

Federal Motor Carrier Safety Administration
Office of Analysis, Research and Technology



**Smart Roadside for
Commercial Vehicle
Operations Initiative &
Wireless Roadside
Inspections**

**Jeff Loftus
Technology Division**

2008 TRB 87th Annual Meeting
ART Forum



Key Challenges

Forecasted increases in commercial vehicle traffic will strain capacity (infrastructure and enforcement resources) and adversely affect highway safety, mobility, and the environment.

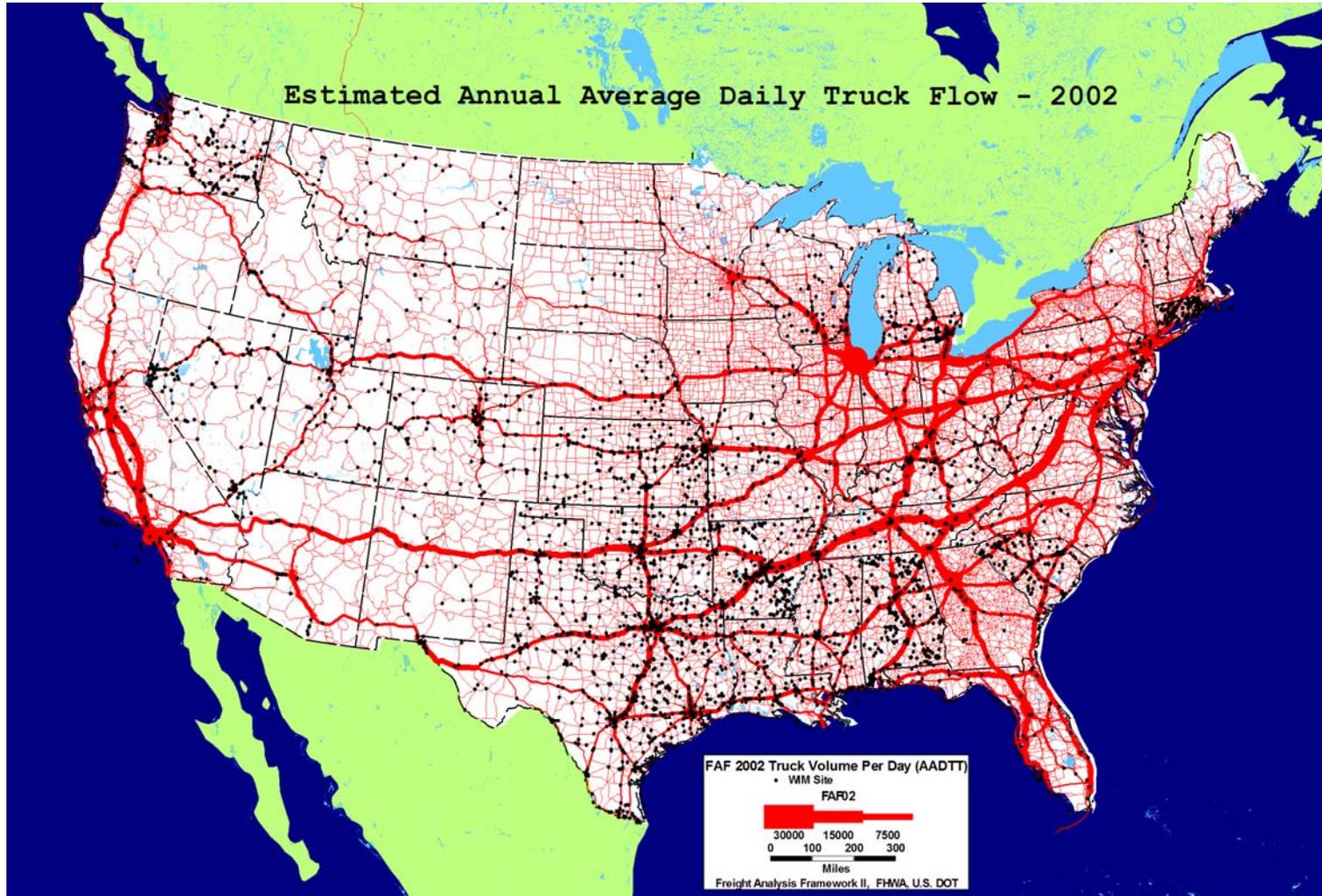


More Key Challenges

- ◆ Challenges posed by the increases in freight volume and commercial vehicle traffic include:
 - Highway fatalities and injuries
 - Truck inspection frequency
 - Congestion
 - Freight transportation costs
 - Global competitiveness
 - Infrastructure deterioration
 - Air quality

