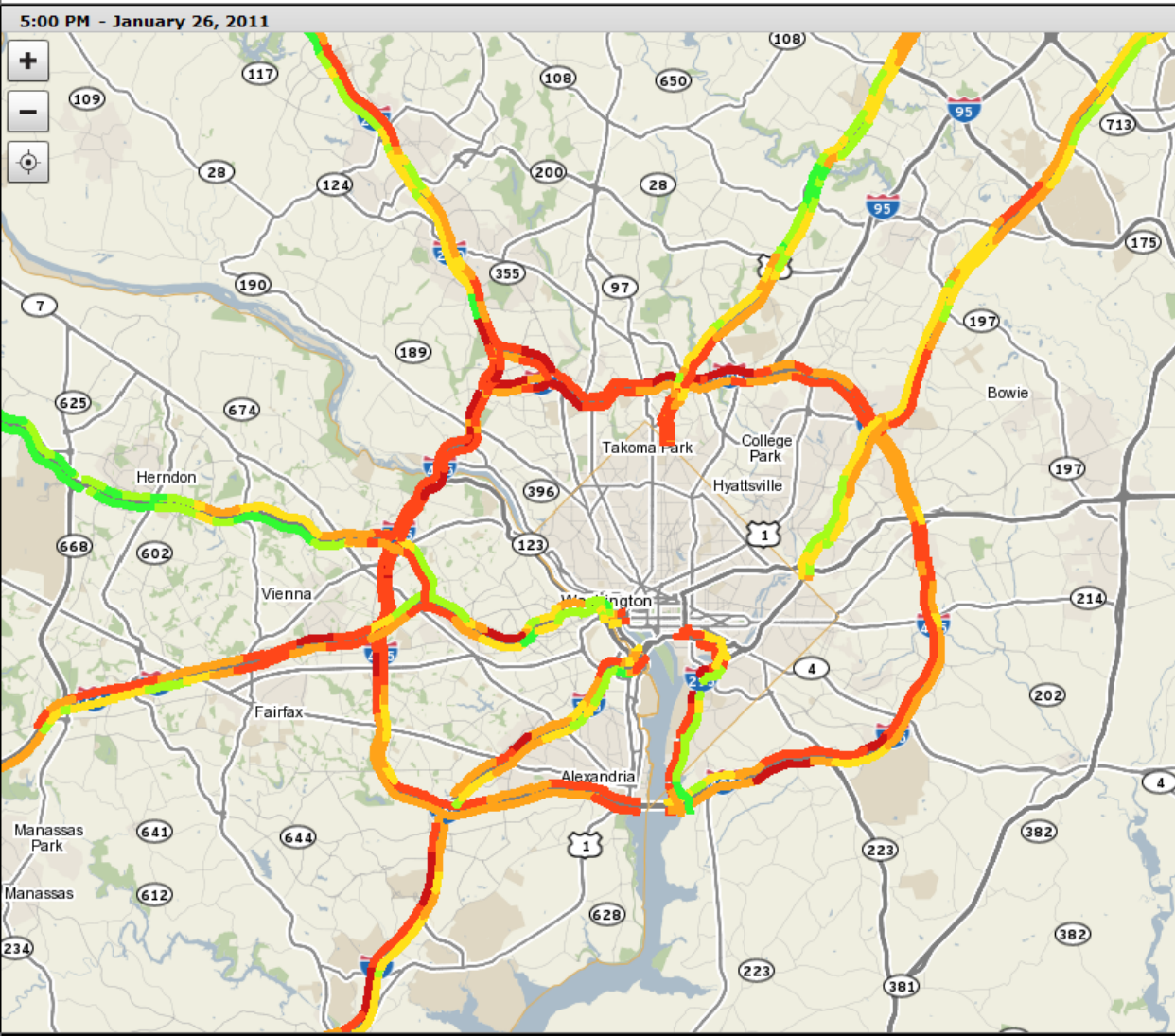
Data Type

Speed ▼

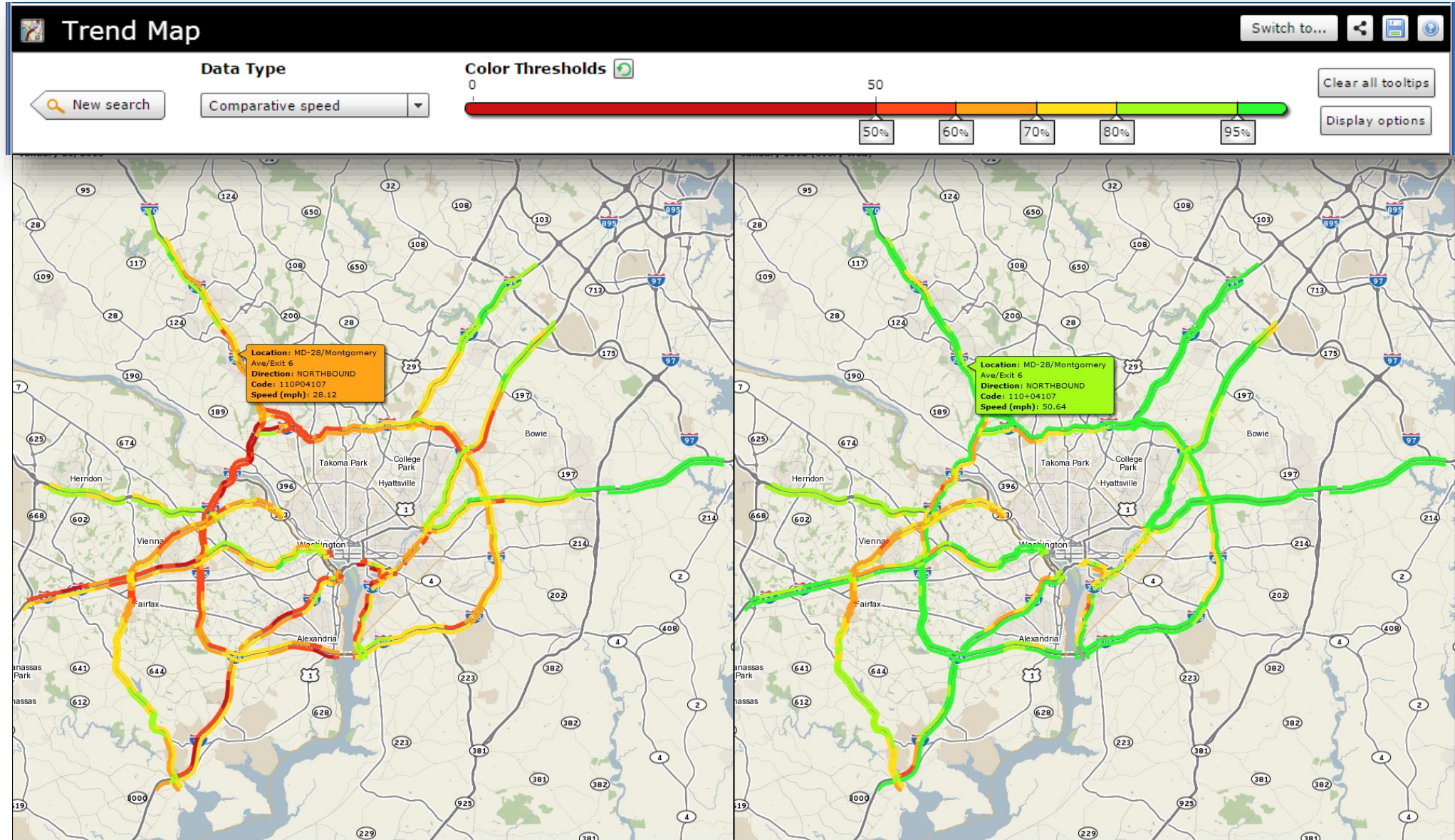
Color Thresholds 



Display options



Press Releases: Pre-Thanksgiving traffic vs. normal

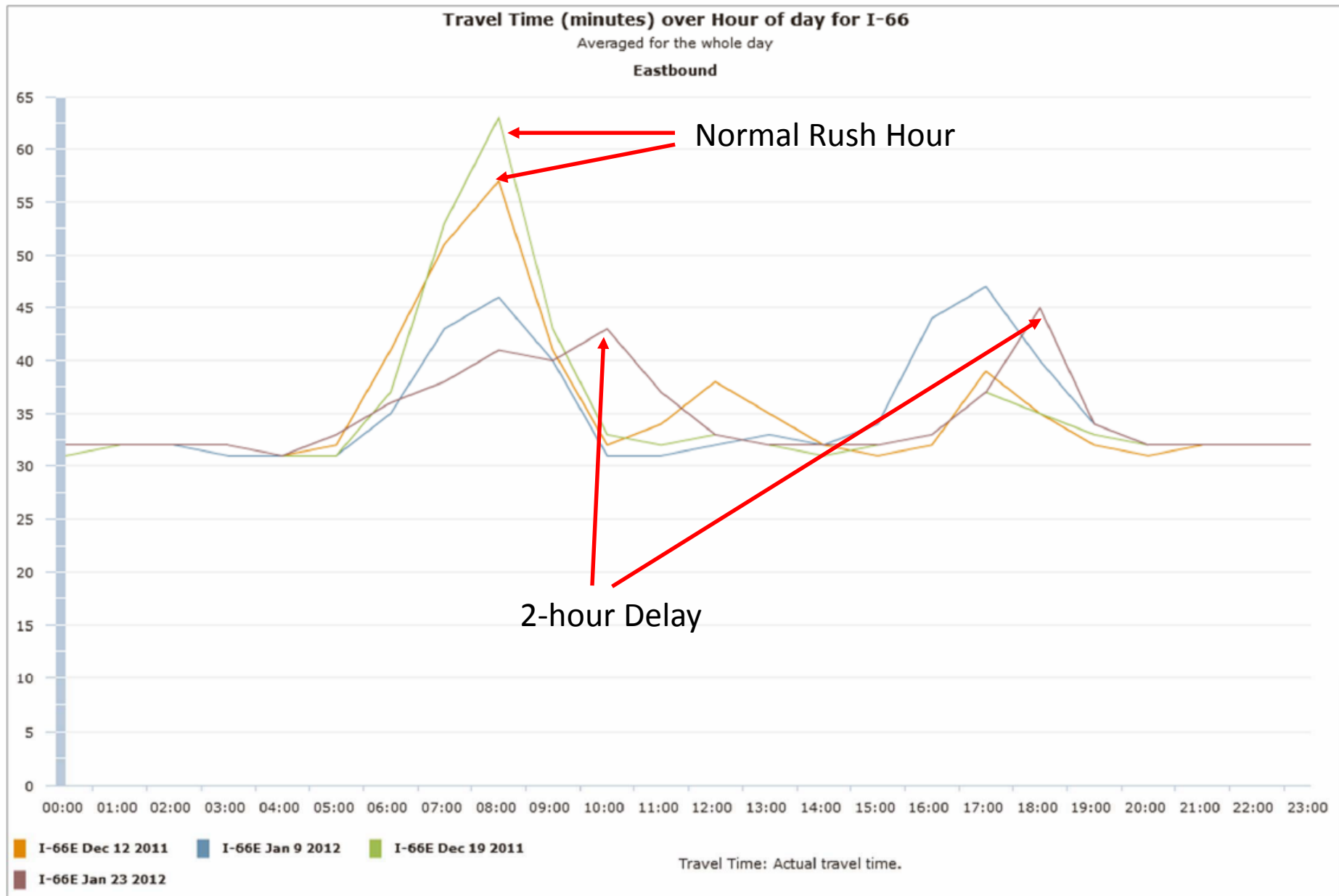


2PM Wed. Before Thanksgiving

2PM Normal Wednesdays in November

2-hour delayed Opening

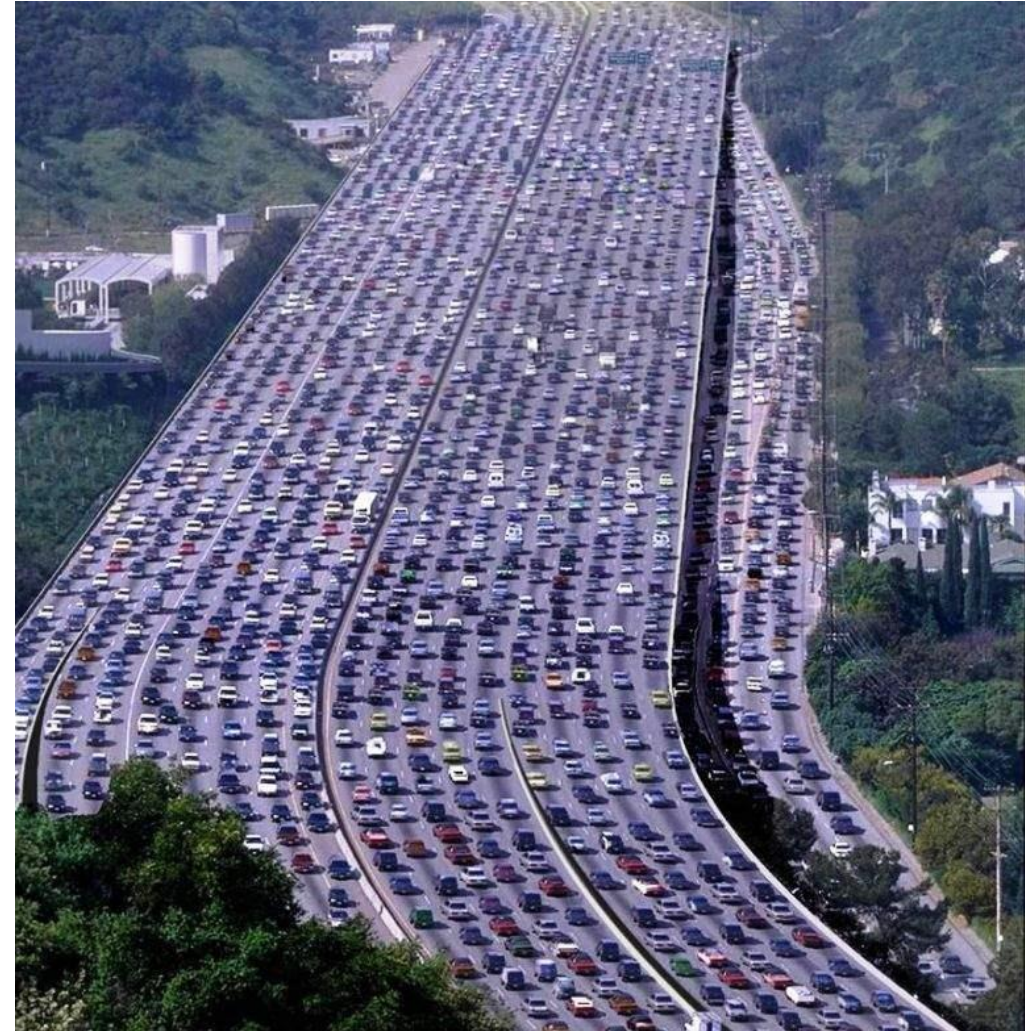
- It's winter. Yesterday there was concern about icy roads in the morning. As a precautionary measure, the federal government (and most of the schools in the area) decided to open 2-hours late. Traffic seemed better than usual in the AM, and there weren't many accidents. Traffic even seemed better in the PM. Several politicians (and the media) are calling to ask for some stats on how the commute compared to normal. What are you going to tell them?



Data Provided by the I-95 Corridor Coalition Vehicle Probe Project Suite / RITIS / MATOC

