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Wireless Roadside Inspection Phase II Evaluation Final Report

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The University of Tennessee

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FOREWORD

This final report describes the independent evaluation of the Phase II Wireless Roadside Inspection (WRI) Pilot Tests. This evaluation was performed by researchers at the University of Tennessee (UT), under the guidance and direction of National Transportation Research Center, Inc. (NTRCI) funded by USDOT's Research and Innovative Technology Administration (RITA) through the University Transportation Center (UTC) program. This report is a comprehensive description of the WRI system pilot tests, as envisioned and as implemented, including three pilot test platforms that tested different technologies (Dedicated Short Range Communication, Commercial Mobile Radio Services, and Universal Identification) and the Federal Government Office Systems. This evaluation report follows the Phase I proof of concept report and complements Phase II platform-specific evaluations and cross-platform topical evaluations. A separate executive summary report synthesizes findings across all reports. This evaluation report also includes a complete list of references of supporting documents.

The evaluation of each of the pilot test platforms resulted in a series of findings and recommendations that are meant to inform policy and system design for potential future implementations of WRI on a larger scale. These findings are based on quantitative analysis of system performance during the pilot test, demonstrable success or failure of various technology types, qualitative assessment of system performance, and perceptions of stakeholders who participated in the pilot test.

NOTICE

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16. Abstract

The Federal Motor Carrier Safety Administration (FMCSA) Wireless Roadside Inspection (WRI) Program is demonstrating the feasibility and value of electronically assessing truck and coach driver and vehicle safety at least 25 times more often than is possible using only roadside physical inspections. The WRI program is evaluating the potential benefits to both the motor carrier industry and to government. Potential benefits include reduction in accidents, fatalities and injuries on our highways and keeping safe and legal drivers and vehicles moving on the highways.

Wireless Roadside Inspection pilot tests were conducted to prototype, test, and demonstrate the feasibility and benefits of electronically collecting safety data messages from in-service commercial vehicles and performing wireless roadside inspections using three different communication systems, Dedicated Short Range Communication (DSRC), Commercial Mobile Radio Services (CMRS), and Universal Identification. This report documents the evaluation of the Wireless Roadside Inspection Program Phase II pilot testing evaluated by the University of Tennessee, under contract from the National Transportation Research Center, Inc. and funded by the Research and Innovative Technology Administration (RITA) of the USDOT.

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Unclassified	**Unclassified**	**368**	

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SI* (MODERN METRIC) CONVERSION FACTORS

Table of APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	Millimeters	mm
ft	feet	0.305	Meters	M
yd	yards	0.914	Meters	M
mi	miles	1.61	Kilometers	Km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	Hectares	Ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME	1000 L shall be shown in m^3	
fl oz	fluid ounces	29.57	Milliliters	mL
gal	gallons	3.785	Liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		MASS		
oz	ounces	28.35	Grams	G
lb	pounds	0.454	Kilograms	Kg
T	short tons (2000 lb)	0.907	megagrams (or “metric ton”)	Mg (or “t”)
		TEMPERATURE	Temperature is in exact degrees	
°F	Fahrenheit	5 × (F-32) ÷ 9 or (F-32) ÷ 1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	Lux	Lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		Force and Pressure or Stress		
lbf	poundforce	4.45	Newtons	N
lbf/in^2	poundforce per square inch	6.89	Kilopascals	kPa

Table of APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
Mm	millimeters	0.039	inches	in
M	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or “t”)	megagrams (or “metric ton”)	1.103	short tons (2000 lb)	T
		TEMPERATURE	Temperature is in exact degrees	
°C	Celsius	1.8c + 32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		Force & Pressure Or Stress		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003, Section 508-accessible version September 2009)

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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Acronym	**Definition**
ABS	Antilock Braking System
BASIC	Behavior Analysis and Safety Improvement Categories
BOS	Back Office Systems
CFR	Code of Federal Regulations
CMRS	Commercial Mobile Radio Services
CMV	Commercial Motor Vehicle
CMVRTC	Commercial Vehicle Roadside Technology Corridor
ConOps	Concept of Operations
CSA	Compliance, Safety, and Accountability
CVAS	Commercial Vehicle Automatic Screening
CVIEW	Commercial Vehicle Information Exchange Window
CVII	Commercial Vehicle Infrastructure Integration
CVO	Commercial Vehicle Operations
DB	Database
DMCU	DSRC Mobile Communication Unit
DOT	Department of Transportation
DSRC	Dedicated Short-Range Communication(s)
EOBR	Electronic On-Board Recorder
FMCSA	Federal Motor Carrier Safety Administration
FMCSR	Federal Motor Carrier Safety Regulation
HazMat	Hazardous Materials
GBOS	Government Back Office System
GOS	Government Office System
HMR	Hazardous Materials Regulation

Acronym	Definition
HOS	Hours-of-Service
ID	Identifier; Identification
ISE	Innovative Software Engineering
KSP	Kentucky State Patrol
KSP/CVE	Kentucky State Police/ Commercial Vehicle Enforcement
KY	Kentucky
KYU	Tax License Number Issued for the KY Weight Distance Tax
LPR	License Plate Reader
MC	Motor Carrier
MCSAP	Motor Carrier Safety Assistance Program
MOU	Memorandum of Understanding
NAS	North American Standard
NIST	National Internet Standard Time
NORPASS	North American Preclearance and Safety System
NTRCI	National Transportation Research Center, Incorporated
NY	New York
OCR	Optical Character Recognition
OIT	University of Tennessee Office of Information Technology
OOS	Out of Service
ORNL	Oak Ridge National Laboratory
ORNL-CSED	ORNL Computational Sciences and Engineering Division
POC	Proof of Concept
PII	Personally Identifiable Information
PRISM	Performance and Registration Information Systems Management
RSDM	Roadside Data Message
RSDS	Roadside Data Set

Acronym	Definition
RSE	Roadside WRI Equipment
SAFER	Safety and Fitness Electronic Records
SDM	Safety Data Message
SDMS	Safety Data Message Set
SSL	Secure Socket Layer
TCW	Tennessee Commercial Warehouse
THP	Tennessee Highway Patrol
TN	Tennessee
TPMS	Tire Pressure Monitoring System
UCR	Unified Carrier Registration
UK	University of Kentucky
USDOT	U.S. Department of Transportation
UT	University of Tennessee
UTK	University of Tennessee, Knoxville
VIN	Vehicle Identification Number
WRI	Wireless Roadside Inspection

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1. INTRODUCTION

FMCSA, in cooperation with its partners and customers, strives to reduce crashes, injuries, and fatalities involving large trucks and buses. A key element of FMCSA's safety strategy is the roadside safety inspection program wherein commercial vehicles are physically inspected for compliance with laws and regulations intended to ensure safe operations. Truck numbers and mileage grow each year, but roadside safety inspection resources have remained relatively constant. In a wireless inspection the compliance of drivers, carriers, and the vehicle with safety regulations is verified automatically. Augmenting the current roadside physical inspection program with wireless inspection is intended to increase compliance and safety performance, as well as improve motor carrier efficiency, without increasing the burden on either enforcement and compliance officers or motor carrier operators.

For a commercial vehicle today, the likelihood of undergoing a physical safety inspection is far less than being inspected for weight. When inspections do occur, it is very likely that a violation will be found. According to FMCSA's statistics for FY 2008,(1) more than 3.4 million roadside inspections were conducted, with a violation rate of approximately 69%. This can be contrasted with the number of weight measurements taken (more than 200 million, including both static scales and weigh-in-motion) and violations detected (less than 1%).(2) Increased safety inspections would be expected to substantially improve compliance, and, consequently, also substantially improve CMV safety.

As stated in FMCSA's request for information on new commercial vehicle safety inspection concepts,(3)

> "Commercial vehicle roadside safety inspections represent one of the most effective tools for monitoring and regulating the condition of the in-use commercial vehicle fleet, as well as for auditing and enforcing driver and operational-related safety practices, including hours of service, proper driver credentialing, and other safety aspects of commercial vehicle equipment and operations. New technologies such as advanced sensor and on-board diagnostics as well as wireless communications offer the potential for dramatically improving the effectiveness and efficiency of the roadside commercial vehicle safety inspection process."

The University of Tennessee (UT) evaluation team conducted the pilot test evaluation and drafted this report, under the guidance and direction of National Transportation Research Center, Inc. (NTRCI) funded by USDOT's Research and Innovative Technology Administration (RITA) through the University Transportation Center (UTC) program. This report describes the results of the WRI Program Phase II pilot testing whose objective was to prototype the system using different communication methods and technologies and to demonstrate its operational feasibility. The remainder of this introduction summarizes WRI concepts, its benefits, and the Phase II pilot test. Subsequent sections of this report provide more detailed descriptions of the pilot testing, the results of the evaluation, and recommendations. References are provided for more detailed reports on the Phase II testing and evaluation.

1.1 WIRELESS ROADSIDE INSPECTION CONCEPTS

Of the hundreds or even thousands of CMVs that approach a typical weigh/inspection station in a given shift, each inspector may select only 6 to 10 CMVs for a thorough safety inspection. New WRI technologies and enforcement strategies could increase dramatically the number of times a commercial motor vehicle and its driver are checked for compliance without the need to detour into a weigh station, leading to better-targeted enforcement, safer operations, and reduced numbers of truck and bus crashes.

Today a vehicle is selected for inspection based on resource availability (e.g., whether an inspector is available, parking area at inspection site, traffic flow), safety history (e.g., safety fitness rating, date of last inspection), and other screening criteria (e.g., weight, visual observation of a potential problem). This approach relies heavily on the inspector's intuition, training, experience, and professional judgment. A safety inspection may take one half to one hour to complete, limiting the number that an officer can conduct in a day, and delaying the CMV and driver in reaching their destination on schedule.

According to the Large Truck Crash Causation Study,[4] 56 percent of fatal truck crashes are linked to a truck driver related crash factor. Today's inspection selection process does not generally consider the active driver's condition or history. The WRI process will enable automated assessment of driver hours of service as well as carrier and vehicle specific factors to facilitate better usage of limited enforcement resources.

In a WRI, public sector entities (e.g. officers, inspectors and systems) electronically request driver and CMV compliance related data from onboard electronic equipment. The vehicle and the motor carrier's office system compile driver hours of service data and vehicle condition data and deliver the data through direct wireless communications to the government WRI system. This communication is all possible while the vehicle maintains its planned route and highway speed. The system conducts an assessment against a set of WRI inspection rules and electronically issues a WRI inspection report on the truck and driver to the requesting entity and the motor carrier. If enforcement officers receive a negative WRI result, they may use WRI data in screening to determine whether to pull the vehicle in for further scrutiny, use it to inform a traditional inspection, use it to trigger interception, or choose to take no action. Data from the WRI assessment process is envisioned be used in the Compliance, Safety, Accountability (CSA) Program safety measurement system for motor carriers and drivers, managed by FMCSA. The results of a WRI inspection can be stored to provide more instances of positive and negative inspections results for carriers and drivers. WRI supports multiple enforcement activities including real-time screening, inspection selection and traditional inspection processes, as well as non-real-time interdictions.

Wireless roadside inspection is based on the fundamental precept that inspections encourage compliance with safety regulations and that compliance improves safety. Safe motor carrier operations benefit the traveling public and society at large. Whether physical or wireless, the expectation of frequent inspections is expected to encourage motor carriers and drivers to maintain compliance and operate more safely. Furthermore, compliant and safe motor carrier operations are considered to be cost effective for the trucking industry and for enforcement as a whole. While some operators fail to comply in an attempt to gain competitive advantage, such actions increase overall cost due to accidents, fatalities and injuries, as well as increase the cost burden for enforcement.

Many of today's trucks are equipped with sensors that monitor system performance characteristics in real time and are also equipped with on-board recorders that help drivers comply with the hours-of-service (HOS) regulations. Also, many equipped vehicles have onboard communication systems that relay data to motor carrier operations centers for fleet management and maintenance purposes. This existing and growing commercial base of technology can support wireless roadside inspection with minimal incremental cost, thus supporting the rapid implementation of WRI system and rapid capture of its benefits.

1.2 BENEFITS OF WIRELESS ROADSIDE INSPECTION

Wireless roadside inspection can benefit enforcement, Federal, state and local agencies, the CMV industry, and society at large. The overall benefits of WRI include improved commercial motor vehicle safety and corresponding reductions in accidents, fatalities, injuries, and property damage. Safety benefits also support improved mobility for the trucking industry and the traveling public by reducing congestion and delay caused by accidents, as well as reducing environmental emissions and energy use. WRI can enhance motor carrier productivity by reducing likelihood of physical inspection for participants leading to reduced delays in delivery, as well as reduced fuel use, and emissions. WRI has the potential to provide credit for positive inspections and safe operations, enabling safe, compliant motor carriers to better demonstrate an accurate view of their safety performance. The benefits of WRI are explained in more detail in later sections in this report.

1.3 WIRELESS ROADSIDE INSPECTION PROGRAM

FMCSA developed a multi-year roadmap for the Wireless Roadside Inspection Program and organized the program into three major phases with critical "go/no-go" decision points after each. The three phases are

- Phase I Proof of Concept Test (Technical Concept Development and Verification),[5]
- Phase II Pilot Test (System and Strategy Definition), and
- Phase III Field Operational Test (Finalize Deployment Strategies and Impacts).

The program team collaborated with private-sector onboard equipment and service providers to complete a proof-of-concept test in August 2007. This report addresses the results of the WRI Program Phase II Pilot Test (System and Strategy Definition). If the third phase is activated, it is planned as a field operational test of WRI, operating on multiple fleets across multiple state jurisdictions.

1.4 WIRELESS ROADSIDE INSPECTION PILOT TEST

This phase of the WRI Program has supported prototyping three different WRI communication methods and a WRI government office system as well as testing and demonstrating all four in CMV operations. The four pilot tests conducted were

- New York Dedicated Short-Range Communications (DSRC) WRI Pilot Test
- Tennessee Commercial Mobile Radio Services (CMRS) WRI Pilot Test
- Kentucky Universal Identification (Universal ID) WRI Pilot Test
- Government Back Office System (GBOS) Pilot Test, supporting operations in all three states[1]

Together the pilot tests were designed to assess the feasibility of the WRI strategy and the ability of the prototyped WRI system to support screening, assessments, and interdiction by inspectors and enforcement; with the ultimate goal of enhancing motor carrier safety (reduction in accidents) due to increased compliance (change in motor carrier and driver behavior).

1.5 PURPOSE AND CONTEXT OF THIS DOCUMENT

This document is one of several documents that describe the activities associated with the Phase II pilot test. Pre-pilot test documents include the Concept of Operations (ConOps),(6) the WRI Requirements report,(7) and the Use Case report.(8) The Phase II pilot evaluations are outlined by the Evaluation Plan document.(9) This document describes the evaluation of the three pilot platforms and the GBOS, providing a consistent evaluation and reporting framework across the platforms. This report is meant to be comprehensive and to stand-alone from all other WRI documents. Each of the three platforms and the GBOS produced platform-specific evaluations, which, in many cases, provide more detail than this report.(10-13) A Cross-Cutting report describes overall lessons learned from the pilot test experience,(14) and a Cost-Benefit Analysis report evaluates the cost effectiveness of various technology options.(15) Finally, an Executive Summary report(16) highlights the main findings of the this evaluation report, the three platform and GBOS reports, the cross cutting report, and the cost-benefit analysis report.

[1] The Back Office Systems (Carrier, State, Federal Government) referenced in this report are synonymous with the term “Office Systems” uses in other related reports.

1.6 ORGANIZATION OF THIS DOCUMENT

A brief outline of the report is shown in the box to the right. The remainder of this report is organized as follows. Section 2 provides descriptions of WRI and the three individual communication paths, an overview of the GBOS, the anticipated benefits of WRI, and a discussion of the three phases of the WRI program. In Section 3, the Phase II pilot tests platforms and independent evaluation overviews are described. Section 4 describes the general analysis approaches taken by the evaluation team and the evaluation data sources from all of the platforms. The evaluation goals and the manner in which they were established and prioritized are described in Section 5. Section 6 presents the evaluation for each of the three pilot test platforms evaluated. This includes the evaluations of New York (NY), Tennessee (TN), Kentucky (KY), and the cross-platform GBOS. Each evaluation activity is described in detail in section 6, including data collection activities and challenges. Platform-specific findings are presented and cross-platform comparisons are made. Section 7 presents the findings from the evaluation and ties these findings to the overall goals of the Phase II pilot test. Total system performance and maturity of the technology and processes for larger deployment are discussed as well. Finally, the implications of the findings are presented in Section 8, with a focus on recommending updates to the Concept of Operations (ConOps).

Outline

1. Introduction
2. WRI Phase II Pilot Description
3. WRI Pilot Test Evaluation Overviews
4. General Evaluation Methods
5. WRI Goals and Objectives
6. Platform-specific Evaluations
    a. NY DSRC
    b. TN CMRS
    c. KY Universal ID
    d. GBOS
7. Goal-Oriented Findings
8. Implication of Findings
9. References

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2. DESCRIPTION OF WIRELESS ROADSIDE INSPECTION AND THIS PROJECT

This section provides descriptions of the three WRI communication paths and the GBOS and the manner in which they were envisioned during the Phase II pilot tests. An overview of the general WRI concept is presented, including proposed information and data flow paths for each of the pilot test platforms and the GBOS. Actual information flow and data collection is shown in subsequent sections. This section also includes a synopsis of the likely benefits to system users, descriptions of the three major phases of WRI system development and the exit criteria that drive the overall Phase II goals. The system Operational Scenarios, Use Cases, and Evaluation Cases are detailed as well. This section does not describe the actual pilot tests, as conducted, which are described in Section 3.

2.1 WIRELESS ROADSIDE INSPECTION PROGRAM

The WRI program consists of three major phases. Section 2.1.1 provides details of the Phase I Proof of Concepts (POC). Section 2.1.2 provides details of the Phase II pilot tests, and section 2.1.3 summarizes the proposed Phase III field operational tests, should they occur.

2.1.1 Phase I POC

In August 2007, as part of Phase I, a POC test was conducted. The POC tested technology to validate the wireless inspection concept (i.e. collecting driver, vehicle, and carrier information; formatting a Safety Data Message Set [SDMS] from the information, and wirelessly transmitting the SDMS to enforcement). Phase 1A of the POC testing (testing the ability to generate and format the SDMS) involved a round-trip route of a CMV from Knoxville, TN, to London, Kentucky, to Ringgold, GA, and back to Knoxville. Phase 1B of the POC testing (testing of the transceiver's ability to transmit and receive the SDMS) was conducted at inspection stations on I-81 (TN), I-40 (TN), and I-75 (KY). The successful completion of Phase I allowed the WRI team to move forward with the WRI pilot test for Phase II.

2.1.2 Phase II Pilot Test

The second phase of the WRI program involved conducting pilot tests for multiple communication paths in multiple locations. The pilot test goal was to test three different communication pathway concepts—DSRC, CMRS, and Universal ID—one each in New York, Tennessee, and Kentucky, respectively. Upon phase implementation, the main components of the test plans were not changed (to the extent possible). In addition to the three state pilot test platforms, the WRI program developed a prototype Federal GBOS that accepted SDM information from each pilot test and issued level WRI inspection reports. The criteria for continuing to Phase III from Phase II are as follows:[17]

1. At least one of the proposed technology/network options is feasible and supports the operational scenarios in a cost effective manner.
2. Technology/network recommendation for further development made.
3. At least one of the proposed technologies is feasible and cost effective.

4. Set of potential interdiction strategies and incentives identified with stakeholder support for further exploration in Phase III.
5. Wireless access point can address multiple vehicles inputs under a variety of conditions.
6. Projected costs of system are feasible.
7. Validation of benefit assumptions from initial exploration.
8. All technical assumptions are valid and there are no technical barriers.
9. Performance of system (network, and field) meets acceptable operating thresholds.

2.1.3 Stakeholders / User Community support further development. Phase III Field Operational Test

The decision to proceed to the phase III field operational tests will come from a “go/no-go” decision that will, in part, be made from evaluation results from the phase II pilot tests. Phase III of the WRI system will involve a wider deployment of WRI system infrastructure in more locations, with significant increases in participation among various stakeholders.

2.2 PHASE II WIRELESS ROADSIDE INSPECTION PILOT TEST

Conceptually, there are three sub-systems that serve the larger WRI system:

1. Roadside/mobile enforcement systems
2. State and Federal government back office systems (BOS)
3. Motor carrier (MC)/service provider systems

The proposed conceptual WRI system is illustrated in Figure 1. This figure is generalized for the three different communication paths, each employing unique methods of gathering and transmitting information. Under the proposed system, a CMV will trigger an inspection when passing a predetermined specific location (step 1 in Figure 1). This trigger event initiates a series of actions, which then compile Safety Data Messages (SDM) from various sources. SDMs include vehicle, driver, and carrier data critical to the inspection process. The SDMs may originate from three sources, 1) the onboard WRI application (on the vehicle) may compile data from Electronic On-Board Recorders (EOBRs) and onboard equipment sensors, 2) the onboard WRI application may also send or request information to or from the MC/service provider system and/or the state BOS, and 3) state and/or motor carrier systems will deliver the SDMs to the FMCSA government office systems (steps 2 in Figure 1), where they will undergo initial data processing. The Federal government BOS (GBOS) will validate and corroborate SDM data and append the dataset with additional Federal data from various infrastructure Databases (DBs). The SDM will include many (but not all) of the elements reported in a North American Standard (NAS) level I inspection, including information about the driver, vehicle, and carrier (see Appendix A: CVSA North American Standard Levels of Truck Inspection). The WRI data can include appended historic safety performance data, derived from archived databases, and could include real-time vehicle and driver information such as onboard equipment condition (e.g. brakes or lights), vehicle weight, and Hours-of-Service (HOS). Last, the “Level WRI Inspection Report” is generated from the assessment of the SDM, RSDM, and WRI data from the infrastructure databases. The inspection report is then provided to the state roadside law enforcement and/or motor carrier systems (steps 3 in Figure 1) in the form of a Web-based user interface.

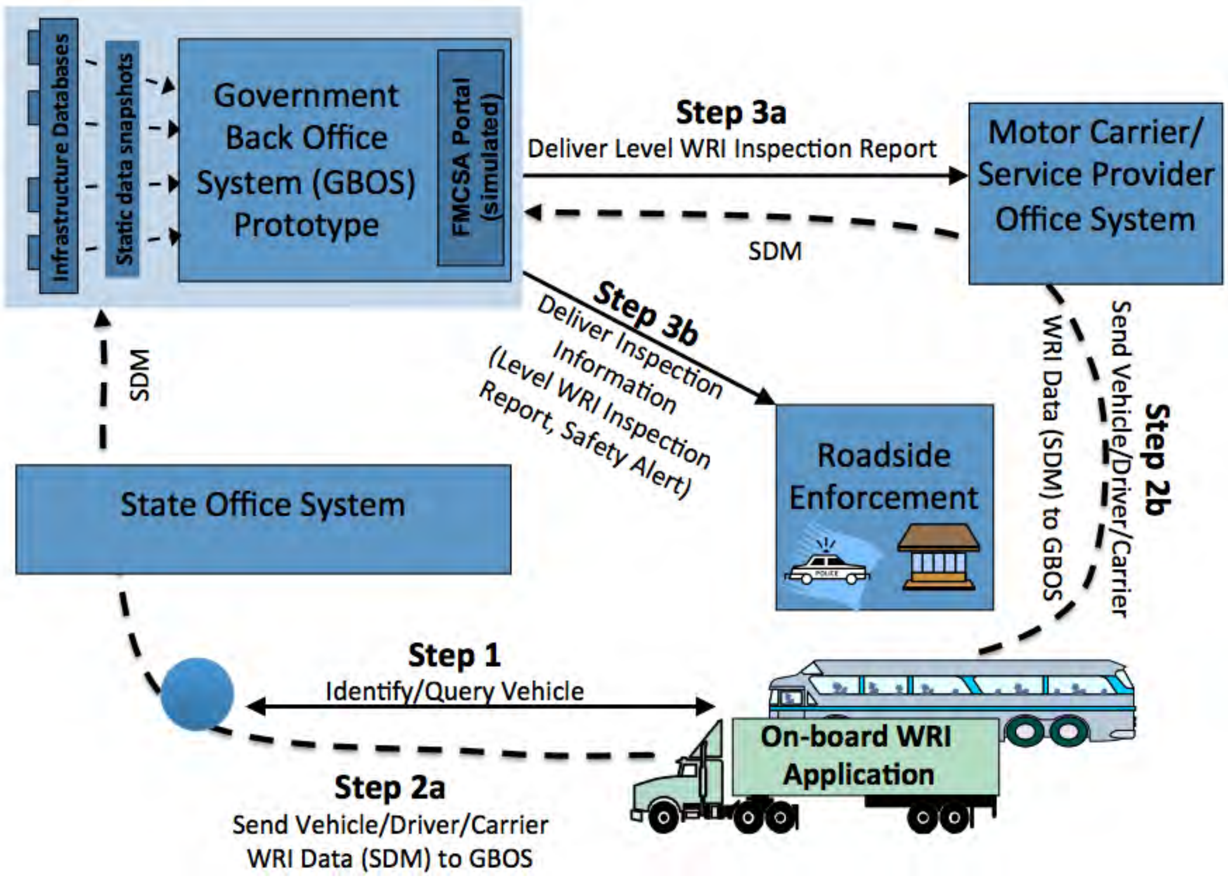


Figure 1. Diagram. General flow of information and components of WRI system for all pilot tests.

In order to assess the WRI concepts, three separate pilot tests, in three states, were conducted and evaluated: Dedicated Short-Range Communication (DSRC) Path A, Commercial Mobile Radio Services (CMRS) Path B, and Universal Identification (ID) Path C. The following subsections present proposed description of each pilot test. Each subsection describes the design goals at the onset of the pilot test. Actual implementation and data collection is described in sections 3 and 6. Additional information on the end-to-end flows of each path can be found in the WRI Con-Ops documentation.(6,18)

2.2.1 DSRC Path A (New York)

The Path A pilot test is an implementation of the DSRC concept, using a Commercial Vehicle Infrastructure Integration (CVII) system as a test bed. Figure 2 shows the conceptual flow of information. The CVII concept utilizes short-range 5.9 GHz radio communication that transmits small packets of information between equipped vehicles and roadside infrastructure, linked with state and Federal office systems. Under this concept, when a vehicle is in range of a DSRC roadside node, an onboard application receives a message via DSRC (3), which triggers the vehicle to compile onboard WRI data. The vehicle's onboard WRI application collects data from the CMV and compiles the WRI data (4). The data are then sent to the roadside node (5) and subsequently to the state BOS (6). The state BOS compiles the SDM and adds data from state infrastructure databases, and then sends the SDM to the FMCSA portal prototype[2] (7). The GBOS accepts and validates the SDM and appends more Federal safety data from Federal infrastructure databases (as needed). The processed SDM is stored on the FMCSA's enterprise databases and a level WRI inspection report is developed and broadcast on the WRI user interface to be viewed by enforcement and the motor carrier (8). One CMV equipped with CVII technology participated in this pilot test.

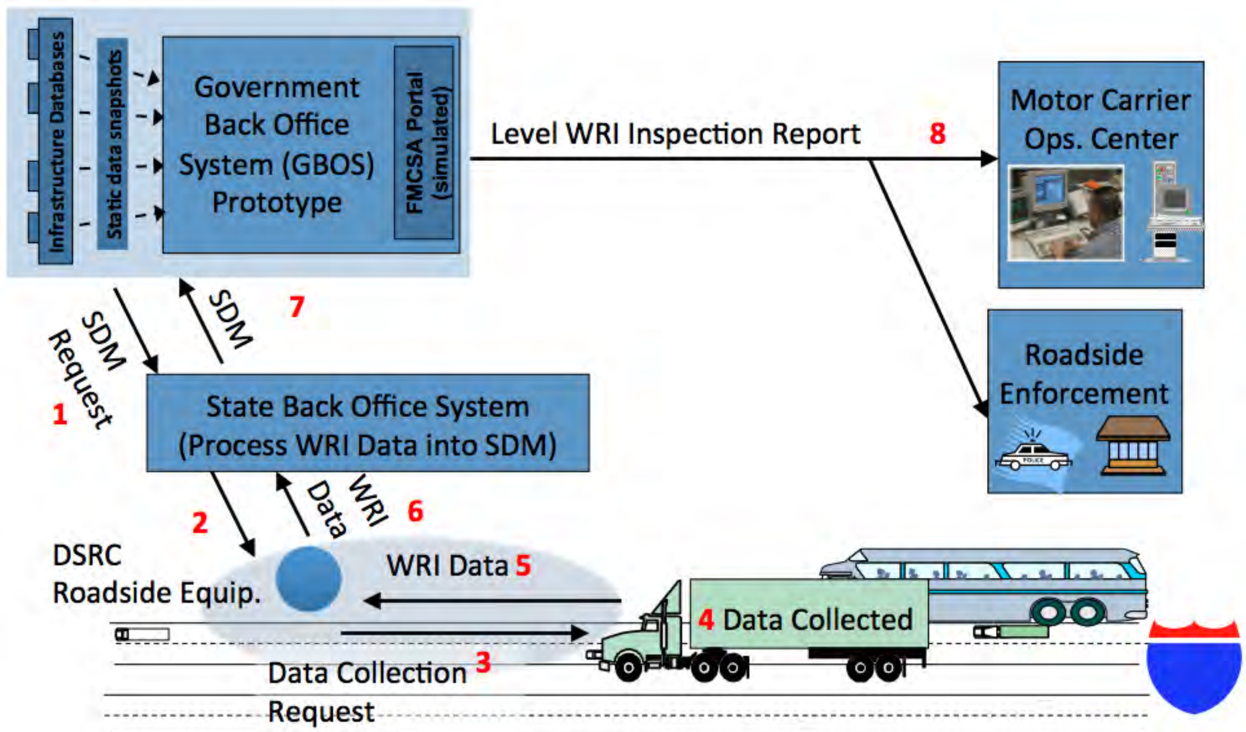


Figure 2. Diagram. Data flow for DSRC Path a pilot test.

2.2.2 CMRS Path B (Tennessee)

The Path B pilot test was an implementation of the Commercial Mobile Radio Services (CMRS) concept. The conceptual, end-to-end flow of information is shown in Figure 3. Under this concept, an inspection location is requested by enforcement in the form of a coordinate (geopoint)(1), a geofence is constructed around the geopoint as in inspection cordon (3). A CMV encounters a geofence upstream of an inspection station and/or another predefined geographic location. Once the vehicle triggers the geofence, a specified telematics service provider requests a set of information (the SDM) from the CMV's onboard reader. The CMV then populates the data set with information from the vehicle (4) and sends the CMV-specific information to the

[2] The portal prototype is an illustrative IT system to accommodate transactions between third–parties and FMCSA office systems. Future WRI deployments could use different IT technologies and protocol to negotiate transactions of the government office systems.

telematics service provider or directly to the GBOS (5). The telematics service provider collects the various carrier and driver information and sends an SDM to the WRI GBOS where the SDM is validated against other government information (6). The resulting SDM contains some of the following: vehicle/carrier identifiers (IDs); including but not limited to license plate state and number, Vehicle Identification Number (VIN), vehicle unit number, carrier name, and carrier U.S. Department of Transportation (USDOT) number. The Federal GBOS appends this SDM with more information from other Federal GBOS platforms and uses the validated SDM to populate the user interface (7) as appropriate to deliver inspection reports, safety alerts, or pull-in messages.

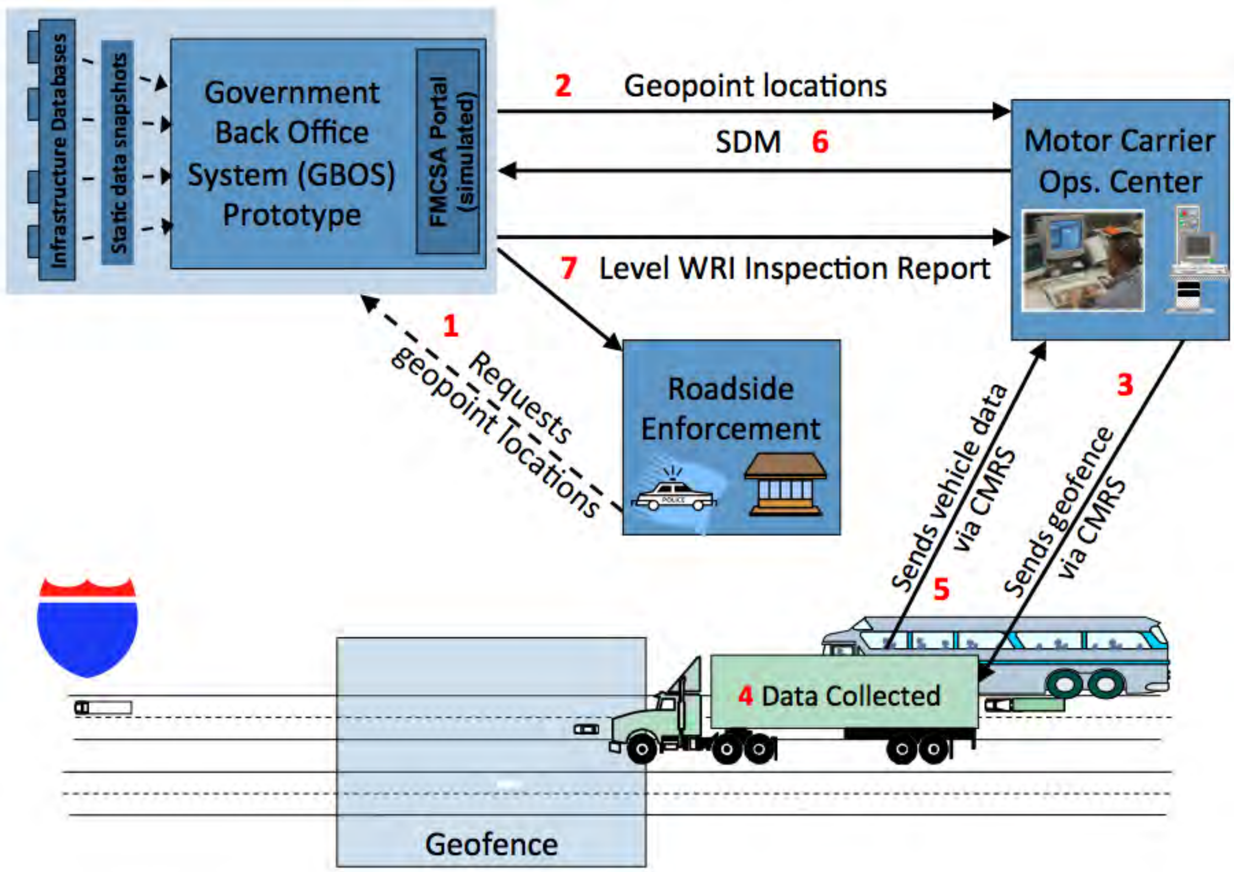


Figure 3. Diagram. Data flow for CMRS Path B pilot test.

2.2.3 Universal ID Path C (Kentucky)

The Path C pilot test is an implementation of the Universal ID concept. The conceptual, end-to-end flow of information is shown in Figure 4. In this pilot test, a CMV encounters vehicle ID technology (license plate reader [LPR], USDOT number reader, and/or transponder). When the vehicles come into range of Universal ID technologies, the technologies are triggered to identify the vehicle (1). The information compiled from the roadside technologies is then analyzed by the Commercial Vehicle Automated Screening (CVAS) computer to identify the CMV and carrier; using some combination of license plate data, USDOT number reader, and/or vehicle transponder. The vehicle/carrier ID information is then passed to the state BOS (2). The Roadside Data Message (RSDM) is compiled by the state BOS and sent to the Federal GBOS

(3). The RSDM contains vehicle/carrier IDs, including but not limited to license plate state name and number, VIN, vehicle unit number, carrier name, and carrier USDOT number. Receipt of the RSDM triggers the Federal GBOS to request driver and vehicle data from the specified motor carrier (4). The SDM is then sent from the motor carrier to the Federal GBOS (5). The information is logged in Federal systems and sent to the state GBOS through the FMCSA prototype portal. The information then populates the WRI user interface with an inspection report and safety alert (6, 7) and the reports are sent to the state BOS to populate their databases.

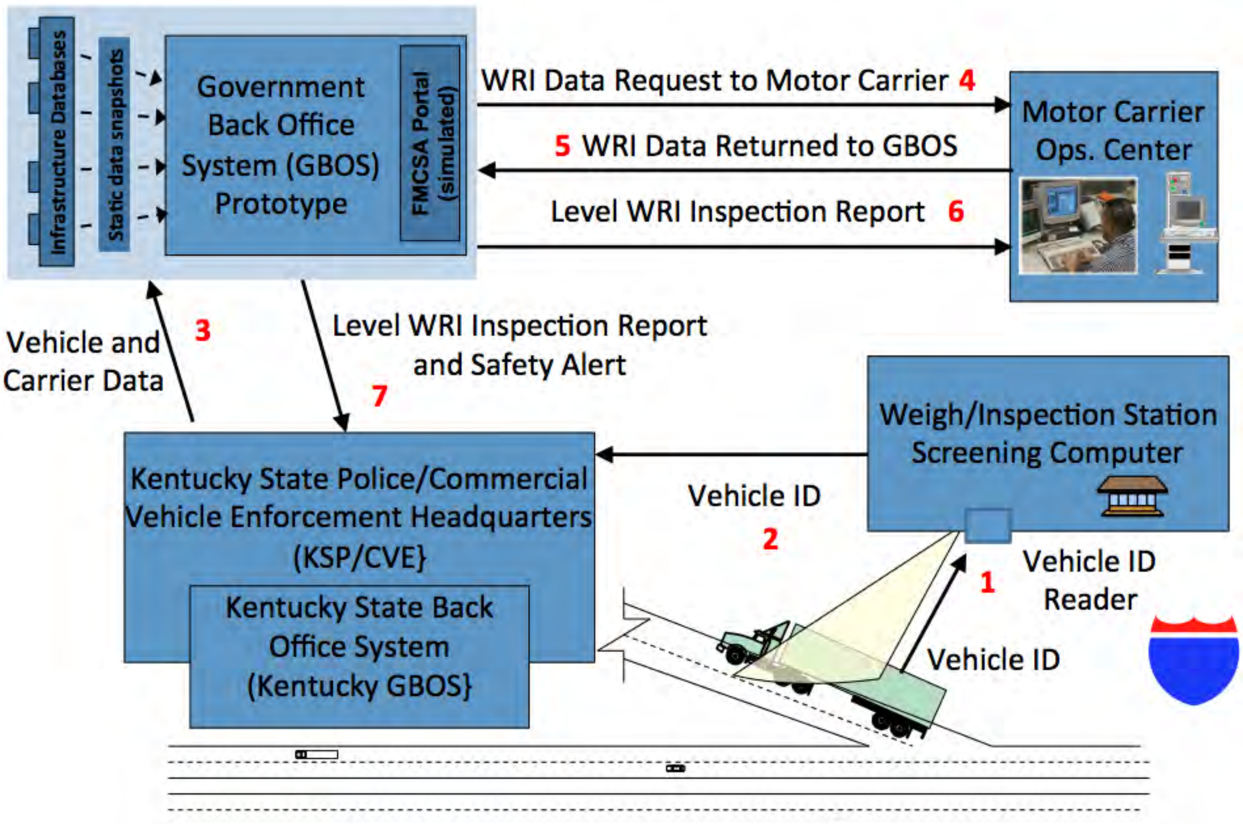


Figure 4. Diagram. Data flow for Universal ID Path C pilot test.

2.2.4 GBOS Overview

In concept, the GBOS communicates with carrier/vendor BOS, test platform state BOS, FMCSA systems that support the WRI back office functions, state systems that provide services that support the back office functions, such as Commercial Driver's License Information System (CDLIS); and other private systems (i.e. North American Preclearance and Safety System [NORPASS] and PrePass).

The GBOS communicates with the above-mentioned entities, whereby the SDM data are populated with data from each entity. After population, the SDM is sent to the GBOS where it is examined and a level WRI Report is completed. Once the SDMs are parsed and accepted by the input communication component, they are passed to the processing subsystem of the WRI BOS prototype. This subsystem validates components of the incoming SDMs by checking for completeness; accepts values for information within a message, and timeliness of messages;

performs a safety compliance assessment by checking against safety regulations such as Federal Motor Carrier Safety Regulations (FMCSR), WRI processing constraints, Compliance, Safety, Accountability (CSA), and Hazardous Materials Regulations (HMR) regulations; and generates error logs, validation results, timestamps for incoming SDMs, WRI results, and requests for SDMs. The GBOS also determines whether or not to send data to the Federal or state systems and then does so. Next the GBOS checks to ensure that the WRI results are compiled and validated, the raw SDM data and intermediate processing results are stored, safety alerts are initiated, inspection reports generated, pull-in message sent, and any data to support CSA 2010 are logged. The data are then transmitted to the user interface.

2.3 EXPECTED BENEFITS OF WRI

WRI is expected to improve safety of commercial vehicles operating on our roads and highways while improving operational efficiency for both enforcement and motor carriers. Most CMV stakeholder groups will benefit from WRI. The following is a description of potential benefits including:

- Precepts and understanding
- Global benefits for the traveling public
- Potential benefits for FMCSA and Federal partners
- Potential benefits for state and local partners
- Potential benefits and incentives for the Motor Carrier industry

2.3.1 Precepts and Understanding

The following precepts support the assessment of benefits expected from WRI:

- Safer commercial vehicle operations are more cost-effective because they can reduce the cost incurred by accidents and potentially reduce the cost of insurance.
- Safer commercial vehicle operations benefit society at large through reduced accidents and reduced congestion caused by commercial vehicle accidents.
- Compliance with Federal safety regulations supports safer commercial vehicle operations.
- Conducting inspections of commercial vehicles contributes to safer operations by encouraging all motor carriers to be compliant with safety regulations.
- Because inspection events are rare today, a single “bad” event can skew the safety rating for a carrier.
- Many of today’s trucks are equipped with sensors that monitor system performance characteristics that influence safety in real time.
- Many of today’s trucks are equipped with on-board recorders that help drivers comply with the hours-of-service (HOS) regulations.

- Technology to transmit on-board sensor data and driver's logs to the roadside or to other locations is widely available.
- Resources are limited for traditional safety inspections.
- Using available technologies it is possible, without additional inspection staff, to assess safety status of CMV drivers and vehicles 25 times more often than is routinely done today.

2.3.2 Potential Global Benefits of WRI

WRI will benefit the nation and the traveling public because it will help:

- Improve safety of commercial motor vehicles and their operation, thereby reducing CMV involved accidents and reducing corresponding:
  - Fatalities, injuries, and property damage
  - Overall congestion and delay
  - Air emissions
  - Energy use
- Increase productivity and mobility of our transportation system through:
  - Reduced delays at border crossings and other inspection points
  - Uniform and fair collection of user fees and taxes
- Increased security and livability of our communities through improved road and highway safety

2.3.3 WRI Potential Benefits to FMCSA and Federal Partners

WRI will support improved compliance with safety and other regulations without increasing demands upon limited enforcement resources. WRI will support the objectives and mission of FMCSA and other federal partners through helping:

- Improve compliance by:
  - Increasing the likelihood and frequency of (wireless) inspections that encourage compliance with safety and other regulations
  - Providing credit for positive inspections and safe operations that incentivize compliance
- Improve productivity and efficiency of inspection and enforcement resources by:
  - Providing the ability to check driver and vehicle status without stopping the vehicle
  - Providing the ability to focus resources directly on unsafe drivers and vehicles within safe and unsafe carriers
  - Providing automated ability to check inter versus intra state operations of carriers
- Improve productivity and efficiency of FMCSA resources by:
  - Enabling them to focus on problem carriers, drivers, and vehicles

- Providing the ability to monitor compliance and progress within the CSA 2010 BASICS measurement and incremental intervention process
- Assisting in verifying motor carrier authorities to operate and other compliance assessments (UCR, Medical, Tax, etc.)

2.3.4 Potential Benefits to State & Local Partners

State and local partners support the enforcement of Federal, as well as state and local regulations. WRI will benefit for state and local partners in a manner similar to those of FMCSA and federal partners by helping:

- Improve compliance by:
  - Increasing the likelihood and frequency of (wireless) inspections that encourage compliance with safety and other regulations
  - Providing credit for positive inspections and safe operations that incentivize compliance
- Improve productivity and efficiency of inspection and enforcement resources by:
  - Providing the ability to check driver and vehicle status without stopping the vehicle
  - Providing for real time access and transparency and status of carriers, drivers, and vehicles across state lines
  - Providing improved screening for vehicles and drivers for physical inspections and assistance in physical inspections when they take place
  - Providing the ability to focus resources directly on unsafe drivers and vehicles within safe and unsafe carriers
  - Providing automated ability to check inter versus intra state operations of carriers
  - Providing automated ability to verify HAZMAT route compliance
- Improve productivity and efficiency of state and local resources by
  - Enabling them to focus on problem carriers, drivers, and vehicles.
  - Assisting in verifying motor carrier authorities to operate and other compliance assessments (UCR, Medical, Tax, etc.)

2.3.5 Potential Benefits and Incentives to Motor Carrier Industry

WRI will benefit motor carriers and the motor carrier industry by helping:

- Improve efficiency and predictability of CMV travel by:
  - Reducing likelihood of delays for physical inspection
  - Reducing delays for border crossing and other inspection points
  - Reducing congestion caused by CMV involved accidents
- Improve cost of motor carrier operations and competiveness by:

- Reducing fuel use and emissions caused by waiting in line for inspection, border crossing and congestion.
- Reducing the cost incurred by accidents and potentially reducing insurance costs.
- Providing data for improved fleet safety management and monitoring.
- Providing a level playing field by ensuring compliance of all operators.

- Enhance CMV operations safety by:
  - Allowing for more rapid identification of problem drivers and vehicles and correction before incidents or enforcement actions
- Improve compliance and compliance ratings by:
  - Providing transparency and real time monitoring of safety status and inspection results to carriers and drivers
  - Providing credit for frequent positive inspections
  - Supporting more accurate and reliable measures and records of a motor carrier, driver, and vehicles safe operations

2.4 EVALUATION FRAMEWORK

In order to develop the methods necessary to accurately and thoroughly evaluate the WRI Phase II pilot tests, evaluation criteria were established using the WRI Vision and Goals Criteria.[17] Section 2.4.1 outlines the goals, hypotheses, and objectives. Section 2.4.2 discusses the relationship(s) of the evaluation criteria to one another. Section 2.4.3 gives an introduction to the Operational Scenarios. Section 2.4.4 provides an introduction to the Use Cases and section 2.4.5 discusses the Evaluation Cases. In section 2.4.6 the application of the Evaluation Cases is examined as well.

2.4.1 Goals/Hypotheses/Objectives

Using the Phase II exit criteria (shown in section 2.1.2), evaluation goals were established for the Phase II WRI pilot tests to determine success or failure and to uncover problems from each of the three communication path technologies. Results from these goals will be used to assess the viability of continuing development of the WRI program in Phase III. The *goals* are decomposed as follows. Each *goal* has embedded within it one or more *objectives*. The *objectives* each have one or more related *hypotheses*, and each *hypothesis* has an explanation. The *objectives* and *hypotheses* were established during the development of the Wireless Roadside Inspection Evaluation Plan. Further discussion on this is given in section 5 and in the Wireless Roadside Inspection Evaluation Plan.[9]

2.4.2 Evaluation Criteria Relationship

Figure 5 shows the relationship of the goals, objectives, and hypotheses and the manner in which they relate to the Operational Scenarios, Use Cases, and Evaluation Cases. Figure 6 shows an example. In this example Operational Scenario 6.1.1 and its Use Cases are linked to the first hypothesis of Goal 1, objective 1.2. This figure is intended as a generic example in order for the reader to understand these relationships. Further details on the goals, hypotheses, and their objectives are explored in section 5.

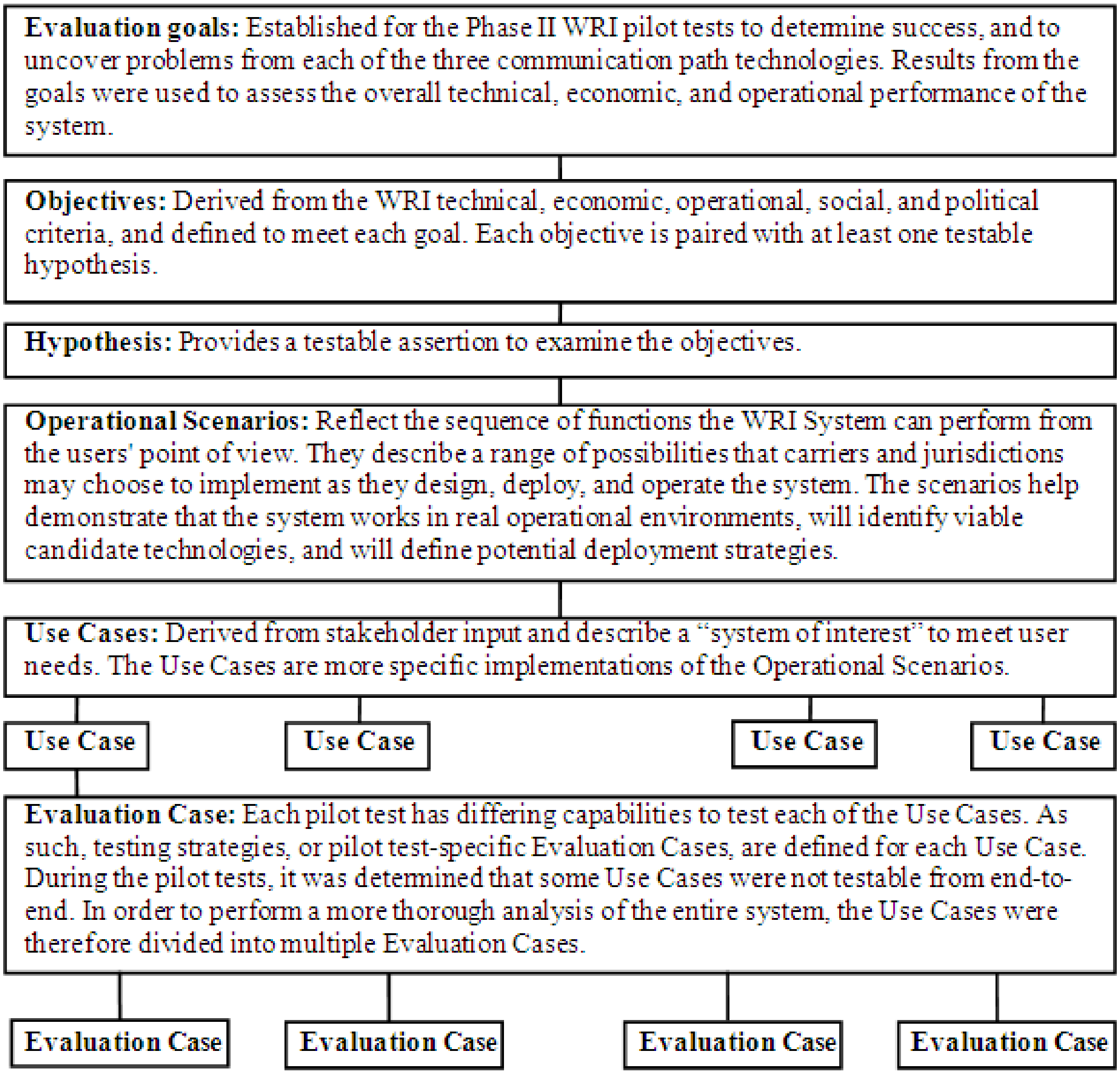


Figure 5. Diagram. Vision, goals, operational scenarios, use cases, and evaluation cases relationships.

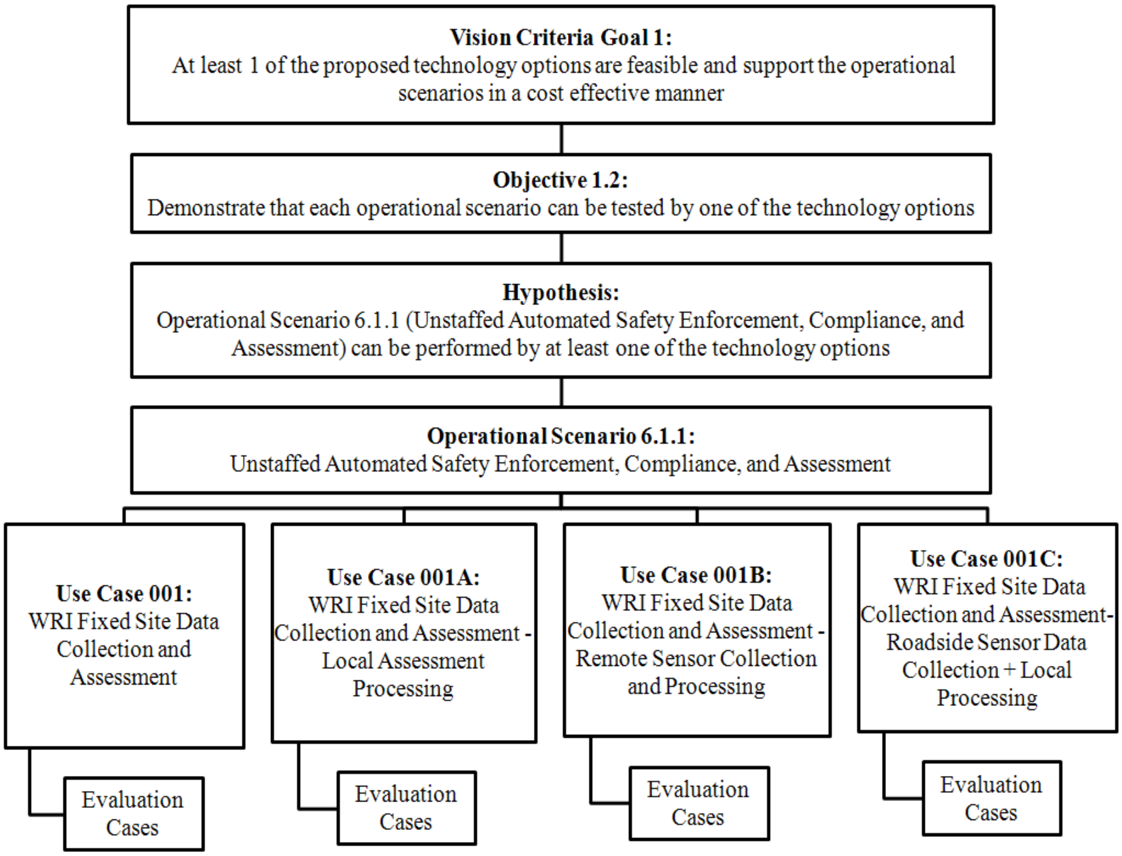


Figure 6. Diagram. Example--vision, goals, operational scenarios, use cases, and evaluation cases relationships.

2.4.3 Operational Scenarios

Operational scenarios reflect the sequence of functions the WRI System can perform from the users' point of view. The scenarios describe a range (but not all) of possibilities that carriers and jurisdictions might choose to implement as they design, deploy, and operate the system. The scenarios help demonstrate that the system works in real operational environments, will identify viable candidate technologies, and will define potential deployment strategies. It is important for the Phase II Pilot Tests to demonstrate whether or not they can or cannot perform the functions of the respective Operational Scenarios (as taken from the Concept of Operations (ConOps))[6,18] listed below:

6.1.1 Unstaffed Automated Safety Enforcement and Compliance Assessment

> The most widespread automatic functionality is to weigh and measure a vehicle. At some sites, additional sensors measure radiological or chemical signatures. If the site equipment can identify a vehicle and carrier automatically, an automated system can access and check historical safety data and current credentials status.

6.1.2 Screening Support

Once a vehicle and carrier are identified, the screening system can access infrastructure data to factor in the safety record of the associated carrier, registration status of the vehicle, etc., and determine whether to pull in the vehicle for inspection.

6.1.3 Traditional Inspection Support

When WRI capabilities are deployed, the results of the automated WRI assessment process will be used to augment and expedite the traditional inspection process. The Level WRI Inspection Report will pre-populate fields in the mobile client application so that the WRI results are automatically included in the traditional inspection process.

6.1.4 Mobile Safety Check

Mobile enforcement vehicles will be configured to request, receive, and use the SDM. In some cases, a CMV will submit SDM information, and a mobile enforcement vehicle will act as a roadside WRI node. If a mobile enforcement vehicle is located at a geofence boundary, the carrier will submit the SDM when that boundary is encountered, and the enforcement vehicle will retrieve the SDM (or WRI results) from the WRI system. In other cases, the officer or the cruiser’s on-board sensors will identify a vehicle (and potentially the carrier and/or driver) and submit a Roadside Data Message containing the identifiers. In this case, the mobile enforcement system will request an SDM based on the identifiers. The WRI system will forward the request for SDM to the appropriate carrier, who will then submit the requested SDM.

6.1.5 Routine Safety Analysis or Special Study

WRI data and WRI results will be stored in the FMCSA data warehouse for use in safety analyses and special studies. The analysis and study functions are non-real-time activities in that they are performed on historical data rather than real-time WRIs for vehicles currently on a trip. Government and private safety analysts will be able to access the WRI information via the FMCSA Portal.

6.1.6 Carrier Use of SDM

Carriers will be able to retrieve and review WRI records that contain information about entities associated with their own companies. Drivers will be able to retrieve and review WRI records about themselves. FMCSA will provide access via the FMCSA IT infrastructure. States may also choose to provide access to WRIs via their systems.

6.1.7 Use of SDM in Transportation Planning and Management

The SDM may provide information useful to transportation planners and managers. Depending on the amount of interest expressed from planners and managers, it may be appropriate to produce periodic sets of data or reports. For instance, it could be useful to provide a quarterly report summarizing the number of CMVs that traveled on a particular roadway span.

6.1.8 Managing the WRI Network

In general, the network management scenarios involve control of the roadside WRI nodes, managing WRI trigger areas and associated information, providing operations and maintenance information to network management staff, and reporting network status information to the designated state CMV Safety System component.

The Operational Scenarios involve many similar functions as they are executed. There are several different options for attaining the same result, depending on technology. Many events can happen that can cause a disruption in the nominal Operational Scenarios. Some of the non-nominal scenarios include:(6)

- The SDM may not be transferred successfully.
- The SDM may fail one or more validation or corroboration checks.
- The SDM may not be stored as planned.
- The SDM may not be shared as planned.
- Government authorities may suspect fraudulent activity.

2.4.4 Use Cases

Use Cases were derived from stakeholder input and describe a “system of interest” to meet user needs. The Use Cases are more specific implementations of the Operational Scenarios. Table 1 shows the Use Cases that were derived from stakeholder meetings, defining the desired functions of the WRI system, paired with the Operational Scenarios defined to meet overall WRI program goals and objectives

Table 1. Operational scenarios and corresponding use cases.

Operational Scenario		Use Case	Use Case Name	Use Case Description
6.1.1	Unstaffed Automated Safety Enforcement, Compliance, and Assessment	001	WRI Fixed Site Data Collection and Assessment	Automatically detect, and identify the CMV at highway speeds and request, receive and process the SDM.
		001A	WRI Fixed Site Data Collection and Assessment - Local Assessment Processing	A special case of this automated safety assessment occurs when the roadside enforcement staff / systems provide the function to determine whether the information provided within the WRI data indicates a safety or credential violation.
		001B	WRI Fixed Site Data Collection and Assessment - Remote Sensor Collection and Processing	A special case of this automated safety assessment occurs when the roadside WRI node is co-located with other equipment at a virtual inspection station.
		001C	WRI Fixed Site Data Collection and Assessment - Roadside Sensor Data Collection and Local Processing	It is possible a site could provide for both roadside sensor data collection, and local assessment processing. In this case, all Use Case 001A and 001B steps would be followed.
6.1.2	Screening Support	001	WRI Fixed Site Data Collection and Assessment	Automatically detect, and identify a CMV at highway speeds and request, receive and process the SDM.
		001A	WRI Fixed Site Data Collection and Assessment - Local Assessment Processing	A special case of this automated safety assessment occurs when the roadside enforcement staff / systems provide the function to determine whether the information provided in the WRI data indicates a safety or credential violation.

Operational Scenario		Use Case	Use Case Name	Use Case Description
		001B	WRI Fixed Site Data Collection and Assessment - Remote Sensor Collection and Processing	A special case of this automated safety assessment occurs when the roadside WRI node is co-located with other equipment at a virtual inspection station.
		001C	WRI Fixed Site Data Collection and Assessment - Roadside Sensor Data Collection and Local Processing	It is possible a site could provide for both roadside sensor data collection, and local assessment processing. In this case, all Use Case 001A and 001B steps would be followed.
6.1.3	Traditional Inspection Support	001	WRI Fixed Site Data Collection and Assessment	Automatically detect, and identify a CMV at highway speeds and request, receive and process the SDM
		001A	WRI Fixed Site Data Collection and Assessment - Local Assessment Processing	A special case of this automated safety assessment occurs when the roadside enforcement staff / systems provide the function to determine whether the information provided within the WRI data indicates a safety or credentials violation.
		001B	WRI Fixed Site Data Collection and Assessment - Remote Sensor Collection and Processing	A special case of this automated safety assessment occurs when the roadside WRI node is co-located with other equipment at a virtual inspection station.
		001C	WRI Fixed Site Data Collection and Assessment - Roadside Sensor Data Collection and Local Processing	It is possible a site could provide for both roadside sensor data collection, and local assessment processing. In this case, all Use Case 001A and 001B steps would be followed.

Operational Scenario		Use Case	Use Case Name	Use Case Description
6.1.4	Mobile Safety Check	002	WRI Mobile Enforcement Data Collection and Assessment	The WRI system will be used to automatically retrieve the identifying information for the carrier, vehicle and driver. The identifiers can be used to query for additional information. If the vehicle is stopped, temporary equipment can be deployed to weigh the vehicle and conduct an inspection.
		002A	WRI Mobile Enforcement Data Collection and Assessment - Local Assessment Processing	A special case of this automated safety assessment occurs when the mobile enforcement staff / systems provide the function to determine whether the information provided with the WRI Data indicates a safety or credentials violation.
6.1.5	Routine Safety Analysis or Special Study	003	Post Processing Analysis of WRI Data and Results	The GBOS will store WRI data and WRI results in their database for use in safety analyses and special studies.
6.1.6	Carrier Use of SDM	004	Carrier Use of WRI Data and Results	Carriers will be able to retrieve and review WRI Data and results that contain information about entities associated with their own companies.
		007	WRI System Self-Test by a Motor Carrier/Coach	A driver should be able to run an electronic inspection as an on-board diagnostics function on the tractor and trailer.
6.1.7	Use of SDM in Transportation Planning and Management	003	Post Processing Analysis of WRI Data and Results	The GBOS will store WRI data and WRI results in the their database for use in safety analyses and special studies.

Operational Scenario		Use Case	Use Case Name	Use Case Description
6.1.8	Managing the WRI Network	005	Management of the WRI Network	Network management, maintenance and monitoring of the performance, security and configuration of the fixed (non-mobile) components of the WRI System.
		008	WRI System Self-Test by Roadside or Mobile Enforcement	While bringing a roadside or mobile Enforcement site online, the collection of SDM and RSDS should be enabled for testing purposes without the system keeping the data for long-term storage or processing against non-real time database systems.
		006	Dropped Storage of SDM data on-board the vehicle for future transmission	

2.4.5 Evaluation Cases

Each pilot test has differing capabilities to test each of the Use Cases. As such, testing strategies, or pilot test-specific Evaluation Cases, are defined for each Use Case. During the pilot tests, it was determined that some Use Cases were not testable from end-to-end. In order to perform a more thorough analysis of the entire system, the Use Cases are divided into multiple Evaluation Cases. Table 2 lists the Evaluation Cases, coupled with relevant Use Cases and Operational Scenarios. It is important to note that Use Cases 001 and 004 are bound together such that Use Case 004 cannot occur and be evaluated without Use Case 001 also occurring.

2.4.6 Application of Evaluation Cases

By determining which test site (NY, TN, and KY) was able to perform the specific steps in the Use Cases, Evaluation Cases could be matched with the WRI Concepts A, B, and/or C. The Operational Scenarios were not explicitly tested in the pilot program; however, the Use Cases and Evaluation Cases can demonstrate their testability. Table 2 shows the relationship between the Evaluation Cases and the Use Cases and Operational Scenarios.

Many Evaluation Cases were tested with all WRI Concepts, but some were not. For example, in Use Case 001-B, Concept B cannot test components of this Use Case since the geopoint is not capable of collecting, compiling, or transmitting information from CMVs. Instead, the geopoint triggers the CMV to transmit this information. Due to this sub-process, Evaluation Cases 001B-01, 001B-02, and 001B-03 were not tested under WRI Concept B.

Table 2. Evaluation cases and their relationships to use cases and operational scenarios.

Operational Scenario		Use Case	Use Case Name	Evaluation Case	Evaluation Case Name
6.1.1	Unstaffed Automated Safety Enforcement, Compliance, and Assessment	**Use Case 001**	WRI Fixed Site Data Collection and Assessment	**001-01**	Confirm Roadside Enforcement Interfaces with the GBOS to establish trigger points for SDM Collection
				001-02	Safety Data Message Collection: Part 1 (Confirm the vehicle Crosses SDM Trigger Point, the SDM Data is collected, and the SDM Message is compiled)
				001-03	Safety Data Message Collection: Part 2 (Confirm the SDM Message is Transmitted)
				001-04	WRI Assessment Processing and Report Generation: Part 1 (Confirm receipt of SDM)
				001-05	WRI Assessment Processing and Report Generation: Part 2 (Validate structure and format of message received)
				001-06	WRI Assessment Processing and Report Generation: Part 3 (Validate message data)
				001-07	WRI Assessment Processing and Report Generation: Part 4 (Correlate the SDM, infrastructure data, and roadside data message, if applicable)
				001-08	WRI Assessment Processing and Report Generation: Part 5 (Assess compliance and safety status)
6.1.2	Screening Support			**001-09**	WRI Assessment Processing and Report Generation: Part 6 (Confirm generation of Level WRI Inspection Report and CMV Safety Alert)
				001-010	Confirm storage of WRI Data and Level WRI Inspection Reports in Back Office Database
				001-011	Confirm Database Access and Interface receives WRI Results (Level WRI Inspection Report, Safety Alert, SDM Alert) and/or WRI Data
6.1.3	Traditional Inspection Support			**001-012**	Confirm Real Time Enforcement Support and Interface Receive WRI Results and/or WRI Data
				001-013	Confirm Local Enforcement Protocols can be enforced
				001-014	Confirm the Bypass/Pull-in Result is transmitted
				001-015	Confirm receipt of Bypass/Pull-in Result

Operational Scenario		Use Case	Use Case Name	Evaluation Case	Evaluation Case Name
	Traditional Inspection Support (Cont.)	**Use Case 001A**	WRI Fixed Site Data Collection and Assessment - Local Assessment Processing	**001A-01**	WRI Assessment Processing and Report Generation: Confirm state GBOS can complete Evaluation Cases 001-04 through 001-09
				001A-02	Confirm WRI Data and Results are sent to state GBOS and can be viewed
		Use Case 001B	WRI Fixed Site Data Collection and Assessment - Remote Sensor Collection and Processing	**001B-01**	Roadside Encounter Data Collection: Part 1 (Confirm Roadside Sensors collect Carrier, Vehicle, and/or Driver identification data associated with the trigger "encounter")
				001B-02	Roadside Encounter Data Collection: Part 2 (Confirm Roadside Data Message is compiled)
				001B-03	Roadside Encounter Data Collection: Part 3 (Confirm Roadside Data Message is transmitted)
				001B-04	WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 1 (Confirm SDM is Received)
				001B-05	WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 2 (Confirm GBOS receives RSDM)
				001B-06	WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 3 (Validate RSDM for Structure and Format)
				001B-07	WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 4 (Validate SDM for structure and format)
				001B-08	Confirm GBOS requests SDM from Carrier
				001B-09	Confirm Carrier sends SDM
		Use Case 001C	WRI Fixed Site Data Collection and Assessment - Roadside Sensor Data Collection + Local Processing	**-**	No New Evaluation Cases: Evaluation Cases for 001C are a combination of Evaluation Cases 001, 001A, and 001B

Operational Scenario		Use Case	Use Case Name	Evaluation Case	Evaluation Case Name
6.1.4	Mobile Safety Check	**Use Case 002**	WRI Mobile Enforcement Data Collection and Assessment	**002-01**	Confirm Roadside Enforcement communicates with the GBOS to establish trigger points for SDM Collection
				002-02	Mobile Encounter RSDM Collection: Part 1 (Confirm Roadside Sensors may collect Carrier, Vehicle and/or Driver identification data associated with the trigger "encounter")
				002-03	Mobile Encounter RSDM Collection: Part 2 (Confirm the Roadside Data Message is compiled)
				002-04	Mobile Encounter RSDM Collection: Part 3 (Confirm the Roadside Data Message is transmitted)
				002-05	Confirm WRI Results are accessible to Mobile Enforcement Staff/Systems
				002-06	Confirm Local Enforcement Protocols can be implemented by Mobile Enforcement Staff/Systems
		Use Case 002A	WRI Mobile Enforcement Data Collection and Assessment - Local Assessment Processing	**002A-01**	Mobile Enforcement System: Part 1 (Confirm Mobile Enforcement Systems receives SDM and RSDM)
				002A-02	Mobile Enforcement System: Part 2 (Confirm WRI Data and WRI Results are sent from Mobile Enforcement System for analysis)
				002A-03	Mobile Enforcement System: Part 3 (Confirm WRI Results may be viewed by Mobile Enforcement Personnel)
6.1.5 6.1.7	Routine Safety Analysis or Special Study Use of SDM in Transport. Planning and Management	**Use Case 003**	Post Processing Analysis of WRI Data and Results	**003-01**	Verify transfer of Data Analysis of WRI Results from Roadside Enforcement Staff/Systems
				003-02	Verify transfer of Data Analysis of WRI Results from Analysts (Government)
				003-03	Verify transfer of Data Analysis of WRI Results from Analysts (Private)
				003-04	Verify transfer of Data Analysis of WRI Results from Motor Carrier/Coach
				003-05	Verify transfer of Data Analysis of WRI Results from Government Back Office Systems
				003-06	Verify generation of Government Back Office System Query Report

Operational Scenario		Use Case	Use Case Name	Evaluation Case	Evaluation Case Name
6.1.6	Carrier Use of SDM	**Use Case 004**	Carrier Use of WRI Data and Results	**004-01**	Confirm Government Back Office Systems sends notification to carrier
				004-02	Confirm request of subscription to automatically receive Safety Alerts associated with the carrier
				004-03	Confirm request of a report of all WRI Assessments associated with the carrier
				004-04	Confirm access to Enterprise Database containing WRI Data and WRI Results and User Access Control System
				004-05	Confirm ability to challenge Incorrect SDM Data
				004-06	Confirm operations of Existing Data Qs System
6.1.8	Managing the WRI Network	**Use Case 005**	Management of the WRI Network	**005-01**	Confirm Management of the WRI System configuration
				005-02	Confirm Provisioning and configuring of fixed WRI System
				005-03	Confirm detection, isolation, and correction of WRI Infrastructure and service problems
				005-04	Confirm monitoring of WRI System and subsystem performance
		Use Case 006	Deleted	**-**	-
6.1.6	Carrier Use of SDM	**Use Case 007**	WRI System Self-Test by a Motor Carrier/Coach	**007-01**	Confirm carrier receives SDM from GBOS (if subscription exists)
6.1.8	Managing the WRI Network	**Use Case 008**	WRI System Self-Test by Roadside or Mobile Enforcement	**008-01**	Confirm enforcement submits SDM in training mode and data submitted to GBOS is tagged as training data and kept separate from "real" data

2.5 NORTH AMERICA STANDARD (NAS) INSPECTIONS

A CMV may be inspected in accordance with one of seven levels of the North America Standard (NAS) driver/vehicle inspections, as defined by the Commercial Vehicle Safety Alliance (CVSA). These are:

- Level I. North American Standard Inspection
- Level II. Walk Around Driver/Vehicle Inspection
- Level III. Driver/Credential Inspection
- Level IV. Special Inspections
- Level V. Vehicle-only Inspection
- Level VI. North American Standard Inspection for Transuranic Waste and HRCQC of Radioactive Material
- Level VII. Jurisdictional Mandated Commercial Vehicle Inspection.

Further details on these NAS level inspection reports (I-VII) are provided in Appendix A.

Furthermore, and in order to facilitate the WRI program:

> FMCSA will work with CVSA to expand the number of NAS levels to include one or more levels corresponding to the automatic compliance assessment performed when WRI data are evaluated. WRI documents call the wireless inspection result a “Level WRI Inspection Report” as a placeholder for whatever level(s) is (are) eventually assigned. The WRI inspection level will depend on the contents and completeness of the data provided to the system.[6]

In the context of this pilot test, all inspections reports that are produced by WRI data are referred to as “Level WRI Inspection Reports”

3. WIRELESS ROADSIDE INSPECTION PILOT TEST OVERVIEWS

This section discusses the pilot tests as they were actually performed, including each of the three individual communication path platforms, the GBOS (Volpe), and the methods of the larger University of Tennessee (UT) evaluation team, under the guidance and direction of National Transportation Research Center, Inc. (NTRCI). The information for the pilot test overviews is explained in greater detail in the individual platform evaluation reports.[10-13] An overview of the scope of the independent evaluation (this report) by the UT evaluation team is also presented in this section.

While the ideal communication pathways A-C are presented in sections 2.2.1-2.2.4, the actual pilot tests included significant deviations from what was originally conceptualized in the WRI concept of operations. Sections 3.1-3.4 describe the actual deployment of the various communication pathways during the New York, Tennessee, and Kentucky pilot tests. This section follows the following subsection outline:

- 3.1 NEW YORK DSRC PILOT TEST
  - 3.1.1 Participants and Roles
  - 3.1.2 System Design
- 3.2 TENNESSEE CMRS PILOT TEST
  - 3.2.1 Participants and Roles
  - 3.2.2 System Design
- 3.3 KENTUCKY UNIVERSAL IDENTIFICATION PILOT TEST
  - 3.3.1 Participants and Roles
  - 3.3.2 System Design
- 3.4 GOVERNMENT BACK OFFICE SYSTEM PILOT TEST
- 3.5 INDEPENDENT EVALUATION—UT EVALUATION TEAM

3.1 NEW YORK DSRC PILOT TEST

This section provides insight into the participants of the DSRC communication pathway during the New York pilot test. Section 3.1 describes participants and system design and includes the following subsections:

- 3.1.1 Participants and Roles
- 3.1.2 System Design

3.1.1 Participants and roles

The New York DSRC pilot to test the WRI application was a subset of activities of the larger CVII initiative conducted by the New York State DOT, Intelligent Imaging Systems (IIS) and Volvo Technology. For the WRI task, Volvo and IIS developed and tested in-vehicle technologies to communicate with roadside infrastructure. The New York State DOT managed the installation and integration of infrastructure with state BOS systems.

3.1.2 System Design

The CVII initiative includes the development and testing of four CVII Use Cases (Tasks 2-5). The WRI program is linked to Task 3—Driver Credential Verification, which requires a CMV driver's credentials to be validated prior to allowing a parked vehicle to be started and Task 4—Wireless Vehicle Safety Inspection, which develops and demonstrates a CVII application that performs a moving WRI inspection of a CMV. Task 3 includes acceptance testing with an off-line, stationary CMV. Task 4 includes a series of highway-speed tests of CMVs delivering WRI data from the CMV to the roadside, to the state BOS, back to the roadside, and then back to the CMV. The main communication components include an onboard DSRC Mobile Communication Unit (DMCU) that communicates with the roadside and compiles an SDM, the state BOS simulator that simulates a state BOS that validates SDM information and generates an inspection report, serves as a communication link with the Federal GBOS, and finally the Roadside WRI Equipment (RSE) that provides the communication link between the state BOS and the DMCU. During this test, the onboard data were simulated and the state back office systems were also simulated. There was no link to the Federal GBOS. Figure 7 illustrates the communication pathways between the main hardware components.

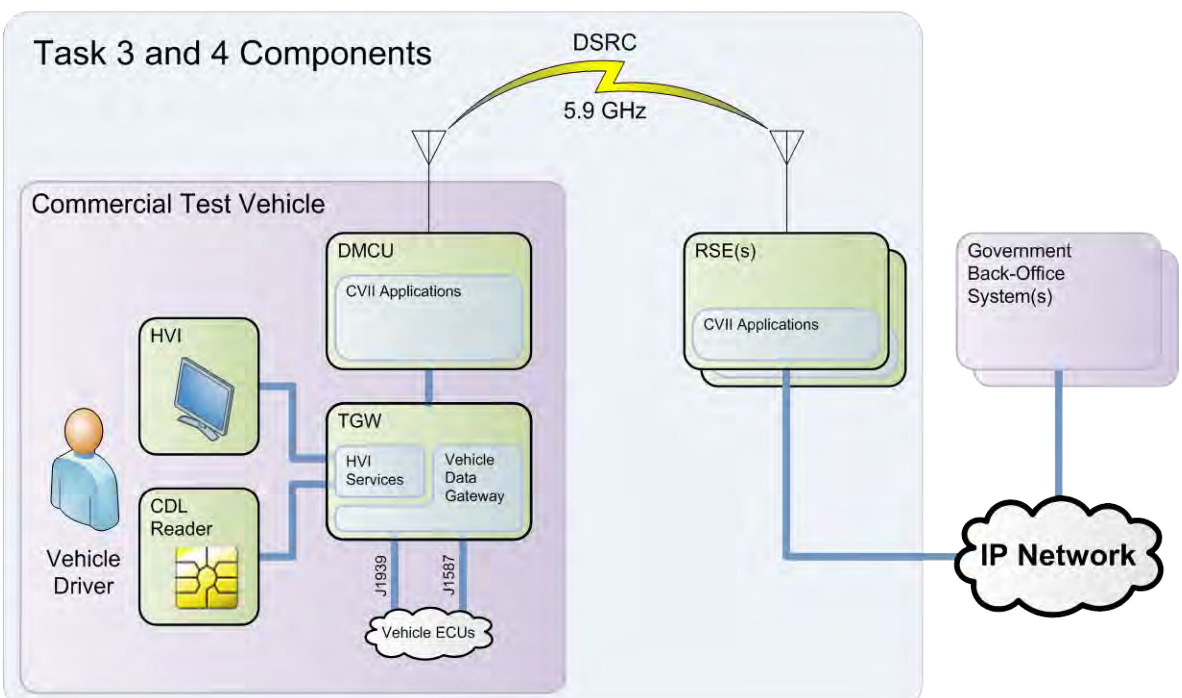


Figure 7. Diagram. New York DSRC system components and communication pathways.

The test was initiated in a 2.5-mile test corridor on I-40 in Greensboro, North Carolina, near the Volvo Technology's Greensboro facilities (see Figure 8). The system was developed with one RSE device and three associated inspection regions. Three regions are developed in order to test the ability communicate with the same vehicle as it traveled the corridor, sending different messages (inspection message, requesting inspection advisory, and displaying inspection advisory) at different locations along the corridor. The spacing, number, and size of each region were not varied for the test and it is possible that this system can be configured in a number of ways to meet the same end.

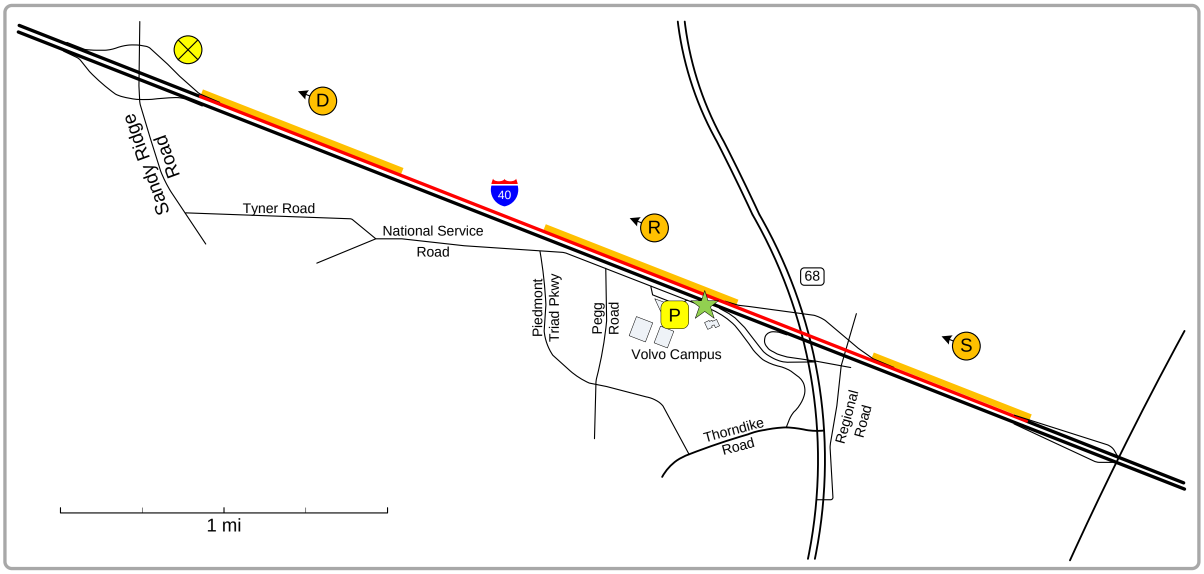


Figure 8. Map. New York DSRC pilot test corridor in Greensboro North Carolina.

3.2 TENNESSEE CMRS PILOT TEST

This section provides insight into the participants of the CMRS communication pathway implemented during the Tennessee pilot test. Section 3.2 describes participants and system design and includes the following subsections:

- 3.2.1 Participants and Roles
  - *3.2.1.1 Management and Facilitation*
  - *3.2.1.2 Government Systems*
  - *3.2.1.3 Law Enforcement*
  - *3.2.1.4 Telematics*
  - *3.2.1.5 Fleets*
  - *3.2.1.5 Sensors and Sensor Providers*
- 3.2.2 System Design
  - *3.2.2.1 Telematics Team 1*
  - *3.2.2.2 Telematics Team 2*
  - *3.2.2.3 Telematics Team 3*

3.2.1 Participants and Roles

The participants and stakeholders for the WRI CMRS pilot test effort are subdivided into six participant areas for the purposes of this section. Each area is outlined below relative to the participants' roles and responsibilities. The participant areas are shown below.

