



DMA Webinar Series

FRATIS Bundle

Carl Andersen and Robert Rupert

February 9, 2015

TODAY'S AGENDA

- Carl Andersen
Connected Vehicle Program Manager, FHWA Office of Research, Development, and Technology
 - FRATIS Bundle Overview
 - Prototype Description and Current Project Status

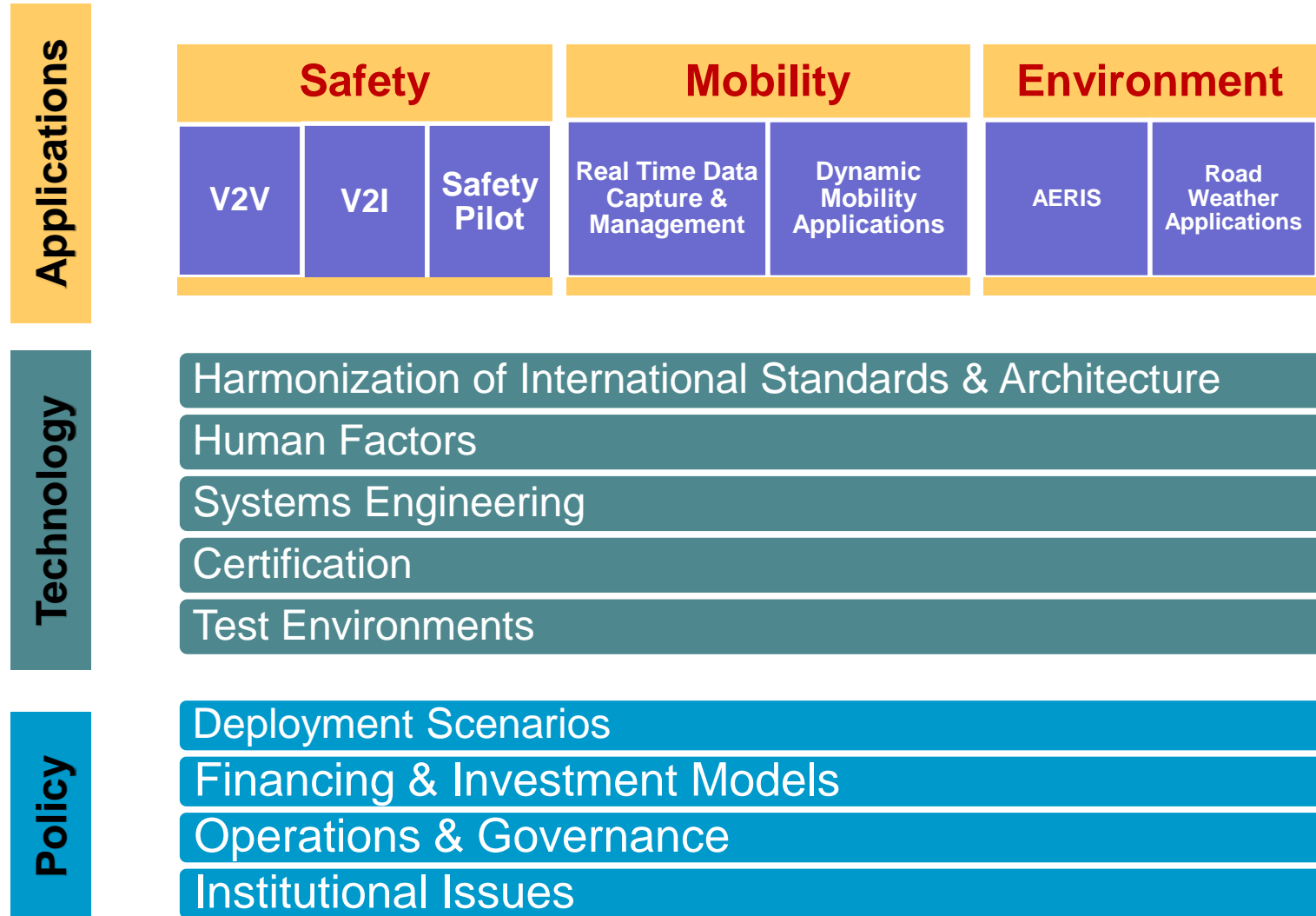
- Robert Rupert
Team Leader, FHWA Office of Operations
 - DMA Program Overview
 - Current Project Status of Impact Assessment
 - Testing Results and Impacts/Benefits from IA

- Stakeholder Q&A
 - We can only answer the questions related to the DMA program.
 - We cannot answer any questions related to the CV Pilots.



DMA Program Overview

ITS RESEARCH PROGRAM COMPONENTS



DMA PROGRAM APPROACH TO OVERCOMING TWO KEY CHALLENGES TO APPLICATION DEPLOYMENT

▪ **Challenge 1 (Technical Soundness)**

Are the DMA bundles technically sound and deployment-ready?

- Create a “trail” of systems engineering documents (e.g., ConOps, SyRs)
- Share code from open source bundle prototype development (OSADP website: <http://www.itsforge.net/>)
- Demonstrate bundle prototypes (in isolation)
- Field test integrated deployment concepts from across CV programs

▪ **Challenge 2 (Transformative Impact)**

Are DMA bundle-related benefits big enough to warrant deployment?

- Engage stakeholders to set transformative impact measures and goals
- Assess whether prototype shows impact when demonstrated
- Estimate benefits associated with broader deployment
- Utilize analytic testbeds to identify synergistic bundle combinations



DMA BUNDLES AND APPLICATIONS

FRATIS: Freight Advanced Traveler Information Systems

Apps: Freight-Specific Dynamic Travel Planning and Performance, Drayage Optimization (DR-OPT)



IDTO: Integrated Dynamic Transit Operations

Apps: Connection Protection (T-CONNECT), Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)



R.E.S.C.U.M.E.: Response, Emergency Staging and Communications, Uniform Management, and Evacuation

Apps: Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)



MMITSS: Multimodal Intelligent Traffic Signal System

Apps: Intelligent Traffic Signal System (I-SIG), Transit and Freight Signal Priority (TSP and FSP)
Mobile Accessible Pedestrian Signal System (PED-SIG), Emergency Vehicle Preemption (PREEMPT)



INFLO: Intelligent Network Flow Optimization

Apps: Dynamic Speed Harmonization (SPD-HARM), Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)