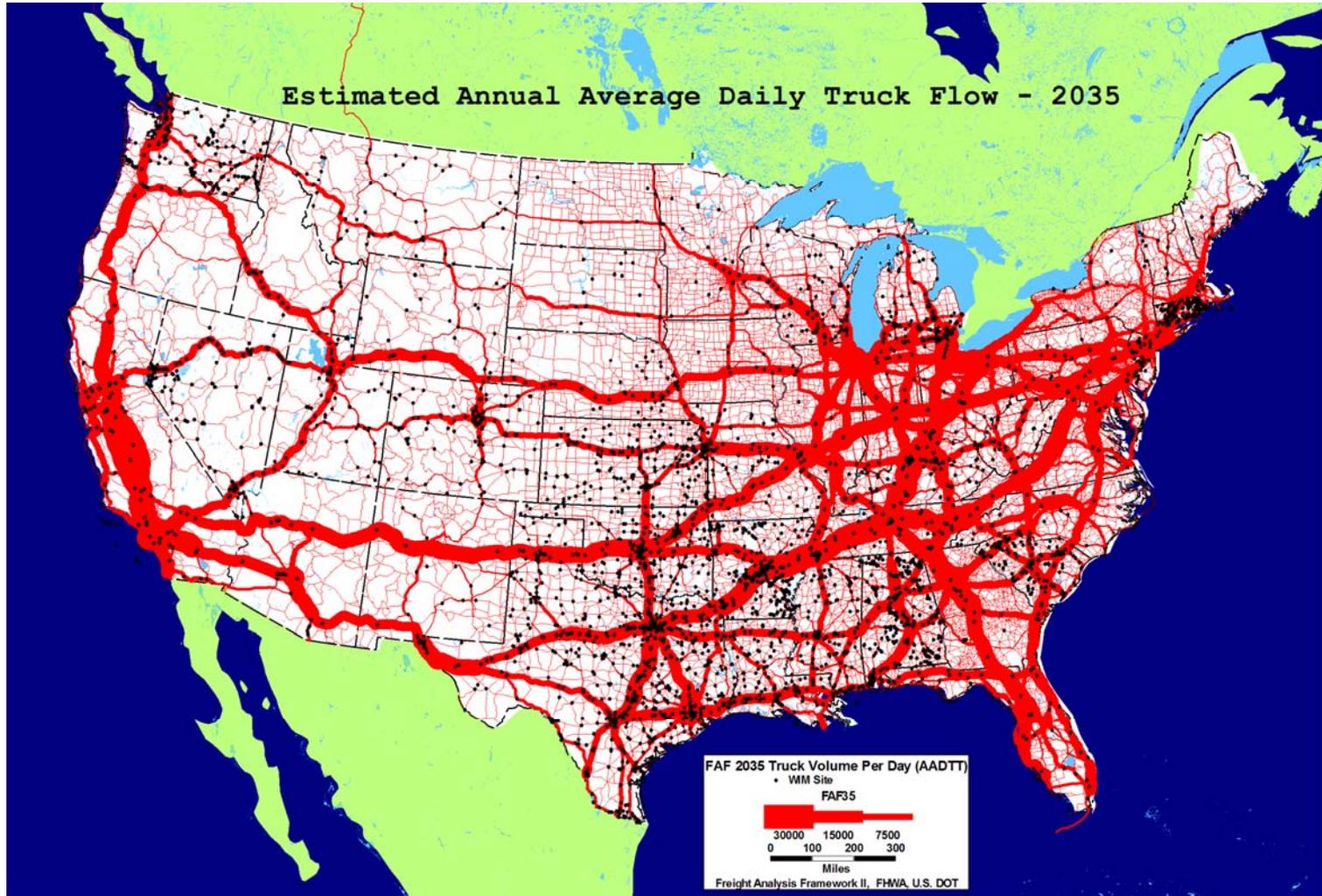


Daily Truck Volume – 2002





Daily Truck Volume – 2035





Smart Roadside for Commercial Vehicle Operations Initiative Vision

Improved motor carrier safety, operational efficiency, and freight mobility are realized through the application of interoperable technology and information sharing in the vehicle, on the road, and in off-road systems.

