I-35 FRATIS Impacts Assessment

Sponsored by FHWA, supported by TXDOT, deployment by PAI, led by Cambridge Systematics with support from University of Washington

Partial Automation for Truck Platooning

Sponsored by FHWA, managed by Caltrans, led by UC Berkeley PATH, with support from Volvo and Cambridge Systematics

presented by

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CAMBRIDGE SYSTEMATICS

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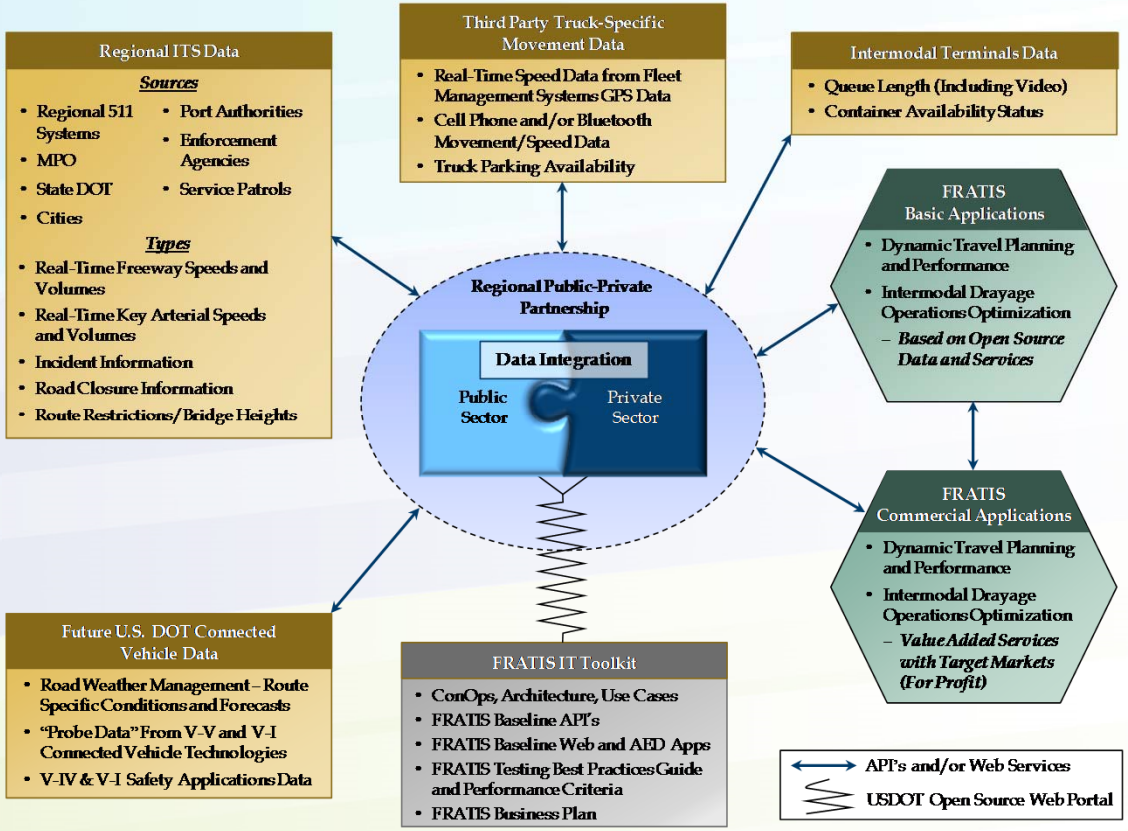
Think Forward

Background – FRATIS ConOps



"FRATIS I-35" in Texas

- With a long-term construction program underway, the I-35 corridor in Texas is one of the most congested roadways in Texas
- Goal of improving freight movement along the construction corridor through tailored work zone planning information for trucking fleets
  - lane-closure locations, delay lengths and projected delays
- Software and in-vehicle tablets deployment with trucking fleets to optimize truck trip dispatch planning
- Expected benefits: freight mobility, trucking fleet efficiency, and corresponding environmental improvements

I-35 FRATIS Impacts Assessment

"FRATIS I-35" in Texas (continued)

