

FHWA FREIGHT FLUIDITY PROGRAM

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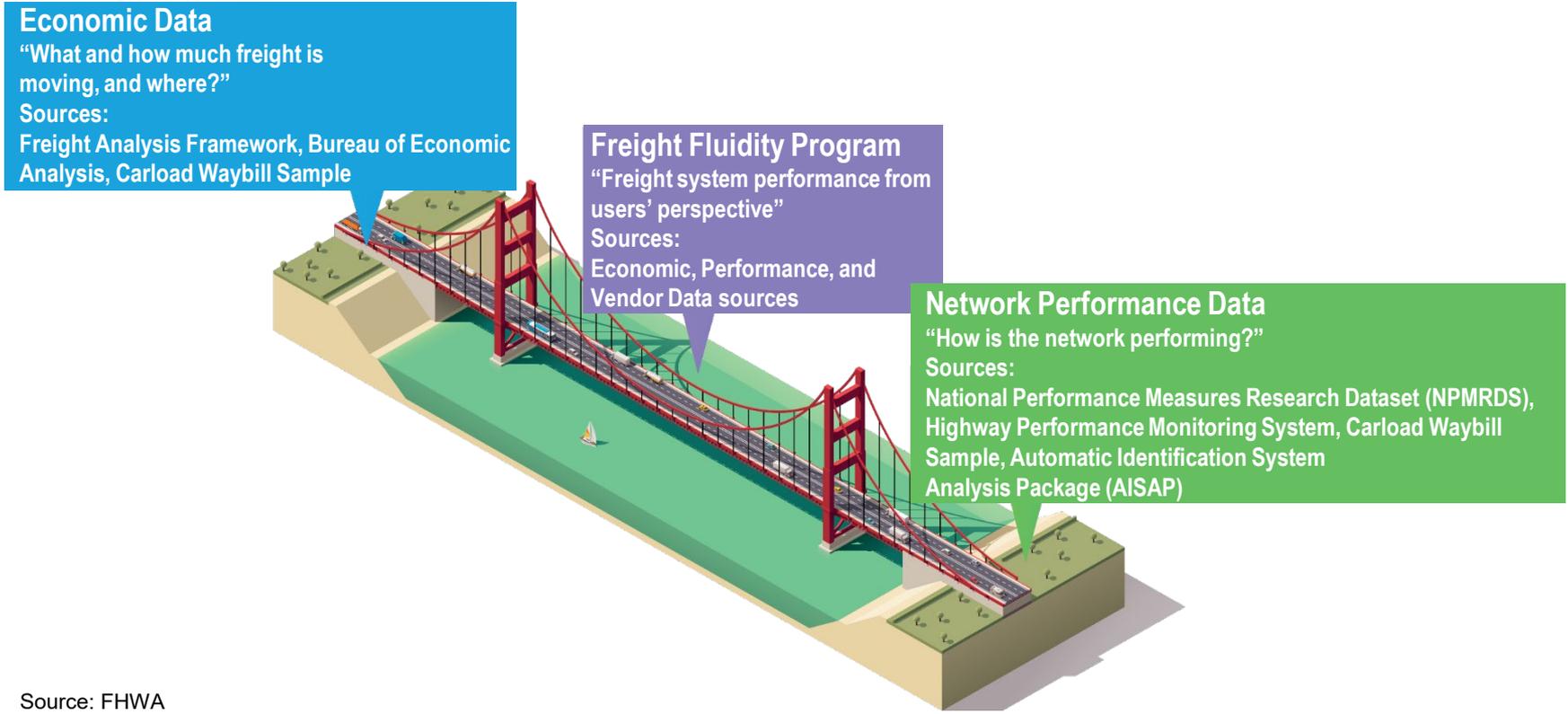
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FLUIDITY BRIDGES AND LEVERAGES EXISTING DATA PROGRAMS



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Source: FHWA

Fluidity is a bridge between economic and network data, showing how freight flows and facility measures merge into effects on multi-stage, multimodal industrial performance

THE PRODUCT



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- A new USDOT-owned database of information, with a visualization and mapping tool to record and report three types of performance metrics across multiple modes, scalable to future expansion and enhancement.
- A major advance beyond highway-only metrics, allowing us to measure performance from the supply chain perspective and identify critical flows/connections, bottlenecks and improvement opportunities over the larger multimodal system.

