

# I-95 Vehicle Probe Project Traffic Monitoring System



*Missouri Traffic and Safety Conference*  
May 16, 2012



# Agenda

- Vehicle Probe Project Overview
- Data Quality and Validation
- Applications of the Data
- Next Gen VPP

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- **Vehicle Probe Project Overview**
- Data Quality and Validation
- Applications of the Data
- Next Gen VPP

# I-95 Coalition Background

- ... an alliance of transportation agencies, toll authorities, and related organizations, including law enforcement, from the State of Maine to the State of Florida, with affiliate members in Canada.
- ... provides a forum for key decision and policy makers to address transportation management and operations issues of common interest.

[www.I95Coalition.org](http://www.I95Coalition.org)

# VPP Timeline / Milestones

- 2006: Project planning begins, RFIs
- 2007: RFP Process, INRIX selected
- 2008
  - Service Starts July
  - NJ and NC Statewide Expansion
  - Initial Validation
- 2009 & 2010
  - PA & FL Expansion
  - SC & MD Statewide Expansion
  - Monthly Validations
- 2011
  - Contract Extended to 2014
  - VA, FL (East Coast), GA, RI Expansions
  - States pay 50% of core coverage and all expansions
- 2012 – Next Gen VPP

**THE WALL STREET JOURNAL**  
TUESDAY, JANUARY 29, 2008 \*\*\* \$2.00

**I-95 Panel Plans Satellite Traffic-Report Network**

By CHRISTOPHER CONROY

In one of the biggest rollouts yet for technology designed to help motorists avoid traffic jams, the I-95 Corridor Coalition will announce plans today to disseminate real-time data on traffic flows and accidents along the East Coast using a satellite network by Inrix Inc.

**Traffic Tools**  
Many states have their own traffic information sites, including New Jersey, New York, Connecticut and Ohio. These tools offer additional traffic information. I-95 Corridor Coalition [www.I95Coalition.org](http://www.I95Coalition.org)

The rollout this summer will cover 2,500 miles, including many major roads and a continuous stretch of heavily congested Interstate Highway 95 between New Jersey and North Carolina. Coverage may extend to every major road to Florida from Miami. The deal marks a big step in a broader effort to help motorists steer around traffic backups.

Traffic congestion in major U.S. cities costs \$78 billion in lost hours and wasted gasoline, according to a study last year by the Texas Transportation Institute.

Under the agreement, Inrix of Kirkland, Wash., will beam real-time data to transportation departments on traffic speeds, with incident reports and other data about traffic flows. This will allow the government agencies to offer up-to-the-minute information via the Internet, mobile alerts and road signs.

Inrix plans to offer expanded data on traffic flows in the I-95 corridor to vendors of navigation services and products such

**USA TODAY** | [usatoday.com](http://usatoday.com)  
Friday, June 13, 2008

**Project aimed at avoiding traffic**

By Larry Copeland, USA TODAY

In a maddening phenomenon familiar to anyone who uses the interstate, traffic and daily commutable comes to a standstill and there's no way of knowing whether to make alternate routes, call to cancel appointments simply not exist.

Ben Tim Lerner — one of the nation's foremost experts on highway needs as co-author of the annual report on U.S. traffic congestion by the Texas Transportation Institute (TTI) — is not immune. On a Fourth of July run with his family to Washington, D.C., in 2006 he was stuck in traffic on Interstate 95 as the wind to visit a Civil War battlefield.

**NEED FOR SPEED?** Technology will help drivers get on the traffic flow.

"It took us two hours to go 17 miles," says Lerner, a research engineer at TTI. "I didn't really want to spend time in traffic on my vacation. My wife and kids were like, 'Oh, yeah the traffic is great!'"

A project that began next month on Interstate 95 is designed to help drivers avoid those kinds of headaches — at least let them know how long they can expect to be stuck in traffic. On I-95, the I-95 Corridor Coalition and Inrix Inc. will begin providing real-time traffic information on 2,500 miles of highway between New Jersey and North Carolina, including 1,500 miles of I-95.

**FIND MORE STORIES IN:** Washington | New Jersey | Civil War | Federal Highway Administration | Texas Transportation Institute | Association of State Highway | Highway Trust Fund | Transportation Officials | North Carolina Department of Transportation | I-95 Corridor Coalition | Inrix Inc.

**INRIX**

**I-95 Corridor Coalition with INRIX Expands Vehicle Probe Project Helping States Do More With Less**

- Coalition Expands and Extends the Nation's Largest Public-Private Traffic Data Partnership to 2014
- Ten States Now Using INRIX Traffic Data for More Than 20,000 Miles of Roads to Streamline Operations, Pinpoint Investments and Deliver Better Traveler Services

College Park, MD and Kirkland, WA - October 11, 2011 - The I-95 Corridor Coalition, the University of Maryland and INRIX announced a 3-year extension and expansion of a program that significantly improves how state and federal transportation agencies allocate billions of dollars in transportation funds.

The I-95 Coalition Vehicle Probe Project (VPP), first operational in 2008, uses crowd-sourced traffic data and advanced analytics techniques to turn billions of data points into insights that are transforming the manner in which member states build, manage and measure their road networks. The project now provides INRIX real-time and historical traffic information for more than 20,000 miles of roads across 10 states along the I-95 corridor.

"By expanding the program, we expect to achieve even greater gains from smarter investment in our transportation networks and help our members provide improved service to travelers," said George Schoener, Executive Director, I-95 Corridor Coalition. "The significance of the project to our member agencies is very clear, with all 10 states investing some level of their own resources in the project, in some cases committed out to 2014."

Key elements of the project's expansion over the next 3 years include:

- **Massive Coverage Expansion** - The project coverage increases from 5,000+ miles of road coverage in 8 states to more than 20,000 centerline miles in 10 states.
  - o Complete freeway coverage in 6 states - Rhode Island, New Jersey, Delaware, Maryland, North Carolina and South Carolina. In addition to complete freeway coverage, North Carolina is investing in coverage across their entire road network gaining access to more than 15,000 miles of highways, interstates, arterials and secondary roads of INRIX real-

