Optimizing Freight Transportation System Performance

Ed Strocko
FHWA Office Of Freight Management and Operations

- Why We Care
- Perspectives
  - System User v. Owner
- System Solutions
  - Freight Fluidity
- Operational Solutions
  - FRATIS

System Solution – Measuring Freight System Performance with Supply Chain Fluidity Measures

- Objective
  - Demonstrate and improve the measurement of freight transportation performance using a supply chain perspective
- Case Study Sponsors
  - U.S. Department of Commerce, Advisory Committee on Supply Chain Competitiveness
  - FHWA, Office of Freight Management
  - I-95 Corridor Coalition, Intermodal Committee

Supply Chain Case Studies

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

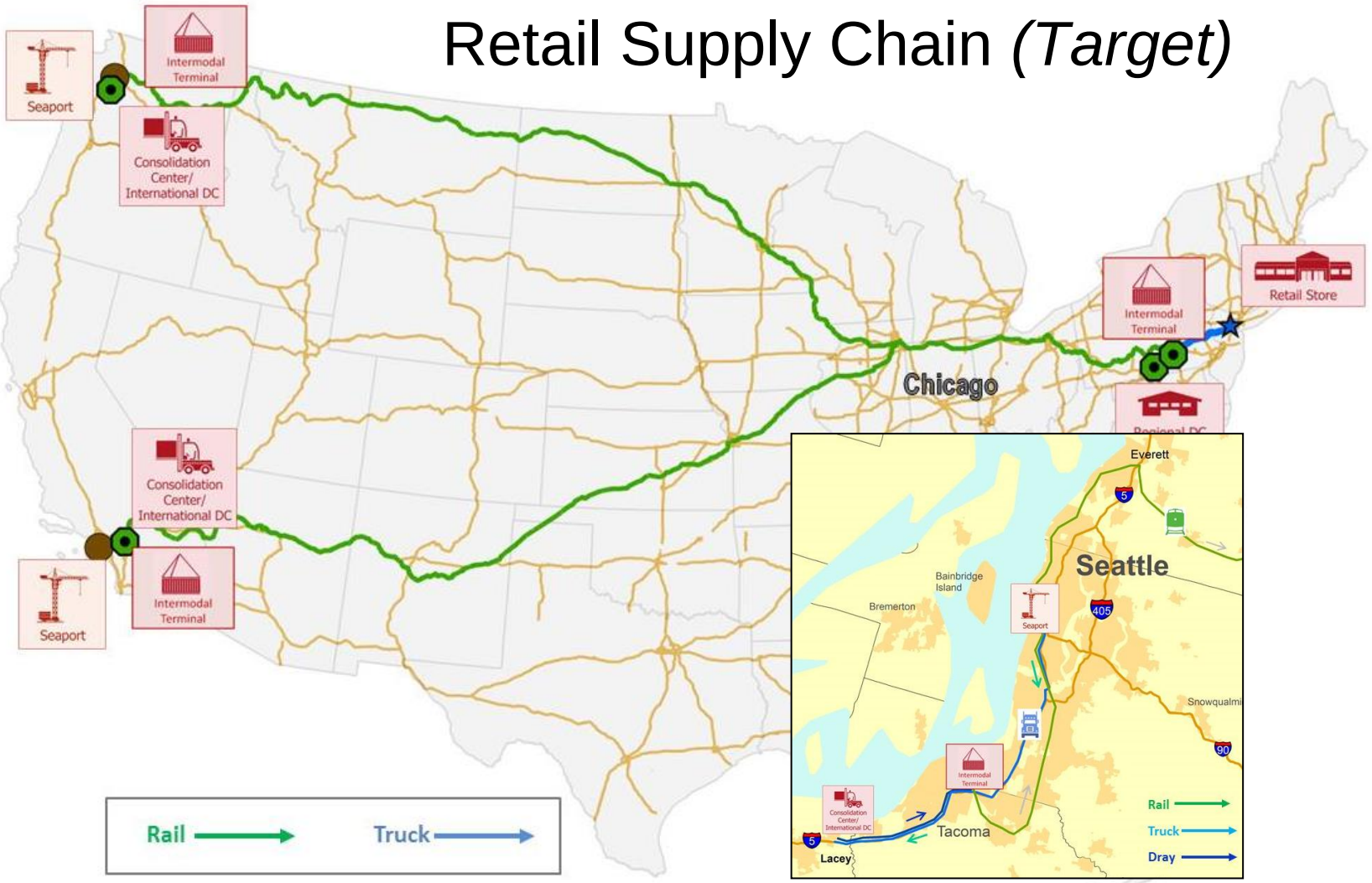
Scope

- Address performance of supply chains
  - But not the performance of modes, networks, etc., or environmental and economic impacts
- Address performance of public and quasi-public links and nodes
  - Include ports, highways, rail lines, airports, etc., but not private-sector manufacturing, warehousing or distribution nodes
- Use measures and metrics that are common across supply chains and “drill down”
- Focus on high-level performance of representative supply chains to inform national policy
  - Cover key industries, national regions, major trade lanes, but do not duplicate firm-, carrier- and agency-level analysis

Performance Measures and Metrics

Measure	Metric
Transit time	Travel time in days (or hours)
Reliability	95% travel time in days (or hours)
Safety	Fatality and injury rate
Cost	Dollars
Risk	Cargo loss and damage *(accidents, poor handling, theft…)*
	Disruption *(storms, labor, political forces…)*
	Capacity expansion delays *(physical, regulatory limitations and delays…)*

Retail Supply Chain *(Target)*



Retail Supply Chain Measures

Links and Nodes	Transit Time/Dwell Time *(Hours)*	Reliability *(95% travel time)*
West Coast port (SEATTLE)		
Dray move	1.1	4.3
Transload or Consolidation Center		
Dray move	0.8	3.3
West Coast rail intermodal terminal		
Rail move		
Midwest rail intermodal interchange		
Rail move		
East Coast rail intermodal terminal		
Dray move	1.0	2.7
East Coast Regional Distribution Center		
Truck P&D move	3.5	6.5
Retail Store		
Totals		

Estimated using Railinc, RSI Logistics or Transcore data.