Current System Performance Capture (Typical)	Freight Fluidity Performance Capture
Travel Time	Travel Time (Industry/Supply Chain)
Travel Time Reliability	Travel Time Reliability (Industry/Supply Chain)
Cost of Wasted Time and Fuel	Transportation Cost (Market Price, Industry/Supply Chain)
Highway Only	Multimodal: Highway, Rail (IMX & Carload), Water

Source: FHWA

DATA – SUPPLY CHAIN DEFINITION



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30 major U.S. companies identified to represent a broad cross-spectrum of industry sectors, commodities, modes

- 24 at national level, 6 regionally focused on NY/NJ and Chicago areas
- Through interviews, industries shared “wiring diagrams” of their most critical supply chains, without revealing other business-sensitive information

Contribution to national gross domestic product (GDP) and projected growth among freight-dependent industries

Geographic coverage of U.S.: regions, urban centers, rural areas, gateways, corridors, direction of travel

Contribution to regional GDP and projected growth among freight-dependent industries

Industry importance to resilience of other supply chains and of population

Industry importance to U.S. trade

Modal and travel distance diversity

DATA – PERFORMANCE METRICS



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- Customer Prices:
 - Truck and Rail Intermodal Price data purchased from commercial aggregator
 - Rail Carload Price data estimated by consultant team from Surface Transportation Board (STB) Waybill
- Travel Time (with Reliability measured as variations in travel time)
 - Water data provided by U.S. Army Corps of Engineers Automatic Identification System, with detailed analysis by the Bureau of Transportation Statistics – 25%, 50%, 75% percentiles
 - Rail carload and intermodal travel time data purchased from commercial aggregator – 50% and 95% percentiles -- some routes not available
 - Truck data developed through analysis of FHWA's National Performance Management Research Data Set (NPMRDS)
 - FHWA acquired first NPMRDS in July 2013, second version in April 2017; see https://ops.fhwa.dot.gov/perf_measurement/index.htm
 - Aggregates observed travel times from vehicle-based probes on Traffic Message Channels (TMCs) over five minute intervals, continuously, for freight and passenger vehicles

