

Measuring Supply Chains for Freight Fluidity From a Corridor Perspective

Reflections from I-95 Corridor Coalition Freight Fluidity Measures Pilot Project

TRB Workshop - Advancing Freight Fluidity Performance Measures

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Project Background

- **Objective**

- Demonstrate and improve the measurement of freight transportation performance using a supply chain perspective
- ➔ **End to end** conception of performance and measurement, across modes and stages

- **Case Study Sponsors**

- I-95 Corridor Coalition, Intermodal Committee
- FHWA, Office of Freight Management
- U.S. Department of Commerce, Advisory Committee on Supply Chain Competitiveness

Why the I-95 Corridor Coalition?

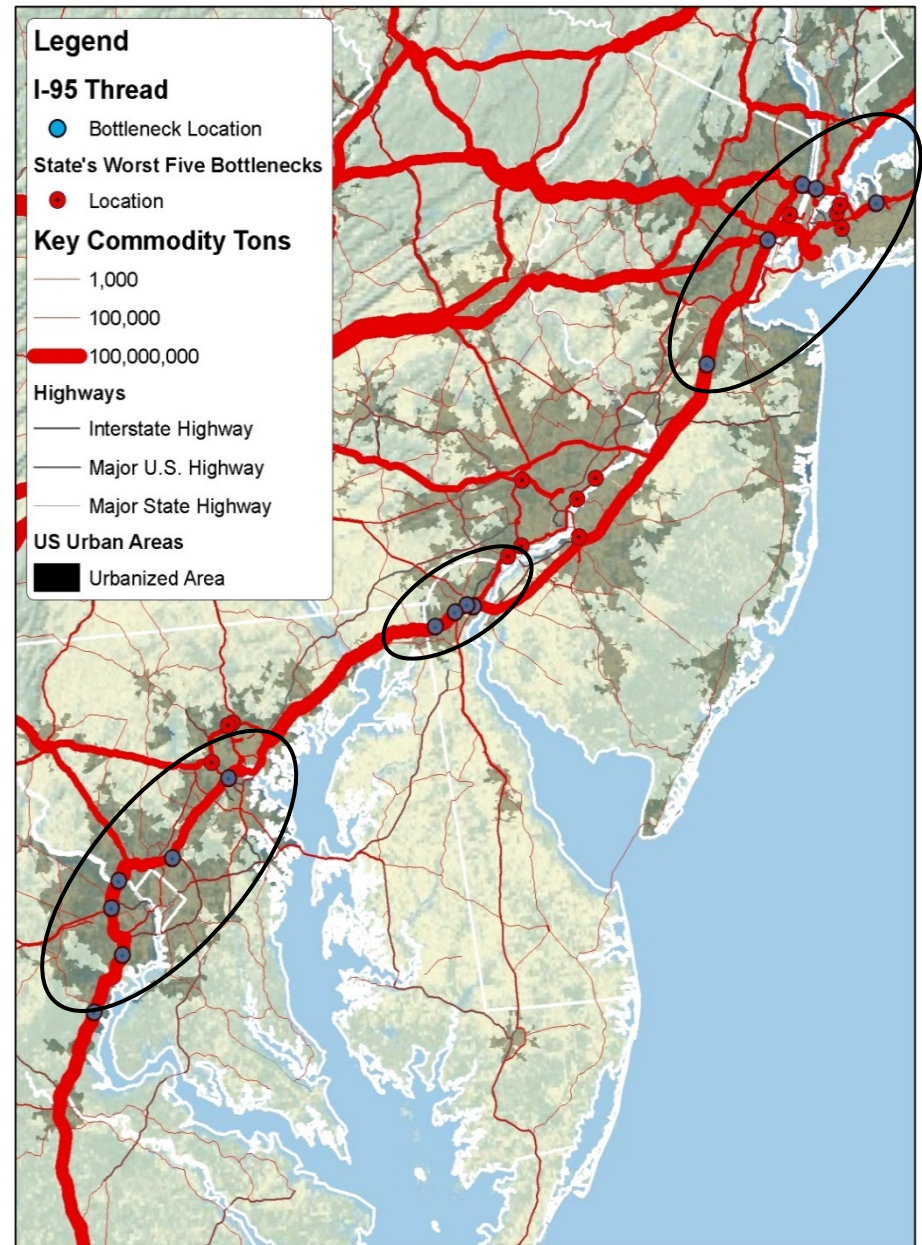
Supply chains and supply chain performance are multi-jurisdictional. So are we:

- 16 states with District of Columbia:
 - \$4.7 trillion economy (40% of US GDP)
 - 21% of nation's road miles; 35% of nation's VMT
 - 5.3 billion tons of freight shipments annually
 - Multimodal corridor
- 2 Canadian Provinces (Quebec, New Brunswick)

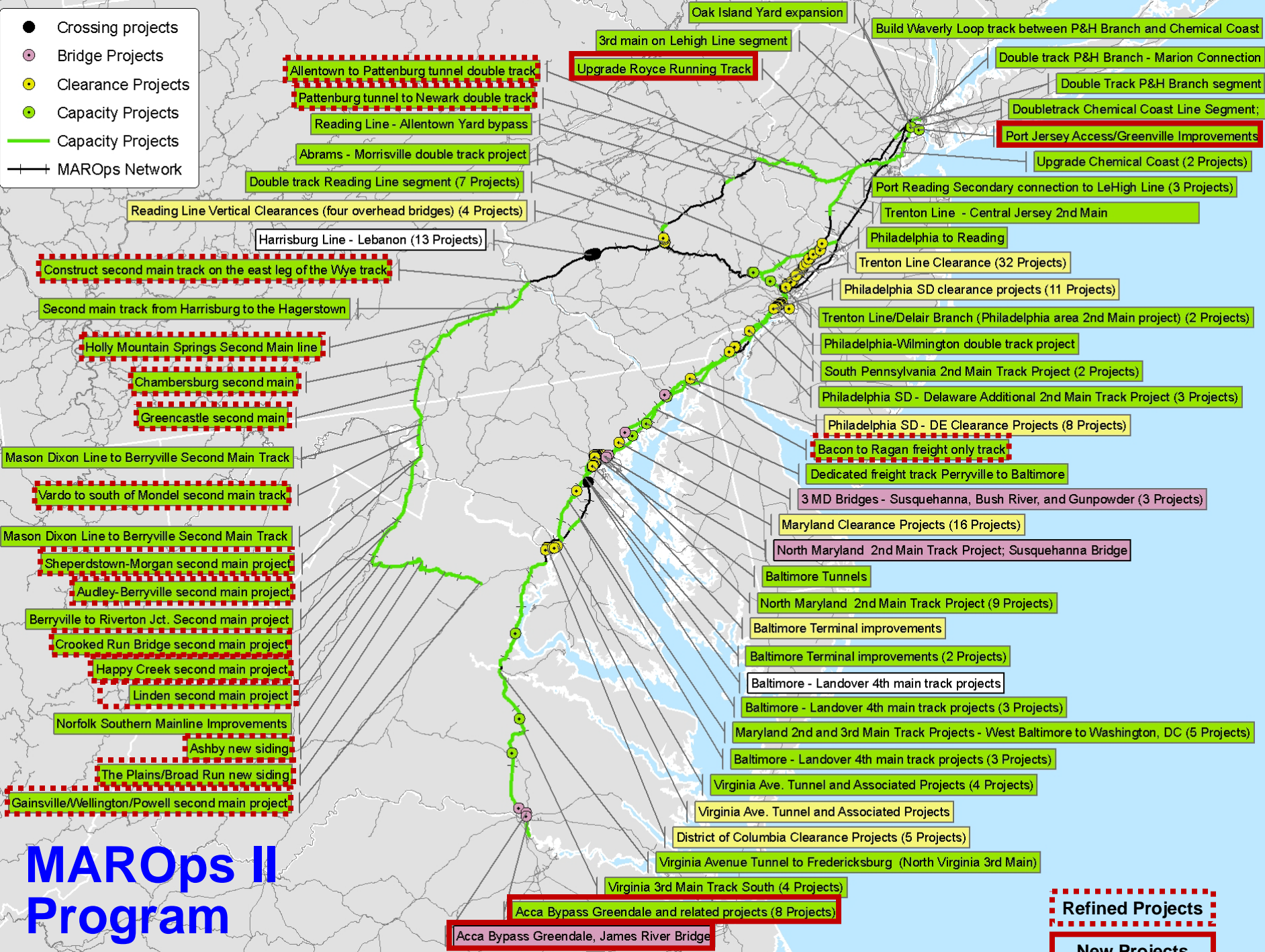


Freight Corridors & Bottleneck Strings

- I-95 Trunk Line Bottleneck Strings
 - I-95 New York/New Jersey Bottleneck String
 - I-95 Wilmington Bottleneck String
 - I-95 Baltimore/Washington Bottleneck String



- Crossing projects
- ⊙ Bridge Projects
- Clearance Projects
- ⊙ Capacity Projects
- Capacity Projects
- + MAROps Network



Allentown to Pottsville tunnel double track
 Pottsville tunnel to Newark double track

Upgrade Royce Running Track

Oak Island Yard expansion
 Build Waverly Loop track between P&H Branch and Chemical Coast

Double track P&H Branch - Marion Connection

Double Track P&H Branch segment

Doubletrack Chemical Coast Line Segment

Port Jersey Access/Greenville Improvements

Upgrade Chemical Coast (2 Projects)

Port Reading Secondary connection to LeHigh Line (3 Projects)

Trenton Line - Central Jersey 2nd Main

Philadelphia to Reading

Trenton Line Clearance (32 Projects)

Philadelphia SD clearance projects (11 Projects)

Trenton Line/Delair Branch (Philadelphia area 2nd Main project) (2 Projects)

Philadelphia-Wilmington double track project

