Multi-State Collaboration with MPO for Common Data Sourcing and Performance Measures Calculation

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Metropolitan Washington Council of Governments (MWCOG)

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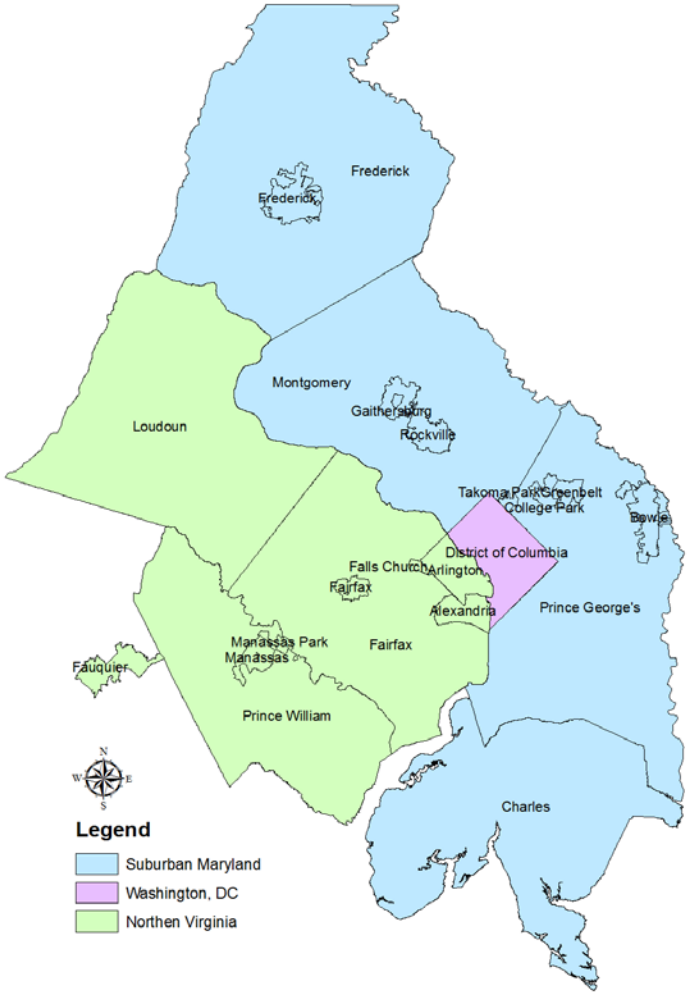
Today's Presentation

- Multi-State MPO Challenges
  - Traditional challenges
  - New challenges under MAP-21
- Preparations for MAP-21
  - All performance areas
  - Congestion/System Performance area
- Highlights of congestion reporting in the National Capital Region MPO
- Questions for the future

National Capital Region Transportation Planning Board (TPB)

50 Years!



- The TPB is the officially designated MPO for Washington, D.C., Suburban Maryland, and Northern Virginia
- The TPB is a separate board, housed at the Metropolitan Washington Council of Governments (MWCOG)
- TPB members include representatives of local governments, state transportation agencies, state and District of Columbia legislatures, and the Washington Metropolitan Area Transit Authority (WMATA)

10% MPOs Are in Multi-States

- 408 Metropolitan Planning Organizations (MPOs) in the U.S. to date
- 40 MPOs have boundaries crossing state lines

The **TPB** is:

- 9th largest MPO in the nation by population
- 2nd largest multi-state MPO (behind DVRPC)
- Population (2010): 5,046,600
- Employment (2010): 3,076,300
- Household (2010): 1,885,700

Location of Multi-State MPOs
(Source: NCHRP Project 08-36, Task 44, 2006)

Challenges

- Different legal and institutional authority
- Different processes in project development and selection
- Different priorities among DC, MD and VA
- Dealing with multiple federal agencies and different divisions of the FHWA and FTA, addressing funding needs, and obtaining support for projects within the individual states
- As the MPO for the Nation's capital, the work of the TPB may be more visible and receive more scrutiny than in some other regions, including input from members of Congress.

Opportunities

- The TPB provides an important forum for the discussion of key transportation issues affecting the region
- The TPB provides technical resources and expertise to assist in the regional decision making process
- After consensus has been reached on projects and programs, the multi-state nature of the TPB provides more support for obtaining funding

MAP-21 Added Another Layer of Challenges and Opportunities for Multi-State MPOs Such As the TPB.

Changes Require Amendments of Metropolitan Planning Agreements

- (23 CFR 450.314) The written agreement(s) shall include specific provisions for cooperatively developing and sharing information related to:
  - 1) **transportation systems performance data**,
  - 2) **the selection of performance targets,**
  - 3) **the reporting of performance targets,**
  - 4) **the reporting of system performance** to be used in tracking progress toward attainment of critical outcomes for the region of the MPO,
  - 5) **the collection of data for the asset management plans for the NHS**,
  - 6) the development of financial plans that support the metropolitan transportation plan and the metropolitan TIP, and
  - 7) development of the annual listing of obligated projects (see § 450.334).