Defining and explaining congestion

- What's the threshold for Congestion in:








Communicating Road Conditions



MATOC Severe Weather Coordination Workgroup (FY13)

Updated: 09/17/12

TABLE 1: Transportation system status levels		Suggested terminology and <i>PIO templates</i>
<p>Road Condition 5: IMPASSABLE/ DANGEROUS/ TREACHEROUS</p> <p>Some roads could be temporarily impassable. This may be the result of severe weather (low visibility, etc.) or road conditions (drifting, excessive unplowed snow, glare, ice, accidents, stranded vehicles, etc.) Skeletal transit services. Limited above-ground rail service if more than 8" of accumulation. Lane drops in certain sections.</p>		<p>"treacherous", "impassable", "dangerous" <i>Be where you need to be by <time>.</i></p> <p><i>Get where you need to be before the weather gets bad.</i></p> <p><i>Stay where you are.</i></p>
<p>Road Condition 4: ICY/SNOW PACKED</p> <p>The pavement surface is covered with packed snow and/or ice. There may be loose snow on top of the icy or packed snow surface. Transit lifeline services only with significant delays for rail and bus. Refreeze possible. Lane drops in certain sections.</p>		<p>"unsafe", "impassable" "major delays" <i>Be where you need to be by <time>. Avoid or postpone travel for next <hours>.</i></p> <p><i>Stay at the office an extra <hour>, or leave early, to avoid travel during a winter storm.</i></p>
<p>Road Condition 3: SNOW AND/OR SLUSH COVERED</p> <p>The pavement surface has continuous stretches of packed snow with or without loose snow on top of the packed snow or ice. Core bus services only, delays in rail services. Lane drops on certain sections of roadways.</p>		<p>"caution", "passable"</p> <p><i>Avoid being stranded at bus stops</i></p> <p><i>Avoid or postpone travel for next <hours>.</i></p> <p><i>Stay off the roads.</i></p> <p><i>Stay at the office an extra <hour>, or leave early, to avoid travel during a winter storm.</i></p>
<p>Road Condition 2: SNOW / SLUSH COVERED W/ WHEEL TRACKS EXPOSED</p> <p>Accumulations of loose snow or slush up to 2 inches are found on the pavement surface. Packed and bonded snow and ice are not present. Regular transit services with some minor exceptions and detours for buses. Drifting snow.</p>		<p>"passable"</p> <p><i>Avoid discretionary travel. Road crews engaged in clearing activities.</i></p> <p><i>Curtail "elective" travel. Avoid unnecessary travel.</i></p>
<p>Road Condition 1: CLEAR WET/DRY</p> <p>Clear and wet/dry pavement surface is the general condition. There are occasional areas having snow or ice accumulations resulting in drifting, sheltering, cold spots, frozen melt-water, etc. Transit operations per schedules.</p>		<p>"passable"</p>

