Emerging Freight Mobility ITS Applications

presented to

ACGM 2013 – Toronto, Canada

presented by

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Cambridge Systematics, Inc.

May 29, 2013

Transportation leadership you can trust.

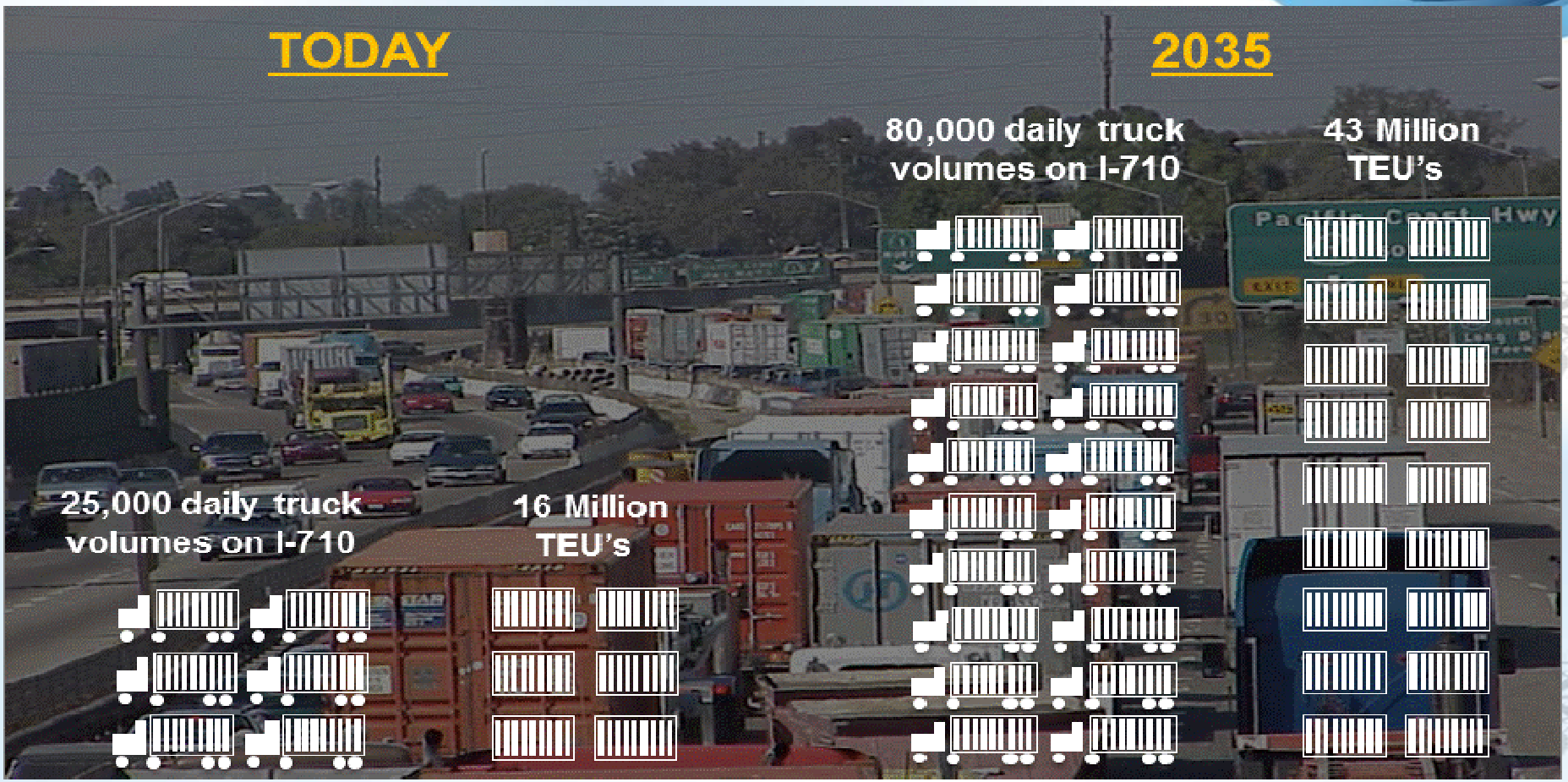
CAMBRIDGE SYSTEMATICS

Gateway Cities Technology Plan for Goods Movement

THE GATEWAY REGION'S FREIGHT SYSTEM

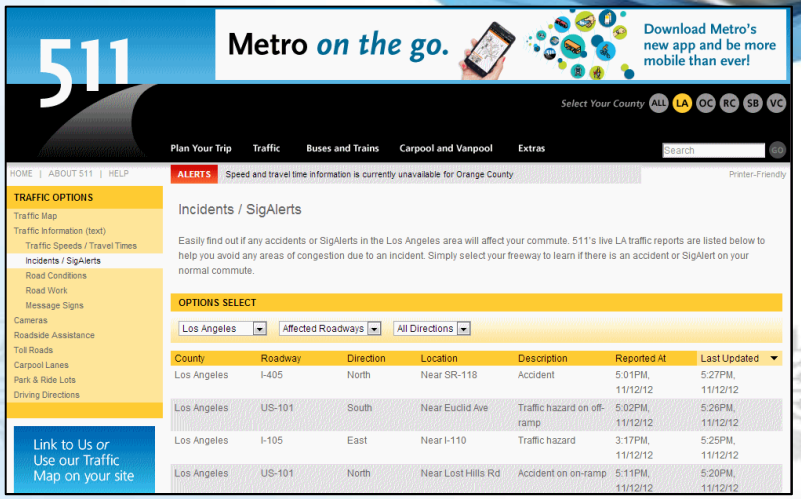
- The most important gateway in our nation
  - 40 percent of the nation's total import traffic and about 25 percent of its total exports
  - 10% of U.S. Population lies within 100 miles
- Planning for the future
  - While the I-710 redesign will include dedicated truck lanes, this alone will not be enough to reduce expected future

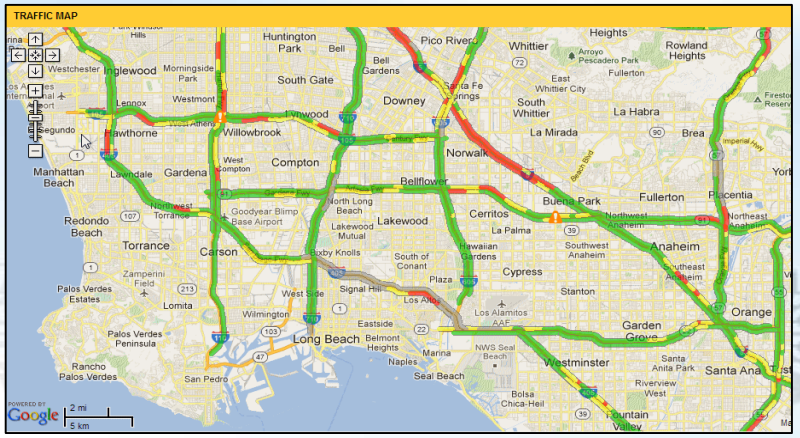
"THE PROBLEM"


TODAY
2035
80,000 daily truck volumes on I-710
43 Million TEU's
25,000 daily truck volumes on I-710
16 Million TEU's

THE LA REGION'S ITS PROGRAM

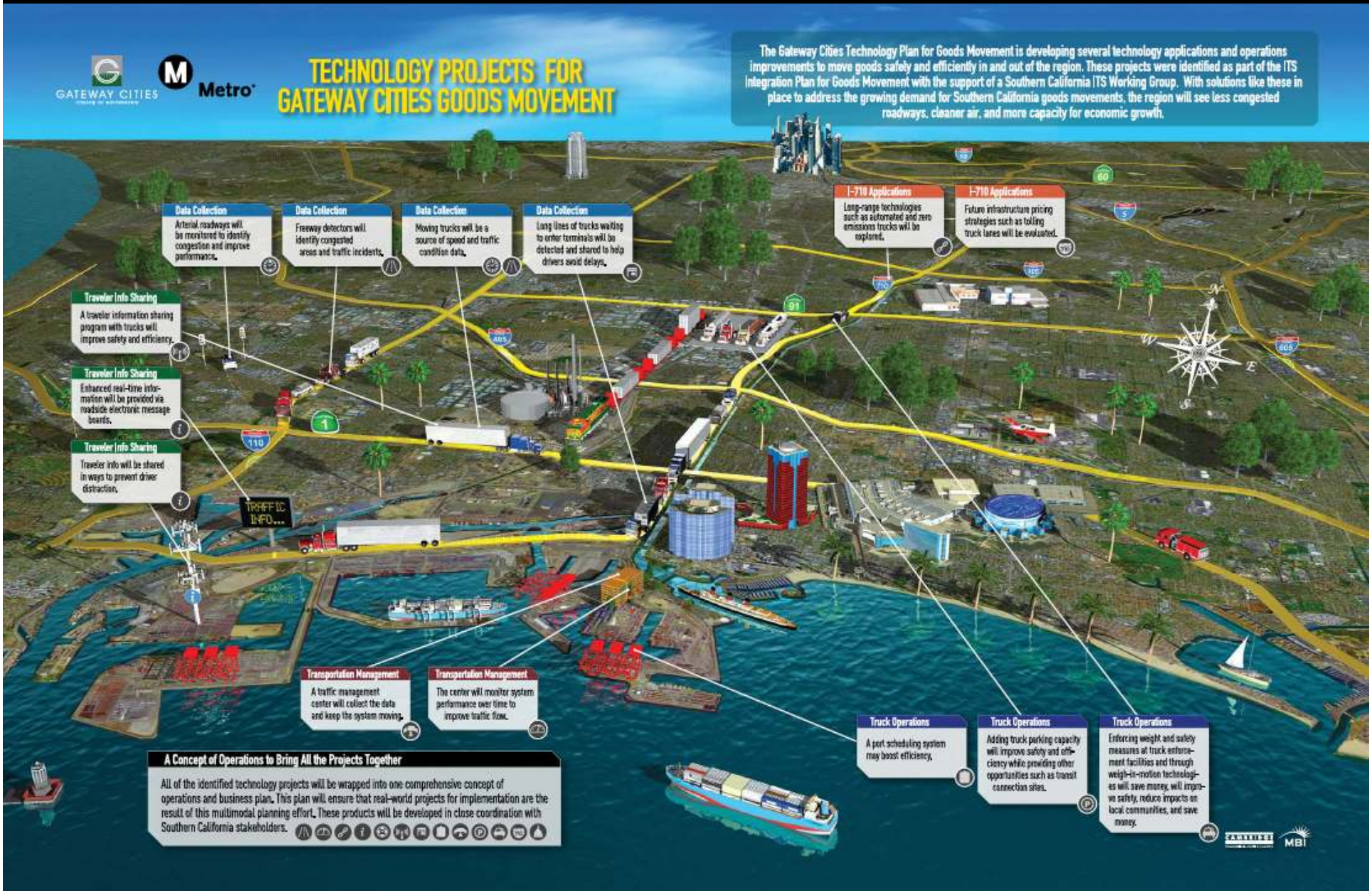
- Available resources have varying coverage and do not always provide freight-specific information
  - Generally good coverage of freeway traffic conditions
  - Lack of traffic information on key freight arterials is a major hole
  - Historical lack of real-time data on port region traffic data contributes to operational inefficiencies
- Freight routing, scheduling, and dispatch decisions are sometimes made in an ad-hoc fashion
- Freight has unique operational characteristics – tailored freight focused traveler information is a major need