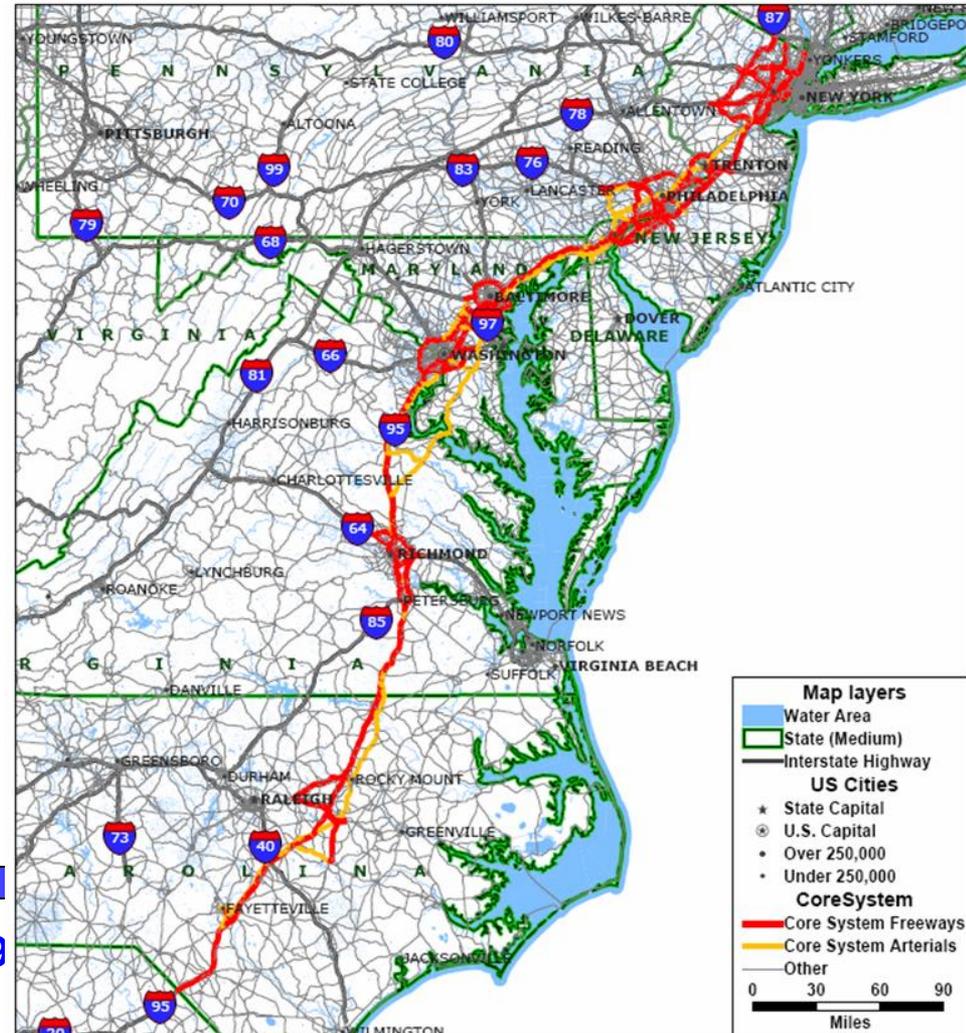
# I95 Vehicle Probe Project

- **Initial Coverage in July 2008**

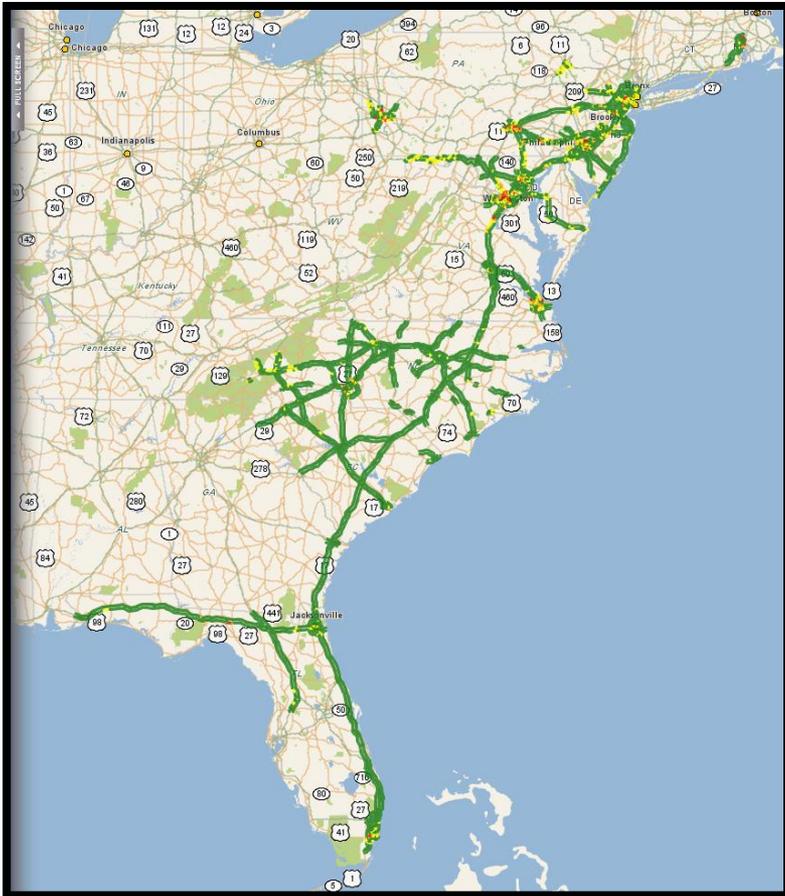
- 1500 Freeway miles
- 1000 Arterial miles
- New Jersey to North Carolina

- **Expansions**

- All NJ Freeways (500miles)
- All NC Interstates (1000 miles)
- All SC Freeways (1000 miles)
- Florida (500 miles)



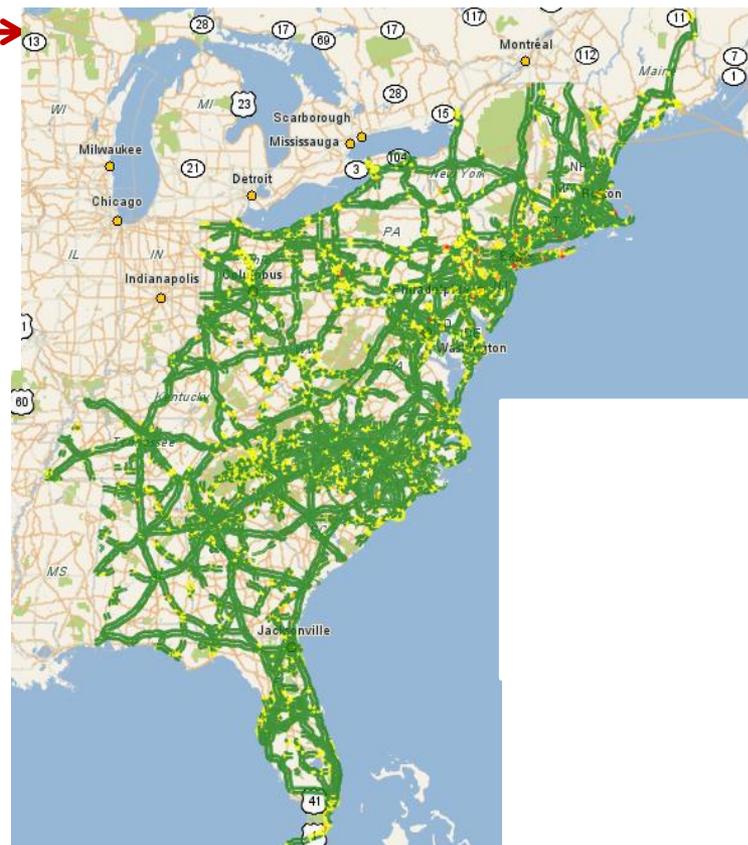
# Current Contracted Coverage – Oct 2011



State	"Freeway" Miles		
	Core	Expansions	Total
Maine	0	0	0
New Hampshire	0	0	0
Massachusetts	0	0	0
Rhode Island	78	0	78
Connecticut	0	0	0
New York	0	0	0
New Jersey	471.7	423.6	895.3
Pennsylvania	148.7	488	636.7
Delaware	46	0	46
Maryland/DC	301.1	445.1	746.2
Virginia	309.5	198.6	508.1
North Carolina	261.8	1291.2	1553
South Carolina	0	1200	1200
Georgia	139.1	0	139.1
Florida	728	533	1261
<b>Total</b>	<b>2483.9</b>	<b>4579.5</b>	<b>7063.4</b>

# VPP Services

- **Monitoring Site** →
  - <http://i95.inrix.com> (agencies only)
  - ~ 450 officials in corridor have access
- **Data Feed**
  - Real-time access for integration into applications (published I/F Guide)
- **Data Archive**
  - 5 minute archive available through monitoring site
- **Traffic Tile Overlay**
  - Traffic flow image only to layer on agency maps (defined in I/F Guide)
- **VPP Suite (NEW)**
  - Real-time and historical tools for ops and planning