Retail Supply Chain Measures

Links and Nodes	Transit Time/Dwell Time *(Hours)*	Reliability *(95% travel time)*
West Coast port (LA/LB)		
Dray move	1.2	5.8
Transload or Consolidation Center		
Dray move	0.3	1.3
West Coast rail intermodal terminal		
Rail move		
Midwest rail intermodal interchange		
Rail move		
East Coast rail intermodal terminal		
Dray move	1.0	2.7
East Coast Regional Distribution Center		
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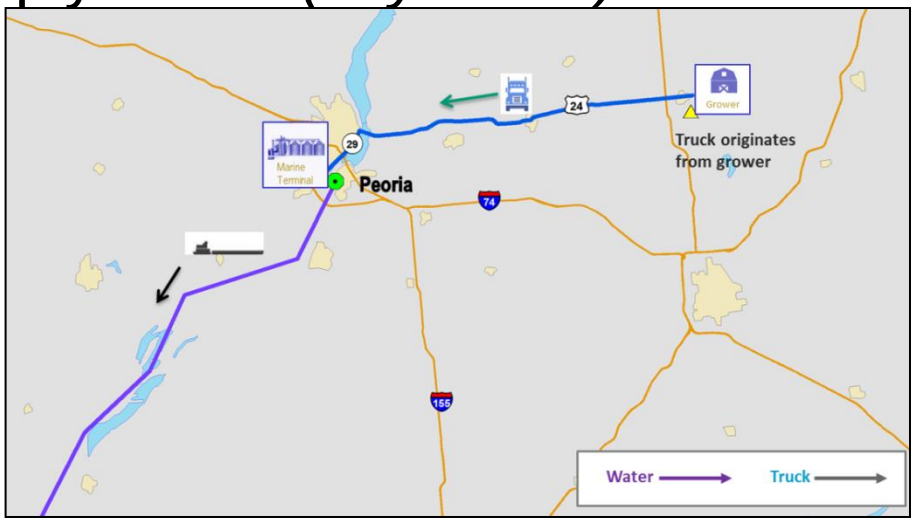
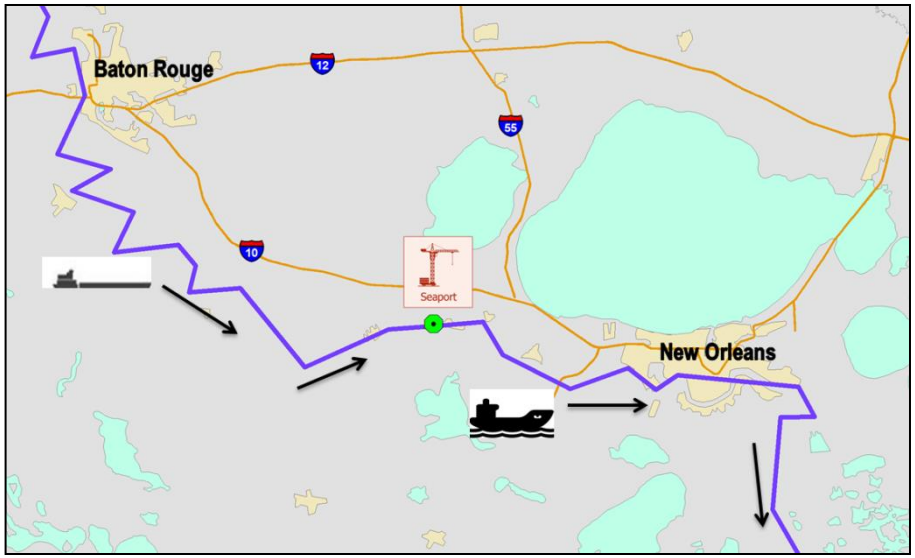
Agricultural Export Supply Chain *(soybeans)*





Agricultural Export Supply Chain Measures

Links and Nodes	Transit Time/Dwell Time *(Days, hours)*	Reliability *(95% travel time)*
Farm in vicinty of El Paso, IL		
Truck move	0.8 hours	1.7 hours*
ADM/Growmark Peoria Terminal Wharf Port Facility		
Barge move	8.2 days	14.5 days*
Cargil Loading Facility, Reserve, LA		
Totals	**9.0 days**	**14.6 days**

* Estimated using *U.S. Army Corps of Engineers* data *for the period June 2012 through January 2014; TTI Mobility Report 2012 for 95% index for small urban areas.*

Conclusions and Issues*(preliminary)*

- We can measure the high-level performance of representative supply chains
- 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…”
  - Safety data are available, but not readily accessible
  - Cost data can be purchased from private suppliers
  - Risk data can be estimated, but are not readily available
- Data availability, access and cost
- Urban freight stages
- Representative market basket of supply chains
  - How much is enough?
    - Industries, supply chains, geographies, etc.

