Visualizing Big Data

For Informed Decision Making and Communication

Performance Measures

Planning

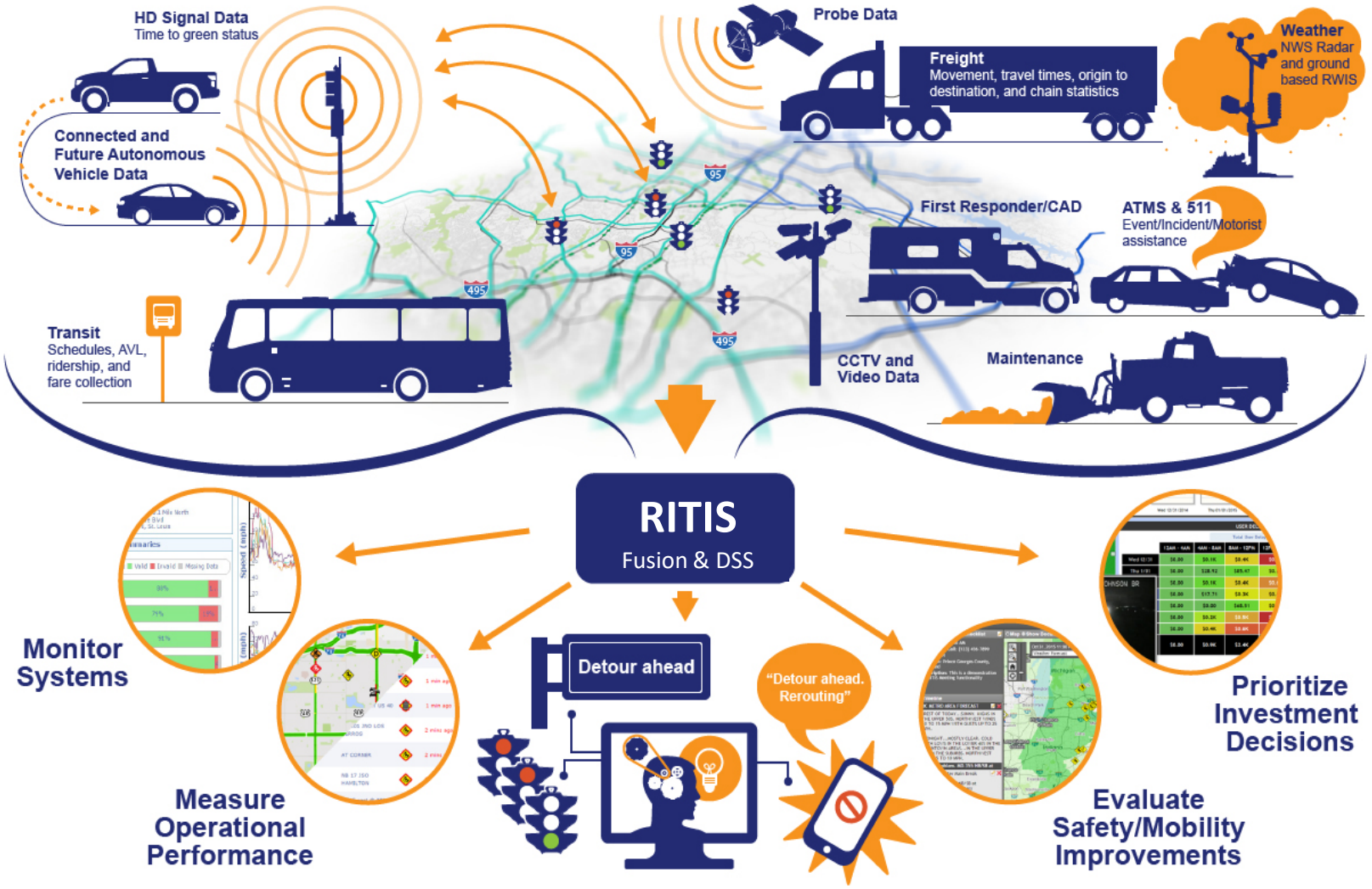
Operations

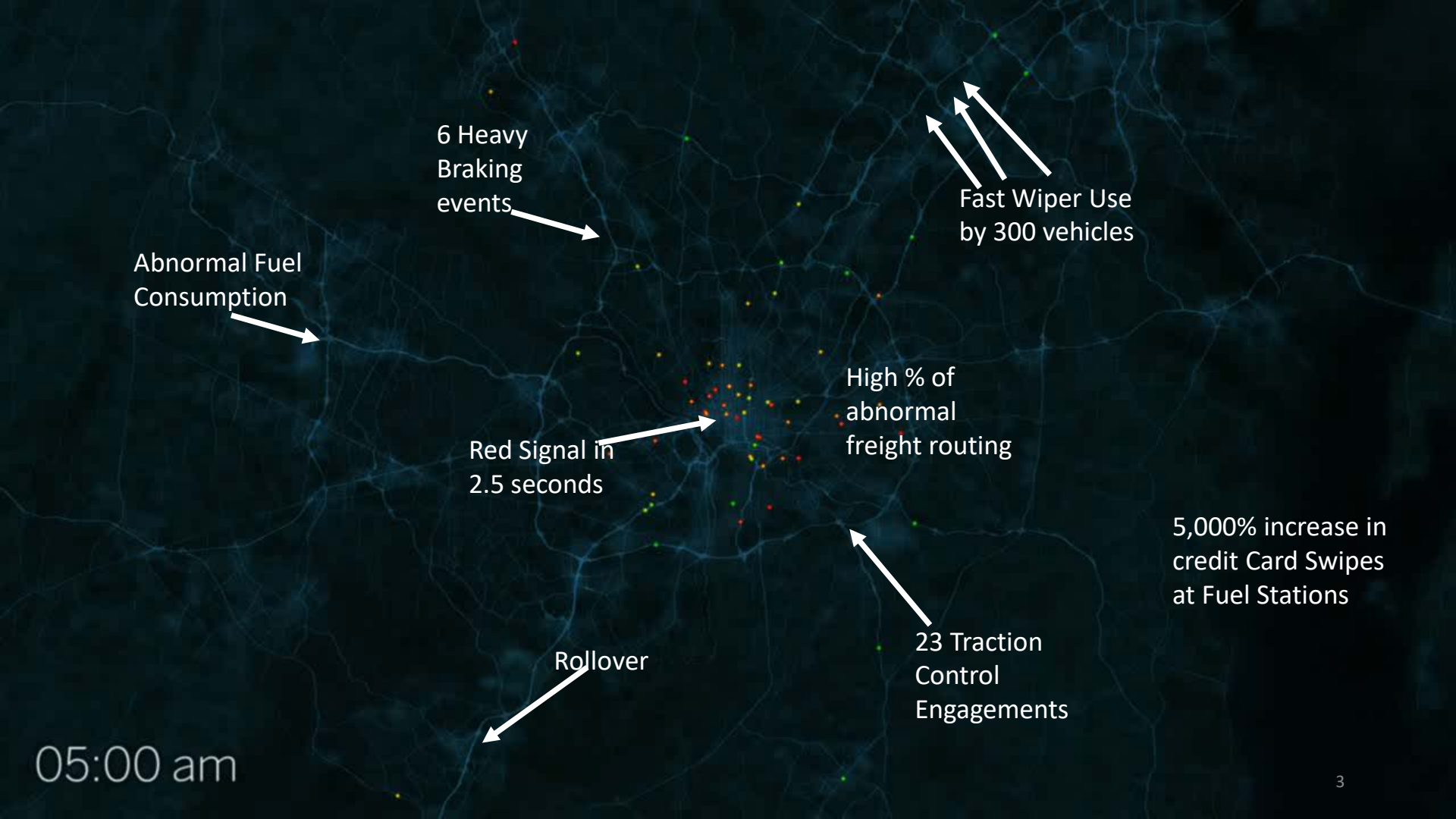