1. Management and facilitation
2. Government systems
3. Law enforcement
4. Telematics
5. Fleets
6. Sensors

Early in the planning phase, and in order to facilitate the WRI CMRS platform testing with limited financial resources while developing a system that would be near-to-market, Oak Ridge National Laboratories (ORNL) presented to FMCSA the option of gratis partnerships with industry stakeholders to develop, test, and field a system to conduct WRI using CMRS. This also allowed for multiple systems (multiple teams with different approaches), from multiple telematics providers, to be developed, thereby better ensuring success and demonstrating diverse solutions. FMCSA approved this approach and ORNL was tasked to form partnerships with private industry as a way to leverage existing technologies and systems to benefit the WRI effort.

3.2.1.1 Management and Facilitation

ORNL provided sole management and facilitation of the WRI CMRS effort at the direction of FMCSA under the umbrella of the Commercial Motor Vehicle Roadside Technology Corridor (CMVRTC), a research corridor operated by ORNL for FMCSA. ORNL was tasked to define, conduct, and report on the WRI CMRS pilot test, as well as to perform a cursory analysis of the data collected to provide input regarding lesson learned and recommendations for refinement and enhancement of the WRI system.

3.2.1.2 Government Systems

By agreement with FMCSA, Volpe provided the GBOS, which included SDM processing capabilities. Volpe also developed an interface to the government BOS to receive the SDM and defined the XML schema and specifications for the telematics teams to format the SDM. An interface was also developed to allow researchers and stakeholders the view SDM contents and inspection results.

3.2.1.3 Law Enforcement

The Tennessee Highway Patrol (THP) provided staff to inspect trucks to validate the SDM data collected during the pilot test, review and comment on the WRI concept, participate in the national WRI teleconferences, and provide end-user feedback to the UT evaluation team. This support was provided through a Motor Carrier Safety Assistance Program (MCSAP) grant under the CMVRTC.

3.2.1.4 Telematics

ORNL conducted a market survey to identify potential telematics providers to participate in the WRI pilot test. Sixty-two companies were identified; of these, 35 were found to be viable (still in business at the time of the WRI effort and purported to have technology/systems capable of supporting WRI). ORNL was able to establish contact with 33 of the 35 and sent to them a document of introduction of the pilot tests. Of these 33, 28 expressed an initial interest in the effort. As a next step in the selection process, ORNL sent out a questionnaire to ascertain the potential company's capability of supporting WRI relative to the planned Evaluation and Use Cases. ORNL eventually received 11 completed questionnaires, all of which indicated the companies met the technological requirements for participation. Offers of participation were extended to these 11 companies in the form of a memorandum of understanding (MOU). Ultimately, three companies signed the MOU to participate in the pilot test. They were as follows:

- Innovative Software Engineering, LLC (ISE)
- PeopleNet, Inc.
- Qualcomm, Inc.

These three telematics companies participated in the pilot test by providing staff, hardware, software, and systems to attempt to meet the requirements of the pilot test by collecting data required for the SDM, formatting the SDM, and transmitting the SDM to the GBOS. All participating companies were promised anonymity in the presentation of results. As such, the telematics teams will henceforth be referred to as Telematics Team 1, 2, and 3 (in no particular order).

In addition to providing the SDM to the GBOS (a fundamental requirement for participation in the pilot test), some telematics providers also implemented (successfully or unsuccessfully) the following additional features and/or components of the WRI CMRS system:

1. Self-test – This feature allows the vehicle operator to test the functionality of the WRI system in advance of starting their duty day and provides information about carrier, driver, and/or vehicle deficiencies (telematics teams 1-3).
2. Pull-in/bypass indicator – This feature indicates to a driver of a WRI-equipped vehicle the need to pull into an upcoming fixed inspection station for further review by enforcement personnel. Depending on yet-to-be-determined protocols, this feature could also inform a driver that he/she may bypass an upcoming inspection station upon the processing of a valid and violation-free SDM (telematics team 1)
3. Safety sensor – The integration of safety sensor data could be used as a screening tool for roadside enforcement as well as providing safety indicators to the vehicle operator and/or fleet maintenance personnel (telematics team 1).

3.2.1.5 Fleets

Based on recommendations from the participating telematics providers, a pool of 21 fleets was established and contacted for possible participation in the pilot test. Six fleets of these 21 agreed to participate in the WRI CMRS pilot test and entered into agreement with ORNL with an MOU.

The 6 participating fleets made 27 vehicles available to be fitted with WRI telematics devices and safety sensors. The six fleets were: Bridgestone Americas Tire Operations, LLC, Greene Coach Tours, Inc., McKee Foods Corporation, Pilot Travel Centers, LLC, Tennessee Express, Inc., and the H.T. Hackney Company, Inc.

3.2.1.6 Sensors and Sensor Providers

Safety sensor data, though not required for the test scenarios defined for the pilot test, is potentially of interest to stakeholders for a variety of uses. Sensor data can be used by drivers, in real time, to assess the condition of their vehicle and can be used by maintenance staff for near-term and predictive maintenance. Such data could also be used by enforcement entities for the screening of vehicles with potential brake, tire, or weight issues.

For the pilot test, vehicle weight, brake stroke information, and tire pressure and temperature information were placed on the vehicles' J-1708 data bus for collection by their respective telematics provider.

The sensor provider partners were: Advantage PressurePro, LLC, Hi-tech Transport Electronics, Inc. (Air-Weigh), MGM Brakes, Inc.

3.2.2 System Design

Two major differences between the nominal system design shown in Figure 3 and the design actually implemented in the pilot test were shared by all the telematics teams from the constraints inherit in the pilot tests. First, the geofences did not originate from roadside enforcement or GBOS but instead were manually distributed by ORNL. Secondly, the inspection report was not generated in real-time.

Three inspection stations in east Tennessee actively participated in the test: two Knox County inspection stations located on I-40 near mile marker 372 (see Figure 9) and the Greene County inspection station located on I-81 southbound around mile marker 22 (see Figure 10). All of the participating CMRS partners were provided with information that allowed them to build geofences around these inspection stations. Specifically, ORNL provided each partner with geopoints, a latitude/longitude coordinate marking the beginning of the off-ramps that are the entrances to the inspection stations (see insets in Figure 9 and Figure 10).

Figure 9. Photograph. Knox County, Tennesee, I-40/I-75 eastbound and westbound inspection station geopoints.

Figure 10. Photograph. Greene County, Tennessee, I-81 southbound inspection station geopoints.

As described previously, one of the features of the Tennessee platform system was a “pull in” driver notification capability. For a “pull in” driver notification implementation, these geopoints mark the “point of no return”; that is, if the driver did to receive the pull in notification before reaching the specified geopoint, he/she would be unable to enter the inspection station.

3.2.2.1 Telematics Team 1

The system designed by telematics team 1 was very similar to that envisioned for the CMRS platform in general. As shown in Figure 11, the telematics team 1 system was designed to implement a pull-in/bypass functionality. Based on analysis of the submitted SDM, the driver was provided real-time instruction regarding whether or not to stop for additional inspection.

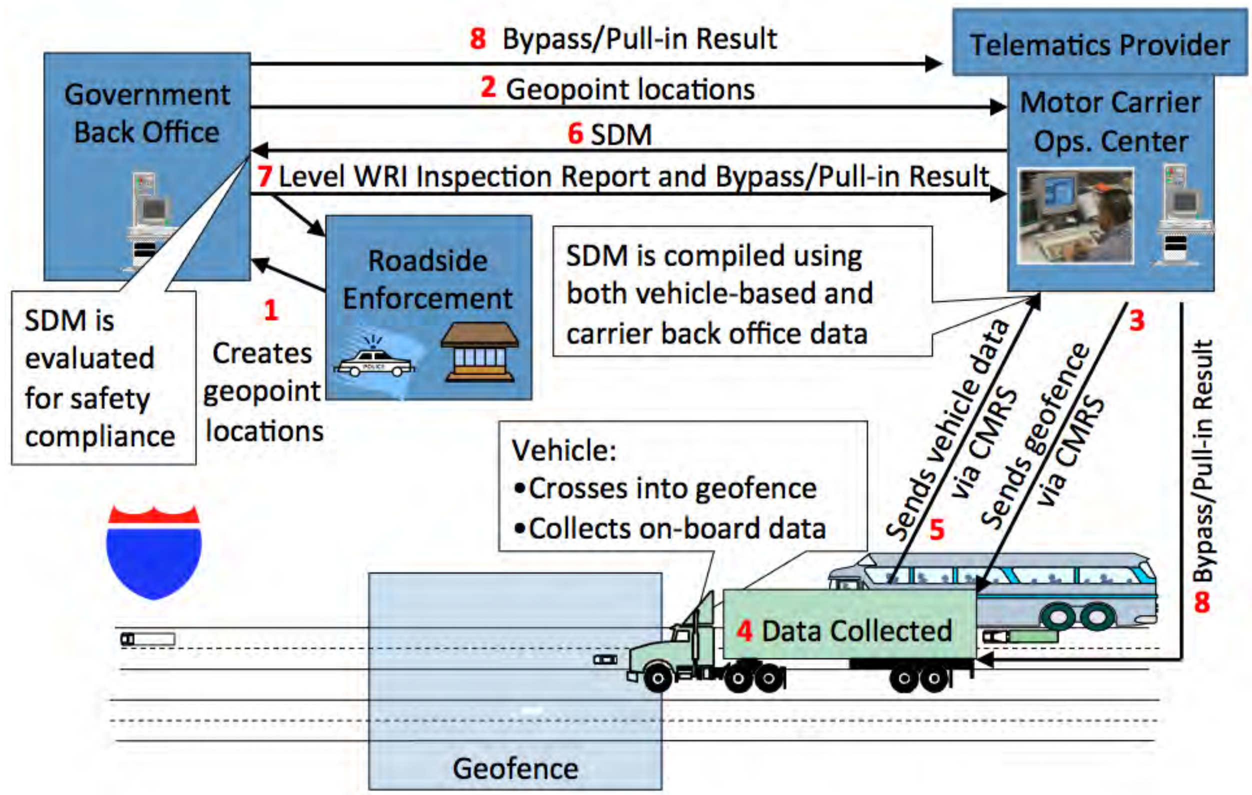


Figure 11. Diagram. Overview of data flow for telematics team 1.

3.2.2.2 Telematics Team 2

Unlike the other telematics teams, telematics team 2's system was designed to submit the SDM directly from the vehicle to the GBOS without the use of the telematics provider's back office to facilitate the data transfer. This data flow is shown in Figure 12.

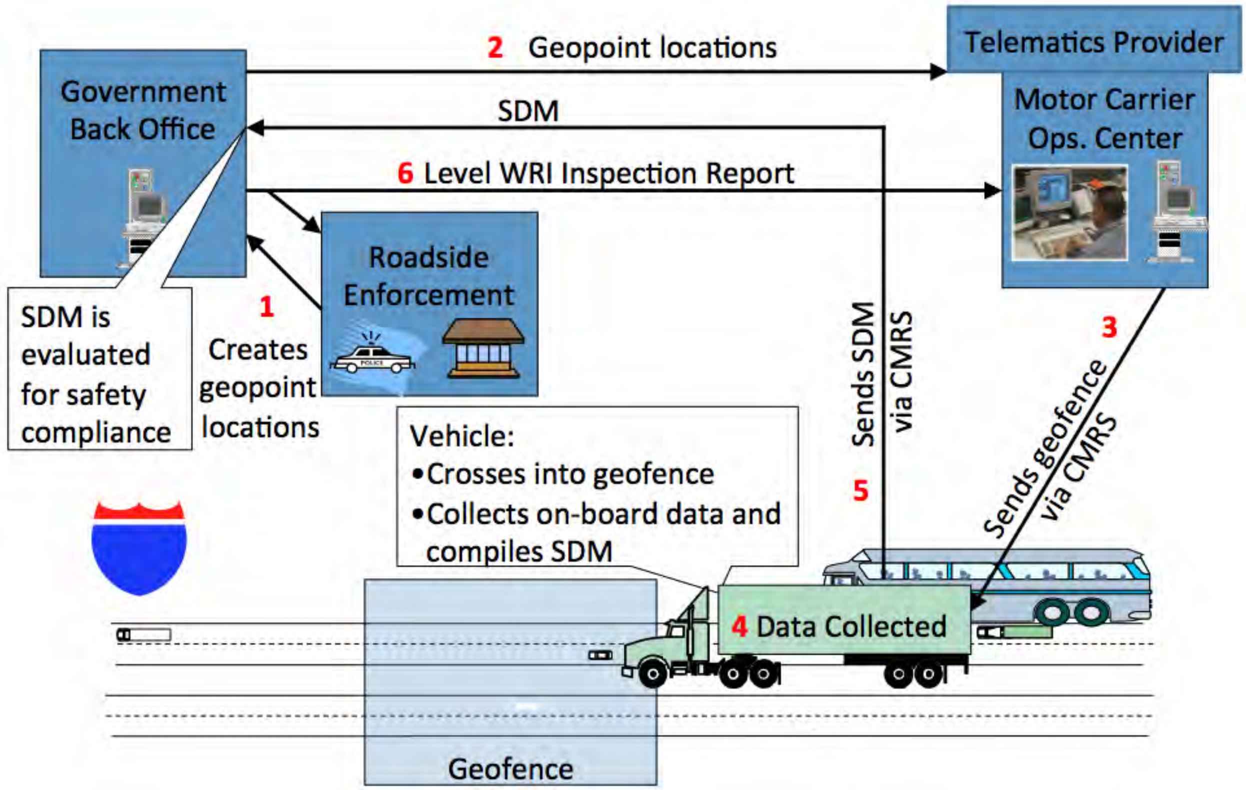


Figure 12. Diagram. Overview of data flow for telematics team 2.

3.2.2.3 Telematics Team 3

Unlike the other two telematics teams, the vehicle portion of telematics team 3's system did not make the determination regarding whether a geofence had been crossed. Instead, the back-office monitored the on-board system at regular intervals and made a geofence determination based on the GPS data received. The SDM was then assembled and submitted to the GBOS if the vehicles were found to be within a designated geofence. The data flow is shown in Figure 13.

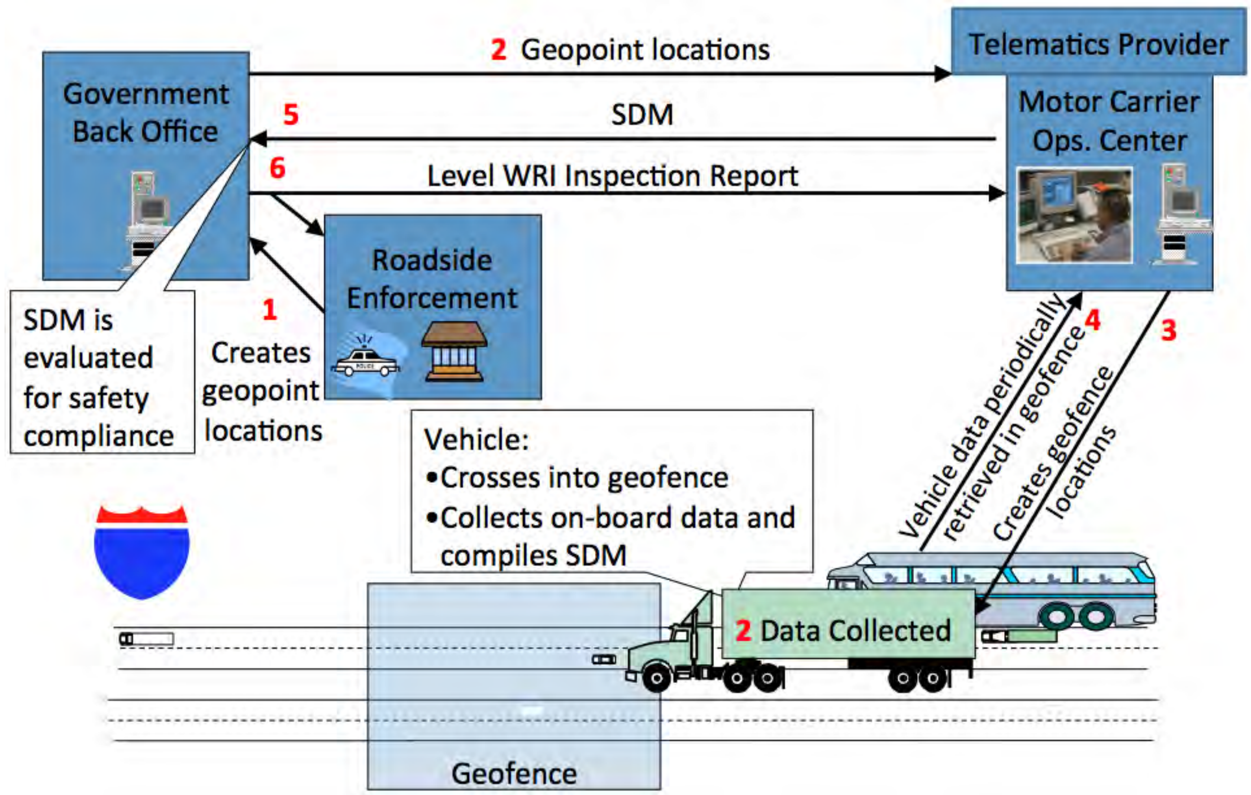


Figure 13. Diagram. Overview of data flow for telematics team 3.

3.3 KENTUCKY UNIVERSAL ID PILOT TEST

This section provides insight into the participants in the Universal ID communication pathway implemented during the Kentucky pilot test. Section 3.3 describes participants and system design and includes the following subsections:

3.3.1 Participants and Roles
3.3.2 System Design

3.3.1 Participants and roles

The Kentucky Universal ID WRI pilot test was a team effort directed by the University of Kentucky (UK) Transportation Center's Intelligent Transportation Systems staff. The project required the contribution of numerous participants including members of the Kentucky Transportation Cabinet's Office of Information Technology, the Kentucky State Police Commercial Vehicle Enforcement Division, staff from the Volpe Center, and the ORNL Computational Sciences and Engineering Division (ORNL-CSED). The carrier participants included Grammer Industries, Inc., based in Grammer, Indiana, and Mercer Transportation Company, Inc., based in Louisville, Kentucky. Finally, the project depended heavily upon the direction and guidance of the WRI project staff. Each participant played a crucial role in the success of the Universal ID WRI pilot test.

The motor carrier participants provided vehicle and driver information for the participating CMVs to the UK Transportation Center staff that, in turn, provided the information to the Volpe staff. Ultimately there were six CMVs from Grammer Industries and 15 from Mercer Transportation that participated in the project. Safety directors from the fleet partners worked closely with the fleet drivers to establish an understanding of the goals, objectives, and benefits of the fleet partner's participation in the WRI pilot test.

The Kentucky Transportation Center contracted the system integration and support to ORNL-CSED. Researchers at ORNL-CSED collaborated with researchers at the Kentucky Transportation Center in the design, development, specification, procurement, installation, integration, and evaluation of the Kentucky BOS for the Kentucky pilot test of the FMCSA WRI project. ORNL-CSED provided assistance on real-time and near real-time data exchange methodologies, protocols, and analysis software for the information exchange between the Kentucky and GBOS. Volpe provided guidance and direction on message formats and troubleshooting issues related to sending properly formatted messages between the Kentucky and GBOS. Volpe also worked with the participants, including the safety directors of the fleet partner participants and vehicle enforcement officers, to provide permission for access to the GBOS.

Staff from the Kentucky State Police Commercial Vehicle Enforcement Division assigned to the Boone facility provided access to the station and the necessary support to complete construction activities. The Kentucky Transportation Cabinet's Office of Information Technology provided guidance and direction relative to network security and access management. The UK Transportation Center's Intelligent Transportation Systems group coordinated all activities related to equipment acquisition, installation, testing, and evaluation.

3.3.2 System Design

The Kentucky Universal ID WRI pilot test built upon an existing automated screening system located on the entrance ramp to the Boone County, Kentucky, weigh/inspection station located on I-71 southbound near mile marker 75. The FMCSA Performance and Registration Information Systems Management (PRISM) team provided a grant to the Kentucky Transportation Cabinet to develop and deploy an automated system to identify commercial vehicles designated by FMCSA as being in the PRISM target file. The Kentucky Transportation Cabinet contracted this effort to the UK Transportation Center

The system design for the PRISM Automated Screening System called for two automated LPR systems (to provide a side-by-side comparison of the leading suppliers) and a USDOT number reader, both of which depend on optical character recognition (OCR) to provide a decode of the character string. A DSRC device to read transponders and a scene camera to capture a digital image of each passing vehicle (for general description and visual identification purposes) completed the roadside equipment. The PRISM Automated Screening System is also interfaced with the existing weigh-in-motion and CMV tracking system that directs commercial vehicles to either the static scale or the bypass lane. During the time of the data collection for the Universal ID WRI pilot test, Kentucky had only one automated LPR system and the DSRC transponder reader installed, but this equipment was deemed sufficient for the purposes of the data collection associated with the WRI pilot test. The automated LPR vendor was Perceptics Imaging Technology Solutions, LLC (Perceptics) of Knoxville, TN.

The automated LPR system and DSRC transponder reader are located just downstream of the on-ramp entrance to the station. The site of the roadside equipment is nearly 1,800 feet from the station's scale house. The main communications backbone between the equipment and the station house, where the PRISM screening computer and server are located, is fiber optic cabling, which essentially runs parallel to the station ramp between the ramp and the mainline section of I-71. Ethernet cabling was also used to provide connectivity between the ramp-side equipment and the PRISM screening computer. The Kentucky Transportation Cabinet's network system was used to provide communications between the Kentucky BOS and GBOS.

As a truck diverges from the mainline and starts up the weigh/inspection station entrance ramp, it approaches the roadside sensors for the PRISM Automated Screening System. The system sensors collect information from the passing CVM and communicate that information to the screening computer located in the scale house. A DSRC reader reads the vehicle transponder (if CMV is so equipped), and sends the DSRC transaction message, or transponder's unique number, to the screening computer. An in-ground loop detector triggers the LPR and overhead scene camera simultaneously. Two images from the front of the truck, the license plate decode information, including the plate's alphanumeric string, jurisdiction and confidence level, and a photograph of the truck are relayed to the screening computer.

The screening computer correlates data from various sensors into a single transaction record and displays the transaction record on the user interface for the enforcement personnel. Enforcement personnel have an opportunity to make corrections (if needed) to the OCR result for the license plate number and/or jurisdiction. As part of processing the transaction record and for any vehicle determined to be a participant in the WRI pilot test, the PRISM screening computer sends an RSDM containing the carrier and vehicle identity to the Kentucky BOS for transmission to the GBOS. If the PRISM screening system receives a WRI SDM for a participating vehicle from the Kentucky BOS, the additional information provided by the WRI SDM is attached to the transaction record for that vehicle. The GBOS prompts the carrier to populate the driver information for a particular inspection and, once received, generates an inspection record and Level WRI inspection report. The SDM and report are displayed on the GBOS web interface. The record (which may or may not have additional data provided by a WRI result message) is returned to the Kentucky BOS server and stored for enforcement access, follow-up action, and evaluation.

3.4 GOVERNMENT BACK OFFICE PILOT TEST

Developed by the John A. Volpe National Transportation System Center, the Government Back Office System (GBOS) was designed to provide the back office functions necessary for wirelessly collecting roadside information from the test platforms in New York, Tennessee, and Kentucky.

During the pilot test, the GBOS served as a processing unit for receiving and identifying safety data messages (SDMs) from Federal, state, and motor carrier systems via the Internet. SDMs related to a specific vehicles, drivers, and carriers were transmitted to the GBOS at various inspection trigger locations. The GBOS user interface provided a view for carriers and service providers of roadside data and WRI results, as well as a view for FMCSA and state agencies of data pertinent to carriers operating within their jurisdictions, WRI results, and stored data for analysis. The GBOS interacted with a number of external systems, including motor carriers, third-party (telematics provider), and state back office systems; interaction with FMCSA safety systems and databases was simulated by using data snapshots of the systems.

The following subsections are below:

3.4.1 Participants and Roles

Table 3 shows the participants and external stakeholders that were involved in the GBOS pilot test. These included the sponsoring organization, the sponsor's contractors and consultants, and partner organizations.

Table 3. GBOS pilot test participants and roles.

Organization	Role
FMCSA	Project Sponsor
Kentucky Division of Motor Carriers	Test Participant
Kentucky Department of Vehicle Enforcement	Test Participant
Kentucky Transportation Cabinet	Test Participant
New York Department of Transportation	Test Participant
Tennessee Department of Motor Vehicles	Test Participant
Tennessee Department of Safety	Test Participant
Volpe National Transportation Systems Center	Technical Lead for Development of Back Office System Prototype Lead for System Integration with Pilot Tests
Oak Ridge National Laboratory	Technical Lead for Roadside Identification in Tennessee WRI Overall Program Technical Coordinator
University of Kentucky Transportation Center	Technical Lead for Roadside Identification in Kentucky
National Transportation Research Institute, Inc. (University of Tennessee and Battelle Memorial Institute)	Field Operational Test Evaluator and WRI Team Member
John Hopkins University/Applied Physics Laboratory	WRI Concept of Operations and Architecture Manager
Noblis	WRI Team Member
Commercial Vehicle Safety Association	WRI Team Member
Motor Carrier Industry (Selected Fleets)	Test Participants

3.4.2 System Design

3.4.2.1 Hardware Architecture

The GBOS prototype was comprised of two distinct systems: a front facing server and an application server: The front facing server included a web service to receive SDMs and a graphical user interface (GUI) website. The application server hosted web services for the internal applications and interfaced with an Oracle database server to store intermediate processing results, log information, and WRI results.

3.4.2.2 System Logical Architecture

The GBOS was implemented on three physical servers: (1) a front-facing server with a web service that received SDMs and sent replies in the form of acknowledgment messages, error messages, or requests to resend an SDM, as well as a user-interface website; (2) an application server, which hosted the bulk of major system components; and (3) an Oracle database server, which provided storage of system data, including system users and credentials, SDMs received, SDM responses, and safety compliance evaluation results.

3.5 INDEPENDENT EVALUATION—UT EVALUATION TEAM

Researchers from the University of Tennessee, Knoxville (UT), conducted the independent evaluation and reporting for the WRI Phase II pilot testing. The results of these efforts will be used to support a go/no-go decision on whether or not to proceed to the Phase III field operation tests. This evaluation is meant to be a within- and cross-platform analysis of the WRI technologies and operations in the context of the goals proposed at the onset of the project.

An evaluation plan was developed to support the assessment for all components of the WRI system for each of the three pilot test platforms. All end-to-end communication data were collected and analyzed. The evaluation team also collected answers to a set of qualitative questions asked during stakeholder interviews.

The evaluation focused on the technological feasibility of WRI systems, verifying architecture and requirements to the degree possible with the planned pilot tests, and assessing the utility and operational feasibility of WRI for the enforcement community and other participating stakeholders. These tasks were accomplished by conducting evaluations of both the roadside and back office systems and users of the system.

4. EVALUATION METHODS

In order to assess the outcome of the WRI pilot test, the UT evaluation team, with input from the greater WRI project participants, developed a detailed evaluation plan[9] that was not only specific to individual platforms, but also spanned across all platforms. This section describes cross-platform evaluation frameworks and methods.

The evaluation was performed using two different approaches: a quantitative approach and a qualitative approach. The UT evaluation team used a quantitative evaluation to collect and analyze the transmitted wireless data (timestamps, sensor data, etc.) and a qualitative evaluation to collect system performance information from the project participants. The manner in which these two different evaluation methods was conducted is described in sections 4.1 and 4.2. This section follows the following subsection outline:

4.1 QUANTITATIVE EVALUATION

The quantitative evaluation approach is examined in section 4.1.1. In order to perform the quantitative evaluation the UT evaluation team collected a large amount of quantitative data. The sources of this quantitative data are described in section 4.1.2. The UT evaluation team, using statistical methods, then analyzed this data. The methods used to analyze the quantitative data are discussed in section 4.1.3.

4.1.1 Quantitative Evaluation Approach

The basis of the WRI system pilot tests is to examine data as it moves between the various system components. As such, the scope of this evaluation was to analyze how quickly and accurately these data moved between infrastructure components and people. To this end, the three main data types collected were the platform timestamp data, platform and Volpe event logs, and the SDM data itself.

All SDM data were first uploaded to the UT evaluation team database as exact copies of Volpe's database (absent of tables containing Personally Identifiable Information [PII] data). Next, all platform timestamp log files were imported into the UT evaluation team database. These data were validated for the purposes of error checking and data reporting. Once the validated data were obtained, it was determined whether the data were transmitted accurately and on-time. The data were then statistically analyzed to estimate the successful performance of the WRI system in terms of timely delivery for inspection support.

Data were collected to support the Use Cases and were decomposed into independent sub-processes (Evaluation Cases) such that the Use Cases could be evaluated incrementally if needed. The Use Cases tested are:

Use Case 1. WRI fixed-site data collection and assessment

Use Case 2. WRI Mobile enforcement data collection and assessment

Use Case 3. Post-processing analysis of WRI data and results

Use Case 4. Carrier use of WRI data and results

Use Case 5. Management of the WRI network

Use Case 6. Use case dropped[3]

Use Case 7. WRI system self-test by carrier

Use Case 8. WRI system self-test by roadside or mobile enforcement

Due to the independent nature of the Evaluation Cases, each subsystem was evaluated independently and at different times based on variations in the coordinated project timeline. Only after all the critical Evaluation Cases were assessed could a system evaluation be considered complete.

Overall evaluation requirements were developed and evaluated individually by the UT evaluation team.(9) The team evaluated the validity of the data through two accuracy checks, 1) validation against an expected range of values and 2) corroboration with observed field data. The team produced 95 percent confidence intervals of the mean data processing times from the initiation of the trigger event (CMV passing a trigger point) to the delivery of the level WRI inspection report to roadside enforcement and the motor carrier operations center (through the web-based interface). The confidence interval of the mean gives a determination of the true duration needed to perform certain Evaluation Cases, and ultimately Use Cases, within the three pilot test sites and the GBOS. The 95th percentile is also reported, indicating the latency at which 95 percent of the observations fall under. The validation and latency evaluation process used throughout the data analysis is as follows:

1. Timestamps were analyzed to show time intervals between the sending and receiving of data. Latency distributions were determined for the time needed to send SDMs between interfaces. This was done for each sub-process within the end-to-end data transfer period.

[3] Use Case 6 was dropped early in the pilot test planning stage

2. The completeness of the SDM data sets were analyzed as they entered the GBOS, and the proportion and distribution of missing data were determined.
3. The correct translation of the SDM data into a level WRI report was analyzed, and the associated elements in each dataset compared to one another.
4. The amount of data lost at various interfaces was analyzed by counting the number of triggers that occurred and by comparing these to the number of SDMs received by the GBOS. Similarly, the number of level WRI inspection reports received by the roadside was compared to the number of level WRI inspection reports sent from the GBOS.
5. Internal data loss or process failures were determined by analyzing the number of events that timed-out or failed to transition to the next sub-process.
6. The GBOS log was tested to see if a given encounter produced an inspection.
7. All GBOS records were checked to validate valid encounter ID range for each platform.
8. All duplicate encounter IDs were flagged.
9. All encounter IDs that existed outside of a platform's allowed range of encounter IDs were flagged. Data were linked to correlate all encounter IDs to their corresponding Unique ID (an identification number generated by the GBOS). The Unique ID was then linked to a CMV VIN Number.
10. Inspections reported in the platform log files, but not received by the GBOS, were flagged. The process by which this was done varied between platforms.
11. All times reported by platforms and the GBOS were converted to number of seconds since midnight December 31, 2009 (EST). This process correctly accounts for the differences in time zones and time formats.
12. End-to-end latency was calculated for all encounter IDs reported in the log files of the platforms.

4.1.2 Quantitative Data Sources

The quantitative data were gathered from four different sources: roadside/mobile enforcement systems, Federal GBOS, experiment event logs, and motor carriers/service provider systems. These systems' representatives communicated the data to the UT evaluation team via e-mail and/or by posting them to a secure website. The data were generally delivered in delimited text files or Oracle database dump files.

It was requested that all clocks, on all hardware and software responsible for assigning timestamps, be set to NIST (National Internet Standard Time) for the purpose of collecting accurate timestamps for the evaluation. This was of particular importance since several entities generated and processed data using differing hardware. This proved to be a challenge in the data collection process and is discussed in Section 6.

All requested evaluation timestamps were appended in specific timestamp ID (TSID) domains in a running appended log file in correspondence with the platform specific tables' TSID. The key data elements include the encounter ID number, NIST, and associated TSID. The encounter ID is unique to each inspection and carriers throughout the duration of the transmission of the SDMs, allowing individual encounters, through various entities that generate or process data, to be traced. The timestamp log files were used to validate various hypotheses in the evaluation, and a database “view” was created to combine timestamp log files and other platform data. Each entity generated log files in slightly different formats. The recommended format, given to the platform developers, is shown in Table 4 (though variations of this were provided by partners).

Table 4. Sample log file.

Encounter_ID,NIST,TSID
Encounter_ID,JJJJJ YY-MM-DD HH:MM:SS TT L H msADV UTC(NIST) OTM,T1
Encounter_ID,JJJJJ YY-MM-DD HH:MM:SS TT L H msADV UTC(NIST) OTM,T2
Encounter_ID,JJJJJ YY-MM-DD HH:MM:SS TT L H msADV UTC(NIST) OTM,T3
Encounter_ID,JJJJJ YY-MM-DD HH:MM:SS TT L H msADV UTC(NIST) OTM,T4

The SDM data (alerts, carrier registration, etc.) for the data table fields (unique ID, alert category, etc.) are shown in Table 5 It should be noted, however that the population of these fields may vary by pilot platform.

Table 5. Data table fields for SDM data.

SDM Data Category	Data Table Fields								
Alerts	Unique ID	Alert category	Alert Severity	CFR part number	CFR part number section	Alert comment	Create date time	Update date time	
Carrier Registration	USDOT Number	Name	E-mail	Service provider EPR	Owner-operated flag	Passenger carrier	HazMat carrier	Create date time	Update date time
CFR Reference Set	Code	Description	Violation message	Category	Create date time	Update date time			
Global Reference	Code	Description	Type	Create date time	Update date time				
HOS Events	Unique ID	Status code	Date time	Latitude	Longitude	Location name	Diagnostics code	Create date time	Update date time
	VIN number	USDOT Number							
Vehicle Brakes	Unique ID	Axle number	Brake chamber number	Leftt/Right brake measure	Brake stroke status	Wheel brake lining	Create date time	Update date time	
Vehicle Weight	Unique ID	Axle group location	Axle group weight	Create date time	Update date time				
Vehicle	Unique ID	VIN number	Registration number	State of registration	Create date time	Update date time	Type	Registration country	
Violations	Category	CFR part number	CFR part number section	Message	Create date time	Update date time			
Records	Unique ID	State of inspection	Encounter date time	Vehicle poll date time	USDOT number	Trigger type	Mode	Carrier country	Inspection station
	Carrier name	HazMat registration ID	Low-tech status	Encounter latitude	Encounter longitude	Outcome ID	Transponder ID		

4.1.3 Quantitative Data Analysis Methods

The quantitative-oriented hypotheses introduced in the next section (Section 5) were analyzed statistically. The outcome of these analyses will support the policy decision as whether or not to proceed to Phase III of the WRI program.

Before conducting the statistical analysis, extreme outliers in the datasets were removed, where a significant communication breakdown likely occurred, though mild outliers were not removed. The UT evaluation team estimated the mean and standard deviation for each step in the information flow and for the end-to-end message transmission latencies, and then determined 95 percent confidence intervals of the average transmission times based on the platform and Volpe log files. The 95th percentile value for each step and for the end-to-end transmission latencies were extracted from the latency data and will be used to help design future applications of the system.

The accuracy of the SDM, a key criterion of the goals, was estimated in two different ways; 1) based on the frequency of validation errors found in the report and 2) by corroborating data received through the WRI system with actual vehicle records during field-visits. The corroboration was conducted using a very limited sample of days and inspections and was done to verify the performance of the system, rather than to provide a summative assessment of the consistency between WRI and on-board data.

The reliability of data transmissions was estimated using timestamp report datasets obtained from the platform and Volpe log files. The transmission performance was calculated as the ratio of reports received by Volpe to those transmitted to Volpe.

System event logs were used to examine the availability of the WRI system to perform an inspection. Any system downtime was considered as unplanned downtime. The ratio between unplanned downtime and planned system up time was estimated in order to determine the percentage of up time of the WRI system.

4.2 QUALITATIVE EVALUATION

In order to perform the qualitative evaluation, the UT evaluation team conducted a series of telephone interviews with the participating stakeholders. The approach for this is examined in section 4.2.1, the data sources for this portion of the evaluation are given in section 4.2.2, and the methods used to analyze the quantitative data are discussed in section 4.2.3.

4.2.1 Qualitative Evaluation Approach

A qualitative approach was used to analyze the portions of the WRI pilot tests that, by their very nature, could be done only by collecting input, observations, and feedback from the participating stakeholders and users. In order to do this the UT evaluation team conducted a series of telephone interviews with participants during the data collection period.

For this approach, the UT evaluation team developed an evaluation plan that included further educating the participants on the WRI system and then obtained feedback and input from them related to their understanding and perceptions of the WRI systems and the pilot tests. A webinar was developed, in collaboration with multiple partners from the greater WRI project team, to educate participants on all aspects of the WRI system and to highlight the areas of focus for the qualitative evaluation. The purpose of the webinar was to supplement the stakeholders' actual experiences with WRI and to provide them with additional information about the larger program objectives. In conjunction with the webinar development process, the group produced a set of specific questions designed to elicit insight from stakeholder participants as to how well the goals, objectives, and hypotheses were being fulfilled. After viewing this webinar, the participants were given the question set for review and consideration. Usually within one week, the UT evaluation team interviewed participants. The interviews were recorded with the full knowledge of the interviewees, then transcribed and examined by the UT evaluation team. General themes were drawn from the interviews and conclusions of the participants' perspectives and concerns of the project were summarized in an anonymous manner.

4.2.2 Qualitative Data Sources

The qualitative analysis data sources for this evaluation are the representatives from the stakeholder groups who participated in the pilot tests and the answers they provided during the post-pilot test telephone interviews. These groups included law enforcement and/or compliance personnel and representatives from the participating fleets, carriers, telematics providers, and sensor providers from both Tennessee and Kentucky.

4.2.3 Qualitative Data Analysis Methods

Qualitative analysis was conducted on data collected from stakeholders related to the various policy and perception questions presented in section 5, particularly those related to stakeholder approval and user feedback. The answers gleaned from the interviews were evaluated based on common themes and then summarized (see section 6). The transcripts from these interviews can be found in the report titled Wireless Roadside Inspection Stakeholder Participant Evaluation Interview Transcripts.[19] Included in the analysis was the determination of the interviewees' level of participation with, and understanding of, the WRI system and its components. By targeting specific participants within the industry, plausible inferences were drawn, which could be attributed to the industry as a whole.

4.2.3.1 Interview Question Topic Areas

The interview questions included specific questions related to various stakeholder operational uses including:

- *User Interface.* The user interface is one of the most critical items from the stakeholders/users' point of view. Given this, the viewpoints of the stakeholders/users were collected, used to evaluate performance standards, and to determine possible system improvements.
- *Qualitative Specifics.* The users' overall experiences with the WRI system were determined. Most of the results obtained from this subset of data were expected to validate the results from the quantitative analyses. By determining instances where this proved not to be accurate, user perceptions of system performance were determined.

- *Overall Assessment.* The UT evaluation team set out to obtain an overall “feel” for the WRI system based on the experiences of the participants during the pilot tests. By collecting this information, the UT evaluation team was able to determine the attitudes of the participants and weigh their responses.
- *Enforcement/Compliance*. Feedback from enforcement/compliance personnel was collected. Enforcement perceptions and willingness to embrace further WRI development are crucial elements to uncover in order to assess system performance.
- *Suggested Improvements.* The stakeholders were encouraged to provide their input related to their pilot test experiences and webinar exposure. These answers were compared to quantitative results where pertinent.

5. EVALUATION GOALS

Evaluation goals were established for the Phase II WRI pilot tests to determine success, and to uncover problems from each of the three communication path technologies. Results from these goals will be used to assess the viability of continuing development of the WRI program in Phase III. Each *goal* has embedded within it one or more *objectives*. The *objectives* each contain one or more related *hypotheses*, and each *hypothesis* contains an associated explanation. The manner in which the goals were developed and prioritized are presented in Section 5.1. Section 5.2 presents the overall project goals, objectives, and hypotheses tested in this pilot test phase.

5.1 PROCESS OF ESTABLISHING AND PRIORITIZING EVALUATION GOALS

The overall goal of the evaluation was to determine if the main criteria for success of Phase II of the WRI program were met in order to make an informed decision as to whether or not to proceed to Phase III. As such, a series of goals was developed based on the exit criteria (section 2.1.1). The goals evaluated the overall technical, economic, and operational performance of the system. The technical criteria of the evaluation were based on whether the system could competently and reliably deliver the intended services with acceptable risk. The economic criteria of the evaluation were based on whether or not the system supplied the intended benefits within acceptable cost and risk limitations, and if it could be deployed in a self-sustaining manner. The operational aspects of the evaluation were based on the operational feasibility and performance requirements of the overall system. The evaluation does not include significant discussion of social, political, legal, or regulatory criteria.

5.2 EVALUATION GOALS, OBJECTIVES, AND HYPOTHESES

The goals of the evaluation are derived from the WRI Vision and Goals Criteria[17] and were first presented in the WRI evaluation plan. They are presented below. For each hypothesis, it is noted as to whether or not it was to be evaluated using the quantitative or qualitative methods described previously in Section 4.

Goal 1: Determine that at least one of the proposed technology/network options is feasible and supports the Operational Scenarios in a cost-effective manner.

- **Objective 1.1:** Demonstrate that DSRC, CMRS, or Universal ID technology, used under the WRI system, will provide a high percentage of accurate level WRI inspection reports.
  - Hypothesis: The Level WRI inspection report is obtained 95 percent of the time a vehicle encounters a trigger event. (Quantitative)

    Calculating the total number of trigger events and then comparing the results to the total number of SDM and level WRI inspection reports delivered to the end user quantitatively evaluate this.

  - Hypothesis: The level WRI inspection report is on time 95 percent of the time. (Quantitative/Qualitative)

The delivery time of the level WRI inspection report, as measured from the trigger event to the final delivery to the end user, will meet the latency requirements 95 percent of the time. By measuring the amount of time needed to pass between each subsystem interface, and then summing the latencies to estimate end-to-end mean latency and the associated standard deviations, this can be quantitatively evaluated. The mean latency can then be compared to the required latency with a certain level of confidence. The latency requirement is undefined and instead depends on system requirements for different Use Cases and Operational Scenarios. Ultimately, the latency distribution will be used to determine the maximum threshold (95^{th} percentile) of time needed to conduct an inspection process on a platform-by-platform basis.

  - Hypothesis: The level WRI inspection report is accurate 95 percent of the time. (Quantitative)

    The elements of the level WRI inspection report are consistently corroborated against observed data 95 percent of the time (on average). This is estimated by comparing SDMs and level WRI inspection reports against manual inspections of individual vehicles during the pilot tests. For corroboration, comparisons of the SDMs archived in the Federal system will be made to a sufficient number of physical inspections that are performed.

- **Objective 1.2:** Demonstrate each Operational Scenario[4] can be tested by one of the technology options.
  - Hypothesis: Operational scenario 6.1.1 (unstaffed automated safety enforcement, compliance, and assessment) can be performed by at least one of the technology options. (Quantitative/Qualitative)

    A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

  - Hypothesis: Operational scenario 6.1.2 (screening support) can be performed by at least one of the technology options. (Quantitative/Qualitative)

    A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

[4] This document is based on the 2008 version of the ConOps[5]. The ConOps document has been subsequently updated in 2010 and the Operational Scenarios renumbered with a leading five (5), instead of six (6). So, for example, Operational Scenario 6.1.4 became 5.1.4. The reader should be aware of this when reading this report in the context of the 2010 ConOps[18] and future related documents.

– Hypothesis: Operational scenario 6.1.3 (traditional inspection support) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

– Hypothesis: Operational scenario 6.1.4 (mobile safety check) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in the Kentucky and New York platforms, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario. (Quantitative/Qualitative)

– Hypothesis: Operational scenario 6.1.5 (routine safety analysis or special study) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

– Hypothesis: Operational scenario 6.1.6 (carrier use of SDM) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

– Hypothesis: Operational scenario 6.1.7 (use of SDM in transportation planning and management) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario. Downloading and stripping the data of PII can also test this. The data can then be used by outside sources.

– Hypothesis: Operational scenario 6.1.8 (managing the WRI network) can be performed by at least one of the technology options. (Quantitative/Qualitative)

  A set of technologies, tested in any of the three pilot tests, evaluated independently or in conjunction with an individual pilot test subsystem, can be combined to complete the function of this operating scenario.

<u>Goal 2</u>: Based on performance, specific technology/network recommendations can be made for further development, and shortcomings can be identified.

- **Objective 2.1:** Determine which technology/network system develops the fastest data results within the system between the DSRC, CMRS, or Universal ID technologies.
  - Hypothesis: At least one of the three different technologies is able to produce data results faster and more reliably as compared to alternative technologies. (Quantitative)

    Under this objective, the evaluation team will determine which of the technologies is the most appropriate for specific applications, depending on the requirements of the system. An example of this is latency requirements between a trigger event and delivery of a level WRI inspection report for interdiction purposes. The UT evaluation team will quantitatively estimate the variances of end-to-end latencies to estimate reliability parameters such as the percentage of inspections that arrive within a certain timeframe. Measuring the time needed for each step of the data transfer and delivery process for each technology and statistically comparing latency between systems will test this hypothesis.

- **Objective 2.2:** Determine which technology/network system develops accurate data results within the system between the DSRC, CMRS, or Universal ID technologies.
  - Hypothesis: One of the three different technologies is able to produce accurate data results more often compared to alternative technologies. (Quantitative/Qualitative)

    Each SDM, and ultimately each level WRI inspection report, will require data corroboration and validation as it is collected by the various system components. Determining acceptable threshold values and the proportion of acceptable observations within each SDM will validate the elements of the SDM. SDM data will be corroborated by comparing the results of the SDM (or level WRI inspection report) to a reasonable sample of manual inspection reports. This will be done in order to determine systematic inconsistencies and to compare the inconsistencies between the three technologies.

- **Objective 2.3:** Determine data and functionality produced by each technology to fulfill the needs of the greatest number of Operational Scenarios.
  - Hypothesis: One of the three different technologies produces enough data and functionality to fulfill Operational Scenario needs compared to alternative technologies. (Quantitative)

    Each technology has the capability to gather different types of information. Testing this hypothesis will involve qualitatively and quantitatively evaluating and tabulating system abilities to collect important pieces of information. From this analysis, a policy maker can determine levels of importance and suggest technologies that provide information to inform inspection decisions.

- **Objective 2.4:** Determine which technology can satisfy the demands related to all of the data quality attributes.
  - Hypothesis: One of the three different technologies is capable of producing accurate data results with the given data attributes. (Quantitative/Qualitative)

    Test that the technologies have the capability to apply each of the data quality attributes to the data results. Testing this hypothesis will involve testing of the data quality, privacy, security, system access, system reliability, functionality, usability, and maintainability.

- **Objective 2.5:** Scrutinize observations gleaned from objectives 2.1-2.4 to determine shortcomings in each technology and recommend improvements.
  - Hypothesis: Potential inadequate performance from each technology can be determined and alternative solutions then used to increase overall system performance. (Quantitative/Qualitative)

    Using the quantitative factors obtained during the evaluations from objectives 2.1-2.4, technologies can be compared to one another and deficiencies noted. Users should make suggested improvements as well. From this, the WRI system can be finely tuned to achieve optimal performance.

Goal 3: Determine that at least one of the proposed technologies is feasible and cost effective.

- **Objective 3.1:** Demonstrate that the DSRC, CMRS, or Universal ID technologies deliver timely, accurate, and complete results 95 percent of the time.
  - Hypothesis: DSRC, CMRS, or Universal ID technology associated with the pilot tests are able to produce an SDM and level WRI inspection report 95 percent of the time. (Quantitative)

    In order to deliver satisfactory results, the various technologies should deliver an SDM and level WRI inspection report at least 95 percent of the time. Moreover, that report should contain acceptably accurate information at least 95 percent of the time. Counting and verifying the number of trigger events or requests for information that occur and then comparing this information to the number of SDMs delivered to the end user will quantify this hypothesis. Accuracy of the SDM and level WRI inspection report is addressed in objective 2.2.

- **Objective 3.2:** Demonstrate that the DSRC, CMRS, and/or Universal ID technologies reduce the cost per inspection and increase CMV and carrier productivity.
  - Hypothesis: The cost per inspection by at least one of the technology options is less than the cost per current inspection. (Quantitative)

    Based on the given technology option as compared to current inspection costs, the average marginal capital and personnel costs to the users, and the costs and time required to public agencies, are lower per inspection for the level WRI inspection. This can be estimated by comparing average costs of inspecting CMVs manually versus the average cost of WRI inspections with the technology options.

– Hypothesis: The time needed for vehicle inspection will be less than current NAS level I and III inspections. (Quantitative/Qualitative)

  The total number of inspections, divided by the total delay, will yield the average delay per inspection for the fleets. Alternatively, the total delay of all inspections can be divided by the total amount of CMV traffic to estimate the delay per CMV. In both cases, it is expected that delay for the carriers will be reduced, an indicator that productivity will have increased.

Goal 4: Verify that potential interdiction strategies are feasible and are agreed upon by the various stakeholders.

- **Objective 4.1:** Demonstrate the established real-time or near-real-time interdiction strategies are feasible.
  - Hypothesis: A CMV safety alert can be used in the e-screening process to flag a vehicle for inspection. (Quantitative/Qualitative)

    A safety message can be delivered from an electronic inspection at an upstream node to a staffed enforcement location in enough time for enforcement personnel to identify and pull in a vehicle for further inspection. This hypothesis will be quantified by determining latency requirements and enforcement-to-driver communication systems, assuring that enforcement can relay a pull-in message to a driver in time. In the CMRS platform, instead of enforcement, the GBOS could relay the bypass/pull-in message as a response to the SDM contents, and then enforcement will have the ability to make a decision to inspect or release a flagged vehicle, but the flag will not be generated locally.

  - Hypothesis: A level WRI inspection report can pre-populate a NAS level I or level III inspection report. (Quantitative)

    A level WRI inspection report can be delivered to the roadside enforcement user interface, fields can be automatically matched between the level WRI inspection report and NAS level I or III inspection report, and the manual form can be prepopulated. The latency should allow the form to prepopulate automatically before the inspector begins a manual inspection.

  - Hypothesis: Enforcement can query any CMV and relay a CMV safety alert to mobile enforcement. (Quantitative/Qualitative)

    A safety message triggers a CMV safety alert for a specific CMV at an unmanned inspection site. The pilot tests should demonstrate that this safety alert could be broadcast to mobile enforcement interfaces with information regarding the time and location of the automated inspection, CMV ID information, and safety violations. This message should be sent quickly enough for a mobile enforcement officer to estimate vehicle location for interception.

- **Objective 4.2:** Demonstrate the established non-real-time interdiction strategies are feasible, can support other strategies, and can be accessed at later times.
  - Hypothesis: Enforcement officers can access data well after WRI assessment results are returned. (Qualitative)

    Enforcement personnel can access WRI assessment results that are stored on the Federal BOS and use that information to schedule appropriate interventions or otherwise monitor negative WRI results.

  - Hypothesis: All interventions can be successfully carried out after WRI assessment results are returned. (Qualitative)

    Interventions such as a warning letters, targeted roadside inspections, offsite investigations, focused onsite investigations, comprehensive onsite investigations, cooperative safety plans, notices of violation, notices of claim, settlement agreements, or unfit suspension can be carried out based on WRI assessment results.

- **Objective 4.3:** Stakeholders, carriers, and representatives will agree on feasible interdiction strategies.
  - Hypothesis: Stakeholders agree that the established interdiction strategies can be completed. (Qualitative)

    Stakeholders, primarily the enforcement community, agree that real-time and non-real-time interdiction strategies can be implemented and that WRI will add benefit to their current inspection processes. Polling various stakeholders, carriers, and other users can test this hypothesis.

Goal 5: Ensure the WRI inspection trigger point can address multiple vehicle inputs under a variety of conditions.

- **Objective 5.1:** Demonstrate that different locations can accommodate a multitude of vehicles and still obtain data results under varying technological conditions.
  - Hypothesis: Subsystems are scalable. (Quantitative)

    The evaluation will document that the system works on a scalable platform and that increases in demand can be met by proportional increases in capacity. This hypothesis can be tested theoretically through system design architecture.

  - Hypothesis: Subsystems can receive and process a variety of data formats. (Quantitative)

Depending upon carrier, CMV, and trigger technology, SDMs will be sent to different subsystems of the WRI system in differing formats and with differing content. Under this objective, the evaluation will determine if all of the data inputs can be appropriately received and consistently translated into level WRI inspection reports.

Goal 6: Determine that the projected costs of the system are within a reasonable budget.

- **Objective 6.1:** Determine the initial capital costs are lower than the potential capital budget based on method and level of deployment of the WRI system.
  - Hypothesis: Projected costs are within acceptable budget limits. (Quantitative/Qualitative)

    Comparing the proposed deployment costs by public and private investments to acceptable constraints can test this objective.

  - Hypothesis: System is financially feasible. (Quantitative/Qualitative)

    The long-term operating costs of the WRI program are funded by a long-term investment strategy.

Goal 7: Benefit assumptions are validated.

- **Objective 7.1:** The WRI system increases inspection rates.
  - Hypothesis: The WRI system is able to produce a level WRI inspection report at 25 times the current rate—at rates similar to CMV weight and size inspection rates. (Quantitative)

    It is assumed that the WRI system can increase inspections 25-fold due to faster inspections and limited physical infrastructure requirements, addressing two current inspection process capacity constraints—personnel and facilities. To test this hypothesis, the WRI inspection capacity will be estimated in each pilot test and then compared to the current inspection capacity at each respective site.

- **Objective 7.2:** Benefits are demonstrated well enough to withstand reasonable skepticism.
  - Hypothesis: The benefits, as compared to costs, are substantial. (Quantitative/Qualitative)

    The benefits of the system—measured in increased inspections, lower costs per inspection, decreased long-term crash rates, and increased productivity of safe and legal carriers—are quantifiable and clearly show that the system is cost effective.

- **Objective 7.3:** WRI can provide assumptions of increased benefit from a high number of both positive and negative inspections.

- Hypothesis: More wireless roadside inspections will theoretically influence safety ratings. (Quantitative/Qualitative)

  Since the WRI system will increase the number of inspections, this will lead to an increase in the number of safety ratings (both positive and negative) for carriers. This hypothesis can be tested by observing an increase in safety ratings for carriers as a result of a greater percentage of positive inspections.

Goal 8: Show all technical assumptions to be valid and that no technical barriers exist.

- **Objective 8.1:** Adequate capacity exists for end-to-end inspections.
  - Hypothesis: Current capacity exceeds resource demands for the pilot tests. (Quantitative)

    The capacity developed for the pilot test is able to adequately address demand for inspections. The scalability of the system will show future capacity can exceed demands.

- **Objective 8.2:** WRI system's technological functions are reliable during scheduled up time.
  - Hypothesis: Unplanned system downtime is less than 5 percent of the planned system up time. (Quantitative)

    Each WRI pilot platform will record unplanned downtime and planned up time. The unplanned downtime should be less than 5 percent of the total planned up time.

- **Objective 8.3:** WRI system's technological functions work on a scalable platform with increases in demand being met with proportional increases in capacity.
  - Hypothesis: Subsystems are scalable. (Quantitative)

    See objective 5.1

- **Objective 8.4:** Data formats will be non-proprietary, and technology can be proprietary.
  - Hypothesis: All data formats are non-proprietary, and technology may be proprietary. (Qualitative)

    Each pilot test will document all data formats and whether or not they are open and non-proprietary. Hardware and software components can be proprietary.

- **Objective 8.5:** System can evolve to accommodate innovations in technology except where technological or operational limitations prevent innovation.
  - Hypothesis: SDMs can accept inputs from different technology types. (Quantitative)

Each platform will be testing different technology types. By doing this, the evaluation will determine if different technologies can provide data relevant to the SDMs. Testing this hypothesis includes determining if the SDM content can be dynamic.

<u>Goal 9</u>: Determine that the performance of the system (network and field) meets acceptable operating thresholds.

- **Objective 9.1:** Demonstrate the performance of the system to a predetermined operational level. (Completion of goal 1 implies completion of goal 9.)
  - Hypothesis: The level WRI inspection report is obtained 95 percent of the time. (Quantitative/Qualitative)

    The level WRI inspection report is delivered 95 percent of the time. Calculating the total number of trigger events and then comparing this number to the total number of SDM and level WRI inspection reports delivered to the end user tests this.

  - Hypothesis: The level WRI inspection report is on time 95 percent of the time. (Quantitative)

    The level WRI inspection report delivery time, as measured from the trigger event to the final delivery to the end user, will meet the latency requirements 95 percent of the time. This is to be tested by measuring the amount of time needed to pass between each sub-system interface and by then summing these times to estimate end-to-end mean latency and the associated standard deviation. It can then be estimated, with a certain level of confidence, if the mean latency is lower than required.

  - Hypothesis: The level WRI inspection report is complete and accurate 95 percent of the time. (Quantitative)

    The elements of the level WRI inspection report are consistently corroborated against observed data an average of 95 percent of the time. This is estimated by comparing SDM and level WRI inspection reports against manual inspections of individual vehicles during the pilot tests.

- **Objective 9.2:** Data transfer and use is secure, and network access is managed. (Completion of goal 1 implies completion of goal 9)
  - Hypothesis: The data will be encrypted or otherwise stripped of PII to limit exposure from unauthorized users. (Quantitative/Qualitative)

    The SDM data should be encrypted when it passes outside of secure systems and/or PII data should be removed for uses that do not require such information. Examples of this include post processing by traffic managers or infrastructure planning.

– Hypothesis: The network is securely managed to limit unauthorized access. (Quantitative/Qualitative)

  All network access must be securely monitored in order that PII, as well as proprietary carrier information, is protected. A list of authorized users of sensitive data should be developed to systematically control access to sensitive data.

– Hypothesis: The network will contain different levels of access authority. (Quantitative/Qualitative)

  All network access must be securely monitored and users will be given different levels of access authority. This can be evaluated by testing the amount of data that users at each level can see and/or have access to.

Goal 10: The Stakeholder/User Community supports further development of the WRI system.

- **Objective 10.1:** Stakeholders and WRI participants support implementation of the WRI system.
  - Hypothesis: Stakeholders and WRI participants support the implementation of the WRI system. (Qualitative)

    Stakeholders and WRI participants (service providers, sensor providers, CMV drivers, fleets, and enforcement/compliance personnel) think that the WRI system is shows enough promise to warrant further development. This will be qualitatively analyzed to determine if there is a majority consensus that the WRI system will provide for increased highway safety and operational efficiency. This consensus could be estimated through interviews with stakeholders and WRI participants in the pilot tests using questionnaires and/or conference calls.

  - Hypothesis: Stakeholders and WRI participants support that the technical aspects of the WRI system should be implemented. (Qualitative)

    Stakeholders and WRI participants (service providers, sensor providers, CMV drivers, fleets, and enforcement/compliance personnel) think that the WRI system's technical aspects show enough promise to continue development. This will be qualitatively analyzed to conclude if there is a majority consensus that the WRI system's technical aspects, such as the EOBR reader and user interfaces, will provide operational efficiency. This consensus could be estimated through interviews with stakeholders and WRI participants in the pilot tests.

  - Hypothesis: Stakeholders and survey participants involved with the WRI project believe that the system should be implemented due to the benefits to participants. (Qualitative)

Stakeholders and WRI participants (service providers, sensor providers, CMV drivers, fleets, and enforcement/compliance personnel) think that the WRI system shows enough promise to continue development due to the benefits to participants. This will be qualitatively analyzed to conclude if there is a majority consensus that the WRI system will provide benefits such as less time at inspection stations and positive inspection score rating benefits. This consensus could be estimated through interviews with stakeholders and WRI participants in the pilot tests.

6. WIRELESS ROADSIDE INSPECTION PILOT TEST EVALUATIONS

Sections 3.1-3.4 describe the actual deployment of the various communication pathways during the New York, Tennessee, and Kentucky pilot test. The quantitative evaluations of the three pilot test platforms and the GBOS are outlined in this section with actual test design and results are described in Sections 6.1-6.4. A summary of the basic data collected is shown in Table 6, with details discussed in the subsequent sections.

Table 6. Data collected in each pilot test.

	New York Platform	Tennessee Platform (Telematics Team 2)	Tennessee Platform (Telematics Team 3)	Kentucky Platform
Participating Carriers	0	1	1	2
Participating Vehicles	1	2	10	21
Drivers per Vehicle	1	1	1	1
Identity Messages Sent	0	0	0	29
SDMs Generated and Sent	2	213	607	26
SDMs Validated by GBO	0	213	277	26
Level WRI Inspection Reports Generated in Pilot (including post-processing)	0	199	204	26
Data Accuracy	N/A	80%	92%	100%
Mean Transaction Time (sec.)	1	46.1	35.8	43.3*
Level WRI Inspection Reports Received by state BOS	0	0	0	1

* Corrected for Unplanned Human Interaction Time not intended in experimental design.

An outline for section 6 is:

- 6.1 NEW YORK DSRC PILOT TEST
  - 6.1.1 Test Design
  - 6.1.2 Chronological Description of Work
  - 6.1.3 Data Collected
  - 6.1.4 Impact of the Test Environment
  - 6.1.5 Data Summary and Analysis
  - 6.1.6 Pre-Evaluation by Pilot Test Teams
  - 6.1.7 Observation and Assessment
- 6.2 TENNESSEE CMRS PILOT TEST
  - 6.2.1 Test Design
  - 6.2.2 Chronological Description of Work
  - 6.2.3 Data Collected
  - 6.2.4 Impact of the Test Environment
  - 6.2.5 Data Summary and Analysis
  - 6.2.6 Pre-Evaluation by Pilot Test Teams
  - 6.2.7 Observation and Assessment
- 6.3 KENTUCKY UNIVERSAL ID PILOT TEST
  - 6.3.1 Test Design
  - 6.3.2 Chronological Description of Work
  - 6.3.3 Data Collected
  - 6.3.4 Impact of the Test Environment
  - 6.3.5 Data Summary and Analysis
  - 6.3.6 Pre-Evaluation by Pilot Test Teams
  - 6.3.7 Observation and Assessment
- 6.4 GOVERNMENT BACK OFFICE PILOT TEST
  - 6.4.1 Test Design
  - 6.4.2 Chronological Description of Work
  - 6.4.3 Data Collected
  - 6.4.4 Impact of the Test Environment
  - 6.4.5 Data Summary and Analysis
  - 6.4.6 Pre-Evaluation by Pilot Test Teams
  - 6.4.7 Observation and Assessment

6.1 NEW YORK DSRC PILOT TEST

The New York DSRC pilot test is a sub-activity of a larger Commercial Vehicle Infrastructure Integration (CVII) program underway in New York State. This pilot test consisted of two tasks of the New York CVII program. Task 3 demonstrates the ability to verify driver credentials. Task 4 investigates the ability to transmit vehicle information to the roadside and state BOS.

6.1.1 Test Design

The initial test for Task 3, driver credential verification includes the following procedures:

- The driver credential verification service is configured
- The driver credentials are stored on a Smart Card and which requires a valid PIN code for access
- The state BOS delivers an invalid driver credentials status and disables the vehicle
- The state BOS delivers a valid driver credentials status and enables the vehicle

The primary research activity under Task 4 includes sending SDMs in real time and monitoring performance. To test the WRI Use Case, the following procedures were developed:

- The vehicle is moving, approaches an inspection site and enters within range of an RSE.
- The vehicle sends an SDM to the state BOS through a message management system (MMS).
- The MMS application receives and validates the SDM information.
- The MMS application forwards the SDM to New York State Commercial Vehicle Information Exchange Window (CVIEW) for compliance review and is archived for storage and further processing.
- The New York State CVIEW system checks the vehicle, driver and motor carrier data for compliance with state and Federal regulations.
- The New York State CVIEW system creates a safety and credential snapshot based on available data and sends it to the MMS application and optionally, the FMCSA/Volpe WRI system.
- The state BOS sends the status message to the vehicle through the RSE, indicating whether the vehicle may bypass or must enter the inspection station. If the vehicle must enter the inspection station, the reason for the failure will be provided (e.g. a driver, vehicle and/or carrier safety or credential violation).
- The vehicle receives and displays the message to the driver.
- The SDM and violation message can be displayed to the demonstration audience/enforcement community via a web interface.

6.1.1.1 Unique IDs

The New York DSRC application did not process data, but rather measured the ability to track transactions. As such, there were no unique identifiers to track the SDMs as they progressed from the onboard DMCU, to the RSE, to the state BOS simulator, and then back through the RSE to the vehicle.

6.1.1.2 Timestamps

Several timestamps were collected by three pieces of equipment in the DSRC pilot: the onboard DMCU, the RSE, and the state BOS simulator. These timestamps were collected at the interfaces of these system components, as shown in Figure 14 and described in Table 7.

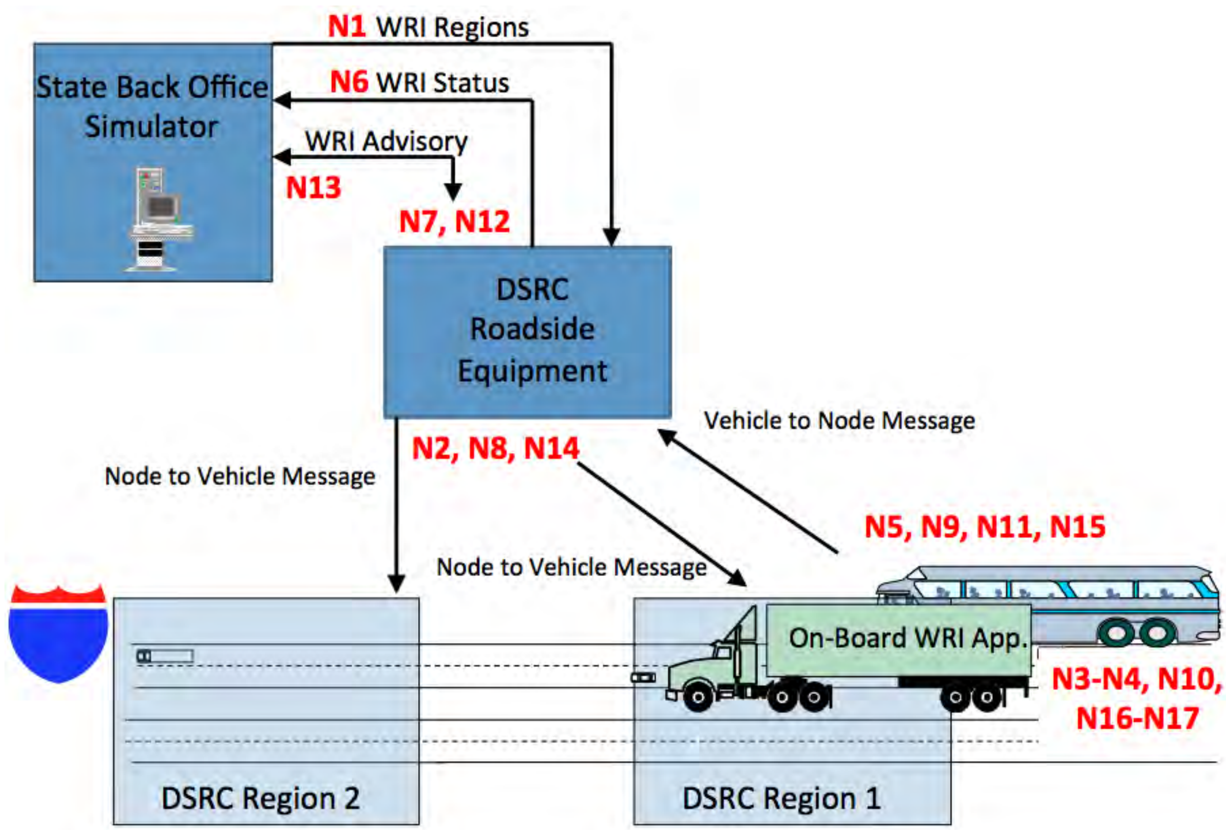


Figure 14. Diagram. Measured timestamps in deployed New York pilot test

Table 7. New York DSRC timestamps.

TSID	Location / Sub-Process Step	Interface of Timestamp	Group Generating Timestamp	Timestamp Application	Event Causing Data Collection
N1	State BOS simulator broadcasts regions	BOS simulator	BOS simulator	When BOS begins transmitting regions to RSE	Initial setup of DSRC regions
N2	RSE begins transmitting every 5 seconds	RSE	RSE	RSE begins transmitting regions	Every 5 seconds, BOS generates message to transmit regions
N3	DMCU registers regions	Vehicle	DMCU	The DMCU registered regions that were generated and begins transmitting	DMCU receives message that system is active
N4	DMCU determines it is in inspection region	Vehicle	DMCU	DMCU identifies it is in an inspection region	Vehicle enters DMCU inspection region
N5	DMCU sends SDM to RSE	Vehicle	DMCU	Send time of SDM from vehicle (DMCU) to RSE	DMCU finished compiling SDM and sends to RSE
N6	RSE sends SDM to BOS simulator	RSE	RSE	RSE sends SDM data	RSE receives data from DMCU and sends to BOS simulator
N7	BOS simulator sends WRI acknowledgement to RSE	BOS simulator	BOS simulator	BOS simulator sends SDM receipt acknowledgment to RSE	BOS simulator receives SDM
N8	RSE sends WRI acknowledgement to DMCU	RSE	RSE	RSE sends the WRI acknowledgement	RSE receives and passes the WRI acknowledgement to DMCU
N9	DMCU receives WRI acknowledgement	Vehicle	DMCU	DMCU receives acknowledgement	DMCU receives status acknowledgement message
N10	DMCU determines it is in an advisory region	Vehicle	DMCU	DMCU recognizes that it is in a DSRC region	Vehicle crosses into range (region) of an RSE
N11	DMCU sends advisory message request to RSE	Vehicle	DMCU	DMCU sends advisory request message to RSE	Advisory request sent from DMCU
N12	RSE transmits DMCU advisory request	RSE	RSE	RSE forwards request to BOS simulator	Advisory request sent from RSE to BOS simulator, after receiving the request from the DMCU
N13	BOS simulator sends WRI advisory (inspection pass or fail) to RSE	BOS simulator	BOS simulator	Advisory message is sent from the BOS simulator	When BOS simulator receives an advisory request from RSE, it sends an advisory back to the RSE

TSID	Location / Sub-Process Step	Interface of Timestamp	Group Generating Timestamp	Timestamp Application	Event Causing Data Collection
N14	RSE transmits WRI advisory message to DMCU	RSE	RSE	RSE sends the WRI advisory to the DMCU	RSE receives and forwards the WRI advisory message to the DMCU
N15	DMCU receives advisory message	Vehicle	DMCU	DMCU receives the WRI advisory message	DMCU receives WRI advisory message (pass or fail inspection)
N16	DMCU determines it is in inspection message display region	Vehicle	DMCU	DMCU recognizes that it is in a DSRC region	Vehicle crosses into range (region) of an RSE and a bypass/pull-in message is displayed
N17	DMCU exits display region	Vehicle	DMCU	DMCU recognizes that it has left the DSRC region	Vehicle leaves the range (region) of an RSE

6.1.1.3 Data requirements

The DSRC platform did not connect to the GBOS; therefore, all data were required to be developed by the DSRC pilot team. The required data included each of the timestamps shown in Table 7 for each inspection. The SDM dataset was also required from the platform. This is a notable difference from other platforms in the pilot tests, where SDM data were uploaded to the GBOS and then delivered to the UT evaluation team by Volpe.

6.1.1.4 Overview of Data Transfer

Data were collected in binary ASN.1c format, following CVII data protocol (SAE J2735). Data were decoded from ASN.1c by the New York DSRC team and delivered to the UT evaluation team in a Microsoft Excel format.

6.1.1.5 Operational Scenarios, Use Cases, and Evaluation Cases

Since this platform did not connect to the GBOS, it was difficult to evaluate any Use Cases directly; however, transactions between the roadside and state BOS can provide insight into potential system performance. Some Evaluation Cases were performed, specifically the state BOS to roadside to CMV communications as shown in Table 8.

Table 8. DSRC operational scenarios, use cases, and evaluation cases

Operational Scenario	Use Case	Evaluation Case Name	Successful DSRC Evaluation
6.1.1 Unstaffed automated safety enforcement, compliance, and assessment	1. WRI fixed-site data collection and assessment	001-02. SDM collection: Part 1 (Confirm CMV crosses SDM trigger point, SDM is collected, and SDM is compiled)	Yes. CMV performed these actions.
6.1.2. Screening support		001-03. SDM Collection: Part 2 (Confirm SDM is transmitted)	Yes. CMV sent SDM to state BOS
		001-14. Confirm bypass/pull-in result is transmitted	Yes. BOS, RSE transmit inspection status
		001-15. Confirm receipt of bypass/pull-in result	YES. DMCU receives inspection status

6.1.2 Chronological Description of the Work

The acceptance tests for Tasks 3 and 4 were executed on Oct 13, 2010 and included several activities. For task 3, driver credential verification, the New York development team conducted the following tests successfully:

- Driver Credentials Validation Service
- Driver Credential Verification
- Invalid Driver Credentials Status Response
- Valid Driver Credentials Status Response

Similarly, the New York team conducted a moving WRI inspection between the CMV's DMCU, the RSE, and the simulated BOS. That test included two highway-speed tests, one with a "passed" inspection and one with a "failed" inspection.

6.1.2.1 Log of test-related incidents/problems

The primary challenge faced while evaluating this platform was the inability of the system to connect the simulated state BOS with the Federal GBOS, thus negating the possibility of a true Level WRI Inspection.

6.1.3 Data Collected

Data collected includes raw XML data from the components of the system. The following XML data tables were provided:

- DMCU data table

- RSE V2N data table
- RSE N2V data table
- State BOS simulation table
- WRI regions table
- WRI status table
- WRI advisory request table
- WRI advisory status table

A log file included important time stamp information from each of the test components (DMCU, RSE, and BOS simulator). The time stamp-generating clocks in each of the components were not synchronized, therefore the ability to measure latencies between subsystems was not possible; however, the unsynchronized times were irrelevant for the measurements of the end-to-end transaction times (DMCU→RSE→BOS→RSE→DMCU), which was less than one second (the resolution of the data).

The data included in the SDM data are shown in Table 9. For the sake of this test, many of these data were artificially populated in the SDM.

Table 9. SDM data collected in DSRC pilot.

Tractor VIN
Tractor tire location, pressure, and temperature
Tractor brake stroke, lining, and Antilock Braking System (ABS) status
Seatbelt status
Light status
Tractor axle weight
Trailer position
Trailer VIN
Trailer tire location, pressure, and temperature
Trailer brake stroke, lining, and ABS status
Trailer axle weight
Driver license number and state
Driver license issue and expiration date
Driver name, date of birth, and address
Vehicle position

Two tests were conducted, one with all systems functioning to demonstrate a *passed* inspection, and one with a simulated light failure, to demonstrate a *failed* inspection. The passed inspection resulted in a bypass message being sent to the driver, and the failed inspection resulted in a pull-in message being delivered to the driver.

6.1.4 Impact of the Test Environment

This platform did not produce a large sample size of data or an experience representative of a full pilot test. Since the sample was limited to two observations, the amount of confidence in conclusions that can be established related to performance and reliability of such a system is limited. Nonetheless, the demonstration did produce two partial inspections that reveal impressive results. It took less than one-second to trigger an inspection, deliver an SDM from the vehicle to the state BOS, and then return an advisory message (pass/fail) back to the vehicle.

Another challenge with this platform is that it did not establish a connection with the GBOS. The connection with the state BOS simulator was developed, but the important connection with the GBOS, illustrated in Figure 2 as interface 1 and 7, was not established. The primary reason for this is the significantly different data formats and processing requirements needed to convert the messages across data formats. More development in this area could potentially solve this problem, but would likely change the performance of the system, relative to this pilot test. Since this test was a carefully controlled experiment with limited data collection, it is difficult extrapolate the effect of a more realistic hardware and software environment on performance. While it is possible to use the experiences and performance from the other platforms and apply them to the New York pilot test, it is difficult to draw any reliable conclusions since the New York platform data formats require significant reformatting in order to be compatible with the required GBOS data requirements.

6.1.5 Data Summary and Analysis

6.1.5.1 Test Statistics

There were two inspections from one CMV for this platform. One driver participated but the inspection did not include driver-specific information. Each inspection involved four message transactions with a maximum package size of 1236 bytes:

1. Broadcasting WRI regions (135 bytes)
2. Requesting and sending SDM (1236 bytes)
3. Sending the inspection (advisory) request (69 bytes)
4. Sending inspection report status (185 bytes for success/199 bytes for failure)

6.1.5.2 Message Accuracy

The nature of this test did not allow for the analysis of message accuracy. The data that were developed on the DMCU were successfully sent from the CMV to the BOS to accurately simulate data transfer, and those data were consistently delivered throughout the test.

6.1.5.3 Message Latency

All transmission and processing times during the inspection took less than one second; however, the resolution of the data did not allow the UT evaluation team to estimate precise transmission times. The test plan developed and used two RSE regions to demonstrate the ability of the DSRC application to send the SDM to the BOS simulator from one RSE region and receive the advisory message (inspection report) in a downstream RSE region. In this test, there were three main transactions:

1. The BOS simulator broadcast WRI regions to the roadside. This event took less than one second in both experiments. (N3-N1).
2. The SDM was sent from the CMV to the BOS and the acknowledgement returned to the CMV. This event took less than one second in both experiments. (N9-N5).
3. The WRI advisory message was requested by the CMV and inspection status returned from the BOS to the CMV. This event took less than one second in both experiments. (N15-N11).

Intermediate process latency is related to the distance between RSE regions and the time required for the CMV to traverse that distance (the time between transactions 1 and 2, as identified in the numbered list above). This value can be modified with the spacing or operating rules of the RSE. For example: RSEs can be spaced close together, or multiple messages can be transmitted while the CMV is in the same RSE region. In the case of this experiment, the time between the WRI region being transmitted (1) and the CMV recognizing it is in an RSE region (2) was three seconds in both experiments. The time between the WRI SDM transaction (2) and the advisory being requested (3) was 40 to 41 seconds in the experiments. Again, this latency is related to the design of the experiment (spacing of the RSEs), not limitations of the technology. Finally, the time needed to display the bypass/pull-in message was 13 seconds, after the inspection was completed (3) again, based on the spacing of the regions. Finally, in both experiments, the time to exit the message display region was 40 seconds, after entry into the region.

6.1.6 Pre-Evaluation by Pilot Test Teams

6.1.6.1 Qualitative Analysis

There were no stakeholder interviews related to the New York DSRC. None of the traditionally defined carrier or enforcement stakeholders were involved in this pilot test.

6.1.7 Observations and Assessment

6.1.7.1 WRI System Functionality

The New York platform was successful in achieving some of its goals and had an average SDM creation time of approximately 40 seconds (which was defined by the test procedure); however, this platform was unable to communicate with the GBOS or to generate a Level WRI Inspection Report and law enforcement were unable to view the CMV inspection results on the GBOS interface. The New York Platform did not demonstrate the ability to self-test.

6.1.7.2 WRI System Performance

The New York DSRC platform had meaningful data for the WRI Pilot Test to demonstrate the DSRC technology. Overall, these data were accurately transmitted. The New York platform did not lose any data and there were no steps in this platform that appeared to be problematic, in the context of this limited test. The message transmission and processing times were impressive, less than one second. There were no errors with the data; however, this platform did not communicate with the GBOS and did not generate any Level WRI Inspection Reports.

6.1.7.3 Lessons Learned

The New York Platform demonstrated vehicle-to-state BOS communication. While there were neither problems, nor errors, this platform did not operate with the same assumptions as expected at the beginning of the pilot tests, specifically in the realm of connecting with the GBOS. The New York platform did not connect to the GBOS, no Carriers were involved, and no law enforcement personnel were involved, thus, many of the objectives of the pilot test cannot be fully evaluated. Among the primary challenges is the ability to automatically convert inspection messages from DSRC's SAE J2735 message format to a XML format compatible with GBOS data input requirements. Regardless, DSRC shows promising results and further testing could reveal if this primary challenge can be overcome.

6.2 **TENNES**SEE CMRS PILOT TEST

6.2.1 Test Design

6.2.1.1 Unique IDs

Unique IDs were developed by the Tennessee platform to populate the encounter ID field at the onset of each inspection. For the purpose of the evaluation, the encounter ID did not change as it carried through the entirety of the data collection and transfer. It was included in the SDM as well.

The assigned values for the CMRS platform telematics providers are:

- Telematics team 1: 30000000 to 39999999
- Telematics team 2: 10000000 to 19999999
- Telematics team 3: 50000000 to 59999999

6.2.1.2 Timestamps

CMRS timestamps that were collected are shown in Figure 15 for telematics team 2 and in Figure 16 for telematics team 3. Telematics team 1 did not successfully submit timestamps or an SDM. Descriptions for the timestamps are provided in Table 10. Timestamps were to be collected at each process or transaction beginning with the activation of the geopoint. In practice, only a subset of timestamps was collected due to technology limitations or changes in the manner in which the pilot test was executed. The timestamps that were not collected are shaded grey in Table 10.