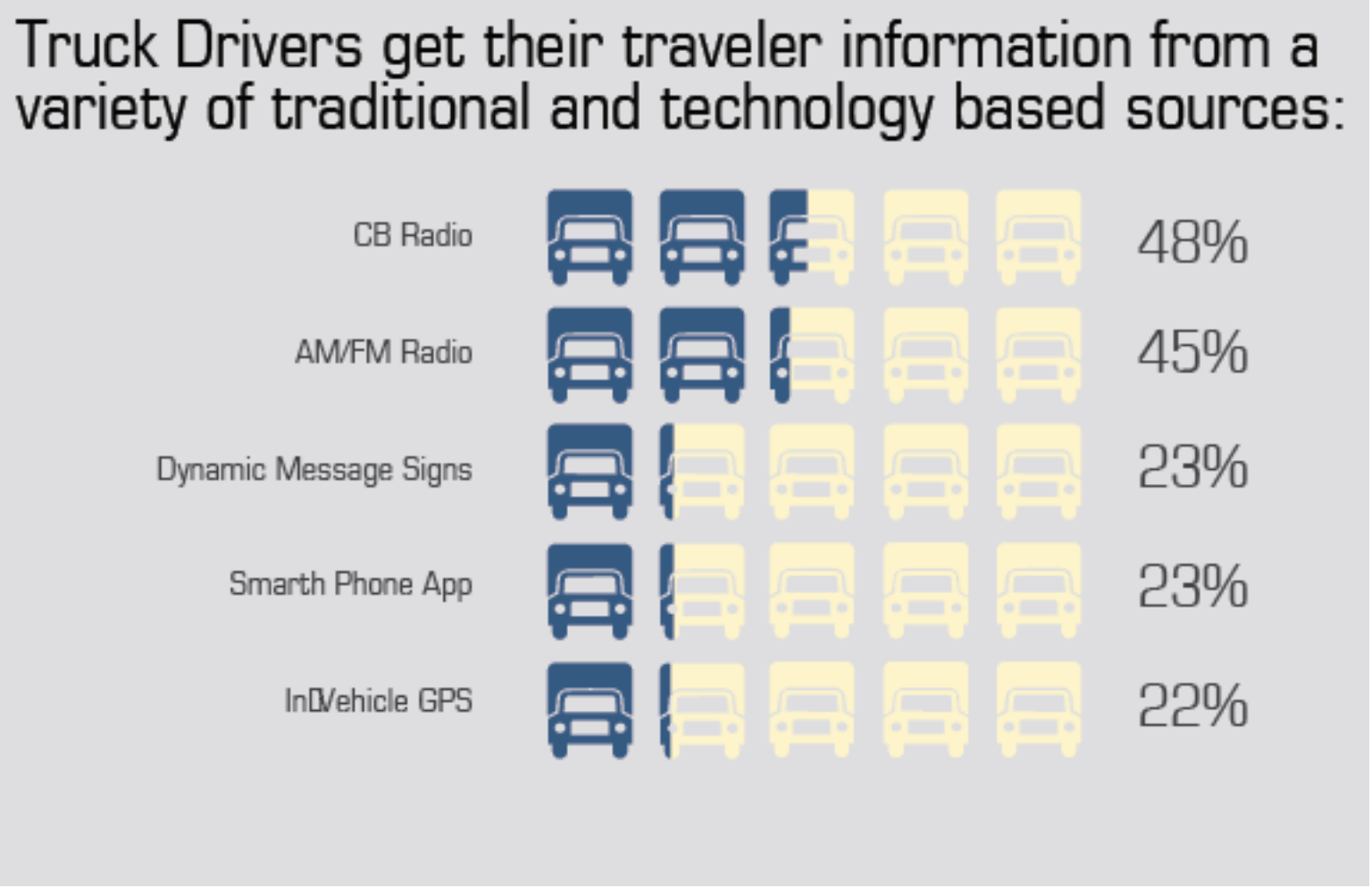
Operational Solutions - Freight Advanced Traveler Information (FRATIS)

- Technology is not used consistently by the trucking industry
- Trucks have unique operational characteristics
- Freight terminals do not always share queue information
- Existing public resources do not always provide freight-specific information
- System effectiveness is often limited by data availability and accuracy