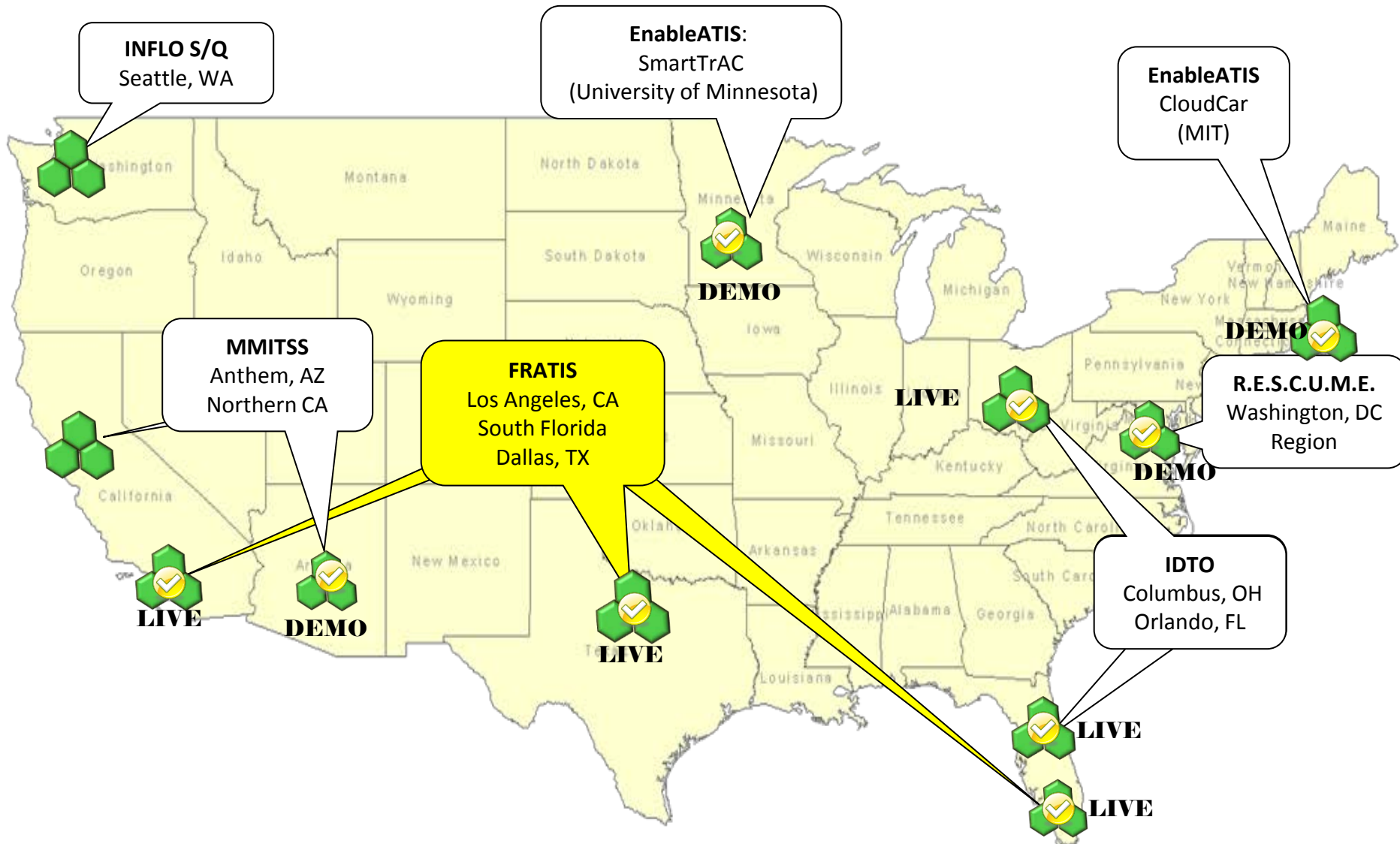


Enable ATIS: Enable Advanced Traveler Information Systems

Apps: EnableATIS (Advanced Traveler Information System 2.0)



DMA PROTOTYPE DEVELOPMENT ACTIVITY



FRATIS Bundle Overview

FRATIS OVERVIEW

- FRATIS application bundle seeks innovations to transform freight mobility, including methods to:
 - Leverage freight mobility information technologies under development in the private sector regarding freight traveler information, dynamic routing, and load matching;
 - Integrate these technologies with public sector Intelligent Transportation Systems (ITS) and sensor information available for roadways in major metropolitan regions; and
 - Facilitate accelerated public-private deployment of FRATIS applications.



FRATIS BUNDLE APPLICATIONS

FRATIS bundle is composed of two applications

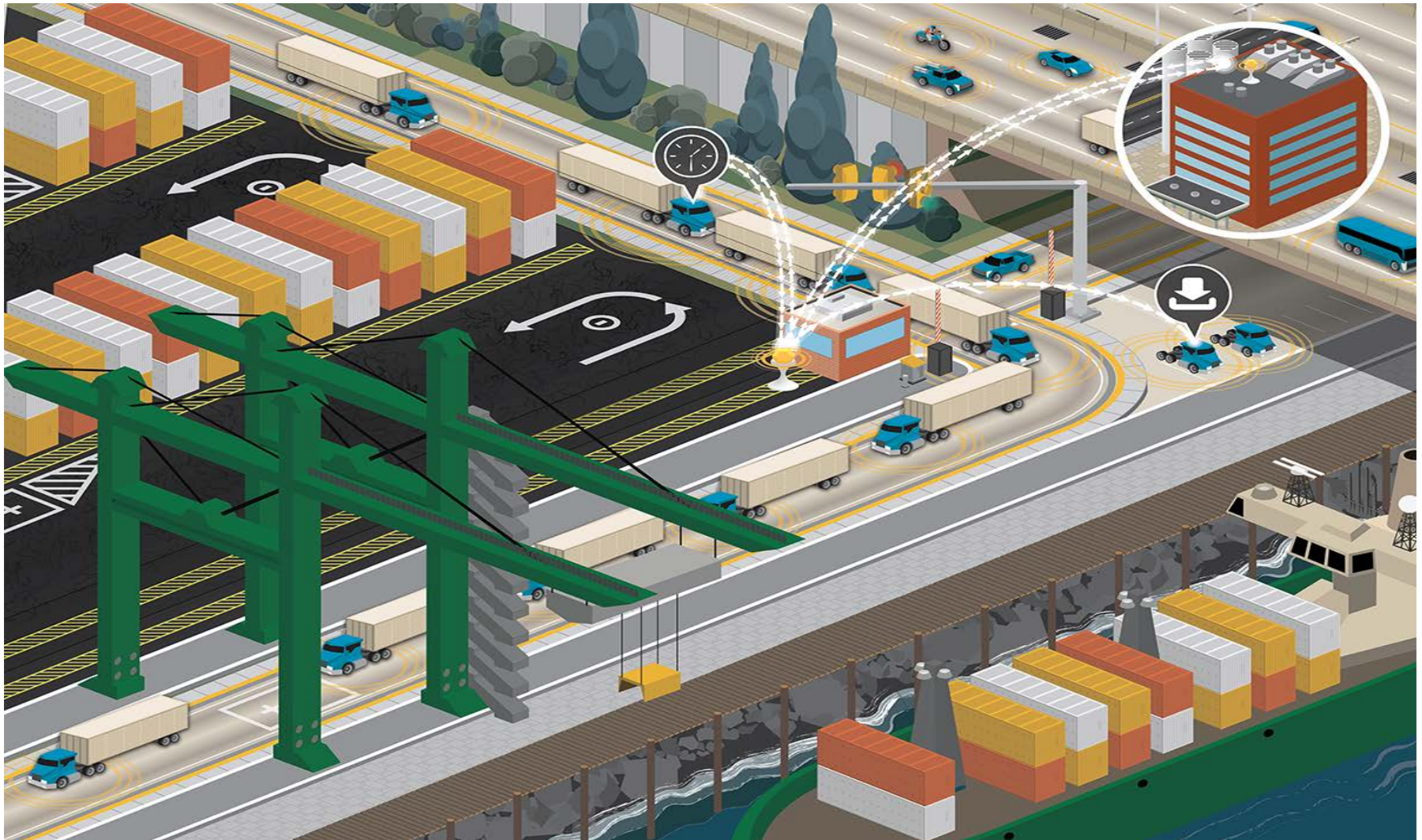
- **Freight-Specific Dynamic Travel Planning and Performance:** Series of applications integrating freight traveler information, dynamic route guidance, and public sector performance monitoring to improve freight travel time and reduce fuel consumption and emissions