South Pennsylvania 2nd Main Track Project (2 Projects)

Philadelphia SD - Delaware Additional 2nd Main Track Project (3 Projects)

Philadelphia SD - DE Clearance Projects (8 Projects)

Bacon to Ragan freight only track

Dedicated freight track Perryville to Baltimore

3 MD Bridges - Susquehanna, Bush River, and Gunpowder (3 Projects)

Maryland Clearance Projects (16 Projects)

North Maryland 2nd Main Track Project; Susquehanna Bridge

Baltimore Tunnels

North Maryland 2nd Main Track Project (9 Projects)

Baltimore Terminal improvements

Baltimore Terminal improvements (2 Projects)

Baltimore - Landover 4th main track projects

Baltimore - Landover 4th main track projects (3 Projects)

Maryland 2nd and 3rd Main Track Projects - West Baltimore to Washington, DC (5 Projects)

Baltimore - Landover 4th main track projects (3 Projects)

Virginia Ave. Tunnel and Associated Projects (4 Projects)

Virginia Ave. Tunnel and Associated Projects

District of Columbia Clearance Projects (5 Projects)

Virginia Avenue Tunnel to Fredericksburg (North Virginia 3rd Main)

Virginia 3rd Main Track South (4 Projects)

Acca Bypass Greendale and related projects (8 Projects)

Acca Bypass Greendale, James River Bridge

Double track Reading Line segment (7 Projects)

Reading Line Vertical Clearances (four overhead bridges) (4 Projects)

Harrisburg Line - Lebanon (13 Projects)