Preparations for MAP-21

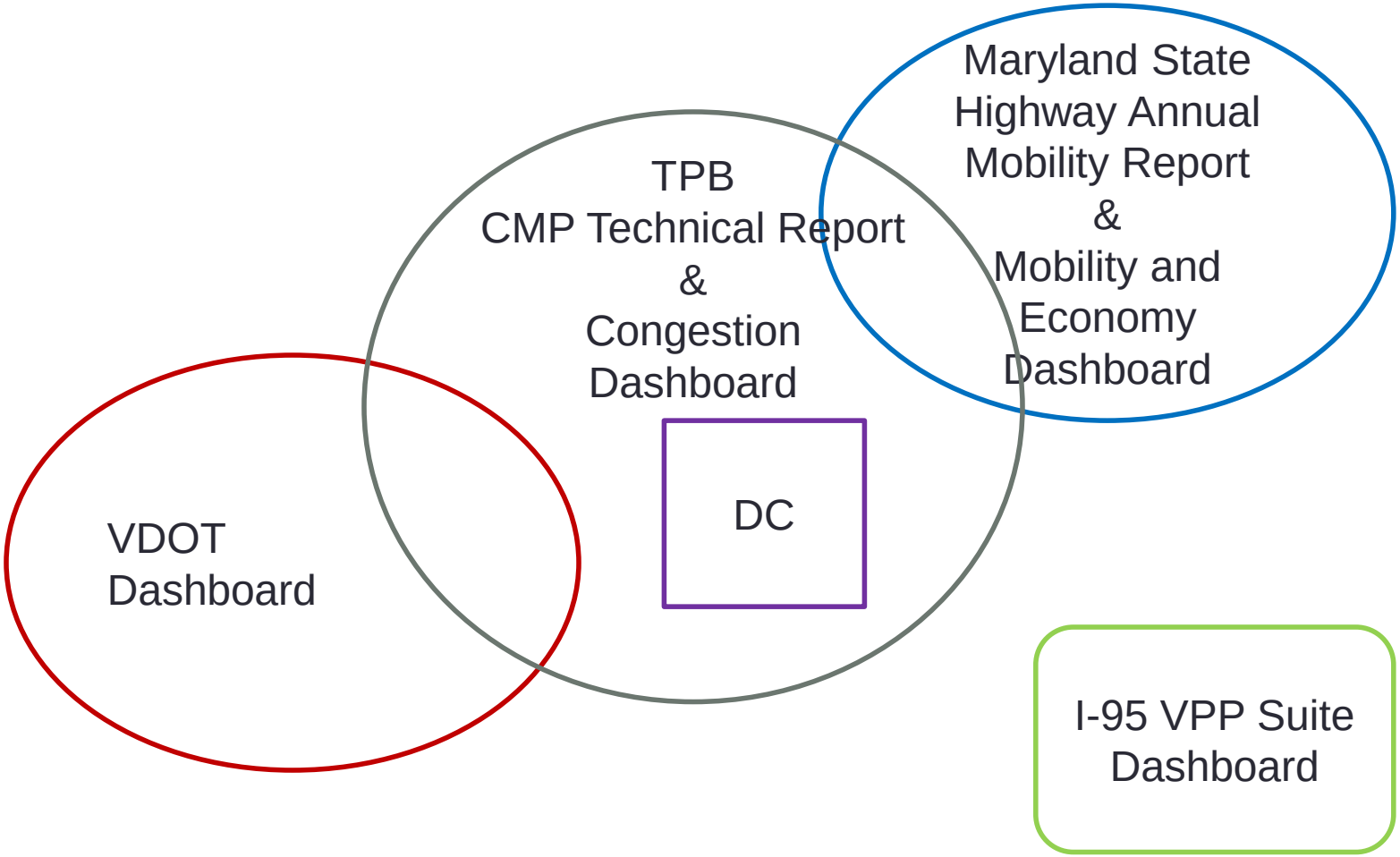
- On-going dialogues (across all performance areas)
  - Point of Contact
  - Sharing information on data collection, performance calculation, trend forecasting, performance targets setting, and overall strategies in response to MAP-21 requirements
- Congestion and System Performance
  - Vehicle Probe Data Users Group
  - Consensus building on probe data processing and performance measures calculation

Point of Contact

- Overall coordinating representative
- Subject matter expert representative for each category/measure

MAP-21 Performance Areas		TPB	States and Agencies				
			DDOT	MDOT	VDOT	WMATA	Others
Overall Planning							
Highway Safety							
Highway Conditions	Pavement and Bridge conditions						
	Asset Management						
Congestion/ System Performance (rules pending)	Congestion/ Performance						
	On-road mobile source emissions						
	Freight movement on Interstates						
Transit Performance (rules pending)	Safety						
	Asset						

Congestion/System Performance Reporting



Vehicle Probe Data User Group

- Provide a regional platform for probe data information exchange, user experience sharing, and professional skills development.
- Provide user feedback to vehicle probe data vendors and analytical tools developers.
- **Develop recommended technical guidelines for probe data processing and performance measure calculation and improve the guidelines over time**.
- Address probe data-related other data and system performance issues to support performance-based transportation planning and programing.

Group website:
www.tinyurl.com/vpdug

Data Collection

- TPB will need to rely on state/agency-provided data, **preferably geographically-detailed, to the maximum extent practicable**
  - TPB is a multi-state MPO
  - MPO boundary changes over time
  - Common data sourcing
- Currently, what are the data sources for congestion/system performance?
  - DC
  - MD
  - VA