Resources

ABJ95: Visualization in Transportation Committee

- We are here to help you!
- We are a resource for you!
- We help to advance all forms of visualization through the identification of Research Needs

Standing Committees

Standing committees identify research needs; provide information to the transportation community on research priorities and procedures; review papers for presentation at the TRB Annual Meeting and for publication; encourage the incorporation of appropriate research findings into practice; and develop special programs, conferences, and workshops. Standing committee members may serve up to three consecutive three-year terms and are considered experts in their field. Standing committees are overseen by TRB's [Technical Activities Division](#).

Code Committee Name

A0030T	Special Task Force on Data for Decisions and Performance Measures
ABC30	Performance Measurement
ABC40	Transportation Asset Management
ABJ00	Section - Data and Information Systems
ABJ10	National Transportation Data Requirements and Programs
ABJ15T	Task Force for the Using Census Data for Transportation Applications Conference
ABJ20	Statewide Transportation Data and Information Systems
ABJ25T	Task Force on the Traffic Monitoring Conferences
ABJ30	Urban Transportation Data and Information Systems
ABJ35	Highway Traffic Monitoring
ABJ40	Travel Survey Methods
ABJ45T	Task Force on Understanding New Directions for the National Household Travel Survey
ABJ50	Information Systems and Technology
ABJ60	Geographic Information Science and Applications
ABJ70	Artificial Intelligence and Advanced Computing Applications
ABJ80	Statistical Methods
ABJ90	Freight Transportation Data
ABJ95	Visualization in Transportation
AFB80	Geospatial Data Acquisition Technologies in Design and Construction
ANB20	Safety Data, Analysis and Evaluation



MAP-21 Resources

- www.cattlab.umd.edu/map-21
- www.ritis.org (click “request an account”)



MAP-21

Create a dashboard widget to monitor states', MPOs', and Urbanized Areas' performances against the new MAP-21 ruling.

[FAQ](#)