Communications

CATT LABORATORY

UNIVERSITY OF MARYLAND 18 56

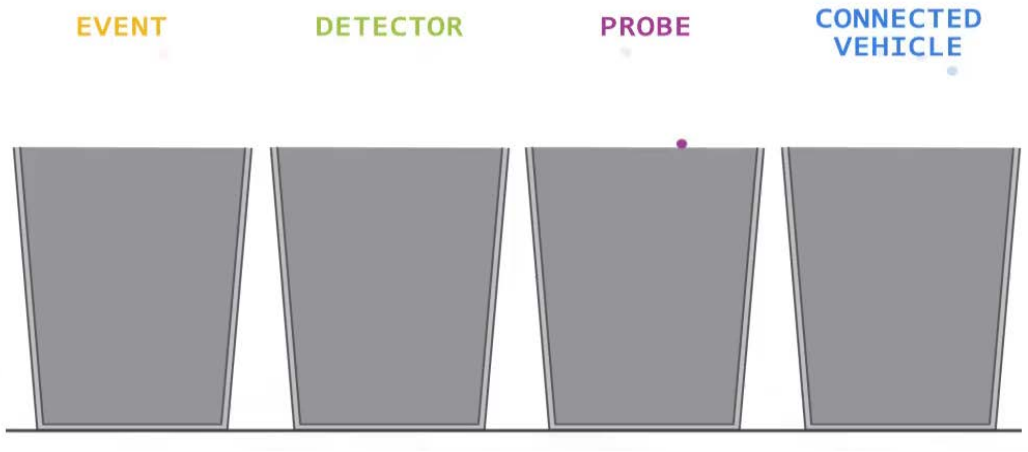
Enabling Decision Making & Effective Communication