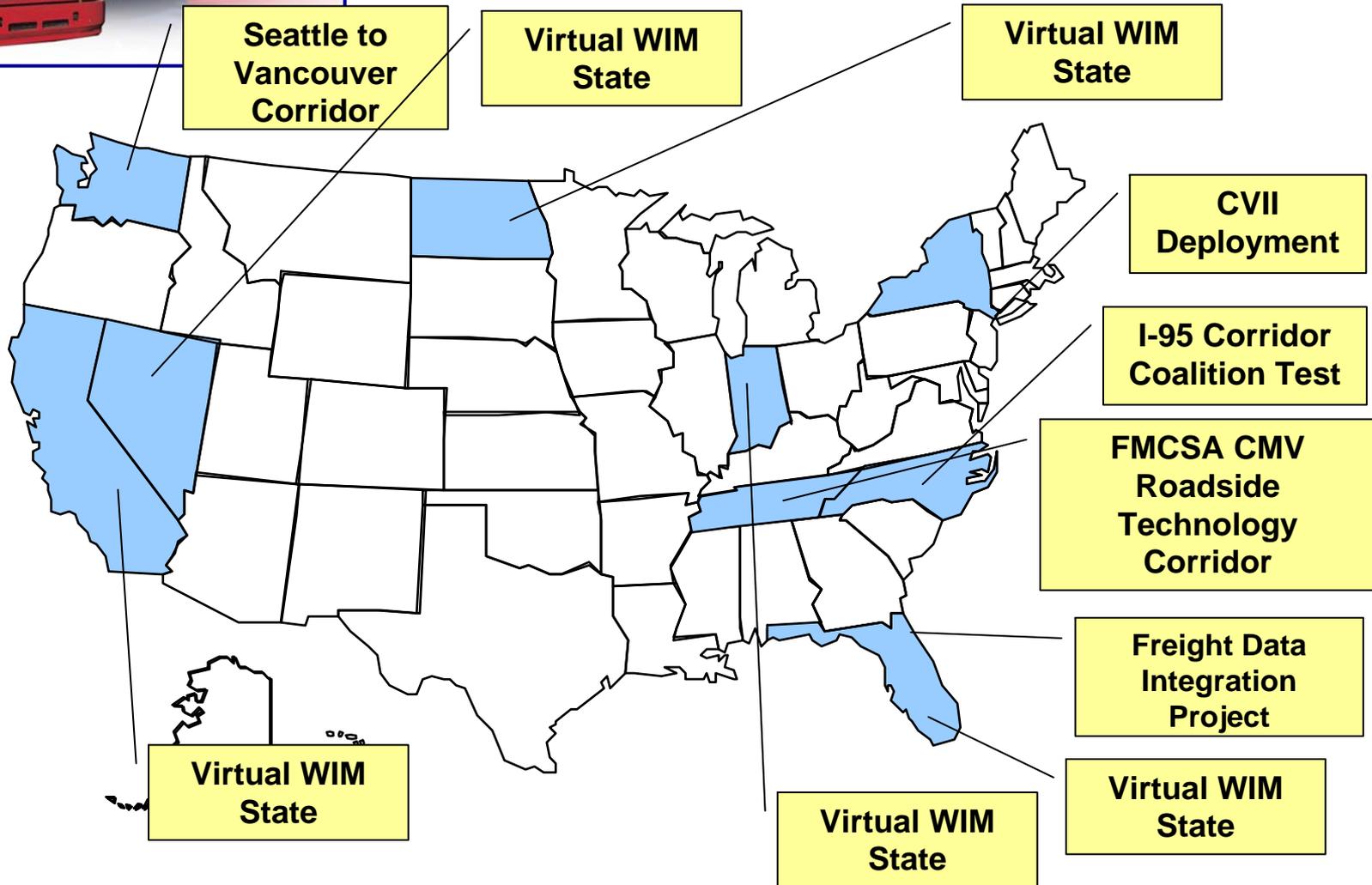


Smart Roadside Goals

- ◆ Building on current capabilities, 21st century technology, and the emerging infrastructure for light vehicles, the Smart Roadside Initiative seeks to improve:
 - Commercial fleet management and traffic operations
 - Congestion due to crashes and other incidents
 - Targeting of enforcement resources on high-risk CMVs
 - Air quality through reduction of unnecessary delays for CMVs
 - Preservation of the roadway infrastructure



Initial Deployments



Welcome to the Commercial Motor Vehicle Roadside Technology Showcase

Sponsored by:

Federal Motor Carrier Safety Administration, Tennessee Department of Safety,
Tennessee Department of Transportation, Oak Ridge National Laboratory, and the University of Tennessee





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Commercial Motor Vehicle Roadside Technology Corridor

A series of fixed and mobile state-of-the-art facilities for testing and evaluating CMV enforcement technologies in a real-world setting

"The goal of this long-term collaborative effort among FMCSA, TDOS, TDOT, ORNL and UT is to develop and promote advanced truck and bus safety inspection and enforcement technologies to save lives."

Benefits

- Provide Quantitative Assessments of Technology Benefits and Costs
- Support Technology Deployment Decisions
- Expedite Technology Testing Process
- Flexibility to Address Multiple Technology Types
- Test-bed for Truck and Bus Vehicle Infrastructure Integration (VII) safety applications

*Field Operational Testing
VII Test-bed for Truck
and Bus Safety*

**Greene County
Inspection Station**

*Bench-top testing
Hardware-in-the-loop testing
Driving simulator testing
Test course testing*

TDOT Region 1 Headquarters

*Active testing of
infrastructure-based
technologies at
Inspection Stations*

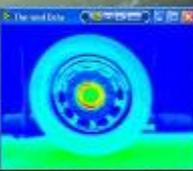
**Knox County
Inspection Stations**

The University
of Tennessee

Knoxville

OAK
RIDGE
National Laboratory

NTRC
National Transportation
Research Center





Technology Corridor Benefits

- ◆ National Showcase for CMV Enforcement Technologies
- ◆ Builds on TDOS' recent *2006 Motor Carrier Safety Leadership Award*
- ◆ Venue to test and prove technologies in an actual roadside environment
- ◆ Ready location for future field operational tests & implementation



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Wireless Roadside Inspection (WRI) Program Overview



The Problem

- ◆ The likelihood of a roadside inspection is far less than a truck being weighed
 - 3 million annual truck inspections with a **73% violation rate (25% OOS rate)**
 - 177 million weigh inspections (staffed & WIM) with 515,587 citations – a **0.29% violation rate**
 - 82 million weigh inspections (staffed)
 - 95 million weigh inspections (WIM)



WRI Program Vision (The Solution)

- ◆ Motor Carrier safety could be improved through dramatic increases in roadside safety inspections due to wireless inspections using proven technologies and processes
- ◆ Driver and vehicle safety assessments occur frequently enough to ensure compliance while minimizing disruptions to safe and legal motor carrier transportation





Opportunities for Technology

- ◆ Analysis of historical inspection data reveals that a large portion of significant “defects” are limited to a few items
- ◆ With the exception of load-securement, most of the key vehicle and operator condition criteria lend themselves to onboard electronic monitoring and diagnostic assessment