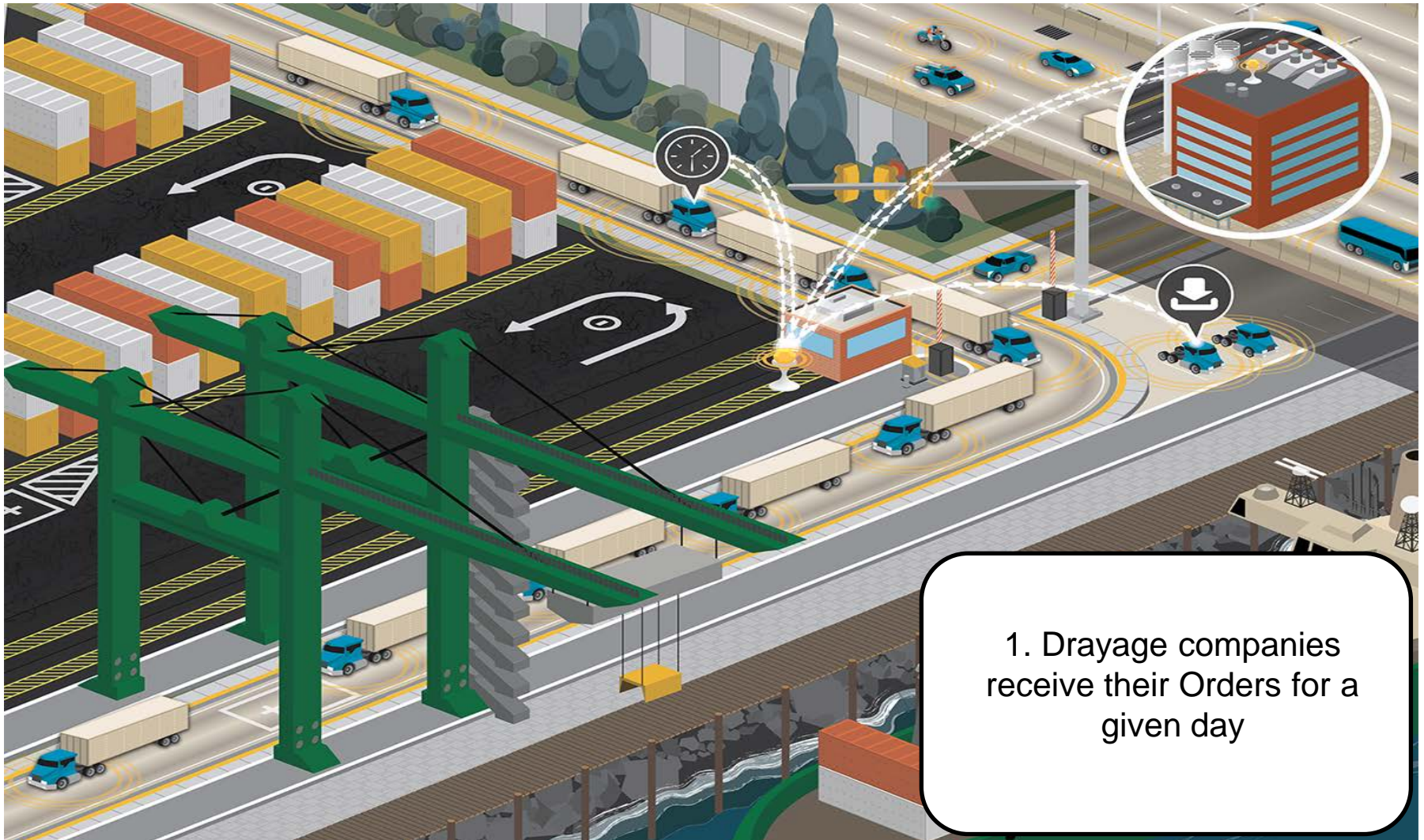
- **Drayage Optimization:** Integrated load matching and freight information exchange, including appointment scheduling and equipment availability at intermodal terminals