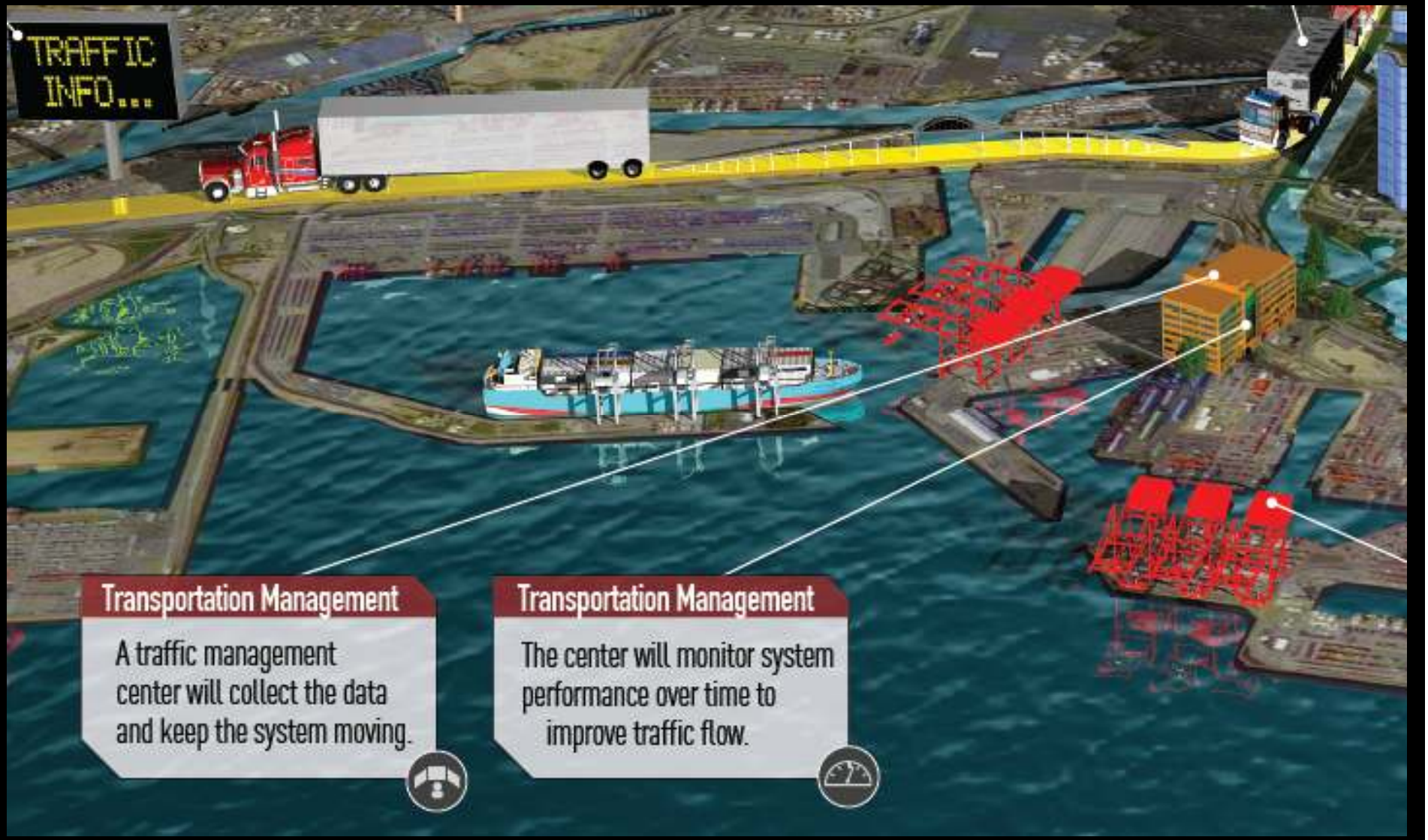
HI-LEVEL OVERVIEW OF PROJECT CONCEPT

Overview of Project Components



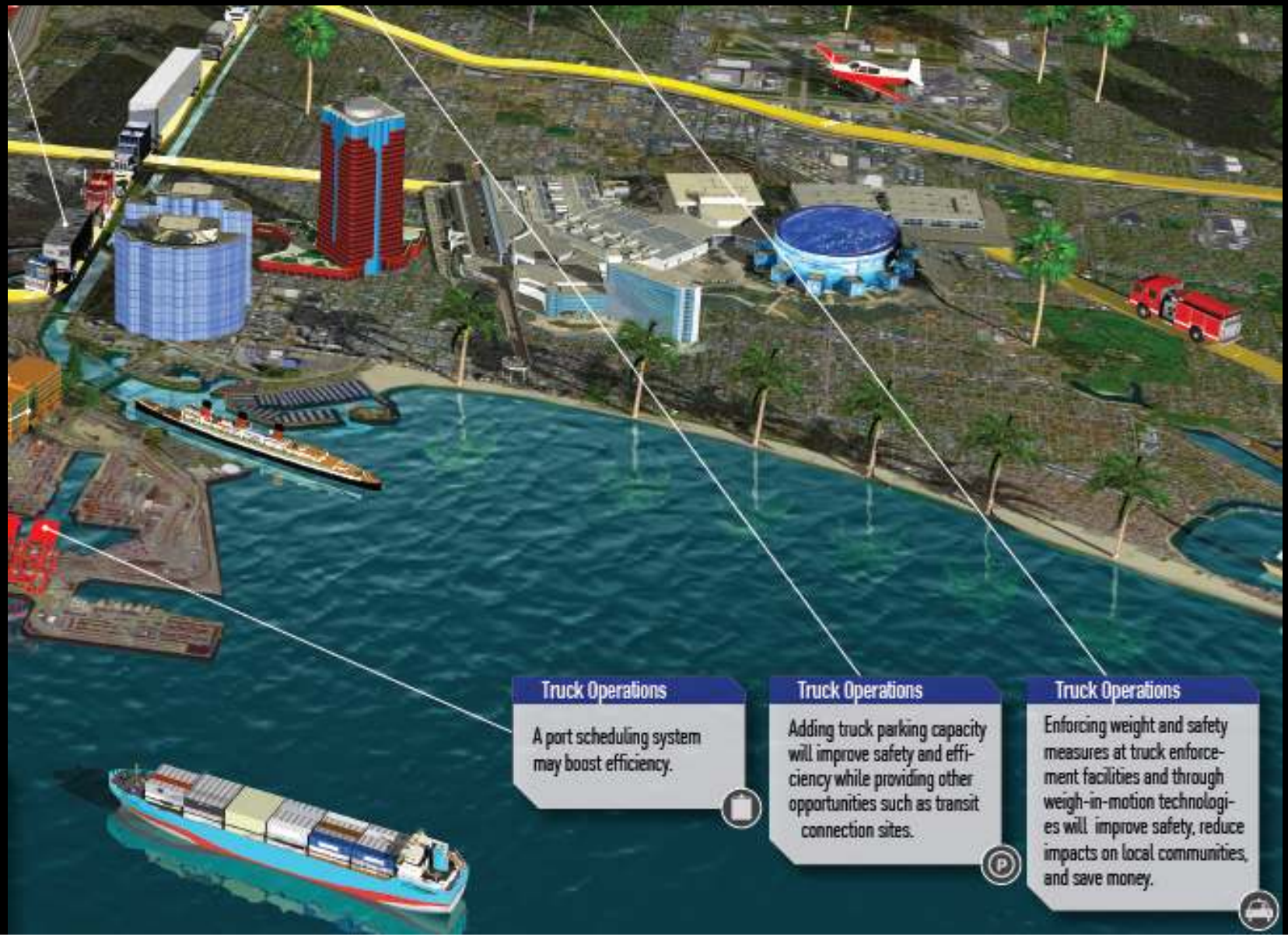
Data Collection Elements

Transportation Management Elements



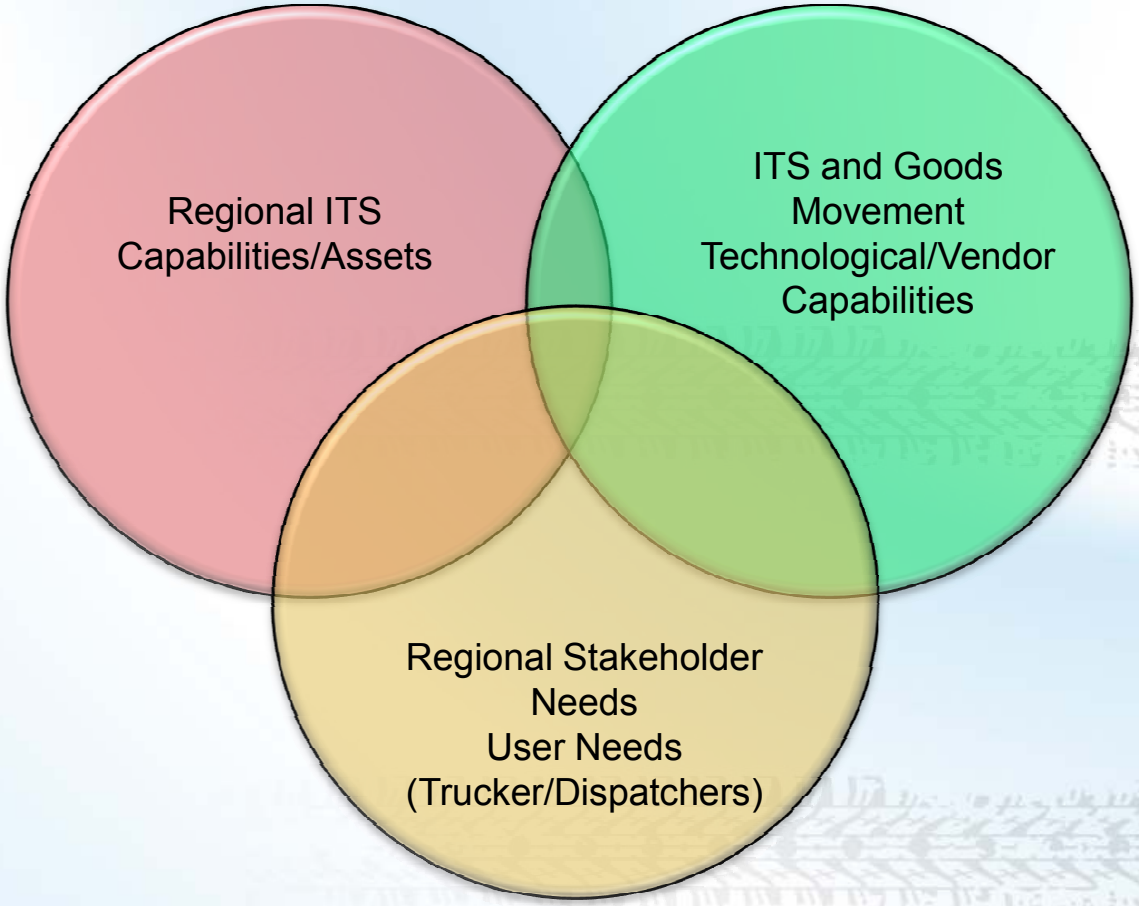
Traveler Information Sharing Elements

Truck Operations Elements



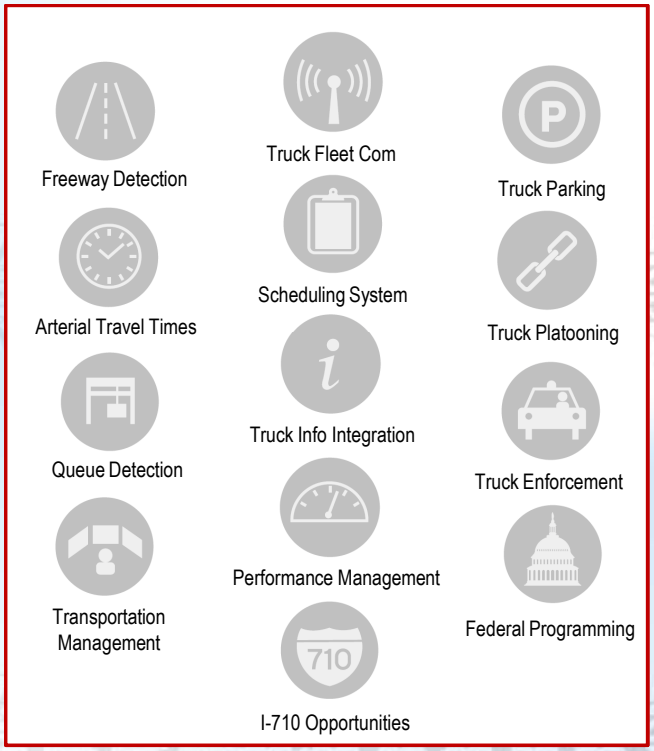
I-710 Applications Elements

PROJECT INTEGRATION PHILOSOPHY



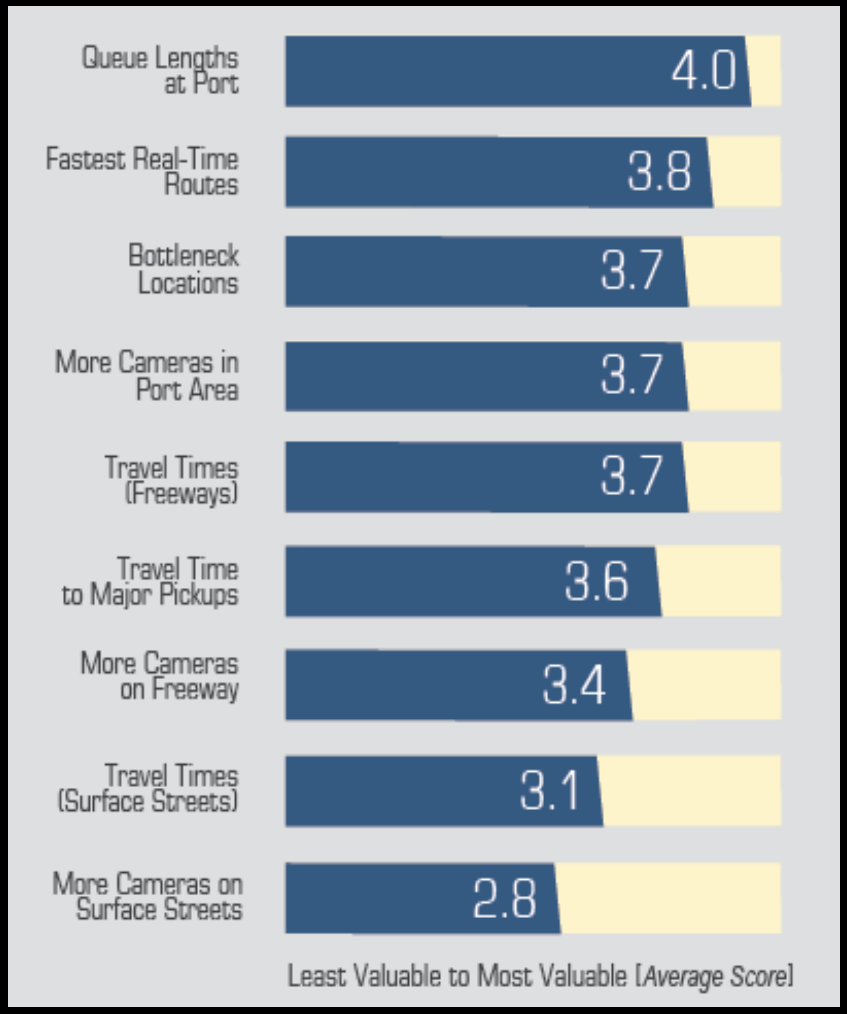
Overview of This Project

- **Conduct 13 Feasibility Studies**
  - Leverage recent advances technology
    - Traveler Information (LA SAFE/511)
    - Mobile Applications (smart phones)
    - Freight/Enforcement Technologies
  - Research future I-710 automation needs
- **Create technology plan that will facilitate near-term implementation**
  - Background Research