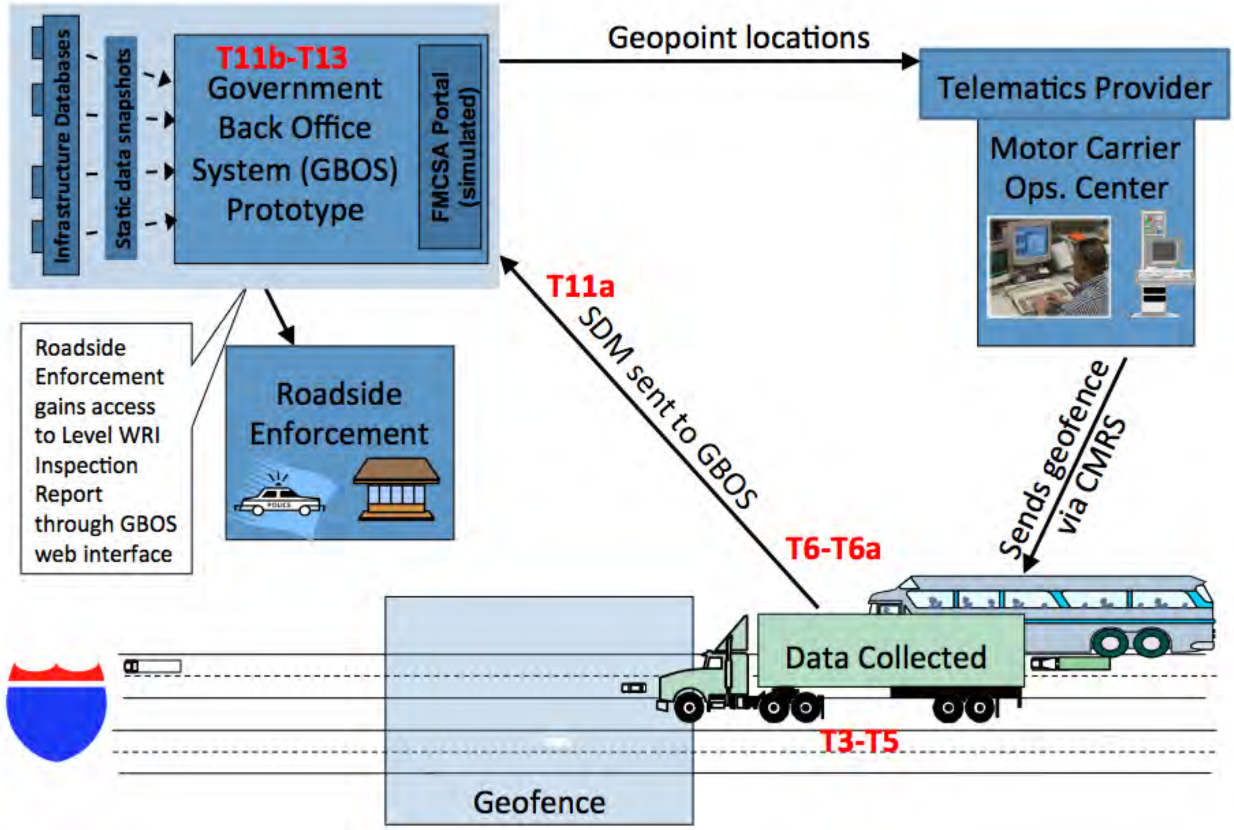


Figure 15. Diagram. Measured timestamps in deployed Tennessee pilot. telematics team 2.

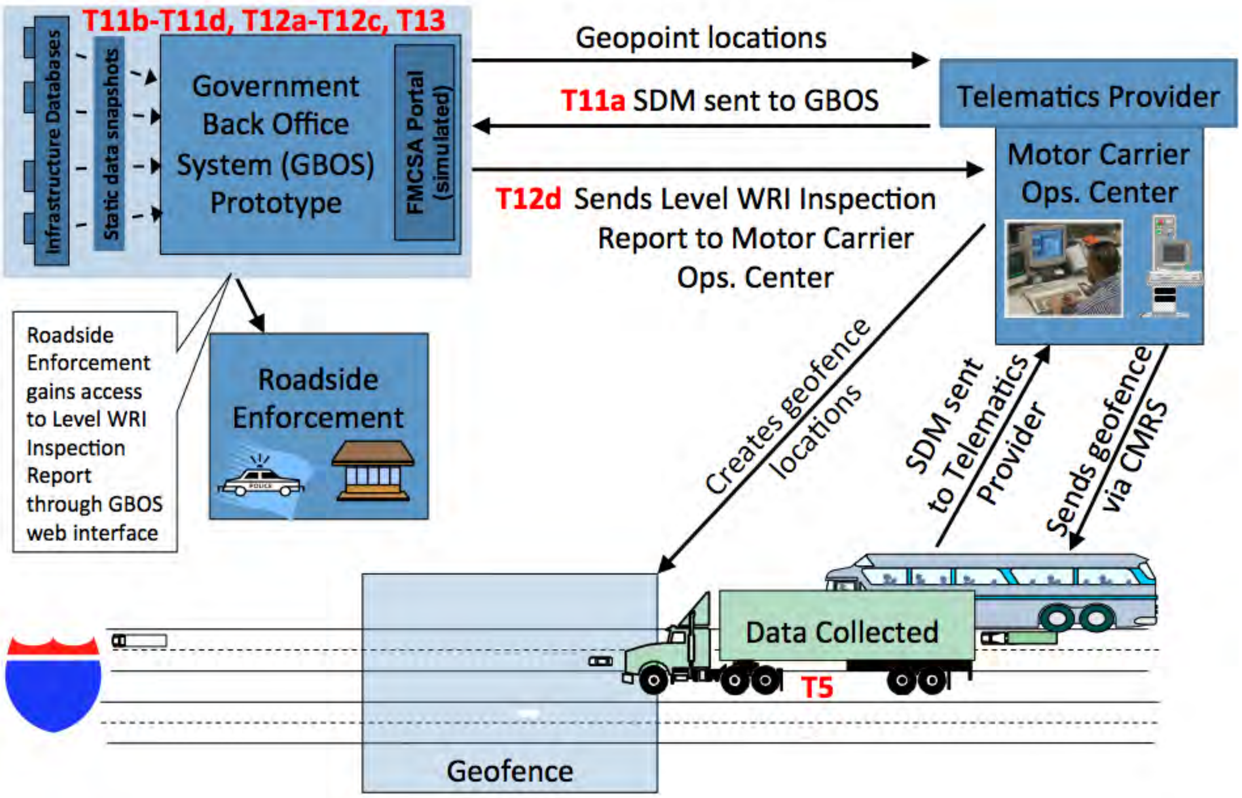


Figure 16. Diagram. Measured timestamps in deployed Tennessee pilot telematics team 3.

Volpe collected several timestamps that added resolution relative to the original evaluation framework. The timestamps are represented in Table 10 by sub-event timestamps and a TSID followed by a letter (e.g. TSID T11a).

Data not collected are shaded grey. TSID T2 was not collected. TSID T11 and T12 were not directly provided by Volpe, but instead provided using several different alternate timestamps. TSID T14 and T15 were not collected due to the fact that there was no roadside enforcement to whom to send the level WRI inspection. Instead, roadside enforcement accessed the GBOS interface.

Table 10. UT evaluation team data collection requirements–Tennessee platform.

TSID	Location / Sub-Process Step	Interface of Timestamp	Group Generating Timestamp	Unique ID Assignment/Pass-through	Timestamp Application	Event Causing Data Collection
T2	Geopoint activation	Telematics provider	Telematics provider	ID associated with specific geopoint passed through	When geopoint is activated / logged by the telematics provider	Telematics provider push geopoint locations to CMV onboard computers
T3	Trigger event	Telematics provider	Telematics provider	This geopoint/vehicle trigger event shall have its own unique ID assigned in the SDM	The vehicle receives message indicating the SDM collection service is available (the vehicle is in range of the geofence to activate)	Vehicle crosses the boundary of the geofence created by the geopoint, and the vehicle is queried
T5	Completion of SDM	Vehicle	Telematics provider	The ID established in #3 above shall be passed through	End SDM compilation	End of data collection on the vehicle
T6	Transmission of SDM	Vehicle	Telematics provider	The ID established in #3 above shall be passed through	Transmission of the SDM	Transmission of SDM from vehicle to telematics provider
T6a	Connection terminated	Vehicle	Telematics provider	The ID established in #3 above shall be passed through	Vehicle communication link is terminated	Communication to Volpe has terminated
T11	Reception of SDM	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At reception of SDM from telematics provider	Reception of appended SDM at Volpe from telematics provider
T11a	SDM is received by internal app server	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At reception of SDM at internal app server	Reception of SDM at internal app server
T11b	SDM is sent for validation	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM is sent for validation	SDM sent for validation
T11c	SDM has finished validation	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM finishes validation	SDM finishes validation
T11d	SDM saved into the database	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM is saved into the database	SDM is saved into the database

TSID	Location / Sub-Process Step	Interface of Timestamp	Group Generating Timestamp	Unique ID Assignment/Pass-through	Timestamp Application	Event Causing Data Collection
T12	Compilation of level WRI inspection report	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At the beginning of the compilation of the WRI inspection report	Beginning of compilation of WRI inspection report by Federal BOS
T12a	SDM sent for safety compliance evaluation	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM is sent for safety compliance evaluation	SDM is sent for safety compliance evaluation
T12b	SDM has finished safety compliance evaluation	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM has finished safety compliance evaluation	SDM finished safety compliance evaluation
T12c	SDM has been sent to the report generation	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM has been sent to report generation	SDM is sent to report generation
T12d	Acknowledge-ment message sent to the sender of the (SDM) message	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	SDM has been sent to sender	SDM sent to sender
T13	Completion of level WRI inspection report	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At completion of WRI inspection report compilation	Completion of WRI inspection report compilation
T14	Transmission of level WRI report to roadside enforcement and the motor carrier (MC) from Federal GBOS	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At transmission of level WRI report from Federal GBOS to roadside enforcement, MC, and UT evaluation team	Inspection report sent to TN roadside enforcement, MC, and the UT evaluation team

TSID	Location / Sub-Process Step	Interface of Timestamp	Group Generating Timestamp	Unique ID Assignment/Pass-through	Timestamp Application	Event Causing Data Collection
T15	Transmission of the pull-in bypass signal	Federal GBOS	Volpe	The ID established in #3 above shall be passed through	At transmission of pull-in bypass signal from Federal GBOS to vehicle	Vehicle has a violation significant enough in the level WRI inspection report to warrant a bypass pull-in signal to be sent

Note: shaded grey rows are proposed TSIDs that were not collected

6.2.1.3 Data Requirements

To conduct the quantitative analysis of the data quality and transaction latency, log files were required from all entities involved in the generating and/or processing of data. These log files, which originated at the telematics provider and the GBOS, document the times of data transmission from sub-process to sub-process. Moreover, since the data were transferred from one entity to another (telematics provider to the GBOS), the clocks generating the timestamps required synchronization to NIST at regular intervals (this was not actually done telematics provider 2). This requirement allowed for all log files with timestamps to be compared across a common time. Additionally, final SDM information was required for consistency and validation. Additionally, each element of the log files for all platforms required a traceable encounter ID number.

Each telematics provider generated data in different ways. As such, the data generation protocol varied, with some vehicles generating and sending data directly from the vehicle (telematics team 2), and others generating and sending data from the telematics provider back office (telematics team 3).

6.2.1.4 Overview of Data Transfer

The main elements of data transferred from the CMRS platform included log files from telematics teams 2 and 3; each having had different methods for collecting and storing data. Telematics team 2 collected and stored all data on onboard computers in each vehicle. As such, it was necessary for the team 2 log files to be manually downloaded from the vehicles. During the evaluation period, these log files were physically downloaded (approximately monthly) from the vehicles at the terminal. Telematics team 3 collected and stored log data at the telematics provider back office and sent the logs via e-mail twice during the two-week test period. Telematics team 1 did not send any log files.

The SDM data from the CMRS platform were gathered and processed by the GBOS. An overview of the CMRS data transfer protocol is described later in section 6.4.1.6.

6.2.1.5 Validating and Corroborating WRI Data

The SDM data were validated through a number of data checks. A focus was placed on identifying whether or not data elements fell within reasonable value ranges and if the data set included duplicates (duplicate encounter IDs or multiple inspections of the same vehicle at the same geopoint). The validation checks included in the CMRS data are as follows:

- All general validation and corroboration checks presented in Section 4.1.1.
- No data were collected or validation conducted for telematics team 1.
- Telematics team 2:
  - At the vehicle log file level:
    - A single vehicle triggered a single geopoint multiple times.
    - A single geopoint triggered two different, overlapping geopoints (at Knox County, TN, station).

        - A fleet-assigned vehicle number was tracked to correlate errors to specific vehicles.
        - Due to an error in development by telematics team 2, the clocks on the EOBRs were offset by an hour. The UT evaluation team corrected for this.
        - Due to an error in development by telematics team 2, the clocks on the EOBRs were not synchronized to NIST time, and subsequently time drift occurred over the course of the pilot test. The UT evaluation team corrected for this.
        - The UT evaluation team used a four-timestamp system–T1, T2, T3, and T4– and flagged any inspection that used one of the timestamps more than once.
        - A CMV was flagged whenever it generated two inspections within 60 seconds at the same geopoint.
        - A CMV was flagged whenever it triggered two inspections within 120 seconds at two different geopoints.
    - At the SDM Level:
        - Correct carrier name was checked.
        - An error in development with telematics team 2 caused an error to be generated with the EOBR registering the driver as unknown, which was an indicator for incomplete starting/stopping of the inspection process, when trucks were moved within a geofence. The UT evaluation team corrected for this and removed unknown drivers from the dataset.
- Telematics team 3:
    - At the vehicle log level:
        - Due to an error in development, the UT evaluation team did not receive adequate information to complete vehicle logs. Due to this error, no latency times were obtained prior to the reception of the SDM at the GBOS.
    - At the SDM Level:
        - Correct carrier name was checked.
        - Due to the nature of the development of telematics team 3, this platform operated, not by an entrance trigger into a geopoint, but instead by a timed trigger. Each vehicle was inspected approximately every 10 minutes while within the geofence.

Both timestamp and SDM data were corroborated by the manual inspections of several CMVs between January 18–21, 2011. The telematics team 2 tests consisted of having a driver log in, drive the CMV several miles, park, and then trigger a WRI self-test (done using an onboard device using its touch-screen capabilities). Simultaneously, ORNL obtained odometer information from the vehicle dashboard; and immediately after running the self-test, pictures were taken from the EOBR hours of service (HOS) screen. The SDMs generated in this way were obtained later from the Volpe, and the information included in the message was checked against the information collected in the field. Both vehicle and driver information were correctly included in the SDMs for each of the CMVs tested. With regards to the HOS, the information included in the SDM was, on average, nine minutes and five seconds shorter than HOS information provided by the EOBR.

The ORNL and UT evaluation teams used a different procedure to corroborate the SDM information for telematics team 3. ORNL requested that all ten of the participating CMVs stop at the Knox County, TN, westbound inspection station on January 21, 2011, to have a Level 3 inspection conducted on the vehicles/drivers by THP officers. Nine of the ten participating CMVs stopped at the inspection station and received a Level 3 inspection. At this time, ORNL took pictures of the EOBR showing the HOS information. The evaluation teams also requested the SDMs for January 21, 2011 from Volpe and compared the information included in those messages to the information collected at the Knox County inspection station on that date. The vehicle ID information and driver name were correctly included in the SDMs. With respect to the HOS, the information included in the SDM was, on average, 2 hours, 29 minutes, and 50 seconds behind the information provided by the EOBR.

6.2.1.6 Qualitative Analysis

In order to assess aspects of the WRI system from the stakeholder perspective, the UT evaluation team carefully examined whether the high-level project goals were met during the CMRS WRI pilot tests by posing a series of open-ended questions to the participating CMRS stakeholders. These questions were based on the goals, hypotheses, and objectives of the WRI project as stated in section 2 of the WRI Evaluation Plan.(9)

The groups interviewed during this process included law enforcement personnel from the THP (eight interviews of six THP officers and two THP IT staff members), representatives from the participating fleets (three interviews of eight representatives, representing three fleets), telematics and sensor providers (five interviews with eleven individuals, representing five companies). These participating CMRS stakeholders were interviewed by telephone during November and December, 2010.

The UT evaluation team worked closely with members of the ORNL team to recruit stakeholders who participated in the pilot tests.

6.2.1.7 Planned Procedures to Evaluate Use Cases and Goals

The following planned procedures of the evaluation are derived from the goals, objectives, and hypotheses outlined in section 5. The format of the *procedure* numbering system is the *objective* number and order of the corresponding *hypothesis*. For example, procedure 1.1-A corresponds to the first hypothesis from objective 1.1. Procedure 1.1-B corresponds to the second hypothesis from objective 1.1 etc.

- Goal 1, Objective 1.1, Hypothesis: The level WRI inspection report is obtained 95 percent of the time.

  Procedure 1.1-A: Tennessee platform obtained PrePass records to the extent possible to corroborate a sample of SDM triggers for geopoints associated with an inspection station.

Tennessee platform use a representative sample of CMVs to initiate a number of self-tests by parked CMVs to start a WRI inspection.

UT evaluation team measured the number of SDMs that were sent to the Federal GBOS based on the timestamp attributes delivered by the CMRS platform and the SDMs submitted by Volpe to the UT evaluation team.

UT evaluation team measured the total number of level WRI inspection reports that were sent to the Tennessee GBOS based on the timestamp attributes delivered by Volpe.

- Goal 1, Objective 1.1, Hypothesis: The level WRI inspection report is on time 95 percent of the time.

  Procedure 1.1-B: Timestamp generating computers were synchronized to NIST and placed in the EST time zone by the CMRS platform where possible

  Timestamps of events involved between each system and sub-system were collected, as outlined in the quantitative data collection requirements document, in a separate comma-delimited file, free of PII.

  Volpe delivered all SDMs to the UT database.

  Volpe delivered all level WRI inspection reports to the UT database.

  The distance of the geopoint from the inspection station to ensure the WRI inspection report is available to enforcement personnel by the time the vehicle arrives will be determined by ORNL.

  Latency issues associated with submission of an SDM and receipt of the bypass/pull-in message was examined via available timestamps.

- Goal 1, Objective 1.1, Hypothesis: The level WRI inspection report is accurate 95 percent of the time.

  Procedure 1.1-C: Tennessee platform manually confirmed accuracy of CMRS equipment.

  All SDMs were delivered to the UT database by the CMRS platform through Volpe.

  Volpe delivered all level WRI inspection reports to the UT database.

  The UT evaluation team corroborated SDMs and WRI inspection reports for specific inspection events.

  Each of the vehicles (with one exception) that deliver a level WRI inspection report were manually inspected by the CMRS platform at least once, and the resulting NAS level III inspection reports were be transmitted to UT.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.1 (unstaffed automated safety enforcement, compliance, and assessment) can be performed by at least one of the technology options.

  Procedure 1.2-A: An SDM was triggered at an unstaffed location by the CMRS platform and submitted to the Federal GBOS for subsequent safety and compliance checks.

  Federal GBOS developed a level WRI inspection report.

  A level WRI inspection report was delivered to the UT database from Volpe.

- Goal 1. Objective 1.2. Hypothesis: Operational scenario 6.1.2 (screening support) can be performed by at least one of the technology options.

  Procedure 1.2-B: The UT evaluation team manually verified successful identification of CMVs (matching of SDM data to the geopoint crossing information provided by the specified telematics service providers).

  Volpe sent WRI inspection report to Tennessee roadside enforcement, meeting latency requirements.

  Tennessee platform verified receipt of Federal BOS message

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.3 (traditional inspection support) can be performed by at least one of the technology options.

  Procedure 1.2-C: The UT evaluation team qualitatively verified from the CMRS platform that a level WRI inspection report (through GUI) is accessible by mobile devices and data are in a format that can be integrated into existing or future handheld inspection support devices.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.5 (routine safety analysis or special study) can be performed by at least one of the technology options.

  Procedure 1.2-E: Motor carriers and other parties verified access to level WRI inspection reports and log files from Federal GBOS archives held by Volpe.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.6 (carrier use of SDM) can be performed by at least one of the technology options.

  Procedure 1.2-F: Refer to procedure 1.2-E.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.7 (use of SDM in transportation planning and management) can be performed by at least one of the technology options.

  Procedure 1.2-G: Refer to procedure 1.2-E.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.8 (managing the WRI network) can be performed by at least one of the technology options.

  Procedure 1.2-H: Qualitative analysis of the CMRS platform by the UT evaluation team was used to test this hypothesis.

- Goal 1, Objective 1.2, Hypothesis: A CMV safety alert can be used in the e-screening process to flag a vehicle for inspection.

  Procedure 1.2-I: Refer to procedure 1.2-B.

- Goal 1, Objective 1.2, Hypothesis: Enforcement officers can access data well after WRI assessment results are returned.

  Procedure 1.2-J: Refer to procedure 1.2-E.

- Goal 1, Objective 1.2, Hypothesis: All interventions can be carried out after WRI assessment results are returned.

  Procedure 1.2-K: Refer to procedure 1.2-E.

- Goal 8, Objective 8.1, Hypothesis: Current capacity exceeds resource demands for the pilot test.

  Procedure 8.1-A: Tennessee platform logged capacity-related errors or system failures.

  Tennessee platform logged total inspection requests initiated.

- Goal 8, Objective 8.2, Hypothesis: Unplanned downtime less than 5 percent of the planned system up time.

  Procedure 8.2-A: Tennessee (and GBOS) platform self-report on the planned up time and downtime of the CMRS system.

  Tennessee platform logged unplanned downtime to the extent possible.

- Goal 8, Objective 8.4, Hypothesis: All data formats are non-proprietary and technology may be proprietary.

  Procedure 8.4-A: Tennessee platform disclosed data formats and technology used.

- Goal 9, Objective 9.1, Hypothesis: The level WRI inspection report is obtained 95 percent of the time.

  Procedure 9.1-A: Quantitative results from procedure 1.1-A were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.1, Hypothesis: Level WRI inspection report is on time 95 percent of the time.

  Procedure 9.1-B: Quantitative results from procedure 1.1-B were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.1, Hypothesis: Level WRI inspection report is complete and accurate 95 percent of the time.

  Procedure 9.1-C: Quantitative results from procedure 1.1-C were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.2, Hypothesis: Data will be encrypted or otherwise stripped of PII to limit exposure from unauthorized users.

  Procedure 9.2-A: Tennessee platform documented data security measures of CMRS system data flows.

  The UT OIT and the Volpe recorded any breaches in data security flows or flows of information that took place during the test with the UT evaluation team.

- Goal 9, Objective 9.2, Hypothesis: Network is securely managed to limit unauthorized access.

  Procedure 9.2-B: Refer to procedure 9.2-A.

- Goal 10, Objective 10.1, Hypothesis: Stakeholder and WRI participants support implementation of the WRI system.

  Procedure 10.1-A: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

- Goal 10, Objective 10.1, Hypothesis: Stakeholders and WRI participants support that the technical aspects of the WRI system should be implemented.

  Procedure 10.1-B: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

- Goal 10, Objective 10.1, Hypothesis: Stakeholders and survey participants involved with the WRI project believe that the system should be implemented due to the benefits to participants.

  Procedure 10.1-C: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

6.2.1.8 Operational Scenarios, Use Cases, and Evaluation Cases

Goal 1, objective 1.2 proposes a series of Operational Scenarios that were to be evaluated in the CMRS platform. These Operational Scenarios can be divided into the series of Use Cases and Evaluation Cases presented in Table 11. The Evaluation Cases are the most disaggregate level of analysis that can be performed. Combining independent Evaluation Cases can assist in evaluating Use Cases and Operational Scenarios that might not otherwise have been fully developed in the pilot test. The proposed Evaluation Cases are listed, as well as whether or not the pilot test (as deployed) was successful in generating data to support these Evaluation Cases.

Table 11. CMRS operational scenarios, use cases, and evaluation cases.

Operational Scenario	Use Case	Evaluation Case Name	Proposed CMRS Evaluation	Successful CMRS Evaluation
6.1.1 Unstaffed automated safety enforcement, compliance, and assessment	1. WRI fixed-site data collection and assessment	001-02. SDM collection: Part 1 (Confirm CMV crosses SDM trigger point, SDM is collected, and SDM is compiled).	Could be tested by using preclearance technology records to determine when test vehicles crossed trigger points (as yet untested methodology), and possibly short-term controlled tests. Need to rely upon validating that an inspection should have been received via direct interaction.	Yes. CMV performed these actions for telematics teams 2 and 3.
		001-03. SDM Collection: Part 2 (Confirm SDM is transmitted).	Part of basic operation of private side of WRI system.	Yes. CMV sent SDM to GBOS for telematics teams 2 and 3.
		001-04. WRI assessment processing and report generation: Part 1 (Confirm receipt of SDM).	(see above)	Yes. GBOS received SDM from CMV for telematics teams 2 and 3.
		001-05. WRI assessment processing and report generation: Part 2 (Validate structure and format of message set received).	Part of basic operation of WRI system (private/GBOS interface).	Yes. GBOS validates basic structure and format of SDM for all data at GBOS.
		001-06. WRI assessment processing and report generation: Part 3 (Validate message set data).	(see above) Real-time corroboration of the data (traditional inspection reports) will be necessary.	Yes. Telematics teams 2 (14 observations) and 3 (9 observations) had live corroboration of data.
		001-08. WRI assessment processing and report generation: Part 5 (Assess compliance and safety status).	Part of basic GBOS WRI operation.	Partial. Telematics team 2 and 3 required post-processing, both accomplished this task less than percent of the time. See discussion on validation errors and post processing in section 6.2.4

Operational Scenario	Use Case	Evaluation Case Name	Proposed CMRS Evaluation	Successful CMRS Evaluation
		001-10. Confirm storage of WRI data and level WRI inspection reports in back office database.	Part of basic GBOS WRI operation.	Yes. GBOS stored appropriate data.
6.1.2. Screening support		001-11. Confirm database access and interface receives WRI results (Level WRI inspection report, safety alert, SDM) and/or WRI data.	(see above)	Yes. FMCSA portal receives and dispenses access to appropriate parties.
		001-12. Confirm real-time enforcement support and interface receive WRI results and/or WRI data.	Could be tested by enforcement users (at inspection station associated with a given SDM); note that it is assumed that any required logging would be done by the GBOS. Inspections are displayed on the Volpe portal.	Partial. Not tested in evaluation.
		001-14. Confirm bypass/pull-in result is transmitted.	Possible through partnership with telematics provider 2.	No
		001-15. Confirm receipt of bypass/pull-in result.	(see above)	No
6.1.3 Traditional inspection support	1A. WRI fixed-site data collection and assessment, local assessment processing	001A-01. WRI assessment processing and report generation: Confirm state GBOS can complete Evaluation Cases 001-04 through 001-09.	Part of basic GBOS WRI operation (Volpe function not requiring any CMRS-specific testing).	Yes. Basic function of GBOS.
		001A-02. Confirm WRI data and results are sent to state GBOS and can be viewed.	Various enforcement uses will be tested to the extent they are supported by the GBOS and possible with CMRS technology.	Partial. No state Government BOS, but visible with The GBOS user interface.
6.1.4. Mobile safety check	2. WRI Mobile enforcement data collection and assessment	002-05. Confirm WRI results are accessible to mobile enforcement staff/systems.	Can be tested	Partial. No mobile enforcement staff/systems, but could be accessed via The GBOS user interface.

Operational Scenario	Use Case	Evaluation Case Name	Proposed CMRS Evaluation	Successful CMRS Evaluation
		002-06. Confirm local enforcement protocols can be implemented by mobile enforcement staff/systems.	(see above)	No
6.1.5. Routine safety analysis or special study	3. Post-processing analysis of WRI data and results	003-01. Verify transfer of data analysis of WRI results from roadside enforcement staff/systems.	These Evaluation Cases refer to GBOS access issues and do not require any additional CMRS testing.	Yes. This use case and operational scenario is possible, though not explicitly tested. Existence and accessibility of WRI data and log files from CMV and GBOS show this can be done.
		003-02. Verify transfer of data analysis of WRI results from analysts (Government).	(see above)	Yes. See above.
		003-03 Verify transfer of data analysis of WRI results from analysts (private).	(see above)	Yes See above.
		003-03. Verify transfer of data analysis of WRI results from MC/coach.	(see above)	Yes. See above.
6.1.7. Use of SDM in transport planning and management		003.04. Verify transfer of data analysis of WRI results from GBOS.	(see above)	Yes. See above.
6.1.8. Managing the WRI network	5. Management of the WRI network	005-01. Confirm management of the WRI system configuration.	Part of basic GBOS WRI operation. ORNL and telematics providers managed geopoint location log and geofence boundaries, adjusting them as needed.	Indirectly. See GBOS event log. ORNL modified geopoint locations and telematics providers constructed and maintained geofence regions.

Operational Scenario	Use Case	Evaluation Case Name	Proposed CMRS Evaluation	Successful CMRS Evaluation
		005-02. Confirm provisioning and configuring of fixed WRI system.	(see above)	Indirectly. See above.
		005-03. Confirm detection, isolation, and correction of WRI infrastructure and service problems.	(see above)	Yes. See GBOS event log.
		005-04. Confirm monitoring of WRI system and subsystem performance.	INDIRECTLY — (see above)	Yes. See GBOS event log.
-	6. Dropped	Use case deleted, no Evaluation Cases.		
6.1.6. Carrier use of SDM	7. WRI system self-test by MC/coach	007-01. Confirm carrier receives SDM from GBOS (if subscription exists).	Tested to the extent supported by the BOS prototype and the participating telematics providers.	No
6.1.8. Managing the WRI network	8. WRI system self-test by roadside or mobile enforcement	008-01. Confirm enforcement submits SDM in training mode and data submitted to GBOS is tagged as training data and kept separate from "real" data.	Tested for fixed roadside enforcement to the extent supported by the BOS prototype. CMRS does not support dynamic geofencing. Testing forms of this scenario in addition to the fixed roadside self-test scenario can collect no new information.	Yes. GBOS shows status of data submitted. Only accomplished by telematics team 2.

6.2.2 Chronological Description of the Work

The CMRS platform pilot test was developed in coordination with the telematics providers, fleets, the Volpe team, and the ORNL team. Earnest development work started in early 2009 and continued throughout 2010. Telematics team 2 began submitting production-level data on October 15, 2010. Telematics team 3 began submitting production-level data on December 21, 2010. The end of the data collection period was January 31, 2011. Additional description of specific test-related activities can be found in the ORNL CMRS platform report [10].

6.2.3 Data Collected

6.2.3.1 Telematics Team 1

- No data were collected.

6.2.3.2 Telematics Team 2

- Vehicle data:
  - Vehicle log files from 10-14-2010 through 01-31-2011 (.csv format)

Vehicle log files are vital for determining the latency and occurrence of events that occur before the SDM reaches the Federal GBOS. Useful fields include platform unique ID, date/time, CMV number, four event timestamps, and location.

- GBOS data (Oracle .dmp format):
  - WRI_ALERTS table
  - WRI_CARRIER_REGISTRATION table
  - WRI_CFR_REFERENCE_SET table
  - WRI_GLOBAL_REFERENCE table
  - WRI_HOS_EVENTS table
  - WRI_LOG table
  - WRI_RECORDS table
  - WRI_VEH_BRAKES table
  - WRI_VEH_TIRES table
  - WRI_VEH_WEIGHT table
  - WRI_VEHICLE table
  - WRI_VIOLATIONS table

These data are useful for determining the latency, content, and occurrence of data stored in the GBOS portion of the pilot. These data were analyzed separately due to an error in the development of telematics team 2 SDM files that caused part of the WRI GBOS to malfunction after January 17, 2011, preventing WRI inspection reports from being generated (see section 6.2.4.2 – Failure to Generate Inspection Report). Pre- and post-January 17, 2011, data were analyzed individually and combined to illustrate an end-to-end test. The two most important tables are WRI_RECORDS and WRI_LOG. The WRI_RECORDS table contains information such as location, carrier name, platform, Federal GBOS unique ID, platform ID, and date/time of the encounter. The WRI_LOG table contains the GBOS's transaction event log table where all database transactions were recorded, thus giving the UT evaluation team a useful understanding of the process and latency of the GBOS system for the pilot tests. Telematics team 2 did not populate the brake, tire, and weight fields in the SDM used to create the WRI_VEH_BRAKES, WRI_VEH_TIRES, or WRI_VEH_WEIGHT tables.

- Field data:
  - Field data from 01-18-2011 (.xls, jpg, and .doc format)
  - Telematics team 2 event log (.xls format)

Field data from 01-18-2011 contains data collected during an attempt to corroborate the data from telematics team 2 at the geofence location in order to verify the timing and reliability of the pilot tests for telematics team 2. This was done in a collaborative effort between ORNL and the UT evaluation team. The ORNL team also kept an event log. This event log was used to help explain unexpected events, data gaps, and/or problems with actual data flow.

6.2.3.3 Telematics Team 3

- Platform data:
  - Vehicle log files from 01-17-2011 through 01-31-2011 (.csv format)

The vehicle log files are vital in determining the latency and occurrence of events before an SDM reaches the Federal GBOS. The fields of importance include platform unique ID, date/time, a unique event timestamp, and encounter location.

- GBOS data:
  - WRI_ALERTS table
  - WRI_CARRIER_REGISTRATION table
  - WRI_CFR_REFERENCE_SET table
  - WRI_GLOBAL_REFERENCE table
  - WRI_HOS_EVENTS table
  - WRI_LOG table (12-21-2010 through 01-17-2011)
  - WRI_RECORDS table
  - WRI_VEH_BRAKES table
  - WRI_VEH_TIRES table
  - WRI_VEH_WEIGHT table
  - WRI_VEHICLE table
  - WRI_VIOLATIONS table

The GBOS data are useful for determining the latency, content, and occurrence of data stored in the Federal GBOS portion of the pilot test. The GBOS log data required post-processing. An error in the development of telematics team 3 caused validation errors in the WRI GBOS, preventing WRI inspection reports from being generated and the GBOS database log from populating. The two most important tables are WRI_RECORDS and WRI_LOG tables. The WRI_RECORDS table contains information on location, carrier name, platform, Federal GBOS unique ID, platform ID, and date/time of the encounter. Most of the data were “dummy” data, populated artificially in order to hypothetically test the performance of sending full SDMs. The non-dummy (encounter specific) data included the driver name, vehicle unit number, and hours of service.

- Field data:
  - Field data from 01-19-2011 through 01-22-2010 (.doc and .jpg format)

– Telematics team 3 event log (.xls format)

Field data from 01-19-2011 through 01-22-2011 provides data collected during an attempt to corroborate the data of telematics team 3 at the inspection station to verify the timing and reliability of the pilot tests. This was done in collaborative effort between ORNL and the UT evaluation teams. The ORNL team also kept an event log. This event log was used to help explain unexpected events, data gaps, and/or problems with actual data flow.

6.2.4 Impact of the Test Environment

There were technical complications with all three telematics teams that required significant modification of the UT evaluation teams' proposed scope. Many of these modifications caused some minor differences between the analysis performed by the UT Evaluation team and the parallel analysis presented in the Tennessee Platform Evaluation, performed by ORNL.[10] Many of these inconsistencies revolve around methods to correct for clock errors and treatment of outliers. Though the test statistics and presentation vary between these two reports, the overall findings are consistent.

6.2.4.1 Telematics Team 1

Telematics team 1 did not successfully transmit inspection data due to technical difficulties with formatting data into an acceptable format for the GBOS; thus, the unique characteristics of telematics team 1 could not be evaluated. This included unique real-time sensor data.

6.2.4.2 Telematics Team 2

Telematics team 2 produced significant data for the CMRS platform pilot test. Still, there were many technical or engineering challenges.

<u>SDM Upload Failure</u>: One primary challenge arose with the placement of the geopoints. For the sake of this project, mainline geopoints were placed near the eastbound and westbound Knox County, TN, inspection stations and the Greene County, TN, inspection station. Since the alignments of the two Knox County approaches are near to one another, the geofences overlap in both travel directions. This created instances where data inspections were mistakenly generated for one CMV in both directions. Though this is not a duplicate inspection, it presents two nearly identical inspections. For the sake of this evaluation multiple inspections with the same CMV but opposite-direction geofences were counted and flagged.

To increase the number of inspections, the CMRS team established geopoints in close proximity to telematics team 2's carrier domicile. Since the geofence at this location overlapped with the location of the CMVs, each time a vehicle was turned on for in-yard movement, the telematics device registered it as being in a geofence and initiated an inspection; however, the EOBR would often complete the inspection before it connected to the Internet, resulting in an apparent incomplete or "failed" inspection attempt. The EOBR did not attempt to retry the connection upon failure to connect.

<u>EOBR Clock Synchronization Error</u>: The UT evaluation team discovered that telematics team 2 was delivering data with significant differences in timestamps as compared to the GBOS SDM time of reception. Furthermore, the scale of the problem differed among individual vehicles in

the test, indicating that the clocks used to generate telematics team 2's timestamps were offset by different values, depending on the vehicle in question. Additionally, it appeared that the time offset increased over time, indicating the presence of clock drift throughout the pilot test. This is illustrated in Figure 17, where the vehicle-GBOS latency is shown over time. This offset and drift was confirmed by manual inspections of the CMVs' EOBRs.

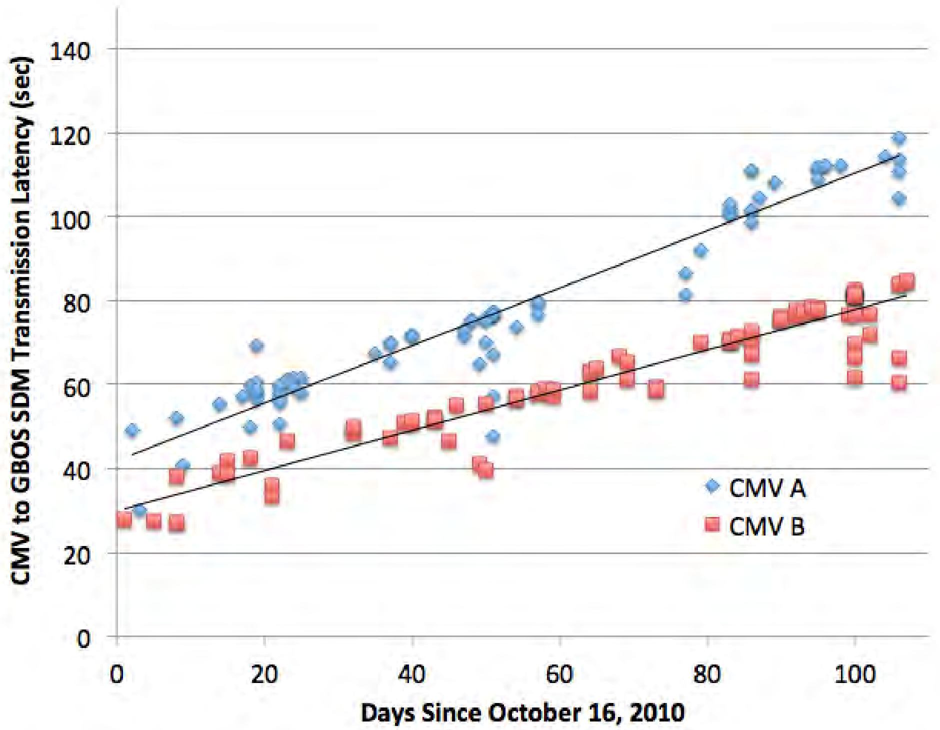


Figure 17. Graph. EOBR clock drift for telematics team 2.

The following method was developed to correct for this drift and offset in order to estimate the actual time (measured from the telematics and GBOS timestamps) needed for inspections to be delivered:

1. The UT evaluation team assumed the drift to be a linear function (y=mx+b) representing an increasing offset over the duration of the test, with the rate of increase being constant.
2. The UT evaluation team calculated the offset of a given data point (our control point) collected from the field for both CMV unit numbers.
3. The UT evaluation team then calculated the time difference between the CMV's EOBR SDM transmission and the GBOS's reception of the SDM for all data points for each of the two CMV unit numbers.
4. The UT evaluation team then plotted a line through all of the data points (keeping both datasets separate) and calculated the rate of increase of time over time. The outliers were removed. This resulted in two slopes corresponding to two linear relationship, representing drift (in seconds) rate per day.

5. With the two slopes calculated, the UT evaluation team then calculated the y-intercept (using the coordinates of the control point, which correspond to the results of the UT evaluation team's field work) to develop the two offset equations.
6. Finally, the UT evaluation team calculated the corrected latency, shifting by the offset calculated above.

This method yields acceptable results, but because of applying an average offset to stochastic data, there are occasional negative values. In total, this is designed to show a trend in the data and give the observer a better idea of how much time an average transaction takes from end to end, correcting for a significant data error.

Failure to Generate Inspection Reports: The developer(s) of telematics team 2 failed to create SDMs that were compliant with the rules specified by Volpe to integrate with the GBOS; thus, the GBOS failed to generate a safety inspection for this platform (though all other processes were completed). Since this error was discovered with only a couple of weeks left in the pilot test, rather than troubleshoot telematics team 2's software, the WRI team decided to post-process all inspections with existing data and reduce validation requirements. This post-processed dataset was created within two weeks of the end of the pilot test by relaxing validation requirements and re-running all available SDMs through the inspection process. The last step, generating an inspection report, was included in this analysis. All previous steps and associated time stamps, collected during the pilot test, were maintained.

HOS Data: The SDM reported HOS that was nine minutes and five seconds behind the information reported on the EOBR at the time of the inspection. This is a relatively minor discrepancy, but should be resolved before proceeding to a larger system.

6.2.4.3 Telematics Team 3

Failure to Generate Inspection Reports: Less than 10% of the valid messages passed the GBOS validation checks, causing the GBOS to fail to generate a safety inspection for many of the records that were considered successful transmissions. Similar to telematics team 2, all data that the GBOS had were post processed to generate a complete safety inspection.

Vehicle and GBOS Log Data Failures: Telematics team 3 submitted data from December 21, 2010, to January 31, 2011. From December 21, 2010 to January 17, 2011, data were gathered in the GBOS, but telematics team 3 did not collect vehicle log data. From January 17, 2011 to January 31, 2011, telematics team 3 began logging data but simultaneously changed their data format submitted to the GBOS and inadvertently violated the data format protocol of the SDM specifications, which caused GBOS to reject all data from telematics team 3, eliminating the ability to conduct a true end-to-end test (although the GBOS did create a record acknowledging receipt of the data). Due to these problems, the UT evaluation team divided telematics team 3's log data into two cohorts to address the log data representing vehicle interactions and GBOS interactions with the data.

The UT evaluation team used the GBOS processing data from December 21, 2010, through January 17, 2011, to estimate GBOS data processing latency. The UT evaluation team used data between January 17, 2011, and January 31, 2011, combined with the first receipt acknowledgement from the GBOS to evaluate the telematics provider's processes.

Geofence Size and CMV Query Frequency: Telematics team 3 developed geofences that were miles long with the vehicle's EOBR periodically determining if it was located within the geofence. If within a geofence, the telematics device submitted an SDM. This is a sharp contrast to other discussed geofence concepts whereby the entrance into a geofence triggers the submission of the SDM. The implication is that CMVs do not submit SDMs upon entrance in geofences and the telematics device is often queried multiple times while within the geofence, resulting in multiple inspections by the same CMV at effectively the same time and location.

HOS Data: The HOS data were not accurately reported for carriers in team 3. The HOS fields logged time when the vehicle was turned off or not moving, in addition to times while moving. This is not what would be reported in the carriers' logbooks or what was recorded on the actual EOBRs when checked at roadside by the research team during the test. Moreover, the SDM reported HOS times that were 2 hours and 29 minutes behind the true HOS from the EOBR. The evaluation team acknowledges this as a significant technical problem with the manner in which data are logged or transmitted. This problem should be addressed before further field operational tests.

6.2.5 Data Summary and Analysis

6.2.5.1 Test Statistics

Test statistics for telematics team 2 include:

- Carriers: 1
- Vehicles: 2
- Drivers: 1 per vehicle
- SDMs: 213
- Validated SDMs: 213
- Level WRI inspection reports (during test period): 6
- Level WRI inspection reports (during post-processing): 199
- Lost data rate: 24.5%

Test statistics for telematics team 3 include:

- Carriers: 1
- Vehicles: 10
- Drivers: 1 per vehicle
- SDMs: 607
- Validated SDMs: 277

- Level WRI inspection reports (during test period): 17
- Level WRI inspection reports (during post-processing): 204
- Lost data rate: 26.4%

6.2.5.2 Message Accuracy

Validation errors existing for each telematics team fell into three categories:

1. Multiple triggers within the same location—E1: This error occurs if the time elapsed between two different WRI_ENCOUNTER_IDs is less than 60 seconds apart at the same geopoint. This error represents a single vehicle triggering a single geopoint multiple times rather than just once.
2. Duplicate Encounter ID—E2: This error is flagged if multiple encounters have the same WRI_ENCOUNTER_ID. This error involves preserving the uniqueness of various CMV encounters and assuring that database errors do not duplicate encounters.
3. Multiple triggers at different stations within 120 seconds—E3: This error is occurs when a CMV triggers selected overlapping geopoints that should not be triggered simultaneously. This was specifically designed for the Knox County east and west geopoints and represents a CMV inspection occurring eastbound and westbound simultaneously.

Detailed error information for telematics team 2 and each of the CMV units is shown in Table 12. Telematics team 2's data are approximately 80% accurate, CMV A's data are 78.7% accurate, and CMV B's data are 83.2% accurate.

Table 12. Data error rates for telematics team 2.

Error Type	CMV A	CMV B
E1	54/404 = 13.4%	40/393 = 10.2%
E2	0	0
E3	32/404 = 7.9%	26/393 = 6.6%

Telematics team 3's data were 92.1 percent accurate, with only 22/277 errors. No errors were recorded for error types 2 and 3 for telematics team 3. This could be explained by telematics team 3's limited test environment, compared to telematics team 2. It should also be noted that the errors are largely due to system design problems, not intrinsic technical limitations.

6.2.5.3 Message Latency

The UT evaluation team estimated the mean and standard deviation of the various sub-process transmission latencies. Before the evaluation team conducted its statistical analysis of the Tennessee platform, the outliers in the dataset were removed. A box plot was employed to flag and remove extreme outliers. Points beyond 1.5 times the quartile range but less than three times the quartile range, are defined as mild outliers. Points more than three times the data quartile range are defined as extreme outliers. Mild outliers are included in the dataset. Extreme outliers were removed from the dataset. All inspections that occurred on January 6, 2011 and January 23, 2011 were outliers, producing extreme positive (over 3000 second) latencies and negative latencies, respectively, indicating a technical problem on these two days.

The mean value, standard deviation, 95 percent confidence intervals for the average transmission latencies, and 95th percentile latency value of each platform were then calculated. The 95th percentile latencies value can be viewed as critical values for the latency hypotheses–namely, 95 percent of the latencies values should be smaller than this value. Therefore, policy recommendations can be made based upon these values. Latencies of various sub-process transmissions include:

1. Latency between T2 and T6
2. Latency between T6 and T11
3. Latency between T11 and T11d
4. Latency between T2 and T11d
5. Latency between T12b and T13
6. Latency between T2 and T13

Detailed latency information for each telematics team is listed below.

Telematics Team 2:

Latency statistics for each main sub process are listed in Table 13. Histograms of latency distributions are shown in Figure 18. Because of the clock drift problem, the Vehicle-GBOS statics could not be reliably estimated. A mean value is presented.

Table 13. Latency analysis for telematics team 2.

Sub-process	Mean (sec)	Standard Deviation (sec)	95% Lower Confidence Interval (sec)	95% Upper Confidence Interval (sec)	95th Percentile (sec)
SDM Generation (T2-T6a)	39.7	30.0	35.5	43.9	86.4
SDM Transmission from Vehicle to GBOS (T6a-T11a)	6.0				
SDM Validation and Acceptance by GBOS (T11a-T11d)	0.48	0.27	0.45	0.52	0.95
Total Time Elapsed to Generate, Validate, and Post SDM to interface (T2-T11d)	46.2	13.5	44.4	48.1	71.7
Level WRI Inspection Report Generation (Post-Processing) (T12b-T13)	0.22	0.13	0.21	0.24	0.42
End-to-End inspection time (including post-processing) (T2-T13)	46.1	13.2	44.2	47.9	70.9

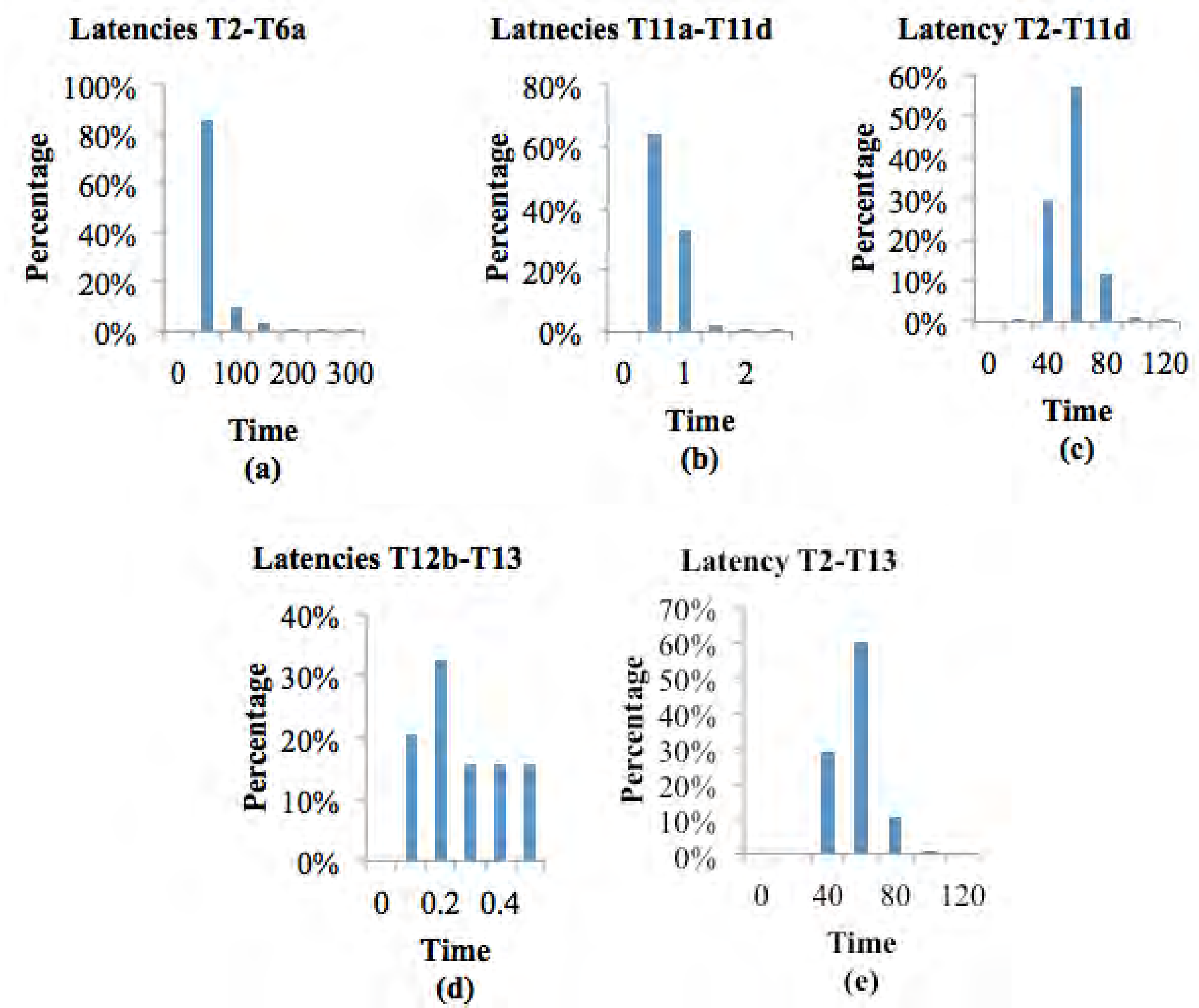


Figure 18. Charts. Statistical distribution of latency for each sub-process for telematics team 2.

As shown in Table 13 and Figure 18.

- It took an average of 39.7 seconds for telematics team 2 to generate an SDM after having crossed a geopoint (Figure 18a).
  - 95 percent of the time, it took less than 86.4 seconds to be generated.
  - The 95 percent confidence interval of the mean falls between 35.5 seconds and 43.9 seconds to generate an SDM.
- It took an average of 6.0 seconds for telematics team 2 to transmit the SDM from the vehicle to the GBOS.
- It took an average of 0.5 seconds for telematics team 2 to generate an SDM (Figure 18c).
  - 95 percent of the time, SDMs took 0.95 seconds to be generated.

  - The 95 percent confidence interval of the mean falls between 0.45 seconds and 0.52 seconds to generate an SDM for a specific instance.
- In total, it took an average of 46.2 seconds for an SDM to be generated (Figure 18d).
  - 95 percent of the time, the total time needed to generate an SDM was less than 71.7 seconds.
  - The 95 percent confidence interval mean falls between 44.4 seconds and 48.1 seconds of total time to generate an SDM for a specific instance.
- It took an average of 0.2 seconds for the GBOS to generate a level WRI inspection report during the post-processing activity (Figure 18e).
  - 95 percent of the time, level WRI inspection reports needed less than 0.4 seconds to be generated.
  - The 95 percent confidence interval of the mean falls between 0.21 seconds and 0.24 seconds to generate a level WRI inspection report for a specific instance.
- The total average end-to-end latency (including post-processed inspection report generation) was 46.1 seconds for the GBOS to generate an end-to-end inspection report.
  - 95 percent of the time, level WRI inspection reports took less than 70.9 seconds to be generated.
  - The 95 percent confidence interval of the mean end-to-end latency falls between 44.2 seconds and 47.9 seconds to generate a level WRI inspection report for a specific instance.

Telematics Team 3:

Due to the existence of many common sub-processes between telematics team 2 and 3, telematics team 3's latency behaves similarly to telematics team 2. Since only one sub-process exists that is not common between the two telematics teams, and because of telematics team 3's data problems, latency for sub-process 1 and 2 combined (SDM generation and transmission from vehicle to GBOS) was evaluated for telematics team 3; and the GBOS processing was process for an independent set of inspections (shown in Table 14 and Figure 19). Because of validation errors discussed above, this analysis includes post-processing of all SDMs by the GBOS to generate inspection reports.

Table 14. Latency analysis for telematics team 3.

Sub-process	Mean (sec)	Standard Deviation (sec)	95% Lower Confidence Interval (sec)	95% Upper Confidence Interval (sec)	95th Percentile (sec)
SDM Generation and transmission to GBOS (T2-T11a)	34.4	9.9	33	35.8	49.0
SDM Validation and Acceptance by GBOS (T11a-T11d)	0.76	0.20	0.74	0.79	0.98
Total Elapsed Time to Generate, Validate, and Post SDM to interface (T2-T11d)	35.2	9.9	33.8	36.5	50.0
Level WRI Report Generation (Post-Processing) (T12b-T13)	0.62	0.09	0.61	0.63	0.75
End-to-end inspection time (including Post-Processing) (T2-T13)	35.8	9.9	33.8	36.5	50.8

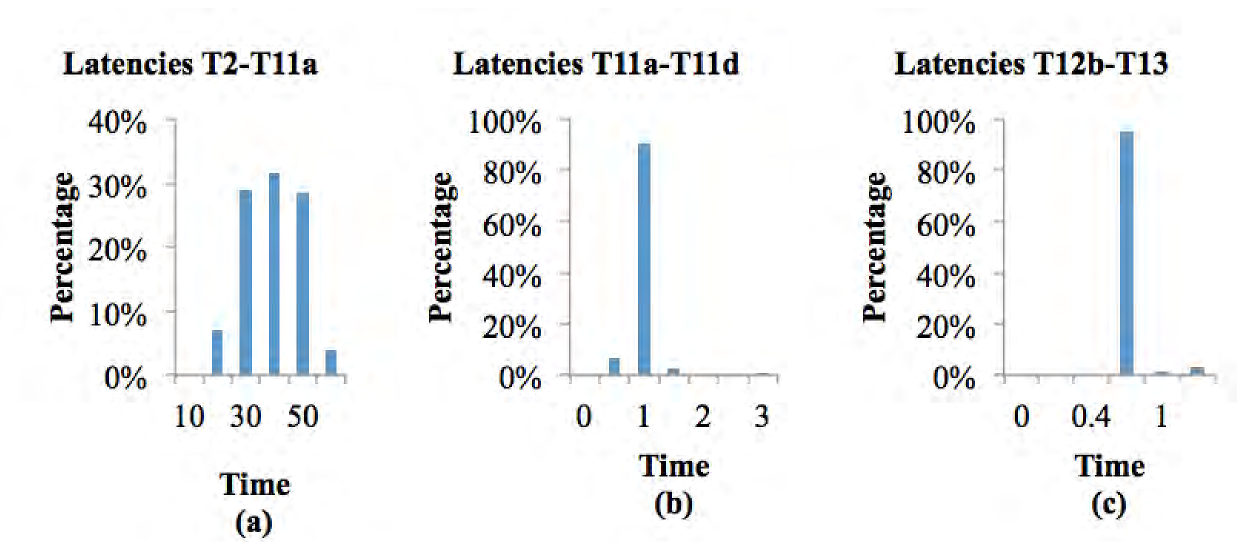


Figure 19. Charts. Distribution of latency between T2 and T11a for telematics team 3.

As seen in Table 14 and Figure 19:

- It took an average 34.4 seconds for telematics team 3 to generate an SDM and to then be received by the GBOS (Figure 19a).
  - In 95 percent of the observations, it took less than 49.0 seconds for telematics team 3 to generate an SDM.
  - The 95 percent confidence interval of the mean falls between 33.0 seconds and 35.8 seconds to generate an SDM for a specific instance.
- It took an average of 0.76 seconds for the GBOS to validate and accept the SDM (Figure 19b).
  - 95 percent of the time, SDMs needed than 0.98 seconds to be generated.
  - The 95 percent confidence interval falls between 0.74 seconds and 0.79 seconds to generate an SDM for a specific instance.
- In total, it took an average of 35.2 seconds for an SDM to be generated.
  - 95 percent of the time, the total time needed to generate an SDM was less than 50.0 seconds.
  - The 95 percent confidence interval falls between 33.8 seconds and 36.5 seconds of total time to generate an SDM for a specific instance.
- It took an average of 0.62 seconds for the GBOS to generate a level WRI inspection report during the post-processing activity (Figure 19c).
  - 95 percent of the time, level WRI inspection reports needed less than 0.75 seconds to be generated.
  - The 95 percent confidence interval falls between 0.61 seconds and 0.63 seconds to generate a level WRI inspection report for a specific instance.
- The total average end-to-end latency (including post-processed inspection report generation) was 35.8 seconds for the GBOS to generate an end-to-end inspection report.
  - 95 percent of the time, level WRI inspection reports needed less than 50.8 seconds to be generated.
  - The 95 percent confidence interval falls between 33.8 seconds and 36.5 seconds to generate a level WRI inspection report for a specific instance

6.2.6 Pre-Evaluation by Pilot Test Teams

6.2.6.1 Qualitative Analysis

- Telematics Provider Assessment:
  - The telematics providers offered several suggestions to improve the test process.
    - One telematics provider believes their specifications should have been clearer, that there needed to be better communication of change, more support, and consistency.

    - It was noted that violation calculations by the vendors should match the violation calculations by the back office and that if they do not, driver confusion could become an issue.
    - It was noted that the direction of travel needed to be included.
    - It was suggested that the back office should enter the SDM into the system and at that point, assign the SDM a unique ID. The unique ID could then be passed back to the vendor as part of a response. Telematics teams should not be responsible with creating message identification numbers.
- The telematics providers provided input of the feedback they would like to receive from the government system after having submitted an SDM.
    - One provider wants a positive acknowledgement or an error message every time an SDM is sent. In the event of an error message, there should be a protocol for retries. If the protocol for the retries exhausts itself, there should be an automatic generation of a trouble ticket and support response to ensure all SDM attempts are successful.
    - One provider wants a record of an inspection and the inspection result as a result of submitting that SDM.
    - One provider believes that instead of just response codes, there should be documentation indicating the exact meaning of an error message.
- Based on the Webinar, and what they were shown the expected user benefits to be, two of the participating telematics providers think the WRI system should be implemented. However, one of them does not think it should be implemented in its current form.
- The telematics providers were prompted to discuss their experiences with any problems they encountered while integrating with the Volpe Back Office System that they think should be addressed in future design of that interface.
    - One provider was unable to process a return response from the back office.
    - One provider has concerns for the need to ensure the back office calculates violations and available hours correctly and that the only way to do this correctly is for the back office to have enough knowledge of the driver's specific HOS rules coupled with more information in the SDM.
    - The idea of having the triggers self test was noted.
    - The ability to track more than one driver/co-driver was noted.
    - The time standard required to flag a violation must be consistent.
    - The need was expressed to explore the method in which geofences are to be handled in relation to communication with vendors and vehicles, and how this is done with the storage requirements and capabilities
- Understanding that the WRI user interface was designed for the pilot tests, two of the providers like it but consider it average. One provider did not use it extensively. Their suggestions for improvements are:
    - That all of that information used to calculate available hours and violations be made available.

    - To receive knowledge that the data they submit actually makes it to the GBOS.
    - One provider primarily used it as a debugging tool to determine if their data was getting through and how it appeared.
    - To show available driver hours and a list of driver status changes.
  - The telematics providers provided some of their impressions of the WRI technologies. Their attitudes were mixed and are as follows:
    - One provider feels that ensuring “things” are calculated correctly must be a priority to ensure system viability. To do this, more information needs to be in the SDM.
    - One provider stated that they had become “a believer in the wireless roadside inspection concept.”
    - There was a concern regarding the overlap between the new rules on wireless log download going into effect and the need for a WRI system too.
  - There were some problems experienced during the pilot tests.
    - One provider worked with the wrong set of documentation for a period of time and/or used documentation that was not exactly what was implemented.
- Fleet Assessment:
  - The fleets all agree that in the context of a nationally-deployed system, WRI will likely improve the safety for all fleets and will help to level the playing field by forcing all companies to get their CMVs up to required standards.
  - The fleets all agree that the efficiency of their companies will improve on a long-term basis.
  - All of the fleets are in strong agreement that company safety standards for their vehicles will improve and that driver attitudes towards safety will improve as well.
  - All of the companies indicate that they felt that WRI is a good way to provide positive credit for “clean” inspections under the CSA measurement system.
  - After having submitted an SDM, two of the fleets wish to ensure they receive all of the same information the government receives, and one of the fleets wishes only to receive notifications of violations and/or warnings.
  - The fleets all strongly agree that the WRI results should be shared with the driver immediately, especially if there is some sort of violation or safety issue.
  - The fleets all agree that a self-test feature is a viable system component.
  - The impressions of the by-pass/pull-in features are that it will save the companies time and fuel.
  - Some of the fleets indicate having concerns in regard to being required to have additional equipment. The noted concerns are related to the financial impact of nationwide deployment of the system. One of the fleets did not seem concerned with the financial impact. Fleet size may play a role in the overall equipment cost concerns.

- Based on the Webinar, and what the fleets have been shown the expected user benefits to be, two of the fleets are strongly in favor of implementing the WRI system. One fleet continues to be skeptical, primarily due to the equipment problems they experienced during the pilot tests.
- The one fleet having real-world experience with the user interface feels that the interface is good and trouble-free.
- Although the other fleets had no hands-on experience with the user interface, they think the interface is acceptable as presented in the WRI Webinar.
- The impression of the WRI technologies held by the fleets is good. They all agree that the future of CMVs will be full of sophisticated technologies.
- One of the fleets notes that they have already seen, with the aspects of CSA going into effect, a difference in the drivers themselves realizing that safety is becoming a paramount issue.
- One of the fleets indicates that their drivers do not have any problems or issues with the system and that “they weren't intimidated by it.” Since EOBRs are already mandated, the drivers are “not afraid of what it will do to the way they perform in the vehicle."
- One fleet states that their drivers indicate the on-board sensors allow them to have greater comfort knowing their trailer is loaded correctly and within limits.
- One fleet states that the drivers (like most people) are “a little hesitant to change” but that they are “comfortable with what they got and make it work.” This fleet also noted that the drivers tend to “lean toward the lines of finding everything that's wrong with something that could be wrong just because they really are trying to promote that they don't want to change.”
- The fleets indicate, when questioned about driver response, that driver resistance stems from a natural human resistance to change rather than with issues with the WRI system itself. One fleet indicates that those drivers who were initially reluctant changed their minds about it after having used the WRI system and that it would decrease their workload.
- One fleet indicates their drivers thought that at first the system was going to be complicated to operate, but that within one workday they found out that was not the situation.
- One fleet noted that some drivers considered the WRI system to be “a little bit intrusive” but that many companies already have methods to monitor their vehicles.
- One of the carriers stated that they did not see any benefit to the brake sensor system.
- One of the carriers stated that they did not see any benefit to checking tire pressure and that they had no experience with tire pressure problems or flats while on the road and that often tire pressure problems were due to something having punctured the tire.

- Enforcement Assessment:
  - The THP officers were asked their impressions of the WRI user interface. The UT evaluation team made it clear that the user interface used in the pilot tests was a model designed for the pilot tests and not a production model. The THP officers were fully aware of this and provided their feedback. Their suggestions for improvements were also solicited. Only a portion of those interviewed had exposure to the user interface during the pilot tests.
    - One THP officer with limited pilot test experiences thinks the manner in which the interface shuts down after 15 minutes and then requires one to log back into the system is detrimental to its effectiveness. This THP officer also emphasizes the need for an audible alarm.
    - One THP officer wishes to see the CMV size and weight appear on the user interface.
    - One THP officer thinks the user interface needs to be much more user friendly and simple in its output and use.
    - A suggestion was made to have all the alerts pop up on the front page in red so there would be no need to scroll down.
    - A suggestion was made to indicate the vehicle manufacturer name on the screen. Given the THP officers' intimate knowledge of vehicle manufacturer, this would be a quick and easy way to assess which vehicle was being displayed.
  - The THP officers were asked to provide their impressions of the WRI technologies. They all agree that, though still a blossoming technology, it has great potential to improve their effectiveness.

Additional comments and feedback from the THP interviews are given below:

- One of the THP IT support personnel is impressed with the ability of the WRI system to not transpose information since the input comes from one source, instead of from two or three different sources.
- Several of the THP officers think the ability to move the geofence as needed will be a great asset in helping law enforcement perform their duties by having the ability to thwart attempts by vehicles that bypass inspection stations on alternate routes.
- One of the officers thinks there would need to be a "check and balance system," whereby verification that the driver logged in was ensured. This same officer also thinks some method for ensuring false credentials are not being used would likely need to be implemented.
- Concern was expressed in regards to the importance of an adequate response time and that it could be an ongoing challenge.
- One officer thinks if the WRI system could give more accurate information on specific vehicles and/or drivers, it would be extensively used by law enforcement nationwide.

- One officer was prompted as to his thoughts on license plate readers and thinks these would be a benefit to the enforcement community.
- One officer thinks WRI will not revolutionize anything but could instead provide the enforcement community with good data to use in the inspection process.

- Sensor Provider Assessment:
  - When asked about how their pilot test experiences went and if they had any suggestions for improvements, two of the sensor providers feel the fleets were not cooperative and that the process of getting all of the participants on the same page initially should have been stronger. One of the providers has trouble understanding why bench tests were not performed before the vehicles went out. One of the carriers also expressed concern with the inability to get their partner telematics provider to assist as needed.
  - After submitting an SDM, two of the sensor providers wish to receive any information/feedback they can, which is related to their equipment from the government system. One of the providers only wishes to see "exception data," that is, data indicating a problem with the vehicle.
  - Based on the Webinar, and what they were shown the expected user benefits to be, all three of the companies indicated their strong desire to see the implementation of the WRI system and had favorable impressions of the WRI technologies.

6.2.6.2 WRI CMRS System Security

The WRI CMRS system consisted of two closed systems: the GBOS and the telematics systems. Thus, there were no security elements under the responsibility of the CMRS testing team. Volpe followed their standard data security procedures and safeguarded the SDM contents during data transfer by dictating the encryption procedures for communication between the telematics providers and the GBOS. For systems internal to the telematics providers (such as storing driver data and handling communication between on-board units and the back-office), the partners made use of their proprietary systems, each with their own security protocols to protect data for their fleet customer. Because the WRI CMRS platform was designed to treat each telematics system as a closed system, the evaluation team did not pursue business-sensitive information regarding their security methodologies and system design.

6.2.7 Observations and Assessment

6.2.7.1 WRI System Functionality

The Tennessee CMRS platform was successful in achieving many of its goals, having had three telematics teams to aid in the accomplishment of these goals. Telematics teams 2 and 3 provided meaningful data, whereas telematics team 1 provided no meaningful data. The lack of meaningful data from telematics team 1 was primarily due to a complication with the data format and communication protocol between the GBOS and telematics team 1, and challenges associated with integrating multiple gratis partners in a concerted effort to format and submit data. The average SDM creation time for telematics team 2 was approximately 46 seconds. The average SDM creation time for telematics team 3 was approximately 35 seconds (after the CMV discovered it was in a geofence). Both platforms were able to process SDMs and generate Level WRI Inspection Reports that were viewable on the web interface. From this portal, law enforcement was able to view appropriate data (within the noted tolerances above) after vehicle inspection. The Tennessee CMRS platform also provided a self-test ability for Telematics Team 2, but was unable to provide this functionality in Telematics team 3. Telematics team 2 provided 16 meaningful instances of self-test data during the WRI Pilot Test.

Based on the series of interviews, it was thought that the WRI system was able to serve the various telematics providers participating in the Tennessee CMRS Platform. Some concerns were raised in regard to the functional aspects of the system, which should be further developed in future deployments. The various fleets involved stated that in the context of a nationally-deployed system, WRI will likely improve the safety for all fleets, will help to level the playing field by forcing all companies to keep CMVs up to required standards, and that the efficiency of their companies will improve on a long-term basis due to the Tennessee CMRS platform. Some of the fleets are in strong agreement that company safety standards for their vehicles will improve and that driver attitudes towards safety will improve under the Tennessee CMRS platform. The fleets raised several issues concerning aspects of vehicle compliance (such as measuring tire pressure), but also recognized that these issues could be resolved in the future. Finally, interviewed law enforcement personnel all agree that, though still a new technology, CMRS has great potential to improve their capabilities. They noted several ways to improve the system in the future such as: audio alarm notifications for inspections, the ability to move geopoints, and the necessity of having the ability to log in to the software for extended periods of time.

6.2.7.2 WRI System Performance

The Tennessee CMRS Platform was divided into three different telematics teams for the WRI pilot tests. For clarity, this section will address each telematics team separately.

Telematics Team 1: Telematics team 1 did not successfully participate in the WRI Pilot Tests and provided no meaningful data. The team was able to successfully compose an SDM, but was unable to format it in order to be accepted and processed by the GBOS.

Telematics Team 2: This telematics team developed meaningful data for the WRI Pilot Test. Overall, these data were accurate (by the criteria mentioned above) approximately 80% of the time. This telematics team had a data loss rate of approximately 24.5%. There were two main causes for data loss:

- A lack of reception at the EOBR when initiated from within a geofence.
- Volpe rejecting SDMs due to violations of the SDM specifications.

The WRI Inspection Message was generated an average of 46 seconds after a vehicle crossed the geofence boundary. The largest portion of the processing time occurred during the SDM generation (40 seconds).

The EOBRs on this telematics team suffered from considerable time drift over the course of the pilot tests. This was addressed using the methodologies described above in section 6.2.4.2 of this report.

Telematics Team 3: Telematics team 3 provided meaningful data for the WRI pilot test. Overall, these data were accurate approximately 92% of the time. This telematics team had a data loss rate of approximately 26.4%. The main cause of data loss was from the GBOS rejecting SDMs due to improperly formatted messages that lead to violations of the SDM specifications.

The WRI Inspection Message was generated approximately 34 seconds after a vehicle became aware it had crossed the geofence boundary (this could be several minutes after it actually crossed the geofence boundary).

One of the challenges faced with telematics team 3 was the occurrence of multiple inspections of the same vehicle inside of a large geofence, within 10-15 minutes of one another. While this creates a challenge for interpreting the results of over-inspected CMVs, it does not necessarily represent an error, simply a high frequency of inspections. The size of the geofence substantially limits the ability to conduct real-time screening or inspection support.

Common Errors with Telematics Teams 2 and 3: There were several common errors that developed during the pilot tests. These errors fell into three categories:

- Multiple triggers within the same geopoint location: This error occurs when the time elapsed between two different WRI_ENCOUNTER_IDs is less than 60 seconds apart at the same geopoint. This error represents a single vehicle triggering a single geopoint multiple times rather than only once. This error is not obviously remedied, but is easily detectable.
- Duplicate Encounter ID: This error is caused if multiple encounters have the same WRI_ENCOUNTER_ID. This error involves preserving the uniqueness of various CMV encounters. This error should be easily remedied with additional system development.
- Multiple triggers at different stations within 120 seconds: This error is caused when a CMV triggers overlapping geofences that were not designed to be triggered simultaneously. This was specifically designed for the Knox County weight station east and west geopoints and represents a CMV inspection occurring eastbound and westbound simultaneously. This error should be easily remedied by creating geopoints that do not overlap.

6.2.7.3 Lessons Learned

Overall, the Tennessee CMRS platform provided a rich set of data from two telematics providers. Although a large portion of the test depended upon the success of telematics team 1 (team 1 employed a variety of sensors that others did not) the CMRS platform proved to be both functional and reliable. While there were problems and errors that occurred, all of the problems and errors were solvable and/or could be solved in the future within current technological limitations. The Tennessee CMRS platform was able to consistently generate a vehicle SDM, send it to the GBOS, have it processed by the GBOS, and have the GBOS post the results to the FMCSA portal within a reasonable amount of time in order to be effective for use by law enforcement.

The latency period is still relatively long for both of the successful telematics providers (2 and 3), indicating that geopoints should be placed appropriately in order to support real-time law enforcement. At highway speeds, geopoints should be placed one to two minutes (miles) upstream of the interdiction location; however, in some locations this would allow the CMV to exit the freeway. It is also imperative for the geopoints to be carefully placed in situations where EOBRs will be powered on and off frequently (such as a domicile or inspection station). If CMVs start and stop frequently within a geopoint, incomplete messages will be initiated.

The system was efficient and effective and, if there were to be any changes made, the UT evaluation team would recommend the various software platforms be developed further to avoid most of the errors that were encountered, which were largely caused by software development issues. Such issues include: time offsets, time drift, overlapping geo-points, and various SDM specification violations – all of which can be addressed. In a nationally deployed system, where dozens or hundreds of technology providers could be participating, it is essential that the message format and development be easily implementable. Even with significant support, one of the three telematics providers could not successfully develop and send an SDM, primarily because of data formatting and compatibility issues. If many private-sector participants, with varying levels of in-house expertise, are developing communication protocol with the GBOS, the criteria must be clear and streamlined.

One of the greatest challenges with the evaluation of this platform was evaluating transaction times across different hardware, with different clock settings. This is a requirement of the evaluation that will not be required in a nationally deployed system. As such, this challenge should not influence the performance of the system.

6.3 KENTUCKY **UNIV**ERSAL ID PILOT TEST

6.3.1 Test Design

6.3.1.1 Unique IDs

A unique ID was developed by the Kentucky platform to populate the encounter ID field at the onset of each inspection. The encounter ID remained unchanged throughout the entire portion of the data collection and transfers and was included in the SDM for the purpose of the evaluation.

For the pilot test, the Kentucky platform had the following values assigned for their use:

60000000 to 79999999.

6.3.1.2 Timestamps

Kentucky’s timestamp information is shown in Figure 20 and described in Table 15. Beginning with the activation of the LPR, timestamps were to be taken at each process or transaction. In practice, only a subset of the timestamps was collected due to technology limitations or changes in the manner in which the pilot test was executed. The timestamps that were not collected are shaded grey in Table 15. TSID 1 (shaded) was not collected since it was not provided by the Kentucky platform. The original TSID K6 was not specifically collected, but a number of supplementary timestamps (K6a-K6f) were collected that give the UT evaluation team more resolution than the proposed K6.

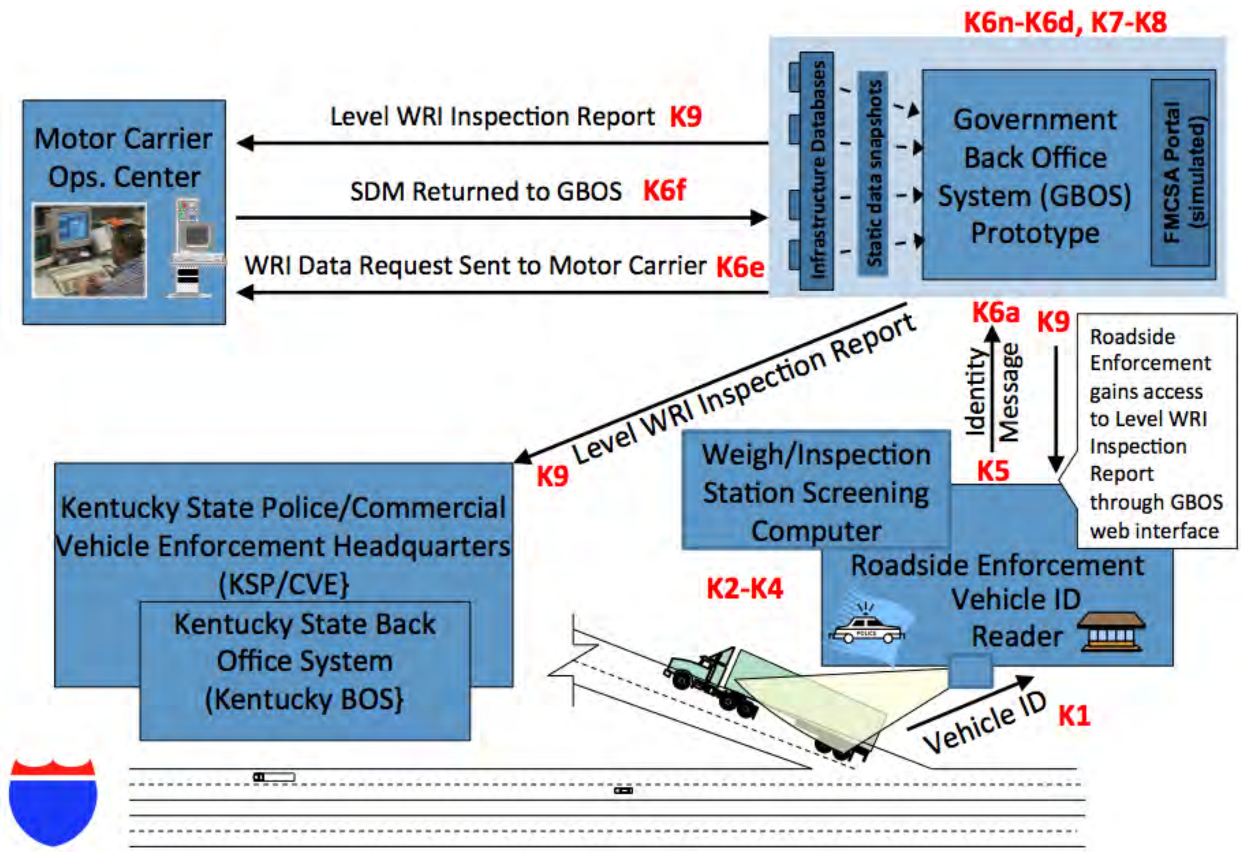


Figure 20. Diagram. Measured timestamps in deployed Kentucky pilot tests.

Table 15. UT evaluation team data collection requirements–Kentucky platform.

TSID	Location / Sub process Step	Interface of Timestamp	Group Generating Timestamp	Unique ID Assignment/Pass -Through	Timestamp Application	Event Causing Data Collection
K1	Roadside enforcement activation	KY roadside enforcement system	KY/UK	Unique ID associated with specific roadside node and instance ID in the identity message	When safety data services are activated by roadside sensors	Roadside enforcement service is prepared to create data from the camera/DSRC station
K2	Trigger event	KY roadside enforcement system	KY/UK	RSE-Vehicle interface event has its own unique ID assigned in the SDM	Vehicle is in range of the camera trigger sensor and picture is taken	Vehicle crosses the boundary of the trigger point created near the camera system; camera takes a photo of vehicle
K3	Compilation of identity message	KY GBOS	KY/UK	ID established in #2 above shall be passed through	Start of identity message data collection (after a picture is compiled at KY roadside enforcement)	Start of data collection on the vehicle
K4	Completion of identity message	KY GBOS	KY/UK	ID established in #2 above shall be passed through	End identity message compilation	End of data collection on the vehicle
K5	Transmission of identity message	KY GBOS	KY/UK	ID established in #2 above shall be passed through	At transmission of identity message from KY GBOS to Volpe	Transmission of identity message from KY GBOS to Volpe and the UT team
K6	Reception of Identity Message	Federal GBOS	Volpe	ID established in #2 above shall be passed through	At reception of Identity Message from telematics provider	Reception of Identity Message at Volpe from telematics provider
K6a	Identity Message is received by internal app server	Federal GBOS	Volpe	ID established in #3 above shall be passed through	At reception of Identity Message at internal app server.	Reception of Identity Message at internal app server
K6b	The Identity Message is sent for validation	Federal GBOS	Volpe	ID established in #3 above shall be passed through	When Identity Message is sent for validation	Identity Message sent for validation
K6c	The Identity Message finished validation	Federal GBOS	Volpe	ID established in #3 above shall be passed through	Identity Message has finished validation	Identity Message has finished validation
K6d	Identity Message is saved into the database	Federal GBOS	Volpe	ID established in #3 above shall be passed through	Identity Message is saved into the database	Identity Message saved into the database

TSID	Location / Sub process Step	Interface of Timestamp	Group Generating Timestamp	Unique ID Assignment/Pass -Through	Timestamp Application	Event Causing Data Collection
K6e	E-mail sent to appropriate KY participant e-mail address	Federal GBOS	Volpe	ID established in #3 above shall be passed through	E-mail is sent to appropriate KY participant e-mail address	E-mail sent to appropriate KY participant e-mail address
K6f	Acknowledgement message is sent to the sender of the (SDM) message	Federal GBOS	Volpe	ID established in #3 above shall be passed through	Acknowledgement message is sent to sender of (SDM) message	Acknowledgement message sent to sender of (SDM) message
K7	Compilation of level WRI inspection report	Federal GBOS	Volpe	ID established in #3 above shall be passed through	At the beginning of the compilation of the WRI inspection report	Beginning of compilation of WRI inspection report by Federal BOS
K7a	SDM is sent for safety compliance evaluation	Federal GBOS	Volpe	ID established in #3 above shall be passed through	SDM is sent for safety compliance evaluation	SDM is sent for safety compliance evaluation
K7b	SDM has finished safety compliance evaluation	Federal GBOS	Volpe	ID established in #3 above shall be passed through	SDM has finished safety compliance evaluation	SDM finished safety compliance evaluation
K7c	SDM has be sent to the report generation	Federal GBOS	Volpe	ID established in #3 above shall be passed through	SDM has been sent to report generation	SDM is sent to report generation
K8	Completion of level WRI inspection report	Federal GBOS	Volpe	ID established in #3 above shall be passed through	At completion of WRI inspection report compilation	Completion of WRI inspection report compilation
K9	Transmission of level WRI inspection report to roadside enforcement and MC	Federal GBOS	Volpe	ID established in #2 above shall be passed through	At transmission of level WRI inspection report	Level WRI inspection report forwarded to roadside enforcement, the MC, and the UT evaluation team
K10	Reception of level WRI inspection report at roadside enforcement	KY GBOS	KY/UK	ID established in #2 above shall be passed through	At reception of level WRI inspection report at KY GBOS from Volpe	Level WRI inspection report received by KY GBOS

Note: shaded grey rows are proposed TSIDs that were not collected

6.3.1.3 Data Requirements

For quantitative analysis of data quality and transaction latency, log files were required from all entities involved in generating or processing data. These log files originated with the telematics provider and the GBOS and document the timestamps of data transmission between sub-processes. Moreover, since the data were transferred from one entity to another (roadside enforcement to the GBOS), the clocks that generated the timestamps required synchronization to NIST. This requirement allowed all log files with timestamps to be compared across a common time. Additionally, final SDMs were required for consistency checking and validation. Each element of the log files for all platforms required a traceable encounter ID number.