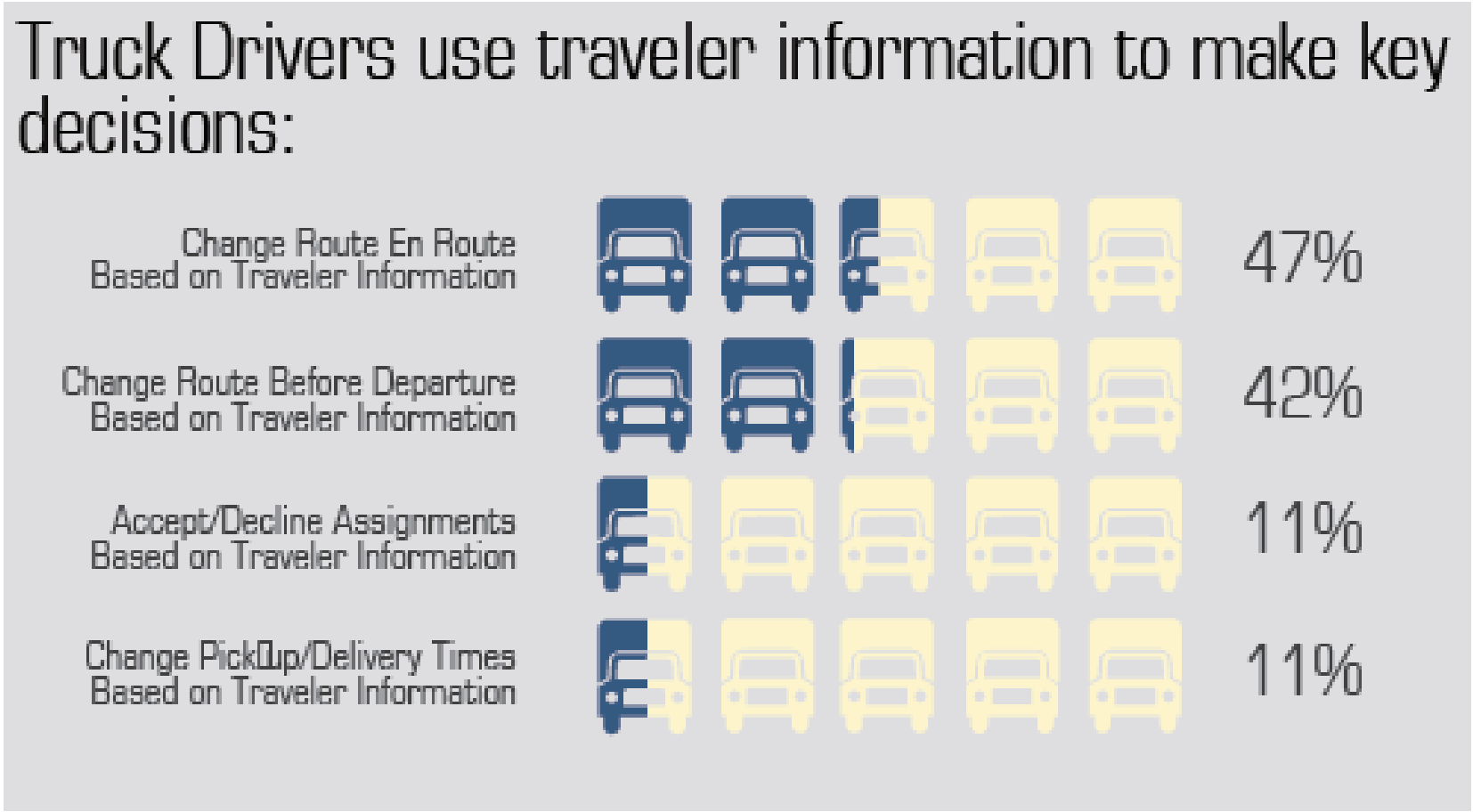
The lack of Freight Advanced Traveler Information has negative effect on:

- **Efficient Movement of Freight Transportation**
- **Planning of freight daily work activities**
- **Logistics Management Systems**
- **Environment of Neighboring Communities**
- **Energy Consumption**
- **Safety of the Traveling Public**