Existing Common Data for Congestion

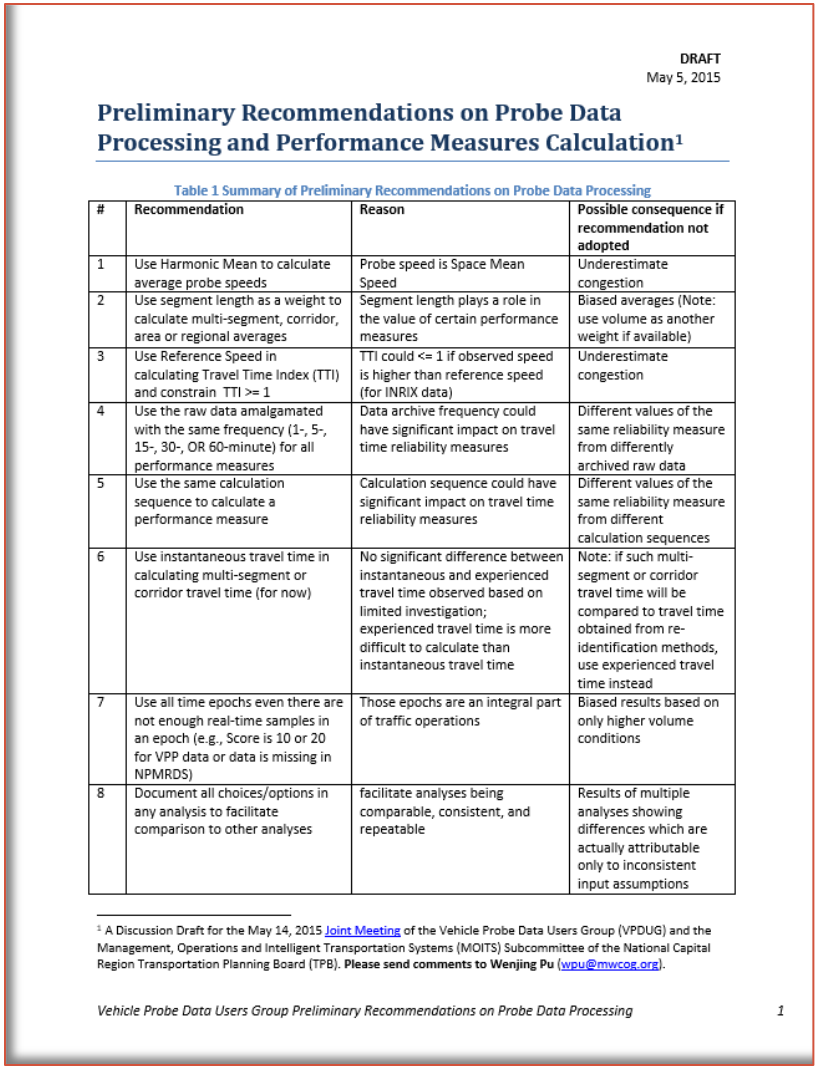
- Speed
  - I-95 Corridor Coalition Vehicle Probe Project (VPP)
    - INRIX
    - HERE
    - TomTom
  - National Performance Management Research Data Set (NPMRDS)
- Volume
  - HPMS

Performance Measures Calculation

- Hope that the Rulemaking would provide specifications
- What if those specifications are not specific enough?
- Currently, what are the methodologies for calculating congestion/system performance?
  - DC
  - MD
  - VA

Preliminary Recommendations

- Use Harmonic Mean to average/aggregate probe speeds
- Segment length
- Data archiving frequency: 5-, 10-, 15-, 30- and 60-min data
- Constrain Travel Time Index >= 1.0
- Use all time epochs data
- Documentation



DRAFT
May 5, 2015

Preliminary Recommendations on Probe Data Processing and Performance Measures Calculation[1]

Table 1 Summary of Preliminary Recommendations on Probe Data Processing

#	Recommendation	Reason	Possible consequence if recommendation not adopted
1	Use Harmonic Mean to calculate average probe speeds	Probe speed is Space Mean Speed	Underestimate congestion
2	Use segment length as a weight to calculate multi-segment, corridor, area or regional averages	Segment length plays a role in the value of certain performance measures	Biased averages (Note: use volume as another weight if available)
3	Use Reference Speed in calculating Travel Time Index (TTI) and constrain TTI >= 1	TTI could <= 1 if observed speed is higher than reference speed (for INRIX data)	Underestimate congestion
4	Use the raw data amalgamated with the same frequency (1-, 5-, 15-, 30-, OR 60-minute) for all performance measures	Data archive frequency could have significant impact on travel time reliability measures	Different values of the same reliability measure from differently archived raw data
5	Use the same calculation sequence to calculate a performance measure	Calculation sequence could have significant impact on travel time reliability measures	Different values of the same reliability measure from different calculation sequences
6	Use instantaneous travel time in calculating multi-segment or corridor travel time (for now)	No significant difference between instantaneous and experienced travel time observed based on limited investigation; experienced travel time is more difficult to calculate than instantaneous travel time	Note: if such multi-segment or corridor travel time will be compared to travel time obtained from re-identification methods, use experienced travel time instead
7	Use all time epochs even there are not enough real-time samples in an epoch (e.g., Score is 10 or 20 for VPP data or data is missing in NPMRDS)	Those epochs are an integral part of traffic operations	Biased results based on only higher volume conditions
8	Document all choices/options in any analysis to facilitate comparison to other analyses	facilitate analyses being comparable, consistent, and repeatable	Results of multiple analyses showing differences which are actually attributable only to inconsistent input assumptions

[1] A Discussion Draft for the May 14, 2015 Joint Meeting of the Vehicle Probe Data Users Group (VPDUG) and the Management, Operations and Intelligent Transportation Systems (MOITS) Subcommittee of the National Capital Region Transportation Planning Board (TPB). **Please send comments to Wenjing Pu** (wpu@mwcog.org).