6.3.1.4 Overview of Data Transfer

The main elements of data transferred from the Universal ID platform included log files from roadside equipment, the GBOS, and the Kentucky Transportation Cabinet. The roadside enforcement log files were collected via e-mail in the middle of the pilot test, and a final set was sent at the end of the pilot test period. The GBOS log files were gathered throughout the pilot test (see section 6.4.1.6), and the Kentucky Transportation Cabinet was able to send one log file (with one observation) at the end of the pilot test period.

The SDM data from the Universal ID platform were gathered and processed by the Volpe. A description of their data transfer protocol is in section 6.4.1.6.

6.3.1.5 Validating and Corroborating WRI Data

The SDM data were validated through a number of data checks, focusing on identifying whether or not data elements fell within reasonable ranges of values and if the data set included duplicate encounter IDs. The validation checks included in the Universal ID data are as follows:

- All data validation and corroboration are described in Section 4.1.1.
- Due to an error in the development of the platform by Kentucky, the following encounter ID range was also assigned to the Kentucky Platform: 6000000 to 7999999 (one digit shorter than the requirement). This caused no errors during the validation process.

One of the unique elements of the data analysis included testing and validating the accuracy of the LPR equipment and software. To this end, the evaluation required manual validation and error checking to identify the confidence of correct identification of license numbers. The Kentucky evaluation teams manually checked the license plate data from the Kentucky platform and compared the data to the LPR reading for a subset of all CMVs that triggered the LPR (including non-WRI participants). This gave an expected success rate of correctly processed identifications for WRI encounters.

A limited, but representative number (nearly 700) of license plate images were analyzed for the pilot test to determine the overall accuracy of the LPR technology. In order to simulate real-world conditions, this analysis included two days of differing weather conditions (clear and snow/ice) to the north of the station.

Overall, the analysis considered the following success/error codes for the LPR images:

0. Success.
1. Image too dark.
2. Image too light.
3. Image is blurry or otherwise difficult to read.
4. System misinterpreted one or more characters.
5. Reader missed a character.
6. Character added to beginning or end of string.
7. Camera caught a string of characters that it incorrectly assumed was the license plate number.
8. Vehicle is not a CMV.
11. License plate number visible and readable, but system failed to read; reason for failure unknown.
12. Number partially or completely out of viewing angle; number too far to the left.
13. Number partially or completely out of viewing angle; number too far to the right.
14. Number partially or completely out of viewing angle; number too far to the top.
15. Number partially or completely out of viewing angle; number too far to the bottom.
16. No license plate visible on CMV (single unit CMV or missing plate).
17. Camera caught the wrong plate and assumed it was the license plate (i.e. vanity plate).
18. Dirty, damaged, or bent license plate or lack of retro-reflectivity.
19. Decal or other obstruction on license plate.
20. Mismatch issue; plate image with wide image or camera 0 with camera 1.
21. Incorrect state/jurisdiction.

For this analysis, the LPR system was not penalized for codes 8 and 16. Code 8 is related to passenger vehicles and pickup trucks that enter the station. Code 16 is the dominant failure mode and relates to an image of a CMV that has no front license plate (single unit trucks are not required to have a front license plate in Kentucky). Code 18 relates to an unreadable license plate due to the plate being dirty, covered with snow and ice, damaged, or bent. If the OCR result indicated “NO READ” or “NO PLATE” for an image and the image analyzer could confirm the absence of a plate or the plate was impossible to read with the human eye, then this data was ignored, i.e., the LPR system was not penalized. However, code 18 was used in the analysis if the image was readable to the analyzer and the OCR result was “NO READ” or “NO PLATE.”

Of CMVs with readable plates, the results of the accuracy analysis indicated the LPR system correctly identified both the plate string and jurisdiction 83.7 percent of the time. Therefore, 16.3

percent of the vehicles that had readable plates were reported incorrectly based on the codes above. Nearly 54 percent of those failures were due to dirty, damaged, or bent license plates, or license plates that lacked retro-reflectivity (Code 18) but were still readable in the LPR image provided by the system. The second highest failure mode was from incorrect state or jurisdiction recognition (Code 21) (16.9 percent). The third highest failure was due to misinterpreted characters (Code 4) (7.7 percent). All other failure modes accounted for 21.4 percent of the failures. The overall ability of the LPR system to correctly identify the combined plate string and jurisdiction enabled the screening computer to determine both the vehicle and carrier responsible for safety via the Kentucky Commercial Vehicle Information Exchange Window (CVIEW). It is important to note that there was a large amount of identifications that failed during inclement weather and the evaluation team was unable to estimate the success of the system during those times.

On January 27, 2011, there was an attempt to interdict a participating WRI CMV at the inspection station. However, this interdiction failed to generate a successful WRI inspection due to an obscured license plate letter. As such, beyond validating the LPR, there were no in-field comparisons between onboard CMV data and data submitted through the WRI system.

6.3.1.6 Qualitative Analysis

In order to assess aspects of the WRI system from the stakeholder perspective, the UT evaluation team carefully examined whether or not the high-level project goals were met during the Universal ID WRI pilot tests by posing a series of open-ended questions to the participating stakeholders. These questions were based on the goals, objectives, and hypotheses of the WRI project as stated in section 2 of the WRI evaluation plan.

The groups interviewed during this process included compliance and law enforcement personnel from the KSP and representatives from the fleets. These participating Universal ID stakeholders were interviewed by telephone during January and February 2011. In all, there were four interviews with four Kentucky compliance personnel (three KSP officers and one compliance inspector) and two interviews with three individuals representing two participating carriers.

6.3.1.7 Planned Procedures to Evaluate Use Cases and Goals

The following procedures of the evaluation are derived from the goals, objectives, and hypotheses as outlined in section 5. The format of the procedure numbering system is the objective number and order of the corresponding hypothesis. For example, procedure 1.1-A corresponds to the first hypothesis from objective 1.1. Procedure 1.1-B corresponds to the second hypothesis from objective 1.1, and so on.

- Goal 1, Objective 1.1, Hypothesis: The level WRI inspection report is obtained 95 percent of the time.

  Procedure 1.1-A: The Kentucky platform ensured the driver log of participating CMVs is delivered to the UT evaluation team from the carriers in order to measure the total number of vehicles that pass the vehicle ID reader trigger point.

  The Kentucky Transportation Center measured the number of vehicles that were correctly identified via the LPR or transponder reader for a representative sample of CMVs and validate the accuracy of the vehicle ID reader.

The UT evaluation team measured the number of RSDMs that were sent to the Federal GBOS based on the timestamp attributes delivered by the Kentucky platform.

UT evaluation team measured the total number of level WRI inspection reports that were sent to the Kentucky GBOS based on the timestamp attributes delivered by Volpe.

- Goal 1, Objective 1.2, Hypothesis: The level WRI inspection report is on time 95 percent of the time.

  Procedure 1.1-B: Timestamp generating computers were synchronized to NIST and placed in the EST time zone by the Kentucky platform.

  Timestamps of events involved between each system and sub-system were collected, as outlined in the quantitative data collection requirements document, in a separate comma-delimited file after being stripped of PII. Volpe stripped GBOS data of PII, and the Kentucky platform did not send PII to the UT evaluation team.

  All RSDMs were delivered to the UT database by the Kentucky platform.

  Volpe delivered all level WRI inspection reports to the UT database.

  Final decision point latency requirements were determined by Kentucky enforcement personnel.

- Goal 1, Objective 1.1, Hypothesis: The level WRI inspection report is accurate 95 percent of the time.

  Procedure 1.1-C: The Kentucky platform manually confirmed accuracy of Universal ID equipment.

  The UT evaluation team collected RSDMs delivered to the UT database by the Kentucky platform.

  The UT evaluation team will collect the level WRI inspection reports delivered to the UT database by Volpe.

  The UT evaluation team corroborated RSDMs and level WRI inspection reports for specific inspection events where possible

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.2 (screening support) can be performed by at least one of the technology options.

  Procedure 1.2-B: The Kentucky platform manually verified successful ID of CMVs (matching of ID with RSDS message).

  Volpe sent level WRI inspection report to Kentucky roadside enforcement meeting latency requirements.

Kentucky platform verified receipt of Federal GBOS CMV safety alert.

Kentucky platform measured time of proceed or stop latency for inspection of the CMV.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.3 (traditional inspection support) can be performed by at least one of the technology options.
  Procedure 1.2-C: The UT evaluation team qualitatively verified from the Kentucky platform that a level WRI inspection report is accessible by mobile devices and that those data are in a format that can be integrated into existing or future handheld inspection support devices through the web interface

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.5 (routine safety analysis or special study) can be performed by at least one of the technology options.
  Procedure 1.2-E: Carriers and other parties verified third-party access to level WRI inspection reports and log files from Federal GBOS archives.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.6 (carrier use of SDMs) can be performed by at least one of the technology options.
  Procedure 1.2-F: Refer to procedure 1.2-E.

- Goal 1 Objective 1.2, Hypothesis: Operational scenario 6.1.7 (use of SDM in transportation planning and management) can be performed by at least one of the technology options.
  Procedure 1.2-G: Refer to procedure 1.2-E.

- Goal 1, Objective 1.2, Hypothesis: Operational scenario 6.1.8 (managing the WRI network) can be performed by at least one of the technology options.
  Procedure 1.2-H: Qualitative analysis of the Kentucky platform by the UT evaluation team was used to test this hypothesis.

- Goal 1, Objective 1.2, Hypothesis: A CMV safety alert can be used in the e-screening process to flag a vehicle for inspection.
  Procedure 1.2-I: Refer to procedure 1.2-B.

- Goal 1, Objective 1.2, Hypothesis: Enforcement officers can access data well after WRI assessment results are returned.
  Procedure 1.2-J: Refer to procedure 1.2-E.

- Goal 1, Objective 1.2, Hypothesis: All interventions can be carried out after WRI assessment results are returned.
  Procedure 1.2-K: Refer to procedure 1.2-E.

- Goal 8, Objective 8.1, Hypothesis: Current capacity exceeds resource demands for the pilot test.
  Procedure 8.1-A: The Kentucky platform logged capacity related errors or system failures.

Kentucky platform logged total inspection requests initiated.

Volpe logged total compiled level WRI inspection reports delivered.

Kentucky platform logged daily enforcement resources by shift.

- Goal 8, Objective 8.2, Hypothesis: Unplanned downtime less than 5 percent of the planned system up time.

  Procedure 8.2-A: The Kentucky platform self-reported on the planned up time and downtime of the Kentucky system.

  Kentucky platform logged unplanned downtime where possible.

- Goal 8, Objective 8.4, Hypothesis: All data formats are non-proprietary and technology may be proprietary.

  Procedure 8.4-A: The Kentucky platform disclosed data formats and technology used.

- Goal 9, Objective 9.1, Hypothesis: The level WRI inspection report is obtained 95 percent of the time.

  Procedure 9.1-A: Quantitative results from procedure 1.1-A were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.1, Hypothesis: Level WRI inspection report is on time 95 percent of the time.

  Procedure 9.1-B: Quantitative results from procedure 1.1-B were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.1, Hypothesis: Level WRI inspection report is complete and accurate 95 percent of the time.

  Procedure 9.1-C: Quantitative results from procedure 1.1-C were combined with a qualitative analysis in order to test this hypothesis.

- Goal 9, Objective 9.2, Hypothesis: Data will be encrypted or otherwise stripped of PII to limit exposure from unauthorized users.

  Procedure 9.2-A: The Kentucky platform documented data security measures of Kentucky and motor carrier data flows.

  The UT OIT and GBOS recorded any breaches in data security flows or flows of information that may take place during the test at UT.

- Goal 9, Objective 9.2, Hypothesis: Network is securely managed to limit unauthorized access.

  Procedure 9.2-B: Refer to procedure 9.2-A.

- Goal 10, Objective 10.1, Hypothesis: Stakeholder and WRI participants support implementation of the WRI system.

Procedure 10.1-A: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

- Goal 10. Objective 10.1. Hypothesis: Stakeholders and WRI participants support that the technical aspects of the WRI system should be implemented.

  Procedure 10.1-B: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

- Goal 10, Objective 10.1, Hypothesis: Stakeholders and survey participants involved with the WRI project believe that the system should be implemented due to the benefits to participants.

  Procedure 10.1-C: Stakeholders (carriers, service providers, sensor providers, and enforcement) were interviewed.

6.3.1.8 Operational Scenarios, Use Cases, and Evaluation Cases

Goal 1, Objective 1.2 proposes a series of Operational Scenarios that are to be evaluated on the Universal ID platform. The Operational Scenarios can be decomposed into a series of Use Cases and Evaluation Cases presented in Table 16. The proposed Evaluation Cases are listed, as well as whether or not the pilot test (as deployed) was successful at generating data to support these Evaluation Cases.

Table 16. Universal ID operational scenarios, use cases, and evaluation cases.

Operational Scenario	Use Case	Evaluation Case Name	Proposed Universal ID Evaluation	Successful Universal ID Evaluation
6.1.1 Unstaffed automated safety enforcement, compliance, and assessment	1. WRI fixed-site data collection and assessment	001-02. SDM collection: Part 1 (Confirm the vehicle crosses SDM trigger point, SDM is collected, and SDM is compiled)	Could be tested by using cameras or DSRC as RSDM trigger point.	Yes. Collected KY TSIDs measure this.
		001-03. SDM collection: Part 2 (Confirm the SDM is transmitted)	Part of basic operation of private side of WRI system.	Yes. Collected KY TSIDs measure this.
		001-04. WRI assessment processing and report generation: Part 1 (Confirm receipt of SDM)	Part of basic operation of WRI system (private/GBOS interface).	Yes. Collected GBOS TSIDs .measure this.
		001-05. WRI assessment processing and report generation: Part 2 (Validate structure and format of message set received)	Part of basic GBOS WRI operation.	Yes. Part of basic GBOS operation/ design.
		001-06. WRI assessment processing and report generation: Part 3 (Validate message set data)	(see above)	Yes. Collected GBOS TSIDs measure this.
		001-07. WRI assessment processing and report generation: Part 4 (Correlate the SDM, infrastructure data, and roadside sensor data set, if applicable)	SDM, infrastructure data and roadside sensor data set will be available.	Yes. See above.
		001-08. WRI assessment processing and report generation: Part 5 (Assess compliance and safety status)	Part of basic GBOS WRI operation.	Yes. See above.
		001-10. Confirm storage of WRI data and level WRI inspection reports in back office database	(see above)	Yes. Collected GBOS database shows successful data storage..

Operational Scenario	Use Case	Evaluation Case Name	Proposed Universal ID Evaluation	Successful Universal ID Evaluation
6.1.2. Screening support		001-11. Confirm database access and interface receives WRI results (Level WRI inspection report, safety alert, SDM alert) and/or WRI data	Part of basic GBOS WRI operation (Volpe function not requiring any Universal ID-specific testing). Carrier will not have access to KY GBOS.	Yes. Confirmed in both FMCSA portal and reception of level WRI inspection report at KY State GBOS.
		001-12. Confirm real-time enforcement support and interface receive WRI results and/or WRI data	Could be tested by enforcement users (at inspection station associated with a given SDM); note that it is assumed that any required logging would be done by the GBOS. Inspections are displayed on the Volpe portal.	Yes. See above.
		001-13. Confirm local enforcement protocols can be enforced	Various enforcement uses will be tested to the extent they are supported by the GBOS and possible with Universal ID technology.	No
6.1.3 Traditional inspection support	1A. WRI fixed-site data collection and assessment; local assessment processing	001A-01. WRI assessment processing and report generation: Confirm state GBOS can complete Evaluation Cases 001-04 through 001-09	Part of basic GBOS WRI operation (Volpe function not requiring any CMRS-specific testing).	Yes. Collected timestamps measure this and is otherwise a basic part of the GBOS operation.
		001A-02. Confirm WRI data and results are sent to state GBOS and can be viewed	State GBOS should be capable of this.	Yes. State GBOS received and viewed level WRI inspection report.
	1B. WRI fixed-site data collection and assessment; remote sensor collection and processing	001B-01. Roadside encounter data collection: Part 1 (Confirm roadside sensors collect carrier, vehicle, and/or driver ID data associated with the trigger "encounter")	There will be roadside sensor data integrated in KY.	No
		001B-02. Roadside encounter data collection: Part 2 (Confirm roadside sensor data set message is compiled)	(see above)	No

Operational Scenario	Use Case	Evaluation Case Name	Proposed Universal ID Evaluation	Successful Universal ID Evaluation
		001B-03. Roadside encounter data collection: Part 3 (Confirm roadside data set [RSDS] message is transmitted)	(see above)	No
		001B-04. WRI assessment processing and report generation from roadside encounter data collection: Part 1 (Confirm SDM is received)	(see above)	No
		001B-05. WRI assessment processing and report generation from roadside encounter data collection: Part 2 (Confirm GBOS receives RSDM)	(see above)	No
		001B-06. WRI assessment processing and report generation from roadside encounter data Collection: Part 3 (Validate RSDM for structure and format)	(see above)	No
		001B-07. WRI assessment processing and report generation from roadside encounter data collection: Part 4 (Validate SDM for structure and format)	(see above)	No
		001B-08. Confirm GBOS requests SDM from carrier	(see above)	No
		001B-09. Confirm carrier sends SDM	(see above)	No
	1C. WRI fixed-site data collection and assessment; roadside sensor data collection + local processing	No new Evaluation Cases: Evaluation cases for 001C are a combination of Evaluation Cases 001, 001A, and 001B	Use case 001C is simply a combination of steps from Use Case 001A and 001B, and since KY can do most of those either directly or indirectly, it is possible.	Partial

Operational Scenario	Use Case	Evaluation Case Name	Proposed Universal ID Evaluation	Successful Universal ID Evaluation
6.1.5. Routine safety analysis or special study	3. Post processing analysis of WRI data and results	003-01. Verify transfer of data analysis of WRI results from roadside enforcement staff/systems	These Evaluation Cases refer to GBOS access issues and do not require any additional Universal ID testing. Completion of this Evaluation Case will depend on carrier and Federal GBOS ability.	Yes. GBOS analyzed vehicles for violations.
		003-02. Verify transfer of data analysis of WRI results from analysts (Government) 003-03 Verify transfer of data analysis of WRI results from analysts (private)	(see above)	Yes. Collected KY TSIDs show this.
		003-03. Verify transfer of data analysis of WRI results from MC/coach	(see above)	Yes. See above
6.1.7. Use of SDM in transport planning and management		003.04. Verify transfer of data analysis of WRI results from GBOS	(see above)	Yes. See above
6.1.6. Carrier use of SDM	4. Carrier use of WRI data and results	004-01. Confirm GBOS send notification to carrier	These Evaluation Cases refer to GBOS access issues and do not require any additional Universal ID testing. (Note that the Universal ID fleet partners will not be subscribing to notifications or alerts; at most, they may choose to access their WRI inspection data via the GBOS's MC user interface.) Also, carriers will not have access to the KY GBOS. Completion of this Evaluation Case will depend on carrier and Federal GBOS ability.	Yes. Collected KY TSIDs show this.
		004-02. Confirm request of subscription to automatically receive safety alerts associated with the carrier	(see above)	Yes. Collected KY TSIDs show this.
		004-03. Confirm request of a report of all WRI assessments associated with the carrier	(see above)	Partial

Operational Scenario	Use Case	Evaluation Case Name	Proposed Universal ID Evaluation	Successful Universal ID Evaluation
6.1.8. Managing the WRI network	5. Management of the WRI network	005-01. Confirm management of the WRI System configuration	The capability for this Evaluation Case exists.	Yes. See GBOS event log.
		005-02. Confirm provisioning and configuring of fixed WRI System	The capability for this Evaluation Case exists.	Yes. See GBOS event log.
		005-03. Confirm detection, isolation, and correction of WRI infrastructure and service problems	The capability for this Evaluation Case exists.	Yes. See GBOS event log.
		005-04. Confirm monitoring of WRI system and subsystem performance	The capability for this Evaluation Case exists.	Yes. See GBOS event log.
-	6. Dropped	Use case deleted; no Evaluation Cases		n/a
6.1.8. Managing the WRI network	8. WRI system self-test by roadside or mobile enforcement	008-01. Confirm enforcement submits SDM in training mode and data submitted to GBOS is tagged as training data and kept separate from "real" data	Tested for fixed roadside enforcement to the extent it is supported by the GBOS prototype.	Yes. GBOS shows status of data submitted.

6.3.2 Chronological Description of the Work

In September 2008, FMCSA's PRISM team awarded the Kentucky Transportation Cabinet a grant to install and evaluate a new commercial vehicle screening system located on a selected weigh/inspection station entrance ramp in Kentucky. The Kentucky Transportation Cabinet contracted with the University of Kentucky (UK) Transportation Center to execute the approved proposal. The project involved the design, specification, procurement, installation, integration, operation, and evaluation of an automated ramp screening system located on a weigh/inspection station ramp. The UK Transportation Center developed a request for proposals and solicited responses from potential vendors for the project. A selection committee comprised of stakeholders from the Kentucky Transportation Cabinet and the Kentucky State Police Commercial Vehicle Enforcement division was established to review proposals. In September 2009, the UK Transportation Center completed negotiations with FMCSA's WRI team to participate in the Phase II pilot test. The objective of the Kentucky Universal ID pilot test was to conduct an end-to-end pilot test of WRI functionality using technology deployed for commercial vehicle enforcement purposes in Kentucky.

After the selection committee reviewed the proposals and observed equipment demonstrations, vendors were selected to provide automatic LPR and USDOT reader technologies. Negotiations between UK and Perceptics were completed in early spring 2010. A decision was made to use a single automated LPR vendor for the WRI project to avoid any possible correlation issues between the various sensor technologies that were to be evaluated as part of the PRISM Automated Ramp Screening project. The Kentucky Transportation Cabinet's Advantage Commercial Vehicle Operations (CVO) Electronic Screening Program supplied the DSRC reader technology, which is based on the Hughes/Raytheon protocol.

Construction and installation requirements were determined, and negotiations began with the electrical service provider in the Boone County, Kentucky area. Discussions also were initiated with the Kentucky Transportation Cabinet's electrical and civil contractor for Kentucky Department of Highways District 6. The electrical and civil work was begun in early May 2010. Meanwhile, the automated LPR vendor came onsite in late July 2010 and performed a temporary installation of their system. The equipment was then tested and optimized. The electrical and civil work was completed in mid October. Power was established to the cabinets used to house the various roadside sensors, and the fiber optic and Ethernet cabling was installed and tested, thereby establishing communications between the roadside and the station's scale house. Permanent installation, configuration, and further testing of the automated LPR system followed this. The PRISM screening computer and Kentucky BOS server were installed at the Boone County facility in early November 2010.

Although the groundwork for the network communications required for the PRISM Automated Screening System had been previously discussed with the Kentucky Transportation Cabinet's Office of Information Technology, there was considerable delay in obtaining the necessary permissions to connect to and transfer data to and from various servers, including the GBOS.

6.3.3 Data Collected

- Platform Data:
  - LPR log files from 12-12-2010 through 01-31-2011 (.csv format).

The LPR log files were required to determine the latency and occurrence of events before the identity message reaches the Federal GBOS. Useful fields include platform ID, date/time, four event timestamps, and encounter location.

- GBOS data (Oracle.dmp format).
  - WRI_ALERTS table.
  - WRI_CARRIER_REGISTRATION table.
  - WRI_CFR_REFERENCE_SET table.
  - WRI_GLOBAL_REFERENCE table.
  - WRI_HOS_EVENTS table.
  - WRI_LOG table.
  - WRI_RECORDS table.

- WRI_VEH_BRAKES table.
- WRI_VEH_TIRES table.
- WRI_VEH_WEIGHT table.
- WRI_VEHICLE table.
- WRI_VIOLATIONS table.

These data are useful for determining the latency, content, and occurrence of data stored in the Federal GBOS portion of the pilot test. Only a single instance of an inspection report being returned to the state BOS (K10) was collected. The two most data-rich tables are WRI_RECORDS and WRI_LOG. The WRI_RECORDS table contained information such as location, carrier name, platform, Federal GBOS unique ID, platform ID, and date/time of the encounter. The WRI_LOG table represents the GBOS transactional event log table where all database transactions were recorded, thus giving the UT evaluation team a useful understanding of the process and latency of the GBOS system for the pilot tests. Since the carrier or CMV did not submit the SDM, no vehicle-specific sensor data were collected from the Kentucky platform in the WRI_VEH_BRAKES, WRI_VEH_TIRES, or the WRI_VEH_WEIGHT tables.

- Field Corroboration Data:
  - Field data corroboration (.doc format).
  - Kentucky platform event log (.xls format).

The field data corroboration is an attempt to corroborate the efforts of the Kentucky platform at the experimental location to verify the timing and reliability of the pilot tests for the Kentucky platform. The Kentucky evaluation team manually validated license plate images using captured images from LPR. The UT evaluation team was not present at the time of data collection. The Kentucky platform also kept an event log documenting unexpected events and/or problems with actual data flow.

6.3.4 Impact of the Test Environment

There were three main limitations that occurred during the data collection phase that limited the manner in which the test was conducted, shown in the sections below.

6.3.4.1 Kentucky Transportation Cabinet IT Security

One of the objectives of this analysis was to provide an end-to-end test that would send a completed inspection report to the state BOS. As such, the Kentucky Transportation Cabinet was required to allow the Federal GBOS to upload an inspection record into the state BOS. For the duration of the test, the GBOS did not have access to the state BOS due to security policies and technical limitations. Once the challenge was resolved, the GBOS was able to successfully transmit one inspection report to the state BOS on January 28, 2011.

6.3.4.2 Manual Driver Information Entry by Carrier

The LPR can only read information from the CMV and cannot measure or confirm any information about the driver. A fully automated inspection would link to the participating carriers' management system and include the driver and associated information. This feature was not, however, developed for this pilot test. To assess driver information, the carrier was responsible for monitoring the WRI interface, and when a participating vehicle triggered an inspection, personnel at the carrier management center would manually enter the driver information, which would allow the inspection to proceed. This is clearly not a real-time solution since the lag time could be on the order of minutes in the best-case scenario. During the test, this step took hours in most cases.

6.3.4.3 Weather-Related Performance Deterioration of LPR

During the pilot test, Kentucky and surrounding states served by the participating carriers encountered severe winter weather, which obscured the front-mounted license plate with ice and/or road-salt and debris accumulation (Figure 21). The LPR had very low successful read rates during these periods. Although these weather events limited the amount of successful inspections that were conducted, some successful data were gathered around these dates.

Figure 21. Photograph. Unreadable license plate from snow and ice accumulation.

6.3.5 Data Summary and Analysis

Test statistics for Kentucky station include:

- Carriers: 2
- Drivers: 1 per vehicle
- Identity Messages: 29
- SDMs: 26
- Validated SDMs: 26
- Level WRI inspection reports: 26
- Data loss rate: 10.3%

6.3.5.1 Message Accuracy

Errors for the Kentucky platform fell in two categories:

- Multiple Triggers within the same station within 60 seconds– E1: This error occurred if the time elapsed between two different WRI_ENCOUNTER_IDs was less than 60 seconds apart at the same LPR. This error represents a single vehicle triggering an LPR trigger point multiple times rather than only once.
- Duplicate Encounter ID – E2: This error was determined by the occurrence of multiple encounters with the same WRI_ENCOUNTER_ID. This error represented an error in preserving the uniqueness of various Universal ID encounters.

None of these error types observed during the test for the Kentucky platform.

6.3.5.2 Message Latency

Mean value, standard deviation, 95 percent confidence intervals for the average transmission latencies, and 95th percentile latencies were calculated. Confidence intervals are an interval estimate for a population parameter. A 95 percent confidence interval means that a 95 percent chance exists that the specified interval contains the true *mean* value. The 95th percentile latencies value can be adopted as critical values for latencies hypotheses–namely, 95 percent of latency values should be smaller than this value. Policy recommendations can then be made based on these values. Latencies of various sub-process transmissions include:

1. Latency between K2 and K4.
2. Latency between K4 and K6a.
3. Latency between K6a and K6f.
4. Latency between K2 and K6f.
5. Latency between K6f and K7.
6. Latency between K7 and K9.
7. Latency between K2 and K9 (minus K6f – K7).

In Table 17, the latency for each process and sub-process is shown. The distribution figures for latency are included in Figure 22.

Table 17. Latency analysis for the Kentucky platform.

Sub-process	Mean (sec)	Standard Deviation (sec)	95% Lower Confidence Interval (sec)	95% Upper Confidence Interval (sec)	95^{th} Percentile (sec)
Generation of Identity Message (K2-K4)	36.8	18	29.5	44.1	63.6
Transmission of Identity Message from Roadside to GBOS (K4-K6a)	2.9	1.8	2.1	3.7	7.1
Generation of SDM (K6a-K6f)	0.46	0.13	0.41	0.52	0.84
Total Time to Generate, Validate and Post SDM (K2-K6f)	42.8	19.3	34.5	51.2	74.6
Time to Receive Driver Information (K6f-K7)	34459.8	57514.1	10173.7	587458	181105.3
Level WRI Inspection Report Generation (K7-K9)	0.1	0.05	0.09	0.13	0.24
Total Time to Generate Level WRI Inspection Report (Minus Time to Receive Driver Information) (K2-K9 minus K6f-K7)	43.3	19.7	34.6	52.0	75.2

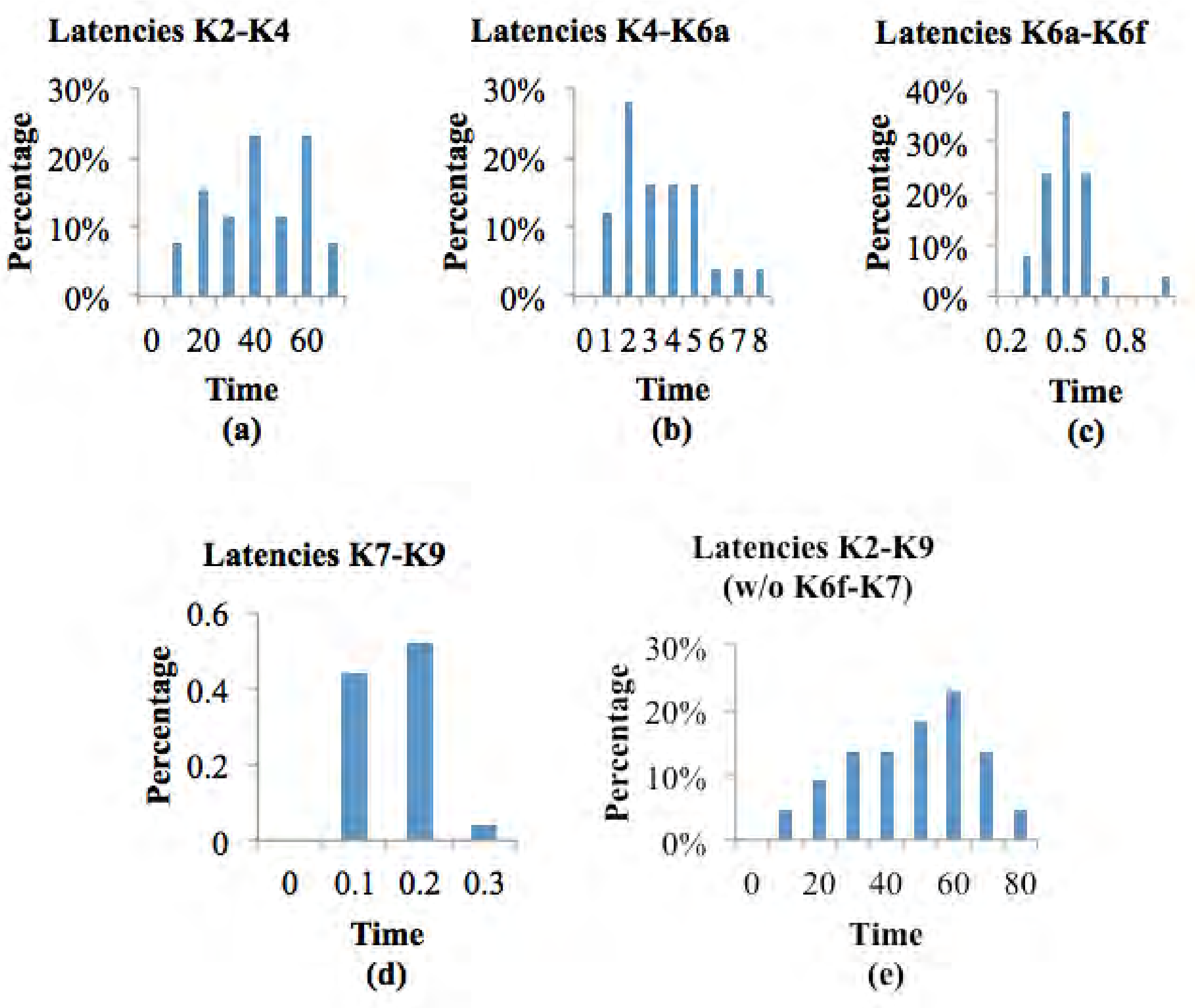


Figure 22. Charts. Distribution of latency for each sub-process for the Kentucky pilot test.

As shown in Table 17 and Figure 22:

- It took an average 36.8 seconds for an Identity Message to be generated (Figure 22a).
  - 95 percent of the time, it takes less than 63.6 seconds to generate an Identity Message.
  - The 95 percent confidence interval of falls between 29.5 seconds and 44.1 seconds to generate an Identity Message for a specific instance.
- It took an average 2.9 seconds for the Identity Message to be transmitted from the Kentucky Platform to the GBOS (Figure 22b).
  - 95 percent of the time, it took less than 7.1 seconds to transmit the Identity Message to the GBOS.
  - The 95 percent confidence interval of falls between 2.1 and 3.7 seconds to transmit an Identity Message for a given instance.

- It took an average 0.5 seconds for an SDM to be generated (Figure 22c).
  - 95 percent of the time, it took less than 0.9 seconds for an SDM to be generated.
  - The 95 percent confidence interval of falls between 0.4 seconds and 0.5 seconds to generate an SDM for a given instance.
- The sum total amount of time it took for an SDM to be generated is 42.8 seconds (Figure 22e).
  - 95 percent of the time, the sum total amount of time it took to generate an SDM was less than 74.6 seconds.
  - The 95 percent confidence interval of falls between 34.5 seconds and 52.1 seconds of sum total time to create an SDM for a given instance.
- The mean latency of the human-in-the-loop inspection was 9.5 hours, with a minimum time of 85 seconds and a maximum time of 51 hours.
  - Including a human as a part of the data processing and entry is clearly not acceptable for real-time automated WRI inspections.
  - Even in the best-case scenario, when the input interface is being monitored in the context of a controlled pilot test, the latency for this step is unacceptably long -- more than one minute.

6.3.6 Pre-Evaluation by Pilot Test Teams

6.3.6.1 Qualitative Analysis

- Fleet Assessment:
  - In the context of a nationally deployed system, the two fleets provided differing answers on how a nationwide deployment of WRI would affect them. One fleet is does not perceive how it would affect them, how they would benefit, or what the ultimate goal is. The other fleet is eager to see it implemented.
  - When asked whether they thought WRI could help improve the efficiency for their fleets on a long-term basis, one fleet is unsure how this will occur other than saving time by a driver spending less time stopped and felt that being required to pull off of the Interstate frequently is not a good thing, but if vehicle speeds could be maintained on the Interstate, that this would be more palatable. The other fleet sees this as a way to improve their efficiency.
  - When asked whether WRI could help improve fleet safety standards for their vehicles, one fleet states that they keep their vehicles up to standards and does not understand how they will benefit. They feel they would needlessly be inspected more but that getting unsafe vehicles off of the road would be a benefit for all. The other company thinks this is a good way to "level the playing field" and force all fleets to adhere to the same set of standards.
  - The fleets were asked about their impressions of using WRI as a way to provide positive credit for "clean" inspections under the CSA measurement system. One of the carriers thinks it is "a base start," but since CSA is not yet completely laid out, does not know how it would work. The other carrier thinks it is a good way to

provide positive credit for “clean” inspections, that presently not enough credit is given for clean inspections, and that this would be “a great equalizer to give people a fair look at fleets.”

- When asked what type of feedback they would like to receive from the government system after submitting an SDM, one of the carriers is in favor of the idea of getting a response indicating the results of an inspection but does not want information over the long term; the other fleet wishes to see the information that shows only vehicle problems.
- The fleets were asked to share their opinions on how and when WRI results should be shared with the driver. One fleet thinks the driver should be aware at all times; the other fleet thinks that it is important to share the information with the driver immediately if there is a problem.
- The fleets were asked about their perceptions of the utility of the self-test feature. One of the fleets thinks this would be beneficial. The other fleet thinks that if they had problems with inspections, this would be of interest, but that if there were no history of problems, they would not receive any benefit from this, nor would they use it.
- When asked to share their impressions of the by-pass/pull-in features, one of the carriers, though they had not reviewed the idea, states that drivers do not like to exit the Interstate, especially in heavy traffic. The other carrier had no impression of it since the scales in Kentucky were so infrequently open during the pilot tests.
- One of the fleets has concerns about the need to possibly have additional equipment. Specifically, they have concerns in regard to weight, location of equipment in vehicles, and possible driver distractions. The other fleet suggests it would depend on the equipment and that they would “need to work through a lot of issues if we wanted to do anything like that.”
- The fleets were asked, based on the Webinar and what they had been shown the expected user benefits to be, whether they think the WRI system should be implemented. One of the fleets, from what they have seen at this time, does not think so. The other fleet thinks there is no way around it.
- The fleets were asked their impressions of a scenario whereby a fleet manager or carrier representative would have a smart phone and would receive an alert in regard to a vehicle inspection on the smart phone requesting them to supply the WRI system with the needed information.
  - With this scenario, there are concerns as to how quickly information would need to be reported and what would occur if a different driver were operating the vehicle.
  - There are concerns as to who would receive the notification as it relates to a person not being able to input the data. People being on vacation, off duty, sick etc. were given as potential problem situations.
  - One fleet thinks this process would best be housed in their safety department, which is staffed 24 hours a day. This would allow the information to appear

on either a safety screen or a dispatch screen. The people working at these positions would then be required to input the needed information.

- With the understanding that the WRI user interface was designed for the pilot tests, impressions of it were asked. One fleet finds it to be user-friendly, and the other fleet finds it acceptable as long as the information is accurate.
- One fleet is impressed with the WRI technologies and thinks it has the potential to prevent crashes related to violations involving speeding and brakes, or at minimum, create awareness about these problems. The other fleet does not see a benefit and worries that it is just more of "the same old thing." This fleet also does not understand how some items (brakes, lights, etc.) will be checked during a rolling inspection.
- Both fleets agree that implementing LPR technology on the main line, requiring no pull-off by drivers, would be a better option.
- In future tests, one fleet would like to increase the number of vehicles involved and have someone dedicated to "watching" it.

- Enforcement Assessment:

For the purposes of the law enforcement qualitative analysis, the UT evaluation team interviewed compliance personnel from Kentucky as well as members of the KSP. For consistency, they will be referred to as Kentucky personnel in this section.

In general, the participating interviewees had limited experience using the WRI system; some of the participants had no personal experience actually using the system. However, all participants were aware of the system in their jurisdiction and viewed the informational Webinar.

- The Kentucky personnel wish to see accurate tag expiration data, registration information, mileage and hours of service data, Department of Transportation (DOT) and KYU (tax license number issued for the Kentucky Weight Distance Tax) numbers, and brake stroke and tire information.
- Some of the Kentucky personnel think they would use WRI results as a possible tool to help aim them in the right direction during the inspection process. Two personnel members do not yet fully understand how they would use the WRI results. One feels that if another issue distracted him, the system prompting other CMVs to pull over automatically, should they need to be, would be an asset.
- The Kentucky personnel were asked how WRI would affect them as they perform their duties. Some of the Kentucky personnel think the WRI system will help to determine violations they would normally miss or not see. Some personnel are unsure how they could be affected given their limited exposure to the system.
- One of the Kentucky personnel members thinks inspection time could be reduced by 10 minutes since the WRI system has the ability to auto-fill paperwork. Because of this, he thinks they could perform more inspections as well.
- The Kentucky personnel tend to agree, that if used properly, and with the proper compliance on the part of the fleets, that there would likely be an initial spike of

Out-of-Service (OOS) violations. Generally, it is thought that once it became apparent the system was performing as advertised, OOS rates would likely decrease. One of the Kentucky personnel members thinks the system could work well with respect to OOS issues with CMVs, but not with drivers.

– None of the Kentucky personnel interviewed understand how non-OOS violations could really be affected in a nationwide WRI deployment scenario. One member of the Kentucky personnel does, however, think license plate violations could be a non-OOS violation that could be helped by WRI.

– There was no clear consensus among the Kentucky personnel as to what degree a traditional inspection would take more or less time to perform if a traditional inspection followed a WRI. Two of the interviewees do not feel they have enough knowledge of the system to provide an informed response. One interviewee thinks the paperwork pre-fill options could decrease the amount of time to perform an inspection; however, this same interviewee expresses concern that if the WRI system were not accurate, there would be a need for computer verification, which would increase the amount of time to perform an inspection.

– The Kentucky personnel provided differing opinions on whether a nationwide deployment of WRI would increase CMV safety. One interviewee indicates a hope that CMV safety would be improved but that compliance would be a necessity. Two of the interviewees feel strongly that CMV safety could be improved. One interviewee expresses a concern that even with the safest CMV, an unsafe driver could still operate the vehicle.

– Based on a nationwide deployment, some of the Kentucky personnel agree that WRI, by providing better information, would increase their efficiency and that overall it would help them to better perform their duties. One interviewee feels that he needs more experience with the system before he would be able to provide an informed response.

– Based on a nationwide deployment, the Kentucky personnel think fleets will be more likely to keep vehicles up to required standards, but express concern with the need for WRI system effectiveness and with those fleets that always find ways to “beat the system.”

– In the context of the pilot tests, suggested system improvements to the WRI system are:
  - The ability to read the trailer license plates.
  - The need to take fleet grace periods for expired license plates into account.
  - The need for the system to clearly communicate with enforcement/compliance personnel.
  - The ability for enforcement/compliance personnel to view electronic logs.
  - The desire for the LPR equipment in the inspection station to have a space bar and be able to pause the scrolling of the screen.

– In the context of the pilot tests, potential system inadequacies of concern were:
  - Data feedback return time.

    - Lack of current information.
    - Snow and ice accumulation on license plates.
- The Kentucky personnel agreed they would likely review past WRIs for examining particular vehicles and/or drivers. One interviewee states that this would just be one part of an overall larger picture. Another interviewee thinks it could be a valuable tool but that if it did not work as advertised, personnel would revert to the traditional methods currently in use.
- Based on using the WRI system and reports, the Kentucky personnel agree they would have the ability to successfully carry out interventions should they need to do so.
- The Kentucky personnel were asked how they would ensure that vehicles were using the WRI system. One interviewee feels that spot checks could be an option. Two interviewees are not quite sure how that could occur; one feels that the WRI system would need to be (and should be) mandatory.
- The Kentucky personnel support the implementation of the WRI system. One would like a guarantee that the system would work as advertised. Another officer stated he "does not see why not, and that more information is always better."
- Kentucky is a state that uses NORPASS as an electronic screening method. The Kentucky personnel were asked to share their opinions on NORPASS and whether they thought there would be changes to it as a result of WRI deployment. For the most part, the Kentucky personnel either like or have no opinion of NORPASS. One of the Kentucky personnel thinks that occasionally bad drivers take advantage of the NORPASS system.
- The Kentucky officers agree that, though still a blossoming technology, WRI has the potential to make them better officers.
- The Kentucky personnel like the idea of placing the LPR technology directly on the Interstate, whereby CMVs could be inspected at speed. One interviewee cautions though that under this scenario, interdiction could be an issue.
- Some of the Kentucky personnel expressed concerns with CMVs bypassing the scale but indicate any method to combat this problem would be justified and welcomed.
- The idea of an audio system to inform enforcement/compliance personnel was thought to be a good idea.

Additional comments and feedback from the KSP interviews are given below:

- Some of the Kentucky personnel provided insight into driver reaction to the newly installed LPR equipment at the Boone Co. station. Drivers immediately started to come into the station to inquire about the LPR readers and their abilities. One Kentucky personnel member stated: "The Boone Co. scales… I worked up there yesterday, ever since we have had that system in up there, we have had drivers come through and actually stopped and come in and ask. They see all these cameras and system when they are rolling in. It kind of scares them. It's gotten their attention. They know there's not much they can hide on their trucks."

- When asked if any drivers had provided feedback, one Kentucky personnel member stated: "No. They didn't give any feedback. I think it was more or less they were just curious about what it would do. But you could tell, the visualization and looking at them in the eye and their body chemistry, they were concerned. It's more they will have to do to their trucks to make sure they are up to date."
- As soon as the LPR equipment was installed, CMVs began to be flagged. One Kentucky personnel member stated: "… it was kicking some of these trucks over for credentials and other violations. When we went out and did a walk-around inspection, we found several out of service violations on some of these trucks that normally we would not have caught."
- One of the interviewees would like to see tire infrared brake and brake stroke detectors. He thinks though that this would "… require a huge company buy in. Nobody wants to put a tabulator on the truck that tells us when something is wrong."
- One of the interviewees stated, in reference to WRI: "I think once, if that is implemented, that will really spike your number of scale bypasses. A driver can come by here and not know their brakes are out of adjustment. With an automatic log, he'll know before he gets to the scale whether or not he needs to shoot this scale and take that risk of getting caught. Which as that approaches a certainty, he's more likely to take the chance of getting caught bypassing."

6.3.6.2 Security and Network Access Management

The Kentucky Transportation Cabinet's Office of Information Technology provided guidance and direction relative to network security and access management. This included establishing an Internet protocol address and secure socket layer (SSL) certificate for the PRISM screening computer and Kentucky BOS server and providing fire wall exceptions to permit RSDMs to be passed from the Kentucky BOS to the GBOS and to receive inspection reports from the GBOS.

6.3.7 Observations and Assessment

6.3.7.1 WRI System Functionality

The Kentucky Universal ID platform was successful in achieving many of its goals. The Universal ID platform was the only platform able to both send SDMs and receive Level WRI Inspection Reports to the state BOS. The Kentucky Universal ID platform had an average SDM creation time of approximately 43 seconds (excluding the time needed to obtain driver information from the fleets) and was able to generate Level WRI Inspection Reports, which were viewable on the web interface. From this portal, law enforcement and compliance personnel were able to view appropriate data (within the previously noted tolerances) after vehicle inspection. The Kentucky Universal ID platform was also able to provide the self-test ability. The primary functional deficiency with the Universal ID pilot test was the non-automated identification of drivers by carrier back-office staff. This added significant delay, on the order of minutes to days, to the initiation of a real-time inspection. Automating this function is essential in future deployments.

Based on a series of interviews with Kentucky fleets, the WRI system was viewed as able to serve their needs. The fleets raised several issues concerning aspects of vehicle compliance such as: the need to take fleet grace periods into account for expired license plates, the ability to pause screening, the value of self-tests, and the ability to view electronic logs. These issues could be addressed in the future with further system development. Law enforcement officials had limited knowledge and experience with the platform but mostly agree, that though still a blossoming technology, the WRI system has potential to improve enforcement effectiveness and compliance.

6.3.7.2 WRI System Performance

The Kentucky Universal ID Platform provided a large amount meaningful data for the WRI Pilot Test. Overall; the data were 100% accurate (as defined by the test criteria). The Kentucky Universal ID Platform had a data loss rate of approximately 10.3%, that is, initiated inspections that did not create a full inspection record.

The WRI Inspection Message was generated approximately 43 seconds after the vehicle crossed the LPR boundary (excluding the duration for driver data to be incorporated into the SDM). It took only 2.9 seconds to transmit messages from the vehicle to the GBOS.

There were no errors with the data; however, in the context of a nationally deployed system issues with the technological limitations of LPRs would need to be scrutinized further. Under ideal conditions, the accuracy of the LPRs is approximately 84 percent, indicating that a significant portion of WRI vehicles could fail to be inspected. With adverse winter weather conditions, or in instances where license plates are damaged and unreadable, the reliance on the license plate as the sole universal identifier is flawed. During this pilot test, poor weather contributed to large spans of time in which no data were collected.

6.3.7.3 Lessons Learned

Overall, the Kentucky Universal ID Platform worked as planned. While there were problems and errors that occurred, most of the problems and errors were solvable and/or could be solved in the future within current technological limitations, with the exception of the aforementioned issues with LPR technology. Whereas, the Kentucky Universal ID platform was able to consistently generate a vehicle identity message, send it to the GBOS, have it processed by the GBOS, and return a Level WRI Inspection Report to the state BOS from the GBOS, the platform was unable to post the results to the user interface within a reasonable amount of time to be effective for law enforcement using the current manual driver identification process. This must be automated in future deployments.

Reliance on the license plate as the sole identifier is fraught with risk. Besides having less than a 90% successful identification of plates under ideal conditions; poor weather, damaged plates, or plates that are tampered with will reduce the effectiveness of this platform. Technological developments could improve successful license identification under ideal conditions, but non-ideal conditions will render automated (or human) LPRs less effective than needed.

While the system was not particularly efficient, it could be highly efficient if driver information input and gathering were automated and streamlined. As a comparison, the Tennessee CMRS Platform was able to accomplish this task in less than 10 seconds. While, LPR technology currently has well-documented limitations, the Kentucky Universal ID Platform had no processing errors and was the only platform to successfully receive a Level WRI Inspection Report and with time it could be a viable tool to aid in the future of CMV compliance.

6.4 GOVERNMENT BACK OFFICE SYSTEM PILOT TEST

6.4.1 Test Design

As described in the Back Office System Prototype Concept of Operations[20], the WRI GBOS is composed of two kinds of major system components: Input and Output Communications, and Processing. These components are illustrated in Figure 23.

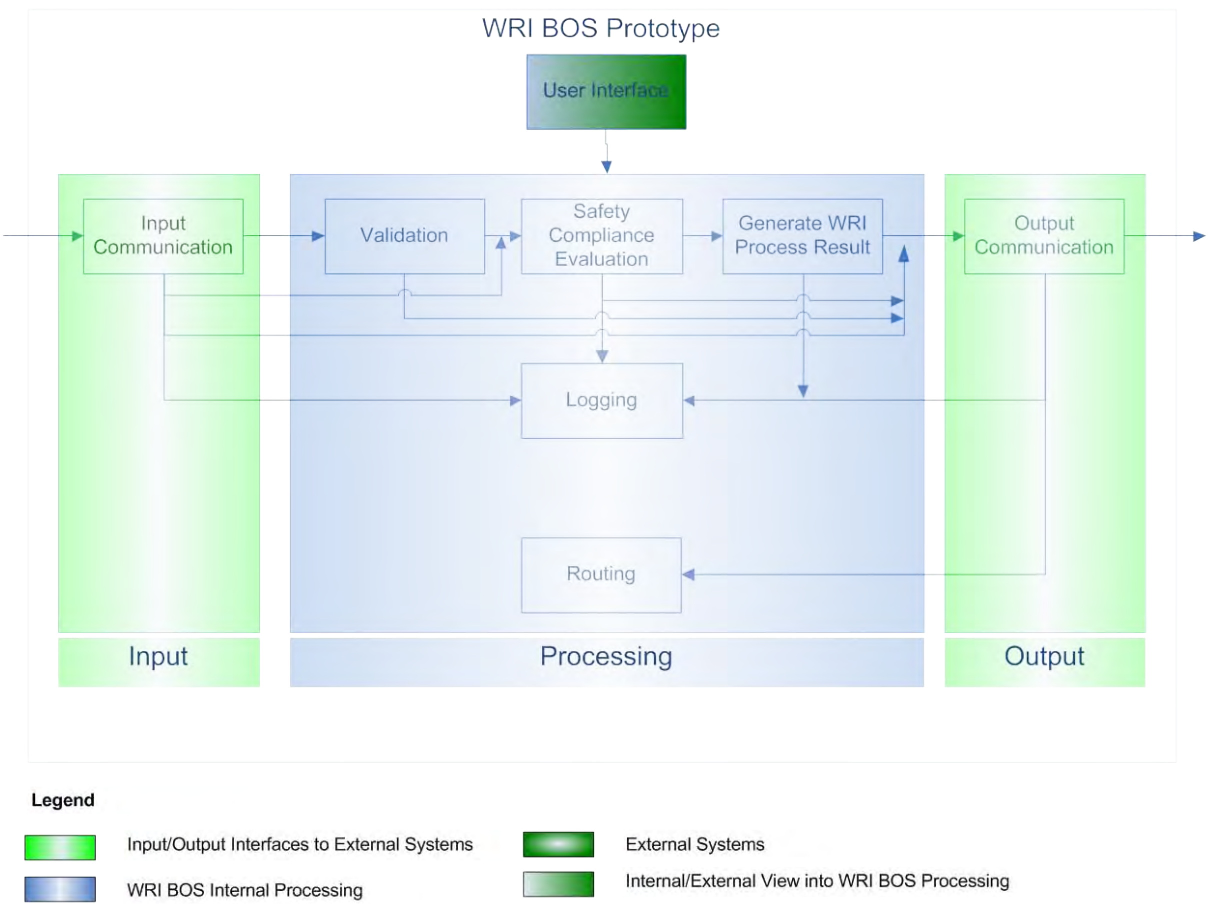


Figure 23. Diagram. GBOS communication and data processing flowchart.

6.4.1.1 Input and Output Communication Components

Input Communications Component. The *Input Communications Component* allowed users of the GBOS prototype to submit SDMs for processing. This component was implemented with a web service interface whereby state systems (Kentucky and New York) and external systems (telematics providers in Tennessee) could send an SDM. The component's parsing mechanisim deconstructed the SDM message, identifying the sender by DOT number. Once the sender of the message was identified, the message was stored in internal memory structures and passed along to the *Validation Component*. Finally, a request was made to the *Output Communications Component* to generate either an acknowledgement message or a message listing validation errors with a request to resend a corrected message.

The *Input Communications Component* was also accessed via the *User Interface Component*. After a Kentucky State system submitted an Identity Message via the web service, a Kentucky carrier was issued an SDM Request e-mail from the *Output Communications Component*. The Kentucky carrier would use the *User Interface Component* to select the driver of the vehicle in the Identity Message. The *Input Communications Component* would add the selected driver information to the Identity Message, generating an SDM.

During the pilot test, the *Input Communications Component* was exercised in "production mode" by the Kentucky state system and two telematics providers in Tennessee. A total of 1,296 SDMs tagged "PRODUCTION" were succesfully submitted via this component. Although no authentication of the sender was performed, the SSL protocol was used during the pilot test for all incoming messages to provide communication security.

Output Communications Component. The *Output Communications Component* provided a mechanism for the GBOS prototype to send messages to communicate with state and external systems. This component was accessed by multiple components and was also called on by the *Generate WRI Process Result Component* once it had generated a message with a WRI Result or a Safety Alert payload to be sent to a target system.

When the *Generate WRI Process Result Component* called the *Output Communications Component*, by passing the message to an internal memory structure, a call was made to the *Routing Component* to locate the information needed to route the message to the receiver. The message to be sent was then constructed and a call was made to the external system, sending the data payload. Finally, the *Logging Component* was called to log the date and time that the message was sent to the external entity.

During the pilot test, the *Output Communications Component* was exercised as follows:

1. For every SDM or Identity Message submitted to the *Input Communications Component*, an acknowledgement/validation error summary message was returned.
2. For every Identity Message submitted to the *Input Communications Component*, an SDM request e-mail was sent to the identified carrier.
3. Late in the pilot test, a pull-in/by-pass message was sent to the CMRS Team 1 provider's web service indicating whether or not a submitted SDM was validated with no violations. Note that the Team 1 provider only received "STOP" (pull-in) messages during the pilot

test because they did not submit any validated SDM without violations; this provider did not successfully send any SDMs tagged as "PRODUCTION."

4. Late in the pilot test, Kentucky's back office web service was deployed to receive WRI Inspection Reports. This was exercised successfully in production mode during the final days of the pilot test.

During the pilot test, the *Output Communications Component* did not make any calls to a *Security Component* to encrypt data elements; however, the SSL protocol was used to encrypt all outgoing messages to provide communication security.

6.4.1.2 Processing Components

The GBOS processing components consisted of the following:

Validation Component. When passed an SDM or Identity Message by the *Input Communication Component*, the *Validation Component* parsed the SDM message and checked for message completeness, missing required fields, valid date and time stamps, and valid field format. Errors detected in the validation process triggered a log entry via the *Logging Component*, and caused an error message and a request for a corrected re-submission to be returned via the *Output Component*. If an SDM passed all validation checks, the SDM was stored internally and passed to the *Safety Compliance Evaluation Component*. If an Identity Message passed all validation checks, the message was stored internally until corresponding driver data was added via the *Input Communications Component*.

During the pilot test, the *Validation Component* was exercised for every SDM and Identity Message submitted. In almost every instance, SDMs tagged as “PRODUCTION” triggered validation errors, causing an error message and a request for a corrected re-submission to be returned via the *Output Communication Component*. In effect, no "PRODUCTION" messages were ever passed on to the *Safety Compliance Evaluation Component* until post processing was performed.[5]

Safety Compliance Evaluation Component. The Safety Compliance Evaluation Component processed the contents of submitted SDMs against FMCSRs and hazardous materials regulations. Snapshots of tables from the Motor Carrier Management Information System (MCMIS) and Commercial Driver License Information System (CDLIS) databases were used to obtain information relevant to the safety evaluation processing.

Safety Compliance Checks were performed in the following areas:

- Carrier
  - Unsatisfactory rated motor carriers; prohibition on transportation: 385.13(a)(1), 385.13(a)(2)
  - New entrant safety assurance program: 385.325(c), 385.337(b)

[5] Due to incompatibilities between platforms, CMRS Team 2 was not able to view the error messages returned from the *Validation Component* via the *Output Component*, and was not aware that there were validation problems with their SDM messages.

- Hazardous materials safety permits: 385.403
- Injunctions and imminent hazards: 386.72(b), 386.72(b)(2)
- Penalties (sanction for failure to pay civil penalties): 386.83(a)(1), 386.84(a)(1)

- Driver
  - Commerical Driver’s License: 383.23(a)(2), 383.23(c)(2), 383.93(a)
  - Qualification and disqualification of drivers: 391.11(b)(1), 391.15(a)
  - Driving of commercial motor vehicles: 392.16
  - Hours of Service: 395.3(a)(1), 395.3(a)(2), 395.3(b)(1), 395.3(b)(2), 395.5(a)(1), 395.5(a)(2), 395.5(b)(1), 395.5(b)(2), 395.8(a)(1), 395.8(k)(2)

During the pilot test, no safety compliance checks were performed against vehicle data (brakes, tires, lights, weight).

The evaulation results identifying violations of safety compliance checks were logged via the *Logging Component* and used by the *Generate WRI Processing Result Component*.

<u>Logging Component</u>. The Logging Component provided services to all of the processing components within the GBOS prototype. Every logged message included a date and timestamp. Some of the events captured by the *Logging Component* included:

- Recording of the content and date timestamp when each SDM and Identity Message was received
- Recording of when an acknowlegement was sent
- Recording of validation errors
- Recording of when the Safety Compliance Evaluation Component processing steps were completed
- Recording of when a WRI result was sent
- Recording of when processing of each SDM started and ended

During the pilot test, the logging component was fully exercised.

<u>Routing Component</u>. *The Routing Component* was accessed by the *Generate WRI Processing Results Component* in order to obtain information about where to send output messages for Kentucky's state system and Tennessee CMRS Team 1's external systems.

During the pilot test, the *Routing Component* was used to:

- Route e-mail messages to Kentucky carriers (indicating that an Identity Message had been submitted, and that carriers should log in and select a driver)
- Route “pull-in” messages to CMRS Team 1's back office system

- Route inspection reports to Kentucky's BOS.

Generate WRI Process Result Component. The *Generate WRI Processing Result Component* accepted a memory structure containing the results of processing done by the *Safety Compliance Evaluation Component*. This component collected processing results and compiled evaluation results into a message to be passed on to the *Output Communications Component*. The contents of the message depended on the result type:

- WRI Result – For the Kentucky Universal ID platform, the evaluation results were compiled into a WRI Result message containing a WRI Inspection Report.
- Safety Alerts - After safety compliance evaluation processing, if any violation was found, a "Safety Alert" message type was generated and stored in a database table. While no team opted to receive Safety Alert messages, the routing component could have been used to send Safety Alerts directly to appropriate state agencies or carriers.
- Pull-In Result – The *Generate WRI Process Result Component* was used to generate a "STOP" or "GO" pull-in result for the Tennessee CMRS Team 1. If any violations were found, a "STOP" message was generated. The *Routing Component* would direct the message to the CMRS Team 1 back office system.

Security Component. The *Security Component* was not implemented during the pilot test. While working with partners during the design phase, it became clear that participants would not be able to utilize the security component as designed during the test. The GBOS concept of operations specifies that an operational *Security Component* would provide authentication and encryption functions to be used by the input and output component.

User Interface Component. For the purposes of the pilot test, the GBOS prototype included a *User Interface Component* with filtered views of data for FMCSA and state agencies, as well as carriers and service providers.

The *User Interface Component* consisted of a website allowing users to view SDM data as received by the GBOS, as well as safety violations detected by the *Safety Compliance Evaluation Component*. Carriers and their service providers were limited to viewing only their own data. State agencies were limited to viewing data for carriers only in their state.

Kentucky state carriers were provided an interface where, upon receipt of an SDM Request e-mail indicating that an Identity Message had been submitted to the GBOS, the carrier would select the driver of the vehicle of which the SDM pertained.

The *User Interface Component* was fully exercised during the pilot test, and provided the main mechanism for viewing the SDM data that was submitted. Note that the *User Interface Component* was devised as a mechanism for entities to view SDM data and safety violations during the pilot test, because WRI partners would not be able to implement modifications to any external systems to receive WRI results from the *Output Communications Component*.

6.4.1.3 Unique IDs

There were two ID numbers associated with the GBOS. First, the *encounter ID*, an ID number assigned at the initiation of the inspection to track the inspection through the process, is carried through the GBOS processes. Second, the *unique ID* is a sequential number that is assigned to SDMs as they enter the GBOS and begin internal processing. This unique ID is specific to the GBOS and independent of platform. It is linked to the encounter ID in several common tables for the sake of tracking log files and SDMs through the inspection process.

6.4.1.4 Timestamps

There are several timestamps collected by the GBOS, outlined in sections 0 and 6.3. The GBOS-generated timestamps are shown in Table 18 (Tennessee CMRS) and Table 19 (Kentucky Universal ID), which include the relevant platform-specific timestamps as a cross-reference (Table 10 and Table 15). GBOS timestamps were generated with different IDs (TSID) in the context of the two platforms that successfully communicated with the GBOS, the Tennessee CMRS platform, and the Kentucky Universal ID platform.

Table 18. GBOS-generated timestamps for the Tennessee CMRS platform.

TSID	Location / Sub process Step	Interface of Timestamp	Group Generating Timestamp	Timestamp Application	Event Causing Data Collection
V1/T11a	Internal App Server receives SDM.	Federal GBOS	Volpe	At reception of SDM at internal app server.	Reception of SDM at internal app server.
V2/T11b	SDM is sent for validation.	Federal GBOS	Volpe	SDM is sent for validation.	SDM sent for validation.
V3/T11c	SDM has finished validation.	Federal GBOS	Volpe	SDM finishes validation.	SDM finishes validation.
V5/T11d	SDM saved into the database.	Federal GBOS	Volpe	SDM is saved into the database.	SDM is saved into the database.
V6/T12a	SDM sent for safety compliance evaluation.	Federal GBOS	Volpe	SDM is sent for safety compliance evaluation.	SDM is sent for safety compliance evaluation.
V7/T12b	SDM has finished safety compliance evaluation.	Federal GBOS	Volpe	SDM has finished safety compliance evaluation.	SDM finished safety compliance evaluation.
V8/T12c	SDM has be sent to the report generation.	Federal GBOS	Volpe	SDM has been sent to report generation.	SDM is sent to report generation.
V9/T12d	Acknowledgement message sent to the sender of the (SDM) message.	Federal GBOS	Volpe	SDM has been sent to sender.	SDM sent to sender.
V10/T13	Completion of level WRI inspection report.	Federal GBOS	Volpe	At completion of WRI inspection report compilation.	Completion of WRI inspection report compilation.

Table 19. GBOS-generated timestamps for the Kentucky Universal ID platform.

TSID	Location / Sub process Step	Interface of Timestamp	Group Generating Timestamp	Timestamp Application	Event Causing Data Collection
V1/K6a	Internal app server receives Identity Message.	Federal GBOS	Volpe	At reception of Identity Message at internal app server.	Reception of Identity Message at internal app server.
V2/K6b	Identity Message is sent for validation.	Federal GBOS	Volpe	Identity Message is sent for validation.	Identity Message sent for validation.
V3/K6c	Identity Message finished validation.	Federal GBOS	Volpe	Identity Message has finished validation.	Identity Message has finished validation.
V5/K6d	Identity Message is saved into the database.	Federal GBOS	Volpe	Identity Message is saved into the database.	Identity Message saved into the database.
V6/K6e	E-mail sent to appropriate KY participant e-mail address.	Federal GBOS	Volpe	E-mail is sent to appropriate KY participant e-mail address.	E-mail sent to appropriate KY participant e-mail address.
V7/K6f	Acknowledgement message is sent to the sender of the (SDM) message.	Federal GBOS	Volpe	Acknowledge-ment message is sent to sender of (SDM) message.	Acknowledgement message sent to sender of (SDM) message.
V8/K7	Compilation of level WRI inspection report.	Federal GBOS	Volpe	At the beginning of the compilation of the WRI inspection report.	Beginning of compilation of WRI inspection report by Federal BOS.
V9/K7a	SDM is sent for safety compliance evaluation.	Federal GBOS	Volpe	SDM is sent for safety compliance evaluation.	SDM is sent for safety compliance evaluation.
V10/K7b	SDM has finished safety compliance evaluation.	Federal GBOS	Volpe	SDM has finished safety compliance evaluation.	SDM finished safety compliance evaluation.
V11/K7c	SDM has be sent to the report generation.	Federal GBOS	Volpe	SDM has been sent to report generation.	SDM is sent to report generation.
V12/K8	Completion of level WRI inspection report.	Federal GBOS	Volpe	At completion of WRI inspection report compilation.	Completion of WRI inspection report compilation.
V13/K9	Transmission of level WRI inspection report to roadside enforcement and MC.	Federal GBOS	Volpe	At transmission of level WRI inspection report.	Level WRI inspection report forwarded to roadside enforcement, the MC, and the UT evaluation team.

6.4.1.5 Data Requirements

The GBOS served as the main data repository for all SDM data sent from the platforms. In lieu of gathering SDM data from the individual platforms, the data were archived in the GBOS database, which included the SDM data tables described in Section 4.1.2. The data arrived to the

GBOS from the platform in a XML format and then populated fields in the GBOS database. The GBOS ran several validation checks, populated appropriate fields, displayed the data on the Web interface for registered users, and issued an inspection report. All of these data were in relevant data tables. Importantly, the data stored in the database included a unique ID (an ID of the GBOS processes) linked to an encounter ID (a cross-platform ID of the inspection).

In addition to the SDM, validation and inspection reporting data, the GBOS maintained a running log file with timestamps of each sub-process. These timestamps were stored in delimited text files and contained the unique IDs used to link timestamp data with encounter IDs in the platform partners' log files.

6.4.1.6 Overview of Data Transfer

All data were transferred through the secure and password-protected Volpe DataMove Web site. Data were uploaded every two days. The SDM and inspection data were uploaded as an Oracle database dump file and included an appended set of all records that were collected in the pilot tests. The database was then imported to the UT evaluation team's database, overwriting all data in the working database. The log files were similarly transferred and imported into the UT evaluation team database.

6.4.1.7 Validating and Corroborating WRI Data

- UT evaluation team checked to ensure all data needed for the quantitative evaluation was available and contained correct values and formats. The UT evaluation team flagged any WRI data that failed this validation.
- UT evaluation team flagged any occurrence of WRI data that contained duplicate unique IDs or encounter IDs. There were not any duplicate unique IDs generated.

6.4.1.8 Operational Scenarios, Use Cases, and Evaluation Cases

Goal 1, Objective 1.2 proposes a series of Operational Scenarios that are to be evaluated with the support of the Volpe GBOS. These supported Operational Scenarios can be divided into a series of Use Cases and Evaluation Cases as presented in Table 20.

Table 20. Volpe GBOS operational scenario, use case, and evaluation case support.

Operational Scenario	Use Case	Evaluation Case Name	Proposed GBOS Evaluation	Successful GBOS Evaluation
6.1.1 Unstaffed automated safety enforcement, compliance, and assessment	1. WRI fixed-site data collection and assessment	001-03. SDM collection: Part 2 (Confirm SDM is transmitted).	GBOS supports test platforms.	See platform.
		001-04. WRI assessment processing and report generation: Part 1 (Confirm receipt of SDM).	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		001-05. WRI assessment processing and report generation: Part 2 (Validate structure and format of message set received).	GBOS supports test platforms.	Yes. Part of basic GBOS operation.
		001-06. WRI assessment processing and report generation: Part 3 (Validate message set data).	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		001-07. WRI assessment processing and report generation: Part 4 (Correlate the SDM, infrastructure data, and roadside sensor data set, if applicable).	GBOS supports test platforms.	Yes. See above.
		001-08. WRI assessment processing and report generation: Part 5 (Assess compliance and safety status).	GBOS supports test platforms.	Yes. See above.
		001-10. Confirm storage of WRI data and level WRI inspection reports in back office database.	GBOS supports test platforms.	Yes. Part of basic GBOS operation.
6.1.2 Screening support		001-11. Confirm database access and interface receives WRI results (Level WRI inspection report, safety alert, SDM alert) and/or WRI data.	GBOS supports test platforms.	Yes. Access available through The GBOS user interface and state GBOS access.

Operational Scenario	Use Case	Evaluation Case Name	Proposed GBOS Evaluation	Successful GBOS Evaluation
		001-12. Confirm real-time enforcement support and interface receives WRI results and/or WRI data.	GBOS supports test platforms	No
		001-14. Confirm bypass/pull-in result is transmitted.	GBOS supports test platforms	Yes
		001-15. Confirm receipt of bypass/pull-in result.	GBOS supports test platforms	Yes. GBOS platform timestamps show this
6.1.3 Traditional inspection support	1B. WRI fixed-site data collection and assessment; remote sensor collection and processing	001B-03. Roadside encounter data collection: Part 3 (Confirm message is transmitted).	GBOS supports test platforms.	See platform.
		001B-04. WRI assessment processing and report generation from roadside encounter data collection: Part 1 (Confirm SDM is received).	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		001B-05. WRI assessment processing and report generation from roadside encounter data collection: Part 2 (Confirm GBOS receives RSDM).	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		001B-06. WRI assessment processing and report generation from roadside encounter data collection: Part 3 (Validate RSDM for structure and format).	GBOS supports test platforms.	Yes. Part of basic GBOS operation.
		001B-07. WRI assessment processing and report generation from roadside encounter data collection: Part 4 (Validate SDM for structure and format).	GBOS supports test platforms.	Yes. See above.
		001B-08. Confirm GBOS requests SDM from carrier	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		001B-09. Confirm carrier sends SDM.	GBOS supports test platforms.	No

Operational Scenario	Use Case	Evaluation Case Name	Proposed GBOS Evaluation	Successful GBOS Evaluation
6.1.4. Mobile safety check	2. WRI mobile enforcement data collection and assessment	002-01. Confirm roadside enforcement communicates with the GBOS to establish trigger points for SDM collection.	GBOS supports test platforms	Yes. See platform
		002-05. Confirm WRI results are accessible to mobile enforcement staff/systems.	GBOS supports test platforms.	Yes. The GBOS user interface access shows this.
6.1.5. Routine safety analysis or special study	3. Post-processing analysis of WRI data and results	003-01. Verify transfer of data analysis of WRI results from roadside enforcement staff/systems.	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		003-02. Verify transfer of data analysis of WRI results from analysts (Government).	GBOS supports test platforms.	Yes. See above.
		003-03 Verify transfer of data analysis of WRI results from analysts (private).	GBOS supports test platforms.	Yes. See above.
		003-03. Verify transfer of data analysis of WRI results from MC/coach.	GBOS supports test platforms.	Yes. See above.
		003.04. Verify transfer of data analysis of WRI results from GBOS.	GBOS supports test platforms.	Yes. See above.
6.1.7. Use of SDM in transport planning and management				
6.1.6. Carrier use of SDM	4. Carrier use of WRI data and results	004-01. Confirm GBOS sends notification to carrier.	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
		004-02. Confirm request of subscription to automatically receive safety alerts associated with the carrier.	GBOS supports test platforms.	Yes. Part of basic GBOS operation.
		004-03. Confirm request of a report of all WRI assessments associated with the carrier.	GBOS supports test platforms.	No

Operational Scenario	Use Case	Evaluation Case Name	Proposed GBOS Evaluation	Successful GBOS Evaluation
6.1.8. Managing the WRI network	5. Management of the WRI network	005-01. Confirm management of the WRI system configuration.	Within the boundaries of the GBOS these functions will be supported; however, this does not include hardware/software outside the boundaries of the GBOS (i.e. carrier equipment, roadside hardware, etc.).	Yes. See GBOS event log.
		005-02. Confirm provisioning and configuring of fixed WRI system.	see above	Yes. See above.
		005-03. Confirm detection, isolation, and correction of WRI infrastructure and service problems.	see above	Yes. See above.
		005-04. Confirm monitoring of WRI system and subsystem performance.	see above	Yes. See above.
-	6. Dropped	Use case deleted; no Evaluation Cases.		
6.1.6. Carrier use of SDMS	7. WRI system self-test by a MC/coach	007-01. Confirm carrier receives SDM from GBOS (if subscription exists).	GBOS supports test platforms.	Yes. GBOS platform timestamps show this.
6.1.8. Managing the WRI network	8. WRI system self-test by roadside or mobile enforcement	008-01. Confirm enforcement submits SDM in training mode and data submitted to GBOS is tagged as training data and kept separate from "real" data.	GBOS supports test platforms.	Yes. GBOS shows status of data submitted.

6.4.2 Chronological Description of the Work

Figure 24 illustrates some of the major milestones in the integration of the GBOS with the three pilot test platforms.

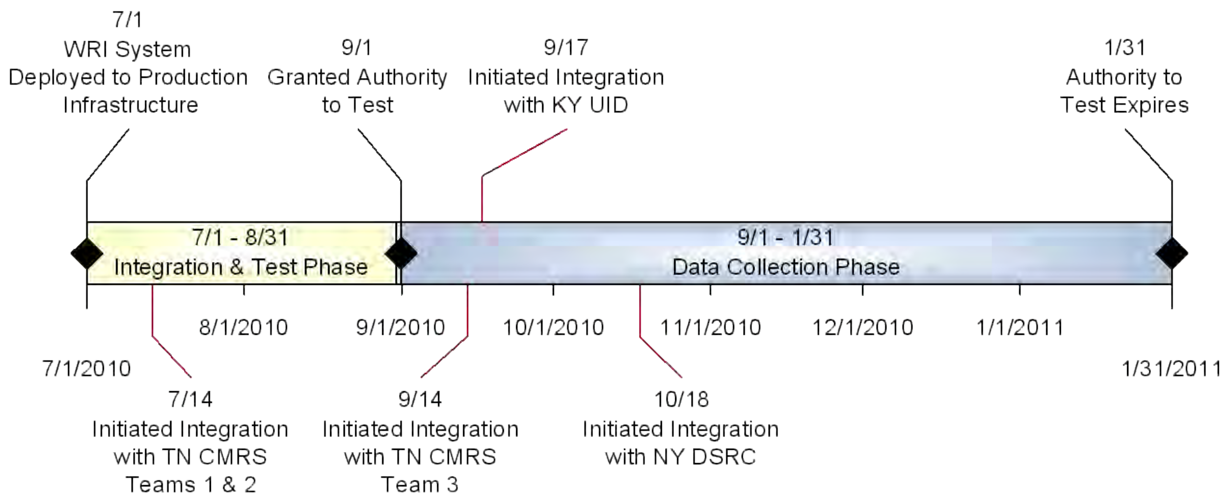


Figure 24. Diagram. Chronology of GBOS integration.

From the perspective of the GBOS, the WRI Pilot Test can be logically divided into two phases: the Integration and Test Phase and the Data Collection Phase. The purpose of the Integration and Test phase was to provide a period of time where the platforms would be able to interact with the GBOS and test their integration code. This phase started when the software that comprised the GBOS was deployed to the production infrastructure and made accessible to the states. At this time, the system had not completed its security review; however, FMCSA allowed the GBOS to begin integration and testing activities with the states so long as no PII was transmitted in the tests. As a result, "dummy" driver data was used in the SDMs submitted to the GBOS. During this phase, only Teams 1 and 2 from the Tennessee CMRS platform began working on their integration with the GBOS. This phase began on July 1, 2010, and ended on August 31, 2010, which coincided with the completion of the security review of the system by FMCSA. Some system integration efforts continued throughout the pilot test.

The second phase in the WRI Pilot Test, the Data Collection phase, was intended to collect the SDM and generate results that would be used to evaluate the success of the WRI Pilot Test. This phase started when the GBOS was granted interim authority to operate by FMCSA after successfully completing the security review. This milestone allowed the GBOS to begin receiving SDMs with actual driver data containing PII, instead of the "dummy" data that was being used to test in the prior phase. At the beginning of this phase, only telematics team 2 from the Tennessee CMRS platform was submitting SDMs with actual driver data to be later used in the evaluation, as telematics team 3 was continuing with their integration efforts. The integration efforts from Tennessee CMRS telematics team 3, Kentucky Universal ID, and New York DSRC all began during this phase.

The initiation of the integration was determined by identifying the point when the GBOS interface documentation was provided to the platform. The conclusion of the integration effort was determined by identifying the point when the first production SDM was received from the platform. Table 21 summarizes the integration timeline for each of the state platforms using these definitions.

Table 21. Integration Chronology of State Platforms.

State Platform	Initiated Integration Discussions	First Production SDM
Kentucky Universal ID	9/17/2010	12/23/2010
Tennessee CMRS – Telematics team 1	7/14/2010	N/A
Tennessee CMRS – Telematics team 2	7/14/2010	10/14/2010
Tennessee CMRS – Telematics team 3	9/14/2010	11/23/2010
New York DSRC	10/18/2010	N/A

The Data Collection phase was originally scheduled to conclude on December 31, 2010; however, FMCSA chose to extend this deadline by one month. This phase concluded on January 31, 2011, when the system was shut down and state access to the system was removed.

6.4.2.1 Overview of Integration Efforts

For the Kentucky Universal ID platform, the GBOS primarily communicated with the Kentucky BOS. In this integration, there was no direct link with the systems of motor carriers participating in the test, instead only requiring the carrier to log in to a web-accessible user interface to supply the necessary information. This platform required the most integration with the state systems and the least integration with the carrier systems.

For the Tennessee CMRS platform, the GBOS primarily communicated with the back office systems of telematics companies, which provide technology solutions to motor carriers to monitor fleet performance. In this integration, there was no direct link with the systems of motor carrier companies participating in the test; rather, the carrier was able to log in to a web-accessible user interface to review the data provide by the telematics company and review the results generated by the GBOS. This platform required the most integration with the telematics systems and the least integration with the state systems.

For the New York DSRC platform, the GBOS was intended to communicate with the New York back office systems. In this integration, there would have been no direct link with the systems of any motor carriers. This platform required integration with the state systems and no integration with the carrier systems. Due to scheduling delays and software incompatibility issues, the New York DSRC platform was not tested successfully or integrated with the GBOS.

6.4.2.2 Log of Test-Related Incidents/Problems

Throughout the course of this pilot test, five different organizations across all three platforms worked to integrate with the GBOS. While each organization ran into slightly different issues, there are two major issues that stood out across all three platforms. The first issue, which affected the New York and Tennessee platforms, was the difficulty in properly forming an SDM. The SDM has a complex data structure, and messages submitted by participants contained numerous errors in the carrier, driver, and hours of service fields. In addition to the complexity of the SDM, the web service architecture, which utilized Simple Object Access Protocol

(SOAP), may have also contributed to the integration issues experienced by the platforms. The second issue, which affected the Kentucky and Tennessee platforms, was the synchronization of their server time with that of the GBOS. The GBOS required that SDMs be received within one minute of the time the vehicle crosses a trigger, and would not accept any SDMs with a timestamp in the future; this resulted in a number of invalid SDMs. Updates to the GBOS were made throughout the pilot test. Table 22 provides an overview of these updates and changes.