Los Angeles/Long Beach Port User Survey Responses

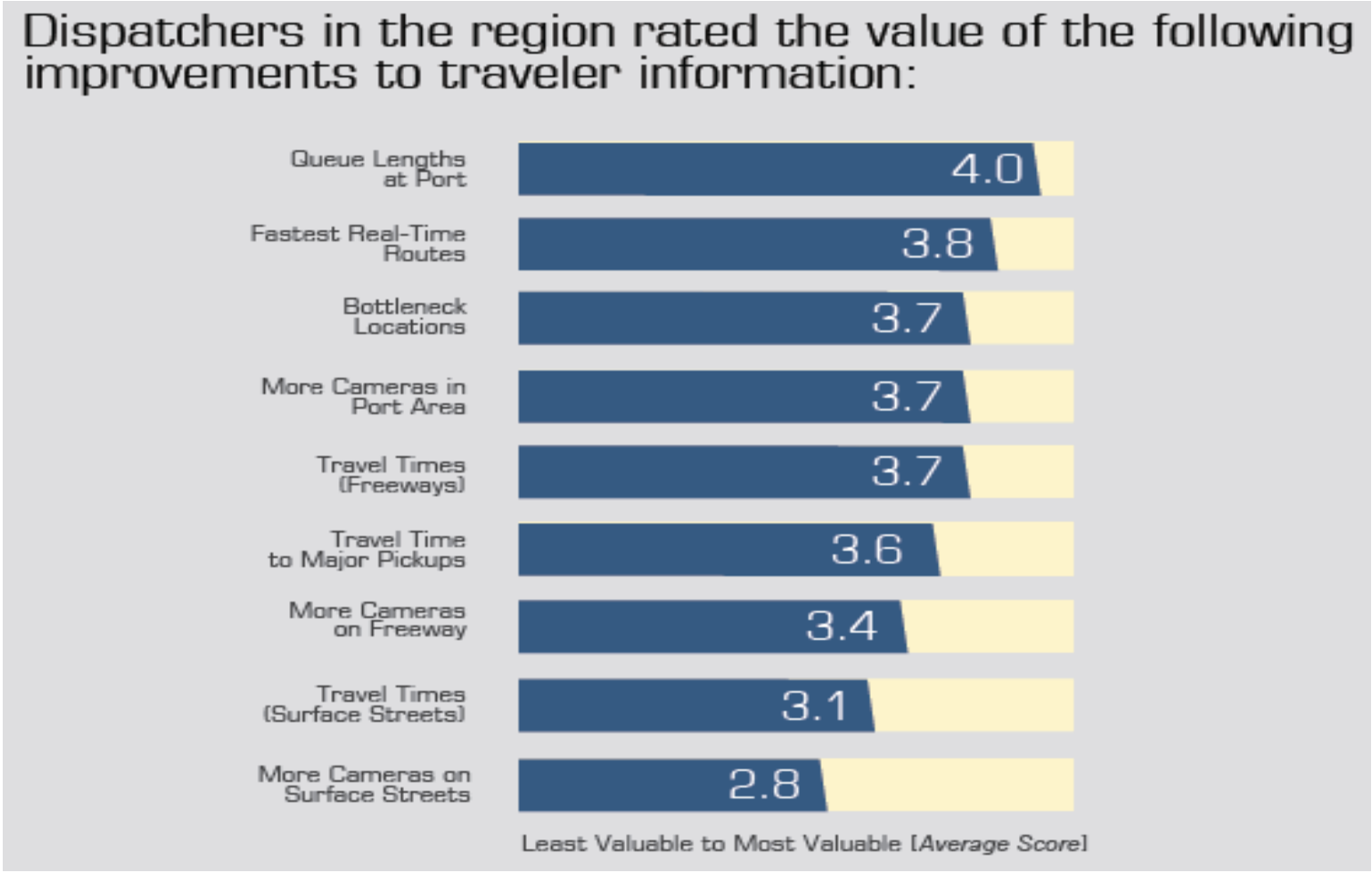


Los Angeles/Long Beach Port User Survey Responses



Source: Gateway Cities COG

Los Angeles/Long Beach Port User Survey Responses



Source: Gateway Cities COG

UNITED STATES
DEPARTMENT OF TRANSPORTATION

Where are the Potential Port Locations for Application of FRATIS?