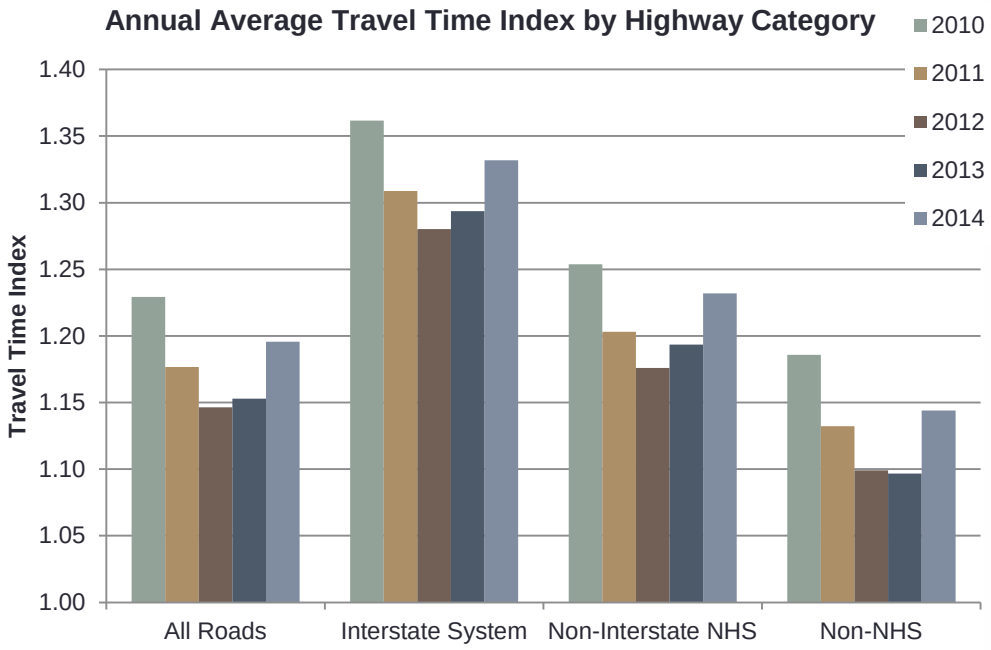
Vehicle Probe Data Users Group Preliminary Recommendations on Probe Data Processing 1

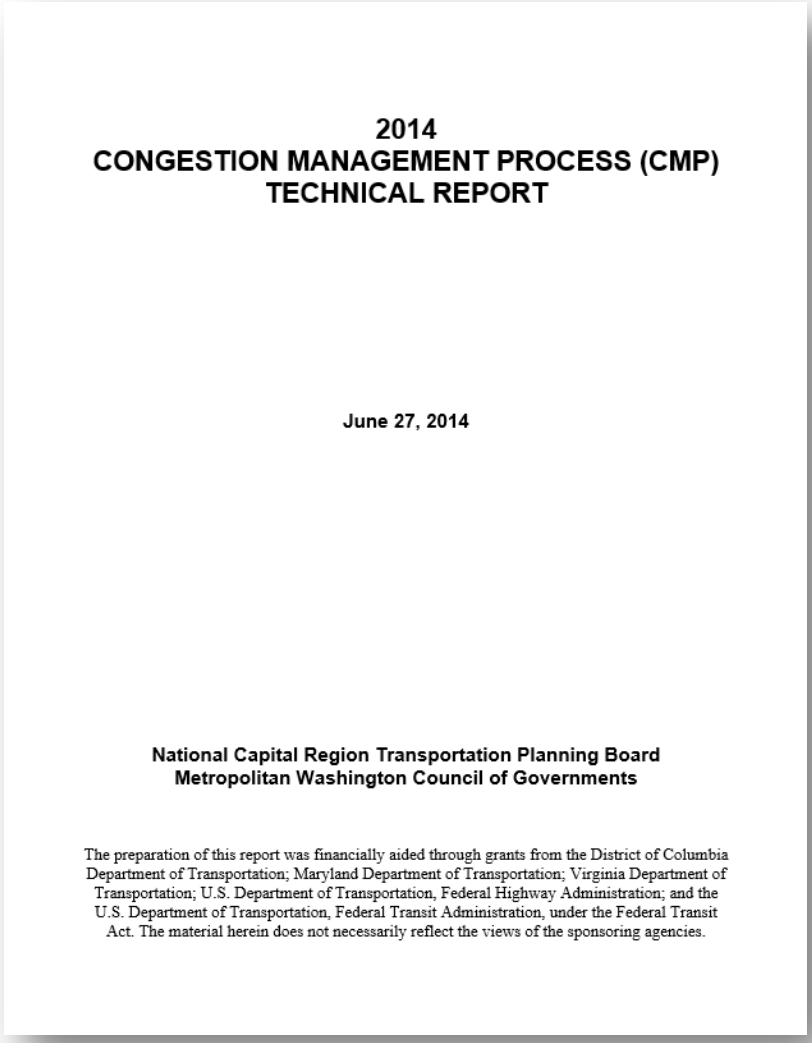
Forecasting Trends

- Hope that the Rulemaking would provide specifications
- What if those specifications are not specific enough?
- Currently, what are the methodologies for forecasting congestion/system performance trends (if any)?
  - DC
  - MD
  - VA