Table 22. Updates or changes in response to pilot test incidents

Date	Update or Change
September 9, 2010	Relaxation of certain validation rules – attempt to run safety compliance checks on valid data, skipping invalid data
October 4, 2010	Changes to web service to accommodate tire pressure data for CMRS Team 1
October 19, 2010	Bug fixes, including better handling of XML requests that are formatted as a single string (without carriage returns)
October 29, 2010	Improved system's ability to close database connections Resolved bug where server crashes when no data is present in optional SDM fields
November 9, 2010	Updated the new application software and rebounded the application server
November 18, 2010	UI revisions: Added tractor_unit_number to driver selection screen Fixed: transponder_id not displaying properly on driver selection screen Added time with date to driver selection screen SDM Request e-mail: Added tractor_unit_number to SDM request e-mail
December 8, 2010	UI revisions: Added driver name to the Overview page, HOS tab, and Identification tab Added filtering (test/production) to SDM page
December 21, 2010	Deployed CMRS Team 1 pull-in component
December 22, 2010	Updated contact information for SDM request e-mail messages with Volpe contact Bug fixes for filtering Kentucky vehicle lookup
January 11, 2011	UI revisions: New text "validation error" added to the "Inspections" page New line in the Home Page: SDM Invalid Inspections Generated
January 26, 2011	Added code for integration with Kentucky BOS

6.4.3 Data Collected

The data collected by the UT evaluation team was a copy of Volpe's Federal GBOS database and is representative only of what was contained within the GBOS related to SDMs and inspection reports. Each table received was designed by Volpe and is an exact copy of their database with the exception of any data that was considered to contain PII. Data were delivered by the GBOS as a full data transfer that included information for all platforms in a consistent format, though specific platforms had different types of data, populating different portions of the database (described in sections 6.2.3 and 6.3.3)

- GBOS data (Oracle.dmp format):
  - WRI_ALERTS table
  - WRI_CARRIER_REGISTRATION table
  - WRI_CFR_REFERENCE_SET table
  - WRI_GLOBAL_REFERENCE table
  - WRI_HOS_EVENTS table
  - WRI_LOG table
  - WRI_RECORDS table
  - WRI_VEH_BRAKES table
  - WRI_VEH_TIRES table
  - WRI_VEH_WEIGHT table
  - WRI_VEHICLE table
  - WRI_VIOLATIONS table
- Field data:
  - GBOS event log (.xls format).

The GBOS event log is used to corroborate downtime and/or other GBOS system events with other data events in the experiment.

6.4.4 Impact of the Test Environment

The biggest difference between the test environment and any eventual operational environment would be integrating the GBOS into the FMCSA production systems. For this test, the GBOS was not allowed to impact any of the FMCSA production systems, since it would only be operational for 4 months. Instead, the GBOS was required to act as a stand-alone system that would only integrate with the state platforms participating in the pilot test. In the eventual operating environment, the GBOS would be much more integrated into the production systems. Existing FMCSA systems, for example, could cover the following functions:

- User Authentication and Account Management – FMCSA Portal
- Viewing Inspection Results – Safety and Fitness Electronic Records (SAFER), Query Central, FMCSA Portal
- E-mail Notification – FMCSA Event Notification System (FENS)

- Driver Credential Verification – Commercial Drivers License Information System (CDLIS)
- Carrier Out-of-Service Verification – Performance and Registration Information Systems Management (PRISM)

Instead of utilizing these functions, which are already implemented in production systems, the GBOS implemented these in a separate application. Implementing some of the functions of the GBOS would have impacts on the overall performance of the system, increasing inspection latency because of added database queries.

Additionally, vast amounts of data had to be copied monthly into the GBOS in order to perform the carrier and driver verification checks for the pilot test. Any differences between the live data in the production systems and the data in the GBOS could have generated errors in the validation or compliance data generated by the GBOS. These issues would not be present in the operational environment since the GBOS would be accessing the production systems in real-time.

6.4.5 Data Summary and Analysis

6.4.5.1 Including Test Statistics

- Carriers: 4.
- Vehicles: 34
- Drivers: 1 per vehicle
- SDMs: 917

6.4.6 Pre-Evaluation by Pilot Test Teams

6.4.6.1 Security and Network Access Management

Every SDM received by the GBOS web service was stored unchanged, in a log file on the GBOS server. The SDM message was parsed and forwarded to the application server for processing and validation where it was again stored unchanged, in a table on the GBOS Oracle database. During the processing of SDM messages, the PII data elements were also stored in a usable format in a driver table and an HOS table on the Oracle database. The PII data elements were then used to perform driver safety compliance checks. Only authorized Volpe staff had direct access to the GBOS servers.

Filtered database dumps were provided to the WRI Evaluation Team at the University of Tennessee on a daily basis. These database dumps *did not* include any tables containing PII data.

The *User Interface Component* (website) provided users with access to SDM data, including the PII elements. All users of the website were assigned to a particular user group, and members of each user group could only view the SDMs applicable to their group.

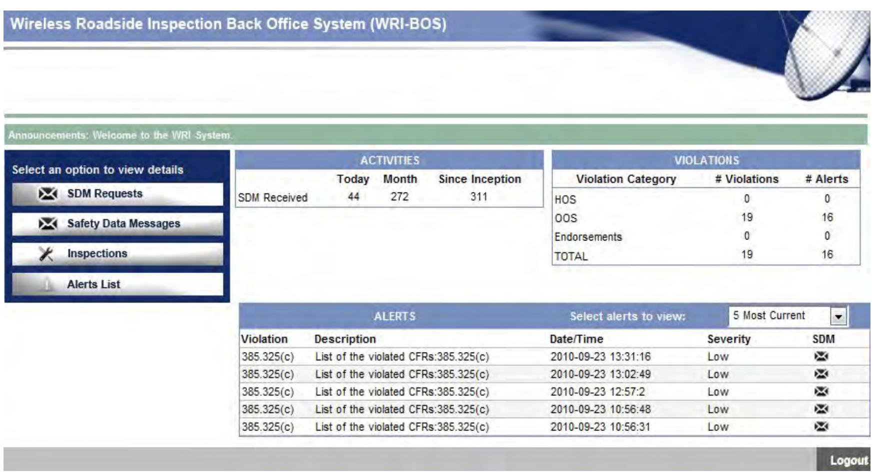
In August 2010, FMCSA's Security Team conducted an assessment of the security and privacy controls applicable to the GBOS. The team utilized NIST SP 800-53A,(21) to determine whether or not the relevant security and privacy controls were implemented correctly, operating as intended, and produced the desired outcome with respect to meeting the security and privacy requirements for the system.

Based on the security and privacy assessment, FMCSA's Security Team then developed a Plan of Action and Milestones (POA&M) to be addressed by the GBOS system owner at the Volpe Center. The POA&M contained 26 "Low Risk" and four "Moderate Risk" recommendations.

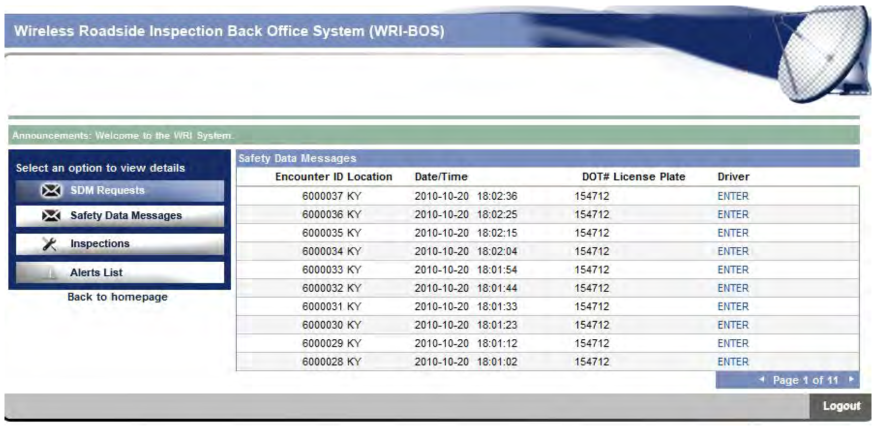
After discussing the recommendations with the FMCSA Security Team, 18 recommendations were "deferred," to be re-evaluated in a field test. Twelve recommendations were addressed for the pilot test.

6.4.6.2 User Interfaces

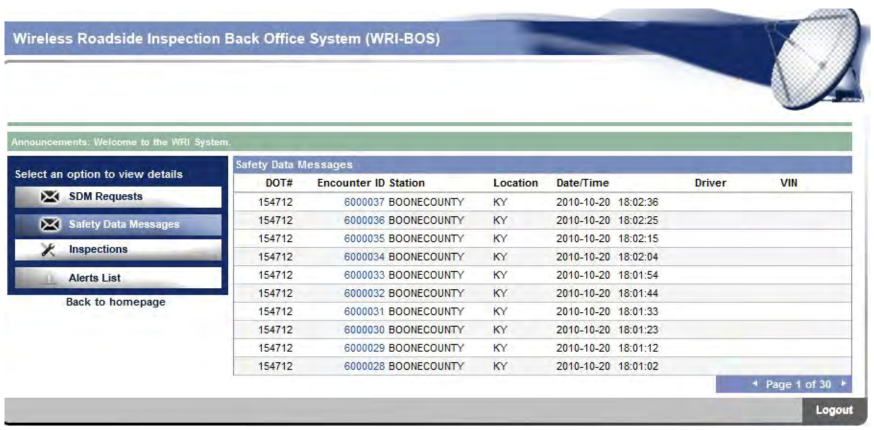
The GBOS prototype included a web-based user interface that allowed any stakeholder with access credentials (enforcement, carriers, drivers, telematics personnel, researchers, etc.) to access the system. The interface was identical, but population of the fields varied for each platform. The interface includes four main list view options: SDM Requests, Safety Data Messages, Inspections, and Alert List. The interface also allows the user to click on a specific encounter identification number to list the details of that encounter, including vehicle identification, driver credentials and hours of service, vehicle information, and metadata from the data collection (including time and location of inspection). The following figures show the main inspection interface pages (Figure 25). Examples of all screens from the web interface are shown in Appendix 3.



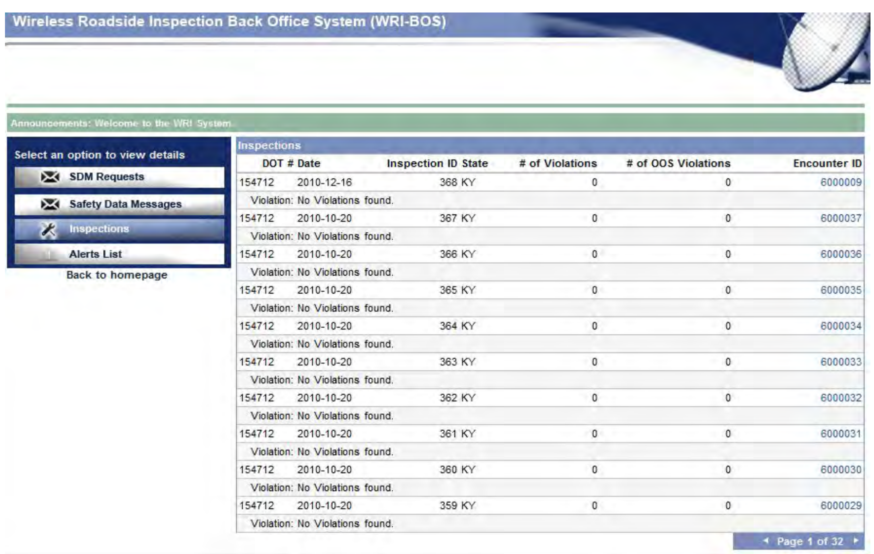
(a)


Wireless Roadside Inspection Back Office System (WRI-BOS)
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage
Safety Data Messages
Encounter ID Location Date/Time DOT# License Plate Driver
6000037 KY 2010-10-20 18:02:36 154712 ENTER
6000036 KY 2010-10-20 18:02:25 154712 ENTER
6000035 KY 2010-10-20 18:02:15 154712 ENTER
6000034 KY 2010-10-20 18:02:04 154712 ENTER
6000033 KY 2010-10-20 18:01:54 154712 ENTER
6000032 KY 2010-10-20 18:01:44 154712 ENTER
6000031 KY 2010-10-20 18:01:33 154712 ENTER
6000030 KY 2010-10-20 18:01:23 154712 ENTER
6000029 KY 2010-10-20 18:01:12 154712 ENTER
6000028 KY 2010-10-20 18:01:02 154712 ENTER
Page 1 of 11
Logout

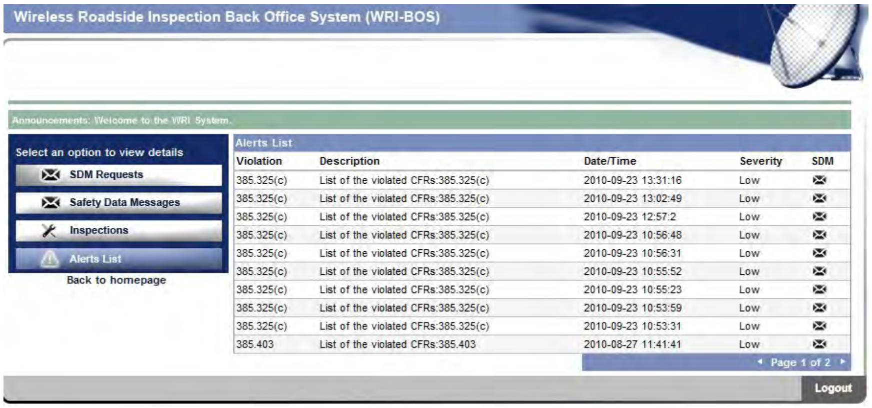
(b)


Wireless Roadside Inspection Back Office System (WRI-BOS)
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage
Safety Data Messages
DOT# Encounter ID Station Location Date/Time Driver VIN
154712 6000037 BOONECOUNTY KY 2010-10-20 18:02:36
154712 6000036 BOONECOUNTY KY 2010-10-20 18:02:25
154712 6000035 BOONECOUNTY KY 2010-10-20 18:02:15
154712 6000034 BOONECOUNTY KY 2010-10-20 18:02:04
154712 6000033 BOONECOUNTY KY 2010-10-20 18:01:54
154712 6000032 BOONECOUNTY KY 2010-10-20 18:01:44
154712 6000031 BOONECOUNTY KY 2010-10-20 18:01:33
154712 6000030 BOONECOUNTY KY 2010-10-20 18:01:23
154712 6000029 BOONECOUNTY KY 2010-10-20 18:01:12
154712 6000028 BOONECOUNTY KY 2010-10-20 18:01:02
Page 1 of 30
Logout

(c)


Wireless Roadside Inspection Back Office System (WRI-BOS)
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage
Inspections
DOT # Date Inspection ID State # of Violations # of OOS Violations Encounter ID
154712 2010-12-16 368 KY 0 0 6000009
Violation: No Violations found.
154712 2010-10-20 367 KY 0 0 6000037
Violation: No Violations found.
154712 2010-10-20 366 KY 0 0 6000036
Violation: No Violations found.
154712 2010-10-20 365 KY 0 0 6000035
Violation: No Violations found.
154712 2010-10-20 364 KY 0 0 6000034
Violation: No Violations found.
154712 2010-10-20 363 KY 0 0 6000033
Violation: No Violations found.
154712 2010-10-20 362 KY 0 0 6000032
Violation: No Violations found.
154712 2010-10-20 361 KY 0 0 6000031
Violation: No Violations found.
154712 2010-10-20 360 KY 0 0 6000030
Violation: No Violations found.
154712 2010-10-20 359 KY 0 0 6000029
Violation: No Violations found.
Page 1 of 32

(d)



(e)

Figure 25. Screenshots. User Interface Home Screen (a), SDM Requests Screen (b), Safety Data Messages Screen (c), Inspections Screen (d), and Alert List Screen (e).

6.4.7 Observations and Assessment

6.4.7.1 WRI System Scalability

As discussed above, the GBOS prototype was implemented on three physical servers for the pilot test:

1. A front-facing server with a web service that received SDMs and Identity Messages (the *Input Communication Interface*) and sent replies in the form of acknowledgement messages or error messages with a request to resend a corrected message. The front-facing server also hosted the WRI website (*User Interface Component*).
2. An application server, hosting the bulk of major system components.
3. An Oracle database server.

Except for issues caused by resource leaks, the server hardware used by the GBOS was relatively untaxed during the pilot test. However, the GBOS was designed using a modular approach, so system scalability can be addressed in an Operational Scenario both horizontally and vertically.

- *Horizontal scalability* could be addressed by deploying additional front facing and application servers to the system. Workload could be distributed across multiple nodes via a dedicated load balancer. Similarly, the Oracle database could be load-balanced, using Real Application Clusters (RAC), Oracle's high-availability architecture. By scaling horizontally, an increase in reliability through redundancy would be achieved.
- *Vertical scalability* could be achieved by adding additional resources (memory, CPUs, and disks) to current hardware in order to maximize available resources. Virtualization could also be used to efficiently use system resources.

6.4.7.2 WRI System Performance

Due to the relatively small number of SDMs received during the pilot test (1,296 messaged tagged as "PRODUCTION" received over four months), the hardware supporting the WRI

GBOS went relatively unstressed. System stability issues made it impossible to determine an upper limit on the number of SDMs that FMCSA could expect to be able to receive and process in a given period of time on the current hardware/software platform.

Late in the pilot test, it was determined that almost every SDM submitted had validation errors, resulting in the *Safety Compliance Evaluation Component* not being exercised; however, once the pilot test ended, all SDMs tagged "PRODUCTION" were submitted to the *Safety Compliance Evaluation Component*, regardless of the validation errors that had caused them to fail.

The average amount of time needed to process an SDM, from the time it was received by the internal application server, validated, and stored in the database (but not including the time to identify violations), was approximately half a second. During post-processing, the average amount of time (across all platforms) to exercise the *Safety Compliance Evaluation Component* to generate evaluation results identifying violations for an SDM was 3.15 seconds.

No significant time was spent to optimize processing speeds. In a field operational test, tuning the Oracle database, optimizing server disk array configurations, and optimizing software code, as well as horizontal and vertical scaling could make performance gains.

The stability of the GBOS platform was affected by a number of influences, including:

- **The robustness of development platform, tools, and libraries.** The GBOS deployment environment was developed using open source tools and libraries, including Red Hat Linux, Java 2 Enterprise Edition platform (J2EE), Axis 2, Apache Tomcat, Spring, Hibernate, and other J2EE libraries. During the pilot test, some of these products caused stability issues. In particular, the development team encountered issues with the following products:
    - **Hibernate object/relational persistence and query service for Java**. Stability issues with Hibernate caused the GBOS servers to crash periodically. In addition, resource leaks within Hibernate objects caused the front-facing and application servers to periodically run out of resources, requiring a reboot.
    - **Java Regular Expression find() method.** Under certain circumstances, a bug in the J2EE REGEX find() method caused the application server to halt, causing users of the front-facing web service to be unable to submit an SDM.
    - **Apache Tomcat / Axis2.** Apache Tomcat and the Axis2 Web Services engine periodically failed to release file handles, causing the front-facing server to run out of resources. A restart was required periodically to free up these resources.
- **Input validation, and the relaxation of validation rules.** During the pilot test, FMCSA requested that the logic concerning validation checks be modified. The GBOS was changed to attempt to run safety compliance checks on valid data even if validation errors occurred, skipping invalid data. Additionally, changes to the validation-checking algorithm for handling timestamps were made mid-way through the pilot test. Changes to this logic effected system stability, since the *Safety Compliance Evaluation Component* was not designed to handle SDMs that did not pass all validation checks.

- **Adherence by web service consumers to the SDM specifications** as determined by the Web Services Description Language (WSDL) and XML Schema Definition (XSD) documents. Throughout the pilot test web service users were submitting SOAP messages that did not adhere to the GBOS WSDL and XSD documents. The GBOS attempted to parse all SDMs in order to provide validation error messages. In certain circumstances, the application could not gracefully handle SDMs with unexpected data. This sometimes resulted in no response message being generated. In the worst case, certain SDMs that did not adhere to the specifications would cause the front-facing or application servers to crash.
- **Resource leaks**. A resource leak occurs when an application consumes system resources, such as memory and file handles, but does not release them. This condition can leave the system without the resources required to perform application tasks, and remediation may require an application restart or a server reboot. The complexity of the GBOS platform made the tracking down of recourse leaks very difficult. While many resource leaks were mitigated, some could not be fixed during the pilot test. New resource leaks were also introduced during the pilot test when new functionality was added. For example, late during the pilot test, new code was added to allow Kentucky carriers to perform a vehicle lookup. This new code introduced a resource leak that affected both the web service and the website, causing the front-facing server to need restarting periodically.

6.4.7.3 Lessons Learned

Lessons learned from the GBOS WRI Phase II Pilot Test fall within the following categories:

- **Integration**. GBOS integration testing should be performed against a dedicated environment, separate from the production environment. Moreover, a verifiable integration process should be developed to help carriers, service providers, and state partners confirm that they have been submitting SDMs without validation issues. Finally, additional resources will likely be required to provide integration support for future partners.
- **Testing.** A robust testing approach will be required to reduce system instability. Such an approach should include dedicated testing resources and a test platform separate from development, production, and integration platforms.
- **Time Synchronization.** Data freshness requirements should be re-examined. Specific time authorities should be agreed upon for time synchronization and clocks should be synchronized frequently.
- **GBOS Platform.** During the pilot test, some CMRS teams experienced integration issues related to platform incompatibility. The WRI Program may wish to investigate the platforms most commonly used by partners in order to provide a web service that is compatible with the largest number of users.
- **System Security.** The WRI Program will need to implement a method to authenticate the senders of SDMs. Moreover, the program will need to address security recommendations made by FMCSA's Security Team that were deferred for the pilot test.
- **FMCSA Systems Integration.** FMCSA may wish to investigate integrating the GBOS with the FMCSA portal. In addition, during a field test or for national implementation,

the GBOS would connect to the live Motor Carrier Management Information System and Commercial Driver's License Information System, rather than the standalone systems used for the pilot test.

- **Data Quality.** The GBOS Pilot Test exposed a number of data quality issues, particularly with hours of service and driver data. Moving forward, there will be a need to explore how to better handle data mismatches.

7. FINDINGS

7.1 GOALS

The goals introduced in Section 1 are composed of several objectives, each tested by a series of hypotheses. By combining the results from the quantitative approach with the common themes from the qualitative approach, each of the hypotheses were assessed in the context of the WRI phase II pilot test. The expectation was, that by addressing the hypotheses, conclusions about the ability to meet larger objectives and goals of the WRI system could be determined. The results of the analysis, by platform, are shown in Table 23 and focus on the ability of each platform to meet the required objectives and ultimately the goals of the WRI pilot test. These results were determined by examining the valid 917 SDMs created during the Phase II Pilot tests by the CMRS and Universal ID platforms and two data points from the DSRC platform. Because of the imperfect nature of this real-world data collection effort, many of the hypotheses were not explicitly tested. However, we can draw conclusions about the technologies' ability to meet the goals and objectives based on a combination of system performance and stakeholder discussion. Indeed, many of the failures of the system were related to design challenges, not technology limitations. As such, the evaluation team conjectures that some of the hypotheses that were not explicitly tested would be successful based on the experience of this pilot test.

Table 23. Ability of pilot test to meet goals and objectives.

<table>
<tr><th>Goal, Objective, Hypothesis</th><th colspan="4">Outcome</th></tr>
<tr><td colspan="5">+, Positive outcome; -, Negative outcome;
(Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion
~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable</td></tr>
<tr><td></td><td>NY</td><td>TN</td><td>KY</td><td>GBOS</td></tr>
<tr><td>Goal 1: Determine that at least one of the proposed technology/network options is feasible and supports the Operational Scenarios in a cost effective manner.</td><td colspan="4">The CMRS and Universal ID platforms both prove feasible and able to support the Operational Scenarios shown below. Given the acceptable performance of the tested Operational Scenarios, it is not unreasonable to conclude the Operational Scenarios that were not specifically tested during the pilot test could perform in a reasonable manner as well. The cost benefit analysis will determine whether or not the proposed technology options are cost effective.</td></tr>
<tr><td>Objective 1.1: Demonstrate that DSRC, CMRS, or Universal ID technology used under the WRI system will provide a high percentage of accurate level WRI inspection reports.</td><td colspan="4">The CMRS platform demonstrated better results for this objective as compared to the Universal ID platform. Neither platform produced significant numbers of full inspection reports, but both submitted SDM. Neither CMRS nor Universal ID met the basic standards set forth to prove its ability to meet this objective. None-the-less, the GBOS, with relaxed validation rules, was able to quickly produce inspection reports during the post-processing with CMRS data. The DSRC platform did not provide any usable information with which to arrive at any conclusions.</td></tr>
<tr><td>Hypothesis: The level WRI inspection report is obtained 95 percent of the time.</td><td></td><td>-
(Quan)</td><td>-
(Quan)</td><td>+
(Quan)</td></tr>
<tr><td>Hypothesis: The level WRI inspection report is on time 95 percent of the time.</td><td></td><td>+
(Quan/Qual)</td><td>-
(Quan/Qual)</td><td>+
(Quan/Qual)</td></tr>
<tr><td>Hypothesis: The level WRI inspection report is accurate 95 percent of the time.</td><td></td><td>-
(Quan)</td><td>-
(Quan)</td><td>+
(Quan)</td></tr>
<tr><td>Objective 1.2: Demonstrate each Operational Scenario can be tested by one of the technology options.</td><td colspan="4">Due to limitations encountered during the Phase II pilot tests, only a subset of the Operational Scenarios was tested as shown below.</td></tr>
<tr><td>Hypothesis: Operational scenario 6.1.1 (unstaffed automated safety enforcement, compliance, and assessment) can be performed by at least one of the technology options.</td><td></td><td>+
(Qual)</td><td>+
(Qual)</td><td></td></tr>
<tr><td>Hypothesis: Operational scenario 6.1.2 (screening support) can be performed by at least one of the technology options.</td><td></td><td>+
(Qual)</td><td>-
(Qual)</td><td></td></tr>
</table>

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Hypothesis: Operational scenario 6.1.3 (traditional inspection support) can be performed by at least one of the technology options.				
Hypothesis: Operational scenario 6.1.4 (mobile safety check) can be performed by at least one of the technology options.				
Hypothesis: Operational scenario 6.1.5 (routine safety analysis or special study) can be performed by at least one of the technology options.		**+ (Qual)**	**+ (Qual)**	
Hypothesis: Operational scenario 6.1.6 (carrier use of SDMS) can be performed by at least one of the technology options.		**+ (Quan/Qual)**	**+ (Quan/Qual)**	
Hypothesis: Operational scenario 6.1.7 (use of SDMS in transportation planning and management) can be performed by at least one of the technology options.				
Hypothesis: Operational scenario 6.1.8 (managing the WRI network) can be performed by at least one of the technology options.				
Goal 2: Based on performance, specific technology/network recommendations can be made for further development and shortcomings can be identified.	The stakeholder participants identified shortcomings and provided a plethora of positive recommendations for future WRI system development.			
Objective 2.1: Determine which technology/network system develops the fastest data results within the system between the DSRC, CMRS, or Universal ID technologies.	The CMRS platform developed the fastest data results during the Phase II pilot tests.			
Hypothesis: At least one of the three different technologies is able to produce data results faster and more reliably as compared to alternative technologies.		**+ (Quan)**	**- (Quan)**	

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Objective 2.2: Determine which technology/network system develops accurate data results within the system between the DSRC, CMRS, or Universal ID technologies.	Given that only a subset of the Operational Scenarios were tested during the Phase II pilot tests, it is difficult to objectively determine whether the CMRS or Universal ID platforms fulfilled a greater number.			
Hypothesis: One of the three different technologies is able to produce accurate data results more often compared to alternative technologies.		**-** **(Quan)**	**+** **(Quan)**	
Objective 2.3: Determine data and functionality produced by each technology to fulfill the needs of the greatest number of Operational Scenarios.	The CMRS platform fulfilled a greater number of the operation scenarios tested during the Phase II pilot tests. Still, all platforms had limited ability to perform a large number of Operational Scenarios			
Hypothesis: One of the three different technologies produces enough data and functionality to fulfill Operational Scenario needs compared to alternative technologies.		**~**	**~**	
Objective 2.4: Determine which technology can satisfy the demands related to all of the data quality attributes.	Only the CMRS platform was able to produce accurate data results with the given data attributes.			
Hypothesis: One of the three different technologies is capable of producing accurate data results with the given data attributes.		**+** **(Quan)**	**-** **(Quan)**	
Objective 2.5: Scrutinize observations gleaned from objectives 2.1-2.4 to determine shortcomings in each technology and recommend improvements.	The Phase II pilot tests provided a rich environment to determine system shortcomings. Through stakeholder interviews and WRI team collaboration, many suggested improvements were gleaned.			
Hypothesis: Potential inadequate performance from each technology can be determined and alternative solutions then used to increase overall system performance.		**+** **(Qual)**	**+** **(Qual)**	

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Goal 3: Determine that at least one of the proposed technologies is feasible and cost effective.	The CMRS and UID technologies both could be technologically feasible under the correct circumstances. Cost effectiveness will be determined by the cost/benefit analysis.			
Objective 3.1: Demonstrate that the DSRC, CMRS, or Universal ID technologies deliver timely, accurate, and complete results 95 percent of the time.	This objective not met by either the CMRS or Universal ID technologies. No tests were performed on the DSRC in regards to this objective.			
Hypothesis: DSRC, CMRS, or Universal ID technology associated with the pilot tests are able to produce an SDMS and level WRI inspection report 95 percent of the time.		**-** **(Quan)**	**-** **(Quan)**	
Objective 3.2: Demonstrate that the DSRC, CMRS, and/or Universal ID technologies reduce the cost per inspection and increase truck and carrier productivity.	The UT Evaluation team did not evaluate the cost per inspection. The Phase II pilot tests did not provide for an accurate appraisal as to whether or not the time needed to inspect vehicles would be greater or less than by using current methods.			
Hypothesis: The cost per inspection by at least one of the technology options is less than the cost per current inspection.				
Hypothesis: The time needed for vehicle inspection will be less than current NAS level I & III inspections.		**~**	**~**	
Goal 4: Verify that potential interdiction strategies are feasible and are agreed upon by the various stakeholders.	Law enforcement personnel from the CMRS and UID platforms agree the interdiction strategies are feasible. No other stakeholder groups were questioned as to their opinions on this goal.			
Objective 4.1: Demonstrate the established real-time or near-real-time interdiction strategies are feasible.	This objective was not tested during the Phase II pilot tests. No team opted to receive safety alerts and thus alerts were not generated in the pilot test to support interdiction strategies.			
Hypothesis: A CMV safety alert can be used in the e-screening process to flag a vehicle for inspection.				

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	TN	KY	GBOS
Hypothesis: A level WRI inspection report can pre-populate a NAS level I or level III inspection report.				
Hypothesis: A CMV safety alert can query any truck and relay that information to mobile enforcement.				
Objective 4.2: Demonstrate the established non-real-time interdiction strategies are feasible, can support other strategies, and can be accessed at later times.	The Phase II pilot tests demonstrated that the non-real-time interdiction strategies are feasible, support other strategies, and can be accessed at later times. Mixed results were found in regards to whether or not successful interventions could be carried out after WRI assessment results were returned.			
Hypothesis: Enforcement officers can access data well after WRI assessment results are returned.		**+ (Qual)**	**+ (Qual)**	
Hypothesis: All interventions can be successfully carried out after WRI assessment results are returned.		**~**	**~**	
Objective 4.3: Stakeholders, carriers, and representatives agree on feasible interdiction strategies.	Law enforcement personnel from the CMRS and UID platforms agree the interdiction strategies are feasible. No other stakeholder groups were questioned as to their opinions on this objective			
Hypothesis: Stakeholders agree that the established interdiction strategies can be completed.		**+ (Qual)**	**+ (Qual)**	
Goal 5: Ensure the WRI inspection trigger point can address multiple vehicle inputs under a variety of conditions.	The WRI system was tested using multiple vehicle inputs, under varying conditions, and it was found that both the CMRS and UID platforms were incapable of generating acceptable results.			
Objective 5.1: Demonstrate that different locations can accommodate a multitude of vehicles and still obtain data results under varying technological conditions.	This objective was not tested.			
Hypothesis: Subsystems are scalable.				

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Hypothesis: Subsystems can receive and process a variety of data formats.		**-** **(Quan)**	**-** **(Quan)**	**-** **(Quan)**
Goal 6: Determine that the projected costs of the system are within a reasonable budget.	The UT Evaluation Team did not test this goal.			
Objective 6.1: Determine the initial capital costs are lower than the potential capital budget based on method and level of deployment of the WRI system.	The UT Evaluation Team did not test this objective.			
Hypothesis: Projected costs are within acceptable budget limits.				
Hypothesis: System is financially feasible.				
Goal 7: Benefit assumptions are validated.	The benefit assumptions were not validated during the Phase II pilot tests; either from the quantitative analysis or from stakeholder feedback. It was, however, determined that the benefit assumptions were not beyond reason in the event of an adequate nationwide deployment.			
Objective 7.1: The WRI system increases inspection rates.	It was shown in the Phase II pilot tests that the WRI system might have the capability to increase inspection rates. This ability though was not, however, proven.			
Hypothesis: The WRI system is able to produce a level WRI inspection report at 25 times the current rate; at rates similar to truck weight and size inspections rates.		**~**	**~**	
Objective 7.2: Benefits are demonstrated well enough to withstand reasonable skepticism.	This objective was not tested.			
Hypothesis: The benefits, as compared to costs, are substantial.				

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Objective 7.3: WRI can provide assumptions of increased benefit from a high number of both positive and negative inspections.	With large numbers of inspections there will be more positive and more negative safety ratings. The feedback received during the evaluation interviews reinforces the conclusion that more inspections would generate more positive and negative inspections.			
Hypothesis: More WRIs will lead to more positive and negative safety ratings.		**+ (Qual)**	**+ (Qual)**	
Goal 8: Show all technical assumptions to be valid and that no technical barriers exist.	All technical assumptions were found to be valid and no technical barriers were found to exist.			
Objective 8.1: Adequate capacity exists for end-to-end inspections.	The Phase II pilot tests showed that adequate technical capability exists for end-to-end inspections.			
Hypothesis: Current capacity exceeds resource demands for the pilot tests.	**+ (Quan)**	**+ (Quan)**	**+ (Quan)**	**+ (Quan)**
Objective 8.2: WRI System's technological functions are reliable during scheduled up time.	This objective was not tested.			
Hypothesis: Unplanned system downtime is less than 5 percent of the planned system up time.				
Objective 8.3: WRI System's technological functions work on a scalable platform with increases in demand being met with proportional increases in capacity.	This objective was not tested.			
Hypothesis: Subsystems are scalable.				
Objective 8.4: Data formats will be non-proprietary and technology can be proprietary.	This objective was not tested explicitly, though data formats used in the pilot were non-proprietary.			

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Hypothesis: All data formats are non-proprietary and technology may be proprietary.	**+ (Quan)**	**+ (Quan)**	**+ (Quan)**	**+ (Quan)**
Objective 8.5: System can evolve to accommodate innovations in technology except where technological or operational limitations prevent innovation.	All technologies provided format. The challenge lies with the ability to process in the GBOS format.			
Hypothesis: SDM can accept inputs from different technology types.	**+ (Quan)**	**+ (Quan)**	**+ (Quan)**	**- (Quan)**
Goal 9: Determine that the performance of system (network and field) meets acceptable operating thresholds.	The CMRS and UID platforms have the ability to meet the acceptable operating thresholds. There were technical failures, but no technology barriers were found with the system.			
Objective 9.1: Demonstrate the performance of the system to a predetermined operational level (Completion of goal 1 implies completion of goal 9).	See objective 1.1			
Hypothesis: The level WRI inspection report is obtained 95 percent of the time.		**- (Quan)**	**- (Quan)**	**+ (Quan)**
Hypothesis: The level WRI inspection report is on time 95 percent of the time.		**+ (Quan)**	**+ (Quan)**	**+ (Quan)**
Hypothesis: The level WRI inspection report is complete and accurate 95 percent of the time.		**- (Quan)**	**- (Quan)**	**+ (Quan)**
Objective 9.2: Data transfer and use is secure and network access is managed (Completion of goal 1 implies completion of goal 9).	Testing the full scope of this objective was not conducted during the evaluation; however, no technology barriers were found in the system during the phase II pilot tests.			

Goal, Objective, Hypothesis	Outcome			
+, Positive outcome; -, Negative outcome; (Quan), Conclusion reached quantitatively; (Qual), Conclusion reached qualitatively; (Qual/Quan), Joint conclusion ~, Neither positive nor negative outcome; grey cells, Non-tested or non-applicable				
	NY	**TN**	**KY**	**GBOS**
Hypothesis: The data will be encrypted or otherwise stripped of PII to limit exposure from unauthorized users.			**+ (Qual)**	**+ (Qual)**
Hypothesis: The network is securely managed to limit unauthorized access.	**+ (Qual)**	**+ (Qual)**	**+ (Qual)**	**+ (Qual)**
Hypothesis: The network will contain different levels of access authority.	**+ (Qual)**	**+ (Qual)**	**+ (Qual)**	**+ (Qual)**
Goal 10: The stakeholder/user community supports further development of the WRI system.	The law enforcement community and sensor provider participants support the creation and implementation of a nationwide WRI system. Some of the telematics providers, and some of the fleets, wish to see the creation and implementation of a nationwide WRI system; some do not.			
Objective 10.1: Stakeholders and WRI participants support implementation of the WRI system.	The participating Phase II pilot test stakeholders provided differing opinions as to whether or not they felt that the WRI system should be implemented.			
Hypothesis: Stakeholders and WRI participants support the implementation of the WRI system.		**~**	**~**	
Hypothesis: Stakeholders and WRI participants support that the technical aspects of the WRI system should be implemented.		**~**	**~**	
Hypothesis: Stakeholders and survey participants involved with the WRI project believe that the system should be implemented due to the benefits to participants		**~**	**~**	

8. IMPLICATIONS OF FINDINGS

8.1 WRI MEASURE OF SUCCESS

Phase II of the WRI program was meant to demonstrate that multiple communication pathway, using different technologies, that could be simultaneously deployed across multiple states. A series of goals and objectives were developed to evaluate the pilot tests' performance. Moreover, there were ten broad exit criteria, from which the goals were developed, to evaluate the success of Phase II. The criteria are:[(17)]

1. At least one of the proposed technology/network options is feasible and supports the operational scenarios in a cost effective manner.
2. Technology/network recommendation for further development made.
3. At least one of the proposed technologies is feasible and cost effective.
4. Set of potential interdiction strategies and incentives identified with stakeholder support for further exploration in Phase III.
5. Wireless access point can address multiple vehicles inputs under variety of conditions.
6. Projected costs of system are feasible.
7. Validation of benefit assumptions from initial exploration.
8. All technical assumptions are valid and there are no technical barriers.
9. Performance of system (network, and field) meets acceptable operating thresholds.
10. Stakeholders / User Community support further development.

The Phase II pilot tests demonstrated that WRI was successful in delivering data, in real time, to assist in automated inspections. In many ways, each of the pilot test platforms operated independently during the testing and though there were many technical, operational, and implementation challenges, the majority of the stakeholders agreed that a nationwide implementation of the WRI would be a positive move toward improved safety in the CMV industry and that the overall outcome of this phase of the effort should be viewed as a success. The motivation for increased efficiency of inspections played a large role in the tests and in the feelings expressed by some of the stakeholder participants. On the whole, some, but not all, of the criteria and goals were met. Many technologies were tested and there were many technologically successful transactions of information. The many operational and institutional challenges diminished the success of the pilot tests and should be adequately addressed prior to proceeding to a larger WRI deployment.

The DSRC (New York) platform shows promise as a potential implementation method of WRI in a nationwide deployment. Though this platform provided only a limited amount of data for analysis, the data provided was noteworthy, particularly in demonstrating the technical feasibility of communicating between the vehicle, roadside, and state BOS. The message latency for wirelessly sending data was less than one second and no data was lost (in the very limited test). This was significantly faster than the other platforms and, in a real world scenario of high speed mainline interstate CMV travel, these latencies would be sufficient to support law enforcement and compliance personnel in effectively carrying out their duties. With no feedback from stakeholders on this platform, the UT evaluation team is unable to provide feedback as to whether or not interested parties would find the technology promising.

The CMRS (Tennessee) platform also shows promise for potential implementation of WRI in a nationwide deployment. Indeed, this communication pathway was arguably the most successful in sending and receiving data (including volume and content capability) in the context of this pilot test. Still, there were many technical errors with CMRS that should be resolved in a nationwide deployment. Two of the telematics teams from the CMRS platform were able to generate reasonable results, although an improvement in latency and accuracy would likely need to be achieved before large-scale deployment could be seen as viable. Telematics team 2 had an average latency of 46 seconds, with an accuracy rate of 80%. Telematics team 2 also provided self-test results that were acceptable. Telematics team 3 had an average latency of 35 seconds, with an accuracy rate of 92%. The *latency* performance could support real-time enforcement under certain situations where adequate geofence design and placement is possible. The latency requirements of supporting CSA or other non-real time processes are met. The *accuracy* rates obtained are not viable for automated enforcement support or other automated compliance systems as they now stand, though improvements in system design could mitigate many of the challenges that were faced in this pilot. Still, these accuracies can provide manual inspection support or non-real time scenarios, including self-tests, where there are opportunities for human interpretation and corroboration of the results. Importantly, at mainline interstate speeds these times would need to be improved upon in order for effective use for screening support. Geopoints could be moved to balance out the latency times, but would need to be placed in a manner that would not allow for CMVs to make course alterations before entering inspection station areas. They would also need to be near enough to the enforcement areas in order for enforcement officers to accurately identify the vehicles and pull them into the inspection areas. Operationally, telematics provider 3's inspection trigger points are undefined and could span a distance of ten miles. This makes the latency of the inspection somewhat irrelevant, since the vehicle could travel for several minutes within a geofence before being inspected. With regards to accuracy, law enforcement personnel who were interviewed made it clear that if a system was not accurate that it would quickly be viewed as unusable and would, in fact, not be used. All of the technological problems encountered during the pilot tests appear solvable. The main lesson learned from the CMRS Phase II pilot tests is that careful consideration should be made in deciding where to place geopoints. It should be noted that law enforcement views a moveable geopoint scenario as a tremendous advantage to their efforts.

As with the other platforms, the Universal ID (Kentucky) platform shows potential as an effective way to wirelessly inspect CMVs (with further development). The Universal ID platform was the only platform that was able to send an SDM and receive a Level WRI Inspection Report to the state BOS. The Universal ID platform also provided a self-test feature for fleet use. The latency time for the wireless transmissions was 43 seconds. This does not however include the time required to collect the pertinent information from the fleets with regards to drivers. The manual data input method for this would likely not be viable in a real world nationwide implementation scenario because of long response times and the potential for fraud. If automated, several seconds could be removed from the total latency. Questions still remain as to whether or not system accuracy could be maintained at the level of comfort needed such that law enforcement/compliance personnel would consider the results usable in their day-to-day operations. Road debris accumulation caused serious degradation to the performance of the LPR and is a serious concern for future system development. Indeed, any technology or Operational Scenario that relies solely on license plate reading may be susceptible to relatively low accurate read-rates. Redundant, or complementary technologies can support this communication path.

The majority of the participating stakeholders were in agreement that the WRI system holds much promise, and that it should move forward if the technological and implementation challenges can be overcome. Law enforcement was nearly unanimous in their support of future system implementation. They expressed concerns about the current systems in place and felt that, given their limited manpower and increasing numbers of CMVs on the roads, WRI could allow them to improve upon their efficiency. Furthermore, it could also level the playing field among the carriers, reduce the number of unsafe CMVs on the nation's roads, and allow for safe carriers to be rewarded for keeping their fleets maintained at an appropriate level of safety.

Fleet feelings towards the WRI system are mixed and it was difficult to ascertain specific motivations among the fleets in regards as to whether or not they viewed the WRI system as a positive or negative step in supporting CMV safety and commerce. When combining the comments from the interviews with the fleets and law enforcement a clear picture of the present state of CMV operations was ascertained; nationwide, many of the fleets do all they can to maintain vehicles up to the highest standards set forth by the Federal government, while others do not. Companies, who maintain a safe fleet of vehicles, invest significant amounts of money to do so and may be at a competitive disadvantage in comparison to those who do not. The companies who abide by the safety regulations wish to see all CMVs and motor carrier fleets meet the regulations, thereby ensuring a level competitive playing field. A mandatory implementation of WRI could force unsafe fleets to invest in safety technology and equalize investment in safety across the industry. Companies that do not invest in maintaining their fleets to meet safety regulations view WRI as an added expense for their operations and do not appear supportive of WRI implementation.

The telematics service providers for the CMRS platform were supportive of the WRI system and would like to see it implemented in the future. These comments should be considered in the context that telematics providers might benefit commercially from a mandatory implementation of the WRI system.

The sensor providers for the CMRS platform were extremely supportive of the WRI system and would like to see it implemented in the future. They noted that similar systems are already in place around the world and in transit systems in the United States. These comments should be considered in the context that sensor providers likely benefit commercially from a mandatory implementation of the WRI system.

Finally, all stakeholders expressed strong interest in consistent technology requirements nationwide, prompting the requirement that certain technologies be regulated at the Federal level. Indeed, for there to be a widespread and voluntary participation by fleets, there must be one overarching and cost effective technology adopted for WRI with a set of national standards and rules. Drivers and fleets cannot be expected to maintain multiple pieces of equipment to accommodate state-by-state implementations of the WRI program.

This pilot test evaluated three platforms, all in imperfect test environments. The CMRS (TN) platform produced the most data, but also encountered data delivery challenges and relatively long latency times. The Universal ID (KY) platform produced some desirable results, but the human-in-the-loop was untenable and the identification technology (LPR) was unsuitable in poor weather situations. DSRC (NY) produced very limited results and did not connect with the GBOS. Moreover, the data was not formatted in a way that could be accepted by the GBOS. Nonetheless, the limited performance was promising and worthy of further investigation. Finally, the GBOS's strict data validation requirements presented many challenges with accepting and processing data from all platforms. Even in the context of a pilot test with active partners, the data formatting was complicated and difficult to provide successful inspections. An expanded test that includes less-engaged partners will require much more simplified data formatting and processing requirements.

8.2 LESSONS LEARNED AND SUGGESTIONS FOR FUTURE CONSIDERATION

In the event that this program proceeds to a Phase III field operational test, the Phase II pilot test revealed several challenges that should be addressed. The suggested improvements to the 2010 ConOps[18] follow.

8.2.1 DSRC Platform

Discover how to automatically (and in real-time) convert the inspection messages from DSRC's SAE J2735 message format to an XML format that is compatible with GBOS data input requirements. It is known that this is feasible but should be tested in a real-world scenario.

8.2.2 CMRS Platform

Since geopoints can collect information from vehicles traveling in any direction it is vital that methods to determine the direction of vehicle travel be employed and thoroughly tested.

It is crucial that a user interface does not time out and does not require the need to repeatedly be logged in to.

Given the speed at which CMVs typically travel on the interstate system, WRI system designers must ensure that trigger events occur within some predefined range of a given geopoint.

As a requirement of mobile or dynamic enforcement, a mechanism is required to dynamically create geopoints. This is necessary for mobile enforcement officers to set up inspection locations and enable and disable those locations on-demand.

8.2.3 Universal ID Platform

The carriers (who were asked this specifically) all expressed a strong interest in the ability to continue to travel at-speed during an inspection. This leads to the suggestion of exploring the effectiveness of at-speed LPRs and of considering alternative technologies such as Radio Frequency Identification (RFID).

CMV trailers are a high theft item within the transportation industry. The law enforcement community indicated the desire to provide the ability to read trailer license plates in order to combat this activity.

Many States have grace periods for the expired license plates of CMVs and trailers. It is crucial that this be taken into account for the fleets and the enforcement community.

Many CMV drivers could eagerly use alternate routes to avoid inspection/weigh stations. To counteract this, a more viable manner in which to automatically collect the driver/vehicle information of those who attempt to bypass inspection/weigh stations should be developed.

Snow, ice, and dirt accumulation can degrade the performance of LPRs. In order to use the LPR technology for WRI system deployment, ways to negate possible weather related problems for LPR technologies should be examined, including alternative or supporting technologies.

Because of snow, ice, and dirt accumulation that can degrade the performance of LPRs. Other automated identification technologies to collect vehicle and carrier information should be examined.

8.2.4 All platforms

The typical inspection/weigh station can be an extremely busy work environment. With so many vehicles going by a station at any given time any non-compliant CMVs must be brought to the attention of enforcement officers. An inexpensive and workable solution to this would be to develop and test an audible alarm to be used in roadside inspection stations.

By ensuring that the CMV size and weight appear on the user interface, enforcement users will have the ability to rapidly focus on non-compliant CMVs.

One of the primary ways in which CMV enforcement officers/inspectors perform their duties is to observe CMVs. By ensuring the vehicle manufacturer name is collected, and appears on the user interface, enforcement users may be significantly more efficient.

Ensure accurate registration information, and tax information is collected.

Ensure that the user interface is user friendly.

Ensure that the ability for fleets and enforcement/compliance personnel to view electronic logs is available.

Enforcement system users should have the ability to pause the user interface in order to focus on a specific CMV.

Require that all alerts pop up on the front page in contrasting colors in order to reduce the need for enforcement users to scroll down and search for information.

The user interface needs to be user friendly and free of any bugs. The need to develop a production model user interface should be a top priority should Phase III pilot tests begin.

Though not the purpose of this evaluation, driver distractions associated with WRI should be considered in relation to other CMV driver distraction-related issues.

One of the sensor providers stated that similar technologies have been used by transit systems for some time. As the WRI program moves forward, the FMCSA should engage current users of similar technologies in the transit community for possible benchmarking opportunities.

WRI processes, sends, and archives PII and business-sensitive data from carriers, drivers, and service providers. It is important that safeguards are in place to secure data within the Federal office systems, but also secure transactions coming from outside the GBOS. Participating partners should be required to adhere to the same relevant security protocol as the GBOS, outlined by the WRI Plan of Action and Milestones document developed by the FMCSA Security Team. All data should be encrypted in all transactions and stored in a secure server.(21)

In the Phase II pilot tests, there was only a very small amount of feedback (from one fleet representative) on the opinions of the ultimate user, the CMV driver; and this feedback was mixed. The need to involve individual drivers to ascertain whether widespread issues with WRI deployment could develop in an operational use scenario is clear.

Future deployments of WRI technology should consider the need to accommodate multiple drivers per CMV and the possibility for CMV's and drivers to operate under multiple carriers.

The FMCSA should work with its state, industry, and judicial stakeholder partners on policy and legal sufficiency aspects of the WRI program. If a decision is made to deploy WRI nationally, establishing policy, procedures, and operational standards would help facilitate a smooth implementation and avoid unnecessary delays.

The operational scenarios were not fully tested in the Phase II pilot tests. Supplemental testing can assure the following operational scenarios are viable.

Evaluate Operational Scenario 6.1.1[6] – Unstaffed automated safety enforcement, compliance, and assessment. This operational scenario was not fully tested during the Phase II pilot tests. Law enforcement/compliance personnel from Tennessee and Kentucky provided positive feedback as to the likelihood of success. In the future, additional quantitative data pertaining to this operational scenario should be collected to provide additional guidance. Analysis from the GBOS and New York platforms should be collected in the future as well.

Evaluate Operational Scenario 6.1.2 – Screening support. This operational scenario was not explicitly tested during the Phase II pilot tests. It would likely be successful, based on the latency times collected during the Phase II pilot tests, law enforcement/compliance personnel feedback

[6] This evaluation report is based on the 2008 version of the ConOps(6). This document has been subsequently updated in 2010 and the Operational Scenarios renumbered with a leading five (5), instead of six (6). So, for example, Operational Scenario 6.1.4 became 5.1.4. The reader should be aware of this when reading this report in the context of the 2010 ConOps(18) and future related documents.

from Tennessee and Kentucky, and potential system engineering improvements to improve performance. Analysis from the GBOS and New York platforms should be collected in the future as well.

Evaluate Operational Scenario 6.1.3 – Traditional inspection support. This was not explicitly tested during the Phase II pilot tests. Again, it would likely be successful with the appropriate software and hardware. In order to determine the ability of WRI to perform these functions, this operational scenario should be tested in the future.

Evaluate Operational Scenario 6.1.4 – Mobile safety check. This was not tested during the Phase II pilot tests and should be in order to assure all possible uses are realistic in the real world environment of interstate CMV travel.

Evaluate Operational Scenario 6.1.5 – Routine Safety Analysis or Special Study. This was not explicitly tested during the Phase II pilot tests and should be. This could be a way to make the WRI system more cost effective since it could prove to be an excellent way for other entities to use collected data for safety and/or other transportation planning needs.

Evaluate Operational Scenario 6.1.7 – Use of SDM in transportation planning and management. Though not explicitly tested during the Phase II pilot tests, third parties can access WRI data with appropriate credentials. Potential planning and management uses could be investigated and data organized and delivered to support those uses.

Evaluate Operational Scenario 6.1.8 – Managing the WRI network. The WRI network was managed for the purposes of the Phase II pilot tests. Robust system testing should be conducted before future deployments of WRI technology.

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APPENDIX A: CVSA NORTH AMERICAN STANDARD LEVELS OF TRUCK INSPECTION

The following inspection levels are defined by the Commercial Vehicle Safety Alliance (http://www.cvsa.org/programs/nas_levels.aspx).

LEVEL I

North American Standard Inspection – An inspection that includes examination of driver's license; medical examiner's certificate and Skill Performance Evaluation (SPE) Certificate (if applicable); alcohol and drugs; driver's record of duty status as required; hours of service; seat belt; vehicle inspection report(s) (if applicable); brake systems; coupling devices; exhaust systems; frames; fuel systems; lighting devices (headlamps, tail lamps, stop lamps, turn signals and lamps/flags on projecting loads); cargo securement; steering mechanisms; suspensions; tires; van and open-top trailer bodies; wheels, rims and hubs; windshield wipers; emergency exits and/or electrical cables and systems in engine and battery compartments (buses), and HM/DG requirements as applicable. HM/DG required inspection items will be inspected by certified HM/DG inspectors.

LEVEL II

Walk-Around Driver/Vehicle Inspection – An examination that includes each of the items specified under the North American Standard Level II Walk-Around Driver/Vehicle Inspection Procedure. As a minimum, Level II inspections must include examination of: driver's license; medical examiner's certificate and Skill Performance Evaluation (SPE) Certificate (if applicable); alcohol and drugs; driver's record of duty status as required; hours of service; seat belt; vehicle inspection report(s) (if applicable); brake systems; coupling devices; exhaust systems; frames; fuel systems; lighting devices (headlamps, tail lamps, stop lamps, turn signals and lamps/flags on projecting loads); cargo securement; steering mechanisms; suspensions; tires; van and open-top trailer bodies; wheels, rims and hubs; windshield wipers; emergency exits and/or electrical cables and systems in engine and battery compartments (buses), and HM/DG requirements as applicable. HM/DG required inspection items will be inspected by certified HM/DG inspectors. It is contemplated that the walk-around driver/vehicle inspection will include only those items, which can be inspected without physically getting under the vehicle.

LEVEL III

Driver/Credential Inspection – An examination that includes those items specified under the North American Standard Level III Driver/Credential Inspection Procedure. As a minimum, Level III inspections must include, where required and/or applicable, examination of the driver's license; medical examiner's certificate and Skill Performance Evaluation (SPE) Certificate; driver's record of duty status; hours of service; seat belt; vehicle inspection report(s); and

HM/DG requirements. Those items not indicated in the North American Standard Level III Driver/Credential Inspection Procedure shall not be included on a Level III inspection.

LEVEL IV

Special Inspections – Inspections under this heading typically include a one-time examination of a particular item. These examinations are normally made in support of a study or to verify or refute a suspected trend.

LEVEL V

Vehicle-Only Inspection – An inspection that includes each of the vehicle inspection items specified under the North American Standard Inspection (Level I), without a driver present, conducted at any location.

LEVEL VI

North American Standard Inspection for Transuranic Waste and Highway Route Controlled Quantities (HRCQ) of Radioactive Material – An inspection for select radiological shipments, which include inspection procedures, enhancements to the North American Standard Level I inspection, radiological requirements, and the North American Standard Out-of-Service Criteria for Transuranic Waste and Highway Route Controlled Quantities (HRCQ) of Radioactive Material.

As of January 1, 2005, all vehicles and carriers transporting highway route controlled quantities (HRCQ) of radioactive material are regulated by the U.S. Department of Transportation and required to pass the North American Standard Level VI Inspection. Previously, U.S. Department of Energy (DOE) voluntarily complied with the North American Standard Level VI Inspection Program requirements. Select radiological shipments include highway route controlled quantities (HRCQ) of radioactive material as defined by Title 49 CFR Section 173.403. And, because only a small fraction of transuranics are HRCQ, DOE has decided to include its transuranic waste shipments in the North American Standard Level VI Inspection Program.

LEVEL VII

Jurisdictional Mandated Commercial Vehicle Inspection – An inspection that is a jurisdictional mandated inspection program that does not meet the requirements of any other level of inspection. An example will include inspection programs such as, but not limited to: school buses; limousines; taxis; shared ride; hotel courtesy shuttles, and other intrastate/interprovincial operations. CVSA-certified inspectors may conduct these inspections, other designated government employees or jurisdiction approved contractors. Inspector training requirements shall be determined by each jurisdiction. No CVSA decal shall be issued for a Level VII inspection but a jurisdiction-specific decal may be applied.

APPENDIX B: WRI EVALUATION CASES

Evaluation Cases for Use Case 001 and Alternatives

Evaluation Case 001-01
Evaluation Case Description: Confirm Roadside Enforcement Interfaces with the GBOS to establish trigger points for SDM Collection

Overview: The Roadside Enforcement Systems (RES) interface with the GBOS to establish trigger points in the region for which they have authority and have a desire to collect Safety Data Messages (SDM) from vehicles.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A: Collect time stamp of vehicle crossing DSRC RSE. WRI Concept C: Collect time stamp of vehicle crossing a Vehicle ID Reader.

Evaluation Case 001-02
Evaluation Case Description: Safety Data Message Collection: Part 1 (Confirm the vehicle Crosses SDM Trigger Point, the SDM Data is collected, and the SDM Message is compiled)

Overview: (1) The Motor Carrier's CMV triggers an SDM collection by driving over a specific road segment. (2) The Motor Carrier's CMV and/or Back Office Systems collect the SDM data. (3) The Motor Carrier's CMV and/or Back Office compile an SDM message.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A: Collect time stamp from vehicle after compiling the SDM. WRI Concept B: Collect time stamp from motor carrier after compiling the SDM. WRI Concept C: Collect time stamp from motor carrier after compiling the SDM.

Evaluation Case 001-03

Evaluation Case Description: Safety Data Message Collection: Part 2 (Confirm the SDM Message is Transmitted)

Overview: The Motor Carrier's CMV and/or Back Office transmit an SDM for a particular vehicle associated with a specific trigger event.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A: Collect time stamp when vehicle transmits SDM. WRI Concept B: Collect time stamp when motor carrier transmits SDM to Back Office. WRI Concept C: Collect time stamp when motor carrier transmits SDM to Back Office.

Evaluation Case 001-04

Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 1 (Confirm receipt of SDM and provide "handshake")

Overview: The SDM will be received by the GBOS. Communications with the sender will be completed, providing confirmation indicating successful receipt or failure.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp when SDM is received by the GBOS.

Evaluation Case 001-05
Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 2 (Validate structure and format of message received)

Overview: The SDM will be validated for structure and format. Possible subsequent processing steps will be determined based on which data elements are present in the SDM. The following steps will be completed: (1) Check the structure and format in the SDM versus the structure and format for when the submission was triggered. (2) Check the structure and format of each identifier (i.e., correct length, character set rules used, and range).
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Check for accepted structure and format of SDM (by various parameters) once it is received.

Evaluation Case 001-06
Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 3 (Validate message data)

Overview: The SDM message will be validated and corroborated by retrieving carrier, driver, and vehicle data from the accessible infrastructure databases. The following steps will be completed: (1) Corroborate each identifier (does it match an actual identifier from the corresponding authoritative source; e.g., Commercial Driver's License system for driver ID, FMCSA enterprise database for carrier ID?). (2) Check that each driver or carrier identified is active according to the authoritative source. (3) Compare the carrier ID in the driver's log with other data in SDM and/or with other observations. (4) Compare the vehicle ID in the driver's log with other data in SDM and/or with other observations. (5) Compare the driver ID in the driver's log with other data in SDM and/or with other observations.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Check for corroboration of parameters.

Evaluation Case 001-07
Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 4 (Correlate the SDM, infrastructure data, and Roadside Data Message, if applicable)

Overview: The SDM Data and Infrastructure Database Data will be correlated to assure a unique set (or subset) of Driver, Vehicle, and Carrier information is being assessed.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Provide time stamp for input time of WRI Report compilations.

Evaluation Case 001-08
Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 5 (Assess compliance and safety status)

Overview: An assessment will be performed to determine whether the information received indicates a safety or credentials violation including any imminent hazards requiring a Safety Alert to be issued. Compliance checks **may includ**e: (1) Verifying the carrier's authority to operate. (2) Determining whether the vehicle is properly registered and operating within permitted parameters (e.g., weight, load type, etc.). (3) Determining if the vehicle is on an allowable route (check against permit). (4) Determining if the driver's license indicates the driver is authorized to operate the vehicle being operated. (5) Determining if the driver is medically qualified, as indicated by the medical certificate. (6) Assessing HOS compliance. (7) Checking the vehicle sensors and status for indications of possible safety problems using Level I or Level II inspection criteria. (8) Checking carrier against a targeted carrier list. (9) Checking vehicle against a targeted vehicle list. (10) Checking driver against a targeted driver list. (11) Checking carrier out-of-service status. (12) Checking vehicle out-of-service status. (13) Checking driver out-of-service status. (14) Checking Unified Carrier Registration (UCR) status. (15) Other assessments as allowed by the FMCRs.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Staff or software can check the various parameters for correctness in order to proceed.

Evaluation Case 001-09
Evaluation Case Description: WRI Assessment Processing and Report Generation: Part 6 (Confirm generation of Level WRI Inspection Report and CMV Safety Alert)

Overview: A Level WRI Inspection Report will be generated, including an indication of a Safety Alert, if applicable.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Check the Government Back Office Database for a completed Level WRI Inspection Report for a particular inspection.

Evaluation Case 001-010
Evaluation Case Description: Confirm storage of Level WRI Inspection Reports and WRI Data in Back Office Database

Overview: The GBOS will store the WRI Data & WRI Inspection Reports in a Back Office Database regardless of the assessment outcome. The WRI Data & WRI Inspection Report will remain in the database for non real-time uses by the FMCSA and/or state CMV Safety systems and other vested parties.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Check the Government Back Office Database for an existing Level WRI Inspection Report for a particular inspection.

Evaluation Case 001-011
Evaluation Case Description: Confirm Database Access and Interface receive WRI Results (Level WRI Inspection Report, Safety Alert, SDM Alert) and/or WRI Data

Overview: WRI Data and WRI Results will be accessible to Motor Carrier/Coach systems through the GBOS database access interface. The carrier can access the data via several **different methods** depending upon preference. Choices include: (1) Detailed data via Subscription. (2) Detailed data via Periodic Delivery. (3) Detailed data via Website Query. (4) Detailed data via web services interface. (5) Notification of data availability through non real-time retrieval via website or web services. Note: Options should support a user interface for carriers as well as automated system interface for software applications.
Testability: NY, TN and KY.
Possible Testing Strategies: WRI Concept A, B, and C: The motor carrier will access the Level WRI Inspection Report by requesting it through the GBOS.

Evaluation Case 001-012
Evaluation Case Description: Confirm Real Time Enforcement Support and Interface Receive WRI Results and/or WRI Data

Overview: WRI Data and WRI Results will be accessible to roadside enforcement staff/systems, via real time enforcement support interface. (1) Roadside Enforcement can access the data via several **different methods** depending upon preference: a. Delivery of summary and details to "sites" (mobile and fixed sites) within some region relative to the SDM trigger point. b. Delivery of summary to sites within some region relative to the SDM trigger point, followed (at receiving operator's discretion) by pull of details. c. Query/response for data collected that match certain parameters (e.g., location, time, carrier, vehicle). Note: Options should support a user interface for an officer as well as an automated system interface for a software application. (2) The data will be available through an interface, which allows Roadside Enforcement to establish local alerts at variable data thresholds.
Testability: TN and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp when Roadside Enforcement receives a Level WRI Inspection Report.

Evaluation Case 001-013
Evaluation Case Description: Confirm Local Enforcement Protocols can be enforced

Overview: The local or remotely located Roadside Enforcement Staff can respond to the WRI Results according to the local enforcement protocols. Methods include: (1) Using the WRI Results as inputs to the locally established interdiction strategies. (2) Using the WRI Results to augment the e-screening pull-in or bypass decision process. (3) Using the WRI Results to augment the inspection selection process [includes enforcement personnel access to previous inspection data (Manual and WRI Results)]. (4) Use of WRI Results to automatically fill in applicable inspection report fields. Note: Optionally, the inspector may manually corroborate the WRI Data by directly observing all, or part of, the information provided via the SDM.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Enable local enforcement to produce a WRI Report and enforce protocols based upon the content.

Evaluation Case 001-14
Evaluation Case Description: Confirm the Bypass/Pull-in Result is transmitted

Overview: The GBOS and/or motor carrier transmit a Bypass/Pull-in Result for a particular vehicle associated with a specific trigger event.
Testability: NY, TN, and possibly KY.
Possible Testing Strategies: WRI Concept B: Collect time stamp when GBOS transmits the bypass/pull-in result to the motor carrier.

Evaluation Case 001-15
Evaluation Case Description: Confirm Receipt of Bypass/Pull-in Result

Overview: The Bypass/Pull-in Result will be received by the motor carrier and/or vehicle. Communications with the sender will be completed, and will provide confirmation indicating successful receipt or failure.
Testability: NY, TN, and possibly KY.
Possible Testing Strategies: WRI Concept B: Collect time stamp when the motor carrier receives the bypass/pull-in result from the GBOS.

Evaluation Case 001A-01
Evaluation Case Description: WRI Assessment Processing and Report Generation: Confirm state Government Back Office can complete Evaluation Cases 001-04 through 001-09

Overview: The state BOS will provide assessment processing and report generation as follows in Evaluation Cases 001-04 through 001-09. Also (for Evaluation Case 001-07), the RSDM Data, in addition to the SDM Data and Infrastructure Database Data (collectively known as WRI Data), will be correlated to assure a unique set (or subset) of driver, vehicle, and carrier data are being assessed.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamps at the end WRI Report generation.

Evaluation Case 001A-02

Evaluation Case Description: Confirm WRI Data and Results are sent to the state GBOS and can be viewed

Overview: The WRI Data and WRI Results will be sent to the GBOS for analysis and storage from the Roadside Systems, and the WRI Results from the local processing can be viewed locally by state GBOS Personnel.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp when the WRI Data is sent to the state GBOS.

Evaluation Case 001B-01

Evaluation Case Description: Roadside Encounter Data Collection: Part 1 (Confirm Roadside Sensors collect Carrier, Vehicle, and/or Driver identification data associated with the trigger "encounter")

Overview: Roadside Systems may optionally collect roadside sensor data associated with identifying the carrier, vehicle and/or driver during the SDM trigger "encounter". This does NOT include other types of sensor data not associated with identifying the carrier, driver or vehicle (such as weigh-in-motion (WIM) or height detection data). Collected data **might include**: (1) License Plate Data. (2) USDOT Number Data. (3) Electronically collected identification data (i.e. Radio Frequency (RF) ID tag data). (4) Other identification data (i.e. photographic data).
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A: Collect time stamp when vehicle passes trigger point and sends an SDM upon encountering a DSRC Reader. WRI Concept C: Collect time stamp when vehicle passes and license plate information is read/collected.

Evaluation Case 001B-02
Evaluation Case Description: Roadside Encounter Data Collection: Part 2 (Confirm Roadside Data Message is compiled)

Overview: The Roadside data will be compiled into a Roadside Data Message (RSDM).
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Validate completeness of RSDM that is compiled by Roadside.

Evaluation Case 001B-03
Evaluation Case Description: Roadside Encounter Data Collection: Part 3 (Confirm Roadside Data Message is transmitted)

Overview: The Roadside Data Message (RSDM) will be sent to the GBOS.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp of RSDM being sent to GBOS by roadside encounter.

Evaluation Case 001B-04
Evaluation Case Description: WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 1 (Confirm SDM is Received)

Overview: The SDM will be received by the GBOS. Communication with the sender will be completed and a confirmation provided indicating successful receipt or failure.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp of SDM being received and validated.

Evaluation Case 001B-05
Evaluation Case Description: WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 2 [Confirm GBOS Receives Roadside Data Message (RSDM)]

Overview: The RSDM will be received by the GBOS.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Collect timestamp of RSDM being received by GBOS.

Evaluation Case 001B-06
Evaluation Case Description: WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 3 (Validation of RSDM for Structure and Format)

Overview: The RDSM will be validated for structure and format.
Testability: NY and KY.
Possible Testing Strategies: WRI Concept A and C: Personnel or software validate RSDM for completeness using various parameters.

Evaluation Case 001B-07
Evaluation Case Description: WRI Assessment Processing and Report Generation from Roadside Encounter Data Collection: Part 4 (Validate SDM for structure and format)

Overview: The SDM will be validated for structure and format. The SDM message will be corroborated by retrieving carrier, driver, and vehicle data from the accessible infrastructure database as mentioned in Evaluation Case 001-06, including comparing the driver, vehicle, and carrier ID's to the RSDM data for identification confidence. Evaluation Cases 001-07 through 001-09 will follow.
Testability: KY only.
Possible Testing Strategies: WRI Concept A and C: Personnel or software validate SDM for completeness.

Evaluation Case 001B-08
Evaluation Case Description: Confirm GBOS requests SDM from Carrier

Overview: Confirm the GBOS requests an SDM from the carrier.
Testability: KY only.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp of request of the SDM being received.

Evaluation Case 001B-09
Evaluation Case Description: Confirm Carrier Sends SDM

Overview: Confirmation that the carrier sends SDM.
Testability: KY only.
Possible Testing Strategies: WRI Concept A and C: Collect timestamp when carrier sends SDM.

Evaluation Case Associated With Use Case 001-Alternative -C

Note: No Evaluation Cases come from this alternative since it is a combination of steps from Use Case 001-Alternative –A and Use Case 001-Alternative –B.

Testability: NY and KY**.**

Evaluation Cases for Use Case 002 and Alternative

Evaluation Case 002-01
Evaluation Case Description: Confirm Roadside Enforcement communicates with the GBOS to establish trigger points for SDM Collection

Overview: The mobile enforcement system communicates with the GBOS to establish trigger points in the region for which they have authority and wish to collect Safety Data Messages (SDMs) from vehicles.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Enforcement predetermines locations for trigger points.

Evaluation Case 002-02
Evaluation Case Description: Mobile Encounter RSDM Collection: Part 1 (Confirm Roadside Sensors may collect Carrier, Vehicle and/or Driver identification data associated with the trigger "encounter")

Overview: Mobile enforcement systems may optionally collect sensor data associated with identifying the carrier, vehicle and/or driver during the SDM trigger “encounter”. Collected data **might include**: (1) License Plate Data. (2) United States Department of Transportation (USDOT) Number Data. (3) Electronically collected identification data (i.e. RF ID tag data). (4) Other identification data (i.e. photographic data).
Testability: NY only.
Possible Testing Strategies: WRI Concept A: Mobile Enforcement use MCNU. WRI Concept C: Mobile enforcement systems “trigger” encounter by using a license plate reader.

Evaluation Case 002-03
Evaluation Case Description: Mobile Encounter RSDM Collection: Part 2 (Confirm the RSDM is compiled)

Overview: The Mobile Encounter data will be compiled into a Roadside Data Message (RSDM).
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Determine whether RSDM is accessible through a database system.

Evaluation Case 002-04
Evaluation Case Description: Mobile Encounter RSDM Collection: Part 3 (Confirm RSDM is transmitted)

Overview: The RSDM will be sent to the GBOS.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp to validate RSDM is accessible through the GBOS.

Evaluation Case 002-05

Evaluation Case Description: Confirm WRI Results are accessible to Mobile Enforcement Staff/Systems

Overview: WRI Results (Level WRI Inspection Report and/or Safety Alert) will be accessible to Mobile Enforcement Staff/Systems, via a Real Time Enforcement Support Interface. Mobile Enforcement can access the data via several **different methods** depending upon preference as follows: (1)Delivery of summary and details to "sites" (mobile and fixed sites) within some region relative to the SDM trigger point. (2) Delivery of summary to sites within some region relative to the SDM trigger point, followed (at receiving operator's discretion) by pull of details. (3) Query/response for data collected matching certain parameters (e.g., location, time, carrier, vehicle). Note: Options should support a user interface for an enforcement officer and an automated system interface for a software application. The data will be available through an interface, which allows Mobile Enforcement to establish local alerts at variable data thresholds.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp verifying Mobile Enforcement received WRI results.

Evaluation Case 002-06
Evaluation Case Description: Confirm Local Enforcement Protocols can be implemented by Mobile Enforcement Staff/Systems

Overview: The Mobile Enforcement Staff can respond to the WRI Results according to the local enforcement protocols. Methods include: (1) Using the WRI Results as inputs to the locally established interdiction strategies. (2) Using the WRI Results to augment the inspection selection process [includes enforcement personnel access to previous inspection data (Manual and WRI Results)]. (3) Use of WRI Results to automatically fill in applicable inspection report fields. Note: Optionally, the inspector may manually validate the WRI Data by directly observing all, or part of, the information provided via the SDM.
Testability: NY and possibly KY.
Possible Testing Strategies: WRI Concept A and C: Implement enforcement protocols based on WRI Results having been accessed.

Evaluation Case 002A-01
Evaluation Case Description: Mobile Enforcement System: Part 1 (Confirm Mobile Enforcement Systems receives SDM and RSDM)

Overview: The SDM and the RSDM will be received by the Mobile Enforcement Systems. Communications with the sender will be completed and a confirmation provided indicating successful receipt or failure. The next steps continue as outlined in Evaluation Cases 001-004 through 001-009, but under Mobile Enforcement Systems.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Collect time stamp when mobile enforcement receives SDM and RSDM.

Evaluation Case 002A-02
Evaluation Case Description: Mobile Enforcement System: Part 2 (Confirm WRI Data and WRI Results are sent from Mobile Enforcement System for analysis)

Overview: The WRI Data and WRI Results will be sent from the Mobile Enforcement System to the GBOS for analysis and storage.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Collection of time stamp when GBOS receives WRI Data and WRI Results.

Evaluation Case 002A-03
Evaluation Case Description: Mobile Enforcement System: Part 3 (Confirm WRI Results may be viewed by Mobile Enforcement Personnel)

Overview: The WRI Results from the local processing may be viewed locally by Mobile Enforcement Personnel.
Testability: NY only.
Possible Testing Strategies: WRI Concept A and C: Determined if mobile enforcement can access and view WRI Results.

Evaluation Cases for Use Case 003

Evaluation Case 003-01
Evaluation Case Description: Verify transfer of Data Analysis of WRI Results from Roadside Enforcement Staff/Systems

Overview: The GBOS will provide tools that facilitate the analysis efforts. Analysts may need to be able to request SDM records within a particular geographic region, over a particular period of time, or that were collected at a specific set of Roadside WRI Inspection Trigger Point.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp of analysts requesting SDM records.

Evaluation Case 003-02
Evaluation Case Description: Verify transfer of Data Analysis of WRI Results from Analysts (Government)

Overview: Government analysts will be able to request and access information via the GBOS. Analysts may be authorized to view any SDM with all identifications intact.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp of analysts (government) requesting SDM records.

Evaluation Case 003-03

Evaluation Case Description: Verify transfer of Data Analysis of WRI Results from Analysts (Private)

Overview: Private safety analysts will be able to request and access information via the GBOS. Some analysts may be able to see the data only after the PII is removed.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp of analysts (private) requesting SDM records.

Evaluation Case 003-04

Evaluation Case Description: Verify transfer of Data Analysis of WRI Results from Motor Carrier/Coach

Overview: A carrier will be able to access its own SDM records to monitor driver and vehicle performance. A carrier may also use its collection of SDM records to discover trends and patterns of behavior. The collection of SDM information may help carriers improve safety. The GBOS will provide tools that facilitate the analysis efforts. Analysts may need the ability to request SDM records: (1) For a particular carrier (vehicle, or driver; or set of carriers, vehicles, or drivers) over a particular period of time. (2) For drivers (or carriers, or vehicles) that match a specified set of criteria (e.g., authorized to drive a particular class of vehicle).
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Collect time stamp when carrier successfully requests and receives SDM records.

Evaluation Case 003-05

Evaluation Case Description: Verify transfer of Data Analysis of WRI Results from GBOS

Overview: The GBOS will store WRI Data and WRI Results in the Government Back Office Database for use in safety analyses and special studies. The GBOS will control access to SDM records based on access rules and users' roles. A user access and control system will allow multiple tiers of users such that information access can be controlled per data field, and possibly based on data content.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Determine GBOS WRI Results and WRI Data can be accessed through the GBOS.

Evaluation Case 003-06

Evaluation Case Description: Verify generation of GBOS Query Report

Overview: Tools in the GBOS should support query and report writing capabilities for analyses that include WRI Results and WRI Data.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Verify software supports query and report writing capabilities for analysis which include WRI Results and WRI Data.

Evaluation Cases for Use Case 004

Evaluation Case 004-01
Evaluation Case Description: Confirm GBOS sends notification to carrier

Overview: The GBOS will send a notification to the carrier (WRI Results Available).
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Determine if the carrier receives notification from GBOS.

Evaluation Case 004-02
Evaluation Case Description: Confirm request of subscription to automatically receive Safety Alerts associated with the carrier

Overview: A carrier may establish a standing request (i.e., a subscription) to be notified when the GBOS processes an SDM involving their company. The carrier then may retrieve the WRI Results and WRI Data, if desired.
Testability: NY, TN, and KY
Possible Testing Strategies: WRI Concept A, B, and C: Determine if the carrier has subscribed to be notified when GBOS processes an SDM.

Evaluation Case 004-03
Evaluation Case Description: Confirm request of a report of all WRI Assessments associated with the carrier

Overview: A large carrier may choose a daily notification of all WRI Results processed instead of receiving individual notifications for each assessment processed, or a carrier may choose to be notified only if the CMV Safety Alert indicates a problem.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Determine if the carrier has subscribed to be notified when GBOS processes an SDM.

Evaluation Case 004-04
Evaluation Case Description: Confirm access to Enterprise Database containing WRI Data and WRI Results and User Access Control System

Overview: The WRI system will provide access to the data via a Government Back Office database interface. States may also choose to provide access to WRI Results and WRI Data via their systems.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Determine states can access the WRI Results and WRI Data.

Evaluation Case 004-05
Evaluation Case Description: Confirm ability to challenge Incorrect SDM Data

Overview: As with other data, if the carrier finds an error in the SDM data held by FMCSA, the WRI system will provide a means to challenge the information via the FMCSA DataQs system.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Fabricate dummy errors and correct them via the FMCSA DataQs System.

Evaluation Case 004-06
Evaluation Case Description: Confirm operations of Existing Data Qs System

Overview: As with other data, if the carrier finds an error in the SDM data held by FMCSA, the WRI system will provide a means to challenge the information via the Data Qs system. FMCSA will provide SDM-data-challenge tools via the FMCSA Portal.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A, B, and C: Establish the carrier has successfully challenged information via the Data Qs system and that the error was logged.

Evaluation Cases for Use Case 005

Evaluation Case 005-01
Evaluation Case Description: Confirm Management of the WRI System configuration

Overview: The WRI System shall provide mechanisms to establish accounts, set account authorizations, and restrict access to management services to authorized personnel.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A and C: Authorized personnel will be able to access accounts, and unauthorized personnel will not be able to.

Evaluation Case 005-02
Evaluation Case Description: Confirm Provisioning and configuring of fixed WRI System

Overview: The WRI System shall monitor, detect, log and report abnormal System (internal components) behavior.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A and C: Determine that upon the introduction of abnormal data, the WRI system detects and reports abnormal incidents.

Evaluation Case 005-03
Evaluation Case Description: Confirm detection, isolation, and correction of WRI Infrastructure and service problems

Overview: The WRI System shall implement controls and mechanisms to detect and diagnose services impacting operational or performance events, incidents or situations. The WRI System shall implement mechanisms and controls to restore failed or degraded services, including the ability to monitor, manage, and administer the system from alternate locations.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A and C: Determine the WRI Infrastructure diagnoses and fixes a performance failure event with the incident being logged.

Evaluation Case 005-04
Evaluation Case Description: Confirm monitoring of WRI System and subsystem performance

Overview: The WRI System shall monitor and analyze the performance of the WRI System.
Testability: NY, TN, and KY.
Possible Testing Strategies: WRI Concept A and C: Verify the WRI System produces a performance report.

Evaluation Cases for Use Case 006

Note: Use Case 006 and the Evaluation Cases for Use Case 006 no longer exist

Evaluation Cases for Use Case 007

Evaluation Case 007-01
Evaluation Case Description: Confirm carrier receives SDM from GBOS (if subscription exists)

Overview:

Prior to departure from the terminal, a driver (or co-driver) will interface with the WRI on-board component and request an inspection. The carrier will submit an SDM for a particular vehicle when "locally" triggered. The inspection process will follow events in Use Case 001:

(1) The WRI GBOS will perform the normal validation, corroboration, and safety assessment processes to determine if an unsafe situation exists.

- a. If so, the driver or co-driver will be notified of the unsafe condition.
- b. If not, the driver or co-driver will be notified the vehicle passed inspection.
- Note: Government agencies will not be notified with the results of a self-inspection trigger.