SOFTWARE PLATFORMS



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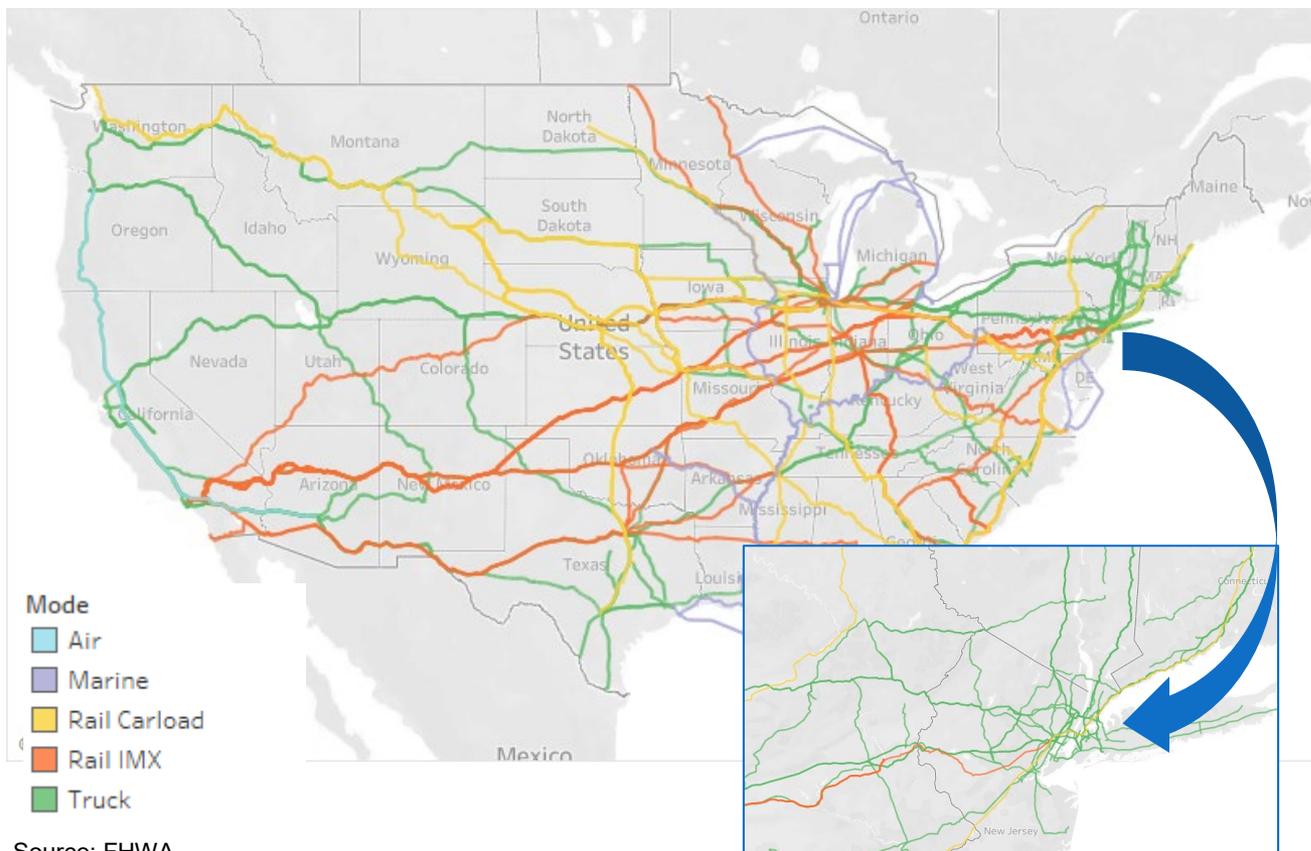
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- Two integrated platforms, both from existing suite of FHWA freight measurement tools:
 - Excel database and Tableau data analysis/visualization
 - FHWA/HOFM GIS data visualization tools, fed from database
- The software platforms meet key criteria:
 - Ability to hold and process large data sets in time series
 - Accessibility of data to internal and external users, via export into common formats such as spreadsheet software, and directly on the platform without purchase of special tools.
 - Ability to restrict access to certain types or levels of data
 - Varied and high quality graphical and cartographical displays
 - Stability as dependable, tested tools
- Open-ended to support additional industries, travel lanes, modal details, data periods, performance calculations – maintainable, expandable

MODE/ GEOGRAPHY COVERAGE



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- Each data record has an assigned path including NHS segment, rail network, waterway network that allows any data attribute or value to be displayed at a path level.
- Captures moves in almost every State, most major metro areas, the national highway freight network from the limited 30 industry sample