  - User Needs
  - Technology Technical Definition
  - Concept of Operations and Business and Implementation Plan
- **18 month project length (completed Dec 2012)**
- **Sponsored by LA MTA & Gateway Cities COG**
  - **COTM: Steve Gota, LA MTA;** gotas@metro.net
  - **COTM: Jerry Wood, Gateway Cities COG;** Jerry@jrwoodconsultant.com

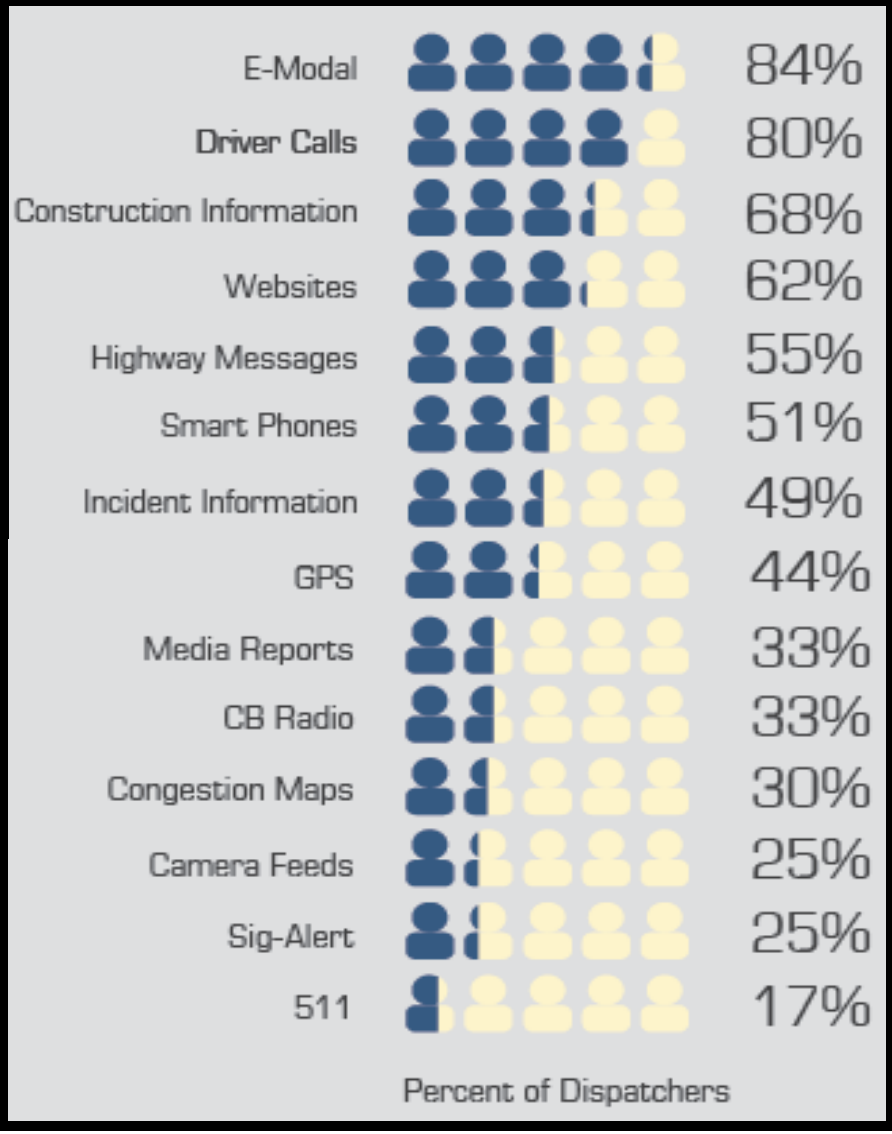


Selected User Needs Survey Results (1 of 4)

Dispatchers: Value of Information (Likert Scale)



Dispatchers: Use of Regional Information Sources

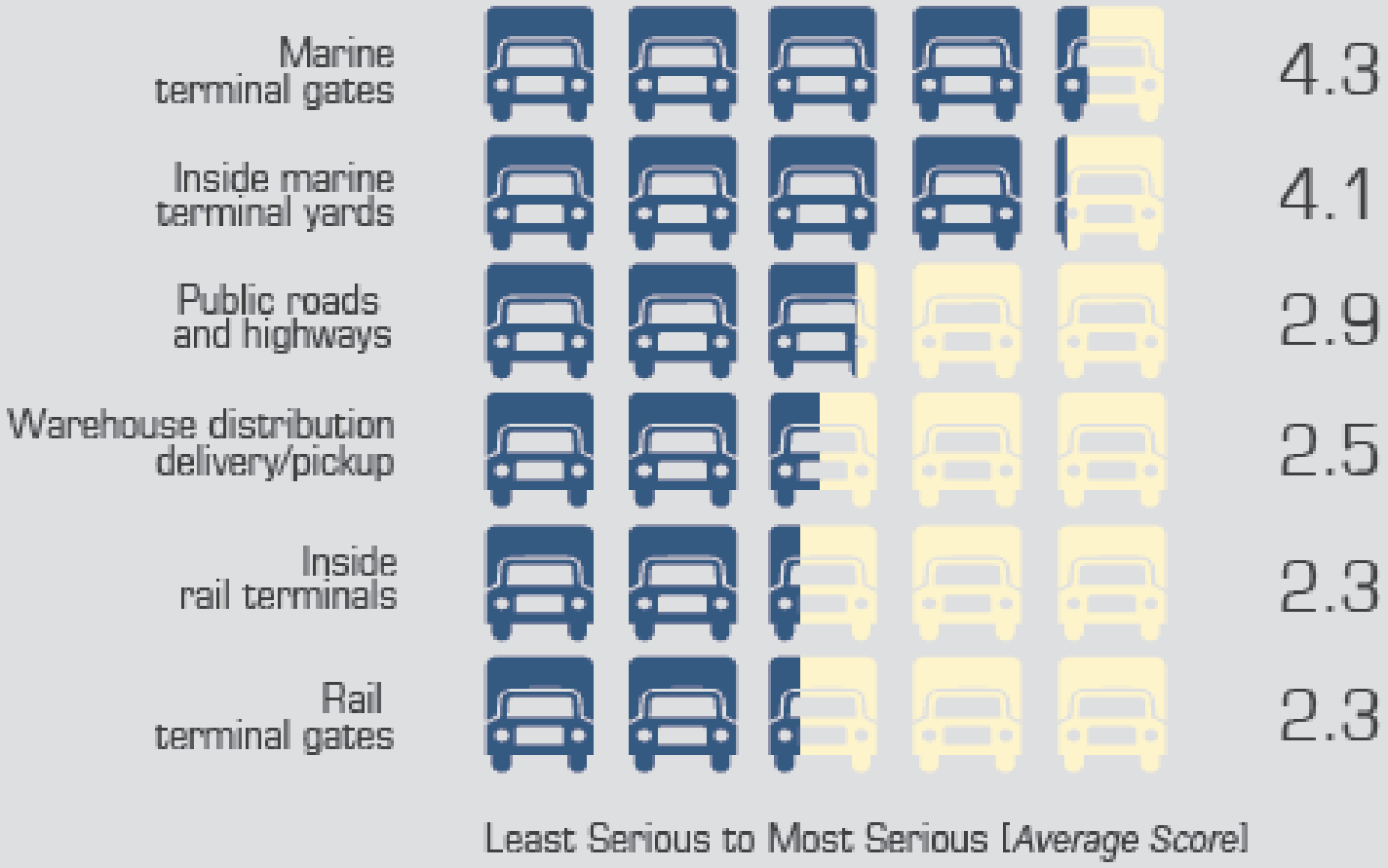


Selected User Needs Survey Results (2 of 4)

Truck Drivers use traveler information to make key decisions:

SELECTED USER NEEDS SURVEY RESULTS (3 OF 4)

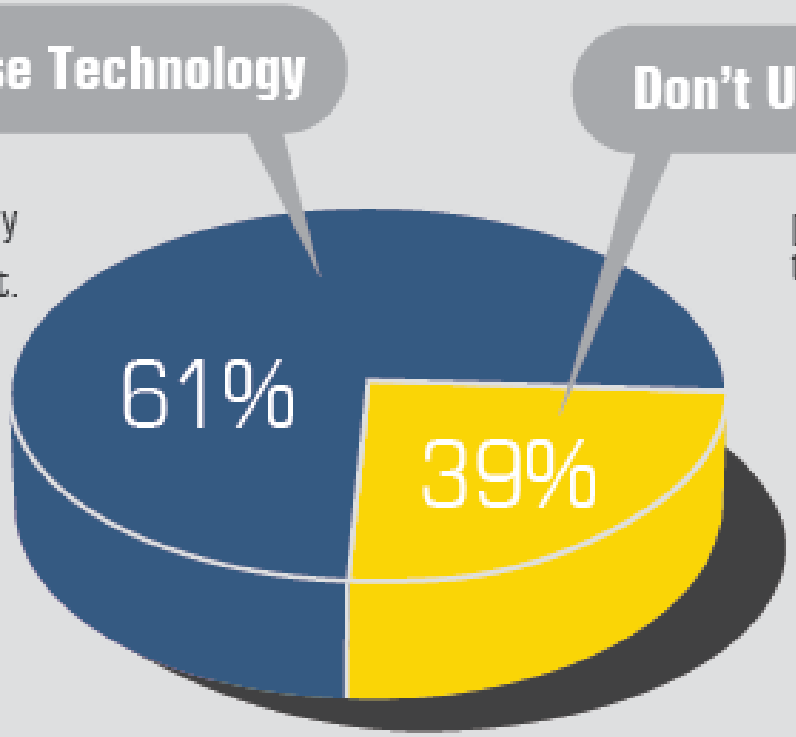
Marine terminal gates were rated as the highest location for delay.