Congestion Management Process (CMP) Technical Reports

- Biennial Reports
- State of congestion
- CMP Strategies
- www.mwcog.org/cmp





2014
CONGESTION MANAGEMENT PROCESS (CMP)
TECHNICAL REPORT

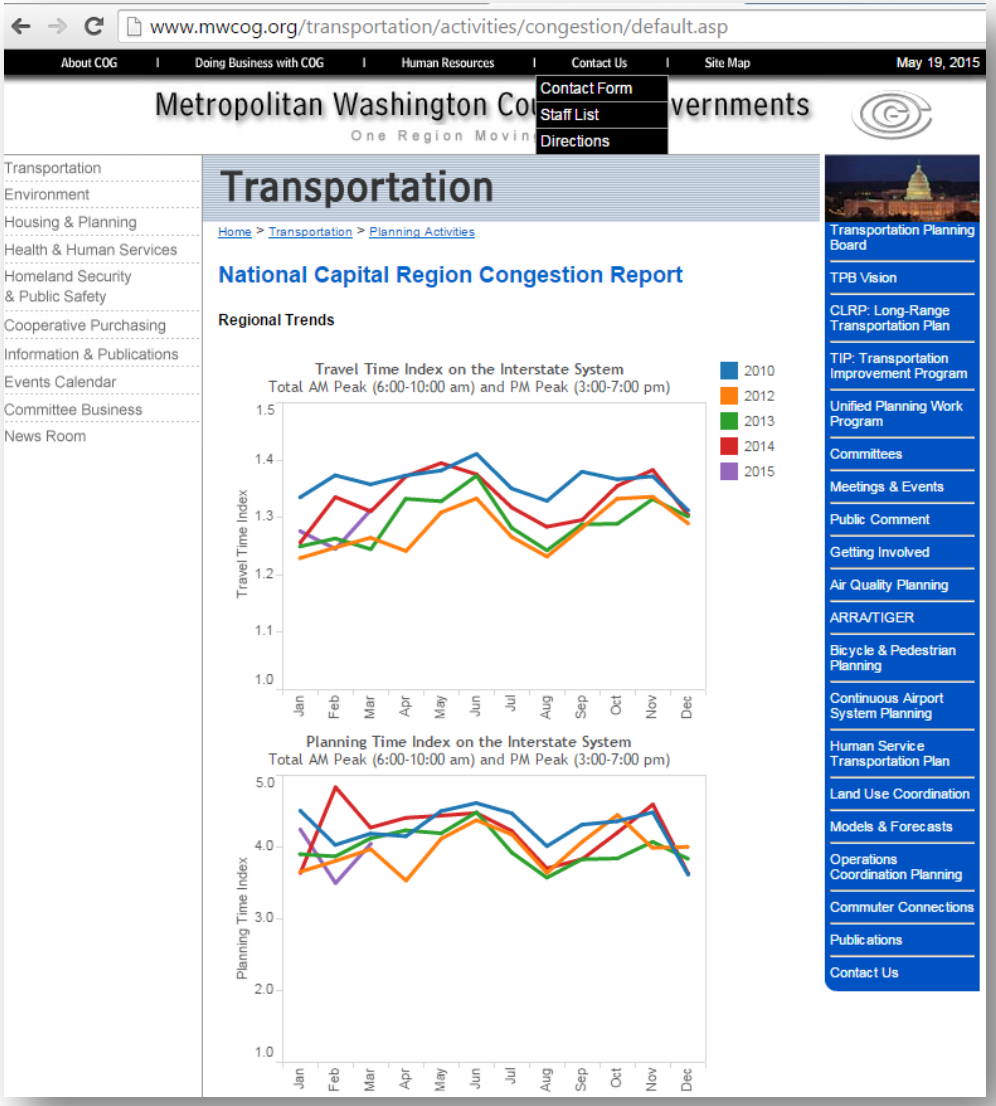
June 27, 2014

National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments

The preparation of this report was financially aided through grants from the District of Columbia Department of Transportation; Maryland Department of Transportation; Virginia Department of Transportation; U.S. Department of Transportation, Federal Highway Administration; and the U.S. Department of Transportation, Federal Transit Administration, under the Federal Transit Act. The material herein does not necessarily reflect the views of the sponsoring agencies.

Congestion Dashboard

- Webpage (www.mwcog.org/congestion)
- PDF document



Regional Overall Trend:

Congestion

Congestion – Travel Time Index (TTI)

Interstate System

TTI 1st Quarter 2015:	1.28	↓1.7% or 0.02[1]
TTI Trailing 4 Quarters:	1.33	↑1.6% or 0.02[2]

Transit-Significant[4] (New)

TTI 4th Quarter 2015:	1.21	↓1.7% or 0.02
TTI Trailing 4 Quarters:	1.25	↑3.0% or 0.04

Non-Interstate NHS[3]

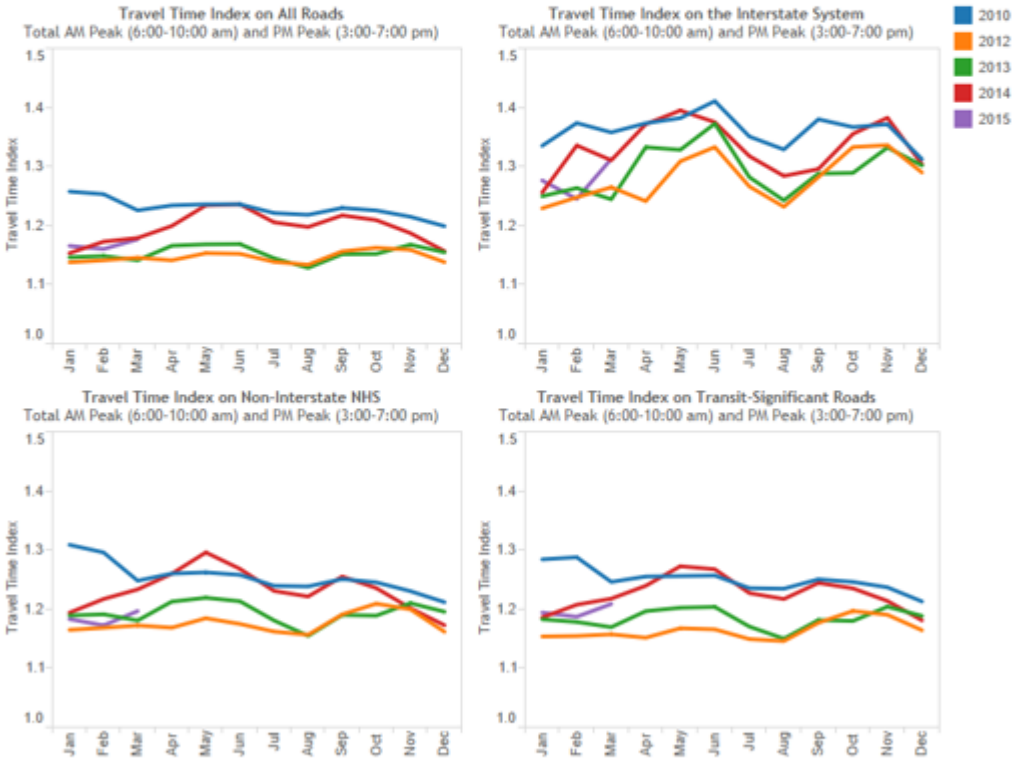
TTI 1st Quarter 2015:	1.18	↓2.5% or 0.03
TTI Trailing 4 Quarters:	1.22	↑2.0% or 0.02