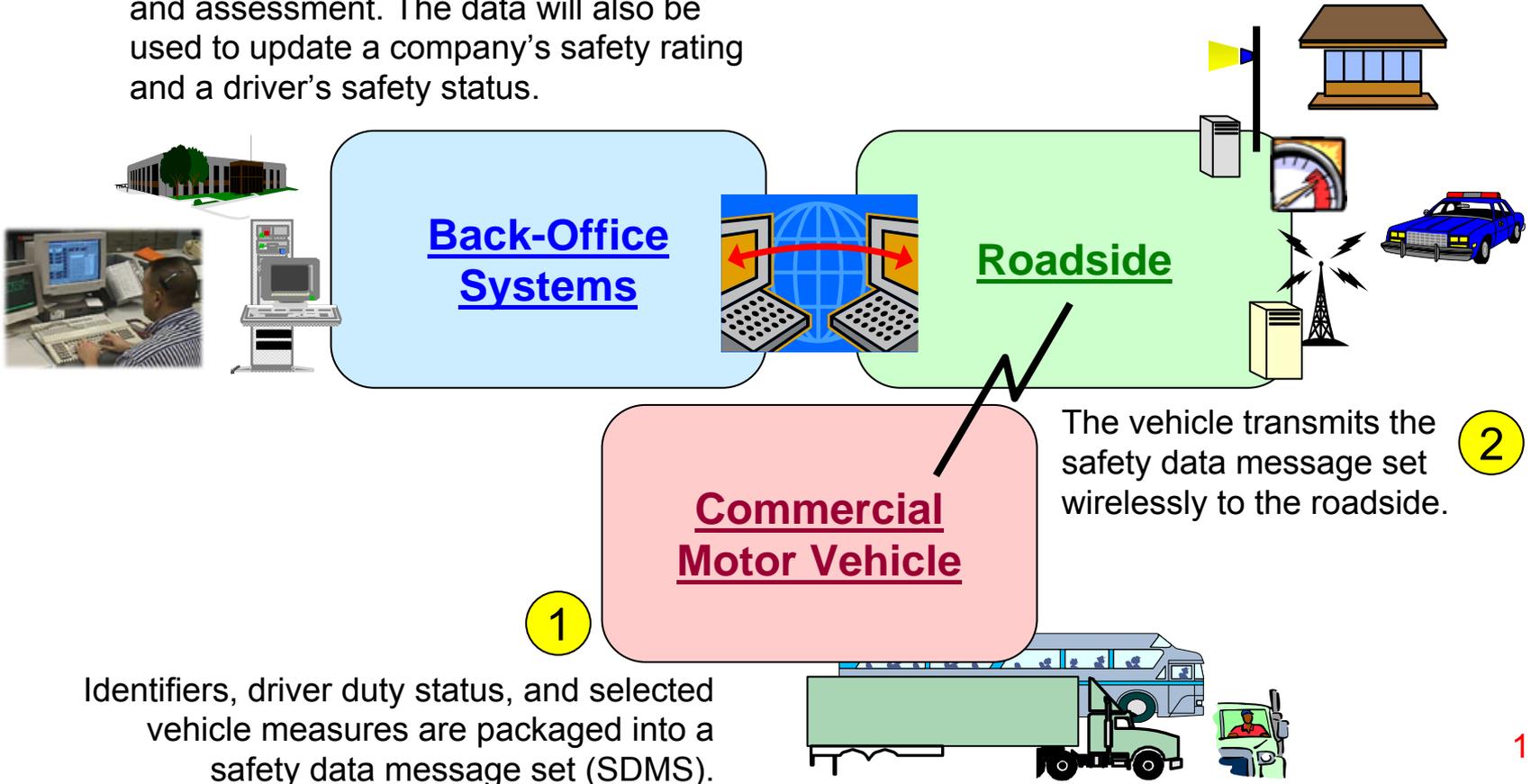
Driver Violations	% Driver OOS Violations
Logbook	40.0%
HOS	28.7%
CDL	19.4%
Total	88.1%

Vehicle Violations	% Vehicle OOS Violations
Brakes	41.2%
Lighting	16.6%
Tires	9.4%
Load Securement	15.7%
Total	82.9%