NOTE: I-710 WAS REPORTED AS THE MOST HEAVILY USED FREIGHT ROADWAY

SELECTED USER NEEDS SURVEY RESULTS (4 OF 4)

About 61% of drivers use technology (such as GPS and traveler info websites) for routing decisions.



Drivers who use technology ranked the following content as most important.

Accident/Incident Information	1
Weather	2
Travel Times	3
Bottlenecks	4
Delay Details	5

Drivers don't use technology because...

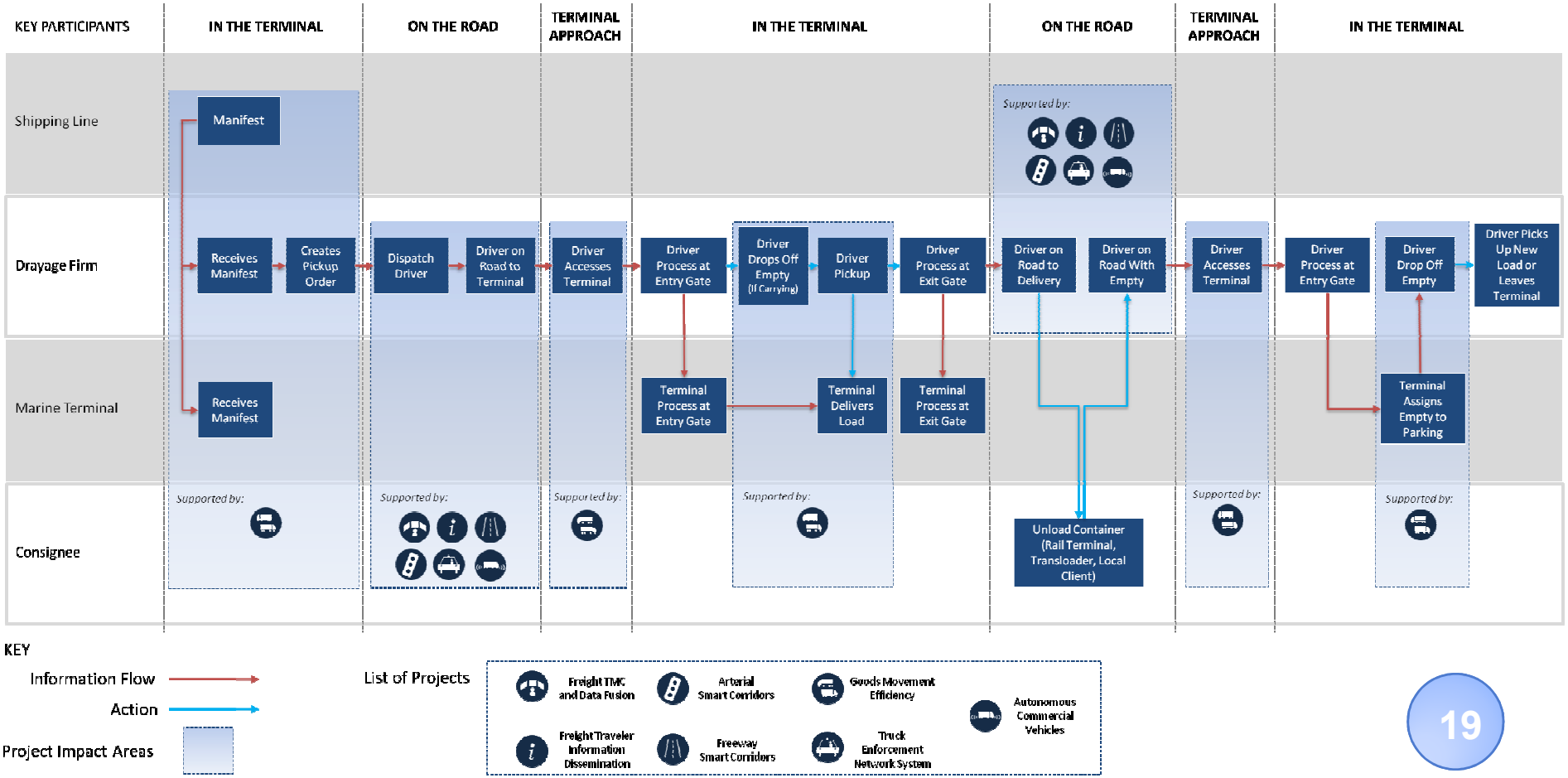
% of Drivers Who Agree	
38%	Inadequate coverage of roads or terminals
27%	Lack of accurate information
24%	Inconsistency among sources
23%	Not aware of systems
17%	It's not available

Note: USDOT FRATIS National Drayage Survey Results

Goods Movement/Drayage Process Map

Goods Movement/Drayage Process Map

This graphic provides a high-level summary of the import drayage process. It is by no means inclusive. But it does include the major components of a shipment arriving at the ports and then being delivered to its final destination. This graphic also illustrates where the various projects which are being developed as part of the effort overlap with various functional areas of this process.



Concept of Operations Elements

- General Description of Program
  - Freight Traveler Information Data Fusion and Dissemination Project
  - Arterial Smart Corridor
  - Freeway Smart Corridor for Freight
  - Container Moves Productivity Improvements
  - I-710 Automated Truck Research
  - Truck Enforcement Network System
- Identifies Stakeholders
- High Level Benefits/Costs
- Interdependencies
- Operational Scenarios/Examples

GATEWAY CITIES COUNCIL OF GOVERNMENTS

Metro

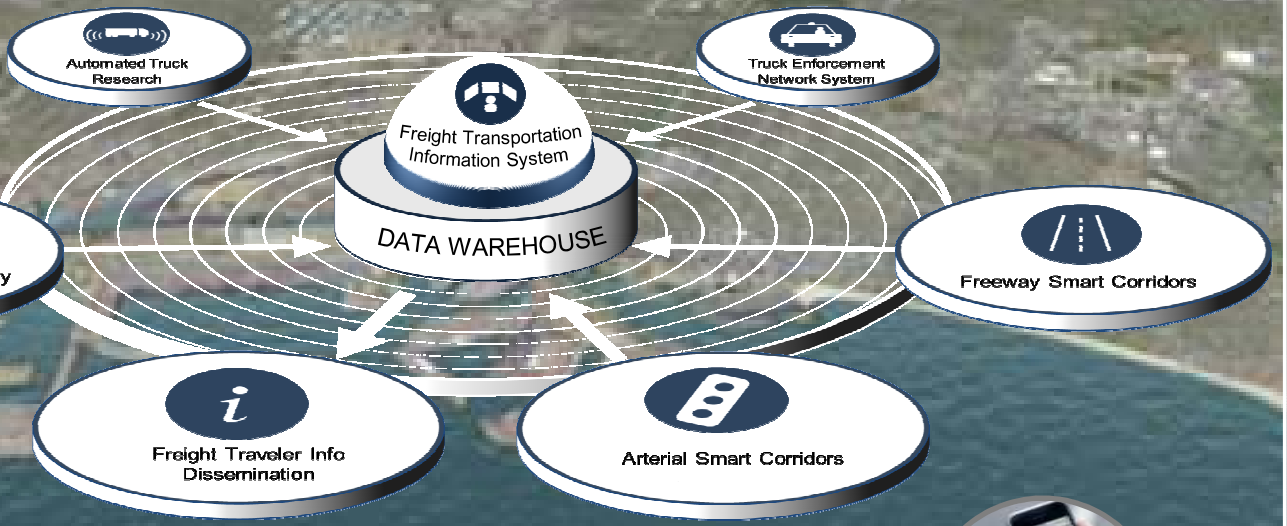
CONOPS AND PROJECTS OVERVIEW

Drayage dispatchers will have access to freight focused traveler information resources.

Drayage drivers will know of traffic conditions at the port before they start their trip via 511 in both English and Spanish.

Radio traffic reporters will have access to more accurate information than ever before.

Third party vendors can use the data from the data warehouse to create Apps for their customers.



Technology systems within the ports improve efficiency through the Gateway Cities region.

An enhanced enforcement network creates a safer environment.

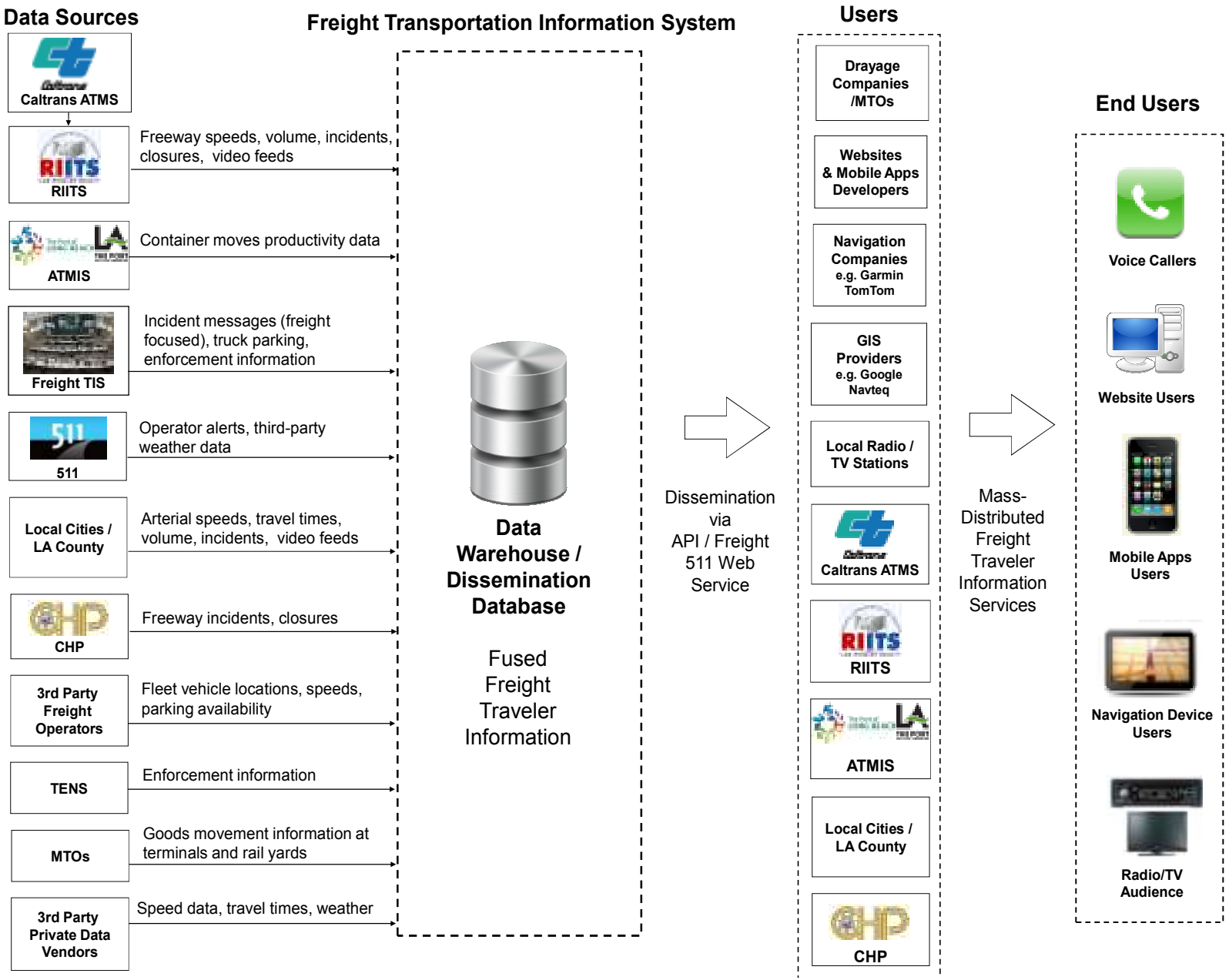
Planners can use the data archived in the data warehouse to better plan for goods movement.