# Benefits of the VPP

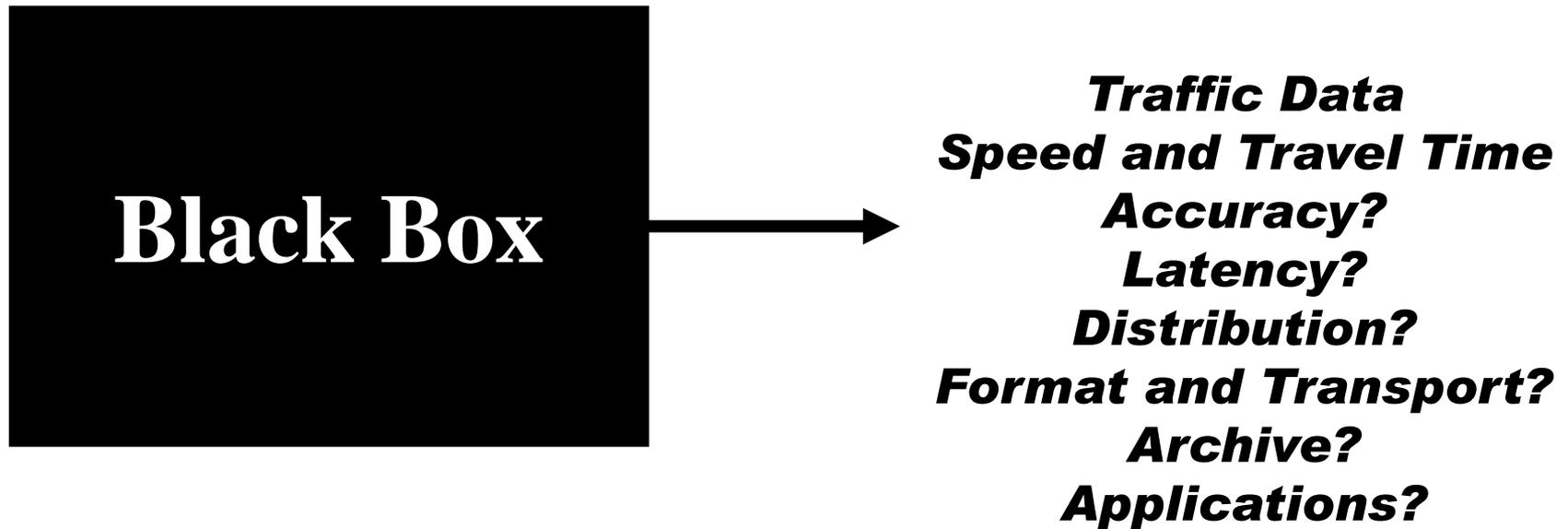
- Real-Time Traffic Monitoring
  - Pay once everyone use
  - Cross border travel times
- Managed by the I-95 Coalition
  - Central admin / procurement mechanism
  - Comprehensive validation
  - Aggressive pricing
- Liberal data licensing agreement
  - Full Rights for all internal applications
  - Archive in perpetuity
  - All external applications supported
  - Limitations only on the distribution of base data
- Vendor Retains Ownership of Data

# Agenda

- Vehicle Probe Project Overview
- **Data Quality and Validation**
- Performance Measures Tool
- Next Gen VPP

# Data Quality Specifications

- Black Box Approach



- Technology Independent / Neutral

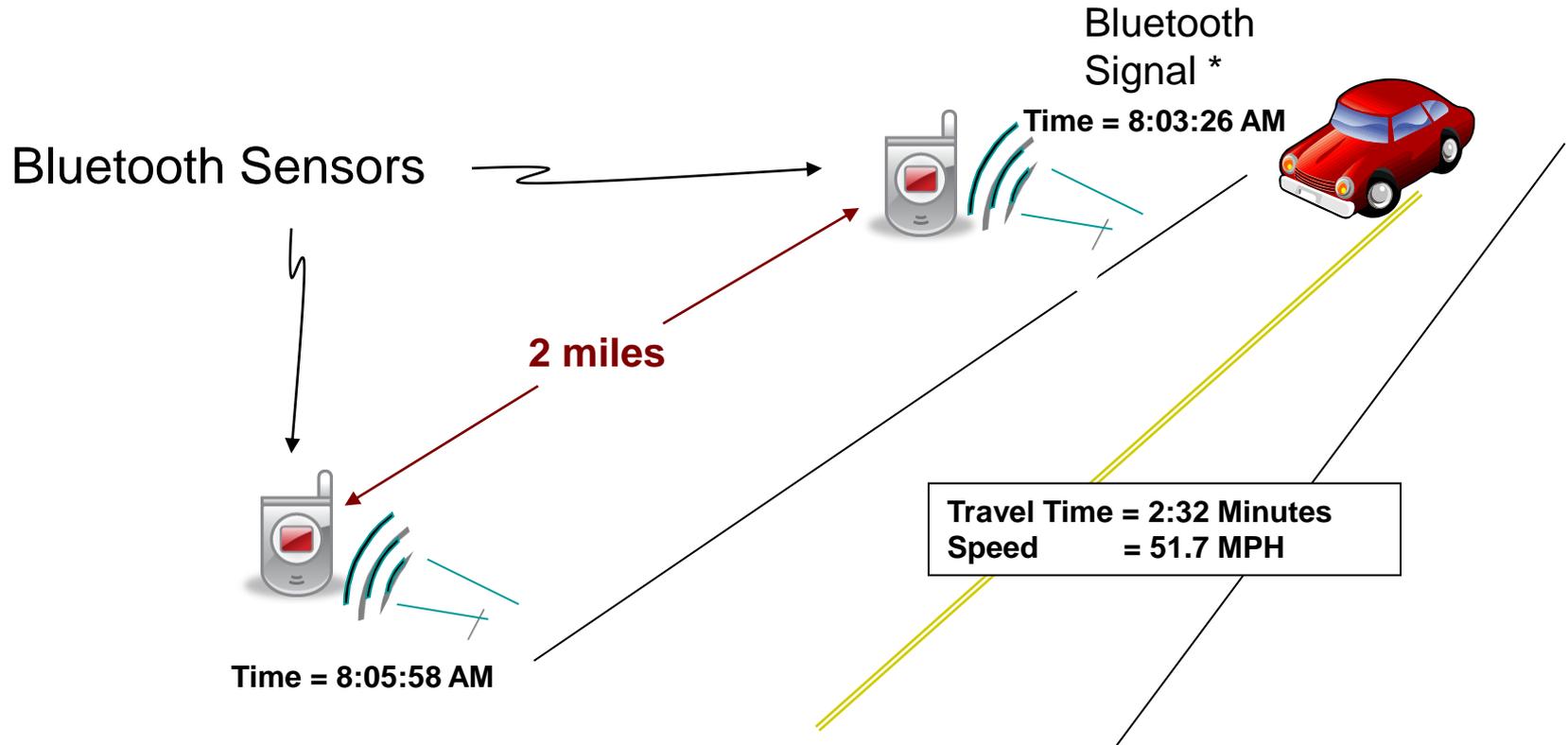
# VPP Validation Effort

- Primary Specifications
  - Max average absolute speed error 10 MPH
  - Maximum speed error bias +/- 5 MPH Max
- Specifications applied in four flow regimes
  - 0 - 30 MPH
  - 30 - 45 MPH
  - 45-60 MPH
  - > 60 MPH
- Use Bluetooth Technology for ground truth
- **Validation performed monthly**
- **Results impact payment**
- **Results and all data are public**

# Confidence Indicator

- *From Contract RFP*
  - *Status flag to indicate normal operations, periods of low-traffic flow, inoperable status or unavailable data, etc. - Mandatory*
  - *Quality indicator – provide a numerical score that reflects the confidence in the estimate of the mean travel time and speed. - Desirable*
- *In the data feed ::Score Metric*
  - *30 Real-time, 20 Historical, 10 Freeflow*