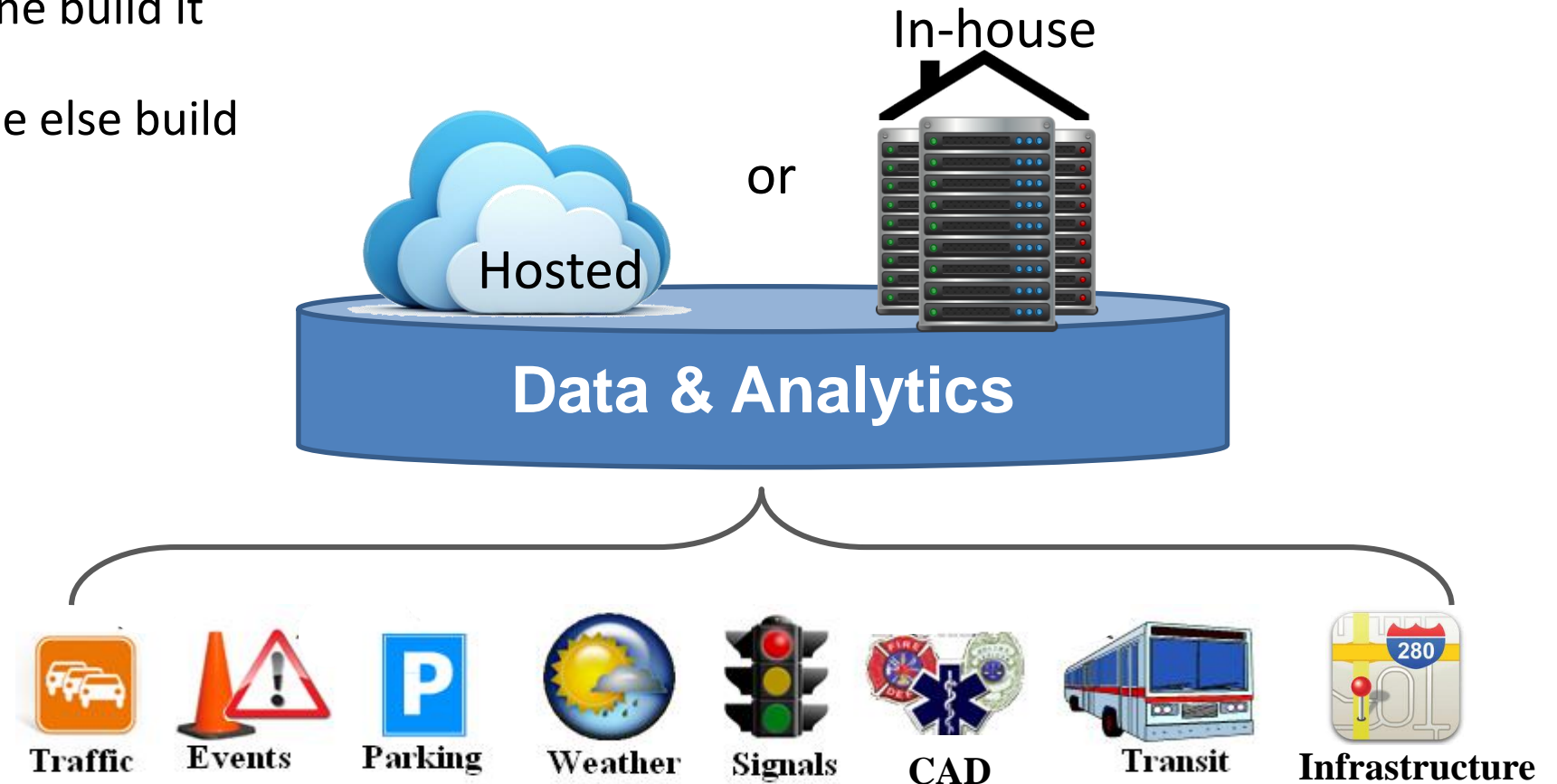
Resources (give me your card or send me an email)

- List of Visualization Research Labs
- 21 Visualization Blogs and Review Websites
- Tools (both free and not-so-free)
- Job Descriptions for InfoGraphics and Visualization Experts
 - For if you want to hire your own experts

give me your card or send me an email
PackML@umd.edu

To Build or to Buy: Implementation Options

1. In house: do it yourself
2. In house: have someone build it and install it
3. Hosted: have someone else build it and operate it.



To build or to buy...

- In-house

- You own it
- You maintain it
- Complete control

- Limited by your staff (and/or your ability to hire)
 - Capabilities
 - Numbers
 - Internal IT policies
- Succession planning
- In-house may not always be cheaper, but it can be if you have the right skills

- COTS

- Quick deployment
- Less worry/work
- Functionalty (may be great, may not be)
- Hosting options

- The product is “what it is”
- Usually little or no control

- Hybrid (customization or custom build)

- Pay someone to build it
- Pay someone to customize a COTS
- More control
- Options for hosting & O&M
- Faster deployment than “start from scratch”
- Can be cheaper over the long run, but usually more expensive than COTS

If you do go it alone

1. Identify your data (where is it, who is “in charge”)
2. Meet with potential users
3. Identify needs (but realize you may not get the enthusiastic feedback from day 1)
4. Let your needs dictate technology, not the other way around.
5. Focus more on usability, the user interface, and the questions/problems you want to address.

Outsourced recommendations

- Leverage what's already been done, and build off of it if necessary. Starting from scratch kills budgets and delays progress.
- Seek someone with visualization skills.
- Avoid black box approaches, if possible.
- Don't overspend on hot-swappable redundancy if it isn't needed.

Tips to avoid failure...

- Contractors
 - Check references
 - Demand live demonstrations as opposed to slide decks
- Overly Detailed Requirements will kill you
- Avoid specifying technologies of any sort
- Iterate, iterate, iterate
- Be open, honest, and communicative with your contractors.

To receive slide deck examples of **Transportation Visual Analytics** for Safety, Operations, and Congestion, along with other visualization resources please email:

Michael L. Pack

CATT Laboratory
301.405.0722

PackML@umd.edu