Navigation and traffic data vendors will have access to more accurate and timely information.

TECHNOLOGY PROJECTS

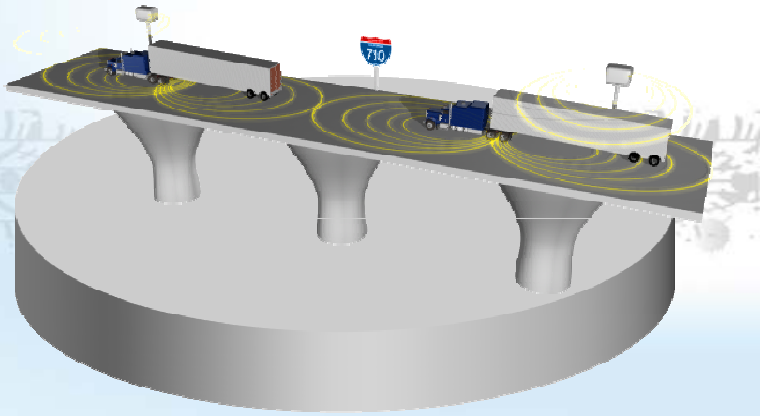
- Freight TIS and Data Warehouse
- Freight Traveler Information Dissemination
- Arterial Smart Corridors
- Freeway Smart Corridors
- Automated Truck Research
- Container Moves Productivity Improvement
- Truck Enforcement Network System

Data Fusion & Traveler Information Dissémination ConOps



SPECIAL FOCUS: AUTONOMOUS TRUCK RESEARCH

- Concept of Operations for research program
  - Finalize test corridor location
  - Develop operational test corridor requirements
  - Document vehicle requirements
  - Create framework for using test results in I-710 corridor design
  - Integrate with ongoing I-710 efforts



OBJECTIVES OF THE GATEWAY CITIES V2X RESEARCH PROJECT

- Helping ensure the future viability of the Ports and Gateway Cities region, as well as the I 710 corridor
- Building upon ongoing and rapidly advancing intelligent vehicle (IV) technologies for trucks to define an effective conveyor operation of trucks is on the I 710 freight corridor that will safely maximize the throughput of trucks in the freight corridor
- Helping Southern California establish a leadership position in Connected Vehicle technologies that will enhance the local economy
- Establishing an ongoing partnership and environment that attract additional funding opportunities to bridge the gap between research efforts and effective real-world solutions in a real-world freight corridor
- Promoting the state of the art in truck guidance and flow efficiency

RESEARCH FOCUS TO DATE

- Review of Demonstrations
  - UC Berkeley PATH
  - EU
  - SARTRE
  - CHAUFFER/CHARUFFER2
  - DARPA Grand Challenge
  - Australia – truck train demonstration
- Autonomous vehicle
  - Volvo, SWRI, Google, Mecedes-Benz, Audi, GM, BMW, Toyota
- Federal initiatives
  - Connected Vehicle Initiative
- Many Issues
  - Legislation, Acceptability, Role of the infrastructure, Operating costs

Potential Operational Testing Locations

- Terminal Island Freeway – provides real-world intermodal truck freeway-like conditions
- Potential connections to 710 (south of I-405) and SR-47 for major test event(s)
- Potential testing might in late night hours (close-down) (e.g. 12:30 AM to 4:30 AM)

Potential Controlled Preliminary Testing Location – Fontana Speedway

- AAA Auto Club owned Speedway in Fontana, CA
- 2-Mile Continuous D-shaped oval; 75 feet wide
- Daily rental: $11K

IMPLEMENTATION ROADMAP

VENDOR SHOWCASES

Mercedes-Benz

VOLVO

TRANSCORE

perceptics
imaging technology solutions

ITERIS

TOMTOM

Parking Carma

Advent

INRIX

DRIVEWISE
Good drivers aren't born, they're built

SENSYS Networks

TELVENT

NAVTEQ

NEXT STEPS

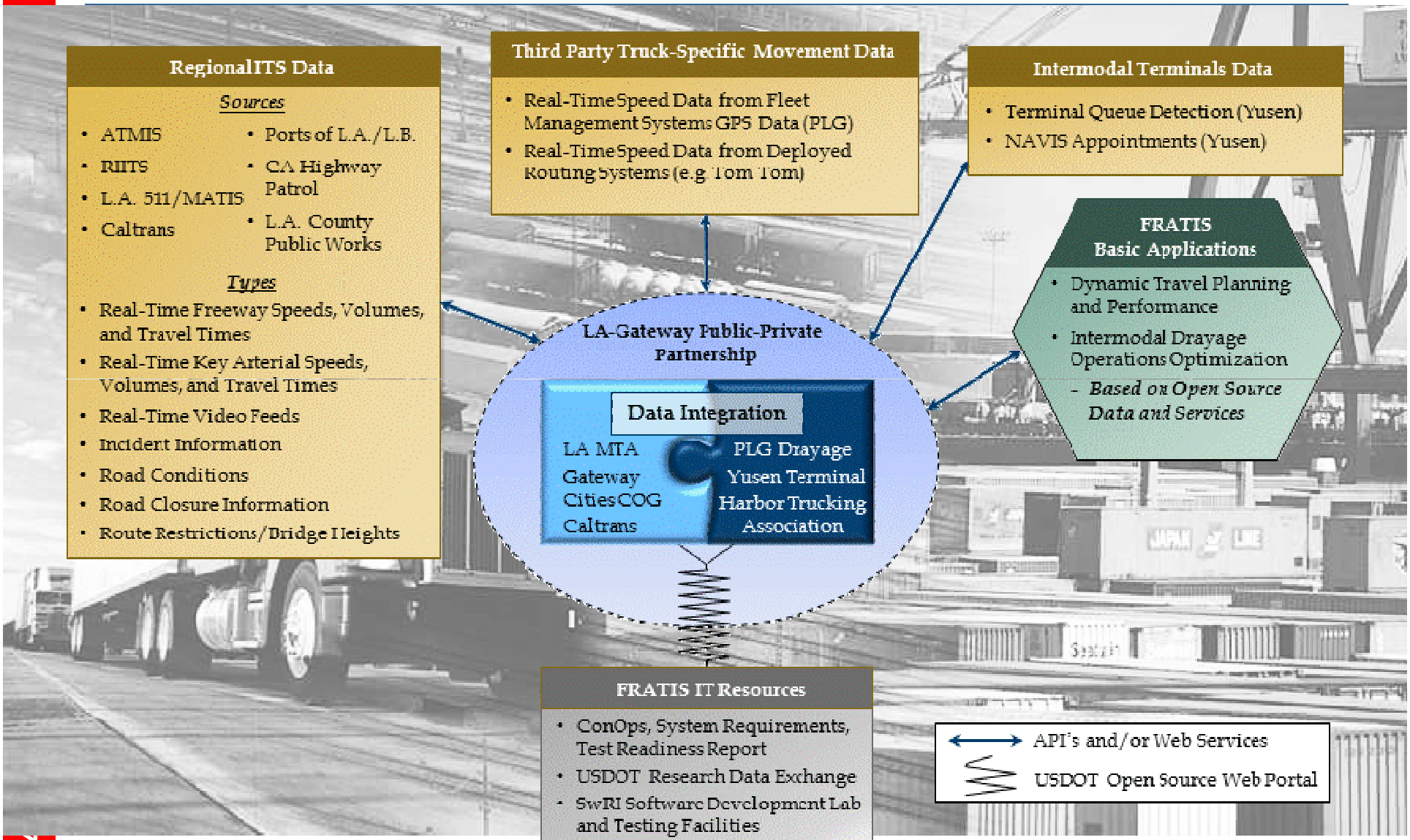
- USDOT Freight Advanced Traveler Information System (FRATIS) Testing in the LA-Gateway Cities Region
  - Ongoing through May 2014
- Freight ITS Planning Elements of the New Gateway Cities Transportation Strategic Plan Program by MTA and the Gateway Cities COG
  - March 2013 to March 2014

Freight Advanced Traveler Information System (FRATIS) Los Angeles Test Program

Why FRATIS Development in this Region?

- FRATIS development and small-scale testing in the LA-Gateway region is designed to:
  - Leverage and integrate public and private sector data sources, and add the missing pieces
  - Test the benefits of added functionality
  - Support regional efforts to build trust and establish a new paradigm for cooperation within the intermodal freight industry
  - Build support for freight-specific ITS applications
  - Serve as an incubator for private industry
  - Lessons learned will support further testing initiatives
- This test can also serve as the first step in deploying elements of the Gateway Cities ITS Goods Movement System
- FRAITS is being sponsored by the FHWA Office of Freight Mgmt. and Operations (POC: Randy Butler, FHWA; randy.butler@dot.gov)

Background – the April 2012 FRATIS ConOps:
The Starting Point for the LA-Gateway FRATIS Testing Concept



Relationship Between FRATIS & the Gateway Cities Goods Movement Technology Plan

During the development of the FRATIS Concept of Operations (ConOps), significant technical cross-fertilization between the FRATIS ConOps and the Gateway Cities Goods Movement Technology Plan occurred in a holistic manner, with the result being the improvement of both projects to better address intermodal freight user needs via ITS. This included utilizing the regional public-private "Freight ITS Working Group" as a sounding board for U.S. DOT's FRATIS concept, which manifested in the conduct of and Intermodal Freight Technology Work Group (IFTWG) meeting in November 2011 in L.A., where CS staff conducted a FRATIS user needs assessment. Additionally, U.S. DOT invited key L.A. regional freight ITS public and private stakeholders to participate in the FRATIS ConOps Walkthrough and the FRATIS System Requirements Walkthrough, both of which were held at LA METRO Headquarters in February and May, 2012, respectively. As a result of this cross-fertilization, the project designs currently being completed for the Gateway Cities Goods Movement Technology Plan are using the FRATIS ConOps and System Requirements and guidance, and the FRATIS ConOps includes an operational scenario centered on deploying FRATIS in the L.A.-Gateway Region.