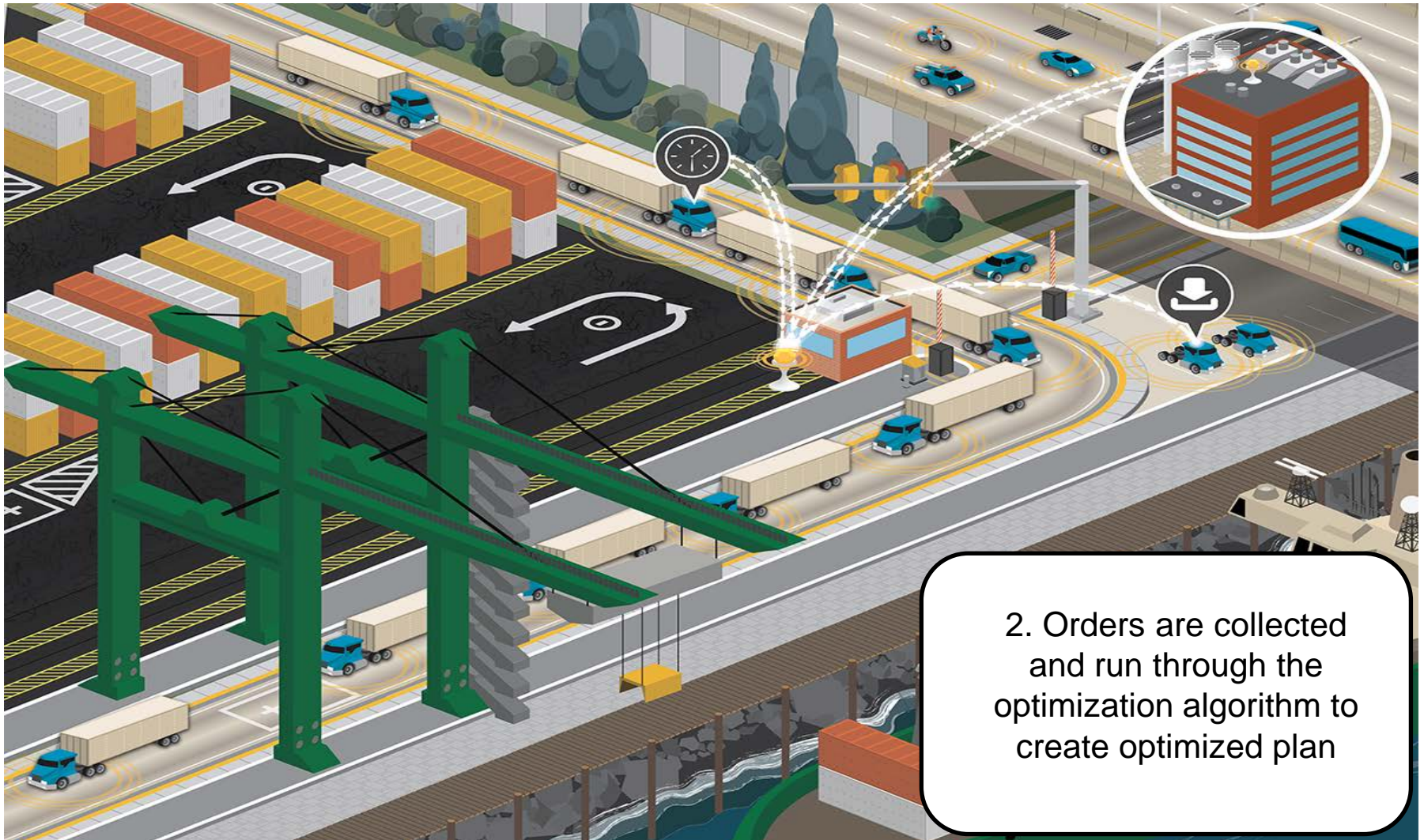
FRATIS SYSTEM FUNCTIONS



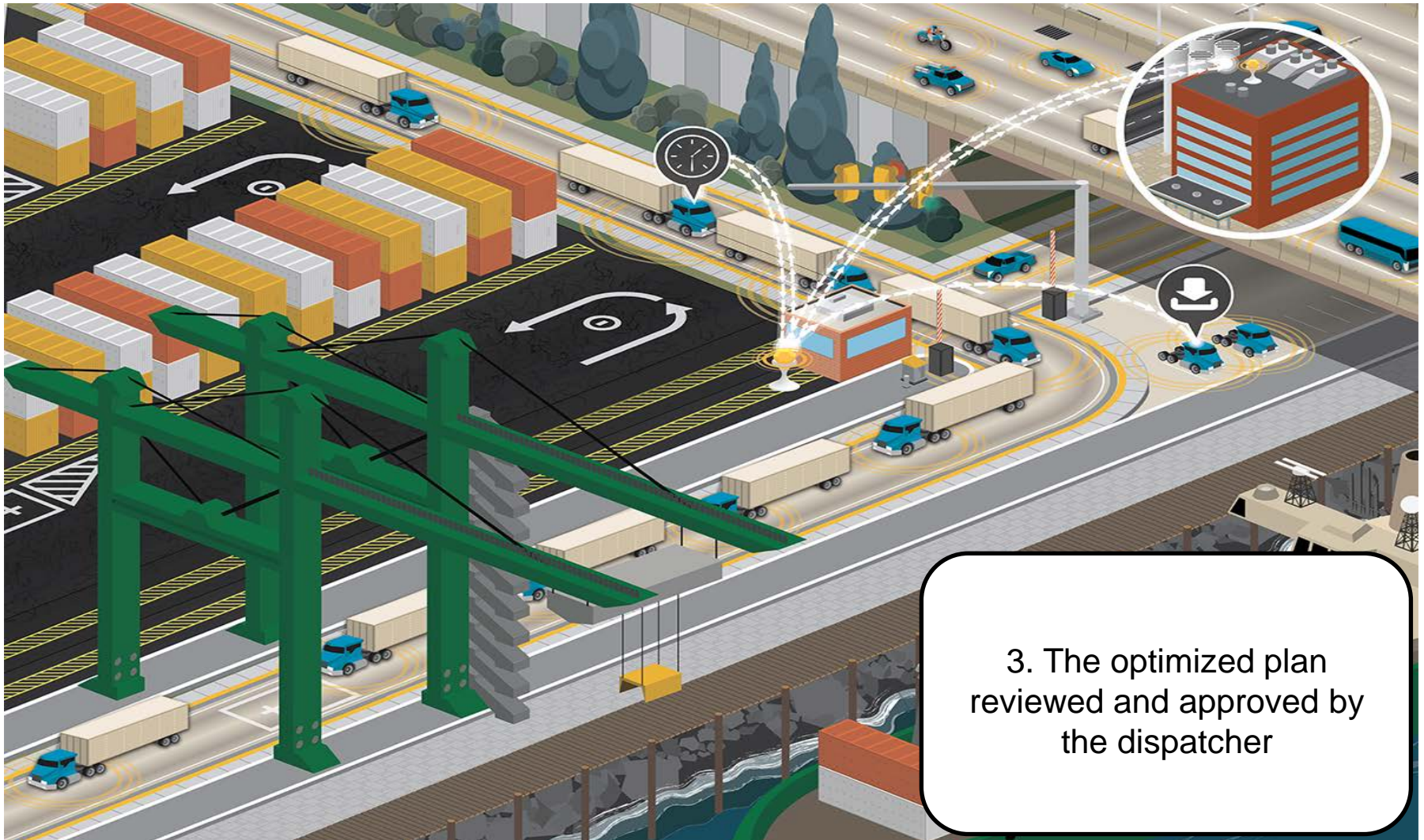
FRATIS SYSTEM OVERVIEW



FRATIS SYSTEM OVERVIEW



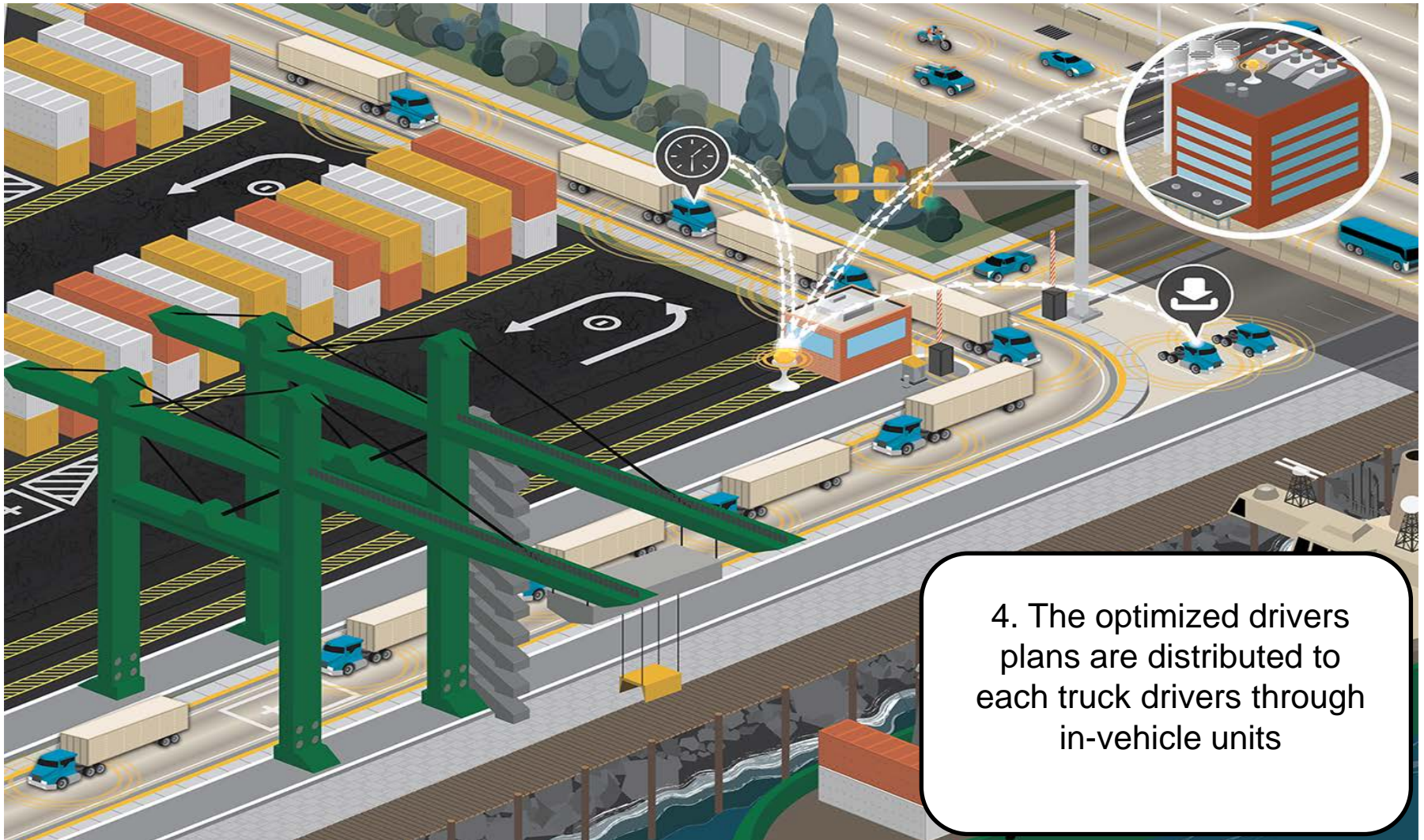
FRATIS SYSTEM OVERVIEW



3. The optimized plan reviewed and approved by the dispatcher



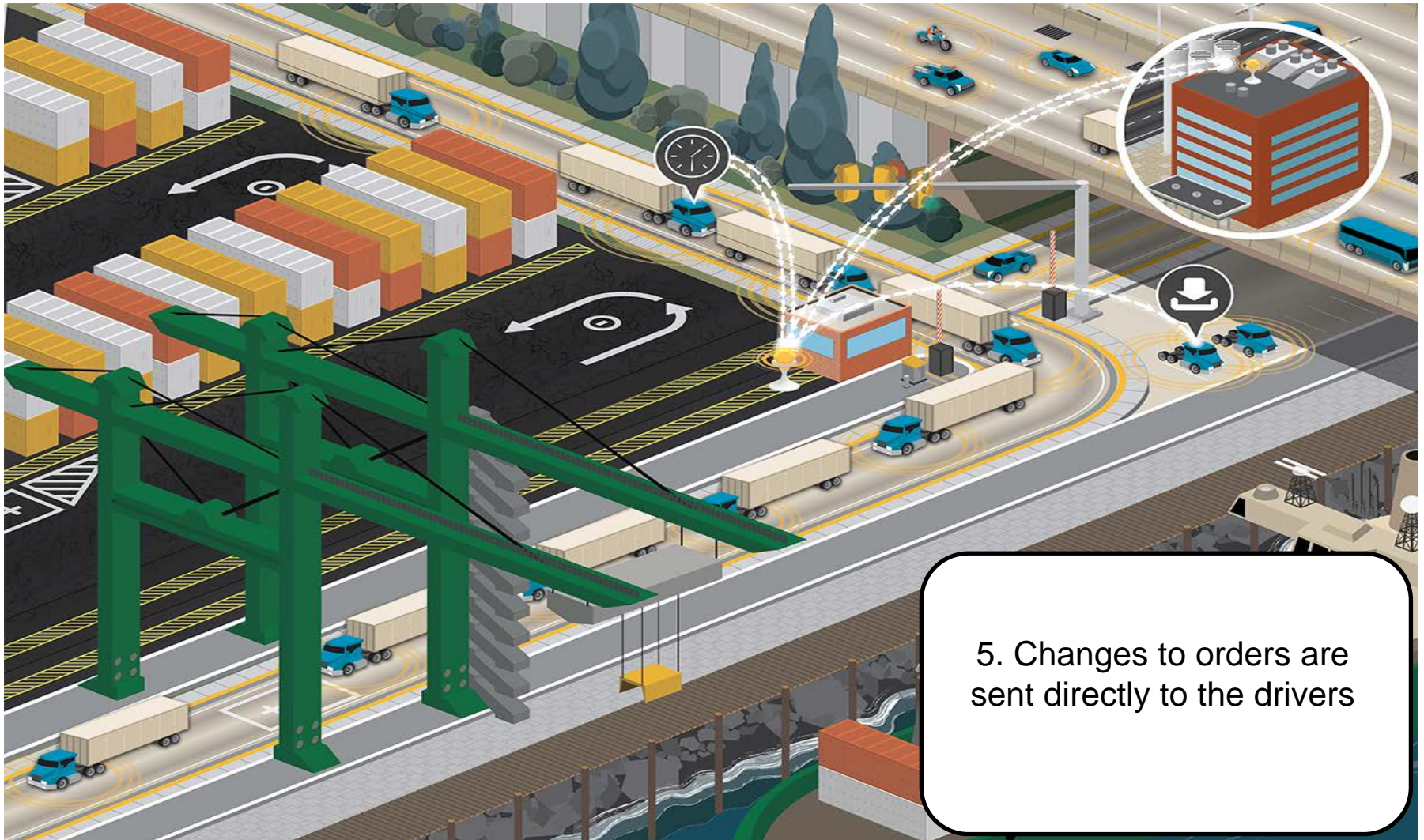
FRATIS SYSTEM OVERVIEW