# Bluetooth Traffic Monitoring

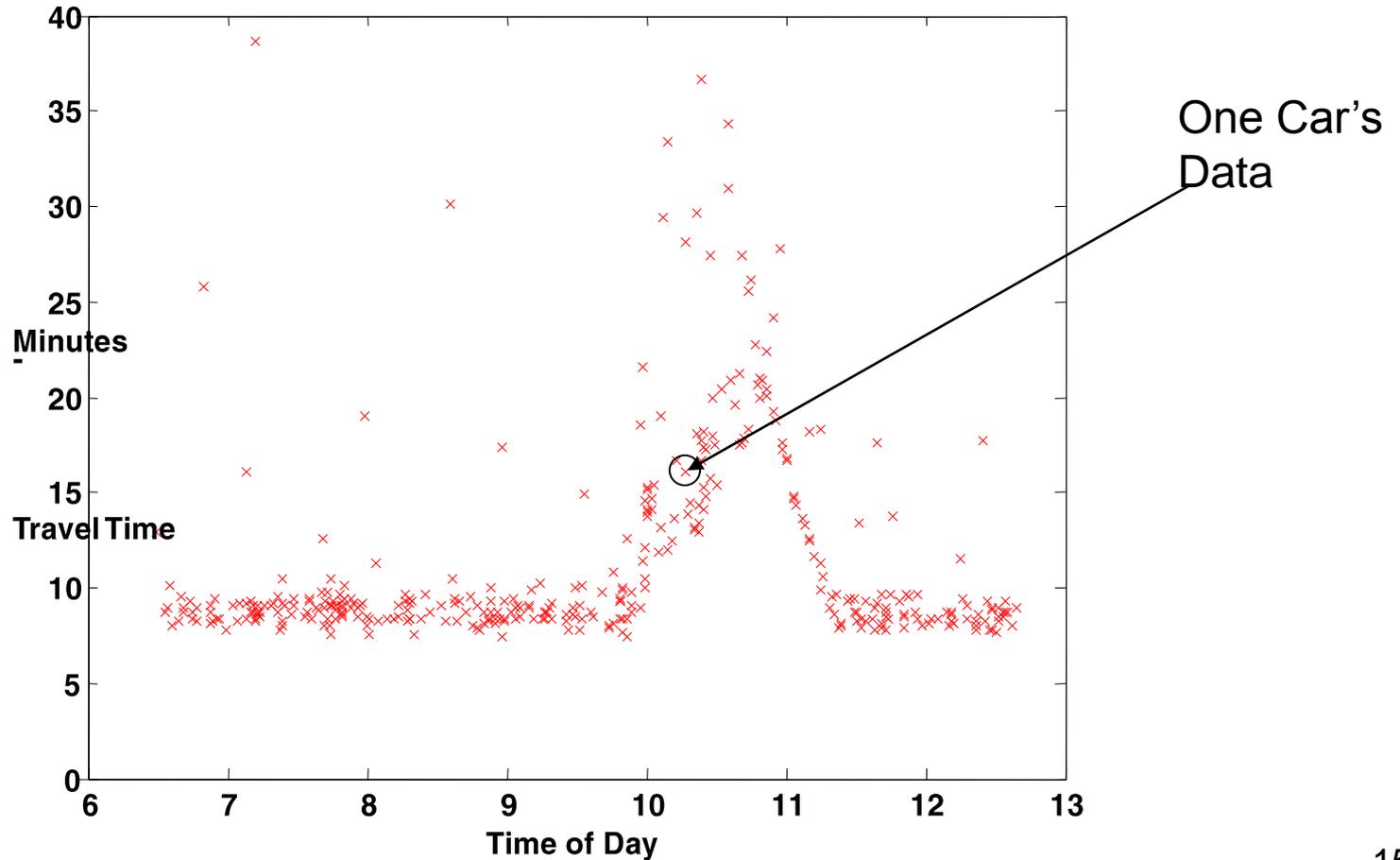


\* Bluetooth signals come from cell phones, PDAs, laptops, GPS, car radios...

\*\* Provisional patent received

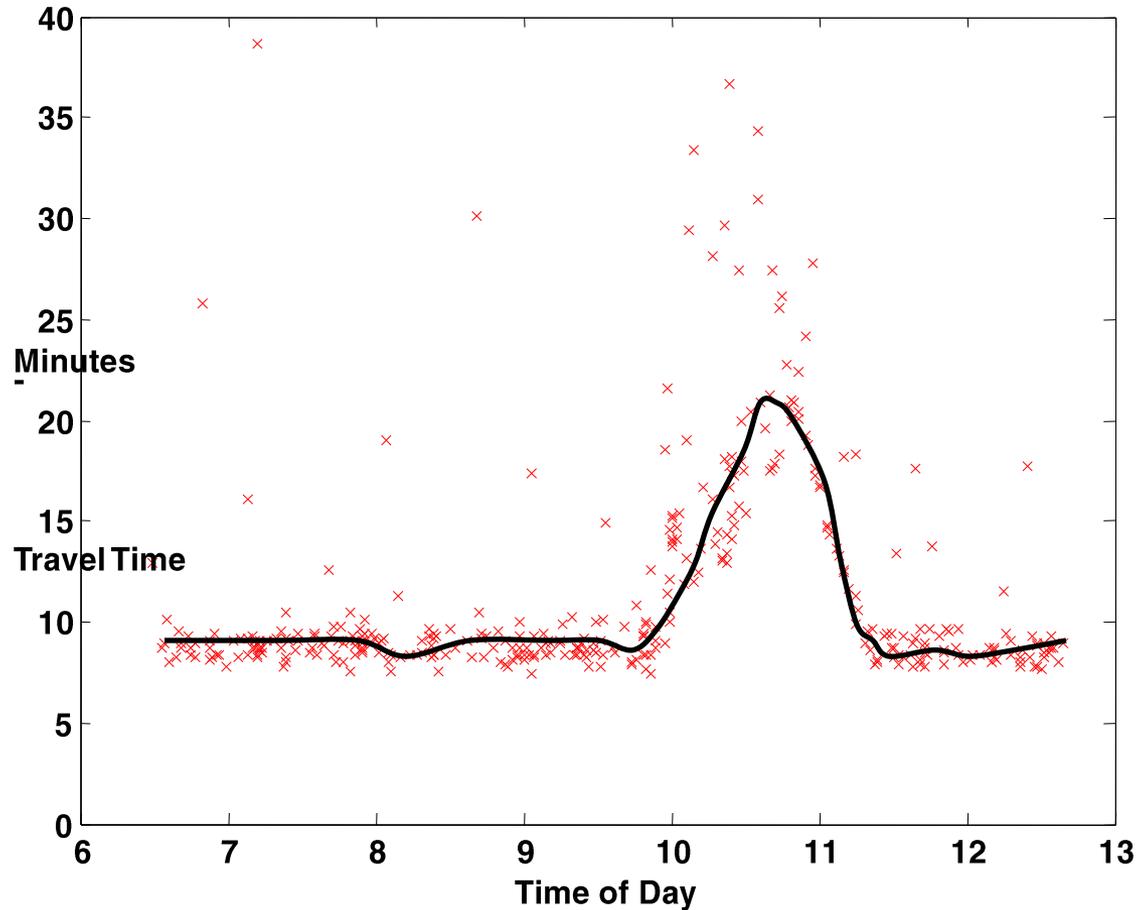
# Data from many cars ...

Actual Travel Time Data from I-95 Northbound on April 2



# Data from many cars ...

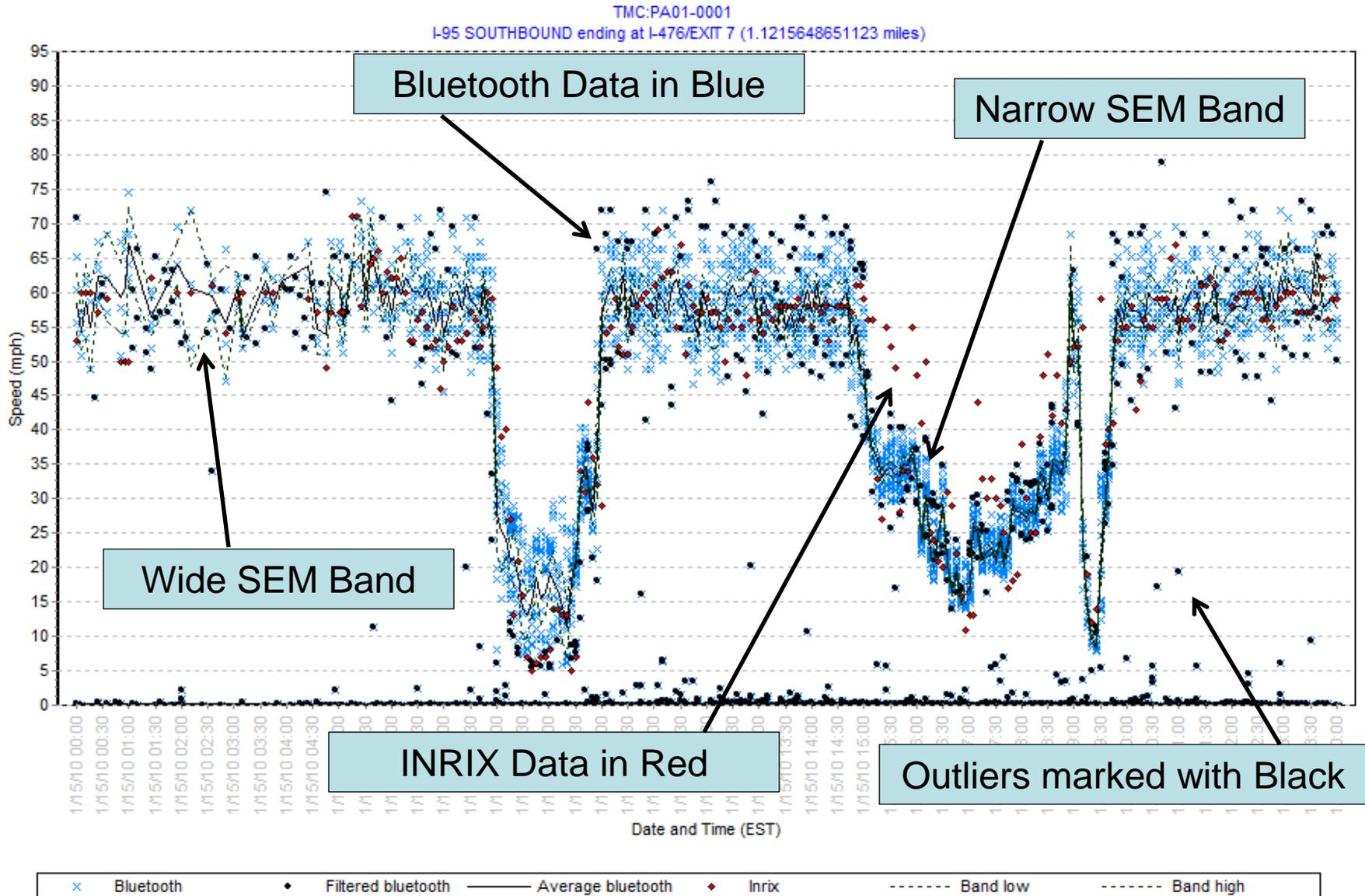
Actual Travel Time Data from I-95 Northbound on April 2