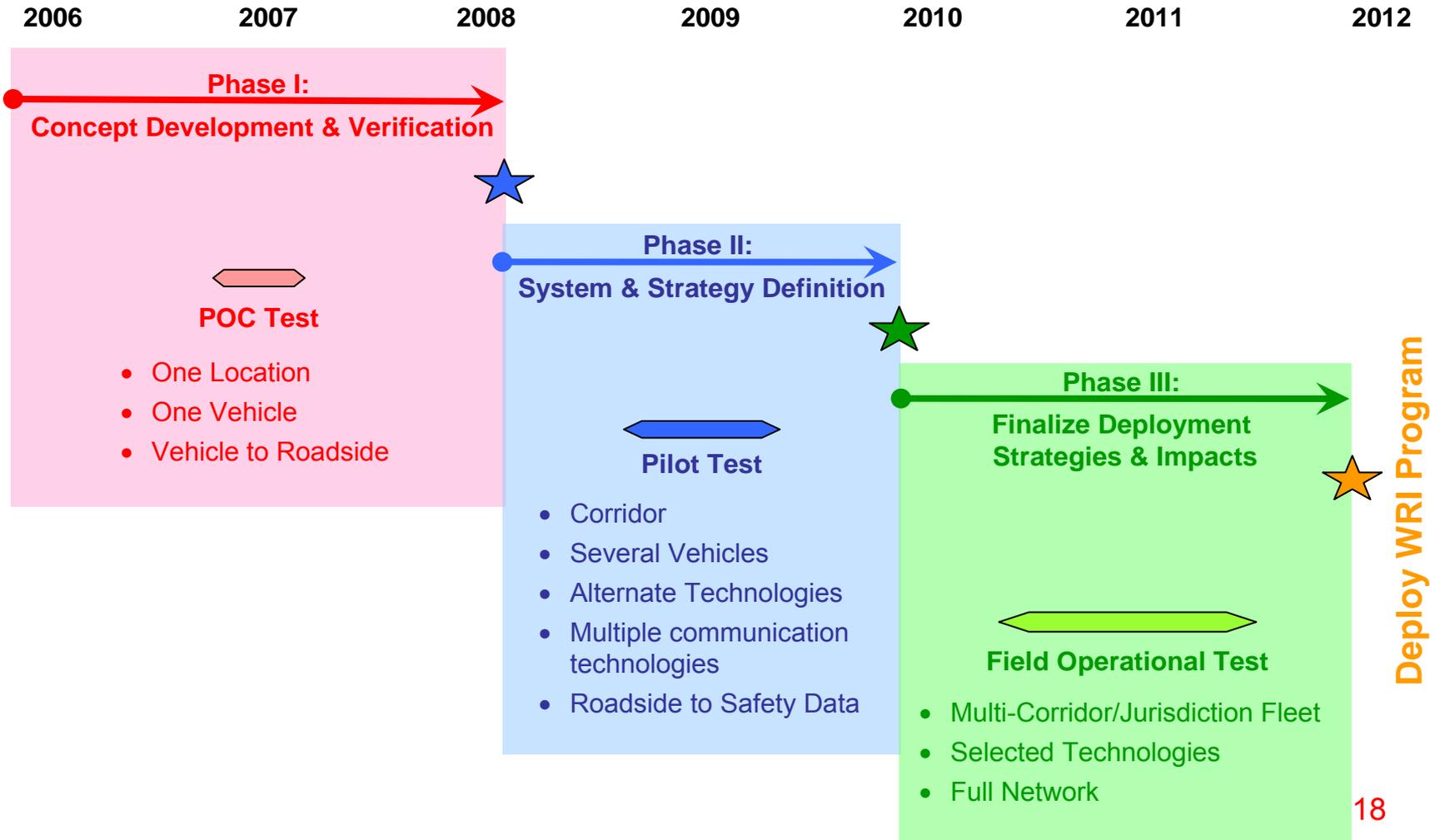
Wireless Roadside Inspection Concept

- 3 The safety data message set is verified, archived, and distributed. It may be used for real-time enforcement, compliance, and assessment. The data will also be used to update a company's safety rating and a driver's safety status.





WRI Phase & Schedule

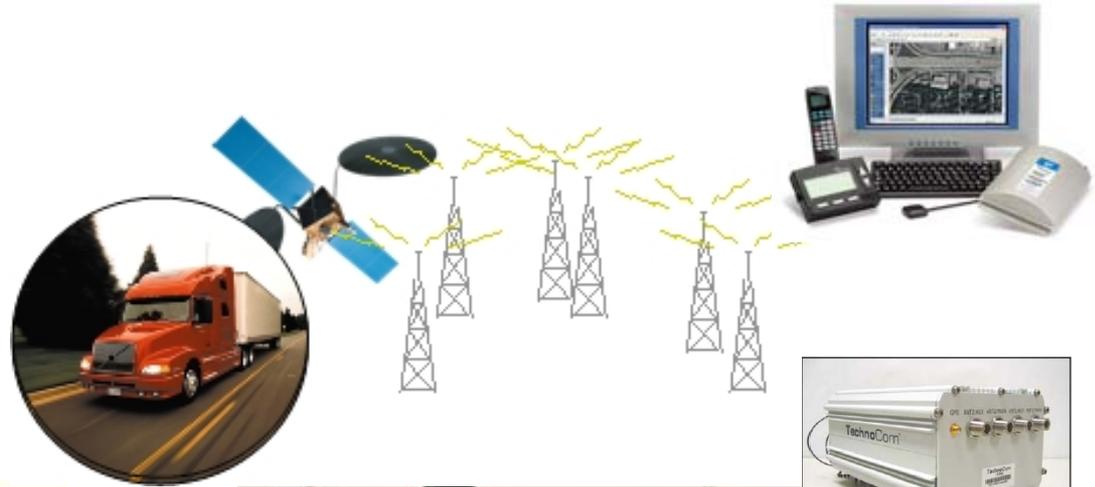




Wireless Roadside Inspection Proof of Concept

◆ Wireless Roadside Inspections

- Driver data
 - Driver information, CDL status, and log info
- Vehicle data
- Fixed and mobile units