4. The optimized drivers plans are distributed to each truck drivers through in-vehicle units



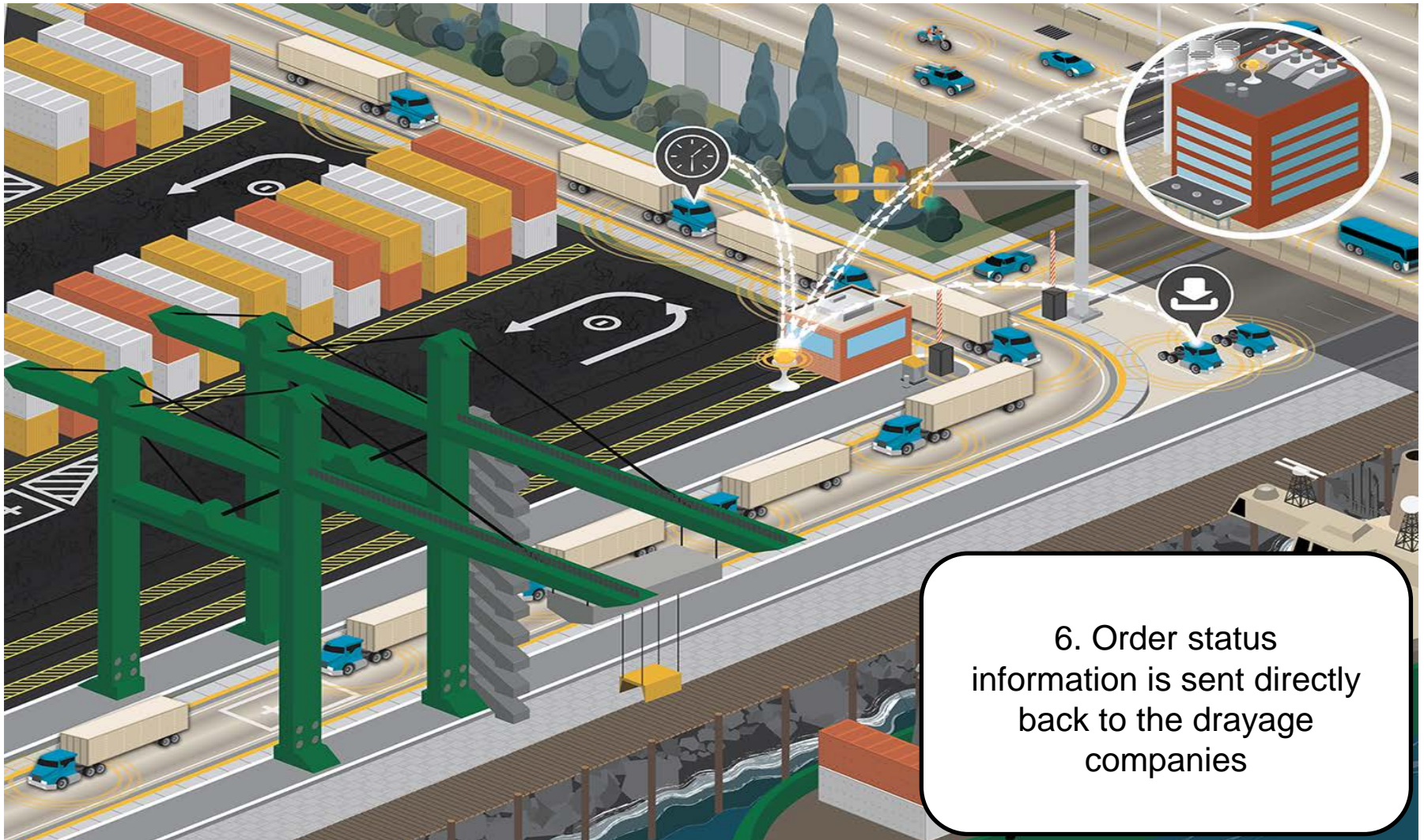
FRATIS SYSTEM OVERVIEW



5. Changes to orders are sent directly to the drivers



FRATIS SYSTEM OVERVIEW



FRATIS PROTOTYPE SITES

- **Los Angeles-Gateway Region:**

- Developing the FRATIS applications to address the dynamic travel planning around the marine terminals and queues to move cargo out of the port more efficiently.
- Used Bluetooth (wifi)-based terminal queue management system.

- **Dallas-Fort Worth, Texas:**

- This site is also testing terminal queue time using Bluetooth (wifi) and DSRC technology (SAE Standard 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 realign the purpose of freight transportation to bring in supplies during an emergency such as a hurricane.