All Roads

TTI 1st Quarter 2015:	1.17	↓0.1% or 0.001
TTI Trailing 4 Quarters:	1.20	↑3.2% or 0.04

[1] Compared to 1st quarter 2014; [2]Compared to one year earlier; [3] NHS: National Highway System; [4]See page 11.

Figure 1. Monthly average Travel Time Index for Total AM peak (6:00-10:00 am) and PM peak (3:00-7:00 pm)



Travel Time Index

Travel Time Index (TTI), defined as the ratio of actual travel time to free-flow travel time, measures the intensity of congestion. The higher the index, the more congested traffic conditions it represents, e.g., TTI = 1.00 means free flow conditions, while TTI = 1.30 indicates the actual travel time is 30% longer than the free-flow travel time.

Regional Overall Trend:

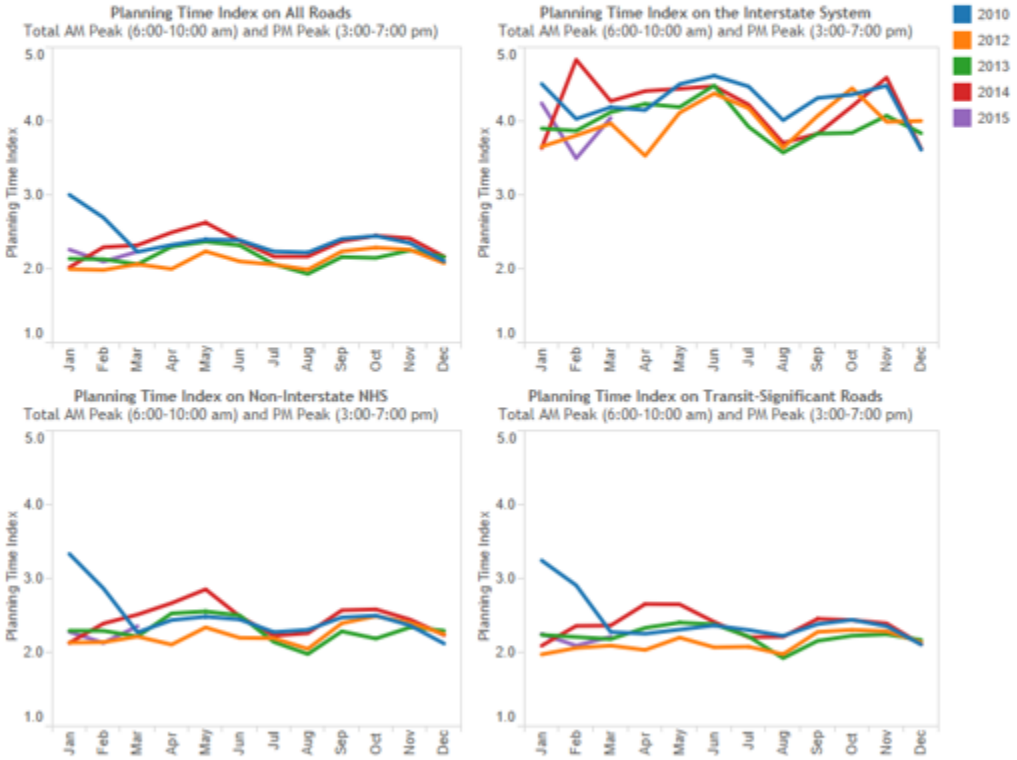
Reliability

Reliability – Planning Time Index (PTI)

Interstate System			**Non-Interstate NHS[3]**		
PTI 1st Quarter 2015:	3.93	↓7.5% or 0.32[1]	PTI 1st Quarter 2015:	2.25	↓3.9% or 0.09
PTI Trailing 4 Quarters:	4.11	↑1.1% or 0.05[2]	PTI Trailing 4 Quarters:	2.42	↑4.5% or 0.10
Transit-Significant[4] (New)			**All Roads**		
PTI 1st Quarter 2015:	2.18	↓3.8% or 0.09	PTI 1st Quarter 2015:	2.20	↓0.6% or 0.01
PTI Trailing 4 Quarters:	2.34	↑4.5% or 0.10	PTI Trailing 4 Quarters:	2.32	↑5.6% or 0.12

[1] Compared to 1st quarter 2014; [2]Compared to one year earlier; [3] NHS: National Highway System; [4]See page 11.

Figure 2. Monthly average Planning Time Index for Total AM peak (6:00-10:00 am) and PM peak (3:00-7:00 pm)



Planning Time Index

Planning Time Index (PTI), defined as the ratio of 95th percentile travel time to free flow travel time, measures travel time reliability. The higher the index, the less reliable traffic conditions it represents, e.g., PTI = 1.30 means a traveler has to budget 30% longer than the uncongested travel time to arrive on time 95% of the times (i.e., 19 out of 20 trips).