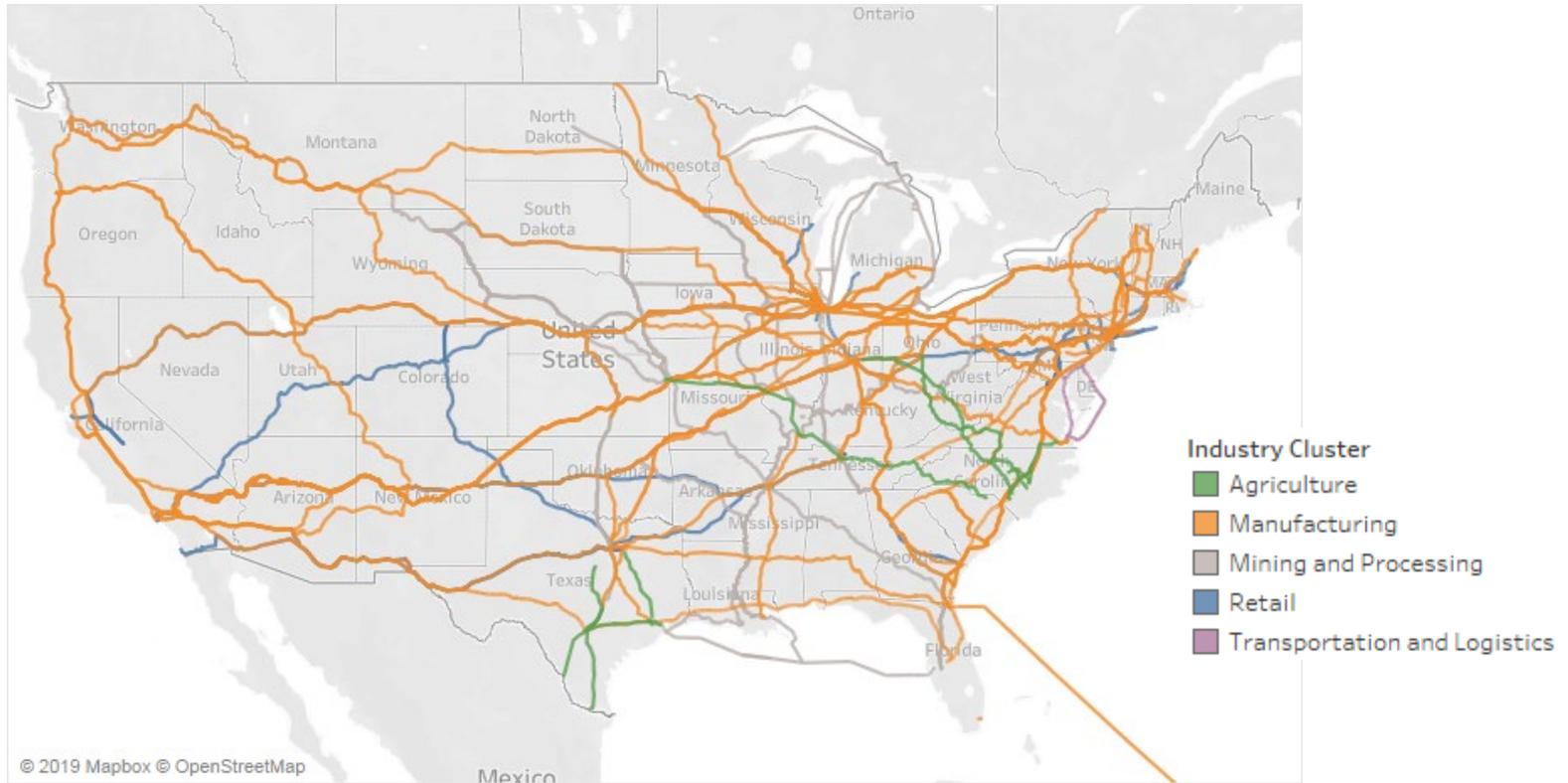
➔ 417 Mapped Moves: Truck (336), Rail IMX (28), Rail Carload (20), Water (28), Air (1)

INDUSTRY COVERAGE



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Source: FHWA

➔ 30 Industries: 14 Manufacturing, 8 Retail, 4 Mining, 2 Agricultural Production (in addition to food manufacturing), 2 Transportation/Logistics

SYSTEM-LEVEL ANALYSIS



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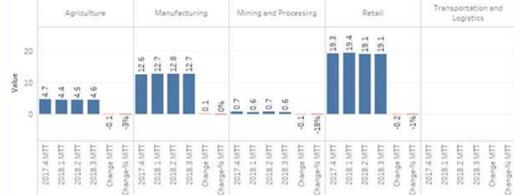
Dashboard #1 -- Travel Time



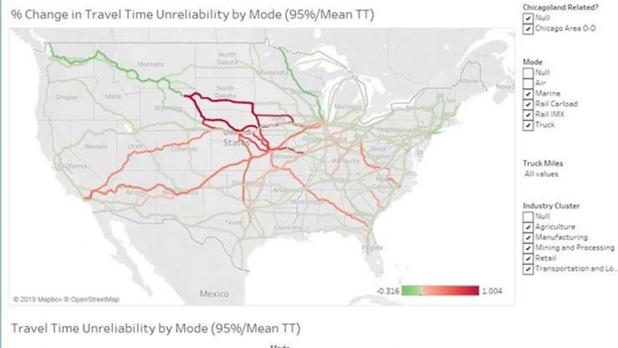
Mean Travel Time by Mode



Mean Travel Time by Industry Cluster



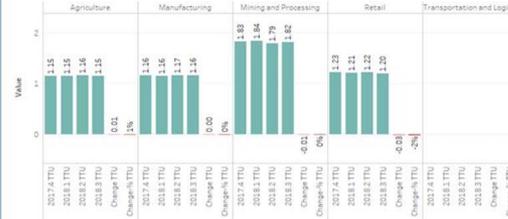
Dashboard #2 -- Travel Time Unreliability