Construct second main track on the east leg of the Wye track

Second main track from Harrisburg to the Hagerstown

Holly Mountain Springs Second Main line

Chambersburg second main

Greencastle second main

Mason Dixon Line to Berryville Second Main Track

Vardo to south of Mondel second main track

Mason Dixon Line to Berryville Second Main Track

Sheperdstown-Morgan second main project

Audley-Berryville second main project

Berryville to Riverton Jct. Second main project

Crooked Run Bridge second main project

Happy Creek second main project

Linden second main project

Norfolk Southern Mainline Improvements

Ashby new siding

The Plains/Broad Run new siding

Gainsville/Wellington/Powell second main project

MAROps II Program

Refined Projects

New Projects

Freight Corridor Approach for Analysis and Investment

Public contribution to supply chain performance crosses many lines:

- Conditions: urban & rural
- Agencies: MPOs, state, ports, etc.
- Modes & sectors

Freight Corridor approach can take advantage of working corridor coalition models that support:

- Multiple players & condition
 - Including Megaregion multijurisdictional economies
- Cooperative performance improvement
- Larger perspective, supply-chain style
- Leveraging data acquisition

Freight Corridor approach suits the emerging environment:

- New Transportation Authorization Legislation (Nationally Significant Freight/Highway Program)



Why Supply Chains

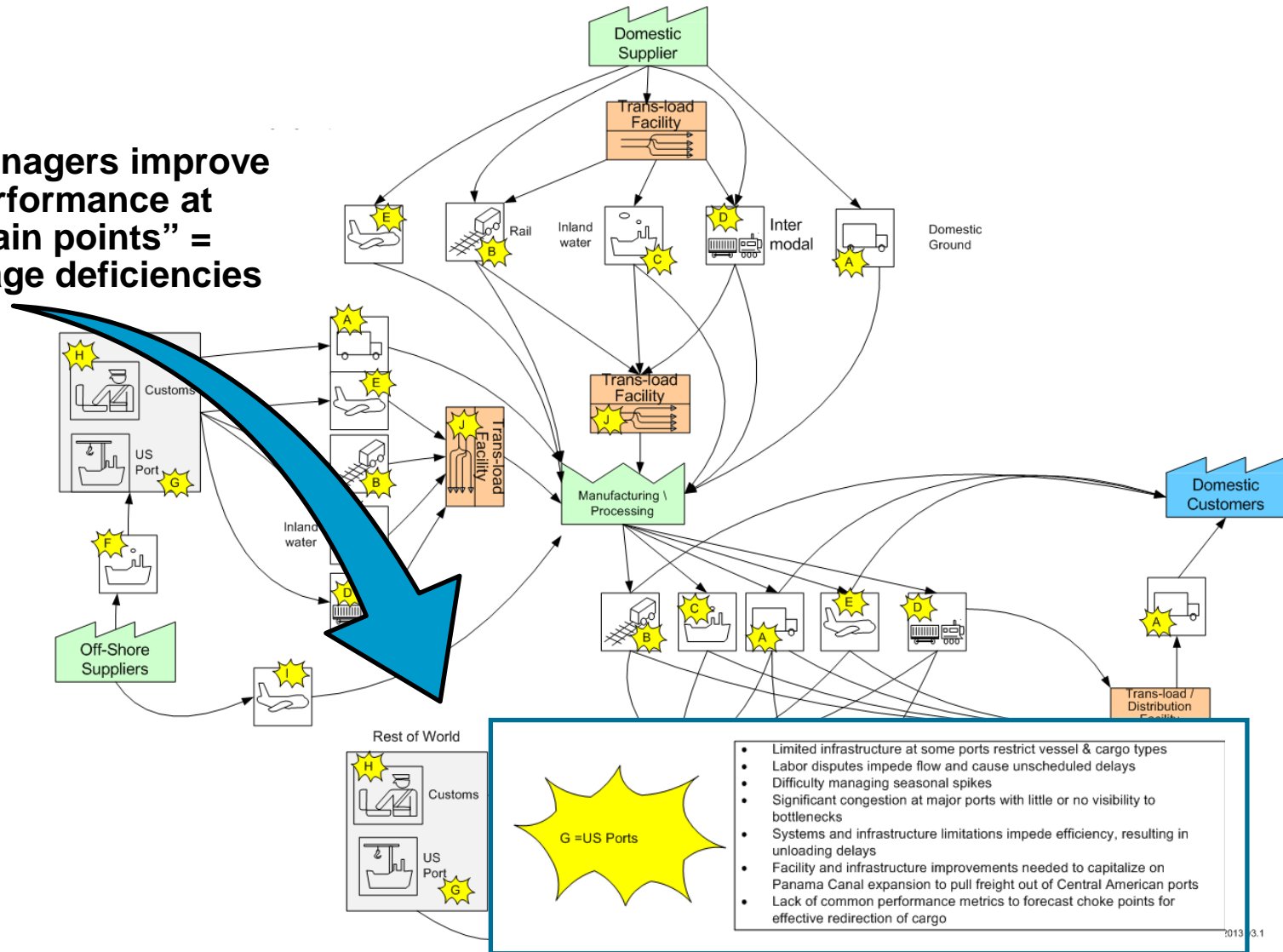


- It's how our freight users do business
- Supply chain performance feeds economic competitiveness
- Performance is end-to-end: sum of stages
- Stages put local dynamics in larger perspective: user view, market view

➔ What's our role?

Supply Chains are Complex, but Manageable

Managers improve performance at “pain points” = stage deficiencies



Multimodal Supply Chain Case Studies

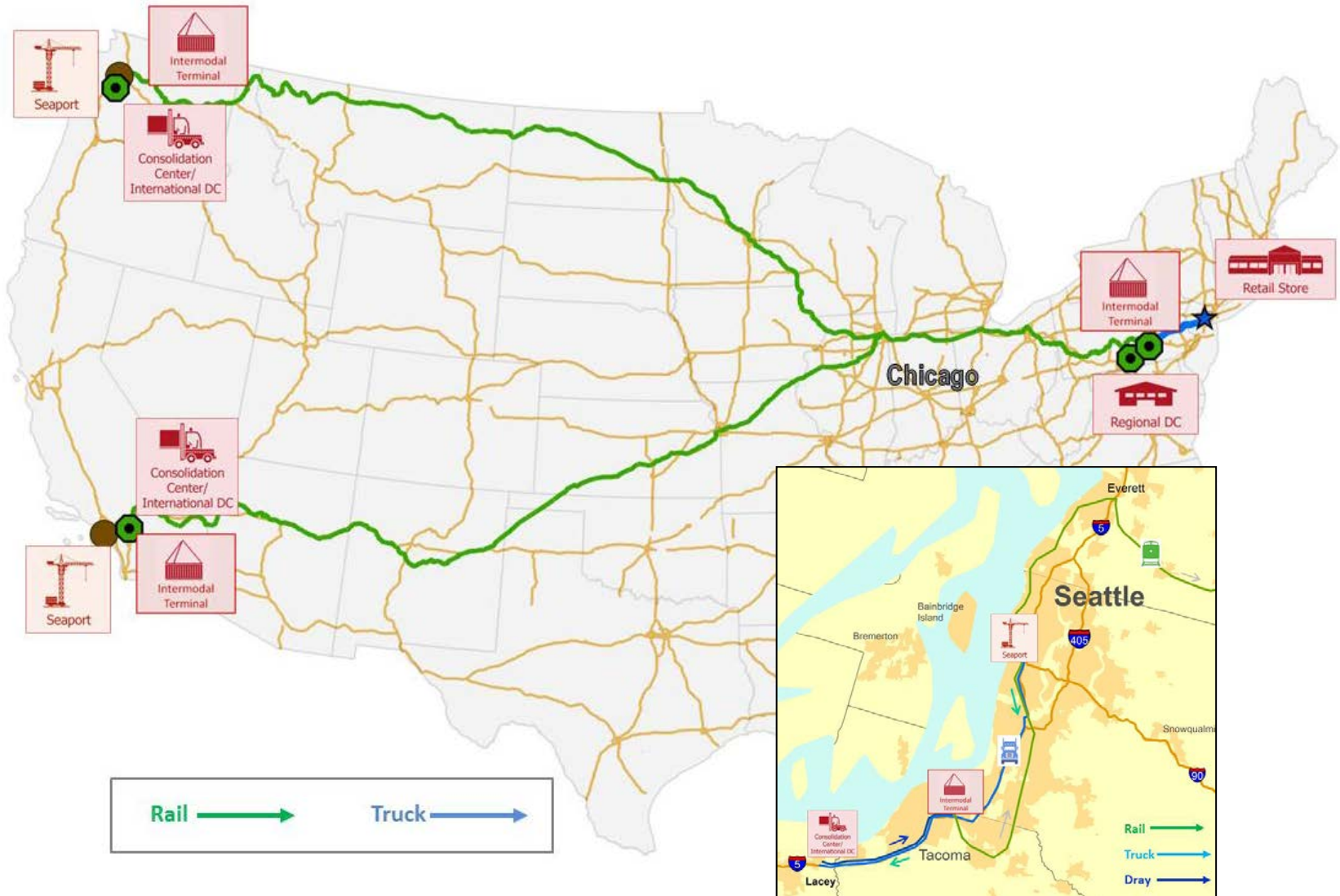
- **Autos – General Motors auto parts**
 - From US and NAFTA suppliers to auto assembly plant in Tennessee
- **Retail – Target® consumer goods**
 - From Ports of Los Angeles/Long Beach and Seattle/Tacoma via Chicago to metropolitan New York
- **Electronics – Panasonic electronics**
 - Between manufacturing and assembly facilities in San Diego and Tijuana
- **Agriculture – Soybean exports**
 - From Illinois farms to Louisiana port
- **Food – Perdue processed chicken**
 - From DelMarVa region to Mid-Atlantic markets