FRATIS Prototypes

LOS ANGELES GATEWAY REGION

Key Partners

- **Port Logistics Group**
 - 50 trucks installed with TomTom Link 510 and TomTom 7150 GPS Truck
- **Yusen Terminal Inc**
 - Testing new information exchange with Port Logistics Group, as well as allowing queue measurement sensors to be placed at their terminal approach (and inside)



LOS ANGELES GATEWAY REGION

- **Unique feature: Drayage-Marine Terminal Operator (MTO) Information Exchange**
 - Two-way messaging between terminal and drayage firm with estimated time of arrival (ETA) for dray approaches and MTO-dispatcher messaging and alerts
 - Benefits of FRATIS Trucking – MTO Communications System Testing
 - If deployed on a large scale, and supported by all parties (including shippers), has the potential to radically improved port terminal and trucking efficiencies
 - Through “dynamic appointments”
 - Has successfully brought together the trucking and terminal operations communities in the ports region
 - A major positive development



DALLAS-FORT WORTH, TEXAS

- Stakeholder Partners
 - IMCG (container yard)
 - Associated Carriers (drayage company)
 - 40 trucks equipped with TomTom Link 510 devices for prototype monitoring
 - Southwest Freight International (drayage company)
 - 10 trucks equipped with TomTom Link 510 devices for prototype monitoring
 - BNSF (terminal yard)
- Providers/Vendors
 - Trinium (dispatch software)
 - Acyclica (Bluetooth hardware and software)



DALLAS-FORT WORTH, TEXAS

- **Unique feature: Calculate terminal queue time using DSRC**
- Partners
 - USDOT ITS Joint Program Office (Connected Vehicle Test Bed)
 - IMCG (facility and drayage company)
- Process:
 - Install equipment (stationary roadside unit and DSRC radios on trucks)
 - Configure connected vehicle data management system to store/query data
 - Develop code to calculate relevant metrics:
 - Wait time
 - Time on yard – active vs. idle
 - Comparison to wi-fi wait times



DSRC RSU (Long view)



DSRC Radio Antenna (truck)

SOUTH FLORIDA

■ Key Partners

- Florida East Coast (FEC) Highway Services – drayage arm of FEC Railway
- Public Sector Freight Data Providers and Consumers
- Emergency management personnel and private partners

■ Technology

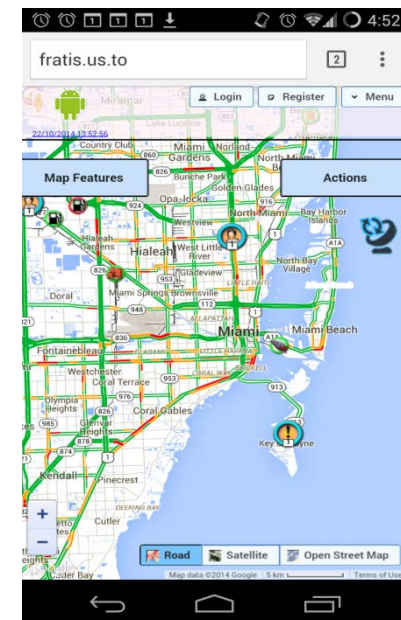
- Drayage Optimization
 - 50 TomTom devices, web-based optimization tool, data mapping, and dedicated encrypted FTP server



SOUTH FLORIDA

- **Unique feature: Increasing Emergency Preparedness and Response Efficiency App**

- Three test scenarios were developed representing progressively worsening hurricane conditions
- As the scenarios increase in severity, the conditions reported by users were anticipated to increase in severity
- Each different user type (emergency management, truck drivers, private business/freight hubs) had different reporting responsibilities
- Each scenario was completed over the course of one day
- Participants used an Android device or internet browser to complete condition reports, comment on other condition reports, and update business/terminal status



* **Testing completed in December**



KEY CHALLENGES

- Institutional
 - Strong partnership and continuous commitment to the project
 - Operational disruptions and partner staffing availability
 - Driver and dispatcher acceptance
- Technical
 - Data exchange interoperability between back-end systems
 - Customization of optimization program for each site
 - Bluetooth equipment outages due to weather and staff interference



FRATIS DOCUMENTATION AND CODE

- Supporting documentation available at -
http://www.its.dot.gov/pilots/pilots_mobility.htm
 - Freight Advanced Traveler Information System (FRATIS) Concept of Operations
 - Freight Advanced Traveler Information System (FRATIS) Architecture and Implementation Report - Los Angeles
 - Freight Advanced Traveler Information System (FRATIS) Demonstration Plan - Los Angeles
 - Freight Advanced Traveler Information System (FRATIS) Architecture and Implementation Report - Dallas-Fort Worth
 - Freight Advanced Traveler Information System (FRATIS) Demonstration Plan - Dallas-Fort Worth
 - Freight Advanced Traveler Information System (FRATIS) Architecture and Implementation Report - South Florida
 - Freight Advanced Traveler Information System (FRATIS) Demonstration Plan - South Florida
- Code from open source FRATIS prototype developments available at
<http://www.itsforge.net/>



FRATIS Impact Assessment

FRATIS IMPACT ASSESSMENT OVERVIEW

- **Separate contract for impact assessment**
 - CDM Smith-Booz Allen-North River Consulting
- **Collect and analyze data to measure reduction in:**
 - Travel time shipper-to-terminal
 - Terminal queue time
 - Fleet average fuel consumption
 - Emissions based on fuel consumption
 - Number of bobtails
- **Obtain stakeholders feedback and perceptions**
 - Dispatchers and drivers
 - Terminal operators
 - Public agencies



FRATIS IMPACT ASSESSMENT OVERVIEW

- Initial Tasks Sept 2012-June 2013
 - Familiarization with prototype at each site
 - Preparation of Impact Assessment Plan
 - Definition of performance measures and data to be collected by prototype contractors
 - Collaboration on analysis tools with other contractors
- Monitoring and Preliminary Analysis July 2013-Nov 2014
 - Coordination with contractors at each side
 - Coordination with DOT
 - Weekly trip analysis reports for LA (May-Nov 2014)
- Impact Assessment is On-going January-July 2015
 - Analysis of Tom-Tom and Acyclica data collected from each site
 - Interviews with dray companies and other stakeholders
 - Estimation of regional benefits after analyzing each site
 - Final assessment reports in July-August 2015



FRATIS ASSESSMENT HYPOTHESES

- Dray companies will find optimization plans more efficient and result in cost savings
- FRATIS will result in reduced queue time for truckers at terminals
- Terminal operators will benefit from advanced arrival information
- FRATIS will result in travel time reductions for drayage company moves to ports and terminals
- FRATIS will result in a reduction of the percentage of trucks involved in traffic bottlenecks
- The prototype site users will find the FRATIS test results useful and will have concrete plans to implement FRATIS and integrate it with their existing systems after the test has been completed
- Other drayage and freight transportation companies in the region will recognize the cost savings associated with FRATIS and are willing to implement it to benefit from its use