# Typical Deployment



# PA Validation – Jan 2010



# Key Results of Validation

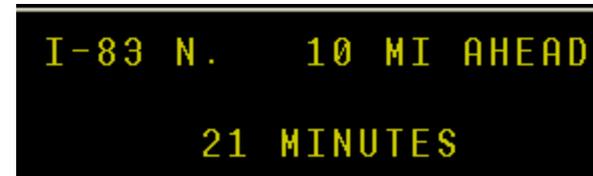
- Monthly data collection and results
  - Anomalies and special concerns addressed
- Over 3+ years
  - Met or exceeded specifications
  - Continued improvement in data quality
- Keyed on performance during congestion
- Quality understood & accepted within 12-18 months

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- Next Gen VPP

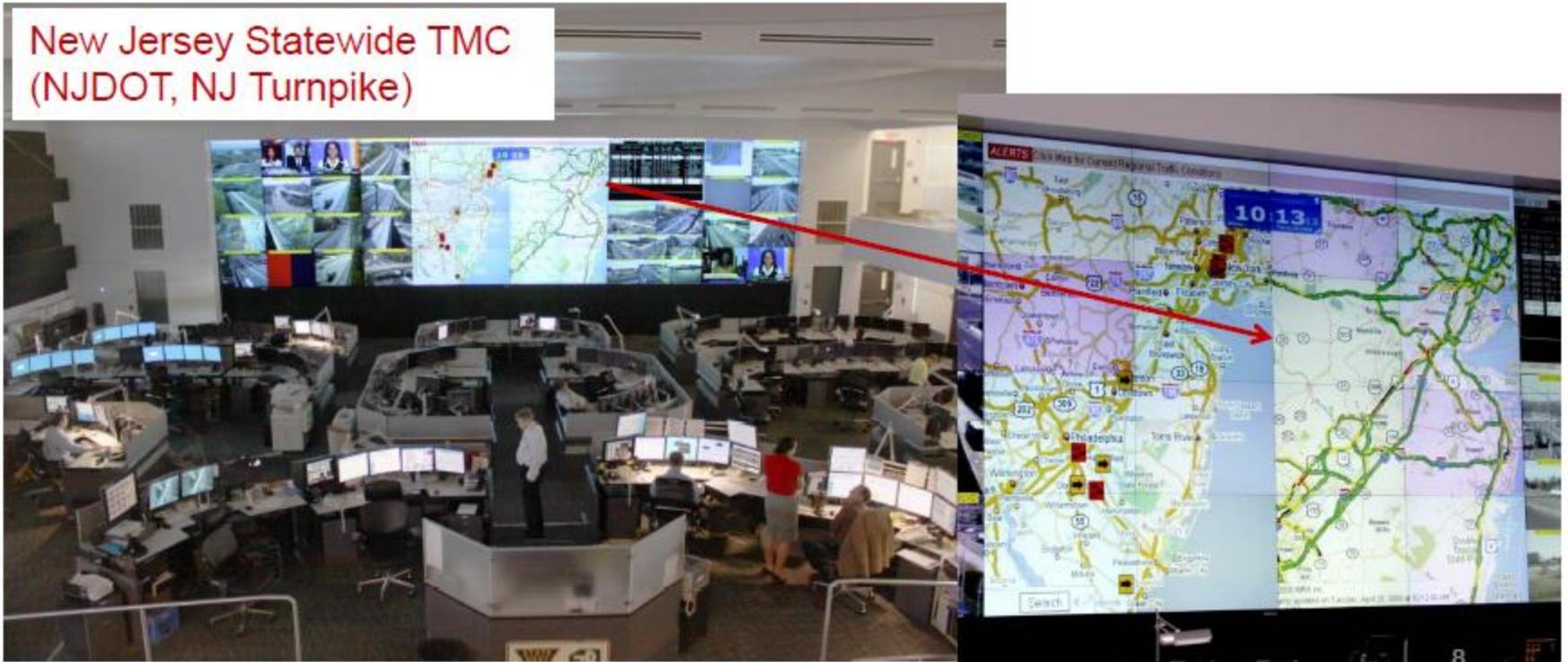
# Noteworthy VPP Applications

- Ops Center Monitoring
  - Monitoring Site – ME, NH, NY, NJ, DE, MD, VA, NC, SC, FL
  - TMC Software Integration – RITIS, SC, FL (soon), NJ (soon)
  - Big Benefit – cross border monitoring
- Travel Times on Signs: SC and MD
- Travel Times on Web Sites: NJ, SC
- Traffic Tile Overlay on 511 site: NC
- Performance Analysis: Several
- Welcome Center/Mall Displays: VA
- Long Distance Trip Planner



# Operations Center Situational Awareness – New Jersey

New Jersey Statewide TMC  
(NJDOT, NJ Turnpike)



# Flow Maps on Web Sites NCDOT

The screenshot shows the NCDOT website interface. At the top, there is a navigation bar with links for 'About', 'Careers', 'Contact', 'News', 'Search', and 'NCDOT'. Below this is a yellow banner with 'Business', 'DMV', 'Newsroom', 'Programs', 'Projects', and 'Travel & Maps'. The main content area is titled 'Travel Information' and 'Triad Region'. It features a search bar with 'Select by Region: Triad', 'Routes: [dropdown]', and 'County: [dropdown]'. Below the search bar are tabs for 'Traffic', 'Incidents', and 'Adverse Weather'. The main map shows a network of highways with green flow indicators and various traffic icons. A legend at the bottom right indicates 'Traffic Overlay Transparency' and '40 miles'. The date and time '12/6/2010 11:42:01 AM' are displayed at the bottom left of the map area.

# Travel Times on Signs

- South Carolina (Columbia)
- Maryland
  - Live Jan 2010
  - Limited deployment
  - Sophisticated software
  - Driver for Statewide coverage expansion
- More on way...