What Data: Performance Measures and Metrics

Market-Driven Factors

Measure	Metric
Transit time	Travel time in days (or hours)
Reliability	95% travel time in days (or hours)
Cost	Dollars
Safety	Fatality and injury rate
Risk	Disruption <i>(storms, labor, infrastructure failure, political forces...)</i>
	Capacity expansion delays <i>(physical, regulatory limitations and delays...)</i>

Case Example: Retail Supply Chain (*Target*)



Retail Supply Chain Measures

Seattle to New York

Links and Nodes	Sources	Notes
West Coast port (Seattle)		
Dray move	ATRI, Chainalytics	
<i>Transload or Consolidation Center</i>		
Dray move	ATRI, Chainalytics	
West Coast rail intermodal terminal	TransCore, Chainalytics	
Rail move	TransCore, Chainalytics	
Midwest rail intermodal interchange	TransCore, Chainalytics	
Rail move		Available for purchase
East Coast rail intermodal terminal		Available for purchase
Dray move	ATRI, Chainalytics	
<i>East Coast Regional Distribution Center</i>		
Truck P&D move	ATRI, Chainalytics	
<i>Retail Store</i>		

Retail Supply Chain Performance

Seattle to New York

Links and Nodes	Transit Time/Dwell Time (Hours)	Reliability (95% travel time)	Cost (2014 \$'s)
<i>West Coast port (Seattle)</i>			
Dray move	1.0	1.4	\$299
<i>Transload or Consolidation Center</i>			
Dray move	1.0	2.25	\$308
<i>West Coast rail intermodal terminal</i>			
Rail move	104	154	\$3,178
<i>Midwest rail intermodal interchange</i>			
Rail move	71	160	
<i>East Coast rail intermodal terminal</i>			
Dray move	1.1	1.4	\$318
<i>East Coast Regional Distribution Center</i>			
Truck P&D move	6.0	9.5	\$775
<i>Retail Store</i>			
Totals			\$4,878