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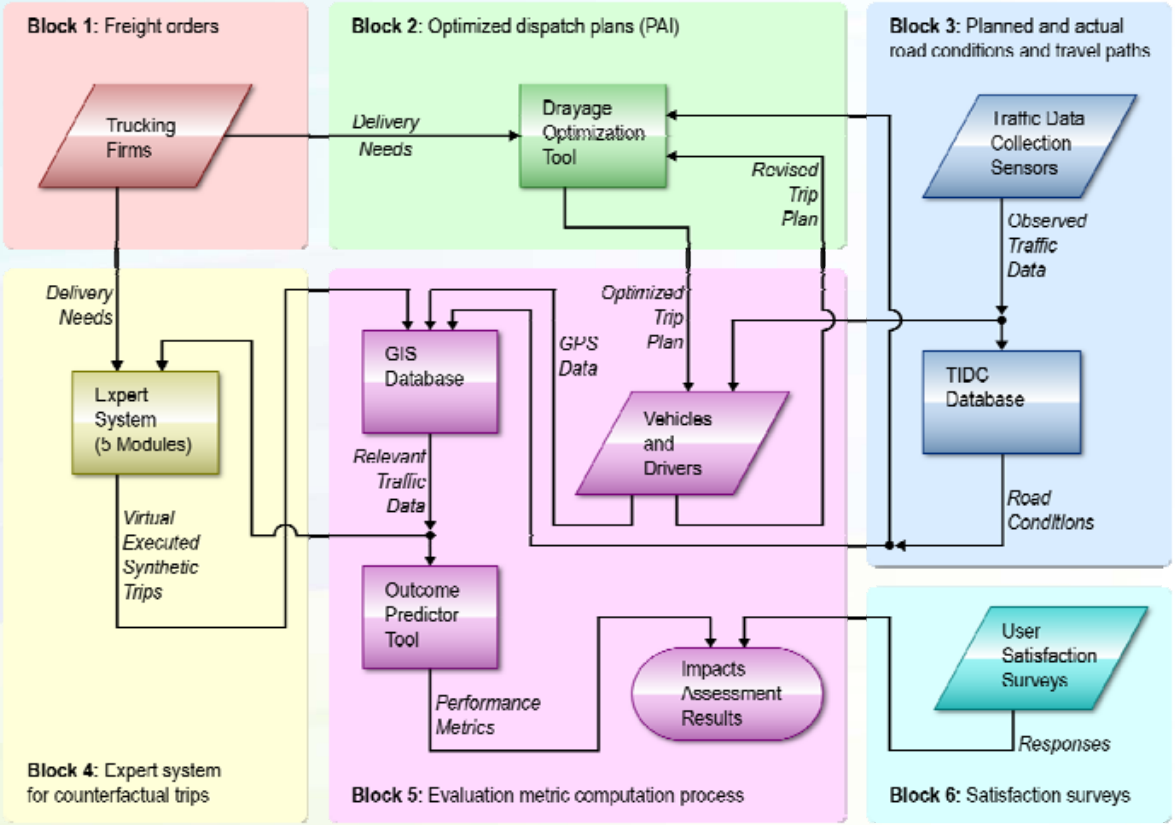
I-35 FRATIS Impacts Assessment

Impacts Assessment Approach



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Status and Expected Outputs

- Developed detailed IA Plan to address the freight mobility impacts of the FRATIS Application, and to develop the Expert System
  - Tool Development Plan (completed)
  - Archived Data Plan (completed)
- Next Steps
  - Baseline data collection with two trucking companies
  - Operational data collection / run Expert System
  - User Acceptance/Satisfaction Assessment
  - Synthesize results and develop Final IA Report

Partial Automation for Truck Platooning

Objectives

- Explore driver preferences regarding Cooperative Adaptive Cruise Control (CACC) headways.
- Evaluate energy savings for different headways.
- Estimate CACC capacity, energy, and emissions benefits.
- Perform public demonstration of truck platooning in mixed freeway traffic
- Eye towards future deployment on I-710 Dedicated Truck Lanes in Los Angeles in the 2020's