WRI POC SDMS Data Elements

Driver First Name	Annual Inspection Date	Fuel
Driver Last Name	Annual Inspection Performed by	Vehicle Make
Driver CDL #	Annual Inspection Number	Vehicle year
Driver CDL State	IFTA year	Vehicle State
Carrier Name	IFTA State	
Carrier ID	IFTA Number	
Carrier USDOT #	Driver Duty Status	
VIN	Time of Last Driver Duty Status Change	Simulated Back-Office Data
Vehicle License Plate	Date of Last Driver Duty Status Change	License Revoked Status
Vehicle Net Weight	HOS Time	License Expiration Date
Vehicle Steer Axle Wt.	Odometer	Expired Registration Status
Vehicle Drive Axle Wt.	Location of Last Driver Duty Status Change	States Apportioned
Vehicle Trailer Wt.	GPS Longitude	ISS Rating
ABS Warning Lamp Flag	GPS Latitude	Inspection History
ABS Off-Road Flag	GPS Heading	Operation Authority
Medical Card Physician Name	GPS Speed	Insurance Provider
Medical Card Physician ID	GPS Time UTC	Insurance Policy Number
Medical Card State	GPS Fix	Insurance Effective Date
Medical Card Exam Date	Engine RPM	Insurance Expiration Date



Overview Driver Carrier Vehicle HOS

Driver

Name

CDL #: 123456789 State: TN

Carrier

Name

USDOT #: 1628871

ISS Rating

84

Vehicle



Make: Freightliner Year: 2005
License Plate #: TN20474HZ State: TN
VIN #: 1FUJA6AV95LU33071

HOS

On-Duty Time Available: 7:1:57
Driving Time Available: 7:1:57

Weight

Steer: 12841
Drive: 8932
Trailer: 9804
Net

Alerts

High ISS rating: 84
Driver's license has been revoked
Vehicle's registration is expired

Dismiss

Quick Save

Quick Save and Dismiss



John Doe One

License Information

Number: 123456789 State: TN

Expires: 05-28-2007

Status: Revoked

Medical Card

By: Feltbetter

Lic. #: 112233 State: TN

Expires on: 12/01/07

HOS

On-Duty Time Available: 7:1:57

Driving Time Available: 7:1:57

Inspection History

	Date	Citation
▶	03/08/2003	Vehicle Overweight
	06/25/2006	Brakes out of adjustment



Commercial Carrier Consultants

USDOT #:1628871

Operating Authority

Number: MC 12345

Proof of Insurance

Insurance Provider: We Insure You

Policy Number: 11335577

Effective Since: 07-24-05

Expires On: 07-24-08

ISS Rating

84



General Information



Make: Freightliner Year: 2005
License Plate #: TN20474HZ State: TN
VIN #: 1FUJA6AV95LU33071

Weight

Net Weight
31577
Steer: 12841
Drive: 8932
Trailer: 9804

Last Federal Annual Inspection

Date: 02/12/07
Performed By: Breakbolt
Number: 121212

IFTA



Apportionment

IRP/Apportioned States



Apportioned For:

US States/Territories:

TN VA KY GA WV AL

Non-US Territories:

System Statuses

Brakes

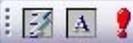
ABS Warning Lamp Status: OFF
ABS Brake Control Status: OFF
ABS Retarder Control Status: OFF
ABS Off-Road Function Switch Status: OFF

Engine

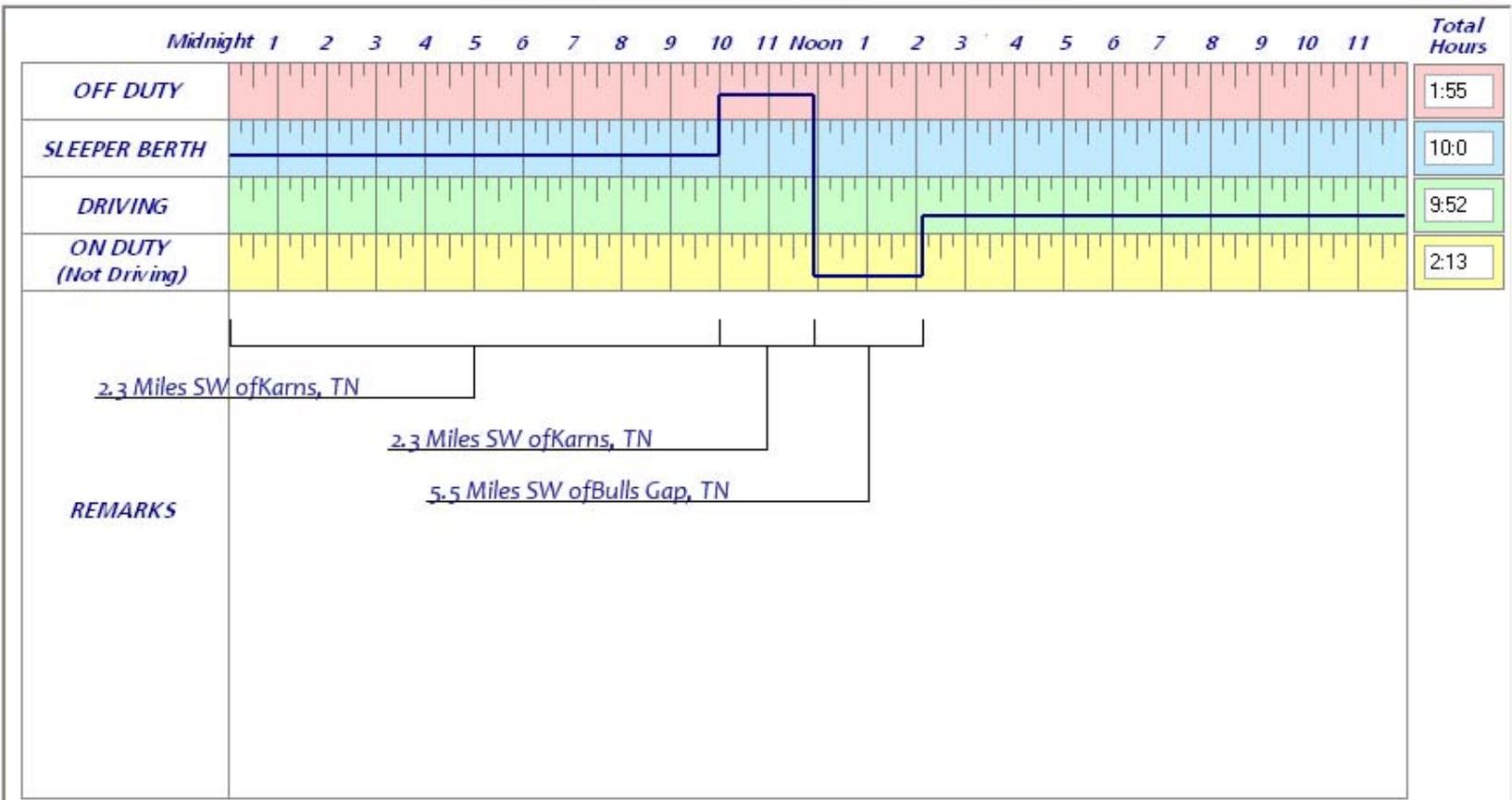
Engine Oil Temperature (deg F):
Engine Oil Pressure (lb/sq.in.):
Boost Pressure (lb/sq.in.):