HD Signal Data
Time to green status
Probe Data
Weather
NWS Radar and ground based RWIS
Freight
Movement, travel times, origin to destination, and chain statistics
Connected and Future Autonomous Vehicle Data
First Responder/CAD
ATMS & 511
Event/Incident/Motorist assistance
Transit
Schedules, AVL, ridership, and fare collection
CCTV and Video Data
Maintenance
RITIS
Fusion & DSS
Monitor Systems
Detour ahead
"Detour ahead. Rerouting"
Prioritize Investment Decisions
Measure Operational Performance
Evaluate Safety/Mobility Improvements


6 Heavy Braking events
Fast Wiper Use by 300 vehicles
Abnormal Fuel Consumption
High % of abnormal freight routing
Red Signal in 2.5 seconds
5,000% increase in credit Card Swipes at Fuel Stations
23 Traction Control Engagements
Rollover
05:00 am

How Much Transportation Data in RITIS?

- RITIS System Today:
  - Traffic accidents: 160,000 records per day: 0.002 Gb/day
  - Traffic detectors: 48,000,000 records per day: 5 Gb/day
  - Probe vehicle data: 7,200,000,000 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 7 months)



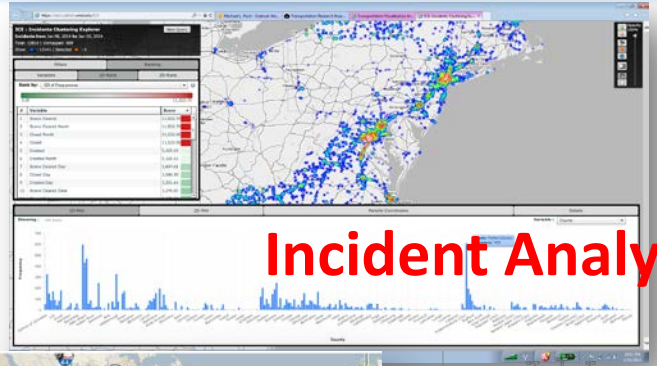
That's a lot of data. Now what? Why Visualization?

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

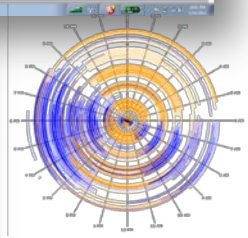
Visualization is so effective and useful because it utilizes one of the channels to our brain that have the highest bandwidths: our eyes.