# Travel Times on Displays

## VDOT

### Tyson's Corner Mall



### I-95 Welcome Centers (2)



**Access Tysons**

**Travel Times**

**Megaprojects**

**Travel Times**

**Traffic Incidents**

Current  
41°F  
January 22  
5:57 PM

**ESTIMATED FREEWAY TRAVEL TIMES FROM TYSONS CORNER**

Alexandria, VA	31 min
via I-495 (17 miles)	
Centreville, VA	22 min
via I-495 to I-66 (14 miles)	
Reston, VA	22 min
via Route 7 to GTC (8 miles)	
Rockville, MD	22 min
via I-495 to I-270 (14 miles)	
Springfield, VA	23 min
via I-495 to I-95 (10 miles)	
Washington, DC	28 min
via Route 7 to I-95 (11 miles)	
Woodbridge, VA	88 min
via I-495 to I-65 south (20 miles)	

**COLOR LEGEND:**  
 Free Flow  
 Moderate  
 Heavy  
 Road Closed  
 No Data

**I-95 Corridor Travel Time Information**

**SafeTrip-21**

**CONGESTION LEVELS:**  
 Free Flow  
 Moderate  
 Heavy  
 Stop and Go  
 Road Closed

Traffic updated on Friday, Nov. 13, 2009 at 11:16 AM EST

**From Fredericksburg Welcome Center via I-95**

DESTINATION	TRAVEL TIME	DISTANCE
Richmond, VA	1 hr 50 min	140 mi
Charlottesville, VA	1 hr 17 min	113 mi
Roanoke, VA	1 hr 3 min	100 mi
Woods Hole, VA	1 hr 40 min	113 mi
Fredericksburg, VA	1 hr 20 min	113 mi
Washington, DC	4 hr 52 min	300 mi

AL NEWS: Family dies in crossfire after sleeper drop-off · Web site post

[www.I95Coalition.org](http://www.I95Coalition.org)

I-95 Corridor Coalition Vehicle Probe Project

# Congestion Management Process – MWCOG

## 2010 CONGESTION MANAGEMENT PROCESS (CMP) TECHNICAL REPORT

September 3, 2010

National Capital Region Transportation Planning Board  
Metropolitan Washington Council of Governments

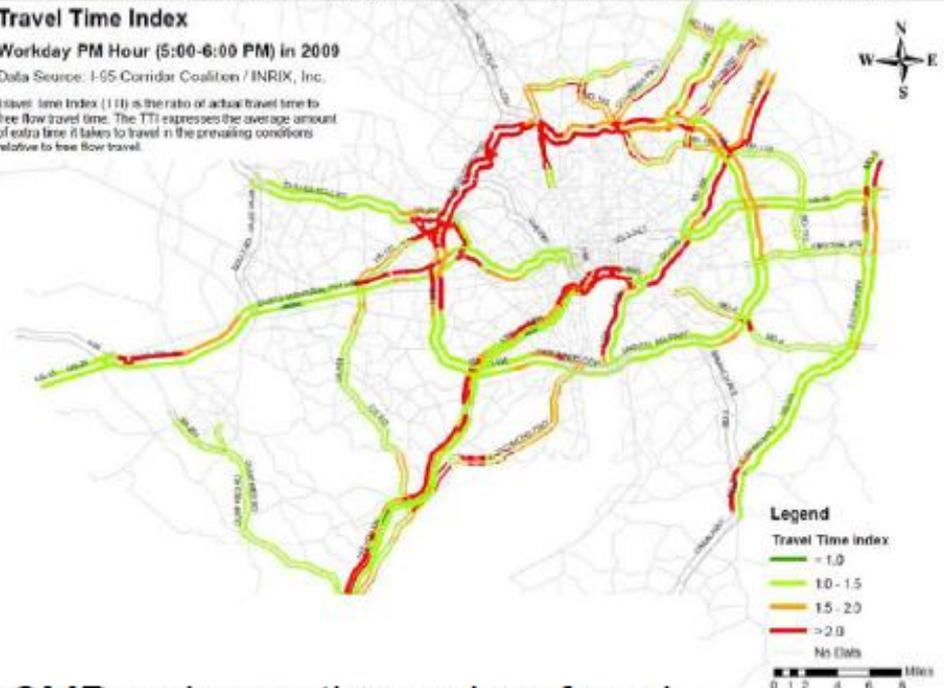
Figure D12: Travel Time Index: 2009 Workday Afternoon 5:00-6:00 PM for the I-95 Corridor Coalition Covered Highways

### Travel Time Index

Workday PM Hour (5:00-6:00 PM) in 2009

Data Source: I-95 Corridor Coalition / INRIX, Inc.

Travel Time Index (TTI) is the ratio of actual travel time to free flow travel time. The TTI expresses the average amount of extra time it takes to travel in the prevailing conditions relative to free flow travel.



From Executive Summary:

- “The [VPP] provides the CMP an innovative and profound data source for both congestion and reliability analyses.”

[www.I95Coalition.org](http://www.I95Coalition.org)

I-95 Corridor Coalition Vehicle Probe Project

# Vehicle Probe Project Suite



I-95 CORRIDOR  
COALITION



# Vehicle Probe Project Suite

## Vehicle Probe Project Suite

-  **Vehicle Probe Project Suite Dashboard** ⓘ  
Explore the impacts of and relationships between bottlenecks and traffic events in real-time and at previous points in the past.
-  **Massive Raw Data Downloader** ⓘ  
Download raw probe data from our archive.
-  **Congestion Scan** ⓘ  
View how congested conditions rise and fall on a single stretch of road.
-  **Historic Tools** ⓘ  
View aggregated data from previous points in time.
-  **Bottleneck Ranking** ⓘ  
Search for recurring bottlenecks and discover which ones have the greatest impact.
-  **Tutorials**  
Learn how to use each of the tools in the suite.

# Massive Raw Data Downloader



## Massive Raw Data Downloader

New request Retrieve previous requests

Road **I-495 in MD and VA** Search again

Entire road  State to state  Partial road

Directions  Clockwise  Counterclockwise

Road **I-695 in MD** Search again

Entire road  State to state  Partial road

Directions  Clockwise  Counterclockwise

Road **I-66 in DC and VA** Search again

Entire road  State to state  Partial road

Directions  East  West

Date range 04/12/2011 - 04/12/2011

Days of week  Sunday  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday

Time of day 00 : 00 - 23 : 59

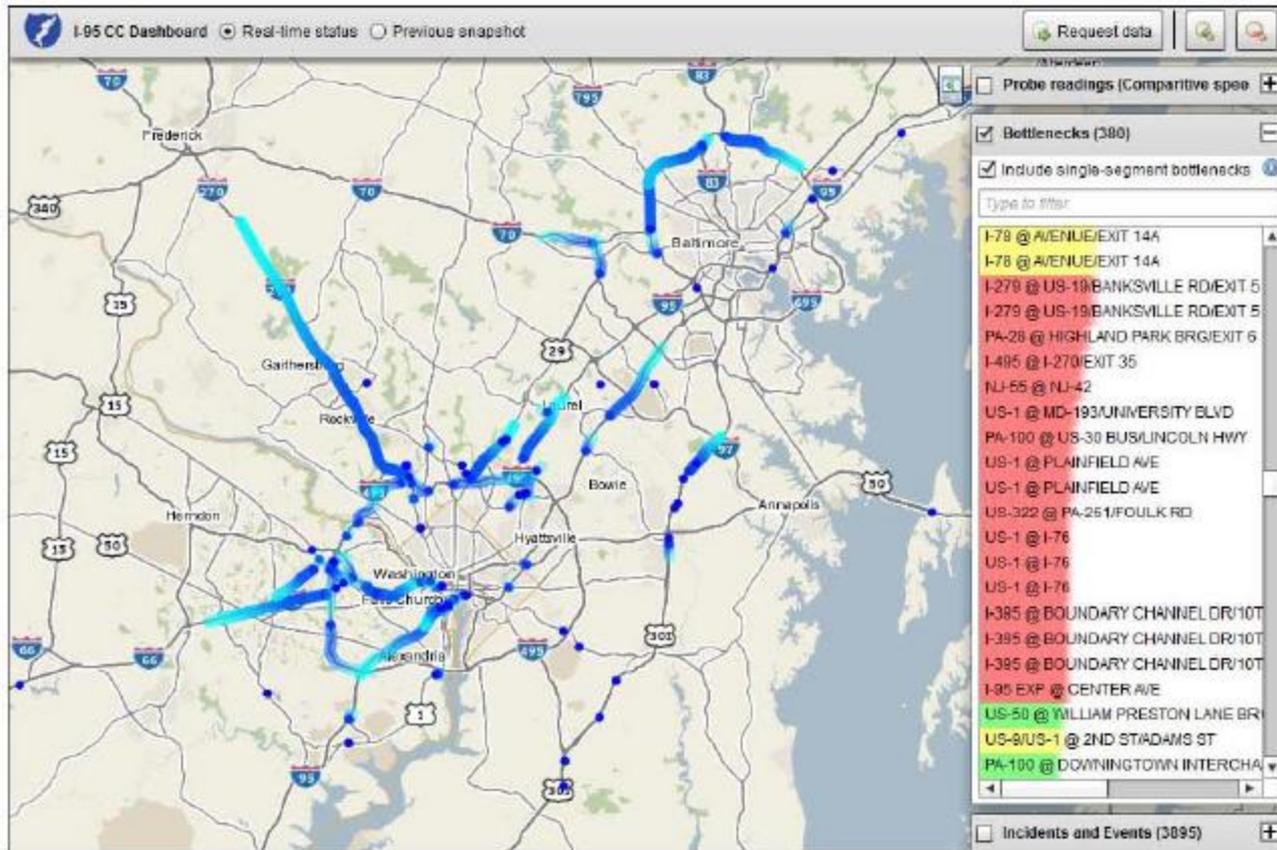
Fields  Speed  Average speed  Reference speed  Travel time  Confidence score