Freight Advanced Traveler Information System (FRATIS): Concepts and Potential Impacts

- **FRATIS Application: Freight-Specific Dynamic Travel Planning and Performance**
  - Enhances traveler information systems to address specific freight needs
  - Integrates data on wait times at intermodal facilities (e.g. ports), incident alerts, road closures, work zones, routing restrictions (hazmat, oversize/overweight)

- **FRATIS Application: Drayage Optimization**
  - Optimize truck/load movements between freight facilities, balancing early and late arrivals
  - Individual trucks are assigned time windows for pick-up or drop-off

- **10-year transformative impact targets**
  - Reduce truck travel times, 17%
  - Reduce bobtail (empty) trips, 15%
  - Reduce terminal wait times, 35%
  - Reduce freight-involved incidents, 35%
  - Reduce fuel consumption/emissions, 10%

FRATIS USDOT Lead: Randy Butler (FHWA Office of Operations)

Benefits to Trucking/Drayage Company and Drivers

- Improve productivity and efficiency of the fleet
- Empower dispatchers with real-time information for faster and better decisions
- Generate near optimal trucks itinerary taking into consideration travel times with traffic, waiting times at the terminal, weather conditions, driver availability, etc.
- Dispatcher will have access to real time Terminal Waiting Times and Turn-Times
- Drivers will be able to navigate to their destinations and be rerouted in case of heavy traffic, incidents and congestion in their current route