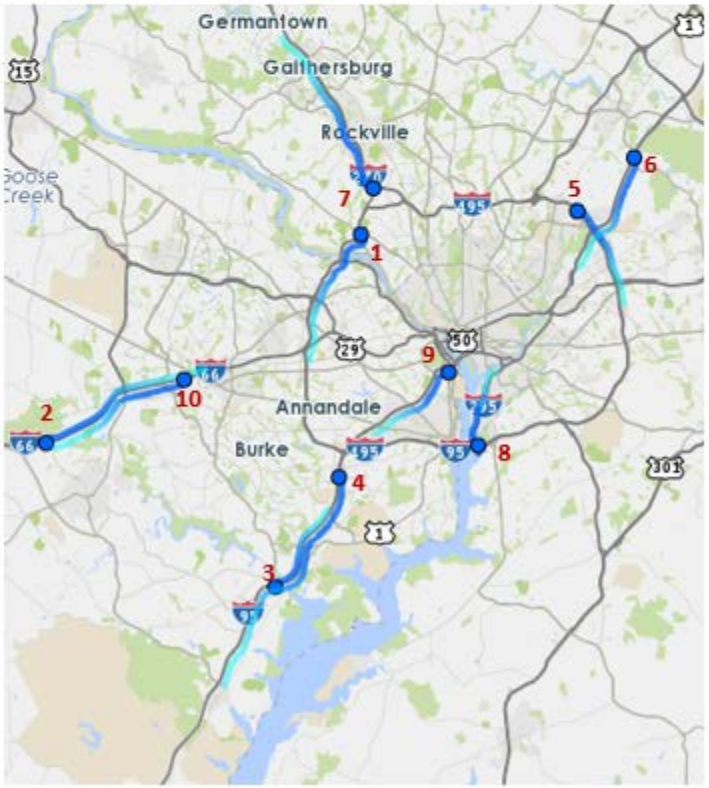
Top 10 Bottlenecks:

Overview

Top 10 Bottlenecks

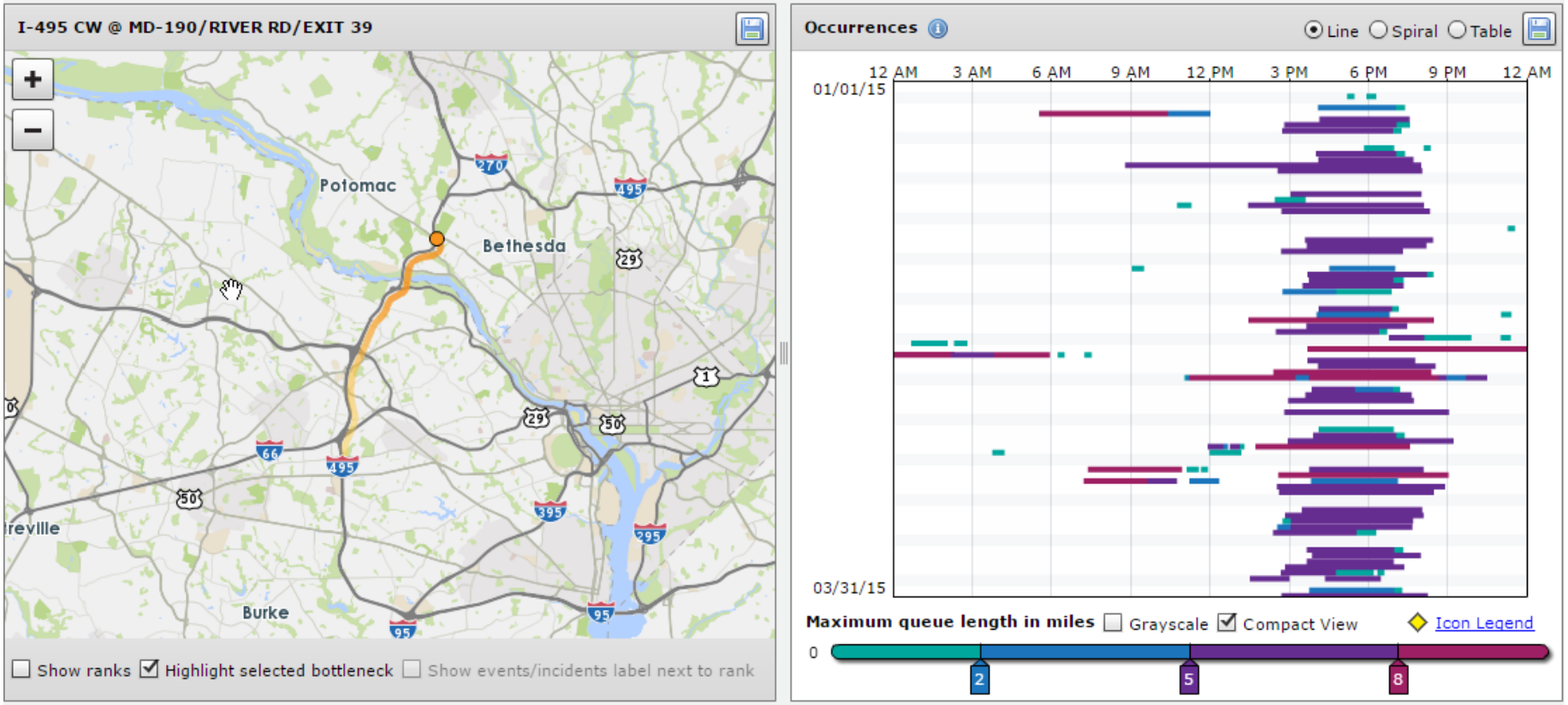
Rank (Last Quarter Rank)	Location	Average duration	Average max length (miles)	Occur-rences	Impact factor
1 (3)*	I-495 CW @ MD-190/RIVER RD/EXIT 39	2 h 37 m	8.86	181	251,720
2 (1)	I-66 W @ VA-234/EXIT 47	2 h 16 m	10.93	144	214,036
3 (11)	I-95 S @ VA-123/EXIT 160	2 h 26 m	5.42	216	170,914
4 (2)	I-95 N @ VA-7900/EXIT 169	1 h 43 m	16.11	96	159,334
5 (6)	I-495 CCW @ GREENBELT METRO DR/EXIT 24	1 h 39 m	6.85	208	140,995
6 (>30)	MD-295 N @ MD-197/EXIT 11	3 h 17 m	7.04	101	140,118
7 (5)	I-270 S @ I-270	1 h 55 m	10.8	106	131,672
8 (10)	I-295 S @ I-495/I-95/EXIT 2A - B	2 h 22 m	5.02	178	126,770
9 (20)	I-395 N @ EADS ST	1 h 50 m	6.18	186	126,388
10 (23)	I-66 E @ MONUMENT DR	1 h 46 m	8.1	130	111,673