(2) The WRI Results and WRI Data will NOT be permanently stored by the GBOS.

(3) If the carrier subscribes to receive automatic notifications, the company will be notified.

Testability:

TN only.

Possible Testing Strategies:

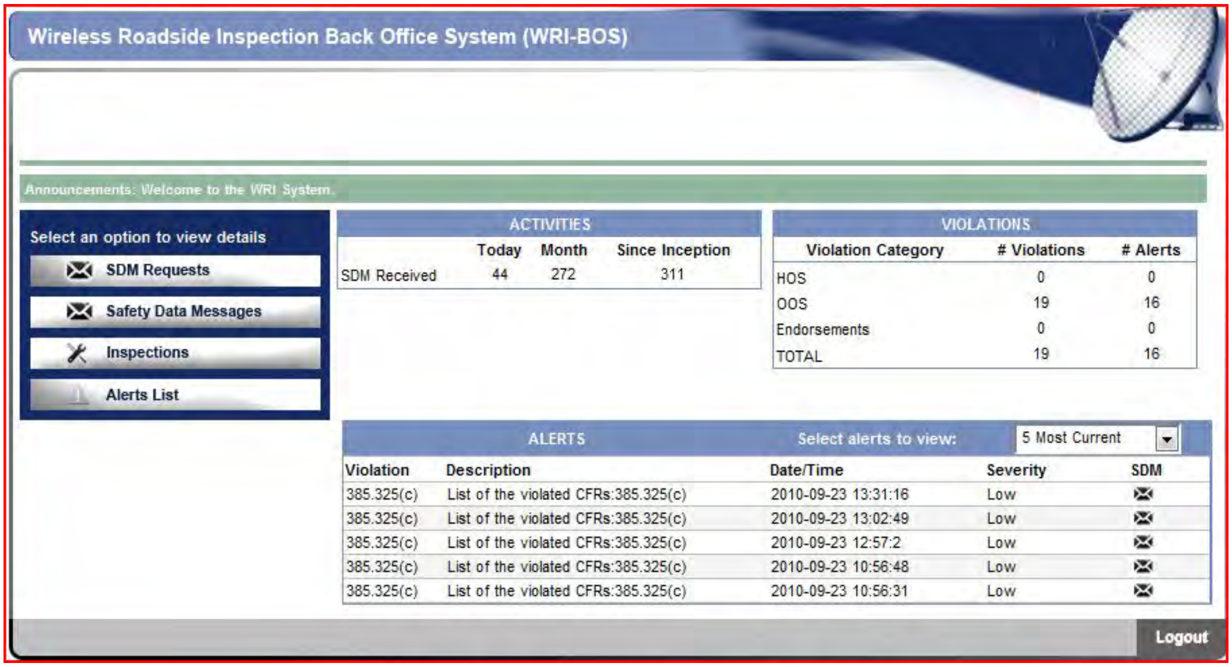
WRI Concept A and C: Determine that onboard equipment initiates process, and after completion of the Evaluation Case a time stamp verifies the SDM was successfully sent to the GBOS. GBOS then notifies the driver whether the particular vehicle was safe or unsafe for normal operations.

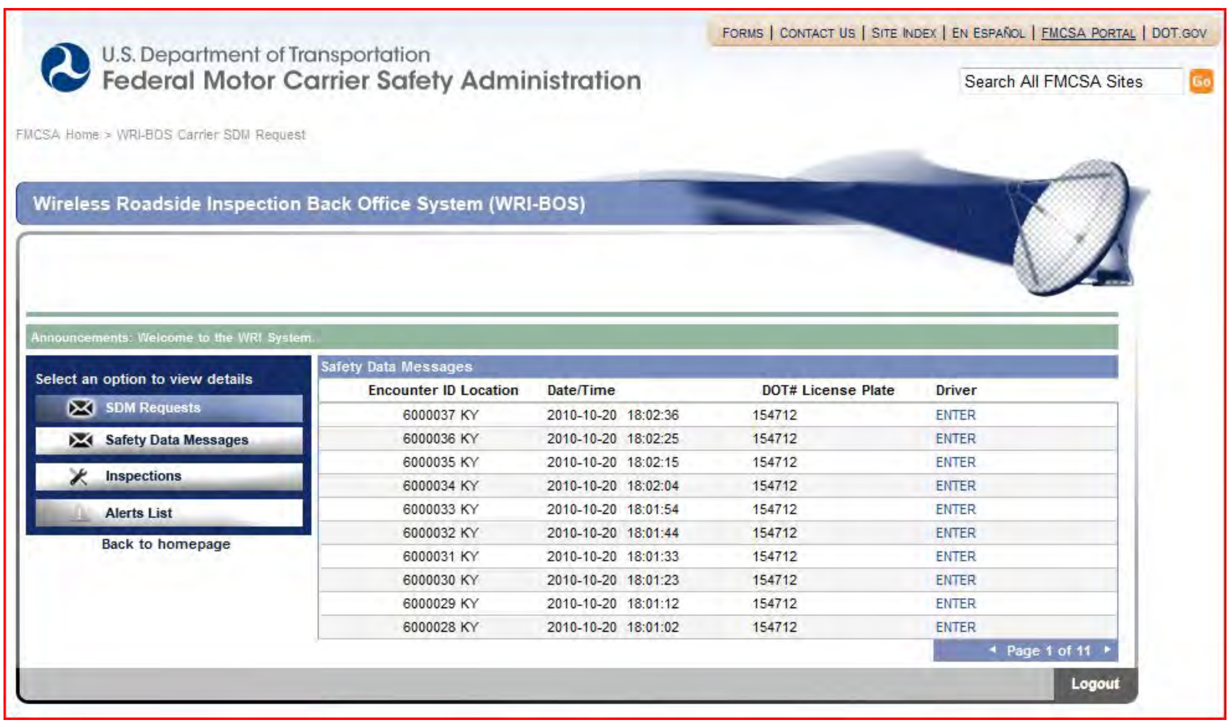
Evaluation Cases for Use Case 008

Evaluation Case 008-01
Evaluation Case Description: Confirm enforcement submits SDM in training mode and data submitted to GBOS is tagged as training data and kept separate from "real" data

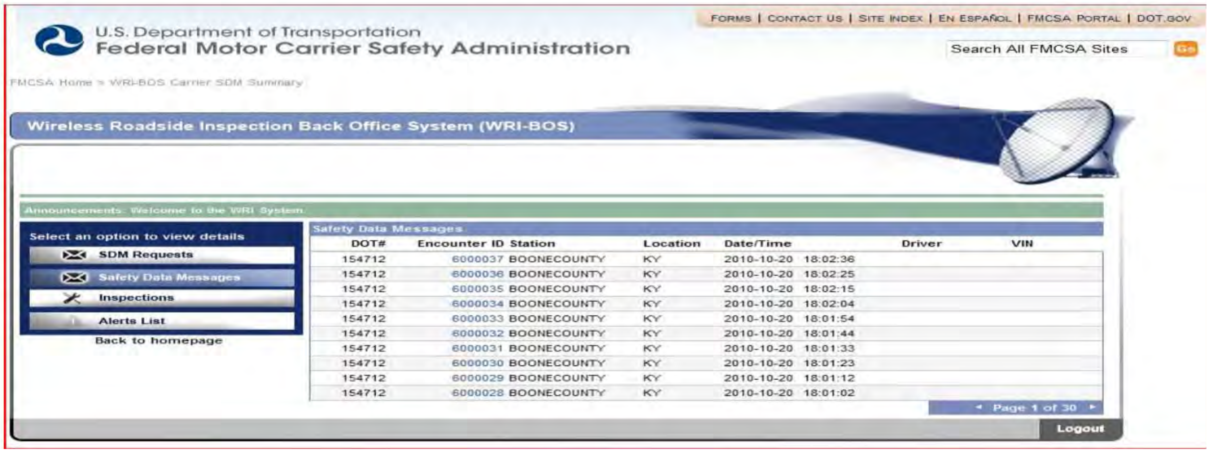
Overview: While bringing a Roadside or Mobile Enforcement site online, the collection of SDM and RSDM should be enabled for testing purposes without the system keeping the data for long-term storage or processing against non-real time database systems. This Use Case supports a "Training Mode" for the Roadside Enforcement and/or Mobile Enforcement Sites. All standard operational processes are the same as the base static and mobile Use Cases, except the data submitted to the Government Back Office System is "tagged" such that it is kept separate from "real" data, and is not stored in the Back Office Database. However, all normal Real-Time Enforcement Support operations occur as usual, but with carrier notifications disabled.
Testability: NY, TN, and KY.
<u>Possible Testing Strategies:</u> WRI Concept A, B, and C: Test "Training Mode" setting for Roadside Enforcement functions correctly. Verify that data is identified and stored in a separate database through appropriate time stamps throughout.

APPENDIX C: GBOS INTERFACE SCREENSHOTS





Safety Data Messages



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U.S. Department of Transportation
Federal Motor Carrier Safety Administration

Search All FMCSA Sites

FMCSA Home > WRI-BOS Carrier SDM Summary

Wireless Roadside Inspection Back Office System (WRI-BOS)

Announcements: Welcome to the WRI System.

Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage

Safety Data Messages

DOT#	Encounter ID	Station	Location	Date/Time	Driver	VIN
154712	6000037	BOONECOUNTY	KY	2010-10-20 18:02:36		
154712	6000036	BOONECOUNTY	KY	2010-10-20 18:02:25		
154712	6000035	BOONECOUNTY	KY	2010-10-20 18:02:15		
154712	6000034	BOONECOUNTY	KY	2010-10-20 18:02:04		
154712	6000033	BOONECOUNTY	KY	2010-10-20 18:01:54		
154712	6000032	BOONECOUNTY	KY	2010-10-20 18:01:44		
154712	6000031	BOONECOUNTY	KY	2010-10-20 18:01:33		
154712	6000030	BOONECOUNTY	KY	2010-10-20 18:01:23		
154712	6000029	BOONECOUNTY	KY	2010-10-20 18:01:12		
154712	6000028	BOONECOUNTY	KY	2010-10-20 18:01:02		

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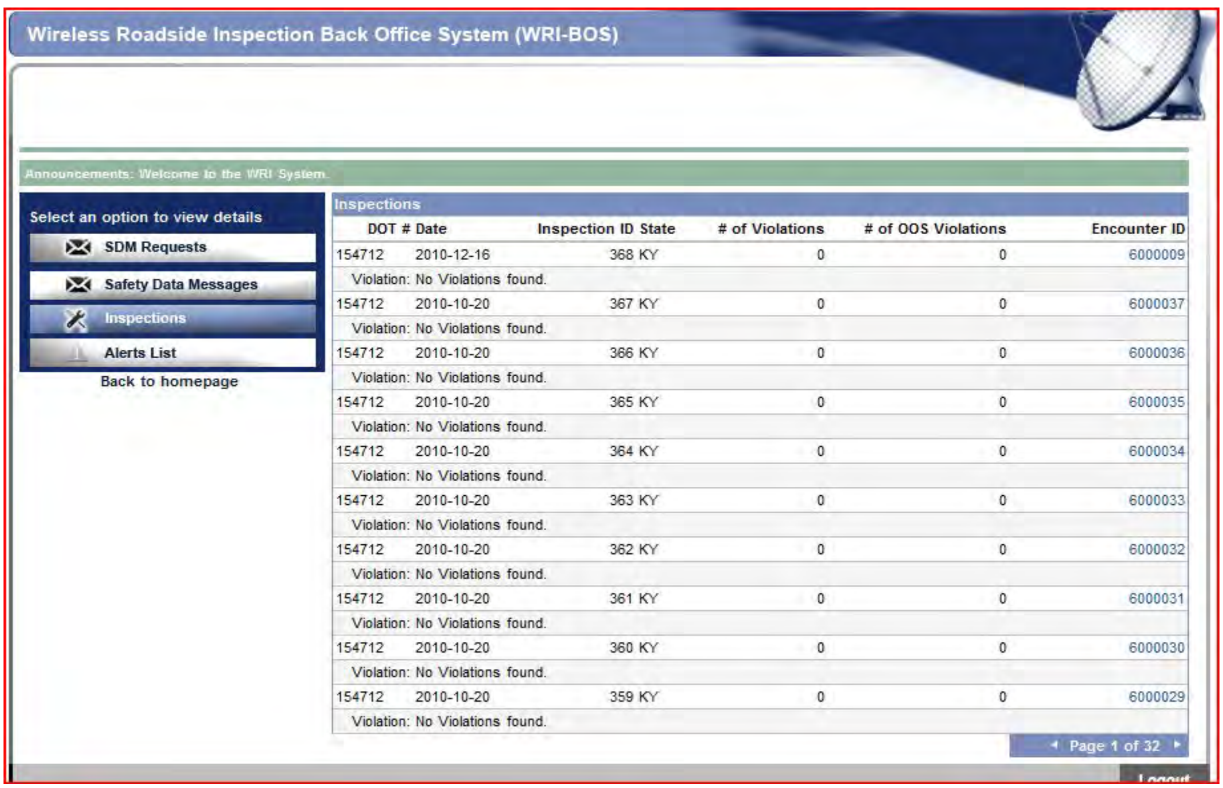
Logout



Wireless Roadside Inspection Back Office System (WRI-BOS)

Announcements: Welcome to the WRI System.

Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
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Inspections

DOT #	Date	Inspection ID	State	# of Violations	# of OOS Violations	Encounter ID
154712	2010-12-16	368	KY	0	0	6000009
Violation: No Violations found.						
154712	2010-10-20	367	KY	0	0	6000037
Violation: No Violations found.						
154712	2010-10-20	366	KY	0	0	6000036
Violation: No Violations found.						
154712	2010-10-20	365	KY	0	0	6000035
Violation: No Violations found.						
154712	2010-10-20	364	KY	0	0	6000034
Violation: No Violations found.						
154712	2010-10-20	363	KY	0	0	6000033
Violation: No Violations found.						
154712	2010-10-20	362	KY	0	0	6000032
Violation: No Violations found.						
154712	2010-10-20	361	KY	0	0	6000031
Violation: No Violations found.						
154712	2010-10-20	360	KY	0	0	6000030
Violation: No Violations found.						
154712	2010-10-20	359	KY	0	0	6000029
Violation: No Violations found.						

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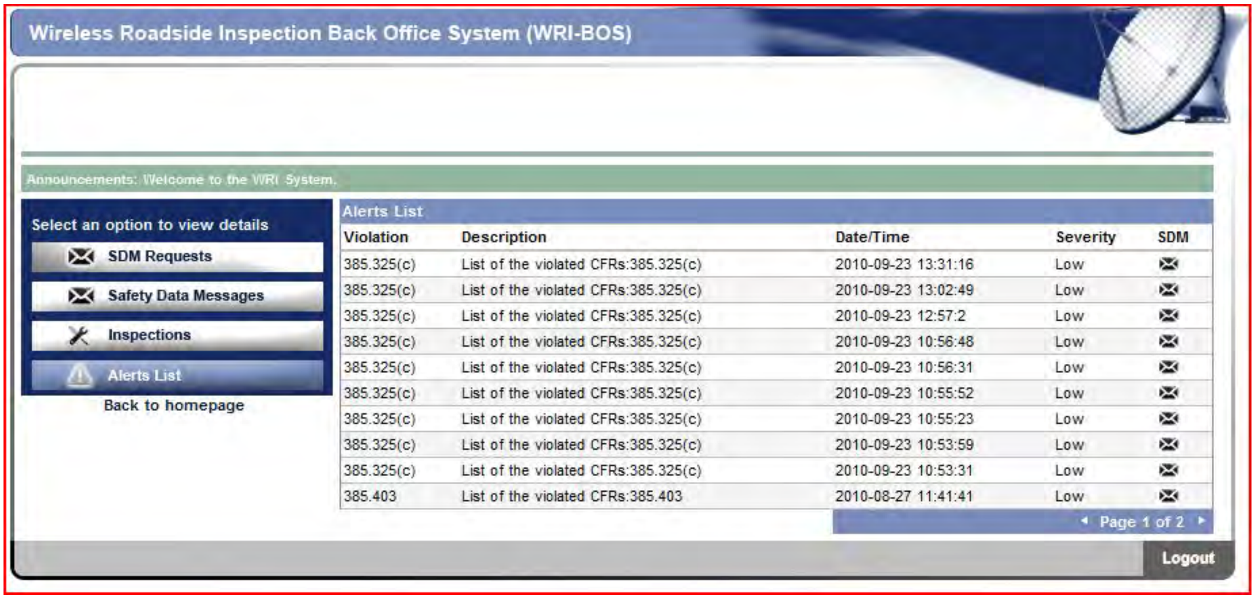
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage
Alerts List
Violation | Description | Date/Time | Severity | SDM
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 13:31:16 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 13:02:49 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 12:57:2 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:56:48 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:56:31 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:55:52 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:55:23 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:53:59 | Low
385.325(c) | List of the violated CFRs:385.325(c) | 2010-09-23 10:53:31 | Low
385.403 | List of the violated CFRs:385.403 | 2010-08-27 11:41:41 | Low
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Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
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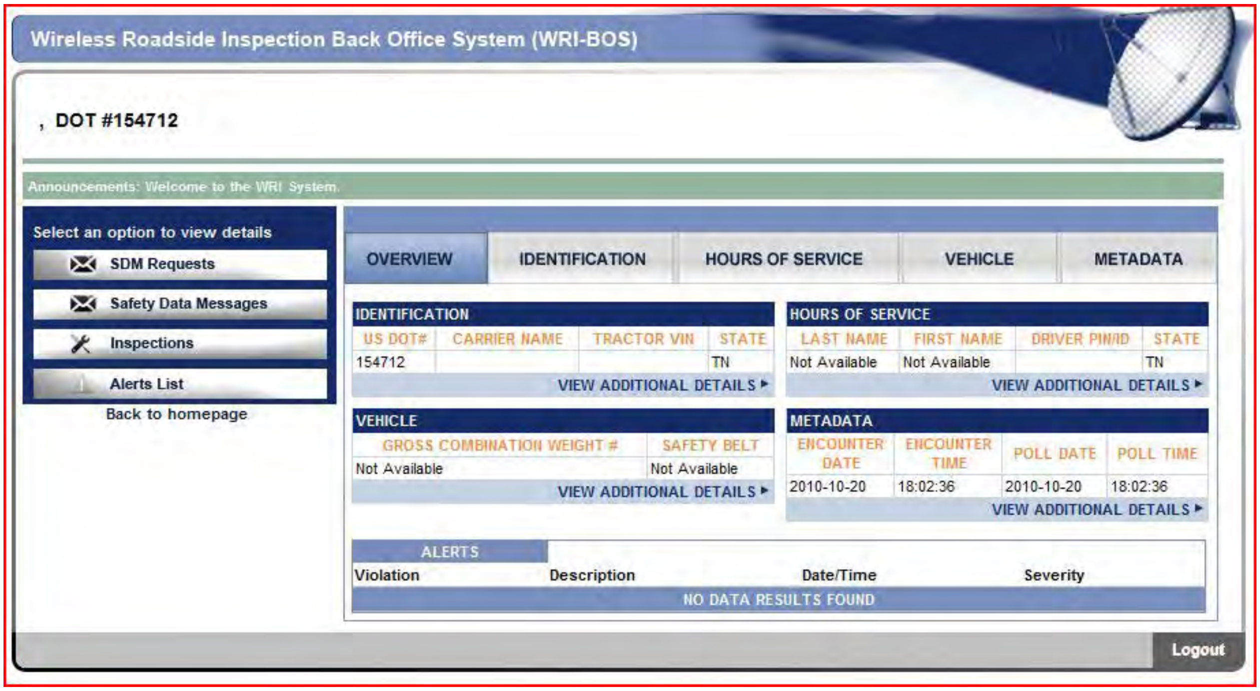
VEHICLE INFORMATION
DOT# | LICENSE PLATE# | DATE | LOCATION
2010-10-20 | KY
Please select driver of the above vehicle.
Select | Last Name | First Name | License #
Submit Driver
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
, DOT #154712
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
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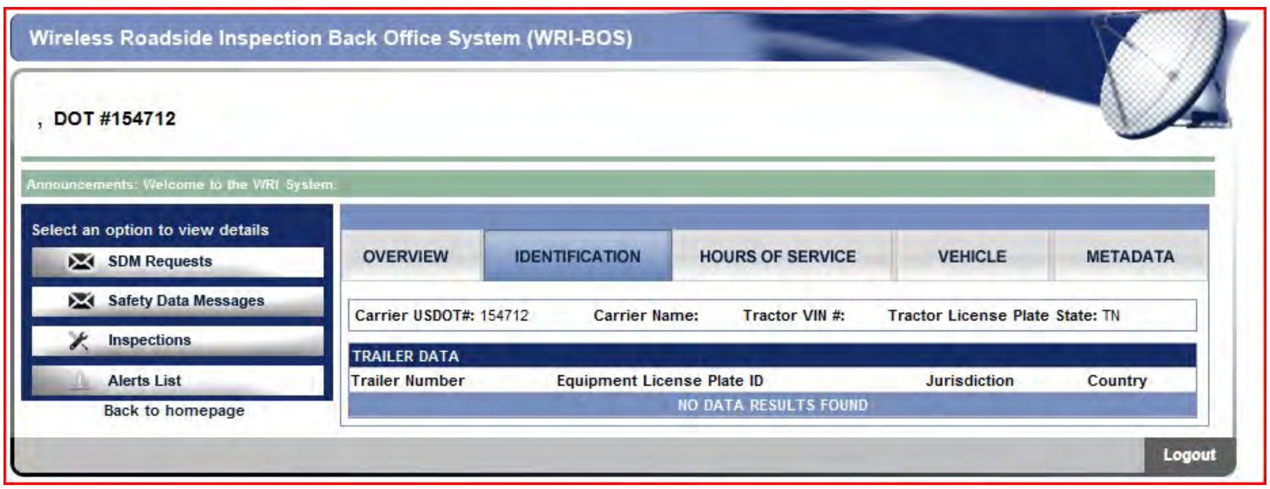
OVERVIEW
IDENTIFICATION
HOURS OF SERVICE
VEHICLE
METADATA
IDENTIFICATION
US DOT#
CARRIER NAME
TRACTOR VIN
STATE
154712
TN
VIEW ADDITIONAL DETAILS
HOURS OF SERVICE
LAST NAME
FIRST NAME
DRIVER PIN/ID
STATE
Not Available
Not Available
TN
VIEW ADDITIONAL DETAILS
VEHICLE
GROSS COMBINATION WEIGHT #
SAFETY BELT
Not Available
Not Available
VIEW ADDITIONAL DETAILS
METADATA
ENCOUNTER DATE
ENCOUNTER TIME
POLL DATE
POLL TIME
2010-10-20
18:02:36
2010-10-20
18:02:36
VIEW ADDITIONAL DETAILS
ALERTS
Violation
Description
Date/Time
Severity
NO DATA RESULTS FOUND
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
, DOT #154712
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
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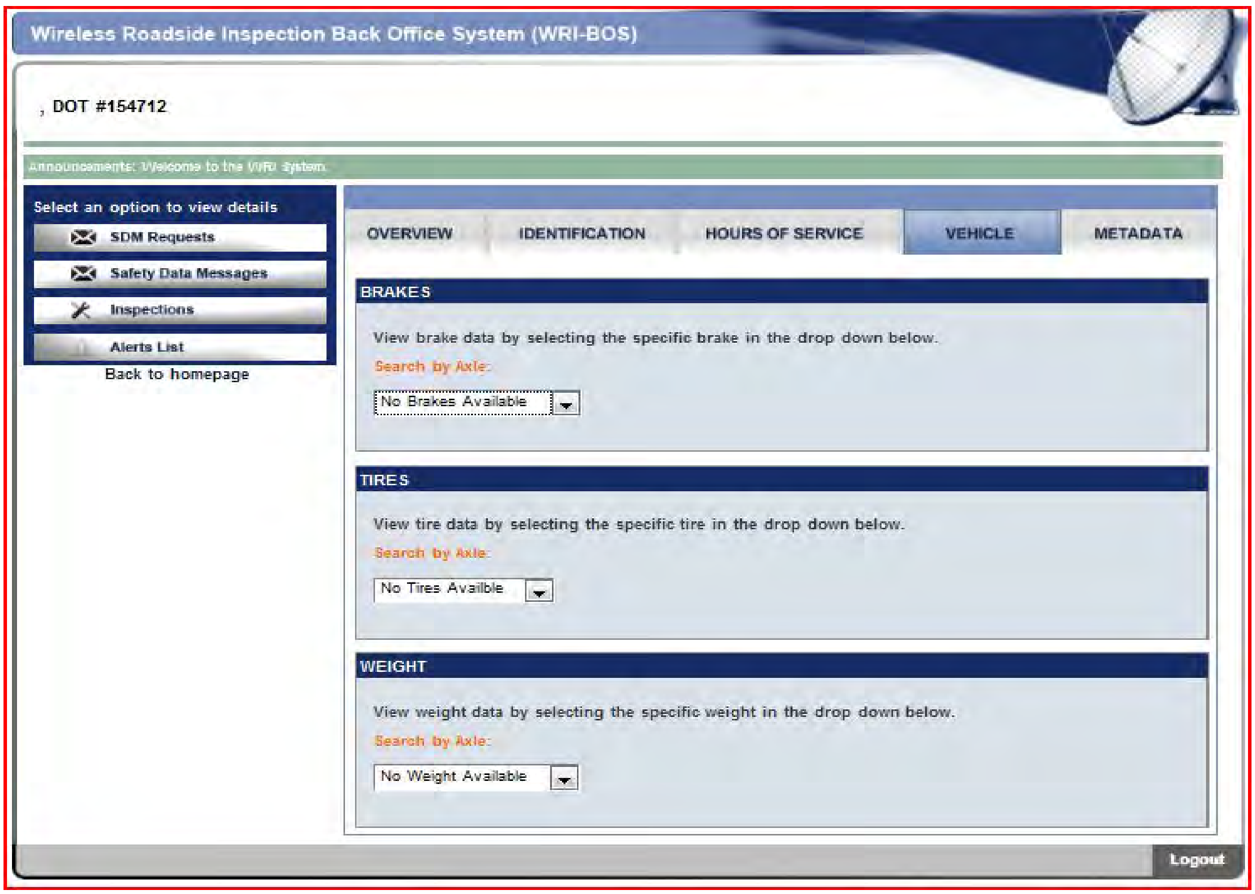
OVERVIEW
IDENTIFICATION
HOURS OF SERVICE
VEHICLE
METADATA
Carrier USDOT#: 154712
Carrier Name:
Tractor VIN #:
Tractor License Plate State: TN
TRAILER DATA
Trailer Number
Equipment License Plate ID
Jurisdiction
Country
NO DATA RESULTS FOUND
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
, DOT #154712
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
Back to homepage
OVERVIEW
IDENTIFICATION
HOURS OF SERVICE
VEHICLE
METADATA
DRIVER
CO-DRIVER
EVENT DATA RECORD
DATE TIME ID STAT CODE PLACE DISTANCE MILES TOTAL VEHICLE MILES
NO DATA RESULTS FOUND
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
, DOT #154712
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
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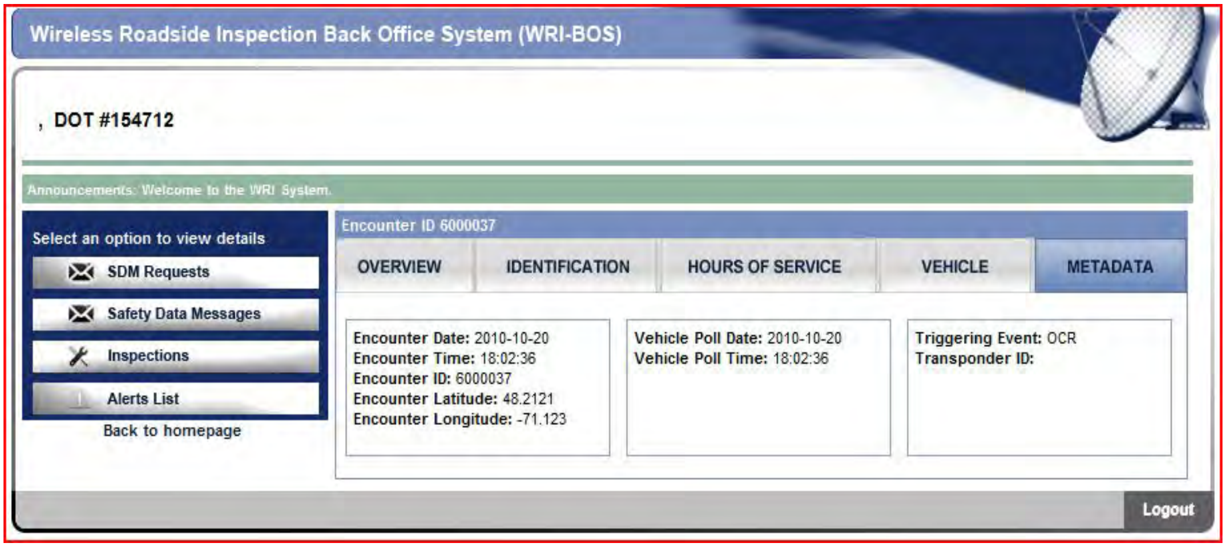
OVERVIEW
IDENTIFICATION
HOURS OF SERVICE
VEHICLE
METADATA
BRAKES
View brake data by selecting the specific brake in the drop down below.
Search by Axle:
No Brakes Available
TIRES
View tire data by selecting the specific tire in the drop down below.
Search by Axle:
No Tires Availble
WEIGHT
View weight data by selecting the specific weight in the drop down below.
Search by Axle:
No Weight Available
Logout


Wireless Roadside Inspection Back Office System (WRI-BOS)
, DOT #154712
Announcements: Welcome to the WRI System.
Select an option to view details
SDM Requests
Safety Data Messages
Inspections
Alerts List
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Encounter ID 6000037
OVERVIEW
IDENTIFICATION
HOURS OF SERVICE
VEHICLE
METADATA
Encounter Date: 2010-10-20
Encounter Time: 18:02:36
Encounter ID: 6000037
Encounter Latitude: 48.2121
Encounter Longitude: -71.123
Vehicle Poll Date: 2010-10-20
Vehicle Poll Time: 18:02:36
Triggering Event: OCR
Transponder ID:
Logout

APPENDIX D: WIRELESS ROADSIDE INSPECTION PHASE II STAKEHOLDER PARTICIPANT EVALUATION INTERVIEW TRANSCRIPTS

As part of the Wireless Roadside Inspection (WRI) Phase II pilot tests, members of the University of Tennessee (UT) evaluation team conducted interviews with the representatives from the participating pilot test stakeholders. In December of 2010, and in January and February of 2011, calls were placed, asking a set of predefined questions, to pertinent parties from the Commercial Mobile Radio Services (CMRS) and Universal Identification (Universal ID) platforms; this document contains the transcripts from those interviews.

This document is meant to be a supplement to the Wireless Roadside Inspection Phase II Draft Evaluation Final Report. Specific details regarding stakeholder participant details, the manner in which the interview questions were developed, how the interviews were conducted, and how the interviews were used for the evaluation are contained in the final report.

In order to maintain anonymity, interviewee and company names have been removed from the transcripts. In places numbers are contained within parentheses. These numbers were used as part of the transcription process and refer to the times in the recordings themselves.

CMRS PLATFORM

The UT Evaluation team conducted interviews with stakeholder representatives from the participating CMRS platform Phase II pilot tests including: telematics teams, enforcement personnel, fleets, and sensor providers.

Telematics Providers

Members from the telematics provider stakeholder participants were involved with the telephone interview sessions. Further specific details regarding the telematics providers can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

Telematics Provider 1

Interview date: 2010-12-21

Interviewer: We are doing this for the evaluation of the WRI pilot tests that have been going on. My group has been tasked with doing the evaluation and trying to figure out things that went wrong and things that went right, suggestions for improvements and people’s opinions on the way things happened and the systems themselves. We are glad to have you guys on board. Want to let you all know we are recording these calls but in the evaluation we are not going to quote anybody. Person A said... and [name] you might be person R.

So, and if you want to say anything off the record, you are certainly welcome to do so. We have a few other people listening in because they have a stake in this as well. I think we sent you guys the service provider questions; there are just a few of them. And did y'all see the webinar?

Interviewee: Yeah, I did actually.

Interviewee: I did not but [name] briefed me on some of the details. But I did not.

Interviewer: Okay. Well, I'm going to start right at the top of these service provider questions and ask you, in your opinion what could have been done differently to improve the test process? If you ran into any problems and if you had any suggestions for any problems and also if there was anything that you thought went really well.

Interviewee: Just um, I guess starting from my perspective, and [name] handled most of the technical interface so I'm sure he's got a lot of comments and feedback. But from the business perspective, I think the program objectives were laid out very clearly. I think the direction and the upfront framing of how this thing was to be put together and the amount of interaction in terms of fleets, I think that was well define. The acquisition, the support of the acquisition of fleets was tremendous from [name] and his team. I think up front, all of that was actually very well coordinated. If nothing, we held up a bit on getting some of our fleets to give us the final nod. But all that was very clean and professional and much appreciated. I think that was the good positive start to the whole thing.

Interviewer: When you said you ran into some errors, if you could tell us what they were and maybe how you worked to fix them and how we could prevent them in the future hopefully.

Interviewee: I'm going to take a little bit of a crack of that. First of all I agree with everything [name] said. The team there has been a pleasure to work with and we have had the opportunity to work with them on more than one occasion. I think that, looking back from my perspective we at People Net, perhaps tried to pull too many things together at one time. We were not only working on a pretty sophisticated interface on our blue system but also tying in data from three different vendors [vendor name], [vendor name], and [vendor name]. It turns out there was an awful lot of moving parts there. And despite the fact that we had great participation with our 4 test fleets, [name], [name], name], and [name]. The other issue you have is you are really juggling a lot of things at one time. So, in order to get certain software and hardware installed, trucks may need to be in a certain location or a state, or a particular, not a state like a city state, but a particular state of operation. And, you are working with schedules and trucks all over the country and so forth. I just found out there is a bit more at pulling that all together than we anticipated.

Interviewer: Okay.

Interviewee: One lesson learned was to be a little less aggressive on when and how fast we thought we could get things done.

Interviewer: Okay.

Interviewee: Particularly when you are working with lots and lots of working parts because one of them can really hang you up for a while.

Interviewer: Right. Is there anything...

Interviewee: Huh?

Interviewer: Is there anything...

Interviewee: Go ahead.

Interviewer: Specifically that reared its head as being a major obstacle?

Interviewee: You know quite frankly all of the vendors participated I think with the exception of [name] participated on a gratis basis and contributing their time and effort. I think that adds to it as well. Because you are constantly in a... you certainly want the project to succeed but you are really weighing a lot of things together. So, ideally you have a representative from every company at every truck facility at the time of installation. So, in an ideal world if [name], [name], and [name] are being tested on a particular truck for say [name], not only are they there but representatives from my team are there and we all work together and we work through each truck and it's all working when we leave. And that turned out to really not be practical.

Interviewer: Right.

Interviewee: And I think that lead to then and even now, some issues although they are starting to come together. But they are coming together late in the game.

Interviewer: Right. Now did you, you did interact with the [name] back office system correct?

Interviewee: Yes. When you're doing that to today, and I think the [name] team did a good job. I think they came in under a lot of pressure coming into the October display. There were some disconnects, I think, may have been on my part or our part as well as others in terms of what [name] expected. And we kind of had to work through those on the fly. There were some restrictions, some edits if you will, in what [name] was expecting that wouldn't work. I think if I were going to have a hand in planning something this in the future, I would try to design the system as resilient as possible so that when somebody sent in data that wasn't exactly what was expected, you flag that and let people know but not necessarily have it be a catastrophic event to the system. Quite frankly, some things that we were doing apparently was having a catastrophic impact on the [name] system. At some point in time we stepped down and out of the way to make sure we didn't impact the actual demonstration in October. But, and since that time we have been able to work with [name]. In fact we are working with them on some testing today. And that's going very well.

Interviewer: So it's fair to say that was some problem that originated in... your understanding of what was expected of you?

Interviewee: I think so. And I'm trying to remember exactly what it was. There was a situation where I think we were either failing to send a piece of data or sending a piece of data that was not formatted exactly as expected. And, evidently resulting in a complete crash of the [name] servers. For the longest time, it was difficult to identify that. In fact, I think the way it was finally identified is that everybody that was participating stood down and we did one at a time until we found out. We had no idea we were doing anything that impactful but evidently we were.

Interviewer: Right. In the course of this information being exchanged from the trucks and y'all and the [name] system, what kind of feedback would you want after you submit the information, SDM? I mean technical kind of information.

Interviewee: Well, certainly if you are submitting something and it's based on your interpretation of documentation. I don't know how this happened, this probably was our fault but we actually ended up working with the wrong set of documentation for a period of time or at least what was documented is not exactly what was implemented or something to that effect. But um, what you are looking for, and we have the same situation when we have our customers integrate to our People Net systems, you are in position to where you really need to let the customer, the vendor know, what isn't working or have a way to help them de-bug it. Because sometimes, what you don't want to do is get into a station where, let's try and it see, well that didn't work well let's try something else and that didn't work. You need some kind of handshake there where you can kind of figure out what maybe is working and isn't working.

Interviewer: Now did you have any um, experiences with the user interface?

Interviewee: Uh, as far as going in and looking at data that was posted?

Interviewer: Yes

Interviewee: Yeah. I'll be very honest, used it a very little bit mainly because most of our issues were between us and [name] or between our other vendor partners and [name]. And so, we did get some data up there. [Name] was able to relax a couple restrictions for us...

Interviewer: Right.

Interviewee: So we could work around that. And yes, we did go in and look at it. But as far as really giving it a critical look, was this a good interface or a bad interface? It certainly got me to the information I needed to see.

Interviewer: Right.

Interviewee: So I certainly have no problems with it. But I didn't give it really a critical eye either because I was concerned with the issues on my end.

Interviewer: What would you like to see in the interface? Or on the interface?

Interviewee: I'll be very frank with you; I haven't given it a great deal of thought.

Interviewer: Okay.

Interviewee: Yes, I would think the interface would be more for one of the trucking participants to see how their trucks are going to understand it. And honestly, I was using it as a de-bug tool to see if our data was actually getting through and if it did, what it would look like.

Interviewer: Right.

Interviewee: One thing I do know that our carrier members have asked for is the ability to see that data as they are heading out of the yard so they can do a pre-check prior to getting to the actual scale.

Interviewer: Right.

Interviewee: Um, I think that's something that we have heard is open access to the information where they can view that information before heading out on the road.

Interviewer: Now, based on the webinar and your experiences and what you have been shown the expected user benefits to be, do you think the WRI system should be implemented?

Interviewee: Say the... I didn't hear the word before "system."

Interviewee: Yeah, [name], I can take that if you want. It is our view that yes, we feel like the WRI system should be implemented. There are certainly some issues to be resolved but from a technical as well a business, on a business side and you know data privacy and that type of thing. But there's a lot of activity going on right now around wireless data transfer around EOBRs, electronic onboard recorders, that are starting to hit this piece of the puzzle as well. But yes, I think this is a clean, efficient manner or way of transferring information. I think there'd have to be appropriate motor carrier benefit in this whether it's through their CSA scores or some other type of incentive. We are always advocate or are for carrier benefit to programs that involve cost on their end. But yes, I think we, in general we feel this is a good, efficient way of conducting this inspection information between the roadside and the motor carrier.

Interviewer: And in general, what are your impressions of the WRI technologies?

Interviewee: From my perspective, I have positive impressions. Again, setting the technical glitches aside that were encountered between our teams here during this process, I think we and the 5 carriers motor carriers that we brought to the table have positive perspectives on the wireless roadside inspection process.

Interviewee: I would add to that that I too have become much a believer in the wireless roadside inspection concept. Some of the presentations I have seen over the last 2, nearly 3 years now are very compelling. And what we are facing in terms of keeping unsafe vehicles off the road and the amount of manpower it would take to provide those inspections in a traditional manner. So, I'm a huge fan of the technology. I think that we've learned that it's not a simple system to implement, there are going to be glitches, there's lots of moving parts. But I think there's enough success out here that we should continue to pursue it.

Interviewer: Okay. Well, I'll ask the rest of the people on the call [name], [name], and [name] if they have any questions for you all.

Interviewer: Nothing from me.

Interviewer: Me either.

Interviewer: Nope, thank you.

Interviewer: Alright. Well, gentlemen, do you have any more questions for us?

Interviewee: I guess in terms, it may be a process question, but next steps and where do you guys go from here from your end?

Interviewer: Well, I'm going to tell you what I've told everybody else this morning. We're at the low end of the totem pole. So I don't have a good answer for you. I don't have any kind of knowledge of that at all. So, I would suggest you contact [name] and talk to him. Sorry!

Interviewee: Okay.

Interviewer: Thanks you so much.

Interviewee: Alright guys.

Interviewee: Y'all have a good day.

Interviewee: You'll welcome.

Interviewee: Any time. Bye-bye.

Interviewer: Bye.

[End interview]

Telematics Provider 2

Interview date: 2010-12-13

Interviewer: Hi there. Our goal is to provide some of your feedback in the evaluation report of the larger WRI pilot tests. So, what we are doing is we are conducting interviews of several of the stakeholders and several participants and players in the WRI pilot. I will turn it over eventually to [Interviewer], and he'll run the interview. If you guys have any questions, you are welcome to chime in. But that said, [Interviewer] will be moving through the questions he sent you earlier in the week, or last week, I should say. I'll turn it over to him and he'll get started. He'll run through the questions, and then there will be plenty of time for questions at the end of course if you have any of us or vice versa. Okay? Go ahead.

Interviewer: Hello gentlemen. Welcome. We are going to let y'all know that we are recording these interviews. If you have anything you want to say off the record, just state that before your comment.

Do you have any questions before we begin the process?

Interviewee: Not from here.

Interviewee: Did you send that email through [Co-worker]?

Interviewee: I did send that email to [Co-worker].

Interviewee: Did you get that [Co-worker]?

Interviewee: I sure did. Do you need me to forward that on to the other folks on the call for purposes of this call?

Interviewer: That would be good, I would think.

Interviewee: Ok, let me get busy trying to get that out to everyone while you guys chat.

Interviewer: I'll go ahead and start with the first question having not seen your responses there. What do you think could have been done differently in this process to improve the test process?

Interviewee: Hmm. I thought that the test actually went pretty well. Um, we put stuff together and threw it over the wall and it seemed to go forward pretty well.

Interviewer: Ok. That's a simple enough answer.

Interviewee: There's a couple more items that we included in the email that were suggestions. Maybe I will just say them then when we get them [can't hear/can't understand].

Interviewer: Ok, that would be great.

Interviewee: Let me see if I can find it. I'm still looking for the email.

Interviewee: I sent it to you. But anyway, one of the items, it would be nice for the test, for provided set of events like if our service status change sequences so that you can for the vendors so you knew the calculations that were coming out of the vendor system would match the calculations of the wireless roadside system so you know that there's a match. That would be a nice thing.

Interviewee: Maybe just to elaborate on that, I don't, in our last call, I asked the question if we were doing the calculations on the backside on the violations and available hours. I think the answer I heard was "kind of." In a future test or if we were to do this test again, I see as one of the critical elements of this whole WRI is that violation calculations by the vendors should match up by violation calculations by the back office. If they don't, that is going to create some confusion to the driver. The driver system says you are fine and you have plenty of hours. But we do a roadside inspection and all of a sudden he gets a red light saying you are out of hours. But then he says my unit says I have hours. That's going to really be confusing to the driver. So, you know, a set of status changes test cases that say hey, if a driver went through a shift with these kind of status changes, we should show these available hours for driving for on-duty or we should show this violation. So a set of test cases that vendors can use to validate their system against the back office just to make sure everybody is in sync might be really helpful.

Interviewer: I see your email now. Would you mind expanding a little bit on your second point as well? There in the email, item #2?

Interviewee: Yeah, after the test got started, well prior to the test [Co-worker] sent us a couple of geo points for the weigh station in Tennessee. One of the geo points was for west-bound traffic and the other was for east-bound traffic. We didn't realize that the direction that the vehicle is going should factor into our geo fence crossing. By the time you build these two geo fences big enough to detect if the vehicle has come near the weigh station, you end up hitting the geo fence for the west-bound and the east-bound. Since we didn't really include bearing in our geo fence crossing detection logic, you end up hitting both geo fences and maybe getting extra messages sent.

If we do, in fact, want to include the direction of travel, if you would like vendors to look at the direction the vehicles are going and factor that into geo fence crossing, then I think we need to make that clear. You also need to include in your geo fence information that you are sending out that this is a west-bound, this is an east-bound, this is a north-bound, this is a south-bound. So we can be smarter about all of that.

Interviewer: Great, this is the kind of information we are seeking to find from y'all. I really appreciate your feedback on this.

I will step on to question #2. In regards to what feedback from the government system you want to receive after you submit a SDM. I do have your email here, but if you would like to elaborate on that, that would be great.

Interviewee: Sure, the first point on that, currently the vendors, like us, are asked to include an SDM encounter ID. It's a unique identifier for each SDM that is in the system. The way we did it for the test, [Co-worker] gave [Interviewer’s Company] a range of encounter ID's to use when we send SDM's. The other vendors were given different ranges. If that's the unique identifier for the SDM in the back office system, it seems to make more sense to me that we would throw a naked SDM over the wall; the back office would put it into the system and, at that point, assign it a unique ID. Then pass that unique ID back to the vendor as part of a response.

To ask the vendor to make sure all the SDM's coming from all their vehicles coming for all of their customers are unique across the world, just seems kind of error prone. I think that's problematic. It's hard enough for us to make sure it's unique just across our vehicles for [Carrier].

Interviewer: Did you have any specific problems with this?

Interviewee: No, we made it work. But it's a maintenance kind of a nightmare. I think we were given some range of 10 million to 20 million or something like that. Somehow we have to carve that up across all of our vendors, or all of our customers and all of our customer's vehicles and we can't have any duplicates. That just seems silly. Why not let the back office assign these unique numbers as it gets messages from everybody across the world.

Interviewer: I personally don't have enough information to comment on that further. We are certainly are appreciative of your feedback on that matter. I'm sure there are reasons and all out there for these things.

Would you mind elaborating on your second point in the comment there to this second question?

Interviewee: If you go back to number 1 to understand that, if every time you walked up to an ATM machine to do a transaction, you had to come up with a unique transaction ID for that event. That's kind of silly. Why not let the bank's back office take care of everything.

Interviewer: Right.

Interviewee: Number 2, [Co-worker] sent me an email months ago proposing a solution for how and when the vendor would be notified that he needs to tell the driver to pull over. We throw an SDM over the wall, a bunch of calculations occur on the back end and then a response comes back to the vehicle. Somehow in that response, we as a vendor would have to interpret that response to signal something to the driver, hey, you need to pull over, you have an issue. That all still needs to be worked out as far as I know.

Interviewer: Okay. I want to move on to the next question. I know y'all participated in the Webinar the other day and appreciate your taking the time to view the Webinar and talk with us today. Based on that Webinar and what you have been shown the expected user benefits to be, do you think the WRI system should be implemented.

Interviewee: My answer was yes.

Interviewer: Would you like to expand at all or? You don't have to.

Interviewee: Um, well, I think if I was a driver, I would rather be able to do an over-the-air drive by inspection rather than get pulled over and waste a bunch of time.

Interviewee: I also like the fact that you would be collecting a lot of good information and you would be able to do a lot more inspections in a day than you can do today physically. That would give you a good balance of good and bad data, good and bad inspections. Safer.

Interviewer: I will move on into the next question and again, if you could go down through your list and expand on your comments to the question, that would be great. The question being whether you experienced any problems integrating with the multi-back office system that you think should be addressed in future design of the interface?

Interviewee: We were able to interface with it without any real serious problems. The main problem we had, I'm trying to see if I've got it in here. The response we got from the system was caused an exception on our side. I think there's a technology disconnect between what we are using and what they're using. I'm trying to find it in here, number 4 I think. We were unable to process a response coming back from the back office. We tried to work with [Co-workers] and others to get that resolved, but we never did quite get it resolved. I think because of the kind of server you were using and we are using, [Current System] The format of the response, we were choking on it for some reason. We got to work that out.

Interviewer: Ok.

Interviewee: If I go back to #1, a lot of these have to do with the concern I have personally that the back office, if we are really going to use this system to do inspections, we need to make sure the back office calculates violations and available hours correctly. And the only way that can be done correctly is if the back office knows enough about the driver's hours of service rules that he can apply rules correctly.

So #1, let's see, what did we say? We do indicate whether he is a 7- or 8-day driver. So, there's nothing in the SDM to say he invoked short-haul or he is an oil field driver and apply oil field kind of rules.

#2 is related to that. There's nothing in the SDM to say hey, this driver should be using interstate rules. He drives in Texas; only drives in Texas, apply the Texas rules.

#3, everything is UTC. All the dates and times of the status changes are in UTC. We do send through as part of the SDM that this driver's start time for the 24-hour period is, let's say, midnight. But there is nothing in the SDM to say what time zone does this driver operate in. So, without that time zone, you don't know what time that midnight is to properly calculate his hours.

I think there needs to be more information in the SDM so that the back office can correctly apply all of the hours and service rules. Those are just a few examples; interstate, time zone, exemptions, did he invoke any exemptions. There's nothing to say he invoked emergency or adverse conditions. So you, the back end, might say he has a violation and gets pulled over. He says to the inspector no, I'm not in violation, I invoked this rule. Why did you pull me over? I think we can do a better job with that.

Interviewer: If you would like to continue to discuss your point, that would be great.

Interviewee: #5, we included in our system the ability to do a self-test. It was a little [can't hear/can't understand] the way Volpe wanted us to indicate that the SDM was coming over the air was a result of the self-test. I talked to [Co-worker], and we both agreed, why not have triggers self test. Why not make it really simple. Say hey, here's the reason you are getting the SDM. I believe they tied it to some other, they buried it in some other property, which kind of didn't make sense to us.

Interviewer: Okay.

Interviewee: Right now, the SDM only allows the primary driver, the guy behind the wheel, and a single co-driver. In the oil field business, you can have multiple co-drivers. So you really need to accommodate for more co-drivers, not just one. Our system allows up to 6 drivers in a vehicle. You might have 6 guys climbing in a truck to go to and from an oil field, a well site. All of them would be on the clock. You really need to be able to track more than one co-driver. That was what #6 was about.

Let's see, #7, that's kind of a picky one. If we don't have a lat[itude] and a long[itude], I think today you are supposed to put a negative longitude in there. I don't know why they did that.

Interviewer: When you say "they" you mean Volpe?

Interviewee: Yes. I think Volpe are the people who developed the XSD, the xml schema definition that has the format rules for the SDM. Requiring a negative longitude, that just seems kind of silly. Maybe the minus signs should be optional. If you think of Alaska, their longitude is in a positive range. So, today if you were to use WRI in Alaska, you wouldn't be able to pass it through the lat/long.

Interviewer: Okay.

Interviewee: Eight, I don't know. I know when it comes to calculations for hours of service whether the guys are in violations or not, some systems are to the second. If you can have, what is it, 11 hours of driving? And if he is 1 second over, some systems will flag a violation. Some systems won't flag a violation until he is 1 minute over. We should probably be consistent with that resolution of time. I think the SDM is to the minute one. I believe our system is to the minute, which is probably the better way to go.

Interviewer: Ok, and #9?

Interviewee: Um, I don't know. I don't have an answer for this. But if you start having thousands of geo fences, you know, for a guy who drives in multiple states but with places he can be inspected, weigh stations in every state. We need a better way of communicating these geo fences. Maybe over the air so that a vehicle knows here's an inspection station you should be aware of. Right now we have a configuration we follow where we put these geo fences. I think we need to explore how we handle those geo fences across the country to get those communicated to vendors and get those into vehicles, and how do we do that with various storage requirements and storage capabilities. Not sure how that should be done.

Interviewer: Is it possible that the need for this kind of data might overpower some of the lesser expensive devices that are in the marketplace or could be in the marketplace that would make the product more [can't hear/can't understand - 24:29]?

Interviewee: Maybe. I don't know.

Interviewer: I don't know either.

Interviewee: This assumes that if the implementation is on-board implementation, but you could imagine this could be off-board implementation, and you are sending the location to the server and the server is commuting whether you went with the geo fence or not. It wouldn't work if you are out of coverage or if you had a very [can't hear/can't understand], but that might reduce the demands on the mobile commuting system.

Interviewee: Exactly.

Interviewer: Well, we certainly appreciate all your feedback on these issues. I'm sure that I feel sure that there are members of the greater WRI team that have thought of many or most or all of these things that you have brought up at one point or another. If not, I feel strongly they'll be glad to dig into them further if things continue.

I noticed in the next question, in the general portion of the questions that you did not have any interactions with the user interface. Is that correct?

Interviewee: I didn't.

Interviewee: I got to see it down at the station. I just saw it far. It was an average impression. It wasn't like wow, this is incredible! It wasn't bad. It was an average impression.

Interviewer: Right. And it was designed for the pilot test. It was sort of a production model so to speak.

Interviewee: I would think in a production model you would want a go or no-go kind of thing, wouldn't you?

Interviewer: I can't speak to that. I'd hate to go on the record of saying anything. I'm the low man on the totem pole.

Interviewer: Let me respond to that. Here's a question for you guys; what would you like on the production model? That is one of the points of this interview. Trying to get some feedback on what pieces of information you might appreciate if it were available easily and what format you would like to see it in. Would you like to access the data offline in batch format and so on? Can you speak to that maybe?

Interviewee: For me it's all about available hours and violations. So, if I throw an SDM over the wall, and I can go online somehow and see how that was processed, I would want to know what available hours did the back end come up with for this driver, and what violations did it come up with for this driver. I would want to see that information.

Interviewer: Okay, good. Thanks.

Interviewee: Would you also want to see information that we can validate that the data that is making over, that we are sending over from the vehicle or the back end is correct?

Interviewee: Ah, yeah definitely. The list of status changes.

Interviewee: Exactly. Would that be in batch form? Would you want to see it by filter or by vehicle or by driver? Just to validate that everything is working properly?

Interviewee: Yeah, I would think so. If you really think about what information goes into this box to perform all those calculations, it's status changes, it's rules; what rules are being applied, what exemptions has he invoked. With all that input, what state is he driving in, what time zone does he operate in, what is his start of day hour? All of that information that is used to calculate available hours and violations, I would want to be able to confirm that the right stuff was picked up on the other side. And then see that the status changes that went through match the status changes that I have. And see that the hours and violations that are calculated match what I have. You want to compare both sides on all of those points. As an engineer, that is what I would be interested in.

Interviewer: I guess I'll move into the last question. If you care again to expand on your comment to what the impressions of what the WRI technologies are.

Interviewee: For me it's the same as what I said earlier. If we are going to use this system to avoid pull-over then we need to make sure we calculate things correctly. To calculate things correctly, you need more information in that SDM.

Interviewer: Okay. Well, certainly you have provided us with a lot of feedback. We certainly appreciate that. It's just a big help.

[Name], do you have anything you would like to add?

Interviewer: No, nothing here. I appreciate, I just want to express that I appreciate your careful thought into these questions, and you have provided a lot of good feedback particularly as you are all are producing information for us and producing inspections and so on. I just really appreciate that. Yeah, thanks!

Interviewee: You are welcome.

Interviewee: You’re welcome.

Interviewer: Do you have any questions for us?

Interviewee: This is [Co-worker]. [Co-worker], you had sent me a reminder this morning. [Co-worker] you are on this call right?

Interviewee: Yes I am.

Interviewee: About some questions that [Co-worker] had sent you [Co-worker] for us to try and address if we were interested in addressing. [Co-worker], we haven't even talked about this this morning so I don't know if we can in this phone call or not.

Interviewee: Yeah, let me give a little quick background on [Co-worker’s] behalf. Then she can join in. She's tasked with doing a cost-benefit analysis for WRI technology. We realize that this does not exist in production form. It is not ubiquitous across the U.S. Getting our hands on cost numbers is a little bit difficult. She is looking for some approximations. I think the categories are in the ranges of equipment cost, ranges of installation cost and ranges of service at a month or annual. So if that could be provided, not necessarily on this call, but if that could be provided fairly soon, that would be helpful to her.

Interviewee: It might be a little bit difficult to address the question in means anything other than the platform we are using. We are not certain of the capabilities are of some of the other systems that are out there or will soon be out there.

Interviewee: In addition, I would say that we have gotten cost information thus far from other providers. Basically, from my understanding, it basically parallels their current equipment, installation, and monthly service fee costs. I don't think anyone has wrapped themselves around what a WRI-only cost would be or a WRI add-on cost would be. If you have some general figures for a telematic system that would be assumed to have this capability, that would be helpful.

Interviewee: We do. We can talk about it [Co-worker] and formulate an answer.

Interviewee: Ok.

Interviewee: Ok, I'll get [Co-worker's] concurrence on this and the study she is doing. My assumption, [Co-worker], is that you are basically going to give price ranges for technology. Again, the providers for this information is anonymous for what you will actually report. Correct?

Interviewee: Exactly. It's non-disclosed.

Interviewee: Thank you.

Interviewee: I would like to make one observation. This is a 30,000-foot observation or whatever you want to call it. It seems to me the need to have the systems provided by the vendors calculate things in a way that will match the way DOT will calculate things would take us a step further into having FMCSA in a manner of speaking, certify that the systems are doing what they are supposed to do, which is not something that they do today. Is there a concern about that from a regulatory standpoint?

Interviewee: Okay.

Interviewee: Along those lines, let's say the back end calculates a driver is in violation but our system says he's not in violation, and we know he is not in violation. How does that get resolved? Is there an appeal process or, you know, some way to resolve those differences?

Interviewer: I think the purpose of these interviews are to bring things like this to light. We are aware of this, and you have made it loud and clear. I say that constructively. That will be reported in the University of Tennessee's evaluation report. It will get addressed. I can't say for sure how DOT will decide to address it, but they are aware of that. I would assume in this yet-to-be-defined process that will be forth in the future for WRI if it goes forward in the certification process that that would be addressed.

Interviewee: I think it would have to.

Interviewer: Rest assured that it's noted, and it will be dealt with and considered.

Interviewee: Cool.

Interviewer: Great. I think that's all we have for y'all today and really appreciate your time.

Interviewee: We would like to thank you all for giving us a chance to participate in this pilot project.

Interviewer: I thank everyone else that has joined us today and everybody have a good day. Enjoy the snow.

Interviewee: You too.

Interviewer: Thanks everybody.

[End interview].

Telematics Provider 3

Interview date: 2010-12-14

Interviewer: We will go ahead and get started. We are recording this call. Anything you'd like to say off the record, just let us know and we'll note that. Do you have any questions for us before we begin? Again, I'll let you know we are doing this as part of the evaluation for the WRI project. As the pilot tests have gone forward, our test here at [Interviewing Company] is to determine how things went and how things put that forward and the decisions that are made as whether to go into the next steps involved. That part of the Webinar the other day was to make sure there was a level playing field for everybody involved so we could make sure everybody is on the same page.

I think somebody else joined us.

Interviewee: This is [Interviewee].

Interviewee: This is Interviewee].

Interviewer: I gave a brief synopsis. [Interviewer] do you have anything you'd like to add before we get started?

Interviewer: Yeah uh, that's it. No I don't.

Interviewer: Do y'all have any questions for us before we begin this? It shouldn't take that long, I don't think.

Interviewee: I don't think so.

Interviewer: Ok, great. I'll go ahead and started. I sent out the interview questions, I hope you got those.

Interviewee: Yep.

Interviewer: What could have been done differently to improve the test process for you all?

Interviewee: Just some general comments that we have; then [Interviewee] can elaborate. First of all, we got started a little bit late. We were probably a little rushed in trying to get things done. But I think, in general, specifications could have been better before we got started. There were things that required clarification. So while we had a fairly hefty document, there were still a lot of things that were kind of open ended. There were a few things that changed along the way and those were informally communicated. So it might have been better communication of changes. Then, in terms of support, perhaps more support or more consistency. I wonder if one of you guys was on vacation for a while, and he was one guy who was more familiar with technology and stuff like that. Those are kind of eye level. I'm not saying we were necessarily upset about any of those things; we were just playing them out as potential areas of improvement.

[Interviewee], do you want to elaborate on any of that?

Interviewee: Nothing really big. So I don't think anything we would say from our end is any type of a slap in the face at all or by any means. But as far as improving it for the next time down the road, I think from my end, from the development side, maybe a little bit of synergy between the document that I saw that said these are the stats, in particular the SDMS. Some synergy between that and what actually needs to happen between that and the code. For myself, I look at the SDMS example that's in the back of the document. But what actually needs to happen in code is that you need to use these objects that are provided through the … that is given. Whenever I got the document, I didn't actually have the …, so it was kind of difficult to match those two up and couldn't get into the code. [Interviewee] was definitely a big help along the way. But I think if documentation, that might have been a bit of a help to know how you use the objects that are given versus the documentation that's out there.

Interviewer: That's the kind of things we are looking for out of this call. We want to figure out how we can make this better and priced.

What kind of feedback from the government system would you like to receive after you submit an SDM?

Interviewer: In the pilot, we felt it was on a test system basis, our test system, your test system. While we kind of put it into production, it's not really a production system in the sense that, it's not like production of how we want systems for our customers which are in a heavily controlled operation center. If we were in a true production environment, it means every time we send an SDM, there would be a positive acknowledgement or an error message. If there was an error message, there'd be a protocol for retries. If that protocol were exhausted for the retries and there would be automatic generation of a trouble ticket, and support response to make sure that every SDM was going to be successful. That's typically how we operate with our customers that are in a production system when they use our system to run their business. There's no such thing as lost messages. Every message either gets retried, or we are going to do something to make it happen.

The other thing, just looking at how the system could be used, is that you want a record of inspection and the inspection result as a result of submitting that SDM. The SDM is effectively to the inspection so you would definitely want the record back and the results of that inspection.

[Interviewee], do you have anything to add?

Interviewee: No. That's good from my side. The only thing I would add, sometimes when you submit, we do get responses from the Volpe system. The only difference is there's no log or record as far as documentation that helps me understand exactly what that message means. Some of the things that I received back as response codes are just warnings for example. But they are not fatal. Some are actually fatal. So, I'd like to understand more about the differences between those things.

Interviewer: For fatal you mean?

Interviewee: One of the data elements that is listed as a required data element now is the driver license number, which is not something that we provide; it gives out an error message in the response code, but it is not fatal. I came to learn that through [Interviewee] who helped me out quite a bit with that. But it is a response code. But there are others for example, you might get a message that says something about the time stamp that you submitted that was not valid, but it is a fatal message. They both come back the same way. I'd like to see something about documentation or something that I would know that this particular code, we can keep on trucking with this one or we could, it may be bad to say, but we could ignore this one. Another error code that we cannot ignore.

Interviewer: Did you have any interactions with the interface itself?

Interviewee: Yes. [Interviewee] got me access to the user interface. I like the interface.

Interviewer: Do you have any suggestions for improvements or anything else you would like to see in the interface? Any kind of information?

Interviewee: For me, not from me, but I'm probably not a great user of the interface. Basically I want to see if the data I submitted actually made it to the Volpe system. Someone, [Co-workers], might be looking for more data off of the system I don't know. But to me, everything seems useful from the interface.

Interviewer: In general, having seen the, participated in the Webinar, what are your impressions of the WRI technologies?

Interviewee: I have a couple comments on that. First of all, there's some overlap with the … rule, the new ABR rule. That has requirements for wireless log downloads. That rule becomes effective. It's a vital rule that is effective in June 2012. Things are a little different in there. However, conceptually there are some strong parallels. Now, WRI has been around for, I mean, I have been discussing this for over 5 years now. It's been there. What's in … in terms of wireless log downloads, at first that became visible was in April of this year when that rule was published. It was not in an earlier proposal. So that's kind of interesting. It included this thing called CMRS, which only a few people really understood what that meant. Most people weren't even aware it was in the … unless you are familiar with how things would, people progress with WRI, you wouldn't know about it.

Given now that we have a rule for wireless log downloads, it somewhat takes away from the need for wireless roadside inspection and why we have it. It's going to be effective pretty soon. WRI is a different way of doing that. But do you need a different way? That's a question that you need to deal with in terms of going forward with WRI is why you want to do something different than what's in … And there may be some reasons for that.

The other thing is, if we look at the potential benefit of WRI to carriers, the most significant benefit to carriers is that they get positive inspection credit applied to their SMS rating for driving. A couple of years ago, we talked about that and nobody understood what that meant. Now that SMS scores have gone public effective yesterday I think, it's kind of a big deal.

Particularly fatigued driving wouldn't go down in service, which is one of the stand-alone basics and is kind of a very important measure of determining carrier safety risks. If carriers have an opportunity to leverage this technology to make sure they have a very good rating in that category, they may be more inclined to adopt this technology and use it. So, that's going to be a strong case there. So, if things have changed and now actually have some tangle things that have very important impacts on the carriers business. That kind of value proposition, nobody would have understood even a year ago and today it's reality. That's something to consider as you talk to carriers and what they may want to see in terms of having a WRI option available to them.

Interviewer: Based on the Webinar and your experiences and what you have been shown the user benefits to be, you seem to be very knowledgeable of this, do you think the WRI system should be implemented?

Interviewee: Probably not in the way in terms of its current form. You have a question later on in terms of some of the interfaces. There's a couple of concerns with the way it was designed for this pilot. One is that I don't think the geo fence approach is scalable. We were operating with a couple of geo fences and we were just like sending you SDMs, and it was pretty straight forward with that because you only had one inspection station. Imagine that you had thousands of inspection points, thousands, and that you have something greater than 1 million mobile EOBR units. If you want to take a geo fence approach, how do you manage that information and keep it current on that many mobile units? Or keep it accessible to those service providers for all those locations? That's kind a difficult thing to do. I'm not saying it isn't possible. You may want to look at how this is done. But that would be a challenge. Of course, every time it doesn't work, what does that mean and so forth? And what kind of cost is associated with it? And what kind of extra value do you get versus the … wireless log download approach? That's a caution.

The other thing is, if you want to do an inspection while the vehicle is moving and you want to get a message to the driver, how do you do that without risking driver distraction? We have a pretty good system for what we call an in-motion user interface which is a text-to-speech. There's a few things we will display. I think we display what we call the DOT clock. It's kind of like a clock but it's a countdown timer in terms of driver available driving time based on all applicable constraints. That's visible. I think there's a kind of a real high level menu for the driver can select a voice message can be played. It's similar to selecting a radio station and getting the audio from that. We are still doing research on that. There's more research to be done on driver distractions. The idea of putting a message up to the driver that he needs to pull into a particular inspection station and so forth is not so easily accomplished as it may seem. We actually could do it with text-to-speech; however, the driver is really in control of what things get played. There are alarms and alerts that 3can go off. But again, I'd want to do more research on that and not just assume it.

Those are just some additional factors to consider.

Interviewer: Do you have any other things you'd like to add or anybody from your team would like to add or any questions for us?

Interviewee: The other thing with …that's one of the WRI technologies, we didn't produce it or participate in the … pilot. I am involved with a committee that's looking at standards related to

… wireless log downloads. … is one option. We've taken a survey of the states in terms of measuring available capability to use … and it's pretty sparse. Which says, unless there's going to be some significant funding, it's going to be challenging making that technology to work. And you can say, yeah but you know that may change in 5 years, and I could argue that we would have DRC in 5 years. That's a much different form of …. So, we need to see where that goes. I wouldn't make too many plans to try and implement that yet, and we have to look at it relative to ….

Interviewee: Do you have anything else?

Interviewer: [Name] do you have any questions?

Interviewer: No, we do not.

Interviewer: [Interviewer], do you have any questions?

Interviewer: No. Nothing. [Name], anything from you?

Interviewer: Nothing on our end. Thank you.

Interviewer: Alright. We sure do appreciate y'all’s time. Again, I appreciate the good feedback. Y'all have a good afternoon. Thank you.

Interviewee: Ok, thank you. Bye.

[End interview]

CMRS Fleets

Fleet partner companies from the CMRS participated in the telephone interview sessions. Further specific details regarding the fleet partners can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

CMRS Fleet 1

Interview date: 2010-12-09

Interviewer: Well, we're going to probably in a few minutes go ahead and start with the interview. I did want to let you know that we are recording this phone call.

Interviewee: Ok.

Interviewer: It will be used in the evaluation report as part of the analysis for the overall roadside inspection project.

Interviewee: Ok.

Interviewer: Do you have any questions before we begin?

Interviewee: No, not that I know of. I probably don't know enough about some of this stuff as I should. I got our mechanic here; I have kind of put this under his watchful eye. He has watched as far as the back-office part of this goes. He keeps check of the loss and everything at night. Matter of fact he came in here this morning and said one of them had went off line last night. He's working with ISE right now to see what that problem is too. Cause we have not experienced that since we have started. But we have had a few quirks in and out but we have worked through them pretty well overall.

Interviewer: Great!

Well, I'm going to state again for the record that I'm [Name]. [Name] is here. [Name] is here. It is Thursday, December 9th.

Okay, we will get started.

Interviewee: Alright sir.

Interviewer: In the context of the nationally deployed system, how do you think wireless roadside inspection will affect your company?

Interviewee: In saying "nationally" do you mean if this is mandatory throughout the industry?

Interviewer: Yes.

Interviewee: Okay. I think it would be good. Matter of fact, that's the only disadvantage I have now is because it evens the playing field for everyone. To be involved in a pilot project like this, if it were elective it would be more difficult. Let me say that. Because not everyone plays by the same set of rules. Well, they have the same set of rules but they don't necessarily play fairly all the time.

I think if it was a nationally deployed system, we would see a great improvement in driver’s services being followed more strictly. Also, I think there would be a period of customer education in that. That's something that would concern me because a lot of people don't understand the rules and regulations we have to follow. We have tried to educate people throughout the years on that and have been fairly successful. But this is going to define it more clearly, and there's going to be some resistance, I think, more from our customer base than from the operator base.

Interviewer: I'm going to move to the ... thank you. I'm going to move to the next questions.

Interviewee: Ok.

Interviewer: I will refer to "wireless roadside inspection" as WRI for the rest of the phone call.

Interviewee: Ok.

Interviewer: Do you think WRI will help improve the efficiency for your company on a long-term basis?

Interviewee: Yes.

Interviewer: Do you think WRI will help improve company safety standards for your vehicles?

Interviewee: Yes. Positively. I'm thinking it would have to improve.

Interviewer: Are you familiar with the CSA measurement system and the CSA 2010?

Interviewee: Basically. I mean the basics of it. It's been hard to find anyone who can tell me a whole lot about it. What little bit I have read, I have learned a little bit about the basics of it.

Interviewer: Given that, do you think WRI is a way to provide positive credit for clean inspections under the CSA measurement system?

Interviewee: Yes. Getting back to what I said earlier, it's going to even the playing field for everyone. I think this is a good way of checks and balances for that.

Interviewer: As you know, your vehicle will submit an SDM, a safety data message, during the inspection process. What feedback from the government system do you want to receive after you submit an SDM?

Interviewee: Well, I don't know that I would need to receive anything back from them unless there's something that is possibly a violation or maybe a warning.

Interviewer: Ok. How and when should the WRI results be shared with the driver?

Interviewee: Well, it would have to be shared immediately if it were an out-of-service situation. I don't know how to answer that because [laughing] uh, hmmm. You know, I think it would be a good way to evaluate the driver. In other words, you bring him in probably after the trip. When you have this data you can present before him and say here's some things and this is how regulators see this. They physically look at it, and you need to know exactly what they are looking at, and you know what the rules are. If we have a situation that is borderline or something, then that would help us improve on it.

Interviewer: I think in a way you could tie this question in with the previous question of you know,

Interviewee: Right. Because on the SDM I'm not sure what data we are going to see anyway.

Interviewer: Well, and ultimately that has yet to be fully decided. One can envision a driver, you know, you having a record of one driver you got through the SDM that you shared with them or evaluated them later. So...

Interviewee: As far as the record keeping that we do now to be compliant, and if this thing eventually gets to the point where it works the way, hopefully, the way I think they want it to, would share all the information on the driver and the vehicle. We're going to want to know that anyway. And right now we make every effort to be compliant with that. I think the hours of service will be the big thing that it's going to be monitored more closely and should be. And when you share information with the drivers, if he is out of service, that's it. Violation’s there; now I don't know how they will approach that if he is basically out of hours. Or if they will let him, I know they won't let him continue. At that point how he would have to be made aware of it.

Interviewer: Great! I am going to move on to the next question. How do you perceive the utility of the self test?

Interviewee: Can you define that a little further for me?

Interviewer: I thought you were going to ask that. How do you see your drivers using this? What benefit do you see it providing you with? How do you fit a self-test into the overall picture of the WRI program?

Interviewee: Well, we need to make self-tests. I don't necessarily know if the driver needs to make a self-test. We in operations need to make sure that everything is transmitting the data as it’s supposed to. There again, you know, how many functions of this thing are going to be deployed and would there be a necessity for a driver to make a self-test. In other words, to see that he should have his CDL in his pocket and his F-card in his pocket and know what those expirations are. So, would he make a self-test to check all this information or is it a self-test to make sure that during the course of his operations that the thing is working. I would think in both instances that yes, there would be a necessity to make sure everything is functional.

Interviewer: Is this something that you would be interested in?

Interviewee: I think we'd have to look at it, yeah. It couldn't be ignored.

Interviewer: Ok. What are your impressions of the bypass pull-in features?

Interviewee: Well, to date, as far as the motor coach industry is concerned, there are very few states that ask them to pull through inspection stations. When I first read this you know, I think trucks. I don't know how this is going to work with, as far as the trucking industry when I look at it and it says "bypass" if this checks all this information and you get a green light. I think that’s great. It saves fuel and saves time on both parties for the inspector and for the driver and for the company. And if there's something that needs to be inspected further, then your pull-in feature, I think that would be a good feature to have.

However, at this time, the way they have us set up now is we work off now, we work off of a GEO fence but I don't know what the parameters of the thing is. I don't know if it would catch us quick enough to motion us in. I'm sure down the road they will engineer something in that would give you the ability to get into that station if you need to.

Interviewer: Thank you.

Again, in the context of a nationally deployed system, do you have concerns in regard to being required to have additional equipment?

Interviewee: There again in the bus industry, I don't think I would need additional equipment. If anything, I think I would need additional drivers.

Interviewer: Do you foresee having to equip your trucks with additional equipment? Do you have concerns with that?

Interviewee: Oh, additional equipment, do you meant as additional devices? Is that correct?

Interviewer: Installing them, purchasing them and staying up to date with the things coming down the line, do you see that as...

Interviewee: I'm not really concerned about it. I mean, if this is how things are going to work, uh then that would be part of it. I have to ultimately think what's the greatest benefit from all of this. The greatest benefit would be hopefully to enhance safety. Better and safer operations, which that is a big selling point for me to my customer. If I go to this system now, that's going to be a sales feature for us. We are just going to say we have wireless logging systems that we go by the book on everything. We have a good, safe, clean record, and we monitor these things. We are a step ahead of our competition.

Interviewer: Have you shared this with any of your passengers?

Interviewee: Yes.

Interviewer: What kind of comments have they made?

Interviewee: They have all been positive. There again, the way they look at it is that we are doing everything we possibly can to ensure that we are being as safe as we possibly can. You know, they are the greatest benefactor of that.

Also, a lot of people have been curious about it. It gives us a chance to show them how it operates. It's on the technology side, it kind of is intriguing to people that we can have technology like that.

Interviewer: I'm going to move to the next question.

Interviewee: Ok.

Interviewer: Based on the Webinar and what you have been shown as the expected user benefits to be, in your own experiences do you think the WRI system should be implemented?

Interviewee: Yes, I think it should be. As I said in the beginning, it is going to level the playing field and make everybody price their business a little more accordingly. That has been a problem in our industry today. For example, we have a lot of trips, a lot of school trips that go in the spring going to say New York City. For the sake of saving a few dollars on motel rooms, they like to leave in the evening, drive through the night then tour all day when they get there. We don't really like to do that but that's what most of our requests are for economic reasons. However, what we have to do in that is to pre-position drivers far enough out from the destination or close enough to the destination to be compliant with hours on the first leg of the operation. So, in doing that, that's quite an expense. We have to use a relay vehicle, two drivers, we have a motel room involved for the driver. We have to pass these charges off. A lot of companies, you know, they don't adhere to that as much as they are supposed to. They will stretch a day out for a driver, therefore lessening the charges. I can't be as competitive. And the customer, right now, is looking for the bottom line, the cheapest price.

So, a system like this, it will be like big brother sitting there. It makes everyone have to charge accordingly and that's going to make it safer on the highways ultimately.

Interviewer: I'm going to move into the next section of a few general questions. With the understanding that the WRI user interface has been designed for the pilot test. And I'm assuming you had experience with it.

Interviewee: Yes.

Interviewer: What is your impression of it?

Interviewee: Well, the ones right now, I think were developed specifically for us, which are have like a six-inch screen on it I think. It works really well. Since then they have come out with a smaller one. He indicated he would like for us to try it some time. I have not had any problems whatsoever with what we are using.

Interviewer: Have you used any of the online and watched the FMCSA as the truck passes? I'm not talking about the equipment in the truck. We have access and other team members have access to a Web site that is a secure Web site that shows a truck goes by, and we can see their information. That is part of this system. Have you had any experience with that?

Interviewee: Only at the [Law Enforcement Location] inspection station early on in this. I didn't get to participate, well I did participate in the program down there at the showcase, but I was driving one of the coaches so I didn't get to go inside and see exactly what everyone else was viewing. Early on before they installed this, I think it was at a showcase maybe last year that they had preliminary information of what was coming up. We did look at some stuff within the scale house there that showed some information. But that's the only chance I've had to see it.

Interviewer: In reference to the Webinar, what are your impressions of the WRI technologies?

Interviewee: Well, there's, I mean, the concept, the basics of it are good. Of course, what we are looking at, the way I understood it, is three different types of ways to communicate this information.

Interviewer: Correct.

Interviewee: I think they are basically doing the same thing but just a different vehicle to do it.

Interviewee: Correct. Basically.

Interviewer: So, the basics of it, the information that is shared with the operator, the state and the federal government or the inspector so I think it's a good concept. Just a matter defining how you want to do it.

Interviewer: I have a few more questions that are not on the list that I sent you.

Interviewee: No problem.

Interviewer: What kind of reaction and feedback have you received from your drivers about this?

Interviewee: [Laughing]. The reason I'm laughing is that I have one guy who says he doesn't want anything to do with this. He's adamant about that. We just kept him off those vehicles. However, if we change colors of the uniforms that we wear, he would be the first thing to say the same thing about that. That was nothing new for us. That's just kind of the way he is.

The other guys, I had one or two that were resistant at first, but once they caught on to it, they actually changed their minds about it, which I kind of suspected would happen. They actually like it. We are still keeping our paper logs. That's no problem. But I have heard a few comments about some guys who said, "Well, if this thing ever goes full blown, it's our benefit because we don't have to carry a log book. Maybe just for an emergency or something, but we don't have to keep up with logs and everything." And they don't have to keep up with times. You get busy and you don't necessarily look at your watch when you pull out or when you stop so you have to think back. This thing has it all right there; it's fool proof.

Actually we are off 15-minute grids on our time. This thing is in minutes. So you actually pick up a little time during the day. That's another thing that I really like about it. Actually, I can squeeze a little more out of a guy on a 10-hour shift. Going from a 15-minute grid to the 1 minute.

Interviewer: What do you think causes, you have the one driver that is reluctant or hesitant or simply won't participate, what do you think the impetus behind that is for him?

Interviewee: Well, you probably have to know this guy. [Laughing]. He's been with me a long time. He's just resistant to change. That's about the bottom line on it. If we were to go to it, I would just bring him in and say listen, this is the way it's going to be and you have to accept it or look for another job.

Interviewer: In your other drivers, what do you think caused their initial hesitation?

Interviewee: It's just change. Resistance to change. Also, they feel like it's a little bit intrusive that somebody can watch exactly what they're doing. But a lot of busses have installed on-board cameras for insurance purposes and so forth. We haven't done that, and I know a lot of companies who had trouble with their drivers on that because they feel like it’s an invasion of privacy. But I look at it otherwise. If it's something that might actually be to their own benefit in an accident or something.

Interviewer: For those who were initially hesitant and now comfortable with it, do you think there's any one thing that caused that to change over so to speak, or do you think they got accustomed to it?

Interviewee: I think at first they thought it was going to be complicated to operate it. You know, within one work day they found out that wasn't the situation. It's pretty much automated other than logging on and logging off. I've talked to ISA about that. It could be polished up a little bit to be more user friendly in a few areas. They've been real receptive to making changes if we need to.

Interviewer: Is there anything specific that comes to mind as far as making it better that you've shared with them that you would like to share with us?

Interviewee: Well, the process of actually logging on and logging off is the way they go through that is a little more confusing than it could be. It may be just a change of one word as far as "duty status" or I think we have talked over it a little bit as far as changing... Actually when you go on and log on, it asks you for your code. You enter your code, and it comes up and it has 4 choices there; one is change status, one is on duty, one is off duty and one is change driver. And all these guys want to go "on duty" have already entered their code and think well, I want to go on duty. That was a mistake we made at first. Actually the correct way is to push "driver." Because once you have entered your code, you have already gone on duty. What you do when you hit "driver" you are telling it you are the driver, the code you just entered. It has a system, they wrote this thing for the trucking industry too. The purpose for that is where you have team operations, more than one driver that is entered in on the same duty status or the same shift let's say. So, that is, we have discussed that. The coach industry is, very, very seldom do one have team operations because we have to have defined sleeper [can't hear/can't understand] installed on the bus, which we do occasionally. But we prefer not to do it. I think we have done it once in the last three years. Most of the time ours are just single operations.

That has been a confusing thing for most guys. When I get a guy in here that hasn't used it before and we take him out to show it to him, now we know how to show him and that's the first thing we show him. You log in your ID, and when it comes up to this, you just push "driver." That's all you have to do. It lessens the confusion. To make it really dummy proof, there's probably a couple of short cuts they could put in there.

Interviewer: I have a couple more questions for you. Have you used this for advertising purposes?

Interviewee: No. Not in print. I have verbally maybe mentioned it to some clients. For the sake of this being a test and a pilot project, I don't feel maybe it would be in my best interest to advertise anything like that. I do have a decal on the door that shows the vehicle is a test vehicle in partnership with FMCSA and all the different partners involved on it.