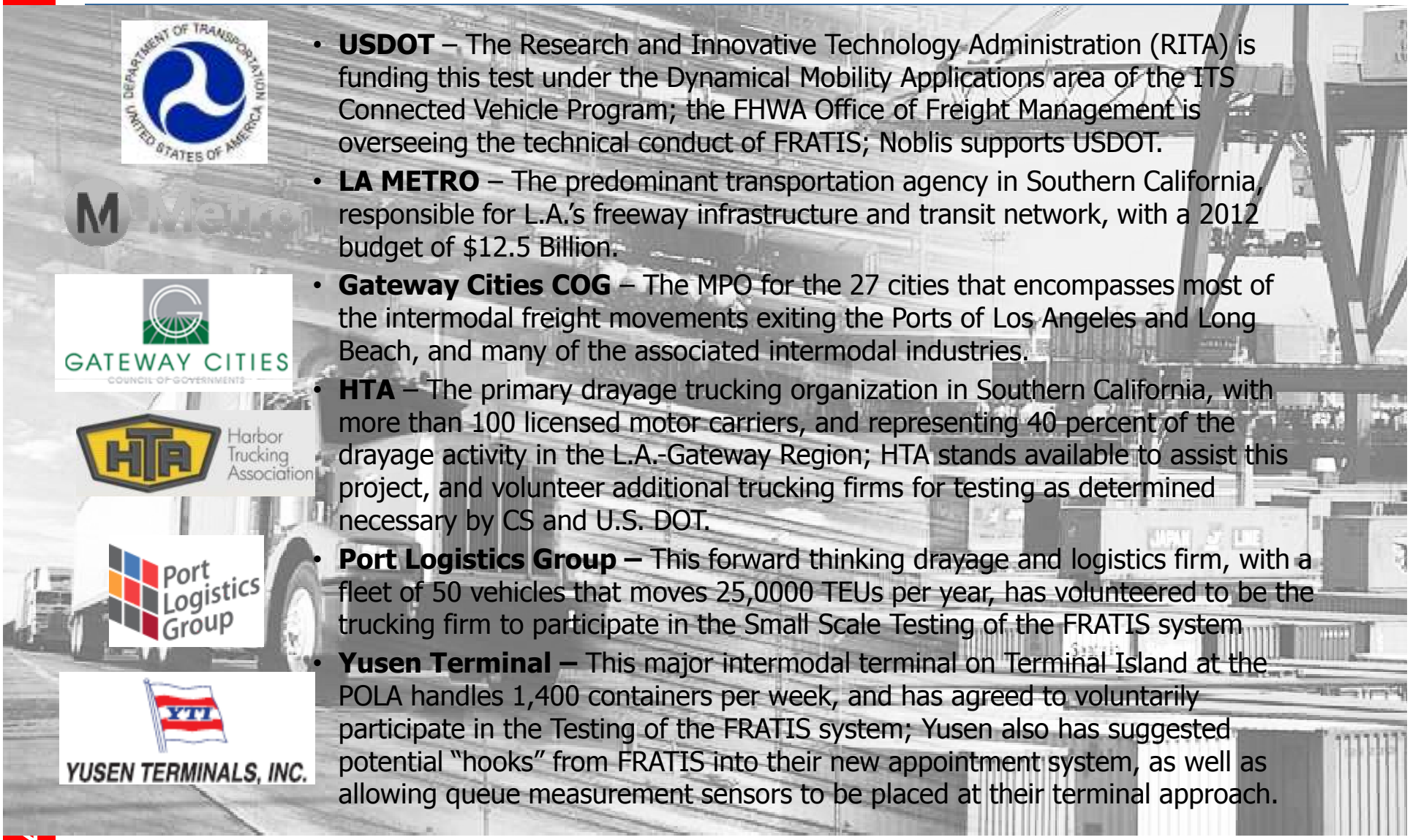
FRATIS Components as Applied to the LA-Gateway Region

- Freight-Specific Dynamic Travel Planning and Performance
  - Real-time information to support planning and operations of dray trucking movements in the region
  - Mobile and web-based delivery of push and pull alert and tailored information – to dray dispatchers and drivers
  - Reductions in fuel usage from applications use; corresponding improvements in air quality
  - Public sector performance monitoring
- Drayage Optimization
  - Real-time information on terminal queues, including predictive algorithms, to support planning and potential diversions/reassignment
  - Real-time information (and predictive algorithm) on number and types of trucks enroute to a terminal – to support terminal operations planning
  - Support appointment status information exchange between drayage dispatchers and MTO operators

What is the Los Angeles FRATIS Project?

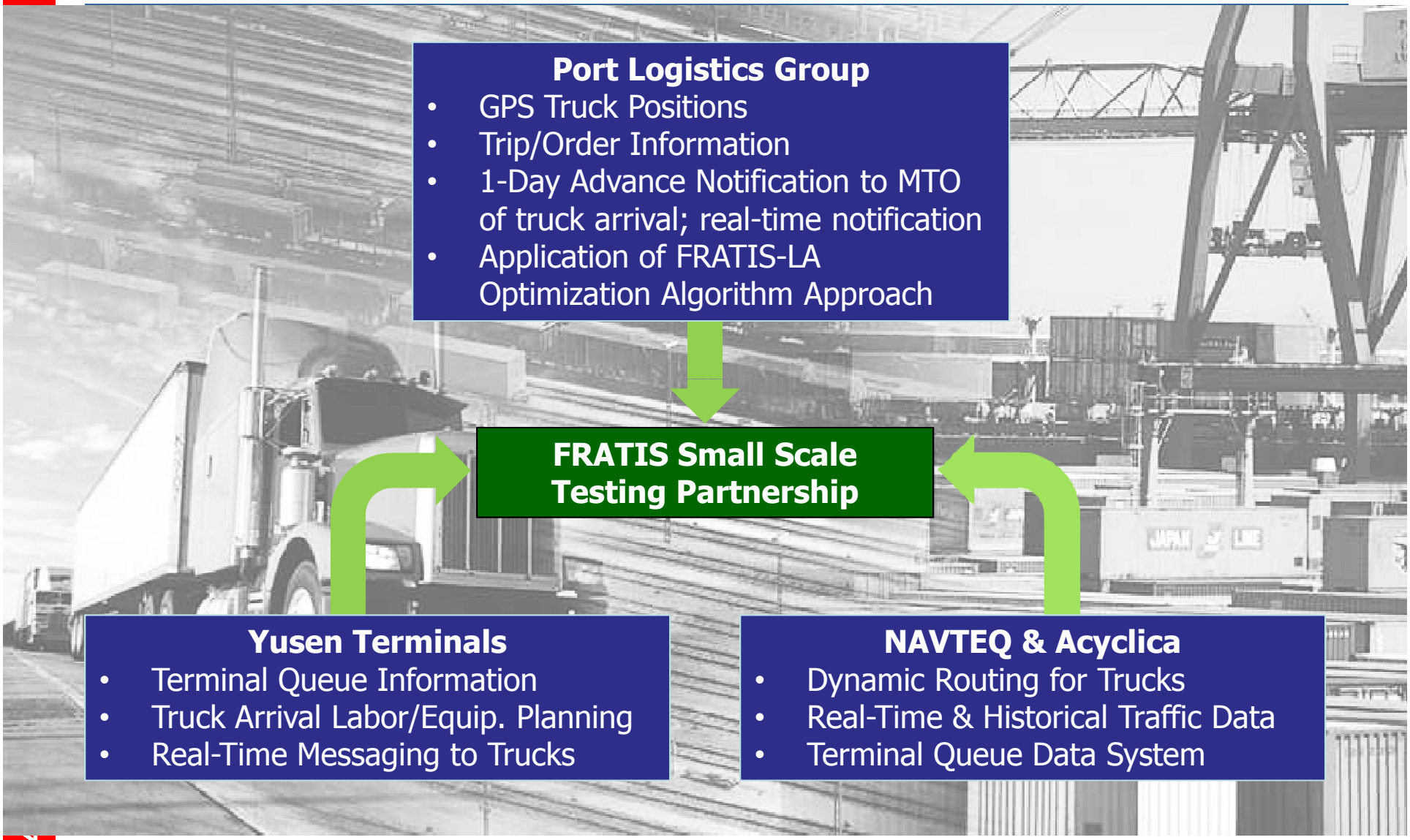
- Primary Goal: ***Enable*** and ***optimize*** information sharing between drayage fleets and marine terminals
  - Dray Operators (DO's): Improved planning for container pickups; dynamic routing to avoid congestion and severe queues; terminal and yard information/alerts
  - MTO's: Improved labor, equipment and gate operations; truck-specific yard management information; push alerts to trucks approaching or within terminal
  - Public Sector: Benefits in more efficient trips lead to congestion reduction and air quality improvements
- Test will be conducted with ***Port Logistics Group*** and ***Yusen Terminals Inc.***; operational testing to occur for six months starting this August
- Technologies to be tested:
  - FRATIS System Integration, Web and Mobile Interfaces – Productivity Apex
  - Point-to-Point Travel Planning and Dynamic Routing – NAVTEQ
  - Comprehensive Terminal Truck Processing Measurement – Acyclica

FRATIS Key Stakeholders/Participants

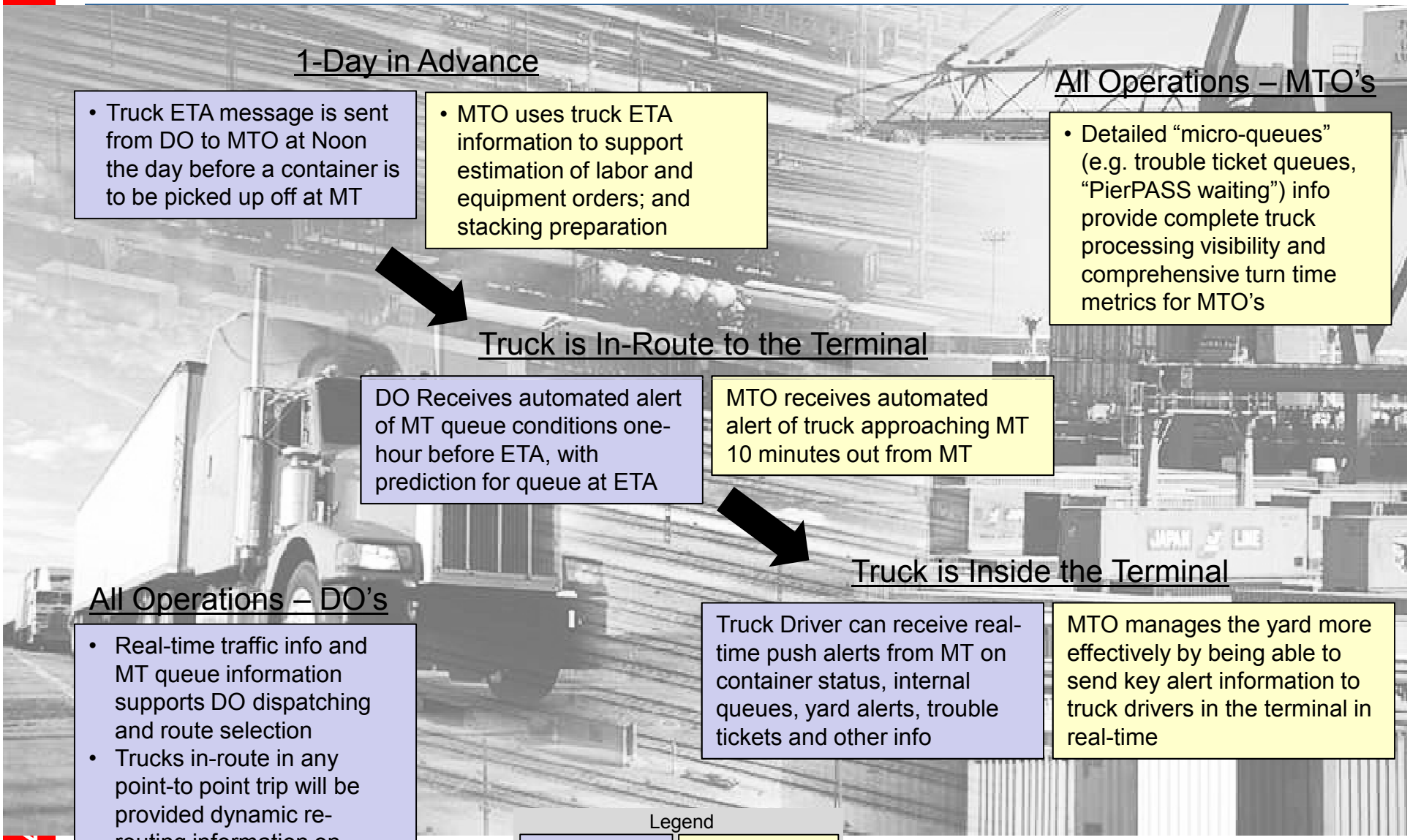


- **USDOT** – The Research and Innovative Technology Administration (RITA) is funding this test under the Dynamical Mobility Applications area of the ITS Connected Vehicle Program; the FHWA Office of Freight Management is overseeing the technical conduct of FRATIS; Noblis supports USDOT.
- **LA METRO** – The predominant transportation agency in Southern California, responsible for L.A.'s freeway infrastructure and transit network, with a 2012 budget of $12.5 Billion.
- **Gateway Cities COG** – The MPO for the 27 cities that encompasses most of the intermodal freight movements exiting the Ports of Los Angeles and Long Beach, and many of the associated intermodal industries.
- **HTA** – The primary drayage trucking organization in Southern California, with more than 100 licensed motor carriers, and representing 40 percent of the drayage activity in the L.A.-Gateway Region; HTA stands available to assist this project, and volunteer additional trucking firms for testing as determined necessary by CS and U.S. DOT.
- **Port Logistics Group –** This forward thinking drayage and logistics firm, with a fleet of 50 vehicles that moves 25,0000 TEUs per year, has volunteered to be the trucking firm to participate in the Small Scale Testing of the FRATIS system
- **Yusen Terminal –** This major intermodal terminal on Terminal Island at the POLA handles 1,400 containers per week, and has agreed to voluntarily participate in the Testing of the FRATIS system; Yusen also has suggested potential "hooks" from FRATIS into their new appointment system, as well as allowing queue measurement sensors to be placed at their terminal approach.