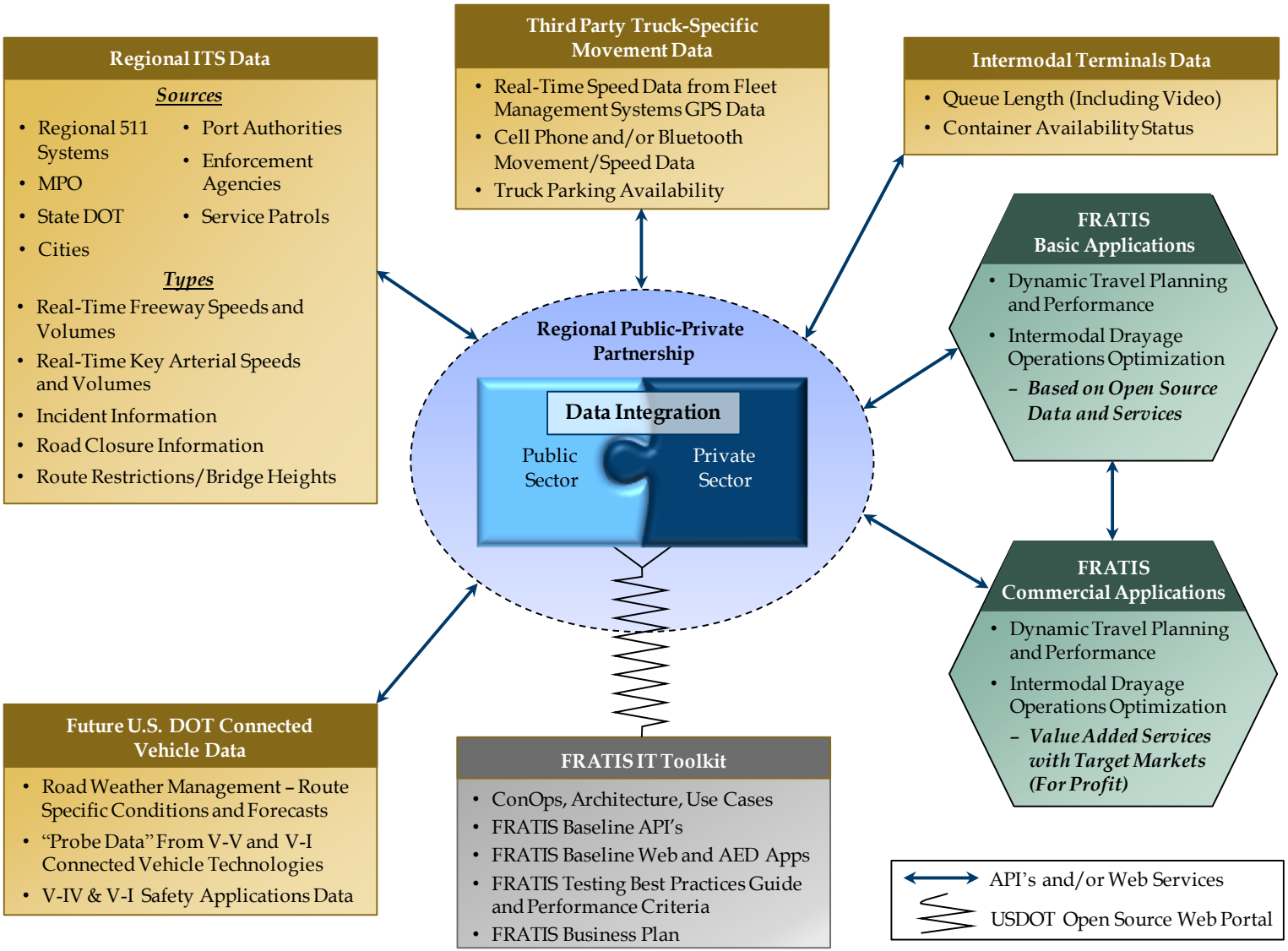
Benefits to Intermodal Facilities

- Receive pre-notifications containing details for trucks coming to perform transactions in their facilities
- Receive real time notifications of trucks heading towards their facilities with estimated time of arrival
- Reduce waiting time and turn around time at the facility
- Reduce unproductive pickups/drop-offs by enabling better container turns and reuse.
- Communicate directly with dispatcher to notify about terminal closures, incidents, or any other operational status in order to mitigate congestion in their facilities.

Public Benefits

- Promote better transportation planning and policy
- Improve air quality by reducing CO2 emissions
- Provides a platform to support economic development in the region
- Improve quality of life of the region
- Better utilization of existing infrastructure and capacity
- Provides capabilities for safer routes for trucking operations.

FRATIS High-Level System Concept Focuses on Data Integration and Dissemination



Planning Execution and Monitoring



- Capture Drayage Operation Constraints
- Receive and Enter jobs into FRATIS
- Run the optimization algorithm
- Generate optimal plan
- Review the optimal plan and approve
- Communicate the plan details
- Drivers receive and execute Jobs
- Monitor the daily operations

Memphis Drayage Optimization Algorithm

Pre-deployment vs. Post-deployment pairwise comparison of average performance measures using clustered data sets:

Performance Measure	Pre vs. Post using clustered data sets
Bobtail Miles Reduction	13%
Total Miles Reduction	9%
Average Miles per Truck Increase	14%
Required Fleet Size Reduction	21%

Three Initial FRATIS Prototypes Under Development

- **Los Angeles-Gateway Region:**
  - Develop FRATIS applications to address dynamic travel planning around the marine terminals and queues to move cargo out of the ports more efficiently
- **Dallas-Fort Worth, Texas:**
  - Incorporate integrated corridor management capability along with size and weight permitting
  - Test Connected Vehicle Basic Safety Message (SAE Standards J2735-2009)
  - Optimize drayage opportunities in coordination with rail and local truck drayage companies
- **South Florida:**
  - Similar focus as the other two sites, but includes emergency response capability to FRATIS that would integrate FRATIS functionality into Emergency Operations Center activity during an emergency such as a hurricane

FRATIS Project Status

- FRATIS Prototype
  - Architecture Complete
  - Baseline data for before and after complete
  - Development of the Application Complete
    - External Traffic Information
    - Devices Installed in 50 trucks
    - Optimization Algorithm designed for Marine Terminal Operations
    - Waiting times will be collected to measure queues at the gates
- Los Angeles FRATIS went live on December 11, 2013
- Dallas live for six month test being February 28, 2014
- South Florida begin six month test on April 1, 2014

Thank You