Interviewer: In general, what could have been done differently, if any, in these ongoing pilot tests to make them better for you and your company? Anything that you can think of?

Interviewee: Gosh, I don't know of anything really. [Company] that developed this system that we are using, they have come down here twice from Chicago and helped us with some maybe some minor issues we had. Most of those were on installation on getting the correct hot wire. But other than that, we communicate with them probably at least three times a week. [Name] and [Company], we have all been in good communication with each other. As far as I know, everything has worked like clockwork.

Interviewer: Great. I have one final question. As a fleet manager or owner, what would you like to see in terms of monitoring inspections, maybe online?

Interviewee: As far as my ability to monitor?

Interviewer: Yeah. Real time, or maybe after the fact. You are sitting at your computer and you know when trucks go by there, do you have any?

Interviewee: Well, bear in mind that I'm just a small operator. So my answer would probably be different than most people. I probably wouldn't be too concerned unless there's something ... a flag pops up somewhere that I would need to see. Because, vehicles are like people, they have personalities, and we know our vehicles pretty well. We know what our maintenance program is, and we know what our safety program is. We know if everybody is doing their job, everything is working pretty well. We don't expect to see a lot of stuff pop up. However, if it does, then we need to know about it so we can say, “What have we missed here and what is going on?”.

I can see where big mega-companies like [Company] or [Company] have lost touch with all that. This would be beneficial for them, even with the best programs in place that they probably have, things can get overlooked. As far as me, the only thing I would like to see, probably, well we've got additional systems on some of our busses, [Company] that monitor a lot of the data on the bus through GPS. We get emails whenever we get alerts; high idle time, key on engine not running, panic stopped, speeding, and so forth. That's been pretty beneficial to me. If a guy bumps 73 miles an hour, I get an email on my phone. I'm being more intrusive than this logging device is. They just don't know it, you know. [Laughing].

But as far as this system goes, as far as monitoring, I think it would be good to go through and set these alerts. Like you know if we have a guy getting close on his hours, if we've got someone if they get this thing up to where it's supposed to be as far as their medical card, the license on the bus, and all this stuff, we could set alerts that would pop us an email whenever something gets critical, and you can set the parameters of that to 30 days or whatever you want to do. I think something we could physically set up a system from this system that is going to show us where we are getting into critical areas.

Interviewer: When you say you are is small company, how many vehicles to you have?

Interviewee: We are running 10 right now.

Interviewer: Do you have any questions for us?

Interviewee: No. I hope I answered some of this stuff satisfactorily. I might not have understood all the questions, but you set me straight a time or two there. Hopefully I got the information that you need to help you out.

Interviewer: Dr. Cherry has a question for you.

Interviewer: Getting back to that last point, is there any benefit of having this data inspection after the fact so you can look back on, say, last year so you can see a summary or a report of what types of flags came up. If you had violations, etc., that would be available to you as a manager?

Interviewee: Sure. A summary, if you could get a monthly or weekly summary that would be good. You know, for this thing to work the way it should, for me even in a test project, would be to have this on every vehicle I have. That way I wouldn't be operating two thought processes in my brain. But just for the point of testing it on the two vehicles that we have, I would assume that all this data you are talking about would be available in a report form. Is that what you are...

Interviewer: That's what I'm getting at.

Interviewee: I would think that, you know, there's probably going to be tons of data you would get from it and that would be good. I think that I would, you know, as an operator, be entitled to get that information.

Interviewer: Well, [Name] we sure do appreciate your time.

Interviewee: Well, you are welcome.

Interviewer: It was nice to speak with you. Have a nice day.

Interviewee: I will. Thank you very much. Ya'll have a good Christmas.

Interviewer: Thank you sir.

Interviewee: Bye.

Interviewer: Bye.

[End Interview]

CMRS Fleet 2

Interview date: 2010-12-13

Interviewer: We will be recording this. Anything you want to say off the record, just let us know that and clarify that. You all have the questions that are going to be asked of you. Before we get started, do you have any questions for us?

Interviewee: Not from our end. I don't think so.

Interviewer: I will begin now with the first question. Ya'll have all viewed the Webinar is that correct?

Interviewee: Yes.

Interviewer: In the context of a nationally deployed system, how do you think WRI will affect your company?

Interviewee: Since we are the only company, I guess you are talking to [us] aren't you?

Interviewer: Yes, your company.

Interviewee: Well, uhhh it's got to have a positive impact if we are pro safety. I can't see how it can have any other kind of effect. [Name] and I consider all the aspects of what we, with our limited knowledge, we know about WRI and the investments y'all are trying to make. What we see is you partnering with the national community, actually, of trucking companies to ensure that we have the right kind of driver and the right kind of equipment on the road. How can you lose doing that?

Interviewer: I will move on. I appreciate your answer. Do you think WRI will help improve the efficiency for your company on a long-term basis?

Interviewee: [Interviewee] is shaking his head yes, and I would have to say yes also. Because again, the information you are providing us only enhances our ability to make sure we have a good driver and safe equipment on the road. That should lead to more efficiency.

Interviewer: That leads into the next question of whether you think WRI will help improve the company safety standards for your vehicles.

Interviewee: Yes. Unequivocally yes. We have already seen with the aspects of CSA going into affect a difference in attitude not only in our locations where the drivers are based, but in the drivers themselves realizing that safety is becoming a paramount issue with the better motor carrier safety administration.

Interviewer: Speaking of the CSA, do you think WRI is a good way to provide positive credit for clean inspections under the CSA measurement system?

Interviewee: Boy I hope so! That's one area that I don't understand yet. I can see all the things we have done wrong with CSA, but I'd like to see some of the things we do right. With WRI it should afford DOT the opportunity to point out good carriers and give them some type of recognition for doing the right thing. And I don't know whether any other way than with inspections that they can do that. WRI to [Interviewee] and I, we have talked about this off and on. What we see from a technology point is that it will enable the trucking community to have their driver and equipment checked without having to fire up man power. We don't have to wait on a trooper to pull a truck over, and we don't have to wait for them to be inspected by a person at the scales. We can have this all done by an electronic device that will give the same information and, in some respect, better information than we get from a human being.

Interviewer: As you know, your vehicle will submit an SDM, a safety data message, during the inspection process. What feedback from the government system do you want to receive after you submit an SDM?

Interviewee: Well, I want to check and see if [Interviewee] agrees by shaking his head, but I think we would want to see the information you obtained from that reading regardless of what that is. Just make sure that we know that there's everything you are collecting we have knowledge of. There are certain areas we would be more concerned with. But if you are measuring other ... I guess the way I should put it is [can't hear/can't understand] taken from the truck or the driver's information and kept in another file that we had no knowledge of. If we participate in it, we should have as much knowledge of the information being collected as DOT does.

Interviewer: How do you think the WRI results should be shared with the driver? And when?

Interviewee: If he has a serious problem, probably it's going to be shared by the trooper pulling him over if it's real bad. But just from the standpoint of the data itself, I would envision that, just like with CSA, which will have an information site that we can go to and collect data from by location eventually, would like to see that data provided maybe Internet-based or whatever so our location can draw down that information that has been collected on a driver and his equipment. I say "his equipment" if he has a proper pre-trip, that's his equipment for that run. I would like to see maybe an Internet-based system where we can draw that information down from, positive or negative, and share it with the driver. I would say as quickly as you can make it available.

Interviewer: How do you perceive the utility of the self-test, which really does tie into your previous answer for your drivers?

Interviewee: I'm not sure I quite understand that. Could you define that a little bit more for me?

Interviewer: Well the self test, you would have the ability to basically run it through the system by yourself before you got out on the road say, so you would know what was happening.

Interviewee: I would love that. If we had the ability to do it, we'd do it. That's one of the things we told [Name] that we wanted to make sure we got trucks by the reader as much as we could. It wasn't just to provide data to [Company] or to you folks to do your study. It was also so we could find out if we had gaps that needed to be closed. If we could enact a self test before you did a test, we would love to do that.

Interviewer: What are your impressions of the bypass pull-in features?

Interviewee: We haven't had a lot of talk about that. I don't know. [Interviewee] do you have anything to say on that? We don't, I like the drive-by a lot better than the pull–in, of course. Some of our drivers run on free-pass, which allows them to bypass the scales. I had never asked the question from [Name] or anyone. I didn't how that would affect the free-pass once and if WRI becomes a reality. I pray that it will. But the drive-by is just really wonderful. It is impossible to even measure how much time you save by not having a truck, not just time but efficiency, having a truck having to make a pass through the scales at a much lower speed and all that sort of thing.

Interviewer: Do you have any concerns in regards to being required to have additional equipment?

Interviewee: No. But industry wise, yes. The cost of it for some carriers will be prohibited, and it may even be a game changer for them. We have always felt that anything we can spend on our trucks to not make our truck and driver safer, but to protect the general public safer, this company has always invested in it. We are not blocked. You don't have a price tag on it yet, but I don't see us being blocked by it. The only way it would be a concern of ours is if you came at us with a very high price for whatever we would have to do to equip our trucks to do that, and we say no way to recapture that investment.

Interviewer: What do you consider a high price?

Interviewee: I don't know. Right now we are spending about $3,000 a truck for [Telematics Provider]. We are spending an additional $40 to $50 a month per truck for air fees. We don't consider that expensive. In fact we think that has paid for the system. This is difficult, but it's hard to measure something that doesn't happen. So, it is really difficult to put a price on what would you pay to have all your brakes properly working so you don't run over a car in front of you and not kill a family of 5. Of course we would pay anything for that. But I would say, if the cost is $5,000 or $6,000 per truck, everyone will be concerned about that. But if you keep it down within the realm of what people are paying for computers, if they are willing to make that investment, the benefit of what you are talking about coming from this would be a further investment in the enhancement of the system we already have on the truck.

Interviewer: How many trucks are in your fleet?

Interviewee: As far as ones that qualify for commercialable to vehicle, a little over 700. But right now we are running about 550 with [Telematics Provider] on them. We have not equipped the rest of the fleet yet because, at the time, for some of them, it didn't make sense. We are using it for electronic logging, etc., and some locations don't have to do electronic logs because they don't get far enough away, and also they don't have IRP placement because they don't leave the state. We also use it for permitting and reporting procedures. Very efficient system! We are probably as good a testimony for the benefits of [Telematics Provider], well, not just [Telematics Provider] because I'm using the brand name, let's just say an electrical on-board recorder. We are as good a witness you can have for it. It's done wonderful for our fleet. I would say we have 4/5 of our fleet equipped, and by the end of the summer have the entire fleet equipped.

What I've seen, [Name] has been able to work, I don't know how cooperative [Telematics Provider] has been. I think they probably have some of ours, that have prevented them from being gung-ho for this project. But what I'm saying, most of the major players in the GPS market that are now providing electrical on-board recorders are able to accommodate with effort, getting this program to work. I don't know what the price tag is on that, but they were able to make it work out where hopefully [Name] was supposed to have collected the data they wanted to collect.

Interviewer: Based on the Webinar and what you have been shown the expected user benefits to be and in personal experiences you have had, do you think the WRI system should be implemented?

Interviewee: Yes. Yes, definitely. Yes.

Interviewer: I have a few more general questions. With the understanding that the WRI user interface has been designed for the pilot test, what is your impression of it, and do you have any suggestions for improvement for the interface?

Interviewee: I really can't address that much because I'm not familiar with the interface. I know that we were able to,[Company] did most of whatever needed to be done and [Telematics Provider] took care of the rest. What we did was provide a warm body and a truck. So, I guess if I wanted to see any improvement in the interface, it wouldn't probably from the [Company] folks or anyone at DOT. I think there's gonna have to be greater cooperation on the part of the provider of the electronic on-board recording device. That seems to be the hindrance and the frustrations that we had at [Company] of trying to satisfy what you wanted in information and making sure we kept them focused on what you wanted done. I think there has to be better cooperation in making that interface work. I think the cooperation, [Name], so I don't just beat up the electric on-board recording people, maybe just the language that's being transferred back and forth between the two parties needs to be a little bit better. There may be some misunderstandings. We weren't a party to that. Only know that in the interface project, the biggest hindrance was getting the system to where it would actually exchange information.

Interviewer: Back to the interface, what do you think the most important pieces of information in the interface are?

Interviewee: Wow. I tell you, we like it all. I guess the condition of the vehicle, things are measured on the vehicle are very important to us. Shame on us if they are checking the driver and they find out they don't have a valid driver's license if it can be verified in the system. Probably the information regarding the condition of the truck, the speed of the truck, anything that can tell us, then it gets into the driver. The driving behavior and the condition of the equipment are more important to us. Not the static items such as him having a medical certificate, he's got a driver's license, etc. That can be dealt with. But when it's rolling, the most important aspects that we see are, for instance, the brake condition, what speed, actually affect the general public and our equipment in making a safe journey.

Interviewer: Have you had any feedback from the drivers who have used this system?

Interviewee: That would have to come from [can't hear/can't understand] because we [can't hear/can't understand]. I know they are not on because of the problems with the weather this morning. We have people covering that normally sit behind desks. My understanding from [Co-worker] is that they had no problem with it. They weren't intimidated by it. We are already mandating electronic on-board recorders; they are not "afraid of what it will do to the way they perform in the truck."

Interviewer: Now, in general, what are your impressions of the WRI technologies based on what you have seen in the Webinar and with your own experiences?

Interviewee: It's great. But I think it still has some work to be done on it. [Background noise - can't understand speech]. I don't think that was something that came from the side of the [Company] or DOT. I think, to get anything to work, there has to be communication. I think the communications we had between our vendor, our recorder vendor and the other folks was a little lacking in substance. But the technologies themselves, golly bum, I'm not a computer whiz and neither is [Name]; we are just amazed at [what] we can see this system do. When we went up to the demonstration at the weigh scale, it's just amazing at what the future has to offer for the trucking industry and everybody concerned with it. I think the technologies are fascinating. The thing is, if we sit here and talk, I'm sure they are changing as we speak.

Interviewer: Have you shared any of this with any of your customers, that you are using this equipment?

Interviewee: We didn't share it with the customers as much as we shared it with the upper echelon with this company who were very much in favor of us participating in the project. I don't know if the locations did. I would have to think, because I know the nature of the drivers, he has probably spoken to some of the ones that we deliver to what is going on with the truck. The more important piece for me is that it doesn't make any difference of what [Interviewee] and I want; if we can't get buy-in by the owners of this company, we are at a loss. That was the most rewarding, that the ownership of this company said they would be involved and do what it takes.

Interviewer: In general, what could have been [done] differently, if anything, in these ongoing pilot tests to make them better for you and your company?

Interviewee: It's been easy on us. [Background noise - can't understand speech]. They haven't made it hard. If there was anything easier to do, it would be that I wish we could have started earlier. There was nothing difficult for us in this process. Folks on the other end, [Name] made it very easy for us to participate. Painless, I might say.

Interviewer: Good, I'm through with my questions. [Interviewer], do you have any questions that you would like to pose?

Interviewer: No, I think you covered them well. Nothing has been raised in my mind. Anyone else?

Interviewee: This is [Name], I wanted to make folks aware, I think [a representative] from the [Company] facility is on the call. I don't know if [Interviewer], you want to circle back to any of your questions for him.

Interviewer: I think not. I think we have been through them. Very appreciative of y'all's participation this morning. Do you have any questions for us?

Interviewee: No. Just let us know what we can do to help. We're still sitting here just waiting. I told [Name] we have an open door for it. We will be your rat, just give us the boxes to run through okay?

Interviewer: Alright. Thanks everybody.

Interviewee: Thank you. Good bye.

[End Interview]

CMRS Fleet 3

Interview date: 2010-12-20

Interviewer: I appreciate you being here this morning and taking time to do this. Certainly, as part of the grander WRI project, our piece here is to conduct an evaluation of the different pilot test platforms. So we are looking at feedback from you all as to your experiences, overall impressions of WRI, things we can do better in the future, so on and so forth. I do want to let you know the call is being recorded; however, you will not be quoted. In the evaluation, it will just say a representative from carrier A said this or so.

Interviewee: Okay.

Interviewer: Certainly, if you wish to say anything off the record, just preface it with that, that you are saying it off the record.

Interviewee: Okay.

Interviewer: Before we get started, do you have any questions for us?

Interviewee: No sir, I don't believe so.

Interviewer: And have you viewed the Webinar?

Interviewee: Yes.

Interviewer: And you are with [name].

Interviewee: Yes. We merged with [name] so we are [name]. The transportation side is now referred to as [name], which is now part of [name].

Interviewer: How many trucks are in your fleet, if you don't mind me asking?

Interviewee: We have a 700 trucks on the road as of right now.

Interviewer: Okay. And we did send a set of interview questions that I hope you got to take a look at. You may not have.

Interviewee: Yeah, I don't remember those.

Interviewer: Okay, well.

Interviewee: But I could have overlooked them over, too.

Interviewer: Okay. It's nothing too grueling I hope.

Interviewee: Okay.

Interviewer: But I'll just go ahead and start with my list of questions here. But in the context of a nationally deployed system, how do you think wireless roadside inspections will affect your company?

Interviewee: Uh, I think it would help. It would probably help our company. We are very diligent on the maintenance of our equipment and the upkeep of equipment. Therefore, I think it could possibly save us time by nothing showing up that would require someone to pull in. It could actually save us time over the period of a year by nothing showing up; therefore, the trucks do not have to be stopped, therefore they keep rolling and we receive a good examination.

Interviewer: Do you think WRI will help improve company safety standards for your vehicles?

Interviewee: Yes, I think it will raise the awareness.

Interviewer: By that you mean?

Interviewee: The awareness that, at any time, your truck could be viewed or examined; therefore, more interest, awareness especially on the part of the driver that I could be looked at any time; therefore, I've got to keep my equipment in good condition. We on the office side instruct it to be done. That driver, he's our #1 tool for our operation. So, if we are checking the lights, checking the brakes, checking all the airlines and making sure everything is working like it should be. We can have all the written procedures in the world but if he's not doing it, uh, you know, it's not near as effective. So with the wireless inspections where he knows a mobile unit can be looking at him or he's approaching a scale that can be looking at him. I think it's just another set of eyes on him telling him somebody could be watching.

Interviewer: Do you think WRI is a positive, is a way to provide positive credit for clean inspections under the CSA measurement system?

Interviewee: Absolutely.

Interviewer: Um, what feedback from the government system would you want to receive in the process? Say you submitted a safety data message, what kind of information would you want back from the system?

Interviewee: Well, we'd like to have, I guess, two categories of information. One being, when an inspection was done, and two would be what was determined during that inspection; either things that needed to be corrected or that were the things that were checked and good results were found. We'd like to see both. That tells us that either, you know, we've got a driver we need to tighten up on or we've got a driver that's really doing a good job.

Interviewer: In your opinion, how and when should the WRI results be shared with the driver?

Interviewee: Uh, I would think as close to the time that the examination occurred would be best.

Interviewer: Are you familiar with the self-test feature?

Interviewee: Not really, no.

Interviewer: Basically it would allow you to inspect the truck through the WRI system before you... sort of at will.

Interviewee: Oh, okay.

Interviewer: Instead of a driver running into a situation out on the road, you will have already run it through yourself enough to know what it is going to say.

Interviewee: Okay.

Interviewer: With a self-test feature like that, do you have any perceptions of the utility of that for you all? Is that something you would be interested in? Is that something you could see yourself using frequently? It's kind of a leading question, I apologize.

Interviewee: Uh, I think we would use it kind of to see what was found. You know, we have 15 regional managers that are scattered out across the country and Canada, and they generally know what drivers they can trust and what drivers need a little hand holding. I think they can probably use that on those drivers that need a hand holding drivers just to make sure they are in line doing what they are supposed to do.

Interviewer: Do you have any impressions of the bypass pull-in features? Or opinions of it?

Interviewee: I'm not sure I quite understand.

Interviewer: I guess the bypass pull-in feature would be, for example, if your truck were driving on the road, they will basically get a green light to keep on going or get a red light to come on into the station. It's sort of an open-ended question as to your thoughts on that. I can't imagine you wouldn't want your trucks to keep rolling.

Interviewee: From a selfish standpoint, we would, we can only perform our services as long as we are rolling.

Interviewer: Right. Now, have any of your trucks actually been wireless inspected to your knowledge?

Interviewee: Not to my knowledge.

Interviewer: In the pilot...

Interviewee: We have 5 trucks that are equipped, but I've not seen anything that says they have or have not been.

Interviewer: Okay. Yeah, I think I was under the impression that y'alls system was not quite up and running. Is that a fair statement?

Interviewee: Yeah, I believe that's true. I'm not... I know that they're still... the last time I thought I understood is that they were trying to get the communication worked out.

Interviewer: Right. Right. Right. Now speaking of equipment, do you have any concerns in regard to being required to have additional equipment?

Interviewee: Yeah. I do at this point in that I'm not sure of some of the ... I'd really need to know what the benefit of that equipment is in relation to the price. Anything we would purchase, especially when you have 700 units, and I know we're not the biggest carrier in the world either or in the United States, but every dollar we spend, we look for what value that returns to us.

Interviewer: Right. Right. Do you have any other...

Interviewee: If somebody says, well, this helps us solve this problem. Well, if I don't have that problem, then it doesn't have any value to me.

Interviewer: Do you have any other concerns to the use of the equipment?

Interviewee: No.

Interviewer: Okay. Based on the Webinar and what you have been shown the expected user benefits to be, do you think the WRI system should be implemented?

Interviewee: Uh, well kind of I'm mixed on that. I like the theory of it. I don't like the pieces of equipment that we have put on the truck. I'm not sure I have seen the beneficial value of that yet.

Interviewer: So you say you have seen them and don't like them? Was that, did I understand you?

Interviewee: I'm saying I like the idea of the WRI but I guess... we've got 3 systems on some of the trucks. We've got the airway system, we've got the [Company] brake and [Company] will hopefully be installed this week for the tractors. So I don't know what [Company] will tell us. The [Company], some of the drivers have said that has been beneficial for them on how to better load the trailers to make sure that they get the max load but not be overweight. On the [Company] brake system side, I haven't found anything with ourselves, maintenance or drivers that have said that was really a benefit to me.

Interviewer: Right.

Interviewee: It has actually been almost more of a pain. It's been a lot of work to try to keep it up. The sensors are going out, wires and all these things not working correctly. The [Company] system, of course we have not had experience with it yet. I guess I'm finding a hard time looking for what benefit that's going to be and that we've not experienced any issues with tire pressures or loss of pressure that, and flats while we are on the road there were due to low tire pressure. Most of that has been from where we have struck something and punctured the tire. So, with those... without seeing what the [Company] system is, I probably wouldn't run out and buy it because I don't have a problem that it can prevent for me right now.

Interviewer: Right. Now with the brakes, you mentioned there were some issues there. Do you have any suggestions of how that could be improved?

Interviewee: I think the only thing that would... and I don't know much improvement, but the system that's put on, it's got to be put on and we can't start having a lot of lights that come on or don't come on or sensors that malfunction or they work for a month then the sensors go out and you are all the time going in and replace sensors and things like that. You put it on, it's just like anything you purchase for your home, you expect it would work for a period of time without having to do any maintenance on it. That's what we would expect to do too.

Interviewer: Right. In general, what could have been done differently, if anything, in the ongoing pilot tests to make them better for you and your company? That could be technical, that can be communications with WRI team members. Really, it's a wide open kind of question from our viewpoint.

Interviewee: Well, I'm not sure there's anything. We approached this as being a test.

Interviewer: Right.

Interviewee: Part of the process was to work out the bugs and identify what the deficiencies were, what the bugs were. We knew going on that we would expect to see these issues.

Interviewer: Right.

Interviewee: I think that the test has done just what it was expected to do.

Interviewer: Exactly.

Interviewee: To point out the deficiencies. So you know, I think it's done what it's supposed to do.

Interviewer: Is there anything else that comes to mind being a problem area?

Interviewee: No not really. All the vendors that we work with as part of the project, they were very nice and very easy to get along with, very responsive and provided all the information that was needed. I don't... everything from our viewpoint of this being a test project, was okay.

Interviewer: Is there anything that you thought really worked well? Sort of the opposite of a problem I guess, something that you were impressed with in particular?

Interviewee: I think most people were trying to understand what the ultimate goal was and what was trying to be achieved. The [name], [name] brakes, [name], and [name], they all knew what the ultimate goal was to be achieved and they were working that way. As we mentioned before, it being a test, it was determined that there were some things that could not communicate with each other so they had to work on the communication parts of it and so forth. So, I guess the best part of it was that everybody seemed to understand what the ultimate goal was, what the benefits of achieving that goal was, and everybody was very positive in working toward that goal.

Interviewer: That's good to hear. Did you get any kind feedback from your drivers, any drivers that dealt with this equipment or your maintenance folks as well as their general impressions of it, etc.?

Interviewee: I guess the most positive was on the airway where they used that to... it gave them a greater comfort that they were not overloaded. That they had loaded their trailer correctly.

Interviewer: The drivers?

Interviewee: The driver. As with most cases with the driver or most people in general, I think most, I will use this very open, at least the drivers that I deal with of ours, they are a little hesitant to change. They are very comfortable with what they got, and they make it work. They lean toward the lines of finding everything that's wrong with something that could be wrong just because they really are trying to promote that they don't want to change.

Interviewer: Right.

Interviewee: So, the [Company] we don't have on the trucks yet so we can't say. [Company], they seemed to like that. It made them feel more secure that they were loading their trailers correctly, and they were within the limits.

Interviewer: So let me ask you this, that airway system, it not only weighs... has a way to measure how much weight is in the or on the truck, but it also does some sort of balance? That it's loaded correctly?

Interviewee: I haven't heard them talk about the balance side, just the more about the weight side. That could be that they haven't understood the balance part yet.

Interviewer: But to your knowledge, does it do that? I'm generally curious, I don't know.

Interviewee: I'm not familiar with that part of it.

Interviewer: Okay.

Interviewee: It could be different with a box trailer versus a liquid trailer that we pull.

Interviewer: Right. Oh so you'll are only, okay, that makes sense, y'all are only hauling gasoline.

Interviewee: We only haul liquid petroleum products.

Interviewer: Okay.

Interviewee: So, I don't think the balance part would fit in on us.

Interviewer: Okay. It may not do that. I don't know if it does. I have no idea whether it...

Interviewee: Yeah, I could see it on a box trailer where they could load one side more than the other or they could load more in the nose than the tail. You could have an issue.

Interviewer: Right. With the understanding that the WRI user interface has been designed for the pilot tests... well, let me back up. Have you had any interactions with the user interface?

Interviewee: No.

Interviewer: Okay. So, are you familiar with the concept of the user interface? That would be something that you got on... you went on your computer and it was in the Webinar of what you would be viewing. Do you have any suggestions to improvements to what you have seen?

Interviewee: No sir, not at this time.

Interviewer: Is there anything on there that you particularly want... that you want to be on there? The hours of service or driver's name? Those things are already on there, but I just wanted to know if there was anything specifically you were interested in?

Interviewee: No, it seems most of the key things are on there. I think if we used it more, there would be some things that would pop up. Right off hand to get started, it looks good.

Interviewer: Great. And overall, what are your impressions of the WRI technologies?

Interviewee: I think it's the way that we are going to need to go to ensure... you know there is so much that is being required from a regulation standpoint, and with due diligence with the motoring public and so many eyes on you and trying to do it right. Technology and what WRI is trying to do, I think that's the only way we are going to be able to do it.

Interviewer: Right.

Interviewee: It does two things; it identifies your good players and identifies your bad players.

Interviewer: Right.

Interviewee: We are all in favor of trying to... the number one goal is to get the bad players to shape up into good players and not necessarily eliminate them because as you well know, if you take one bad player and that makes everybody else look bad in most of the public's eye. And that's not what we are looking for.

Interviewer: Right. Right. Now, [name] or [name], do you have any questions?

Interviewer: Nope, I don't.

Interviewer: I don't either.

Interviewer: Great. Well [name], we sure do appreciate your time.

Interviewee: Yes sir. Absolutely! No problem at all.

Interviewer: Have a great day.

Interviewee: Yeah, thank you very much.

Interviewer: Thank you. Good bye.

Interviewee: Bye.

[End interview]

Enforcement Personnel (CMRS)

Information technology employees and officers from the Tennessee Highway Patrol (THP) participated in the telephone interview sessions. Further specific details regarding the THP participants can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

Enforcement Personnel 1 (CMRS)

Interview date: 2010-12-16

Interviewer: Anything you wish to say off the record, just let us know. I think you have been on a lot of the Friday weekly calls.

Interviewee: I used to work with [name] back in early 2003-4-5 or 2004-5-6. And hired me in 2008.

Interviewer: Were you a student of his?

Interviewee: No, I was an employee working for the transportation research center.

Interviewer: Cool. Good.

Interviewee: Involved with their systems, software and support and all that.

Interviewer: Now what kind of, what role, I have already begun recording the call. What role have you played? Because you know we have this list of enforcement compliance personnel questions that you may have seen, and I'm not sure those are necessarily pertinent to you. I'm thinking that some of these service provider questions that you may not have seen might be more pertinent. So what has your role been exactly?

Interviewee: Well my title is Information Resource Support Specialist. In other words, I support their systems, whatever their needs are for; it could be analysis, it could be installation, trouble shooting, it could be project leads, system analysis. Whatever they want my expertise on, then I can provide it to them. Anything that relates to commercial vehicle, then I directly support them on those aspects.

Interviewer: What I am going to do...

Interviewee: I don't do any direct enforcement of the commercial vehicle.

Interviewer: Right. So, I will switch gears for a little bit out of this enforcement compliance personnel because again, those wouldn't really be... I'm sure you are very knowledgeable about them, but they weren't designed for someone, for you.

Interviewee: Right. I could just give you my opinion though I don't have any direct involvements. If that's what you would like me to provide, I have a few ideas.

Interviewer: That's part of what I could get to. But what I'll do is go through these service provider questions and start with #1. The first question is what do you think could have been done differently to improve the test process?

Interviewee: I don't see anything that could be different or could change to improve. It all seems to be methodical, logical. So, I don't think anything could have been changed at this point. You are still on a pilot testing so it's hard to pinpoint anything that could have been improved.

Interviewer: Right. Now, did you ... you participated I guess in the, in my laymen's terms, the exchange of computer information from the trucks into the highway patrol system? Is that a fair statement?

Interviewee: I would say fair because I am the Safety Net Administrator for the highway patrol. So any data the highway patrol requested for [Company] webs or anything of that nature, I would support that data to them.

Interviewer: Did you run into any road blocks you would like to discuss as you went through this process?

Interviewee: Actually, I didn't see any road blocks. As far as I was sure there wasn't no personal protected information on the driver, then I freely exchanged data with [Company] and the highway patrol. Also, I was the one who helped set up the accounts for the wireless roadside inspection troopers. [Name]. I was a part of that as well.

Interviewer: You interacted some with the [name] back office?

Interviewee: No, sir, I did not.

Interviewer: You did not. So, you mentioned you might have some suggestions.

Interviewee: Um, yeah, I'm curious as to how would this interact with the compliance safety accountabilities SMS that is now released on the driver basics and the vehicle basics? Would there be any kind of indicator on a WRI screen that would give the inspector comparisons to what he sees on the WRI screen and as well notice that this vehicle, this truck, this carrier has a low basis or high basis…. With that in the play of what we are looking at for this pilot, or maybe not. I don't know.

Interviewer: (Interviewer), do you have any comments on that?

Interviewer: Yeah?

Interviewer: Do you have any comments on that?

Interviewer: Yeah. No, not really. Yeah I guess ultimately. Yeah, no comments. I'm not real sure how to approach sort of the scenarios we are looking at.

Interviewer: I do know that the basics information is now part of [name]. So the ISSD has been updated. It's based on the SMS rather than …. But that's kind of separate from WRI.

Interviewee: So we are kind of looking at the WRI completely separate from viewing or seeing any SMS data on the interface right?

Interviewer: Probably down the road it would be inspection data.

Interviewee: Yeah, ok.

Interviewer: So, did you have any interactions with the interface, user interface?

Interviewee: Myself? No. Just viewing what we had on the PowerPoint and briefly when we had the open house in October at [Law Enforcement Location]. scales.

Interviewer: Now, having viewed the Webinar, being in the position that you are in as an information systems person with the Tennessee Highway Patrol, what are your impressions of the WRI technologies?

Interviewee: I enjoyed. Obviously I liked it. If I were the person familiar with it, I would have had some idea of the concepts of what WRI was intended for. So yeah, it's very informative PowerPoint.

Interviewer: Now, based on the Webinar and your experience with the highway patrol and what you have been shown the expected user benefits to be, do you think the WRI system should be implemented?

Interviewee: Oh yes. Very good screening tool for the inspector and trooper. It would give the inspector a heads up that this vehicle should be inspected whether it be for driver basics issue or driver violations perhaps. It would give them a heads up too when they pull a vehicle over on the roadside to take a look at it. Anything to give that inspector or trooper another hand on information and tools, then by all means, yes.

Interviewer: Do you have any thoughts as how this, the WRI system, say as compared to pre pass?

Interviewee: To be honest, that is kind of vague to me how that is interacting.

Interviewer: Ok.

Interviewee: Our credentials do include the pre-pass as a C-vision state. How that interacts with WRI I'm not quite sure.

Interviewer: Okay. [Name], do you have any questions for [Name]?

Interviewer: No I don't.

Interviewer: [Interviewer]?

Interviewer: No, no specific questions. I appreciate your input. Do you have any questions for us, I guess?

Interviewee: No, I just wish I could help you out more on the enforcement side but sorry I could not.

Interviewer: No, that's fine. Any input is great. The challenge with this interview was that you don't quite fit in any of the boxes that we have as law enforcement. The notion is that this could be a very open and frank discussion about the process.

Interviewer: And we are not publishing your name! You will be highway patrol personnel #1.

Interviewee: Okay.

Interviewer: We won't publish your name. But if somebody is clever they can figure it out who said what. But we are being as anonymous as possible with these calls. So, anyways. Okay?

Interviewee: Alright well, thanks for your time.

Interviewer: [Name] has a similar position to yours?

Interviewee: Yes, he does.

Interviewer: Okay. Well thanks a lot. We sure do appreciate your time.

Interviewee: Oh you are quite welcome. Thank you very much.

Interviewer: Have a good day. Good bye.

Interviewee: Bye.

[End interview].

Enforcement Personnel 2 (CMRS)

Interview date: 2010-12-16

Interviewer: We are recording this phone call. Of course we are not going to publish your name or anything, but we are going to transcribe these and put them in the final evaluation. Having been on Friday's call, I suspect you are pretty familiar with what is going on to some extent. We try to ask some open-ended questions. I think the questions you saw that maybe got emailed to you are not questions we are going to be using this morning.

Interviewee: Okay.

Interviewer: Since you are...

Interviewee: That's what you call "throwing a curve"! [Laughing]

Interviewer: We have a list of questions that we have been posing to the service providers. It does seem much more appropriate, some variation of that. I'm just reading off of that. First of all, if you could describe what your role has been in this project would be helpful.

Interviewee: Well, I mean I don't, you know, think I have a role in this project as a whole. My main responsibility here at the safety department has been a support role to the commercial motor vehicle division.

Interviewer: Right.

Interviewee: In most of what we are involved in is just working with the commercial vehicle as IT support.

Interviewer: Right. Right.

Interviewer: Now, in this pilot test and this whole WRI project, up to this point, what is your opinion of what could have been done differently to improve the test process?

Interviewee: The thing about it is that I don't see anything about it that could have been as far as improvement of how it should be done. Because, you know, it's a... it's new technology. It's something that has to be done on with not a lot of knowledge from the very beginning. So there's going to be things and problems that might arise that were not foreseen. And I think as far as what has been done, you know it, you know in my opinion it has went well. I see a lot of benefits to the program. I think that as we go along, we are learning from the experiences that of implementing something like this. In the long run, if we are able to actually implement it and I think the main problem that we are going to have to deal with is the... I guess the response time. That would be one of the main issues as far as the WRI system is concerned. But other than that, information can be captured, and it can be actually sent to a third party provider and then fed into the back office system or whatever we find is the best way to do that. I think it's going to be an enhancement to the commercial vehicle safety enforcement. Hope that answered your question.

Interviewer: In the process... well, these were designed to be open ended as you recall. We are trying to tease out some of the positives and negatives of this process. From an IT perspective, did you run across anything in the run up or during the pilot test that you thought were problems? Or anything you felt that went particularly well?

Interviewee: Well, I mean, we went to the demo in [Law Enforcement Location] and, you know personally, I think everything went well. Of course you are going to have the first time of setting something up like that and considering the connectivity from the back office, there's always going to be some hiccups and this type of thing. But at the same time they were able to resolve those issues and things like that. But as you go forward, you are going to learn from these things, and best practices are coming out of each of these processes. As time goes along, you are refining the process. So, as far as I'm concerned it's kind of like very advanced technology. In my opinion, I think it's a very good thing. The main important thing I think is good about it is what is happening now is that you just don't have enough inspections that you can really uh, get the unsafe motor vehicles off the road. I think anything, too, that you have that will allow you to have increase the inspections, when you look at Tennessee, we are only talking only about maybe 60,000 in inspections a year. Tennessee is like a central hub as far as interstates. You know, we have probably 20 times that many vehicles coming through this state in a year's time. So the situation is that we are not even, in my opinion, not even getting 5% of the trucks that come through Tennessee in a year's time.

Interviewer: Did you interact at all with the [name] back office system?

Interviewee: No I did not.

Interviewer: Did you interact at all with the user interface?

Interviewee: When you say "interact" could you...

Interviewee: Well, I mean from a... and this is from my laymen's terms, did you via computer share information with [name] and all? Did you participate in that at all?

Interviewee: Uh, no I did not. The only thing I have done is when they put it up and brought it online was go into the system and look at the system and evaluate the information that they had out there.

Interviewer: The user interface and the information contained therein?

Interviewee: Yes.

Interviewer: What were your impressions of that?

Interviewee: As far as my initial looking at the system, with the time they had to get it done, I thought they did a fantastic job.

Interviewer: Do you think there's anything else you would like to see in the user interface?

Interviewee: Well, not at the same time... the thing about it right now, you are limited to what you can do. The information ... one of the things I guess I'm impressed about it seeing about it, and that has been one of the major problems that I guess everyone has been addressing, is data integrity as far as inspections and things like this. What I'm seeing is you are moving that data entry out to where it should be. That's out to the carrier.

Interviewer: Right.

Interviewee: So in other words, when the information comes in, everyone is getting information directly from the carrier, so you are not transposing information from two or three different hands of a main input. So you improve your data integrity.

Interviewer: So, based on the Webinar and your experiences and what you have been shown the expected user benefits to be, do you think the WRI system should be implemented?

Interviewee: From what I have seen, yes. I do see... you are working with electronics and there are going to be issues wherever you are doing this and they will be unique issues. But I mean those have to be worked out. But as far as what I have seen, I think we should go forward with it, yes.

Interviewer: [Name], do you have any questions for [name].

Interviewer: No I do not.

Interviewer: [Interviewer]?

Interviewee: None from me. No.

Interviewer: [Name] we sure do appreciate your time this morning. Some of us will be in the call tomorrow. Do you have any questions for us?

Interviewee: No I don't.

Interviewer: Alright, we sure do appreciate your time.

Interviewee: Okay. Alright, thank you.

Interviewer: And have a good day.

Interviewee: Alright, bye-bye.

Interviewer: Bye.

[End interview].

Enforcement Personnel 3 (CMRS)

This subsection contains interviews, one after another, with three different THP officers.

Interview date: 2010-12-17

Interviewer: [Name], you still there?

Interviewee: Yes sir I am.

Interviewer: Great. As you may be aware, we are doing this evaluation, and part of the evaluation is being done to see if the WRI project is going to move forward into the next steps. So we really appreciate you participating this afternoon and allowing us to get some feedback of things that have been going right and things maybe that have been going wrong and your impressions of the system if you had any experience with it.

We are recording the call. If you wish to say something off the record, you are certainly welcome to do so, just state so. We have [name], [name]. Did I get it right?

Interviewer: Yes you did.

Interviewer: Okay, good. They are up in Massachusetts but it's not their fault. [Laughing].

Interviewer: Now it comes out! I was waiting for that.

Interviewer: It's an easy joke down here.

Interviewer: And up here too!

Interviewer: Well, we will go ahead and get started. [Name], could you please describe your pilot test experiences and what parts of the system you interacted with directly, if any?

Interviewee: As far as WRI, is that what you are referring to?

Interviewer: Yes sir.

Interviewee: My experience with it was when they had the showcase here, the commercial show case that the federal government put on here. I talked in section with [name] on WRI. So I had some interaction with it then and tried to familiarize myself with the program then because we discussed it with all the guests that came to the facility. That's what experience I've had with it so far.

Interviewer: Okay. In your opinion, what are the most... what data are most critical to collect and assess in at WRI?

Interviewee: I think the validity of the driver, obviously referring to his status, hours of service, the concept of weight which I... when I look at the WRI program, I'm not an advocate of pre-pass. I know this is not about pre-pass. Pre-pass allows, I'm sitting here watching truck after truck go by on pre-pass, and we know nothing about it other than what the company is. So, I like the information that is given to us on the WRI versus what were not given by pre-pass.

Interviewer: That's interesting. I will skip down to one of the later questions. Do you foresee there being any changes to your electronic screening programs? As pre-pass, as a result of the WRI deployment, if it were deployed on a national level?

Interviewee: As far as, make sure I will answer your question, but again here with pre-pass, if the things that the WRI has discussed of being able, the data it can potentially collect, I would foresee pre-pass becoming a thing of the past. That would be my dream because I do not think, when I sit here and turn pre-pass off and my violations increase here, that tells me a lot about what is going on in pre-pass. I feel more comfortable with vehicles traveling down the road knowing most information can be gathered and presented to me; I feel more comfortable about the vehicle traveling down the road. I would hope that WRI would get pre-pass on board with it or something where they would take more information either on pre-pass or it would take place of it. I guess that would be my hope.

Interviewer: How would you imagine you would use WRI results?

Interviewee: Um, well, a few things with WRI is one, being able to set up the geo fence in different locations. We get, here at this facility, we have a state route which is 11E that trucks can easily bypass; I say easily, without much effort they can take a state route and go right around it. With a geo fence and being able to place it where you wanted it, we could actually, being equipped with our laptops and air cards, we could set up on those state routes and know what vehicles were traveling on our bypass routes. The trooper would have that information there. A lot of things are appealing to me about the WRI with just looking at some of the projections of what it is projected to do and things of that nature. But that would be one that I would see handy, being able to place that fence where you wanted to, even getting on some of our bypass routes.

Interviewer: In the context of the pilot tests, are there any potential inadequacies of the WRI system which you are aware of?

Interviewee: The last time I logged on it, I had a time limit I could stay on it. That's not at all feasible for us to sit here and have a 15 minute or whatever it is log out time and then have to re-enter everything to get back in it. Having to refresh information to see if someone has passed through the geo fence isn't feasible as well. There's too much stuff going on for us just to sit and concentrate on that laptop and constantly refresh that.

Interviewer: Could you give me a few examples of the level of what is going on there in the weigh station that prevents you from doing that? Just to clarify for anybody that might not have a good grasp on that. I have a sort of an idea because I have been up there a couple times, as you may recall.

Interviewee: As manpower flow, there's times you're actually the only trooper working this station. You are watching weigh and motion, you are watching pre-pass as of now, you are watching static scale, you have the phone ringing answering questions about this law and that law, you've got drivers walking in and out whether it be from where they had repairs done from the lot. We have walk-ins come in and ask questions. A lot goes on that your attention is diverted in several different places. To set and constantly refresh, what would happen is that you might do that a little bit then there's other things that require your attention, and it will get neglected.

Interviewer: Were there any other inadequacies that you were aware of?

Interviewee: I don't know about inadequacies. It was covered in the Webinar that the log data in the form that it was currently in would be a lot more user friendly if it was in the grid form that we are used to looking at on log books and stuff. Other than that, a little bit... they had it set up that day, the geo fence just needed to be moved back. But they had it set up the day that we used it for demonstration purposes. But it worked fine. Those things that I mentioned were the only things thus far that I seen that was just... I feel the way it currently is with the refresh and the log back in, I don't think troopers would use it.

Interviewer: Right. When you say it could be more user friendly, this is a pilot, and this user interface was designed for the pilot tests. Do you have any suggestions of how it could be made more user friendly? I know you mentioned some earlier...

Interviewee: I'm sorry, I apologize, go ahead.

Interviewer: And that may have been what you were, if you just want to clarify that more that would be great. If not...

Interviewee: If it just refreshed itself, it would be good if there were some sort of audible alarm that let us know a truck come through at our that there might be some sort of violation on. I have not seen that or heard that, it might be there already. I don't know. But I know there was an alarm icon on that, but I don't recall if that was an audible or exactly how that is set up. But a lot of things we have here, if you have been at the Greene Co. scale facility, we have a lot of beeps and things. If there's not something making a noise, your attention is so diverted here that something might get by you. Pre-pass for example doesn't give us any type of audible induction that a vehicle has been red-lighted and come in. Sometimes by the time we realize that a pre-pass truck was red-lighted, he's already come through our bypass, received a green light and is gone.

Interviewer: Right.

Interviewee: If we have a little bit of knowledge that we have one coming and here's the problem and here's something you might want to look at would be good. Just to draw our attention to it in case something is going on at that time.

Interviewee: Thank you. These are great. This is exactly what we are looking for in these interviews. Appreciate your feedback.

Based on a nationwide deployment of WRI, do you foresee reviewing multiple pass WRIs for particular vehicle or driver? If so, why?

Interviewee: Let me look at that question.

Interviewer: It's almost a little bit more than half way down.

Interviewee: Yeah. [Reading question]. Is that the one you are on right there? [Reading question]. Is that where you are at?

Interviewer: Well, I had gone down to. We should have numbered these. Talking about a based on a nationwide deployment do WRI, do you foresee reviewing multiple past WRIs for a particular vehicle or driver?

Interviewee: I'm not following your question. Can you ask it a different way?

Interviewer: Say a truck comes through there and you get a WRI report on one truck. Then this same guy comes through 2 weeks later, he's a daily customer, do you foresee reviewing his list of past WRI inspections for a specific driver?

Interviewee: You know, I think I understand what you are asking me. Yeah, we look at... as of right now we use [product name]. Everyone I check, I always go back and see if he had any prior inspections through Quarry Central and what violations were noted then. So, if I get drivers that claim they are local drivers and don't keep log books, I go back to Quarry Central to find out. We try to use all available information that's available to us to either confirm that the driver is telling us is right or to see if there's something we need to look at further. So, absolutely if there's more... all the information is there, we would definitely look at and be very interested looking at to see. It wouldn't matter to me if he was local. It would just be more information that would be available to me.

Interviewer: Based on the Webinar and any pilot tests... I'm going to start back where I and work more down through it instead of skipping around but, this is about the 4th or 5th question. Based on the Webinar and any pilot tests' experience you may have had, how do you think the WRI system will affect your role as an enforcement officer?

Interviewee: I think WRI would direct my attention in the proper places that it needs to be and put me spending more time with the companies and drivers that need time spent with them versus me having to search and hunt and thin it out myself. It would help me direct my attention in a more... less time consuming way that it needs to be.

Interviewer: Right. In the context, these next several questions are based on a nationwide deployment of WRI capabilities. How do you think it would affect out of service violations?

Interviewee: In my mind I would have to think if the company knew what I knew and the driver knew what I knew. I would have to think it would lower your out-of-service violations. I am not going to say eventually. I think that once they catch on that hey, they know what I know and are acting on it, I think the long-term effect you would see less violations. I think a lot of your out-of-service violations that we find, I just think they don't think we would find. But if they knew we knew it before they even got here, I think those violations would be repaired. And certainly that's not going to be effective on all companies; some of them are going to try it anyway. But I would think it would have to lower your out-of-service violations.

Interviewer: But there might be an initial spike. Would that fair?

Interviewee: Oh absolutely. Until people caught on that, uh-oh, we need to fix that. I think you might see that initially. But I think the long-term effect is that you would see less violations due to the fact that they would have those repaired. They all know it's cheaper to have it repaired before get here.

Interviewer: Right. How do you think it would affect non-out-of-service violations?

Interviewee: I think it would have an effect on weight. You have companies that won't reimburse drivers for CAT scales. Even though it's just $7-$9, drivers just won't spend that. So, if the driver was able to know he was overweight prior to coming here, I think your weight violations would decrease. That's the only thing that comes to my head.

Interviewer: To what degree will traditional inspections themselves take more or less time to perform if a traditional inspection follows a WRI, again, based on a nationwide deployment of the system?

Interviewee: I think your time saved is going to be on that information. If WRI can... if I can take that information off WRI and it just auto-fill [name] for me, certainly that's going to save me time. Less time spent having to punch all that information in, that's going to save me. Off a level 1 inspection, if I'm not looking at a major defective vehicle, I'm looking at 45 minutes. Probably 25 of that is probably spent just me hunting and pecking on a computer. So if that auto-fill, that's going to save me definitely time. Especially … the driver and the company, and all I had to come in and do his origin and destination, certainly that would save me time.

Interviewer: How would CMV safety be affected in a nationwide deployment scenario? In your opinion?

Interviewee: Again, I think it depends on the company. I think most people that know they are in violation would correct the violation if they knew that we knew they were in violation. So, I think it would be a great asset as far as safety is concerned. I believe that people would be correcting the violations instead of continuing to travel down the road if they knew we knew their violation. I think it would be good.

Interviewer: Right. Now we have touched on this already about how a nationwide deployment would, how your ability to perform your duties would be affected. If you'd like to add anything else, that would be great. If not, we can move on.

Interviewee: I just think it makes it more... it makes my job and time spent with the company, it lowers the time spent with them which makes it more effective. It gives me more... puts me more at ease with vehicles traveling down the road if they go through a WRI; I'm not asking 800 questions about the vehicle I see going out there. We see, we observe violations driving down the interstate on pre-pass every day, and they receive a green light on pre-pass. Based on that, if I'm here by myself, I can't run them down; I can't close the scales down. By the time I do all that, it's long soon. So it would be a great thing for us here. More is better as far as we are concerned. The more information we can gather off that vehicle, I have no problem with the vehicle staying on the interstate, as long as they are safe and not going to hurt anybody, and they are not violating laws and things of that nature. So if that is checked prior to them even coming to this facility, man that's great.

Interviewer: Do you think fleets would be more likely to keep vehicles up to required standards? I know you have touched on this some already.

Interviewee: Absolutely, yes sir. You are always going to have a certain number who try to find ways around it. I would foresee drivers logging in as other drivers if they knew there was a problem with their driver's license. There would have to be a check and balance system where you would have to verify the driver that's behind the wheel is the driver that's logged in on a WRI system. If you are following what I'm saying. I think there will always be people and companies that try to get around things. But absolutely, I think it would cause them to keep their vehicles a lot more up to standards.

Interviewer: What are ways you would use to ensure that trucks are using the WRI system if they were required to do so?

Interviewee: I just think spot checking. Kind of like the philosophy of pre-pass is, a random check. Checking that data and making sure what everything that it claims the driver and all that information, just verifying that all that's correct. You just have to check it and compare it to what is gathered on WRI.

Interviewer: Based on using the WRI system and reports, do you foresee being able to carry out interventions successfully should you need to do so?

Interviewee: When you say "carry out interventions" what exactly, can you give me what you are saying? Present them with a violation?

Interviewer: Well, yeah. If you need to take... if you find something that needs to be taken care of from a law enforcement perspective, would you be able to do that?

Interviewee: Oh absolutely. I think as long as there's, like I said a second ago, as long as there's something that lets us know, hey this is coming that draws your attention to it that way you know what is coming and you don't discover it 3 minutes later when the vehicle done gone. Absolutely, we'd be able to intervene on it.

Interviewer: So do you support the implementation of the WRI system?

Interviewee: Yes I do.

Interviewer: Great. Well, I think that just about answers our questions. Do you have any questions for us or anything you'd like to add?

Interviewee: No, uh... the whole concept of it excites me. When I talked to [name] about this, the more we do here, the more traffic picks up on our bypass route. It really excites me about being able to locate that geo fence anywhere and being able to place troopers there that would see that information and not having to... when you take a vehicle off those back roads and you are trying to make a decision man, am I going to take him back to the scales and check this and check that. Because it's really not safe on some of these back roads to do level 1 inspections and those sorts of things. So if we had that information on our back route, back roads and our bypass route, we would be able to pinpoint which ones needed to come back here. We are not holding up good companies and good drivers that are legitimately on that bypass route. It's a great tool for us, and it would be a great benefit to a good company. No, I like it, and I'm all for it.

Interviewer: Great. I know... we certainly appreciate your time. I know [name] had said that there might be other troopers there that we could interview.

Interviewee: Yes, I don't know, I think he was wanting to speak with you.

Interviewer: Okay. Well, we spoke with him this morning. Do you know if there's anyone else there that he had planned to do this?

Interviewee: Well, I promise if you know him, he'll speak to you again! Hold on just a second.

Interviewer: Thanks so much. I appreciate it.

Interviewee: Trooper [name] is going to talk to you now.

Interviewer: Great, we really appreciate it.

Interviewee: Thank you. Y'all have a good day.

Interviewer: You too.

Interviewee: This is [name]

Interviewer: Hey, how you doing this afternoon?

Interviewee: What about yourself?

Interviewer: Doing pretty good. This is [Interviewer]. I am not sure if we met. I know I met trooper [name], but I don't know if I have met you the couple times I've been up there or not.

Interviewee: You probably have.

Interviewer: We are conducting this evaluation process for the WRI project going on up there that y'all been working on. We'd like to get your opinion on some things and some of your experiences and really valuable feedback. Trooper [name] certainly gave us a lot of good insight of some things. I want to let you know we are recording this call, and it is going to be put in the evaluation, but we will not directly quote you. And also, if you wish to say anything off the record, certainly you are welcome to do so.

We have a list of questions that I hope you maybe have seen, and I hope you saw the Webinar. I'm guessing you were probably out there at the showcase that day. Do you have any questions before we get started?

Interviewee: No sir.

Interviewer: Can you briefly tell me what your pilot test experiences have been?

Interviewee: Such as what?

Interviewer: Have you used the WRI system at all?

Interviewee: No sir.

Interviewer: Were you out there the day of the show case?

Interviewee: Yes sir.

Interviewer: Have you viewed the Webinar?

Interviewee: No.

Interviewer: Ok. Now, so you haven't interacted with the system at all? Is that a fair statement?

Interviewee: I hadn't logged on to it. I hadn't tried it.

Interviewer: Do you have familiarity concept with the project?

Interviewee: Yes sir.

Interviewer: In the context of the WRI project, what data do you think are most critical to collect and assess from your viewpoint as a law enforcement officer?

Interviewee: Hours of service, driver's certificate, weight.

Interviewer: And how do you imagine you would use WRI results?

Interviewee: I'd use them to collect data and check other inspections and things like that. That would be a big help to the inspectors with what we are dealing with. It would be a good help.

Interviewer: Right. Now, how do you think the nationwide deployment of WRI capabilities might affect out-of-service violations?

Interviewee: It would affect them greatly in a whole lot of ways. Because, like I said, it would be another tool we could use and see what the safety value is, safety standard of the carriers, maintaining their vehicles, hours of certifications, and so on and so forth.

Interviewer: How do you think it would affect non-out-of-service violations?

Interviewee: Well, it wouldn't be a whole lot of difference in a whole lot of ways. Without getting out-of-service, it's going to tell you they are a pretty good carrier most of the time and driver's attention to detail with their paperwork and driving habits.

Interviewer: How do you think CM, commercial motor vehicles' safety would be affected if this thing were employed nationwide?

Interviewee: It would be safety all the way around. Carrier and driver and everything. It would be a great tool for us.

Interviewer: Based on a nationwide deployment of WRI, how will your ability to perform your duties be affected?

Interviewee: It would be the same as far as my duties all the way around. My duties wouldn't change on it.

Interviewer: What about your ability to actually... do you think it would make your job easier or more difficult?

Interviewee: I would say it wouldn't make it any more difficult. It should enlighten things and make it a whole lot easier.

Interviewer: Great. Now, based on a nationwide deployment of WRI, do you think fleets would be more likely to keep people up to required standards?

Interviewee: Well, it depends on the company and what kind of carriers you are dealing with. Some just didn't take care of equipment and drivers don't really give a hoot. But the good carriers, they are going to maintain safety because that's what they are all about, safety from top to bottom.

Interviewer: Right. So you have not used the WRI system.

Interviewee: No sir.

Interviewer: Based on a nationwide deployment of WRI, do you foresee reviewing multiple pass WRI inspections reports for a particular vehicle or driver? Would you use results more than once? That's what that question is getting at.

Interviewee: Yes sir, I sure would.

Interviewer: Okay. And how would you use them?

Interviewee: I would use them … the upgrade of them and...

Interviewer: Now, do you foresee being able to carry out... if this were in place, do you foresee being able to carry out interventions or interdictions successfully should you need to?

Interviewee: Yes. Yes.

Interviewer: In what ways would you use to ensure that trucks are using the WRI system? If they had it, how would you know that they really had it?

Interviewee: Probably have to log on and make sure if they had it. That would probably be my only tool to looking on the Web and see if they had it.

Interviewer: Right. Now, do you support the WRI implementation based on what you know?

Interviewee: Yes, highly.

Interviewer: Do you foresee there being any changes to your electronic screening program as pre-pass as a result of WRI deployment?

Interviewee: It probably would change pre-pass. For … I'm sure it would.

Interviewer: Well, I think we have been through most of the questions. [Name] had said there were several of y'all there. Is there anybody else today there that he had wanted us to interview?

Interviewee: Yes sir.

Interviewer: Great.

Interviewee: If you will hold, I'll put him on the line.

Interviewer: Thank you so much. We really appreciate your time.

Interviewee: Yes sir.

Interviewer: Have a great day.

Interviewee: [Name]

Interviewer: Hey [name], this is [Interviewer], how you doing today?

Interviewee: Not bad. How about yourself?

Interviewer: Doing well. I think I've met you before. You gave us the... took us down through that truck that one day didn't you?

Interviewee: Uh, I don't know.

Interviewer: Well, maybe not. We had come up there one day and one of y'all had given us... done an inspection on a truck. I thought that was you. It sounded like you, but I'm not sure.

Interviewee: It may have been. I've done so many different projects lately, I can't keep up with what I was doing.

Interviewer: Join the club! Somebody asked me today said "can you tell me about such and such/" and it's all one big blurry mess in my head. I don't know.

Interviewee: I understand that.

Interviewer: Have you had any pilot test experiences with this WRI project?

Interviewee: Uh, I didn't have a lot of experience with it. It was just for the day or two before that big event we had.

Interviewer: Before the showcase?

Interviewee: Yes.

Interviewer: But you did interact with some of the components in the systems?

Interviewee: Yes a little bit. But like I said, I don't have the most experience with it but I can get in there and play with it I guess

Interviewer: Right. What data are most critical in your opinion to collect and assess in the WRI?

Interviewee: Um, I like the hours of service, the log book and how that was being kept. Driver certification. The registration, anything telling us what it's registered for. A lot of times we will have trucks come in and we don't know what it's registered for until we actually get out the registration. On some of that data it looked like you could actually see or it could be entered what it was.

Interviewer: Right, this is just, uh, a part of the pilot test. Now, I better back up here. We are recording this call but we are not going to tie your name to anything you say. It is going to be in the evaluation that UT is doing on this project, but again you won't be quoted or anything. But if you'd like to say anything off record, just let us know and preface whatever you say that you'd like to be off the record. Again, we appreciate you being here. I had to say that otherwise I would get in trouble.

How do you imagine you would use WRI results?

Interviewer: Well, it would be good working with especially like the pre-pass companies and seeing what is going on with some of these trucks going by. With pre-pass you are pretty much paying to not come into the scales. So I think it would be beneficial for us on that end. That's where we get a lot of our violations at and stuff staying on the interstate if we have no reason to stop them. Or say just road-side inspections, I have a day where I'm just going to go out on the road and work; if I could see what's coming down the road kind of know what is coming at me, that would help too.

Interviewer: Right. Based on the Webinar and any test pilot experiences you may have had, how do you think the WRI system will affect your role as a law enforcement officer?

Interviewee: It's just going to be another tool. It's not going to revolutionize anything. It's going to give us some good data. Kind of let you know what you should check and what you shouldn't check. If you want to check some trucks, I hear a lot of people saying don't check good trucks, check the ones that have problems. That links up to saying the brakes have discrepancies. That's a good thing to check.

Interviewer: In the context of a nationwide deployment of WRI capability of WRI, how do you think that might affect out-of-service violations?

Interviewee: You are saying if everyone used it or just the companies that wanted to volunteer for it?

Interviewer: No, if it was across the board mandatory by everybody.

Interviewee: I think it would help quite a bit. I mean, we put quite a few trucks out of service here. But giving us another screening tool is always beneficial.

Interviewer: Um, how do you think it might affect non-out-of-service violations?

Interviewee: Uh, I mean you are still going to get defects. Regardless of what you check, on a lot of trucks you are going to find defects. I think we are going to get more defects but non-out-of-service violations, we will probably get more out of that, but that just comes with the territory. The more stuff you check, the more violations you are going to have. But, at the same time, these drivers know they are pretty much being watched. Maybe they will take the time to go around the truck and do the pre-trip inspections, check all the lights, maybe look at their own equipment more often if they know they are being checked.

Interviewer: To what degree will, if this was applied nationwide, to what degree do you think traditional inspections themselves could take more or less time to perform if a traditional inspection follows at WRI?

Interviewee: Um, well it will give us the benefit with regards of knowing where to look. But if you are going to level 1, it's not going to make it any shorter because you are still going thoroughly through the truck. But if it's hitting on brake axle 4 right side is not working, is defective, if you are doing a walk-around that will pinpoint where you need to look. It will make walk-around inspections quicker I think, but for level 1 it will be about the same regardless.

Interviewer: And based on a nationwide deployment of WRI, how would you think that CMV safety would be affected?

Interviewee: I think it would go up quite a bit. If the drivers know that they are pretty much being watched and if there's anything going wrong with the truck, it's going to kick them in. It's going to take them longer to take care of their equipment, to take care of their log books. Like with [name] trying to get their company safety rating better, had their pre-pass turned off, and at every scale they were brought in whether they were inspected or not pre-pass kicked them in. But drivers that got used to having their equipment in there, all-in-all the companies' safety rating went up quite a bit once the drivers learned to take care of their own stuff and pay attention to their own trucks.

Interviewer: How do you think WRI would affect... in a nationwide deployment, how do you think that would affect your duties?

Interviewee: I think it would help it. If you know that there... if it's showing you got one of those renegade drivers driving way over their hours, that way when they come down your scales, you already know they are over their hours, you can take the time to check them. So, I think it would definitely help us.

Interviewer: Do you think fleets would be more likely to keep their vehicles up to standards?

Interviewee: Oh, definitely, especially if they know there's equipment that's going to tell on them for what they are not doing or where they are lacking.

Interviewer: In the context of the pilot tests, are there any potential inadequacies with the WRI system which you are aware of?

Interviewee: Not that I know of. I haven't worked with it enough to see any problems yet.

Interviewer: Right. I understand.

Interviewee: With experience, it's like everything else. Once you get into it and start working with it a lot, you will find some discrepancies and then it can be fixed.

Interviewer: Right. This is a question that I think maybe, I'm curious if we have it worded poorly. Do you foresee reviewing past wireless roadside inspections for a particular driver or vehicle? Like if you kept getting them, if a truck kept coming through there, do you foresee going back and looking at the old records?

Interviewee: Several of us do. We use the … portal, we get on the … central and we can see inspections that have been noted on there. We can see problems that haven't been fixed. You know, if you are having a lot of trouble out of a truck, and it always get shut down for the same brake not working and the company just saying they are fixing it or maybe there's a bigger problem to it. Personally, I use that as much as possible. I think it makes a much more valuable tool for us.

Interviewer: Do you foresee carrying out interventions or interdictions successfully should you need to do so?

Interviewee: Not any more than I already would.

Interviewee: Right.

Interviewee: I really probably wouldn't use that intervention tool.

Interviewer: What are some ways that you would use to ensure that trucks are using the WRI system if they were required to do so?

Interviewee: I mean just randomly check and make sure the equipment is there and they have been using it.

Interviewer: Now do you support the implementation of the WRI system?

Interviewee: I do.

Interviewer: I may have already asked this to you and if I did, I apologize. I'm going to ask it again. It's at the bottom of my list. Do you foresee there being any changes to your electronic screening program pre-pass as a result of WRI deployment should it happen?

Interviewee: If it worked together with pre-pass, more trucks would be suspended I believe. Like I said, we get a lot of violations off of pre-pass because they don't expect to be in here and companies don't maintain them as thoroughly as they should. They have been in because they have these defects or driver violations; I see a lot more inspections into it.

Interviewer: I know you said you had limited experience with this, as do I. Did you have any interactions with the user interface?

Interviewee: Not really. Not a lot. We just kind of... there were so few trucks using it. For the most part it was all [name].

Interviewer: Right.

Interviewee: I didn't see a lot of use. I didn't use the interface much.

Interviewer: In general, did you view the Webinar?

Interviewee: Yes.

Interviewer: What are your impressions of the WRI technologies?

Interviewee: I like it. I think it's going to be a great tool for us.

Interviewer: Well, I think I have run out of questions, and I think we are sort of running short on time. Was there anyone else there that [name] wanted us to talk to? I think he had said a couple or two or three. That's about what I was expecting. Do you know if there's anybody else there?

Interviewee: Let me check with him real quick.

Interviewer: Great. Thank you so much for your time. We really appreciate it.

Interviewee: There's a few more troopers that could do it, but they are working the road right now. They are working their way this way. Can we have them call you back?

Interviewer: Well, I think we're going to have to call it... unfortunately call it a day. This phone line, we have it, it's a conference call line through [Interviewing Company], and right at 3:30 it's going to shut off. So I think we are done for today. But is [name] available?

Interviewee: He is, let me get him for you.

Interviewer: Great. Thank you.

Interviewee: Yeah?

Interviewer: Hey [name] how are you doing?

Interviewee: Lovely.

Interviewer: Great. Well, we appreciate your time. I think we have sort of run out of time, and it sounds like you have run out of personnel for us today.

Interviewee: Well, I had another one on the way in. He must have got tied up somewhere. He was supposed to be here by 3:00. I figure he's making a friend somewhere along the way.

[Laughing]

Interviewer: A lasting friendship along the way. Huh?

Interviewee: Yeah.

Interviewee: Again, we appreciate your time. There is some possibility, it's not really up to me, but we may look at maybe coming to you again in January. If we don't... If my boss doesn't think we have enough troopers...

Interviewee: Come on back. I got a couple more. I don't have but 3 or 4 more to talk to you, but we can line them up for you.

Interviewer: And you had said the next couple of weeks didn't look very good for you. Is that a fair statement?

Interviewee: Between now and the first of the year it's kind of bleak.

Interviewer: Ok, well if we need to come back to you, we will. We really appreciate your time.

Interviewee: Okay.

Interviewer: Thank you. Have a good day.

[End interview].

Enforcement Personnel 4 (CMRS)

Interview date: 2010-12-17

Interviewer: [Name], can you explain again, so that we can keep [name] informed and we are recording these calls. They are going to be used for the analysis...

Interviewee: Hold on just a second.

I'm sorry. I got more phones than I got ears.

Interviewer: So we are using this as part of the evaluation to see if this project is going to go on to the next phase. So we are glad to have you participating. Like I said, we are recording this. We are going to write this up into the evaluation itself that we are doing. Although your name will be removed, we won't quote you per say. If you have anything to say off the record, certainly just let us know and we can do that. We have already sent you a list of questions, I think. And certainly you are probably one of the most knowledgeable people in law enforcement at this point on this WRI project. It's great to be talking with you.

I am going to just go ahead and start in at the top of the list of questions that we sent. If you can briefly describe your test experiences and tell what parts of the system you saw and interacted with directly.

Interviewee: Well, I've got limited, just what I've interacted with is the [name] that we set up at [name] at [Company] that we set up the geo fence on. We used them for our demonstration up here at the FMCSA showcase event that day. That's the only actual working that I have had with it while it was in place.

Interviewer: Right.

Interviewee: I was in on the planning session of it. We came up with some things in the planning that was not implemented yet, but I'm sure hopefully the future it will all be in place.

Interviewer: In the context of the pilot tests, are there any potential inadequacies with the WRI system which you are aware of, and what might they be if you have any?

Interviewee: Well, right now the biggest inadequacy I see is that uh, it doesn't show enough data yet. If we are going to let a truck bypass or ignore it, we'd like to have a little more information. Hours of service, weight, driver certification, things like that. And we'd also like to know if he's a portion for Tennessee, if he's current on his fuel tax.

Interviewer: Right.

Interviewee: Those are things as an enforcement officer we look for every day.

Interviewer: Right.

Interviewee: At a weigh station, weight is very important for us.

Interviewer: Right. The next question right after that is whether you have any suggestions or solutions for these problems. Obviously, I guess that would be to test those things.

Interviewee: Yes. I know that they are working on some things that will measure weight through the air system. I've also sent troopers to work weight trucks for [Company] is trying to develop a sensor that can sense distress on a spring system to verify weights.

Interviewer: This is a, I'm going to... this question is similar but phrased a little bit differently. I apologize if I ask you to repeat yourself. But in your opinion, what is the most critical data to collect and assess in the WRI?

Interviewee: Uh, driver qualifications, um of course size and weight, hours of service, registration and fuel tax up to date.

Interviewer: And how would you imagine you would use any WRI results?

Interviewee: Well, it would, as an enforcement officer, if we got an alert on one, we'd definitely want to look at them closer. Where we can actually pull him in and lay hands on his registration, and his log book and his driver's license. Check him out.

Interviewer: Do you foresee any changes to your electronic screening program, the pre-pass as a result of the WRI deployment if it was implemented nationwide?

Interviewee: The only thing I see on the pre-pass is, I'm hoping there was an alright on this WRI. That it would mandate the truck pull in to the scales.

Interviewer: Now, with the understanding that the WRI user interface has been designed for these pilot tests, do you have any impressions of it, suggestions to it or anything you'd like to see on the interface?

Interviewee: On the interface, I would like to see maybe a little... let me be politically correct, be more trooper friendly. I would like to see all the alerts pop up on the front initial page in red so you don't have to scroll through. And also on the original design that we came up with, let's say it was a freight liner. We originally designed; I asked could they put a freight liner up in one corner. That way say we get an alert on one and I can't see which truck it is at the top of our ramp. Or if I'm going down the road and I'm seeing this truck out of my car, I can tell... I can see a truck a long ways off and tell the make of it. I can look up the ramp and see a [name] coming and a freight liner behind it. Because I just know the looks of the vehicles. That would, if I got an alright on say the [name] when I'm in my patrol car, then I can just look around and I know that it’s only scanning so many feet out from me. I can say, let me look for a freight liner right quick. It's going to be a whole lot easier than trying to see a DOT number on a truck door or something.

Interviewer: Right. In general, what are your impressions of the WRI technologies?

Interviewee: Well, I still think it's in its infancy. It's just now getting started but I think it has great potential. Of course now, the way I understand it, the companies have to enter a lot of information like their states or portions and things like that. The driver qualifications, when his medical card expires and all that stuff. As long as the companies do it all honestly, I think it will be a great asset.

Interviewer: Based on the Webinar and any pilot tests that you may have had, how do you think the WRI system will affect your role as a law enforcement officer?

Interviewee: Well, I think it will help me eliminate time spent checking drivers out that do not need to be checked out. The good drivers out on the highway, keep them rolling. We are after the ones that don't play by the rules in the first place.

Interviewer: Right. How will, if there was a nationwide deployment of WRI, how do you think that would affect out-of-service violations?

Interviewee: Well, if it's used properly and the companies comply and all that, our driver out-of-service rate would probably rise a little bit. Of course, it's going to alert the companies that the driver is out of hours too. Hopefully they are smart enough to say that we have a driver out of hours, we need to park him for a while.

Interviewer: Right.

Interviewee: Of course that would be the ideal situation. But the companies that don't do that, then we are going to catch them. Now as far as vehicles out of service defects, I'm sure they will drop. Because even the good companies that come through here, we through our screening processes, we get flat tires, lights out and stuff like that. So equipment violations will probably go down, out of service.

Interviewer: How will nationwide deployment of WRI capabilities affect non-out-of-service violations?

Interviewee: Okay, could you hold on just a second?

Interviewer: Yes sir.

Interviewee: I'm sorry, I'm the only one here and there's 6 phone lines. But uh for the non-out-of-service violations, I don't see a whole lot of change on it. As I say, because if I see one with a head light out and I ping them or not, I want to stop them and you know, at least give them a warning on it.

Interviewer: Right. Based on a nationwide deployment of WRI, to what degree will traditional inspections themselves take less or more time to perform if the traditional inspection follows at WRI?

Interviewee: It won't affect the type of inspection we do now. Say we pull a truck in and we do a, say we do a level 3; it's going to take the same time. We still going to hand check his driver's license, medical card, log book, his registration, all that stuff. If we do a level 1, it's still going to take the same time.

Interviewer: Okay. Based on a nationwide deployment of WRI, how will a CMV safety be affected in your opinion?

Interviewee: In my opinion, of course this is a hopeful opinion, it will make the companies more aware of what their drivers are doing out here. And hopefully that put a tighter rein on those. It should improve safety. One of the biggest problems we have with truck wrecks is driver being inattentive because of fatigue or whatever. That should eliminate a lot of that. Hopefully.

Interviewer: Based on a nationwide deployment of WRI, how will your ability to perform your duties be affected?

Interviewee: It won't affect my abilities to do my job. Of course I like to think of my officers and myself, we have been around long enough that with or without WRI we can see visually the trucks that need to be inspected. We can uh, you know, so our job shouldn't change.

Interviewer: Based on a nationwide deployment of WRI, do you think fleets will be more likely to keep vehicles up to required standards?

Interviewee: Well, unfortunately the WRI does not go in and check brake measurements and stuff like that.

Interviewer: Right.

Interviewee: But so I don't know where it would encourage them. The main thing it's going to encourage the companies to do is keep a tighter watch on their driver. And there's company paperwork like registrations and fuel taxes and things like that.

Interviewer: What are ways you would use to ensure that trucks are using the WRI system if it was mandatory?

Interviewee: Well, it would be easy to look at. Because right now if you bing a red [name] out there and it's mandatory and it don't come up on your screen that truck's in there, then you know that driver's got it disabled some way. He doesn't want to be seen.

Interviewer: So you'd have to do that visually by watching down the road?

Interviewee: Yeah. But that is 90% of our job, visual observation. So, when we see that truck, we're going to know there's a reason he don't want us looking at him. So, should cause him to get a closer look.

Interviewer: Based on the using the WRI systems and reports, do you foresee being able to carry out interventions successfully should you need to do so?

Interviewee: I believe if there's a database where we can go back and pull up all the WRI for a company, and we see they have a habit of letting the driver's run over hours or have a habit of letting their medical cards expire, I think it would be a tool for the federal motor carrier to go in and spank them. Say hey, you are not doing your job as a safe company. Yes, I think it would be a benefit and help us identify unsafe carriers.

Interviewer: So do you foresee reviewing multiple pass WRIs for a particular vehicle driver?

Interviewee: Yes I do. Because that way you can tell if that driver's got a history of what you caught them for. Hours of service or whatever?

Interviewer: Do you support the implementation of the WRI system?

Interviewee: Yes I do.

Interviewer: Do you think the technical aspects of the WRI system should be implemented?

Interviewee: Yes. With of course with improvements and more data involved in it and what I'd like to see a more simplified trooper friendly version of it.

Interviewer: Right. And based on the Webinar and what you have been shown the expected user benefits to be, do you think... looking more at the user benefits, do you think the WRI system should be implanted?

Interviewee: Yes, I think it should be implemented.

Interviewer: Well, [name], I think we have gone through all of our questions. [Name], do you have any questions?

Interviewee: No I don't, thank you.

Interviewer: [Name], do you have any...

Interviewee: Hope I didn't bore you to death! But as I say, the concept is great if we can just get everything working the way I want it to work. Of course, I'm in enforcement. That's my job. I mean, I get paid to write tickets and I enjoy it. I'm looking at it from an enforcement part where most trucking companies are looking at it differently. Of course, no trucking company wants to get caught. But hopefully if they are mandated to go to it, they are going to sit down and scratch their heads and say we are going to have to do things differently if we are mandating to have these things on the truck.

Interviewer: Have you received positive feedback from other troopers there at your station that have used this?

Interviewee: Well, some of them, uh, I don't think they quite understand the concept as well as I do have it.

Interviewer: Right.

Interviewee: They think it's just about like the pre-pass.

Interviewer: Right.

Interviewee: We have caught so many trucks with pre-passes with violation and stuff like that in the past. Now if we catch a real good one, I have a good working relationship with pre-pass. We have caught trucks here pre-passes with drugs and stuff like that. I contact pre-pass and they are off our pre-pass system the next day.

Interviewer: Right.

Interviewee: So I mean, for me, pre-pass works closely with me up here. We have an intimate relationship with them. One of their bosses is one of our ex-bosses. If I can prove that driver sure don't need one, he don't have one. They are off the next day. Of course, troopers think that it's a way these companies are going try to keep from being, what would you say, scrutinized closer.

Interviewer: Right.

Interviewee: But if they get it in place, get it working like it's supposed to, get the weight and registrations interfaced with it, it would actually make our job simpler.

Interviewer: Right. Well, [name] we appreciate your time. We'll will look forward to speaking with how many ever people we can get on the line at 2:30 this afternoon.

Interviewee: Okay sir.

Interviewer: Thank you.

Interviewee: I'll see you then.

Interviewer: Bye.

[End interview].

Enforcement Personnel 5 (CMRS)

This subsection contains interviews, one after another, with two different THP officers.

Interview date: 2011-01-07

Interviewer: Good morning [Name]. My name is [Interviewer] and I'm on the University of Tennessee evaluation team for the WRI project. We have a few questions for you. I guess you have received those through your emails.

Interviewee: Yes.

Interviewer: And you have had a chance to look over those?

Interviewee: Yes.

Interviewer: Good. Just so you know we will be recording this conversation and if there is anything you would like to say off the record, just let us know and we can do that.

Interviewee: Okay.

Interviewer: You will be working with me and [Interviewer] on this interview.

Interviewee: Okay.

Interviewer: We will start from the top. Will you please give a brief description of the pilot test?

Interviewee: Actually I've not had any experience with the pilot test at all other than the Webinar that I've used.

Interviewer: Were you out at the showcase?

Interviewee: No.

Interviewer: Okay.

Interviewer: Okay. Since you have had little interaction with it, what data do you think is most critical to collect and assess with WRI?

Interviewee: Probably the most important is going to be hours of service on drivers as far as their CDL license and qualifications. And then of course the main reason the weight station is there in the first place is size and weight.

Interviewer: Okay.

Interviewee: I'm sure there's a lot of other ones but that would be the 3 that I...

Interviewer: That's what sticks out in your mind at least.

Interviewee: Exactly.

Interviewer: How do you imagine you would use WRI and the results for the inspections?

Interviewee: We would further enhance the vehicle screening process for us here. Right now we normally choose ISS to pull it up to give us a safety score on these vehicles. You are still going into the inspection blindly until you actually get out there and do it. You don't know what you will find until you get out there. This would help us find to find out-of-service violations on vehicles before we stop them for the inspections.

Interviewer: Based on the Webinar, how do you think the WRI system will affect your role as an enforcement officer?

Interviewee: I think it will make us more effective. It will help us in the screening process. It will make us more effective officers. There again, instead of going into an inspection blindly, you go out there and do an inspection and don't find anything wrong on the vehicle. This will allow us to be more effective as far as inspecting vehicles.

Interviewer: What are your current thoughts on the present pre-screening Pre-pass and all?

Interviewee: The problem I see with pre pass is it will get trucks in here that will be pulled in on the 5% random and they are on Pre-pass and active on Pre-pass and have a bad safety rating. We pull them up on ISS and they got an 88 but yet they are still on Pre-pass and getting the green light. But Pre-pass does help cut down on congestion at the scales so we can look at the more unsafe carriers. But at the same time you have some of the unsafe carriers that are on Pre-pass.

ISS is a good tool as far as safety ratings go. When it gives you a history of top 5 violations the company has had in the past, it lets you know what areas to focus in on the. The only benefit as far as law enforcement goes is that it cuts down on congestion at the scales. But for some reasons, some of these carriers falling through the cracks and getting on Pre-pass and staying on Pre-pass even with bad safety ratings.

Interviewer: Okay. Based on a nationwide deployment of WRI, how will this affect the out of service violations?

Interviewee: It should decrease because the carriers know we will be looking closer at them and have more tools to track them with. It should force them to increase their inspection process and their periodic inspections and that type of thing and make the vehicle safer. It would force them to do that. I think CSA2010 already going to take effect on that too.

Interviewer: Do you think there might be an initial spike in...

Interviewer: Out-of-service violations?

Interviewee: Very well could be because of the technology. Until they get some inspections in and see we are catching them on some stuff, they will pay more attention to their maintenance and everything. I would imagine there will be a spike in it because it's going to help us on the screening process and we can concentrate more on out-of-service vehicles.

Interviewer: Based on a nationwide deployment of WRI, how will that affect non-out-of-service violations?

Interviewee: It is probably going to affect it pretty much the same as out of service. You may find a few more non-out-of-service violations than normal but again, they should decrease after a certain period of time due to the companies knowing we are looking at them that much closer.

Interviewer: So again, the initial spike, then leveling off after because of the companies becoming more honest with their work?

Interviewee: Right.

Interviewer: Again, based on a nationwide deployment of WRI, to what degree will traditional inspections themselves take more or less time to perform if a traditional inspection follows WRI?

Interviewee: It may take a little more time because you are looking at more things. But in the long run, it's going to give us better quality inspections instead of quantity of inspections. You might do one less inspection in a shift but you will have more quality inspection than you did in the past.

Interviewer: Again on nationwide deployment, how will commercial motor vehicle safety be affected?

Interviewee: It will be affected like we were talking before; companies will be forced to look at things and become more stringent because of the tools we are going to have to find things wrong with their vehicles and drivers.

Interviewer: How will your ability to perform your duties be affected?