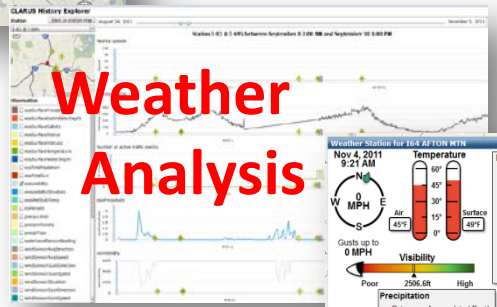
- Robert Kosara

Visual Analytics, Prediction, and Self-creating Dashboards



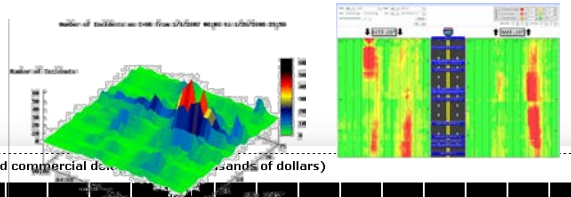
Incident Analysis

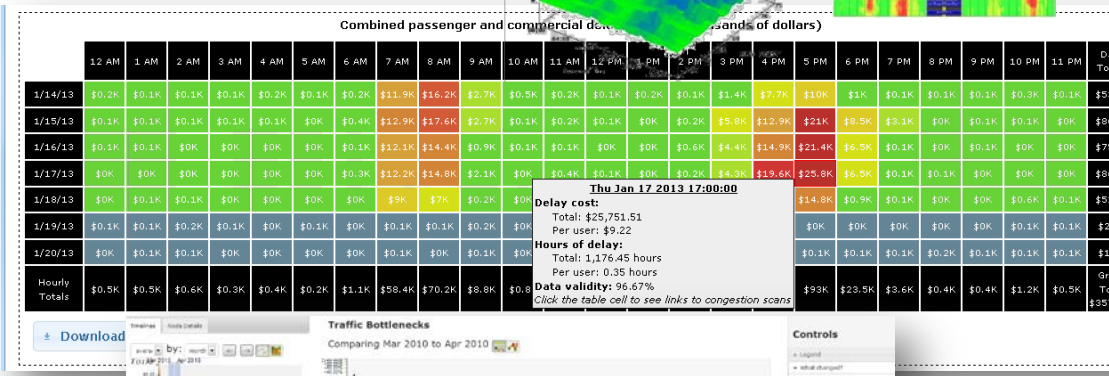


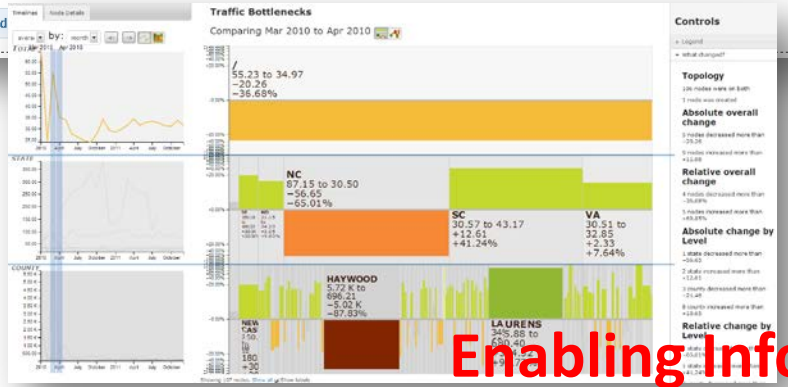


Weather Analysis

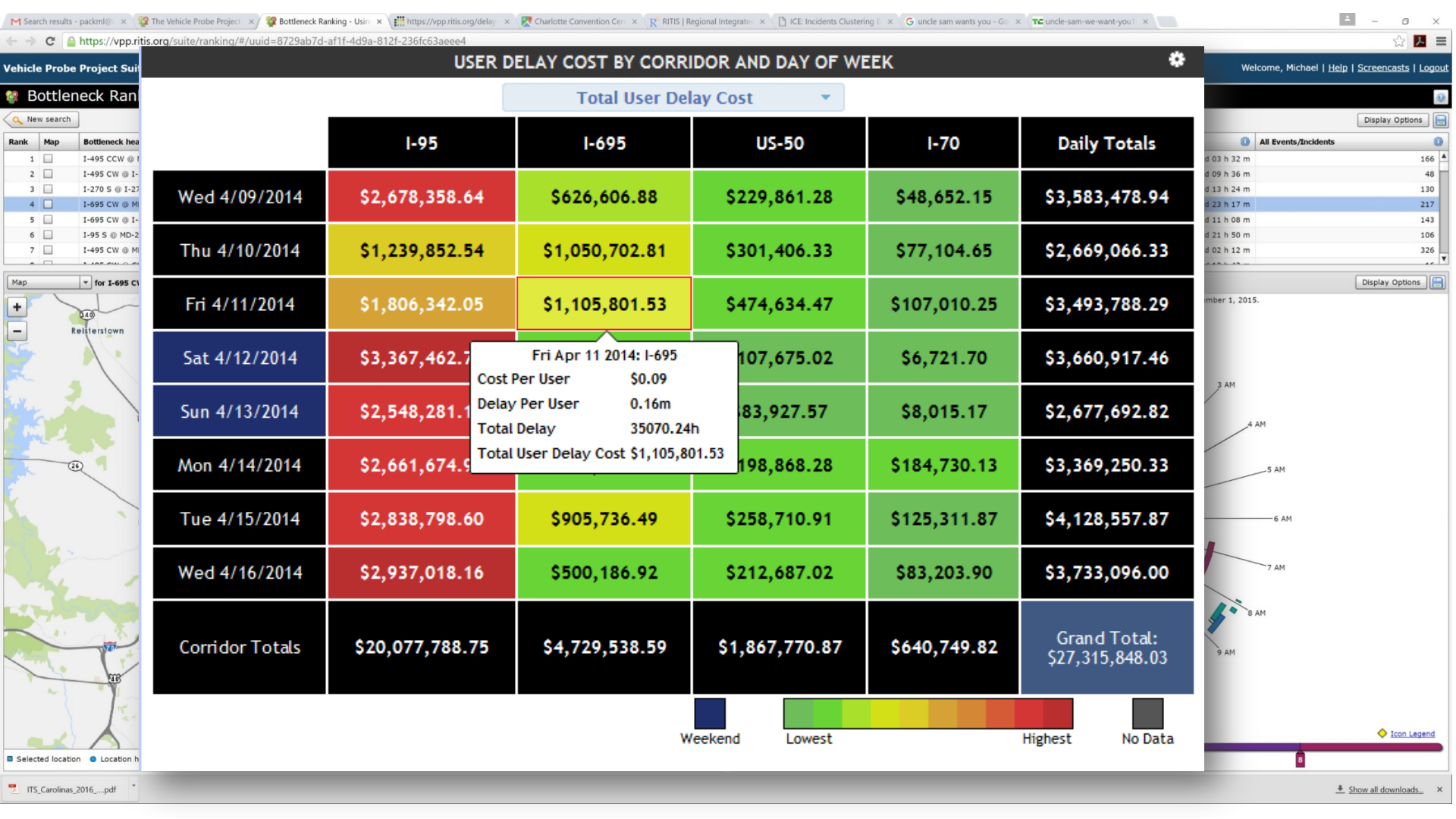
Congestion Analysis



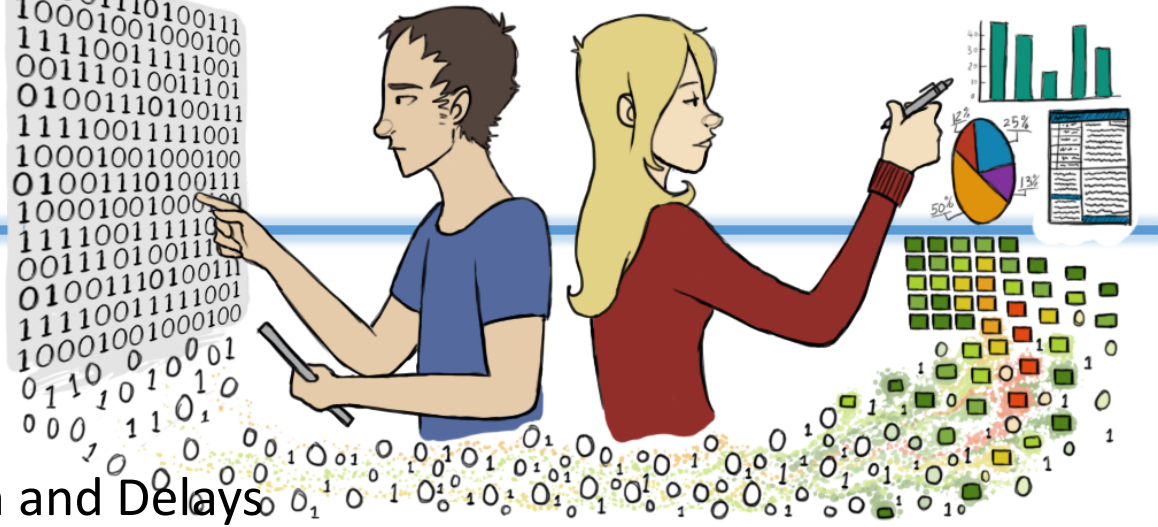




Enabling Informed Decision Making


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 $3,367,462.7 107,675.02 $6,721.70 $3,660,917.46
Sun 4/13/2014 $2,548,281.1 83,927.57 $8,015.17 $2,677,692.82
Mon 4/14/2014 $2,661,674.9 198,868.28 $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
Fri Apr 11 2014: I-695
Cost Per User $0.09
Delay Per User 0.16m
Total Delay 35070.24h
Total User Delay Cost $1,105,801.53
Weekend
Lowest
Highest
No Data

The end result…



- Wise(r) investment decisions that lead to:
  - Safety improvements
  - Reductions in congestion and Delays
  - Lower costs of goods movement
  - Lower cost of doing business
- A better informed public
- Better informed Vehicles and Systems
  - Good information and travel decisions can save lives.
- A better way of life…