Tires

Sensors not available



← Yesterday 8/7/2007 →



9:3

On-duty hours today

70 Hour/8 Day

46:50

Total hours on duty last 7 days, including today.

23:9

Total hours available tomorrow.

53:47

Total hours on duty last 8 days, including today

60 Hour/7 Day

44:21

Total hours on duty last 6 days, including today.

15:38

Total hours available tomorrow.

46:50

Total hours on duty last 7 days, including today

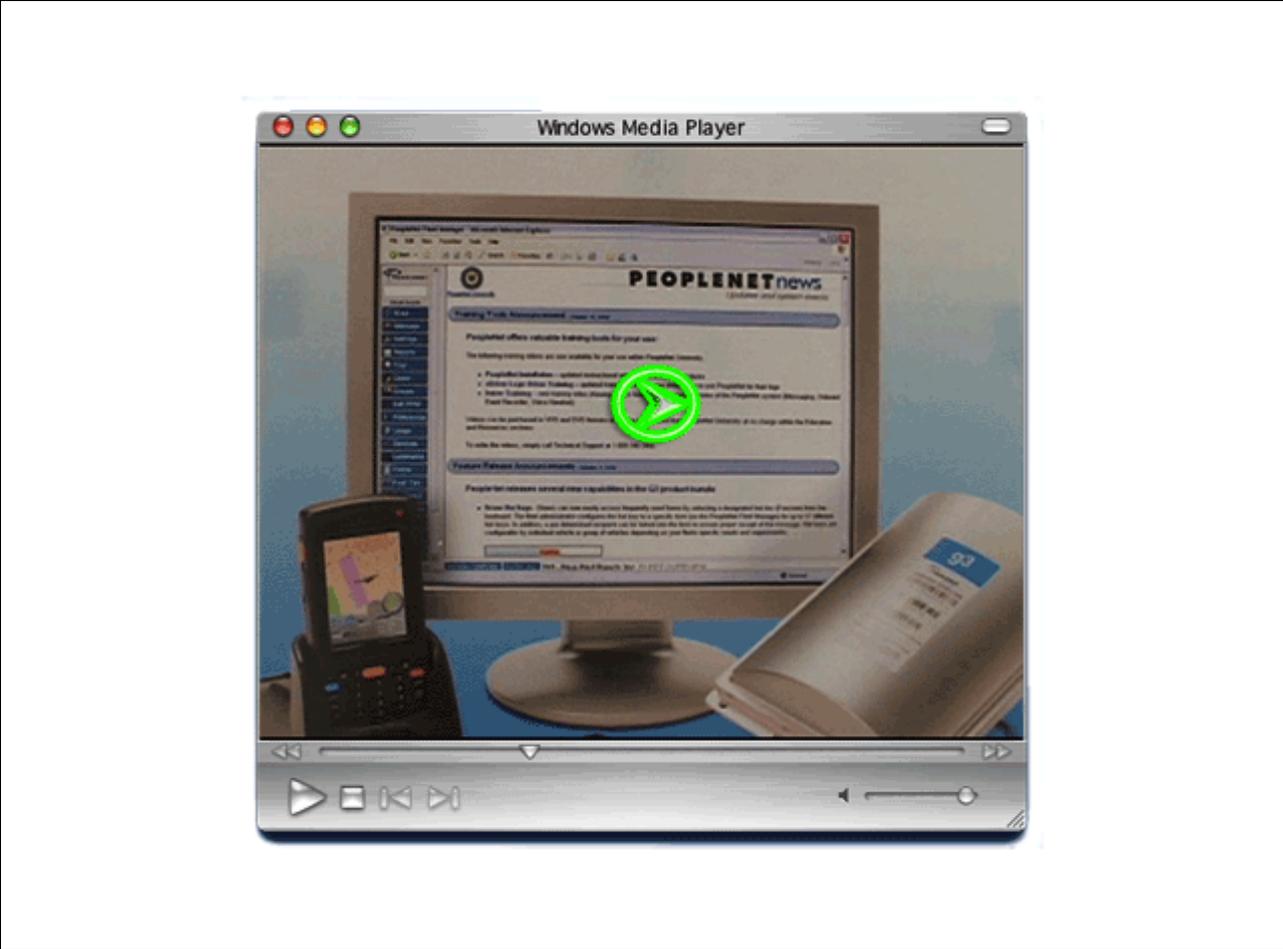


WRI Video

- ◆ The video on the next slide demonstrates a truck and a bus being wirelessly inspected as the two vehicles go past a weigh station. As the vehicles pass by the station, driver, vehicle and motor carrier company data is transferred from the vehicle to the station. The video shows the vehicles passing the station and then shows computer screens inside the station where the transferred data appears. The video shows pictures of the onboard systems provided by PeopleNet Inc and the two-way radio or transceiver provided by TechnoCom. Specifically, a weigh station computer screen with empty data fields is shown. Then a tractor/tractor trailer is shown going through a roadside station, and the wirelessly transferred data is shown populating the empty screen. This data includes information such as the name of the Driver, Company, Inspection Selection System Score and other information. We then see a laptop computer in a State police cruiser showing the same information that was on the weigh station computer screens. This demonstrates that a truck and bus can be wirelessly inspected by a mobile police cruiser driving alongside the vehicle.



WRI Video





Preliminary Results of POC Field Tests

- ◆ Enabling technology of EOBR and transponder worked as expected
- ◆ Concept proved viable in field testing with fixed and mobile units
- ◆ Antenna orientation a key area in follow-on testing
- ◆ Motor carrier and technology provider support outstanding and laudable
- ◆ Products include:
 - Prototype software
 - Example data analysis report
- ◆ Next steps – Pilot Test
 - Corridor
 - Several Vehicles
 - Alternate Technologies
 - Multiple communication technologies
 - Backhaul networks to feed CSA 2010 BASICS Model



Conclusion