Relationship between Test Participant FRATIS Information Elements



Information Elements of the FRATIS LA System



1-Day in Advance

- Truck ETA message is sent from DO to MTO at Noon the day before a container is to be picked up off at MT

- MTO uses truck ETA information to support estimation of labor and equipment orders; and stacking preparation

All Operations – MTO's

- Detailed "micro-queues" (e.g. trouble ticket queues, "PierPASS waiting") info provide complete truck processing visibility and comprehensive turn time metrics for MTO's

Truck is In-Route to the Terminal

DO Receives automated alert of MT queue conditions one-hour before ETA, with prediction for queue at ETA

MTO receives automated alert of truck approaching MT 10 minutes out from MT

Truck is Inside the Terminal

Truck Driver can receive real-time push alerts from MT on container status, internal queues, yard alerts, trouble tickets and other info

MTO manages the yard more effectively by being able to send key alert information to truck drivers in the terminal in real-time

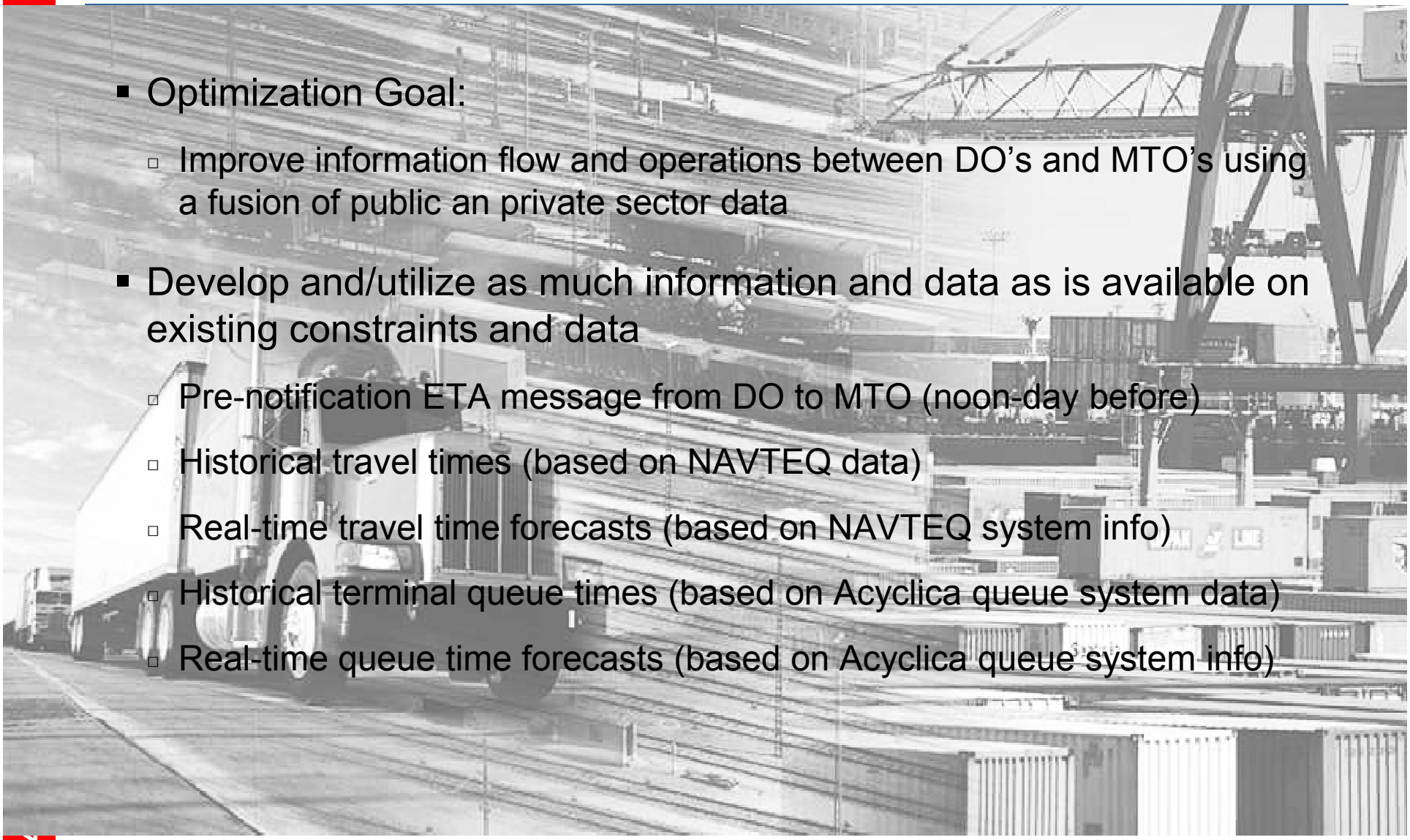
All Operations – DO's

- Real-time traffic info and MT queue information supports DO dispatching and route selection
- Trucks in-route in any point-to point trip will be provided dynamic re-routing information on truck-safe routes

Legend

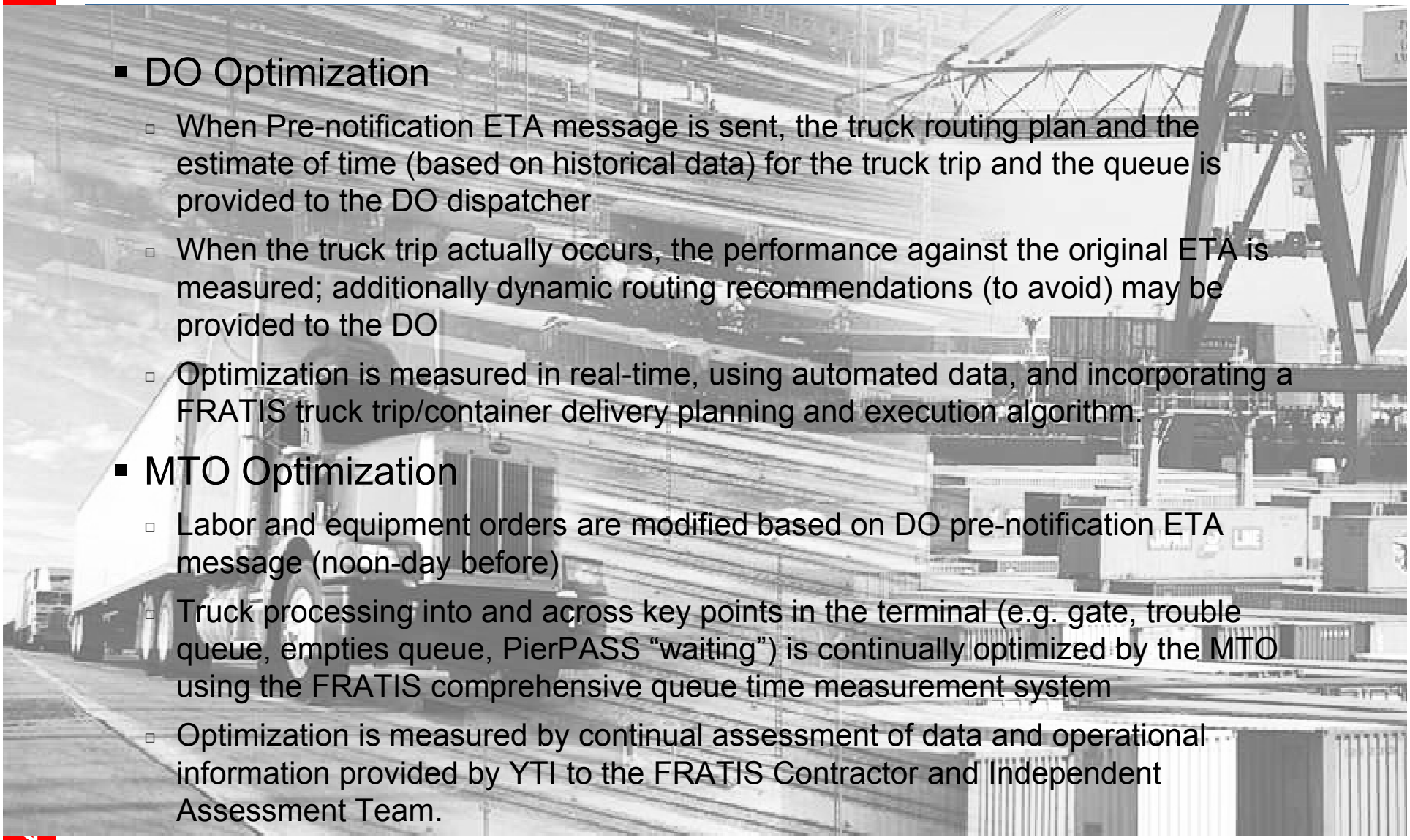
Drayage Fleet Operators (DO's)	Marine Terminal Operators (MTO's)

FRATIS Optimization Approach (1 of 2)



- Optimization Goal:
  - Improve information flow and operations between DO's and MTO's using a fusion of public an private sector data
- Develop and/utilize as much information and data as is available on existing constraints and data
  - Pre-notification ETA message from DO to MTO (noon-day before)
  - Historical travel times (based on NAVTEQ data)
  - Real-time travel time forecasts (based on NAVTEQ system info)
  - Historical terminal queue times (based on Acyclica queue system data)
  - Real-time queue time forecasts (based on Acyclica queue system info)

FRATIS Optimization Approach (2 of 2)