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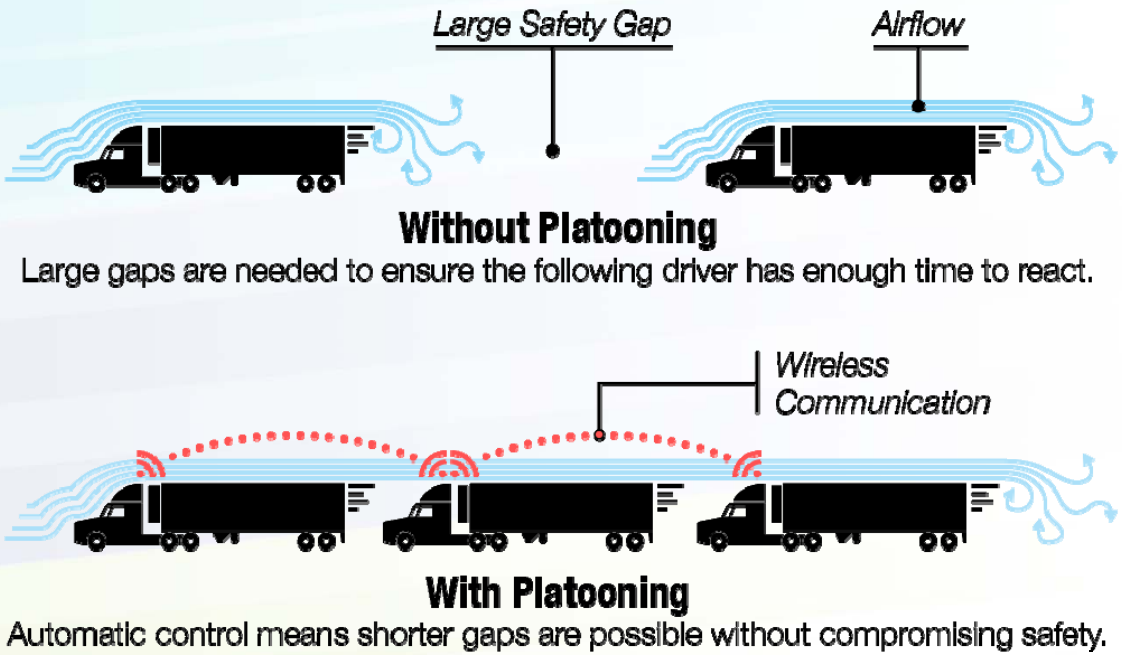
Partial Automation for Truck Platooning

Truck Platooning Concept



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Truck Platooning Benefits

Less Congestion

Capacity improvements result in less delays and better travel time reliability.

Cost Savings

Typical fuel savings average 5-10% for all trucks when platooning.

Improved Safety

Automated control of braking and accelerating reduces crash frequency and severity.

Enhanced Driver Comfort

Platooning technology takes much of the stress out of stop-and-go driving.

Capacity Outcomes

- 8% capacity increase with CHAUFFEUR.
- Simulated lane capacity of 3970 vph.

Environmental Outcomes

- 20%–25% reduction in emissions and fuel use from wind tunnel tests.
- 20% increase in fuel economy with CHAUFFEUR.
- 8%–15% fuel savings with five-vehicle platoons on high-speed test track.
- 8% improvement in fuel economy with three-truck platoons in Japan.
- 4.5%–18.4% improvement in fuel economy with three-truck platoons on Nevada highway.

Trucking Co. Interview Highlights

- How likely do you think drivers will be to use truck platooning technology?
  - A little over half of the respondents were either “very likely” or “likely” to use platooning technology
- When near other platoon-capable trucks, whom would you be willing to form platoons with?
  - Willingness to platoon within pre-established or known fleets
  - Less willingness to randomly platoon with independent owner-operated trucks
- What is the necessary payback or break-even time period you would need from this system?
  - Large majority indicated a 1-year time frame was appropriate

Partial Automation for Truck Platooning

Testing Program Implementation

- Will use constant headways (not spacing)
- Acceleration and braking are wirelessly coordinated among three trucks in platoon formation.
- Steering is still manual.
- The key element of this program is testing in real/normal traffic environments.
- Companion FHWA testing program ongoing in Georgia

Partial Automation for Truck Platooning

Testing and Demonstration Sites

Nor Cal Demo

- **Purpose:** Public demonstration for outreach and publicity to DOT executives and leaders.
- **Completed:** ITS America, June 12-15.
- Would not include final CACC system.

Closed Course

- **Purpose:** measure fuel/emissions benefits.
- **Candidates:** Transport Canada test track, others.
- Transport Canada test track available at no cost, but inconvenient location.

So Cal Demo

- **Purpose:** Public demo for outreach and publicity to industry.
- **Candidates:** Freeway options near Downtown LA, and the Terminal Island Freeway near Long Beach.
- AQMD test track was considered.

On-Road Test

- **Purpose:** test different gap settings.
- **Candidates:** I-80 (Fairfield to I-505) and I-580 (Castro Valley to Tracy)
- Will avoid peak periods.
- Want 3+ lanes.

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Some Lessons Learned to Date

- California Anti-Caravanning Law requires a minimum spacing of 100 feet.
  - Law was recently amended to allow for shorter headways for testing purposes only.
- Gear shifts for trucks have a significant effect on speed.
- CACC system cannot operate at slow speeds.
- Mounting antennas on side mirrors improved reliability of communication.

Questions?

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