Multiple roads at once

Fine-grained time/date selection options

# Bottleneck layer

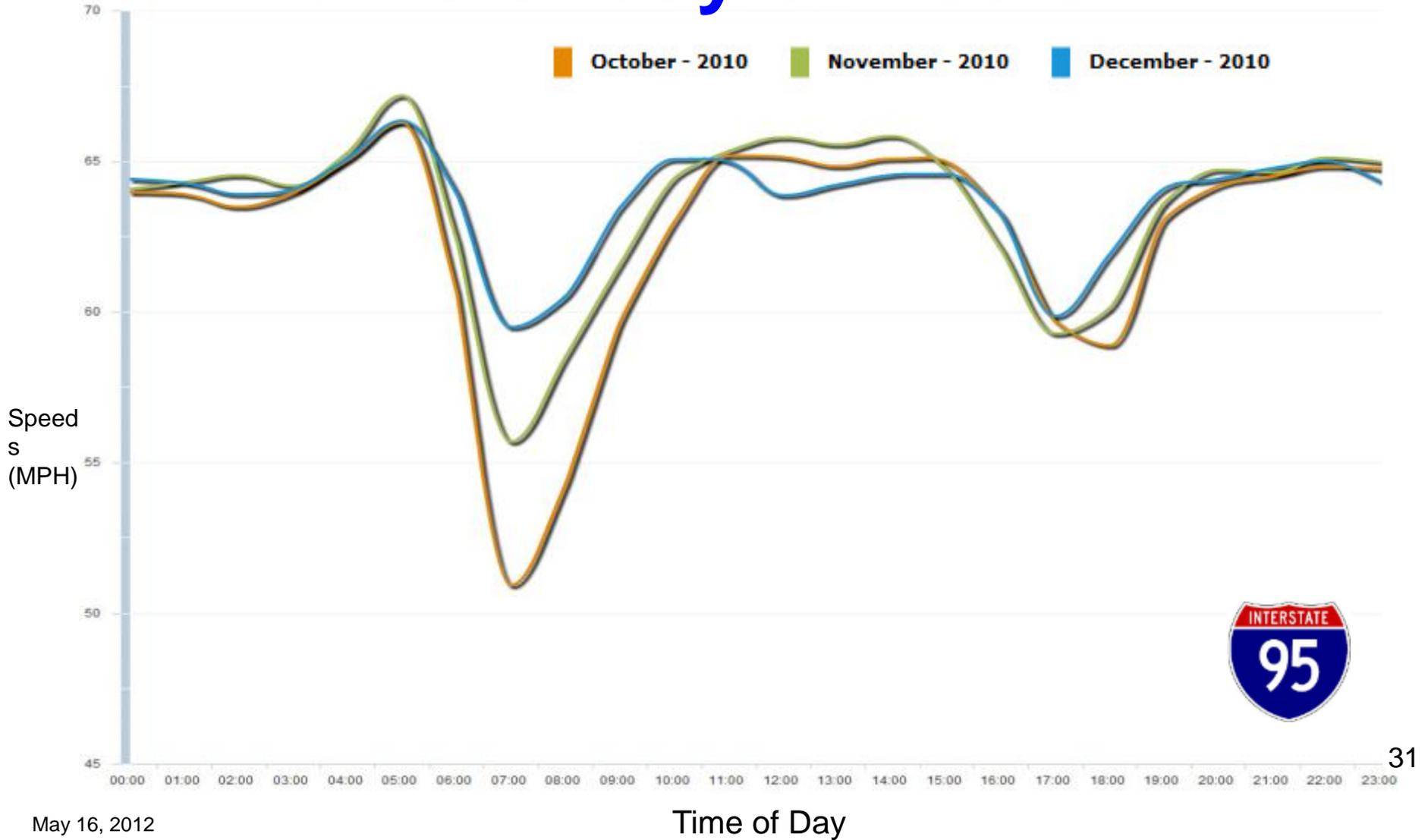


Green 0 – 15 minutes

Yellow 15 – 30 minutes

Red > 30 minutes

# Average weekday speeds by time-of-day on I-95 SB

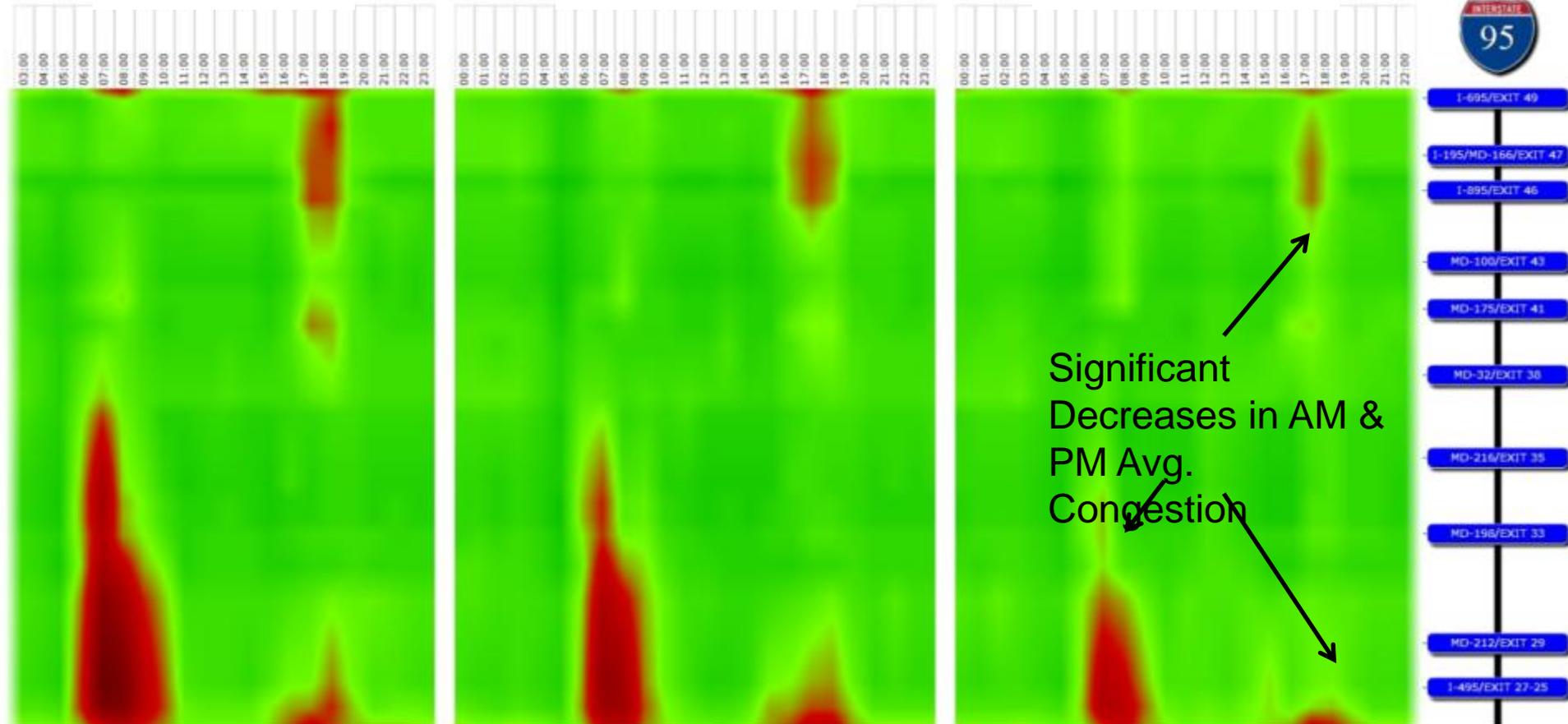


# Monthly comparison of Avg. Congestion on Southbound I-95

October, 2010

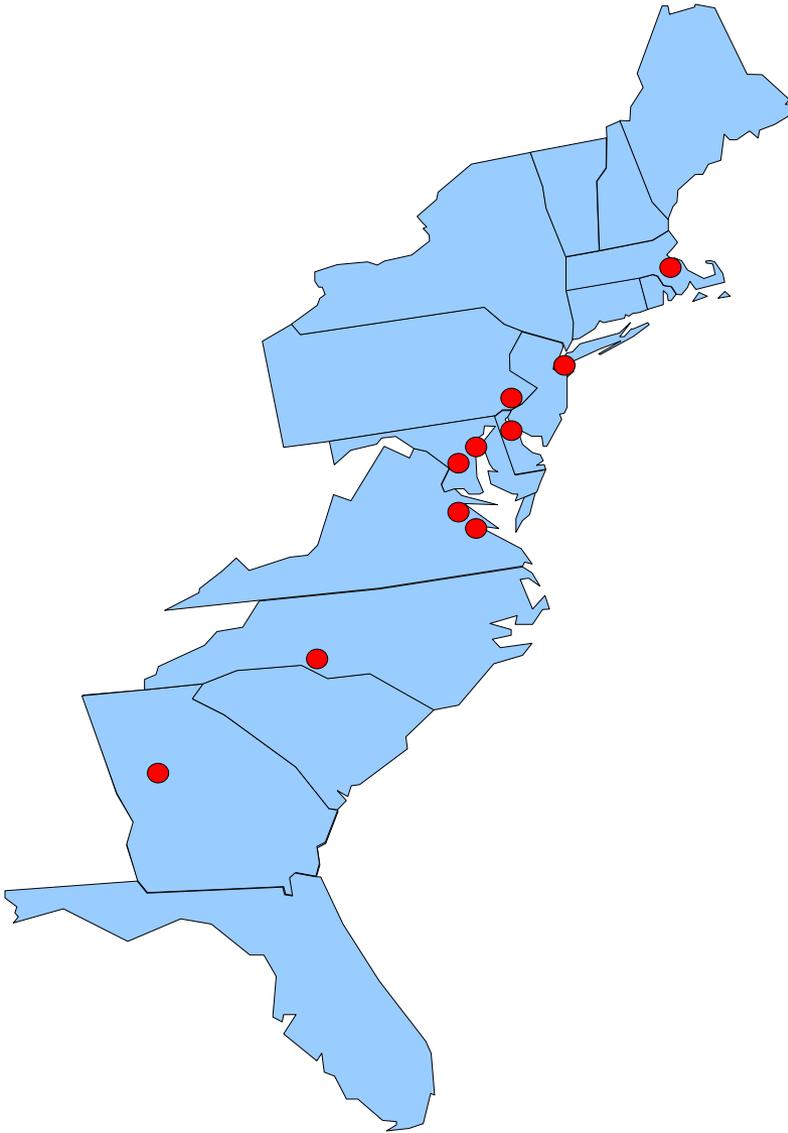
November, 2010

December, 2010



## MPOs using VPP/INRIX data

- Boston
- NJTPA
- DVRPC
- WILMAPCO
- Baltimore
- Washington DC
- Richmond
- Hampton Roads
- Charlotte
- Atlanta



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- Applications of the Data
- **Next Gen VPP**

# Next Gen Improvements

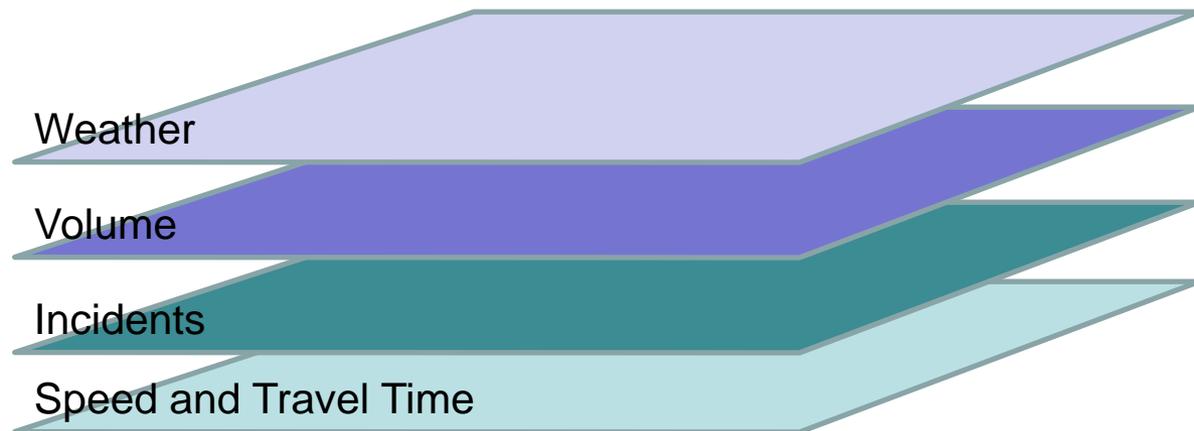
- Expand Coverage from Maine to Florida
- Enhanced content through connected vehicle inspired applications
  - Temps, braking, weather
- Extend VPP Suite
  - Weather, incidents, volume & sensor data
  - Additional Performance Measures Tools

# Next Gen Improvements

- Research and Development
  - Validate Travel Time data on Arterials
  - TMC Codes impact, issues, and use
  - Integrate real-time traffic volume
- Education
  - Travel time On-line Course
  - Training and guidance on effective use of performance measures

# Conceptual Data View

- Provide complete perspective of environment