FRATIS ASSESSMENT METHODS

- Compare test data with baseline data
 - Calculate travel time shipper-to-terminal using Tom-Tom data
 - Calculate terminal queue time using Acyclica data
 - Estimate fuel consumption based on fleet averages and trip mileage
 - Estimate emissions based on fuel consumption
 - Determine number of bobtails if applicable
- Survey and interview stakeholders
 - Dispatchers
 - Drivers
 - Terminal operators
 - Public agencies



TEST VERSUS BASELINE DATA

- Operational conditions examined
 - Apples to apples comparison
 - Bin analysis tried on preliminary LA data
 - Findings not significant
- Current impact assessment focus:
 - Average trip time
 - Overall fleet mileage

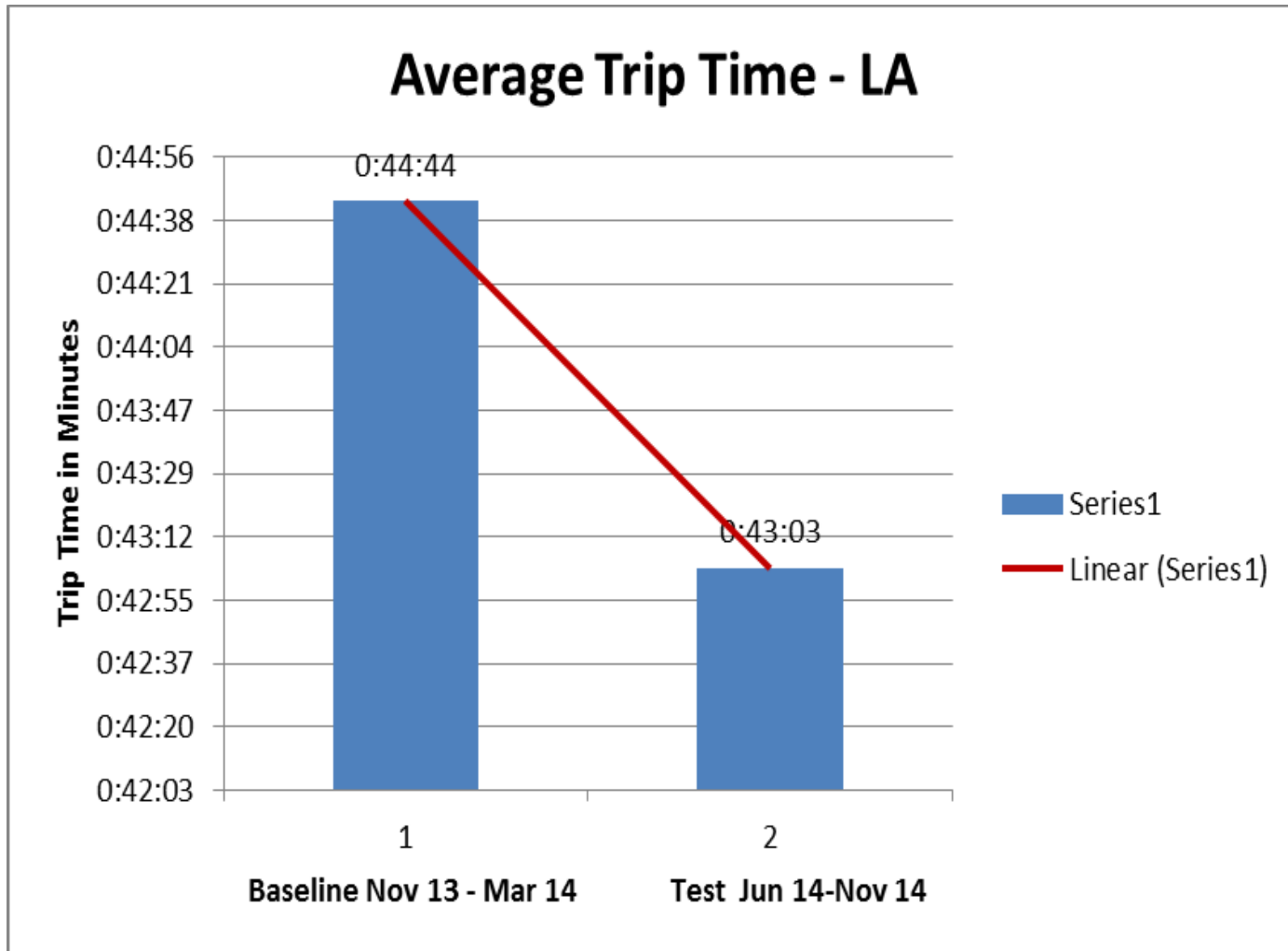


LOS ANGELES TRIP DATA BY DRIVER – 12/29/14

Truck	Trips	Miles	Time	Miles/Trip	Time/Trip
0291-EL - CARC	10	197	6:35:00	19.70	0:39:30
0293-EL - PERR	7	140	5:03:00	20.00	0:43:17
1389-O - JOSV	8	187	5:15:00	23.38	0:39:22
1711-O - MESG&TOUSAM	3	42	2:16:00	14.00	0:45:20



FRATIS LOS ANGELES TRIP TIME ANALYSIS



ASSESSMENT OF REGIONAL IMPACTS

- Based on assessment of trip and terminal queue data for each prototype site
- Identification of impacts of FRATIS at prototype sites
- Assessment of potential impacts of FRATIS on a region
 - Additional customers/partners of test participants
 - Additional drayage companies
 - Other geographic regions



PRELIMINARY LESSONS LEARNED

- Involvement of the assessment team at the beginning is useful, but not sufficient to assure good test results
- Integration of new capabilities into existing systems is essential to a successful test
- Using devices such as Tom-Toms to collect data without human intervention is the best way to collect reliable test data
- Successful tests with transportation companies require significant development contractor resources to help overcome operational inertia
- Despite the best intentions, operational situations that test participants face can interfere with test results



PRELIMINARY IMPLICATIONS FOR DEPLOYMENT

- Integration of FRATIS or similar technologies with existing systems within a company is essential
- Expansion beyond individual companies necessitates a regional, probably public or public-private partnership, entity to successfully deploy and operate



Stakeholder Q&A

DMA Program

Kate Hartman, Program Manager, ITS Joint Program Office
(202) 366-2742, Kate.Hartman@dot.gov

Webinar Speakers

Carl Andersen, (202) 493-3045, Carl.Andersen@dot.gov
Robert Rupert, (202) 366-2194, Robert.Rupert@dot.gov

DMA Website

<http://www.its.dot.gov/dma/>