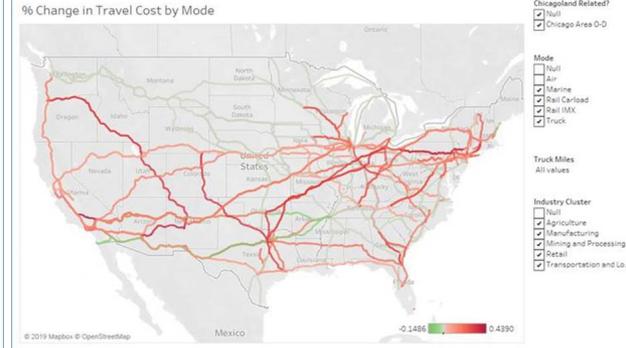
Travel Time Unreliability by Mode (95%/Mean TT)



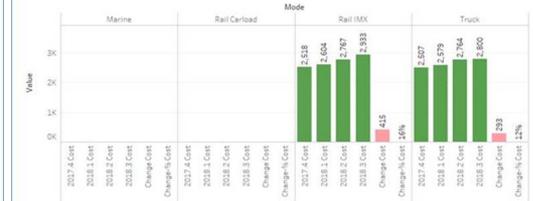
Travel Time Unreliability by Industry Cluster (95%/Mean TT)



Dashboard #3 -- Travel Cost



Travel Cost by Mode



Travel Cost by Industry Cluster



Source: FHWA

Dashboards for Travel Time, Unreliability, and Price by path, mode, and industry cluster; maps showing each quarter or changes; charts showing quarterly data; can filter by mode, industry, geography, etc.

SUPPLY CHAIN-LEVEL ANALYSIS



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Industry Example: Home Improvement

- Multimodal; five stages from port to retail outlet; alternate rail routes
- Half the cost is for four drayage stages of less than 250 miles total
- Import stage reliability worse than delivery stage reliability



	Port to Crossdock Truck	Crossdock to Rail Terminal Truck	Rail Linehaul Rail IMX	Rail Terminal to DC Truck	DC to Retail Outlet Truck	TOTAL
Miles	6	25	2200	109	103	2443
2017.4 Total Cost per Unit (\$)	489	526	2616	699	692	5022
2017.4 Linehaul Cost per Unit (\$)	487	518	2298	659	653	4615
2017.4 Fuel Cost per Unit (\$)	2	8	319	40	38	407
2017.4 Mean Truck Travel Time (hrs)	0.3	0.7		1.9	1.8	4.7
2017.4 Cross Modal Reliability (95%/50%)	1.5	1.6		1.1	1.3	

STATEWIDE ANALYSIS



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State Example: Missouri

- Truck, rail intermodal, rail carload, and water flows
- Inbound, outbound, through
- Ability to track multi-state performance metrics for a limited sample of industries
- Opportunity to build on national platform to increase coverage for industries and moves most significant to each State
- Could help states better fulfill FAST-Act mandate to address multi-State freight planning factors



Source: FHWA

OTHER APPLICATIONS



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- **Public Agencies (Federal, State, Metropolitan Planning Organization [MPO]/Regional)**
 - Monitor Key Performance Indicators (KPIs), comparable to how freight system users monitor themselves, that have critical impacts on industry competitiveness
 - Supports economic development strategies by identifying transportation connections relied on by critical industries
 - Supports timely response to questions about supply chain disruptions, resiliency and redundancy, alternative service options for critical industries, last mile connectivity, and other freight transportation issues
 - Provides working tool that complements and combines with others in the public agency toolbox
- **Private Sector**
 - Potential resource to provide benchmarking data to smaller/rural industries without access to this information



Source: FHWA

NEXT STEPS



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- Complete data validation and documentation
- FHWA launches Freight Fluidity Supply Chain Monitoring tool as part of suite of Freight Data Tools in 2020
 - Provides report on Project and User Guide on Data Tool
- Conduct continued outreach to State DOTs, MPOs and others to create awareness of tool and capabilities
 - Through Transportation Research Board (TRB), American Association of State Highway Transportation Officials (AASHTO), Association of Metropolitan Planning Organizations (AMPO) event presentations in 2020
- FHWA Office of Freight Management and Operations (HOFM) examines adding additional capabilities in tool
 - Additional quarters, industry sectors, applications

MORE INFORMATION



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