Estimated using **ATRI** data for truck transit times, **TransCore** data for rail times, **Chainalytics** data for costs. Reliability factor for Midwest interchange was produced for sum of West Coast plus Midwest dwell, but most of delay is in Midwest (Chicago)

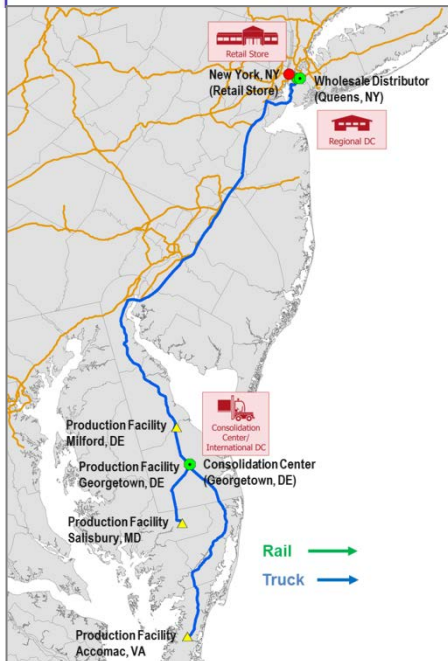
Sources for Modal Fluidity Data

Measure	Mode	Sources
Transit Time & Reliability	Truck	ATRI, NPMRDS, Google/TTI (& others)
	Rail Intermodal	TransCore (& Railinc)
	Rail Carload	RSI Logistics (& Railinc)
	Waterway	ACE Automatic Identification System
	Port (dwell)	ATRI (some)
Cost	Truck	Chainalytics
	Rail Intermodal	Chainalytics
	Rail Carload	STB Waybill
	Waterway	ACE (partial)

Some things we learned...

Processed Food Supply Chain Performance

Links and Nodes	Transit Time/ Dwell Time (Hours)	Reliability (95% travel time)	Cost (2013)
<i>Production Facility, Accomac, VA</i>			
Truckload move	1.6 hours	1.8 hours	\$580
<i>Consolidation Facility, Georgetown, DE</i>			
Truckload move	3.7 hours	4.4 hours	\$886
<i>Distribution Facility, Brooklyn, NY</i>			
Totals	5.3 hours	6.2 hours	\$1,466



Recent research shows 2 things:

- We can understand supply chains, and “know where we are”
- We can measure supply chain performance, and know where to focus

Experience shows 2 things:

- Data reveal symptoms, not diagnosis and treatment
- Solutions are cooperatively created, and multifaceted: investment + operations + visibility + policy

Findings

- **We can measure and track the high-level performance of representative supply chains with market-driven metrics**
- **Key measures and metrics are common across supply chains and can be scaled for national, multistate and metropolitan use**
 - Travel time and travel time reliability are available from public and private sources, but “some assembly is required...”
 - Cost data can be purchased from private suppliers, Safety data available / risk data can be estimated, but not readily accessible
- **Supply chain performance measurement could have significant benefits to State DOTs and MPOs along the corridor**
 - Addressing Freight bottlenecks
 - Targeting Investment
 - Identifying critical supply chain routes /alternative paths for disaster/emergency recovery

Some Recommendations to consider

- **Look at representative supply chains serving key industries across a freight corridor**
- **Work with agencies to determine appropriate performance measures and data granularity needed**
 - Level of granularity will differ for industries, supply chains, geographies – Need must be determined
- **Need to continue to improve state of knowledge and practice related to supply chains, data and performance metrics**
- **Potential for Model Data Acquisition Contracts on Corridor Basis (i.e. I-95 VPP)**
 - Could be effective particularly for Volume O&D, RR and Port data
- **Are there projects based on corridors/supply chain applicable to FAST Act “Nationally Significant Projects Program”**

In closing ...

- **We need to understand supply chains on a corridor basis because supply chains function across multiple jurisdictions and over corridors**
- **Investment decisions that do not look at the compendium of improvement projects across a freight corridor may leave bottlenecks/disruptions in the supply chain**



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