** See "Bottlenecks" section in the "Background" chapter for ranking variability from quarter to quarter.*



(Source: I-95 Corridor Coalition Vehicle Probe Project Suite, Bottleneck Ranking Tool.)

Visualization of Top 10 Bottlenecks

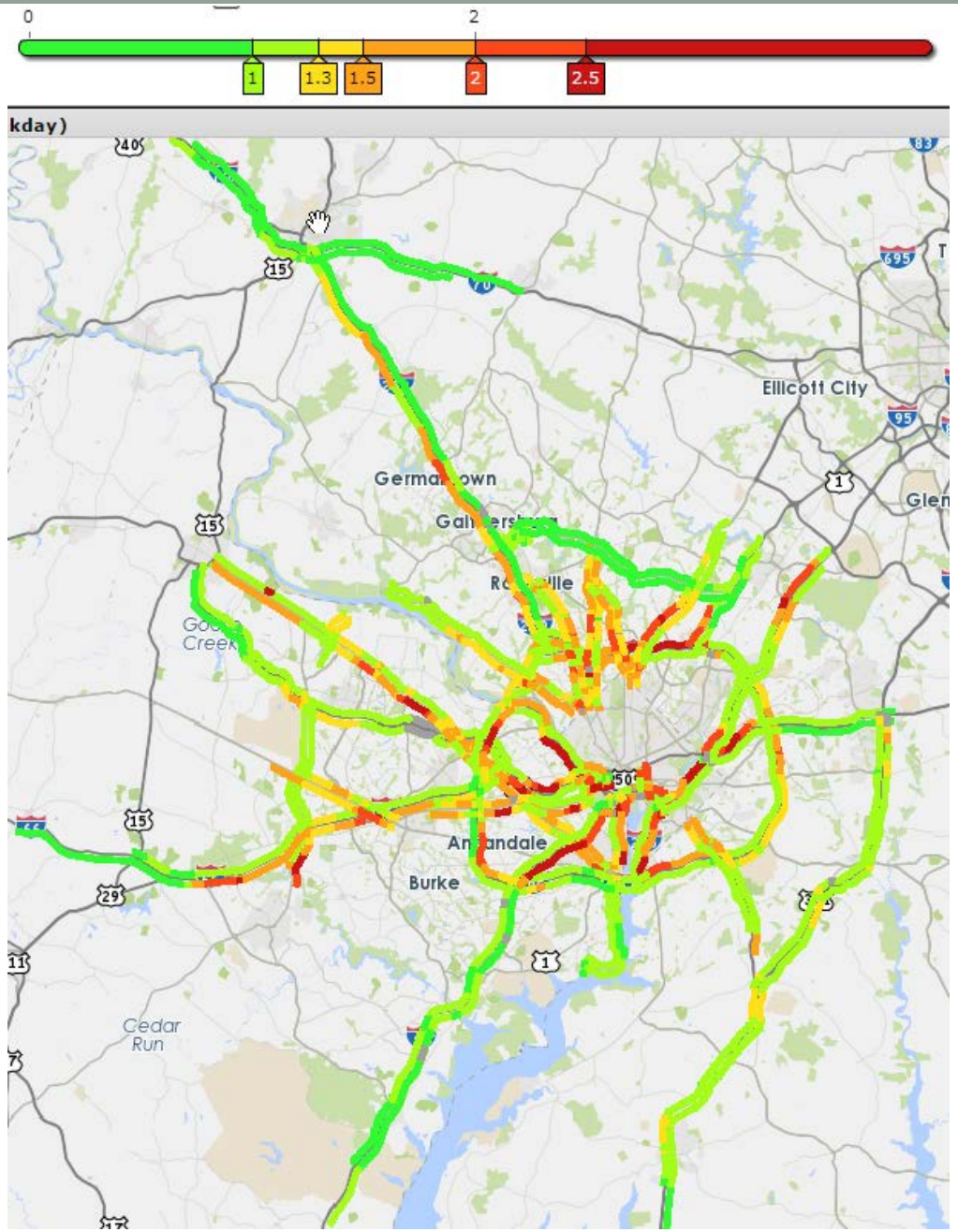


(Source: I-95 Corridor Coalition Vehicle Probe Project Suite, Bottleneck Ranking Tool.)

Congestion Map:

AM Peak Hour

Travel Time Index



(Source: I-95 Corridor Coalition Vehicle Probe Project Suite, Trend Maps Tool.)

Questions for the Future

- What is the business model for a transportation agency to embrace the so called “Big Data” era?
  - Big data: probe speed, real-time & archive OD/volume/population, connected/autonomous vehicles, etc.
  - In-house, contracting out (individual; pooled fund), mixed
- What is the role of federal governments in “Big Data” era?
  - Is NPMRDS a model?
  - National procurement
    - Standardization of data elements
  - How about storage, processing, and performance measures calculation?
  - Best practice