- Support planning and operations
- Ease integration into applications



# Questions?

- **INRIX Monitoring Site**

Rick Schuman at 407-298-4346, [rick@inrix.com](mailto:rick@inrix.com)

- **Vehicle Probe Project Suite**

Michael Pack at 301-405-0722, [PackML@umd.edu](mailto:PackML@umd.edu)

- **Data Validation**

Stan Young at 301-403-4593, [seyoung@umd.edu](mailto:seyoung@umd.edu)

- **VPP Contract Issues**

Kathy Frankle at 410-414-2925, [kfrankle@umd.edu](mailto:kfrankle@umd.edu)

- **General Project Questions**

Marygrace Parker at

# Thank You



**I-95 CORRIDOR  
COALITION**



# THE HEARTLAND VPP

# What would it look like?



# Mileage and Cost at I95 Prices

- Mileage
  - NE ~460
  - IA ~754
  - MO ~958
  - KS ~793
  - OK ~864
  - TOTAL roughly 3829
- At \$900/mile, about 3.4 million per year

# Issues

- Predominantly rural interstate
  - Probability of congestion low
- Primary concerns
  - Weather events
  - Construction delays
  - Congestion
- Percent of fleets are higher
- Is volume data needed?

# A Modest Proposal

- **ITS Heartland Vehicle Probe Project**
- Multi-state traffic monitoring for
  - Speed, Travel Time & **Volumes**
  - **Integrate weather and construction**
- Philosophy of procurement similar to I95
  - Tech neutral, black box approach, validated
  - Challenge vendors to innovate
- Funding via pooled fund mechanism