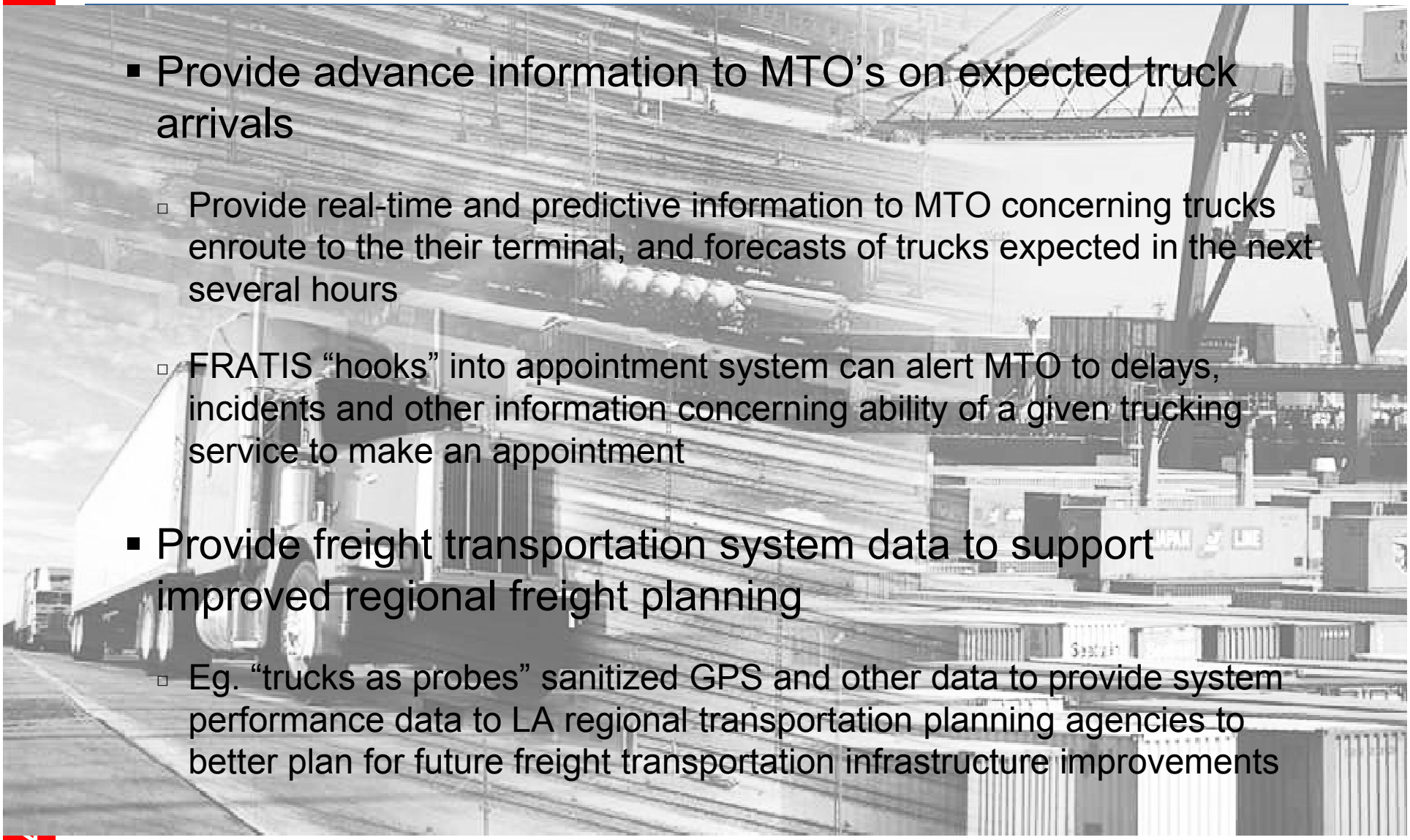


- DO Optimization
  - When Pre-notification ETA message is sent, the truck routing plan and the estimate of time (based on historical data) for the truck trip and the queue is provided to the DO dispatcher
  - When the truck trip actually occurs, the performance against the original ETA is measured; additionally dynamic routing recommendations (to avoid) may be provided to the DO
  - Optimization is measured in real-time, using automated data, and incorporating a FRATIS truck trip/container delivery planning and execution algorithm.
- MTO Optimization
  - Labor and equipment orders are modified based on DO pre-notification ETA message (noon-day before)
  - Truck processing into and across key points in the terminal (e.g. gate, trouble queue, empties queue, PierPASS “waiting”) is continually optimized by the MTO using the FRATIS comprehensive queue time measurement system
  - Optimization is measured by continual assessment of data and operational information provided by YTI to the FRATIS Contractor and Independent Assessment Team.

The Future – Potential Benefits in Deploying FRATIS across the San Pedro Bay Ports (1 of 2)

- Improve logistics efficiency for a dray trucking company
  - Pre-trip planning and dynamic re-routing
    - Improved trip planning
    - Traffic congestion avoidance and/or planning updates
  - Reduced idle time by avoiding congested gates
  - Real-time appointment status information
    - Improves planning, adherence and efficiency
  - Results of the above:
    - Reduced fuel cost and potential truck utilization efficiency gains
    - Reduced idle time by avoiding congested gates
    - Corresponding public benefits (from above) in improved air quality

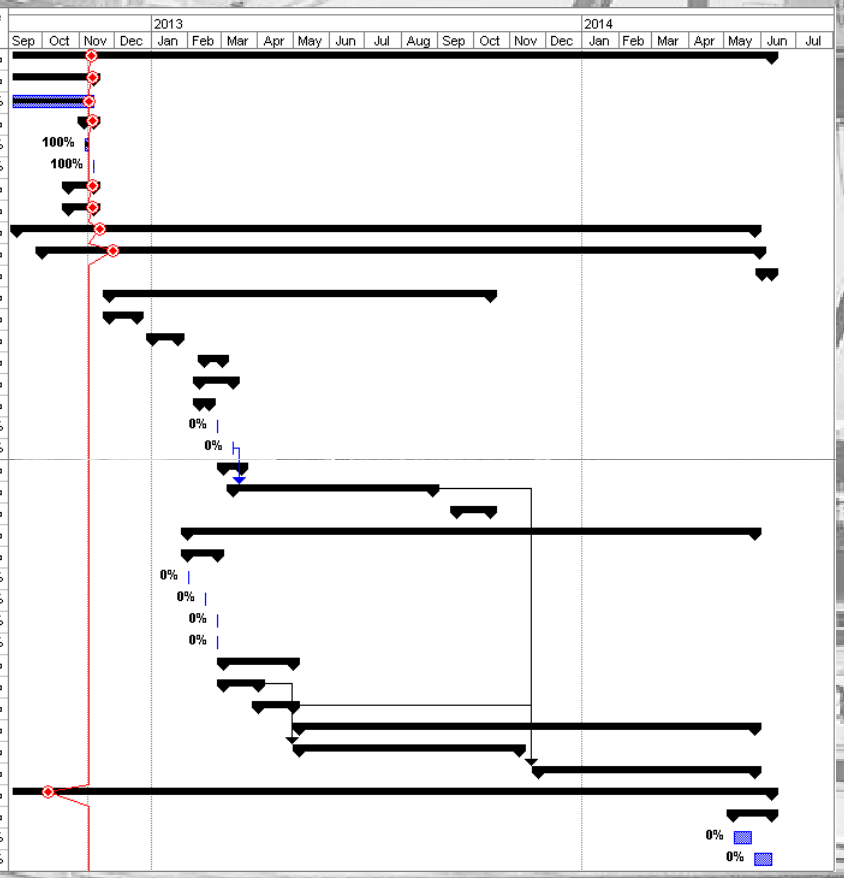
The Future – Potential Benefits in Deploying FRATIS across the San Pedro Bay Ports (2 of 2)



- Provide advance information to MTO's on expected truck arrivals
  - Provide real-time and predictive information to MTO concerning trucks enroute to the their terminal, and forecasts of trucks expected in the next several hours
  - FRATIS "hooks" into appointment system can alert MTO to delays, incidents and other information concerning ability of a given trucking service to make an appointment
- Provide freight transportation system data to support improved regional freight planning
  - Eg. "trucks as probes" sanitized GPS and other data to provide system performance data to LA regional transportation planning agencies to better plan for future freight transportation infrastructure improvements

FRATIS Project Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	% Complete
1	**1**	**Task 1 Project Management**	**459 days**	**Wed 9/5/12**	**Mon 6/9/14**		**53%**
2	**1.1**	**Task 1.1 Technical Concept Definition**	**50 days**	**Wed 9/5/12**	**Tue 11/13/12**		**100%**
3	1.1.1	Task 1.1.1 Preliminary Stakeholder and Vendor Meetings	50 days	Wed 9/5/12	Tue 11/13/12		100%
4	**1.2**	**Task 1.2 Briefing Materials/Kickoff Meeting**	**6 days**	**Tue 11/6/12**	**Tue 11/13/12**		**100%**
5	1.2.1	Task 1.2.1 Briefing Materials	4 days	Tue 11/6/12	Fri 11/9/12		100%
6	1.2.2	Task 1.2.2 Kickoff Meeting	1 day	Tue 11/13/12	Tue 11/13/12		100%
7	**1.3**	**Task 1.3 Develop Project Management Plan**	**16 days**	**Tue 10/23/12**	**Tue 11/13/12**		**100%**
10	**1.4**	**Task 1.4 Develop Project Schedule**	**16 days**	**Tue 10/23/12**	**Tue 11/13/12**		**100%**
13	**1.5**	**Task 1.5 Task Team Meetings Summaries**	**446 days**	**Mon 9/10/12**	**Mon 5/26/14**		**11%**
59	**1.6**	**Task 1.6 Monthly Status Reports**	**435 days**	**Mon 10/1/12**	**Fri 5/30/14**		**10%**
81	**1.7**	**Task 1.7 Briefing Materials, Closeout Meeting**	**6 days**	**Mon 6/2/14**	**Mon 6/9/14**		**0%**
84	**2**	**Task 2 Develop and Test Prototype for FRATIS Bundle of Appli**	**230 days**	**Tue 11/27/12**	**Mon 10/14/13**		**0%**
85	**2.1**	**Task 2.1 Briefing Materials, FRATIS Prototype Backlog Dev**	**17 days**	**Tue 11/27/12**	**Wed 12/19/12**		**0%**
90	**2.2**	**Task 2.2 FRATIS Prototype Backlog Refinement**	**16 days**	**Wed 1/2/13**	**Wed 1/23/13**		**0%**
95	**2.3**	**Task 2.3 Evaluate and Develop Implementation Options**	**11 days**	**Fri 2/15/13**	**Fri 3/1/13**		**0%**
98	**2.4**	**Task 2.4 Update FRATIS Prototype Backlog**	**21 days**	**Mon 2/11/13**	**Mon 3/11/13**		**0%**
99	**2.4.1**	**Task 2.4.1 Briefing Materials, FRATIS Prototype Backlo**	**6 days**	**Mon 2/11/13**	**Mon 2/18/13**		**0%**
102	2.4.2	Task 2.4.2 Draft, Updated FRATIS Prototype Backlog	1 day	Mon 2/25/13	Mon 2/25/13		0%
103	2.4.3	Task 2.4.3 Final, Updated FRATIS Prototype Backlog	1 day	Mon 3/11/13	Mon 3/11/13		0%
104	**2.5**	**Task 2.5 Develop Release Plan for FRATIS**	**11 days**	**Mon 3/4/13**	**Mon 3/18/13**		**0%**
109	**2.6**	**Task 2.6 Agile Software Development and Software Testir**	**121 days**	**Tue 3/12/13**	**Tue 8/27/13**	**103**	**0%**
167	**2.7**	**Task 2.7 As-Built Documentation**	**20 days**	**Tue 9/17/13**	**Mon 10/14/13**		**0%**
170	**3**	**Task 3 Plan, Prepare, and Conduct a Small-Scale Prototype Der**	**342 days**	**Fri 2/1/13**	**Mon 5/26/14**		**0%**
171	**3.1**	**Task 3.1 Plan for Small-Scale Demonstration of FRATIS Prc**	**17 days**	**Fri 2/1/13**	**Mon 2/25/13**		**0%**
172	3.1.1	Task 3.1.1 Draft, Prototype Demonstration Plan for FRATIS	1 day	Fri 2/1/13	Fri 2/1/13		0%
173	3.1.2	Task 3.1.2 Final, Prototype Demonstration Plan for FRATIS	1 day	Fri 2/15/13	Fri 2/15/13		0%
174	3.1.3	Task 3.1.3 Documentation of Materials Purchased	1 day	Mon 2/25/13	Mon 2/25/13		0%
175	3.1.4	Task 3.1.4 Hardware equipment, computers, software, test e	1 day	Mon 2/25/13	Mon 2/25/13		0%
176	**3.2**	**Task 3.2 Preparation and Installation of Required Compon**	**42 days**	**Mon 3/4/13**	**Tue 4/30/13**		**0%**
177	**3.2.1**	**Task 3.2.1 Preparation and Installation of Required Cor**	**21 days**	**Mon 3/4/13**	**Mon 4/1/13**		**0%**
180	**3.2.2**	**Task 3.2.2 Preparation and Installation of Required Cor**	**21 days**	**Tue 4/2/13**	**Tue 4/30/13**		**0%**
183	**3.3**	**Task 3.3 Conduct Small-Scale Prototype Demonstration**	**275 days**	**Tue 5/7/13**	**Mon 5/26/14**		**0%**
184	**3.3.1**	**Task 3.3.1 Conduct Baseline Data Collection**	**134 days**	**Tue 5/7/13**	**Fri 11/8/13**	**177**	**0%**
199	**3.3.2**	**Task 3.3.2 Conduct FRATIS Prototype Demonstration**	**131 days**	**Mon 11/25/13**	**Mon 5/26/14**	**109,180**	**0%**
221	**4**	**Task 4 Support FRATIS Impacts Assessment and National-Lev**	**459 days**	**Wed 9/5/12**	**Mon 6/9/14**		**5%**
224	**5**	**Task 5 Final Report**	**22 days**	**Fri 5/9/14**	**Mon 6/9/14**		**0%**
225	5.1	Task 5.1 Task Draft FRATIS Prototype Technical Report	11 days	Fri 5/9/14	Fri 5/23/14		0%
226	5.2	Task 5.2 Task Final FRATIS Prototype Technical Report	11 days	Mon 5/26/14	Mon 6/9/14		0%



- Baseline data collection underway
- Operational Testing to commence on September 1, 2013

THANKS !

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