- ◆ Using Safety Technology to Save Lives
 - Electronic safety checks will be frequent and expected
 - Unsafe operators and vehicles won't risk driving over HOS hours or with substandard equipment
 - Crashes related to unsafe CMV drivers and vehicle defects would be reduced

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Thank you!

Jeff Loftus

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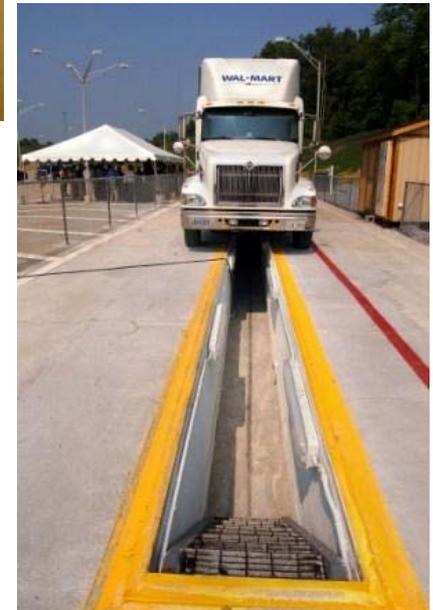
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Technologies Demonstrated – Current Applications

- ◆ CMV Inspection System (ComVIS) & Inspection Pit
 - Handheld computer
 - Rugged to military specifications
 - Enables faster inspections
 - Preloads carrier data into inspection software
 - Inspectors can enter data while in the pit
 - Transmits data wirelessly across parking lot to weigh station printer
 - Applied research
 - Developed under FMCSA's Small Business Research Program
 - IEM Corp of Albany, NY





Technologies Demonstrated – Current Applications

- ◆ Performance-Based Brake Tester
 - Measures Actual CMV Brake Force
 - Safe, Accurate, & Efficient
 - Inspector not under CMV
 - Accuracy to $\pm 3\%$
 - 10 minutes to conduct inspection with print out





Technologies Demonstrated – Current Applications

- ◆ Performance-Based Brake Tester Continued
 - Proven Brake Measurement Technology
 - Already in FMCSRs
 - CVSA OOS Enforcement Criteria – April 2008 (projected)
 - Tool for brake lifecycle research





Technologies Demonstrated – Prototypes

- ◆ Smart Infrared Inspection System
- ◆ Grant for a demonstration of thermal imaging technologies
 - Identify, in real time, faults and failures in tires, brakes and bearings mounted on commercial motor vehicles
 - Employ system along the interstate
 - Develop statistical tools that can predict impending tire, brake, or bearing failures





Technologies Demonstrated – Prototypes

- ◆ Smart Infrared Inspection System
- ◆ Details
 - \$1.4 M Research Grant
 - Two-year Project
 - Grant competitively awarded September, 2006 to IEM, Inc. of Albany NY



L4 Bearing: PASS Brake: HI Temp. Tire: PASS		R4 Bearing: PASS Brake: PASS Tire: PASS	
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