Interviewee: It will take the guess work out of it for us as far as inspections. If you are doing randoms or using ISS it's a shot in the dark. It will make us more efficient at what we do.

Interviewer: Do you think fleets will be more likely to keep vehicles up to required standards?

Interviewee: Absolutely. Absolutely. They'll have to or it will start costing them contracts and that will cost them money. It will absolutely keep them up to standards.

Interviewer: I realize you have only worked with the Webinar but in the context of the pilot tests, are there any potential inadequacies with the WRI system that you are aware of and what are those?

Interviewee: I'm not aware of any. Like I said, I've just had limited access to it.

Interviewer: Okay. Again, based on a nationwide deployment of WRI, do you foresee your viewing multiple pass WRI's for a particular vehicle or driver?

Interviewee: Yeah. Just like when I go in on Quarry Century and look at a driver's past inspections, I'm looking for patterns to see if he's been violating log book rules or if he's had certain violations he's committed over and over again. It will be a good tool for us to see a pattern if this driver keeps violating the same laws.

Interviewer: You have seen a sample of the WRI report correct?

Interviewee: No I haven't. Just what was on the Webinar and it didn't show a whole lot.

Interviewer: Right, with the user interface.

Interviewer: Using what you saw in the Webinar as far as the user interface, do you think those will help you carry out interventions successfully?

Interviewee: Yes. I believe it should.

Interviewer: Okay.

Interviewer: Do you have anything you would like to see specifically in a user's interface? You know sitting there at the station, busy and a lot going on.

Interviewee: Well, I know one thing, the main reason we are here is size and weight. Of course we are here for safety enforcement too. But the main reason of the scale is size and weight. The first thing we check before we pull a truck out is some way to be able to check the vehicle's weight before they come into the scales. We have tried to get them to tie something in to Pre-pass but they've not been able to do it. We have scale platforms in Interstate that have never been hooked up. They were there since we had I-75 before we went to Pre-pass. Right now they're not doing anything. It would be nice to have some type of rolling scale out here on the Interstate. They help us pull these trucks in here.

Interviewer: Those are at-speed scales?

Interviewee: Yeah. Yep. They are mainline scales. Most of the scales aren't around but they reduce speed, they are down to 30 miles per hour. But we need something out there that can weigh them on the Interstate at 55 miles per hour.

Interviewer: Some of these technologies do involve having sensors on the vehicle so they are constantly being weighed, as part of their on-board equipment. That is something you would be interested in?

Interviewee: Absolutely. Absolutely. We can sit here all day long and watch a Pre-pass truck go by and he'll be a 53-foot trailer and he's got his axles slid all the way to the back and he's in violation of the length law. But due to manpower, we can't go run all of them down. We see that all the time.

Interviewer: Okay, we'll move on to the next question. What are ways you would use to ensure trucks are using the WRI system?

Interviewee: Now that one I have no idea. I have no idea how we would ensure they are using it.

Interviewer: Okay. Do you support the WRI system?

Interviewee: From what I've seen so far, I do.

Interviewer: Do you foresee there being changes to your electronic screening programs such as Pre-pass as a result of WRI?

Interviewee: Very well could be. I would say that would be a possibility.

Interviewer: What do you think would happen?

Interviewee: To be honest with you I don't really know. There would have to be changes in this Pre-pass because we have got to be able to get these trucks into the scales. I'm not sure if your system... I know there's supposed to be a light or something that tells them to come in. Are they going to have a transponder in their trucks like the Pre-pass trucks do? How is that aspect of it going to work?

Interviewer: I would hate to be quoted on that but yes. That is my impression of it that there will be some sort of pull-in/bypass signal that would tell the driver you need to go in.

Interviewee: Right.

Interviewer: They're also multiple possibilities with this as far as different stations that driver can obviously take another option and totally skip your scales by going another route. There are ways this system could put up temporary or even more permanent geo points at other locations. Is that something you have thought about?

Interviewee: Now, that would be useful. There again, that will involve manpower that we don't have. But hopefully in the future when we get more manpower, that is something we could definitely use.

Interviewer: Okay. With the understanding that the WRI user interface was designed for pilot tests, what is your impression of it and do you have any suggestions for improvements to the interface?

Interviewee: I don't have any suggestions for improvements. But what I have seen so far everything seems to be impressive and everything seems to be well thought out. But other than that I have limited access to it.

Interviewer: Okay.

Interviewer: One of your fellow officers up at [Law Enforcement Office]. had had a little bit of experience with it during the showcase. He had suggested an audio signal of some sort in the weigh station that would alert you to get your attention. Is that something you think you and your troopers would be interested in as well?

Interviewee: Sure. That would be a big help.

Interviewer: Okay. Moving on. What are you impressions of the WRI technologies?

Interviewee: It would be a benefit to us and make us more effective officers. It is another tool we can put in our toolbox to use to get unsafe vehicles and unsafe drivers off the road.

Interviewer: Do you have any other comments?

Interviewee: Not at this time. I wish I was more knowledgeable about this but I've just not had any access to it.

Interviewer: Well, I appreciate your time. The other officer's name, I don't have in front of me...

Interviewee: [Name].

Interviewer: [Name]? Is he available now? Or should we...

Interviewee: If you will hold for just one second I'll check and see if he's ready to go. We were in the middle of doing some paperwork in the pursuit that we were in. Hang on just a second, he may be able to go ahead and do this.

Interviewer: Great, thank you.

Interviewee: Okay, he's ready to go ahead and do it. I'll pass the phone along to him if you are done with me.

Interviewer: Great. We'll go ahead and end this thing and we won't have the next call which was scheduled at 10. We'll go ahead and wrap this thing up. Certainly appreciate your time this morning.

Interviewee: Not a problem.

Interviewer: Thank you very much.

Interviewer: Thank you sir.

Interviewee: Hello, this is [Name].

Interviewer: Hello [Name]. This is [Interviewers] at the University of Tennessee. We are part of the evaluation team for the WRI project. We have a few questions for you. Have you read through the questions?

Interviewee: Yes I have.

Interviewer: I wanted to let you know this phone call is being recorded. If you would like to say anything off the record, just let us know and we can do that.

Interviewer: When we put this in the report, we are not quoting anybody. You will be officer...

Interviewer: Or trooper #1.

Interviewer: We'll make you Trooper #1

Interviewer: That sounds good, that's the way I like it. (Laughing).

Interviewer: We will start from the top. Will you briefly explain your pilot test experience?

Interviewee: I actually don't have any. The only thing I've got is the presentation you guys sent us through the email.

Interviewer: The Webinar?

Interviewee: That's really about all I have.

Interviewer: Were you at the showcase?

Interviewee: No.

Interviewer: Okay.

Interviewer: Moving on, as an officer, what data is most critical to collect and assess in a WRI?

Interviewee: Size and weight really. The equipment, the mechanical side is probably my pet peeve. I know drivers is important so I want to say drivers. But to me personally, the equipment itself: brakes, suspension, load securement, to me that is really a big issue as far as promoting high way safety and making sure the trucks are safe.

Interviewer: Okay. How do you imagine you would use WRI results?

Interviewee: Well, it would probably make it a little easier to put hands on trucks that need more attention than those trucks that don't. It's like the ISS rating, you look at the high ratings and naturally that is the ones you want to look at more than you would the lower rating.

Interviewer: Okay. Based on the Webinar, how do you think the WRI system will affect your role as a law enforcement officer?

Interviewee: As a tool I think it would help. Anything is going to help to some degree. Again, when it comes to putting hands on trucks that need attention. I think it would probably enhance it some. Yes.

Interviewer: Based on a nationwide deployment of WRI, how would this affect your out-of-service violations?

Interviewee: I think it would raise it some. Again, I'm guessing because I really don't know. I don't see how it could not help it to some degree.

Interviewer: Okay. Again, with the nationwide deployment of WRI, how would that affect non-out-of-service violations?

Interviewee: Again, I think it probably would hurt that. Because if you stop looking at trucks that's got a good rating and you stop looking at them completely, part of their game is they will stay in compliance because they are in check. You quit checking that good company and they may get a little laxed. So, I don't know that's what would happen, I think it might possibly hurt them if we quit looking at the trucks with the good ratings.

Interviewer: Have you had that experience with other technologies?

Interviewee: No not really. All I have to go by is the ISS. That is the one tool I use the most.

Interviewer: So let me clarify, you think out-of-service rates would go up?

Interviewee: On a good safe company it will. You quit looking at them and you knock down some of the incentive to be that safe company. Know what I'm saying? It's like a lock. The purpose of a lock is to keep an honest man honest. Thief is going to get into something regardless. These good companies out here are safe because we are checking them. They want to be safe. I mean, they want to be a good company and a reputable company and they want to be safe. But it's incentive to coming through here and getting inspected and getting a clean bill of health is important to them. Even a good company wants an inspection.

Interviewer: What are your thoughts on Pre-passes as it currently operates?

Interviewee: My personal opinion, I don't care too much for Pre-pass. I think Pre-pass is needed. It alleviates some of the traffic we have here because there is more traffic than our facility is able to handle. So it's probably needed. But I also think there are some companies, not all, but some companies that get a free ride by that should be looked at. If you look on Pre-pass, there's some that have high ratings that are still on there. The system itself is probably good but there are some companies that shouldn't be on there.

Interviewer: Okay. Based on a nationwide deployment of WRI, to what degree will traditional inspections themselves take less or more time? And what if a traditional inspection follows a WRI?

Interviewee: I can't see where it would take much more time. I don't see how it would hurt us. It would make us possibly a little more efficient.

Interviewer: A little more quicker for each inspection?

Interviewee: Yes, because you are getting information to us on a timely manner that's good information to have. Know what I'm saying? Anytime you can get good information that's quick information, that's a good thing.

Interviewer: Okay. Based on a nationwide deployment of WRI, how will commercial motor vehicle safety be affected?

Interviewee: I think it would improve it overall.

Interviewer: How will your ability to perform your duties be affected?

Interviewee: I think it would improve that also. Again, you are getting good information in a timely manner. So, anytime that happens it's a good thing.

Interviewer: Based on a nationwide deployment of WRI, do you think fleets will be more likely to keep vehicles up to required standards?

Interviewee: Yes I do. Because again it's an incentive for them to do that because they know there are more eyes looking at them. The more people you have looking at them, the more reasons they've got to try and comply.

Interviewer: Okay. In the context of the pilot tests, are there any potential inadequacies of the WRI system that you are aware of?

Interviewee: Not that I'm aware of.

Interviewer: Again, based on a nationwide deployment of WRI, do you foresee that reviewing multiple pass WRI for a particular vehicle or driver?

Interviewee: Say that again.

Interviewer: Do you think you would look at a WRI inspection report for a certain carrier or a certain driver and a history of those?

Interviewee: Yes I do. I think that would be... yes I do.

Interviewer: And you have some sort of system that already does that. Is that correct?

Interviewee: I'm sorry; I'm really having a hard time hearing you.

Interviewer: You have some sort of similar system that does something like that already.

Interviewee: Yes, the ISS.

Interviewer: But this would have...

Interviewee: ... is what we have. And I think this would be a good tool too.

Interviewer: Right.

Interviewer: Okay. Based on using the WRI system and the reports, do you foresee being able to carry out intervention successfully should you need to do so?

Interviewee: Yes I do.

Interviewer: Okay. What are ways you would use to ensure trucks are using the WRI system?

Interviewee: What ways? I'm not sure. I think even some road side would be some benefit. I think it would be to fixed sides too. I'm not sure if answered that question the way you wanted me to.

Interviewer: Do you support the implementation of the WRI system?

Interviewee: Yes I do. Because anytime you can get good information in a timely manner it's got to be a good thing.

Interviewer: What are your thoughts on...? I mentioned this with [Name] and some of your counterparts at the [Law Enforcement Office] had talked about this some, about you have some amount of vehicles bypass your station deliberately. One of the WRI benefits would be from a law enforcement perspective would be that there would be temporary sites or maybe you could put one on the route that everyone takes to get around the weigh station. Do you have any thoughts about that?

Interviewee: Yes I do. I think it could be a good thing. Especially if there was some way possibly that particular vehicle could be pinged to see that location. In other words, there may be two of us, for example here at this fixed site. One goes by and the information we get is that the carrier needs to be looked at; either the driver's safety rating is high or the vehicle equipment is high. But for some reason it should have been looked at and he goes by. It would be nice to be able to ping that and track him 2 miles down the road and still pull him over and do a roadside inspection. I think that would be a huge plus.

Interviewer: Moving forward. Do you foresee there being any changes to your electronic screening program such as Pre-pass as a result of WRI deployment?

Interviewee: I'd like to think so.

Interviewer: (Laughing)

Interviewer: Okay. With the understanding that the WRI user interface has been designed for pilot test, what is your impression of it and do you have any suggestions for improvements?

Interviewer: Or what would you like to see...

Interviewee: Just what I've seen and read and what little bit of information I've got I think it's probably a good thing. As far as improvements or something like that, it's really hard for me to say I'd want to improve on something that I have really not been able to put my hands on and use for a while.

Interviewer: Is there something that comes to mind when you think about nationwide deployment that you as a law enforcement officer would like to see, especially if it's not been covered in the Webinar, is there anything that you would really like to see that you maybe think has been looked over?

Interviewee: The individual. You have some companies that slips through. You have a company that may have a bad rating, a low rating or a high rating, whatever the case may be. That don't mean everybody in that company is an unsafe driver or every that every vehicle they have on the highway is an unsafe vehicle. They may have 8 or 10 good vehicles and good drivers and got 2 or 1 bad vehicle or bad driver. It's like the apples in the batch, you got one bad apple and it makes the whole batch look bad.

Interviewer: So ISS looks at everything...

Interviewee: And ISS don't give me that information.

Interviewer: It just does it collectively.

Interviewee: It does it collectively, correct. If this could give more accurate information on what particular vehicle it is and what particular driver it is, I think it would just be wonderful. I think it would be massive information well used by law enforcement all across the country.

Interviewer: What are your impressions of the WRI technologies?

Interviewee: I like it. I know I've said it once and several times, but any time you can get good information in a timely manner it is a good thing. So I think it's so far what little bit I've seen of it and tried to read of it, I think it could possibly be a good program and it could be well used well benefited for all of us.

Interviewer: In the Webinar there were a couple of slides for the Kentucky system where they were using a license plate or a DOT reader. Do you recall that?

Interviewee: Yes.

Interviewer: Do you have any thoughts on that?

Interviewee: I like the DOT readers. Again, you are getting some good on time information there. The license tag especially you are getting some good information. A lot of times you have trucks that the same drivers stay in it. You are not only getting good information not only on the truck but on the driver. It is a lot of information, not just the company. You know, expired tags and stolen tags. The list can go a long way. I think those readers are a huge plus. I wish we had one.

Interviewer: Okay. (Laughing)

Interviewer: The New York system, I don't know if there's anything in the Webinar about that system. So, forget I said that.

[Interviewer], do you have anything else?

Interviewer: Just any general comments you have for us [Name]?

Interviewee: No honestly I don't. Keep up the good work and get us some good information.

Interviewer: I will throw this out to [Name] and [Name] if they have any questions?

Interviewer: I do not.

Interviewer: [Name] may have dropped off. There is another WRI call going on.

[Name] we sure do appreciate your time this morning.

Interviewee: Alright. No problem. Glad I could help. I hope I did help.

Interviewer: Thank you very much. Bye.

[End interview]

Sensor Developers

Participants from the sensor developer companies participated in the telephone interview sessions. Further specific details regarding the sensor developers can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

Sensor Developer 1

Interview date: 2010-12-21

Interviewee: We appreciate your joining us. With whom am I speaking?

Interviewee: This is [name], and I have [name] in here as well.

Interviewer: [Name] and [name].

Interviewee: Yes, hello!

Interviewer: Hey, how y'all doing this morning?

Interviewee: Doing well. I'm sorry, I didn't catch who I was talking to.

Interviewer: This is [Interviewer]

Interviewee: Hey, well good morning everybody. And I'm sorry y'all are going to be getting all that snow I see on the news.

Interviewer: [Laughing]

Interviewer: Where are y'all located?

Interviewee: We're in [State] where it's normally cold. But right now we are enjoying a feasible warm and nice period.

Interviewer: Oh, I'm jealous!

Interviewee: Well, you can come this way if you want to warm up. I think we got the best; it's going to be raining in California, snowing in New York, so it's the God's country in the middle here.

Okay, well, where you at? Do we have other people to join us?

Interviewer: I think the crew is on board. I'll go ahead and tell you what this is being used for. It is part of the WRI evaluation. We have been tasked to perform the evaluation. We are collecting input from all the participants from a qualitative side. I will let you know that this phone call is being recorded, but we are not going to quote you in the report, just say Person A. So you might be person A and [name] might be person B.

Interviewee: Okay.

Interviewer: Or it might be the other way around, I don't know who’s the boss down there.

Interviewee: Well, I'm the president.

Interviewer: Okay, then you're Person A, I'm sure.

Interviewee: I'm a good but with my last name being [name], I could always be person Z.

Interviewer: Okay. [Laughing]

Interviewee: Is [name] on with us?

Interviewer: No, he is not.

Interviewee: Okay.

Interviewer: And so if you... this is being recorded so if there's anything you want to say off the record, certainly feel free to do that. Do you have any questions for us before we get started?

Interviewee: Well, [name] is the point man on this for us. Do you have any questions for them?

Interviewee: No, no I don't think so.

Interviewee: Yeah, [name] has done a good job with this. He's kept us informed...

Interviewer: Could you give us a little...

Interviewee: ... report. Well, you guys go ahead. Is [company name] on?

Interviewer: No, it's just going to be us interviewing you. We are interviewing the other people later this morning. We will have to cut off right at 10:30 because in fact, the line, the way it's set up it will cut us off exactly at 10:30, and I have no control over that.

Interviewee: You ask away, we'll answer real quick.

Interviewer: Great. Can you tell us a little bit about how you all have been involved with the WRI project?

Interviewee: Yes. We were contacted by [name] some time ago, probably going on a year now. I lose track of time. They asked us if we could provide tire pressure monitoring. From that point they asked us if we could also capture information on the brakes and on the weight of the vehicle. Put that through our system on to the vehicle network, which would then be picked up from the trailer to the tractor, from the tractor to the telematic provider and then transmitted to whatever reader is available to pass that off to. We are certainly the most reliable out there on the marketplace. We have probably largest scope of product equipment. We are one of the few that can do an automated drop and hook with any tractor and trailer. We log information. We really support this program. We think as more and more vehicles are hitting the road, and I notice truck sales are up, and we are seeing more vehicles coming in from Mexico, safety on the highway is paramount. We are a strong advocate of this program.

Interviewer: Great! And I hate to focus on the negative, but is there anything that could have been done differently to prove the test product? Anything that went wrong, any problems that stick out?

Interviewee: Well, the first thing and I'll get [name] on this one as well, but we have been prepared to thump on this early on. Other partners haven't been as much. So, we've been really delayed. We have a lot of equipment sitting out there on trucks that is not being utilized yet. We've probably got 20-something thousand dollars worth of equipment out there, but we're still not getting any read from the telematic side. So far we have only worked with one. I would have hoped that the project would have brought in all of their telematic people and talked to them about picking up our signals. We are going to have to do this as we go along. I think [company name] is involved, and we haven't spoken with them yet. It would be nice to get hooked up with all these guys if they are going to do this at some point.

Interviewer: Right.

Interviewee: I really still don't have a good feeling as to the final outcome and what this is going to provide. Is it going to provide... is there an opportunity to mandate this down the road? Which is what we think it's going to do. I mean, we see a hell of a savings opportunity with the government being able to inspect a lot more vehicles as they're going down the road as opposed to putting in expensive weight stations everywhere. So I guess I don't have a good feel for what the final outcome of this is going to be.

The trucking partners that we have dealt with have been somewhat difficult to work with. We have had to chase them down and chase their trucks down. I think the front side of this thing could have been handled a little bit better. But we worked with it within the system to make it work.

Interviewer: How do you think it could have been handled differently? Any specific ways?

Interviewee: I think all the partners should have been brought together either in person or on a conference call. Made to commit to what they were going to do on this.

Interviewer: Right.

Interviewee: That seemed a little loosy-goosy to me.

Interviewer: Okay.

Interviewee: Do you agree [name]

Interviewee: Yeah.

Interviewer: Um, in the process of a WRI inspection, your sensors are on the vehicles. Do you want to receive any feedback after... from the system saying what your equipment has done?

Interviewee: We certainly do.

Interviewer: In what way would you like to see that? If you can provide me with some details of how you would envision that happening?

Interviewee: If we can see any information from each of the participating trucking companies, that's important for us to know their thinking on our product, how the product worked for them, how it performed, what they are thinking, is it a product that they see as providing them benefits, how do they see those benefits, what does the government, the DOT think about our product and how it performs as part of a whole, do they understand the full benefits? I'm not sure the DOT understands all of the benefits but tire pressure monitoring does. I think they see it as saving fuel and helping tires wear a little wire. But I don't think they understand that when tires are properly refilled, the casing isn't damaged, those tires can be reused or sold or retreaded rather than going to a scrap heap. So we reduce by 30% the number of tires going to scrap heap, which means we are using less raw resource to build new tires with. The liability issue becomes lessened on the highway. You are not having a tire shred on the highway and hitting vehicles around it or losing control of a vehicle and causing an accident. The safety factor of it. The carbon emissions is significant. If a truck, the DOT said last year, 57.5 billion pounds of excess carbon emissions due to low tire pressure. That's a pretty significant chunk, I think about a 4% or 5% somewhere in there if I remember right.

Interviewer: So, from a technical standpoint, what kind of feedback would you... in this system, would you like to receive?

Interviewee: The information is being sent back to a [name] software. We would like to see that data.

Interviewer: Okay. Have you had any interactions with [name] during the course of these pilot tests?

Interviewee: Not with [name], directly through [name]. That's where the difficulty...

Interviewer: Okay. And you all viewed the Webinar with us the other day, correct?

Interviewee: Yes.

Interviewer: In general, what are your impressions of the WRI technologies and all of them? I know you have spoken to that already at length this morning. Is there anything else that you think you'd like to share?

Interviewee: We think it's a great idea. Any communication between a vehicle and inspection or understanding where it's within guidelines or where it's outside guidelines, I think it's critical. Communication is the key to that. Our telematic providers are certainly important. We think brakes, we think weight, we think tire pressure are key areas. When I used to drive and had to go through weigh stations, I mean that was all they... three critical areas.

Interviewer: Let me ask [Interviewers] if they have any questions for ya'll.

Interviewer: Um, I do not.

Interviewer: No, I don't. Thanks.

Interviewer: I don't either.

Interviewer: Well, gentlemen...

Interviewee: Did you have... timing? When is this project designed to wrap up? What time frame should be the end of the test?

Interviewer: Well, I'm the lowest, except for [Name] who is my assistant. I give him a hard time. [Laughing]. He's not my assistant. We are really the lowest people on the totem pole. If you spoke to [name] he would be the person to talk to on that. Because I don't have a good informed answer for you on that. I apologize.

Interviewee: Okay. Speaking to what [name] was speaking to earlier, the difficulty we run into was getting the systems onto the trucks many months ago and having them out there. The truck companies were probably up front, certainly cooperative enough, but then the delay came from the WRI side when we couldn't get the integration finished with the telematic companies which was [Company]. So, we that has delayed everything. We had hoped that would already have data coming by now.

Interviewer: Right. Again, I apologize for that. And uh, we are taking your comments and suggestions really for the purposes of if this thing goes into the next phase that we can address some of these problems early on. We really appreciate your feedback on this matter.

Interviewee: Right.

Interviewer: Well, unless y'all have any more questions, I think we have gotten the information we wanted from you guys.

Interviewee: Okay. We appreciate it.

Interviewer: Appreciate your time.

Interviewee: If there's anything we can tell you, we're available.

Interviewer: Great. Thank you gentlemen, have a good day.

Interviewee: Thank you. Bye bye.

[End interview]

Sensor Developer 2

Interview date: 2010-12-20

Interviewer: [Name]?

Interviewee: Yes?

Interviewer: This is [Name] again. I think we're going to go ahead and get started.

Interviewee: Okay, that's fine.

Interviewer: Great. I will let you know that this is part of the evaluation process. We here at UT are doing for the WRI project. We will start the interview here in a minute. I want to let you know that the phone call is being recorded but we are not going to quote you, we won't tie people's names to things they say in the evaluation .

Interviewee: Okay, fair enough [laughing]

Interviewer: Person A. In addition if you would like to say anything off the record, please feel free to do so.

Interviewee: Okay, fair enough.

Interviewer: I'm trying to get my... Can I get you to say one more thing, just anything? We're trying to get the recording going here.

Interviewee: Sure. I can pick up the handset if you think that would help.

Interviewer: Well, I think... say, I think we've got you if you will try one more time. Then we'll give you the green light.

Interviewee: No problem.

Interviewer: That works. We've done some sophisticated adjusting here. I put the iPad up here on my man purse. So we're good.

Interviewee: Fair enough.

Interviewer: So, could you tell us a little bit about your company's role in the WRI project in the pilot test?

Interviewee: Sure. [company name] is privately held company and we have been in the braking business for 50 years. We are a pretty much a one technology company. We make brake products for commercial vehicles. The company invented parking brakes for commercial brakes. We supplied the products to [can't understand - 2:15] years. We started working on a technology called E-stroke [sp?] which is brake stroke monitoring technology probably about 15 years ago. We were actually approached by one of the major class B truck manufactures with a need for the product. Brake adjustment has historically been the leading causes of out of service violations, mechanical out of service violations in the industry for years. Since we make the brake actuator, the rest of the brake system is now streamed from our brake actuator and the brake actuator takes the air pressure and converts it into a mechanical force to acetate the brake. So, [company name] designed and developed a product called E-stroke [sp?] which basically monitors the stroke of the push rod on the actuator that drives the brakes, whether it's a drum brake or an [can't understand - 3:15] I mean an air disc brake. We basically invented the sensor in our brake chamber and we [can't understand - 3:24] and we can tell where the brakes are, whether they are working, not working, whether they are out of adjustment. [Company name] has a history with Oak Ridge. We did work with Oak Ridge many years ago. Our gasket division at the time. So, we've had a relationship with Oak Ridge for many years and we have kept that relationship. We were made aware of this program through Oak Ridge and through some connections we have in the ESA [sp?], TSA [sp?] and Washington environment. We were asked to [can't understand - 3:59] and I've actually met with [name] several times at his facility. I've also done work with [name] at [can't understand - 3:4:08]. [Company name] has invested its own time and resources and money into this program because we feel it's worthwhile. We are kind of one of the leading companies in the marketplace pushing for commercial vehicle safety technology. So, in a nut shell, that's how we ended up on the program.

Interviewer: Have you viewed the webinar?

Interviewee: Yes. I participated in the webinar. I've seen it.

Interviewer: Okay, I kind of thought that was the case. Okay, let me ask you this; you had said that your company was definitely very interested in this?

Interviewee: Yeah. We have defined it as one of the core technology that we feel is important in the marketplace. We actually have a commercial product that we have been selling on the market for about 10 years and has been accepted in the transit market but has had limited to very little acceptance in traditional over the road market.

Interviewer: Why do you think that is?

Interviewee: Money. We have very good success with transit busses. Transit busses are typically higher dollar vehicles and are funded with federal money.

Interviewer: Right.

Interviewee: Commercial vehicles, the OEMs are resistant to add additional content to their vehicles because they are all trying to de-content or streamline their vehicles to reduce options. So you have push back at the OEM manufacturing level and you have push back at the fleet level from a cost perspective. Safety technologies are not cheap. So making [can't understand - 5:56] saving lives is a difficult sale at the fleet level because of the cost.

Interviewer: Now, in your opinion, what could have been done differently or could be being done differently presently to improve the test process?

Interviewee: Um, well we have been involved and this is the second phase. We were involved in the first phase, the earlier phase in the project. We have outfitted several vehicles. Um, I think that the thing that stands out to me was or is that there companies in the market willing to participate and willing to provide technologies and willing to work with the government and regulatory agencies to advance technologies. However the fleet participation has been disappointing. I think that if you are asking me how to make this test better is that you have to have more fleet participation. I participated at the last event that was held in October at the weigh station. You know, you had [can't understand - 7:22], [company name] had a few fleets. That were a lot of other fleets that were asked and declined to participate. I think if you want to make this program more effective from a testing perspective, there has to be more fleet participation and on a larger scale.

Interviewer: Did you encounter any kind of technical difficulties that you'd like to discuss or share with us and/or provide feedback?

Interviewee: Yeah [name] did a really good job of it. The big issue was coordinating which fleets were going to participate and when they would participate, actually getting access to the vehicles to install the technology was a challenge. We sent field technicians at our expense to several different locations to get these installations done. Then getting data from the vehicles when they were in service also provide to be a little challenging. How were the systems doing since the actual wireless part hadn't gone fully live on a lot of the vehicles yet. So I guess to answer your question of how to make the testing go smoother, it's coordination of getting access to the vehicles so the technology can get installed. Then a better way of getting data off the vehicles once they were actually in use, those were the two challenges.

Other than that, technically, getting on the vehicles, putting the systems on, verifying they were working, all that was you know, pretty straight forward.

Interviewer: Have you had any interactions with the user interface?

Interviewee: Uh, which user interface are you referring to?

Interviewer: The WRI user interface.

Interviewee: No we have not. So, since we were I guess what you want to call one of the safety technology providers on the vehicle, the data goes from us over to for example, [company name] and they fix the data. I know there's communication with other back office systems.

Interviewer: Right.

Interviewee: We have seen none of that. I'm not sure whether that was intentional or not intentional or whether it was still under development. I did see on the presentation that the conference we had last week, some screen shots of I guess what would be typical or thought of as being an interface.

Interviewer: Right.

Interviewee: That [name] had shown. That was the first time I had seen any of that.

Interviewer: Did you have any problems connecting with [company name] either to get this thing set up or from a technical standpoint?

Interviewee: Well, all of our data... our product is actually a mature commercial product. We already transmitted all of our data to [can't understand - 10:27]. We have been doing it for years so we know how it works. The problem happens... where we ran into difficulty, [company name], again I'm not bad mouthing [company name] they...

Interviewer: We all realize this is a pilot test. This thing is not a final product. So we're all trying to get this thing going. So, certainly we're not trying to get anybody to badmouth anybody. We are trying to find out where the problems were, find suggestions in areas where they can be improved to move forward.

Interviewee: Right. Well, where we ran into problems were all of the data comes from the safety systems was coming out of 1939 and [company name] either didn't have the 1939 capability or they didn't want to expand their data library to handle all this new data. I guess it was a very difficult process for them and expensive to modify their data library. So we ended up with kind of a patchwork system where data was transmitted from one system to another system then finally [company name] over at [name]. It was just technically difficult. At the showcase event in October, our systems were all working. But [company name] was still wasn't pulling the data off the vehicles in real time. They were still trying to work through the last problems with that. I'm not sure if it's working at this point to be honest.

Interviewer: So you are thinking it could be more streamlined is what you are saying?

Interviewee: Yeah, yeah absolutely. I mean, again [company name] did what they had to do. They were trying to make it work. But yeah, it ended up being a little more difficult. I mean, I can tell you, I did a similar project like this a couple years ago, again I mentioned earlier with [name], [company name] and [company name] and we did the same thing. We were transmitting safety data off the vehicle and it worked great but it was [company name] had control of the vehicles, they had their own engineers grabbing the data, they set up the geo fence. They were working with standard cell technology and our systems were on the vehicle and it worked great. But it was, you had less people involved and less technology.

Interviewer: In general, what are your impressions of the WRI technologies?

Interviewee: I think, I mean I think it's a great thing that needs to be done. [Laughing] from a personal standpoint.

Interviewer: Yeah.

Interviewee: There are a lot of safety violations and problems out on the road and there is not enough enforcement. Me as a person driving down the road and my family in the car, I see a lot of unsafe vehicles out on the road. The more I've been involved in this, I've seen a need for it. I think the stuff they are trying to do is a very worthwhile and it's quite doable with the technology that's available.

Interviewer: Right.

Interviewee: I think the issue is their political will and their real desire for improving safety at the fleet level. You have some early adaptors who really jump on board with this kind of stuff but there's a lot of [can't understand - 14:14].

Interviewer: So you were saying earlier that y'all don't really get any kind of feedback from this system. If a truck is driving down the road and your components send information to [company name] and then it sort of... do you ever get anything back?

Interviewee: Currently no. I don't know if the whole interface is working. It wasn't working when we were at the showcase event.

Interviewer: Would you want to get some sort of information back?

Interviewee: Oh, absolutely. Absolutely.

Interviewer: And what kind of information would you like to receive?

Interviewee: Well, we'd like to receive if our system transmits any safety data messages, we'd like to see what they are. Our system has a warning light on the dash to warn the drivers of the problem but if you want to know what is going on, you got to look at the safety data message.

Interviewer: So would you want... is that information in an ideal world that you would want to collect long term or you want to collect just for the pilot tests or?

Interviewee: Well, we I guess... see deployed this technology now in transit applications. In transit busses there are AVM technologies in the marketplace now, automated vehicle maintenance.

Interviewer: Right.

Interviewee: But a transit bus goes home every day so that's a little bit different. But, our customer's now all have black box recorders, a lot of them, and our data is captured. We get emailed reports off our system every day automatically. This is the fleet, this is the number of events that occurred, this is when they occurred and what vehicle. We use those to help our customers actually manage the brake systems on their vehicle. I'd like to see the same thing out of this program. I'd like to say okay, we put our systems on 10 vehicles, 50 vehicles whatever they are, I'd like to get an email report every night that says, okay, well here's all the vehicles that have your system and here's where there were events. I don't Nd to see events from other technologies, I just want to see events from our technology.

Interviewer: Right.

Interviewee: Not to prove that it works, because we are well beyond that point. But to get some real world data off of an over the road fleet.

Interviewer: Right. Now do you have any questions for us?

Interviewee: Um, well, you know, my understanding is that we have been into this next phase. I guess my first question would be...

Interviewer: Keep in mind I am among the lowest people on the totem pole.

Interviewee: [Laughing]. That's fine. Well, you can pass it along. The question is are we going to finish making this interface work? I have a question, did it ever fully come up and is it running? Are we getting data off of these vehicles?

Interviewer: That is a question for [name].

Interviewee: Right. Then the second question I would have for you is, we were talking about a next phase with a larger sample size and going out the market with a larger set of... larger number of vehicles. Do you think that's going to happen and when is that going to happen? That's certainly a question you can't answer.

Interviewer: Yeah, I certainly have no... zero knowledge of that.

Interviewee: [Laughing]

I could tell you what you... something I guess but it probably ain't going to happen. Whatever I say has no probability of being correct.

Interviewer: [Name] do you have any questions?

Interviewer: No I do not.

Interviewer: Great. Well, [name] we sure do appreciate your time this morning.

Interviewee: Oh, no problem. No problems, just giving you honest feedback.

Interviewer: Alright, we really do appreciate it and have a good day.

Interviewee: Yeah, you too. Talk to you later.

Interviewer: Thank you. Bye.

Interviewee: Bye.

[End of interview].

Sensor Developer 3

Interview date: 2010-12-21
Interviewer: As I'm sure you are aware, well, you may not be aware. But, we are with the evaluation team. I've got [Interviewer] here with me, and we are doing these interviews as part of the evaluation process for the WRI project that's been going on for the pilot tests.

Interviewee: Okay.

Interviewer: We certainly appreciate you taking your time this morning to answer these questions. I'll let you know we're recording all these calls, but we are not quoting people in the evaluation. So, feel free to say what you wish. And of course if you wish to say anything off the record, just let us know beforehand and it will be duly noted.

Do you have any questions for us before we get started?

Interviewee: No, I don't think so. I've worked with [name] in part of the phase I, so I'm familiar with the overall program.

Interviewer: Right. Now can you briefly describe what y'all have been doing for the... and what [Company] does and how y'all have been involved with these pilot tests?

Interviewee: [Company] builds and sells and supports and engineers onboard electronic scales.

Interviewer: Okay.

Interviewee: An onboard electronic scale, when a driver picks up a load or he's loading at a dock, he can see what his actual and gross vehicle weight is without having to go to an in-ground scale.

Interviewer: Right.

Interviewee: So this is a scale that reads in the dash, provides a display in the dash for the driver to see both his actual weights and his gross vehicle weights. So when he leaves the dock, he's assured that he's within the guidelines for weight. Or, if he's not within them, at least he knows he's not within them, and so if he gets a ticket, that's his problem. Um, we don't, you know, a guy can still get a ticket if he's overweight. All we are doing is telling him he's overweight for example.

Interviewer: Right.

Interviewee: We sell internationally and in the U.S. In fact, a lot of our sales are internationally where they have a lot more restrictions with the vehicles being overweight on the highways than they do in the U.S. Overweight vehicles is a primary concern in this country. In the original 2010, CFA 2010 guidelines, weight was one of the more heavily penalized criteria used. But that's been relaxed [can't understand - 3:47]. So an overweight vehicle is a primary concern of many people.

Interviewer: Right.

Interviewee: Fleets want to maximize their weight. They want to, you know, if the limit is 80,000 pounds, they want to drive at 79,000 if they possibly can.

Interviewer: Right.

Interviewee: If that's what the load is. If the load's balloons with helium, then it doesn't matter.

Interviewer: Right.

Interviewee: So fleets hauling things like iron, coal or oil or anything with raw materials, refrigerated goods, flat beds that haul iron, you know, sheet metal and things like that are all concerned with their weight, building materials.

Interviewer: Now do your systems have any kind of way of determining if a truck sort of properly balanced?

Interviewee: We also measure actual weight too.

Interviewer: Right.

Interviewee: Not just gross vehicle weight. So, from ... see the requirements for a class A tractor trailer is 34,000 pounds on the trailer and 34,000 on the tractor drive and 12,000 on the tractor steer.

Interviewer: Right.

Interviewee: We have sensors to measure the weights on all the actuals.

Interviewer: Right.

Interviewee: So that helps from a balance standpoint. A left and right is pretty tough to do depending on the configuration of the vehicle.

Interviewer: Okay. Is there any difference between... we were talking with one of the fleets that carries primary liquid...

Interviewee: Yeah, [Company name].

Interviewer: Yeah. Is there any difference between your systems when dealing with liquids versus non-liquids?

Interviewee: Not really.

Interviewer: This is just kind of a question that I'm asking.

Interviewee: Yeah, not really. There's really no difference. The thing about a liquid though in a trailer is that it's always the same in its proportion or distribution. Because if you take liquids... well, it could be. Now in a case of a tank like [company name] there's several compartments. So if you take all the gas laid out in a compartment that could create an imbalance. But will you be able to tell it because we know what the actual weights are.

Interviewer: Right. Now in the course of the pilot tests, did y'all run into any problems or can you think of anything that could have been done differently to improve the test process?

Interviewee: Well, there's one thing that I would have done differently. That is, there's a lot of different systems that were tests, that were part of the tests.

Interviewer: Right.

Interviewee: Brakes and onboard weighing and onboard computers and things like that. And I'm a strong believer in a system test on the bench before it goes to the field.

Interviewer: Right.

Interviewee: And nobody ever really system tested anything.

Interviewer: Right.

Interviewee: As a bench system test of everything. Now maybe that's not possible to do, I don't know.

Interviewer: I don't know either.

Interviewee: When I do testing of our products, I try to system test with as many alternatives on the bench before I ever test it in the field.

Interviewer: Now, in the process of a wireless roadside inspection, would you want to receive some sort of feedback from the government system when you're... in relation to your sensors and the data that you are transmitting?

Interviewee: That's an interesting question. We don't want to be flooded with data.

Interviewer: Right.

Interviewee: Most people really want to see just exception data. I have been in this industry for over 20 years.

Interviewer: Right.

Interviewee: And looking at data, people want to see just... if he's underweight, nobody cares.

Interviewer: Right.

Interviewee: You only care if he's overweight. So you really only want to see exception data.

Interviewer: Okay.

Interviewee: So, from a data standpoint, I don't want to see data. However, if within the overall program, if it ever gets implemented nationwide, if fleets are historically [intercom interruption] then that would be good information to know.

Interviewer: Right.

Interviewee: For example, I believe that the enforcement agency could care less about the 30 trucks tooling down the highway that are underweight. He wants to know about the one that is overweight.

Interviewer: Right. Now have you... you did view the Webinar with us correct?

Interviewee: Yes I did.

Interviewer: I might have already asked you that. I don't know. I've been conducting a lot of interviews. So, did you have any experience with the [name] back office system?

Interviewee: No I did not.

Interviewer: Did you have any experiences with the user interface?

Interviewee: Well, as I said, I've been in the industry for a long time. And I'm familiar with most of the trucking companies back office systems that there are sold today.

Interviewer: Right.

Interviewee: For example, [company name] which is tech boarded and docked in [City]. These folks... if a program like this is ever going to get implemented, nationwide, all these back office systems that are commercially available have got to be tied into it all to make it of any value, not just the telematic provider. That's one piece that is missing in the overall scheme of things if this moves forward. At one time there were only like 3 or 4 of those companies, but there are 20 or 30 of them today.

Interviewer: Right.

Interviewee: And they have a lot of clout in the industry. They have user groups. They do a lot of things. That's one piece that needs to be tied into all of this.

Interviewer: In general, what are your impressions of the various WRI technologies?

Interviewee: Um, I think it addresses the main areas of concern. Um, I mean, the overall goal, in my opinion, is safety and compliance.

Interviewer: Right.

Interviewee: And probably the 3 or 4 areas of safety that I would be more concerned with is weight, brake status and tire pressure. Those are the 3 in my opinion that are the biggest areas of concern.

Interviewer: Right.

Interviewee: That's from a vehicle safety.

Interviewer: Right, exactly.

Interviewee: … the compliance with the driver logs and hours and is the driver a safe driver? Even if he's compliant with the logs, if he's got 30 speeding tickets you know,...

Interviewer: Right.

Interviewee: Then that's a problem. Of course, a driver that complies with the guidelines and is a safe driver from a driver history standpoint along with the safety factors, those in my opinion are the areas that need to be addressed.

Interviewer: Now, do you have any other questions or comments that you'd like to send our way?

Interviewee: I asked [name] this question. What's going to happen next?

Interviewer: Well, as I told the last caller, I think we are about the lowest of the low on the totem pole. So I don't have an informed answer to that question, and I would hate to be quoted as saying anything at all because we are part of the independent evaluations. I really don't know and can't answer that question for you. But I would suggest talking to [name].

Interviewee: And I have talked to [name], and he doesn't know either. What will be frustrating to me is if we do Phase I and Phase II and that's the end of it, and again in 5 years we start it all over again.

Interviewer: Right.

Interviewee: I'm thinking, well, why did we bother to do this? It either needs to be continued and pushed and enforced or just to say hey, this isn't going to go anywhere.

Interviewer: Right.

Interviewee: I also think it needs to be driven by the trucking companies. The interest that's there is more from suppliers, not employees. That's not even, some of the big name in suppliers haven't even been a part of it.

Interviewer: Right.

Interviewee: So, while I was glad to see the showcase that there were 3 compliance people from [company name] there and I was really glad to see that. And why they went, I'm not really sure I know. But they did go. And they're a huge fleet; they've got several thousand trucks.

Interviewer: Right.

Interviewee: But if you look at the industry, there's no [company name], there's no [company name] which is headquartered in [City]. You got to get those people involved in this to really make it worthwhile. That's my opinion.

Interviewer: Right. Well, and that's why we called. We appreciate your feedback. I'm going to ask the rest of the team members that have been listening [name], [name], and [name] if they had any questions for you.

Interviewer: I don't, thanks.

Interviewer: I don't either, thank you.

Interviewer: Nor I.

Interviewer: Well [name], we appreciate your time this morning.

Interviewee: Okay. I hope it was …

Interviewer: Really appreciate your feedback.

Interviewee: Okay.

Interviewer: Thank you so much.

Interviewee: Alright, thank you.

Interviewer: Bye

Interviewee: Good bye.

[End interview].

UNIVERSAL ID PLATFORM

The UT Evaluation team conducted interviews with stakeholder representatives from the participating Universal ID platform Phase II pilot tests including: fleets and enforcement personnel.

Universal ID Fleets

Representatives of the fleet partner companies from the Universal ID platform participated in the telephone interview sessions. Further specific details regarding the fleet partners can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

Universal ID Fleet 1

Interview date: 2010-12-14

Interviewer: We are going to be recording this conversation to be used in the evaluation that we are doing here at the [Interviewer's Company] for the WRI project. We know you have seen the Webinar, and I actually have your questions and answers here that you provided. We will be working off of them some. If you would like to say anything off the record, just let us know and it will be noted as such.

Do either one of y'all have any questions before we begin?

Interviewee: I just have one thing that I want to get. I'm involved in another meeting right now. I stepped out for a little bit. I had no clue this had time down for an hour. I am on a cell phone, and I don't have a whole lot of battery charge left right now. I'm not sure how you want me to present or what you want to discuss. But I am on limited.

Interviewer: I don't think it will take an hour. We had just scheduled that as a worst-case scenario. So I will just go ahead and get started on this. What I may do, since we have some of your questions that you already answered, I may skip down to some that I would like you to explain a little further if possible or that I will maybe explain a little bit more. Then we'll move from there. How does that sound?

Interviewee: Okay.

Interviewer: The first question, in the context of a nationally deployed system, how do you think WRI will affect your company?

Interviewee: I guess I don't know how it's going to affect us at all. I'm not really for certain what you are trying to get with it. From what I've seen on the WRI, I don't understand how it will benefit our company at all really. I don't know what we are trying to accomplish.

Interviewer: Okay.

Interviewee: I'm not seeing anything that says this is what the accomplishment is going to and where you are going to go for it. I can't see it pulling off the road and going through a scale house when I'm tracking my vehicles in the first place. I don't see how it's going to benefit me.

Interviewer: Okay. Did you see anything in the Webinar as the benefits of WRI project that you thought might be of use or of interest to you?

Interviewee: I don't know how you are going to do an actual roadside inspection. I know where my drivers are. We are going to electronic on-board recording devices. If I saw some way how they're going to try and do an inspection on the vehicle and how is that going to be entered in to the total system, I haven't seen how any of that's going to occur.

Interviewer: Okay. We are doing the evaluation here. A lot of the questions you have on the project are not things I have knowledge of. So, we are here to gather your thoughts on this.

Interviewee: Right now, and one of our other personnel and I don't know where he's at and why he didn't log in yet.

Interviewee: I'm here.

Interviewee: Oh, you’re there? Ok, I didn't know you were there. Oh, you’re the one that's logged in, had to log in. All you have told me about, basically is it is kind of time-consuming and when you go to log in, you can't log in.

Interviewee: We had some initial difficulties with the whole Web site system. I was not getting notification about our first three times our drivers had gone through in Kentucky. It basically got panned out. I was in touch with [Co-workers]. They got us hooked up there online. I would pretty much go online, check what the license plate was, look back through the [Telematics Provider] data and find out who was in that area at that time, who had that license plate number and identify the driver for the program. Whenever I would click on the inspections tab, it didn't have any more information for me on my end. That was just what I had to do as far as that goes.

What he was saying, that we feel our information has been somewhat limited. We are not seeing how this is going to help our company that much while we are kind of doing a pretty good job and ahead of the curve of keeping track of all our trucks and equipment.

Interviewer: You stated in your response that you are putting EOBR equipment on, but being done in baby steps. What exactly do you mean by "baby steps"?

Interviewee: That means we are just doing a few vehicles at a time. We did a one-year review and tried to get it set up to how that was going to be doing. Now we are just starting to enter one truck, two trucks, four trucks at a time. We are just kind of getting ramped up and going. It's just like last week, we started four more guys. We are probably going to start another seven in two weeks. We're going to start another couple, we just started yesterday. As we're ramping up to go to the EOBRs we are just doing a few here and a few there, so as we work with these people, we are not working with 150 drivers at a time and the problems that can be occurring.

Interviewer: Ok, I will skip to the third question of whether you think WRI will improve safety standards for your company vehicles.

Interviewee: Again, I go back to saying I don't see how it's inspecting our vehicles whatsoever. It's giving us a time and a place, where the driver was at that particular point in time. But as we do our [Telematics Provider] monitoring and we're looking at where it is and we have the electronic on-board, I've not seen anything that is going to say what our mechanic condition of our vehicles is.

Interviewer: The context of this program, of course, is that this is a pilot test trying to identify technologies that can help improve both the frequency of inspections and the amount of information that is in an inspection and to support traditional inspections. Clearly, with Kentucky we have not had a lot of experience so far or you could say successes or successful interactions with inspections. We understand, of course, there is not a lot of well-established successes here so far.

But in the context of improving frequency of inspections and so on, do you think it's worthwhile for your company to have more frequent rate of inspection?

Interviewee: I'm not following where you are going with that.

Interviewer: I guess what I'm saying, the WRI system is meant to not necessarily provide a lot of new information that can't be gathered from a traditional inspection, but it is meant to increase the frequency of inspection. Certainly there are some sensors that we can put on board that can improve the amount of information collected. But really what we'd like to do is make sure we are checking hours of service and driver credentials and so on more frequently than we do now. Then giving positive credit to and of course, this is the idea and this is what we are testing as a concept now, giving positive credit to drivers or carriers who are obeying the rules and giving them frequent positive credit. And then identifying the bad drivers, the bad carriers, the ones that are frequently breaking the rules and never getting caught and identifying them earlier. I think that's the overall context of the program. We are trying to test technologies that can make that possible in this pilot test. I want to make sure we understand the context of this pilot test and the context of this evaluation is to identify if there's essentially potential for these technologies to work or if we should scratch the whole system. So, I think that's ...

Interviewee: How are you basically checking the hours of service on a driver when he goes through it? Are you relying on just what the company says? Or what database are you using to actually physically check that driver's hours of service? What are you actually doing to check to see if that guy has a current medical card on file? How do you know what endorsements? If a guy is driving down the road with doubles, how do you know that's a doubles that went down and that guy would have to have doubles, triples endorsement on his CDL?

Interviewer: Yeah, so those are all things of course we are trying to disentangle. We had an interview with a counterpart of yours along the same lines where there are certain things we are not measuring that we certainly should.

Interviewer: And likely will be in the future.

Interviewer: Yes. And again the context here is testing whether we can do anything automatically and tie into federal databases, federal SID lists and other databases and check against those databases. Clearly we have to rely on carrier hours of service and EOBRs and other things for hours of service for instance. There's not a federal log in for that. But the idea is that we would tie into multiple databases that look at driver's credentials and carrier credentials and so on and then real-time automatically identify if there's any problems. That's the scope and context. Again, we're not trying to deploy a full fledge, fully operational system. The interface on the back office that you guys have seemed to have some trouble logging in and so on; that's not a finished product. It's a demonstration of relaying information from the federal system back to the drivers and carriers and enforcement for that matter. That's the context, I guess.

Interviewee: I think that any time you are able to increase the amount of inspections that you are having, especially on those carriers out there that are not playing by the rules and aren't up to standards, I think everyone in the trucking industry except for those small percentage of carriers, are for that. For companies like ourselves who take good care of our equipment, we have people following the rules. For us, I mean I guess we can't say that this would be, it's not great for our company in the sense that we would be inspected more because we try to do so many things right. But we are for trying to get those carriers off the road that aren't doing those things. If more frequent inspections are going to be able to do that, I definitely see that as a benefit.

Interviewer: You think it would be fair to say that this levels the playing field?

Interviewee: If it's going to be a federal requirement that every truck going up and down the road has to be equipped with this equipment, then you are going to level the playing field. But if you know, if it’s just as a voluntary thing saying you know, you've got to have it, you know the carriers that have the problems, they're not going to put that equipment in there. You know, I think one of the best things they did was put in those heat sensors up and down the road where you go past them and they check to see if you have hot spots on the tractor or the trailer so when you have brakes out of adjustment or you've got low tires. I think that does more for bringing an unsafe vehicle off the road than driving through there and just turning around and saying that you've got, what is relying on the motor carrier supplying you with data on a particular driver.

We have drivers down in [State] where we can have 4 different drivers driving the truck over a 12-hour time period. It just depends on how we do a shuttle operation.

Interviewer: Okay. Well, these are the things that are important to know for this project that we are looking for from you guys. We really appreciate your feedback on this.

I will go ahead and continue down on into this. One of the big things that separate this Kentucky platform from some of the pilot tests going on in Tennessee and in New York is that the carrier provides some of the information as part of the loop. One of the things that had come up is whether you as a fleet manager or a carrier, if you had a smart phone where you or your personnel would receive an alright in regards to a truck inspection on the smart phone, requesting to be supplied with the WRI system with the needed information. We are trying to get a feel for, of what your impressions are of this scenario.

Interviewee: I think that, you know, as the person that was going on and plugging in our driver in response to the alerts and things like that, that wasn't something that was a big deal to me. It didn't take very long, especially when the Web site was working and everything. Is that something I'm gonna want to do when I'm not in the office, and it's coming to my phone? I mean, I don't have any problem doing that because that's just how we operate. But are other people going to be doing that, especially people that you are probably looking to clean up the situation. I don't know. For me, I don't think it's a big deal. That's how I felt about it. I was the person who always put our drivers in on the after the alerts.

Interviewer: Okay.

Interviewee: My thought on it is how many people are you going to send that information to? What are you going to do when somebody is on vacation? What are you going to do when somebody is sick? What are you going to do when somebody is sleeping? How fast do they going to want that information to get back on the system? We tried in the beginning to get these active alerts going to two or three different email addresses or texting to different phones so that somebody who was on duty, they would take care of it. What if you are driving down the road and don't have computer access? Those are the questions I had in trying to respond back to that particular information request.

Interviewer: I think that's useful information. Obviously we are thinking about these things and this scenario, but the idea is that you don't necessarily have to have somebody hovering over a computer console waiting for these requests to come along. Maybe they can be pushed along to some cell phone or some other smart phone wherever the fleet manager is or whoever. The idea is of course, what happens when you don't get a response back. Was it because that person was unavailable still with the phone? So, just fleshing out ideas there.

Interviewee: Right. I think if it's a situation where like every fleet in America had to input this data you know, if they got this notification, then yeah, I think it would be best to be able to do it via smart phone or anything other than a laptop. If I'm a fleet manager, I don't want to have to drop everything and go somewhere and input this data into the Web site. So, if via smart phone if that's what everyone had to do, then yeah that would be a great improvement to have. Because, if everyone didn't have to do it, I don't think anybody would take it that seriously or respond that quickly or anything like that.

Interviewer: We have a question about, a little bit of a change of direction, about the interface. This is designed for the pilot test and certainly not a production model. We are wondering what your impressions of it are and what you would like to see in the user interface from your vantage point there at the carrier. If you have any suggestions for it as it is now.

Interviewee: As far as the Web site goes?

Interviewer: Yes.

Interviewee: I mean I thought the Website, I thought that once I started receiving the alerts, the email comes with a link in it. You just click on the link and it takes you straight to the log in page. Once we worked out the kinks with me getting the alerts, that was the bad thing, I would just have no idea. Then finally I started getting emails about it. But as far as getting on the Web site and entering the drivers in, it’s pretty basic and anyone could do it. I thought all of that was user friendly. As far as more information, I think that it would be helpful to have information about how the inspection went or things like that would be great information to have on there. As far as logging in, identifying the driver, submitting the driver, it was pretty easy, pretty simple and easy to navigate.

Interviewer: That leads me to question of how or when do you think the WRI results should be shared with the driver?

Interviewee: That's a good question for [Name].

Interviewee: Whenever we have a roadside inspection come up on it, one of the programs that our company has, if it's 100% clean inspection we give our drivers $100 bonus for doing things that are proper and right. Whenever there are mistakes on it, we call all the drivers up because we are trying to find out, has this been repaired, did this vehicle come in, was this light repaired, was this brake adjusted, etc., and stuff like that. Here again, I go in there to finding out what kind of sensors you have to put on the vehicles. What are you going to do on the trailers? How are you going to check these particular items out? And you know, everybody wants to have as many clean inspections as you possibly can.

You know, I'm concerned how these fit in and qualify towards things like the CSA 2010 or what is now being referred to as the CSA. How is that stuff going to be rolling in? If you have a truck, is this something that is going to be able to be done at road speeds or is this something that has to be done at something less than a 20 mph like we are doing at the scale house now as we go through the bypass at the scale house. What kind of speeds are they going to be able to access all this information?

Interviewer: Okay. I'm going to change gears a little bit because I know you are in a rush for time. I'm trying to come down here to some things I want to make sure we hit on. In general, what could have been done differently in the pilot test, you are just coming online, as my understanding, that could have made it better for you and your company?

Interviewee: From my side of this, I guess the thing I think would have been more beneficial for me to possibly speak to someone a little bit more about the goals or how this, obviously there was a Webinar which I didn't get to see until after the fact. The whole time I was talking with [Name] and trying to learn a little bit more, a little bit more. As far as my side of entering the data and things like that, once we got the kinks worked out of being alerted, it was fine, I thought.

Interviewer: Okay. Any other comments?

Interviewee: I wasn't involved really with any of the actual plugging in of the information. I am all for as much as can be automatically be done. I don't know how much time it actually took him to research that particular tracker. One thing I was concerned about was that we don't necessarily have the same driver driving the same truck all the time. What would have been if we would have had a driver come up, I don't know what would have been situated out, if we had a driver that was driving that truck like on a weekend when the other driver wouldn't have been driving the truck; then his information would not have been in the database? What would we have been doing there for as far as putting information into your system?

Interviewer: Have any of your drivers provided you with feedback on this? The ones that are participating?

Interviewee: I have spoken to one of the drivers that I believe have gone through there two or three times. His comments were just like it sucks that he has to pull off there every time. I was like yeah, they are just trying to test out new things and see how this works out for the future. That's about all he really said about it. I mean, I guess it's inconvenient as always just pulling off the side of the road. You just want to keep cruising along as best you can.

Interviewee: That's what I put down in my comments. What I had heard from a couple of them, it really sucks especially if you are in a high traffic flow pattern having to come off, slow down then go back up to get back up into merging into the traffic.

Interviewer: Let me ask you this, there in [State] ya'll are using DOT and license plate readers. If that was done at interstate speeds instead of having to slow down in the weigh station to do that, would that be something that you are more interested in or do you see similar problems with a situation like that? And at speed ...

Interviewee: I think it's more important that the driver can maintain their highway speed. But here again, as you are going through, I don't know the principles behind what all you are going to inspect on this. Are you going to actually going to be doing inspection of the actual equipment? Or is this going to be somehow be tied into every driver has an hours-of-service system set up in on there to, you know, this driver is meeting the DOT hours–of-service requirement, or does he have the proper endorsement on his CDL or does he have the medical qualifications? I don't know how this particular process is going to be done. Outside of just relying on the carrier saying yes, that driver had plenty of hours of service, I just don't see how that will follow up. I can see too many motor carriers they are just going to say yes, everything is fine with that driver, there is not problem. I just don't see how there's going to be a follow-up.

Interviewer: Okay. I am going to move on to some of the rest of the questions we have here. You provided your feedback in an email that we have here, and if you want to expand any more, that would be great too. I am going to move back up to the top. I apologize if any of this has been disjointed. But what are your opinions on WRI improving the efficiency of your company on a long-term basis?

Interviewee: I mean, I think that any time you are getting pulled off the road is not going to be a decision for you or for ourselves. From that standpoint, if we are more frequently being pulled off the road, it's not going to be as efficient for us to be doing this. You know like how, I'm sorry, I'm not sure who was speaking at the time, but the gentleman that said could we do this more at interstate speed. That's obviously we'd be much more interested in. Keeping our drivers at a constant pace, not having to exit and re-enter traffic and things like that would be really good. I think keeping the efficiency level high as far as that goes.

Interviewer: Okay. As you know, you will submit an SDM during the inspection process. What feedback from the government system would you like to receive after you have sent back the email? Would you want an email back? What kind of information would you like in return?

Interviewee: At that time would they be able to send us back information about the actual inspection?

Interviewer: That, I apologize, I don't know the answer to that question.

Interviewee: Okay.

Interviewer: At some point down the line, yes.

Interviewee: Ok, I guess when I got the email that alerted me, I got on and I researched to see who was driving that truck or which truck it was and I entered the driver. I personally don't need any information back. Now, would it be good to be getting maybe an email notification back about what went down at these inspections? I think something like that would be good. As far as what we were testing here today or this last month and things like that, I didn't need any more information back. The alert was fine. I sent my information in, and I think that was pretty simple and took care of everything that we were looking for as far as testing what was going on now.

Interviewer: One of the features of this, I'm not sure if y'all participated in this or not. Kentucky does a utility of a self-test feature. Is that something that you have any thoughts on?

Interviewee: I heard about that in the Webinar. I wasn't really sure what that was. I don't know if [Name] knows any more about that. But that was not something I was too familiar with.

Interviewee: I don't know exactly what you are looking for as a self-test. If you are looking at auditing where a driver is as opposed to where you think he should be, that is one of the processes we are going through with our electronic on-board recording devices and our [Telematics Provider] tracking of our vehicles.

Interviewer: Let me interject here. The idea of the self-test basically revolves around the capability of a carrier to send up information up to the WRI system. In your case, you would send up some identifier for the driver and the tractor [vehicle]. The federal back office would quarry all the databases it looks at and send back a result, essentially, which would be similar or exactly what the truck would have encountered if, at that moment, it had encountered an inspection point at a weigh station.

The idea is before you send out the driver, you can run a self-test and the federal back office would send one of these inspection reports through the system, and it would be self-test purposes only. It would not be penalized if there were a penalty for running that self test. Basically to give you an idea, so you don't get surprised at a weigh station. That's the idea.

Interviewee: If that were a possibly, I think that would be really beneficial. I think a lot of fleets would be pretty interested in that if the data were readily available and accurate.

Interviewer: I note here, to our question of whether there are concerns in regards to being required to having additional equipment and you commented "yes." Could you expand a little on what your concerns are in being required to have additional equip?

Interviewee: Well, what kind of equipment or what kind of sensors or equipment are we going to have? We just bought sixty 2011 tractors. They have sensors and stuff on them. We have had a lot of problems with those sensors giving us engine …and things of that nature. So if you're going to say … have to have heat sensors on all of our different wheels. We're going to have to have air … systems to check for an air line leak. What kinds of things like that are ... how are you going to have those hooked up and how are you going to have inner connectivity with the tractor and trailer? Then how are they going to be reading those? What happens if you have sensor failures? How are you going to know if those sensors are even working? Do they automatically say there is a fault if there is a sensor? Where is this kind of equipment going to be located in the cab? I would, how is that going to be a potential detractor for the driver if his primary goal of operating that equipment coming down the road in a safe manner? How much is all this particularly going to weigh? How is it going to be located? Those are just all questions.

Interviewer: Okay. I think they are excellent questions.

Interviewer: We don't have answers. The idea is that we are probing to find out what are some of the concerns here. As we think about deploying...

Interviewee: Who is going to pay for all that equipment?

Interviewer: I'm a graduate student, so I'm not! The idea here is we are trying to evaluate this system. The people who are deploying this system are trying to come up with a low-cost scenario where the benefits outweigh the costs.

Interviewee: Guys, my cell phone is just about to go dead.

Interviewer: Okay. We sure do appreciate your time sir. Thank you very much.

Interviewee: You can go ahead and finish out.

Interviewer: Thanks again, thanks a lot.

Interviewee: What I was thinking about with this extra equipment, I think a lot of my thoughts were the same as his just bringing up more and more of those things. We already have a lot of extra equipment on our tractors just because we want to operate as efficiently and safely as possible. I think, if a program like this required a lot more equipment or some more equipment, the benefits of it were going to need to be very, very strong. Because there are so many things that you see. People still don't have electronic communications in their tractors. That's nothing new to the trucking industry. People are not doing electronic logs and things like that until they are being forced to. I mean, to voluntarily jump into this inspection program that's possibly going to cost more money, require more equipment, require our drivers to learn more and more technology and doing things like that, on a voluntary basis it's going to have to have some major benefits. Obviously you guys know that.

Interviewer: Let me ask you this, why did ya'll volunteer to participate in this pilot test study?

Interviewee: I think that, I can't answer that. I think that the owner of our company got approached to participate in it. I think he's always interested in trying to find ways to be better and better as a trucking company. And I would say that's probably why he thought we would be more than happy to participate, which we are. I think staying ahead of the curve with people is something we are interested in doing. I'm just throwing out things to think about what good trucking companies would think about joining a program like this if it's going to cost them more money and things like that.

Interviewer: I think we got two more questions we'd like to go through. Based on the Webinar and what you have been shown the expected user benefits to be, do you think WRI should be implemented?

Interviewee: Implemented as like the law that everyone should have to participate in this?

Interviewer: Nationally deployed. The idea is that it's going to be a, well, there's a number of different scenarios that haven't all been played out. I don't want to lead the question too much. The idea is there's a number of scenarios, and I don't think a federally-mandated program is one of the foreseeable scenarios.

Interviewee: Ok, I understand. Let me tell you, I feel good about getting bad trucking companies off the road. I feel good about possibly being able to do the self-test and further find out if we're running as safely as possible and making even more sure that our drivers are legal. I think, can WRI do that? I'd like to think so. Um, from what we have seen at this point in this infantile stages of testing, I don't think that is the case at this point. So, I would have to say no, now. I think the goals they are moving toward are very good. I think those are goals of every good, legitimate trucking company out there.

Interviewer: In general, what are your impressions of the WRI technologies?

Interviewee: I guess, I mean I am seeing it as how I guess [Name] was seeing it. We don't completely agree with everything. I don't see how, I guess if it's increasing the inspections, that's good. But if these inspects aren't going to be any faster or it's going to be as much, if it's going to be the same old thing just more of them, I don't know if that's as great of a benefit as far as our company goes. Since we are not getting any more information about the inspections, I mean I get now, I wasn't under this impression but after hearing [Interviewer] talk, he was saying this is to improve the frequency of these inspections, I think that's a good thing. I don't know if it's going to help our company that much better.

Interviewer: Ok, that concludes the interview. Do you have any questions for us?

Interviewee: I mean no, not really. I guess it was just good to talk to you guys and gain some more information. Because this was kind of just thrown to me as we need you to whenever you get an email, go on and fill this information out and figure out who is driving and input the data. I was like okay. So, seeing the Webinar definitely helped. Unfortunately I didn't get to see it until after the fact of doing all this. Um, so I mean just being able to talk to you more. I was just feeling a little lost about what I was doing. I thought it was interesting that they drive through here and they can identify license plate number and things like that and the DOT number and get on and fill out that information. I think that's interesting. I mean, I guess I like where this thing is going I just don't know if it's going to get there any time soon with where we're at.

Interviewer: Alright. Great. We sure do appreciate your time.

Interviewer: Yeah, thanks a lot. It was really insightful and really helpful, thank you. .

Interviewee: Thank you guys and thanks for letting us participate. If there's anything more we can do, don't hesitate to let Paul or myself know and we definitely want to keep helping however we can.

Interviewer: Great. Thanks so much. Have a great day.

[End interview]

Universal ID Fleet 2

Interview date: 2010-12-14

Interviewer: We are going to be recording this phone call. Anything you want to say off the record, let us know. Here we have [Interviewers]. We are conducting the evaluation for the entire WRI project. That is the pilot test going on now. We are trying to get some feedback on your experiences with the project and with the Webinar and all as we move forward with this.

Let me go ahead and step into the questions. Do you have any questions before we get started?

Interviewee: No, no, let's go ahead and get started with this thing.

Interviewer: Ok. And we may have another, some other people may join us, but they may not. Some other people involved in the project up in Washington and so on.

In the context of a nationally deployed system, how do you think WRI will affect your company?

Interviewee: We like it. Ok? I have seen different parts of this in different places. And we are just totally for something like this. It is just we have to get it all dialed in and just have everybody on board with it. Right now the enforcement community, it's all over the universe right now. This would give it a lot more uniformities to some basic safety functions.

Interviewer: Do you think this WRI system will help improve the efficiency for your company on a long-term basis?

Interviewee: As far as the equipment, scanning it and looking at it and being able to look at so many vehicles, absolutely.

Interviewer: Do you think WRI will help improve company safety standards for your vehicles?

Interviewee: Yes. Yes. Like I just mentioned, there's a lot of non-uniformity even though it's supposed to be uniform. I think this would be a great equalizer. We have a lot of good inspections. We have no problem having our trucks go through this. I think we have more clean ones than we do now.

Interviewer: Do you think that this WRI program is a way to provide positive credit for clean inspections under the CSA measurement system?

Interviewee: Yes sir. The whole fallacy in the system now is that law enforcement pre-screens trucks. They don't look at good trucks. You don't get credit for good inspections, not nearly enough. That's the whole fallacy in the system. This would be a great equalizer to give people a fair look at motor carriers.

Interviewer: What kind of feedback would you like from the government system when you submit your portion of the required information there in the ... so when your carrier is prompted to send in information, once it is sent in, what would you like to receive back?

Interviewee: Oh, you know...

[Call interruption]

Interviewer: Hey! [Interviewee], we have [Interviewee] from [Carrier] on. Sorry to interrupt you sir. Welcome.

Interviewee: Really, the only information we need is what has been found wrong with the truck.

Interviewer: When and how do you think the WRI results should be shared with the driver?

Interviewee: If there's something wrong with the truck, we would share it immediately with the driver. If not, it can be shared monthly with the DOT on the run. Just the clean ones, as the runs pop up as they do every month. That's more than appropriate to share that. But if it's something we got to fix, course we need to know about it right then.

Interviewee: Are you familiar with the self-test feature?

Interviewee: I don't think we've done that.

Interviewer: This is [Interviewer] here. The idea with the self-test, it's a concept really, is that you can send a message or you can basically initiate an inspection yourself maybe at your domicile at your carrier before your trucks go out to identify what kind of report would be generated, for instance, if, at that moment, your truck crossed an inspection point. The idea here is that you can do this self-test, and there would be no surprises when you did get inspected. The self-test would not count against you or for you for that matter. It would be for your information only type of situation.

Interviewee: I've not done that.

Interviewer: I'm not sure it's been initiated in [State] yet. But the concept, the idea, is this something that would be useful to you do you think as I have described it?

Interviewee: You know, I don't know. I don't know how much time we would do pre-testing out trucks. Real time, things happen. It's a very large fleet, and a lot of things are going on. You know, I don't know if we'd be breaking the data in. Now I can tell you if we'd had problems with inspections, if we had a history of that, you would want to be doing that before you sent anybody out. But if your trucks are in good shape and your drivers are in good shape, that you're really going to need to do much of that.

Interviewer: What are your impressions of the bypass pull-in features?

Interviewee: Well, we don't have much impression of it because we are not getting much out of [State] at the scales.

Interviewer: That's what I've understood.

Interviewee: To be honest with you, we've been pretty disappointed in it. As far as their cooperation and how often they're open.

Interviewer: Whose cooperation?

Interviewee: Well the DOT and the scales. Now [Carrier] and them are doing a good job. But what's going on up there is that they're not ever open. We've had some confusion about our trucks to go through the bypass lane or just pass them. We finally got that straightened out. We are just not getting that many trucks up there right now. We are coming up on the holidays and things have slowed down.

Interviewee: In general, what could have been done differently, if anything, in these pilot tests to make them better for you and your company.

Interviewee: Two things, one is on my end. I committed 15 trucks to that. In retrospect, we should have probably committed maybe a hundred to it and gotten a better sample quicker. We didn't have people in place. It's going to my emails, and I have been traveling about every other week. Fortunately, I have not had to deal with it because the sample has been too small.

Interviewer: You have been getting emails?

Interviewee: No, I haven't been. I knew we had one truck that went through it, but we haven't had to respond anybody needing you know, having problems. We've been getting nothing.

Interviewer: Do you have any, so, let me ask you this. If you had a smart phone and you were personally required to receive an alert in regards to a truck inspection on that smart phone requesting them to supply the necessary information. Do you have a feel for that versus somebody sitting in front of a computer all day or. . . ?

Interviewee: We do and I have thought about that quite a bit. The way we are set up, I've got that and I can do that. It may be better operationally and in our safety department, we have people here 24/7. It may be better to have it on our either safety screen or our dispatch screen and have the people somebody here that's part of their job description to respond to that here. The reason for that is they have more access to getting in contact with that driver to finding out what needs to be done and where he can go to have it done.

Interviewer: How many trucks are in your fleet?

Interviewee: As of this morning I had 1,952.

Interviewer: Do you have any concerns to in regard to being required to having additional equipment? If so, what are they?

Interviewee: Um, it depends on the equipment. You know, most of our units are running pre-pass and or pass. All of our military teams are constant surveillance teams are running [Telematics Provider]. We are used to doing some of that. Our main fleet is not running any [Telematics Provider] or any electronic logs or anything like that. We would have to go through a lot of issues to establish if we wanted to do anything like that. Pre-pass or pass things like that are fine.

Interviewer: Now, based on the Webinar and what you have been shown in the past, the expected user benefits to be, do you think the WRI system should be implemented?

Interviewee: Um, I think you are going to have to implement something like that. There's too many trucks. The way this new system is set up, there's not going to be enough good inspections or accurate records without it.

Interviewer: In general, what are your impressions of the WRI technologies?

Interviewee: Oh, I'm impressed with it. I think there are so many things you can do with it as far as following, as far as speed, as far as brakes, you know, looking at your brakes. I think it has a potential to prevent the really bad accidents that are caused by things like that. Or at least make people aware of the problems.

Interviewer: In [State] y'all are using the DOT and license plate reader.

Interviewee: Right.

Interviewer: What would your feelings be if that was done, if those were done at speed on the interstate versus having to pull into there at the weigh station?

Interviewee: That's where it needs to be. It needs to be at speed on the interstate.

Interviewer: Ok.

Interviewee: That's where we want it to be.

Interviewer: Ok. With the understanding that the WRI user interface ... have you had any experience with the WRI user interface?

Interviewee: From what we have seen with the demos of it.

Interviewer: Ok. That has been designed specifically for the pilot test. Obviously not a production model. If you have any impressions of it, I'd love to hear about it. But also if you have any suggestions or just in general, what you would like to see on there.

Interviewee: As long as the carrier is giving you accurate information as far as the drivers, the VIN on the truck, the plate, I mean as long as the input is accurate, it's fine. It's all a case of being able to verify what you are getting.

Interviewer: We also have [Interviewer] and [Interviewer] on the line. Do y'all have any questions that you would like to ask?

Interviewer: No.

Interviewer: No we don't, thank you.

Interviewer: [Interviewer], do you have any questions?

Interviewer: Sure, something came up. The idea is that there are a couple of different outcomes that are envisioned for this WRI program in the long term. As we move forward with subsequent analysis, we will find out which one of these is worthwhile. It seems there is an impression maybe that this can be an industry-wide requirement and that some impressions that this can be an opt-in or a voluntary type of program. Then there are some that this can be a punitive type of program where bad carriers for instance are required to do this on probationary type of situations. Do you have any impressions on which one of those likely or unlikely scenarios, how do you foresee this working best in a scenario in a nationally deployed system looking at maybe an opt-in type of voluntary system or a mandatory system or some sort of combination of those?

Interviewee: I'd be for the opt-in system. The benefits would be obvious. I think if you have a punitive system it's too late at that point. If you opt-in to it, the benefits are, in my fleets, in our opinion, we will get more clean inspections. We keep our trucks mechanically sound, we try to stay at or below the speed limit, we are not doing things we shouldn't be doing, although we have some players doing that from time to time. But I think the benefits are that you get a more accurate inspection history. As carriers realize that, they will want to buy into that.

Interviewer: Okay. Alright.

Interviewee: Let me take this one step further. On a carrier side, you know, the first people we may put on it are the ones we think have problems. It may be a voluntary, the carrier opts in to you be to as far as me dealing with my drivers, it can very well be a punitive thing because I don't like what he's doing. They may be the first people that get involved in it.

Interviewer: Have you had any feedback from your drivers on this system?

Interviewee: No. Not one, not a bit.

Interviewer: Do you have anything you would like to add or any questions for us?

Interviewee: No, the only thing we didn't do really good with this thing is we delayed it too much. Then I didn't have a big enough sample. I like to put about a hundred trucks on it then have somebody dedicated to watching this thing. I think we can be more helpful. Fifteen trucks at one scale didn't give us probably what we needed to have.

Interviewer: Okay. We certainly appreciate your time.

Interviewee: We'll be happy to work with you if you have anything else. Just let me know. I've got trucks all over the United States, all over Canada, all over Alaska and every once in a while in Hawaii. So, we'll be glad to help you. That's what was not really good with this, was the sample size. I don't know if we gave you what you needed.

Interviewer: Well thanks again. We really appreciate your time. Have a good day.

Interviewee: Ok. Have a good Christmas.

Interviewer: Ok, bye.

Interviewee: Bye.

[End interview].

Enforcement Personnel (Universal ID)

Law enforcement and compliance personnel from the Kentucky State Patrol participated in the telephone interview sessions. Further specific details regarding the Kentucky State Patrol participants can be found in the Wireless Roadside Inspection Phase II Draft Evaluation Final Report.

Enforcement Personnel 1 (Universal ID)

Interview date: 2011-01-21

Interviewer: I'll go ahead and get started and let you know that we're conducting this for the evaluation purposes for the wireless roadside inspection that's going on in three states. The purpose of this evaluation is to get the firsthand feedback and opinions of officers, such as yourself, out in the field that are in the day-in and day-out grind of what's really happening out there. We currently appreciate it.

I will let you know this phone call is recorded. However, when we go through this, we will remove your name. You will never be quoted by anything you say. That being said, if you want to say anything off the record, just say so and we will be glad to take that. These will be published and as I tell every officer, I will make you Officer #1.

Have you had any experience with the pilot test?

Interviewee: I have briefly seen how it's been operated.

Interviewer: So you watched the Webinar. Have you spent any time on the interface at all?

Interviewee: No I haven't.

Interviewer: Did you see the questions we sent out?

Interviewee: Yes.

Interviewer: So some of these will not be applicable. What data are most critical to collect and assess in a WRI in your opinion?

Interviewee: I would say the DOT numbers. Right now this thing is reading the plate which is giving us some good information in that. I've already seen where we're getting some violations in that area. KYU numbers will be valuable. Mostly all the company information that we can get.

Interviewer: What is the KYU number? Is that like the DOT number but for Kentucky?

Interviewee: DOT number is a company identification that the companies use to specifically identify all their information. The KYU number is the road distance tax that Kentucky charges for vehicles that is running certain weights through this state.

Interviewer: When you said you had seen a couple of hits off of the license plate stuff, what did you mean by that?

Interviewee: A couple of them were expired. It showed us several expired plates. Some states have exemptions where they have so many months to get their plates and stuff renewed which has been the case here. But some of the plates that have pulled in, we went on and checked their credentials and found out that a couple of them didn't have those tolerances. So we cited in those areas.

Interviewer: Okay. How do you imagine you would use results? In the perfect flowing program, at the end of the day you have some sort of WRI report. How do you imagine you would use something like that?

Interviewee: I don't really know yet. I think it's going to take some more time before we determine that.

Interviewer: Okay. Based on the Webinar and any pilot tests experiences you have had so far, how do you think the WRI system will affect your role as an enforcement officer?

Interviewee: Like I say, it's going to help us get more violations that we would normally miss or not see. It's going to help us pull in these trucks where we can find these violations, especially with the paperwork and stuff.

Interviewer: Kentucky is a NORPASS state. Is that correct?

Interviewee: Correct.

Interviewer: What are your opinions on NORPASS?

Interviewee: So far NORPASS has been pretty good as far as I have seen.

Interviewer: If WRI were deployed, do you foresee any changes to your electronic screening program?

Interviewee: Um, not that I can tell.

Interviewer: Okay.

Interviewee: Don't really know yet.

Interviewer: Okay. That's a fair answer. I realize we are asking you questions on some things you that you all have limited knowledge on. We are certainly taking that into account with all of this.

How do you think, in your opinion, a nationwide deployment of WRI capabilities, how do you think that will affect out-of-service violations?

Interviewee: Oh, I think it would be good for out-of-service violations. Because already just this past week from when [Name] and the other gentleman was in here, it was kicking some of these trucks over for credentials and other violations. When we went out and did a walk-around inspection, we found several out-of-service violations on some of these trucks that normally we would not have caught.

Interviewer: Do you think there might be an initial spike in out-of-service violations and that people will catch on then people start following the law more closely? Do you think that's valid?

Interviewee: Yeah, I think so.

Interviewer: Okay. Again in your opinion, how do you think nationwide deployment of WRI capabilities might affect non-out-of-service violations?

Interviewee: I'm not really sure about non-out-of-service.

Interviewer: Okay. To what degree will traditional inspections themselves take more or less time to perform if a traditional inspection follows the WRI?

Interviewee: I would say it would take less time.

Interviewer: Right, because the other day ya'll already had a heads up on what to look for.

Interviewee: Yeah, it will speed things up in my opinion.

Interviewer: Okay. How do you think commercial motor vehicle safety will be affected?

Interviewee: Oh, I think it will be affected greatly because if we start getting more, especially out-of-service violations on these vehicles, companies will have to stand up and take notice if they are going to keep their business. I think it's going to greatly affect it.

Interviewer: How will your ability to perform your duties be affected?

Interviewee: I think it will help improve them because it will give us more data to go by. Before we used to have a clerk that would sit here and punch in all these numbers. Now this equip is going to do it for us. That's going to help us greatly.

Interviewer: Do you think fleets will be more likely to keep their vehicles up to standards?

Interviewee: I think so. You are always going to have those out there that tries to get around the system. We can only be in so many places at one time. But with this equipment, I think that's going to help us in that area. But I think they will have to step up and start making sure their equipment is better and their paperwork is the way it should be.

Interviewer: I realize you have had a limited exposure to the WRI, but are there any inadequacies that you are aware of at this early stage of the game?

Interviewee: The only thing I seen was the data feedback time frame there. But [Name] said they are trying to fine tune that so it will give us information back quicker. Having to go through so many processes to get us information at the start. Then of course, a lot of the plates that it was reading, they have been expired since last April I think he was saying. They are trying to get that updated so it will give us more current information.

Interviewer: In a perfect world, what kind of turnaround time would you need this info to be gotten to you?

Interviewee: As soon as it reads it down there when they cross those plates in front of the cameras, and of course it is running it in here right to the screen. So I would say in a matter of minutes.

Interviewer: Okay. Your suggestions for these problems...

Interviewee: I don't really have any at this time.

Interviewer: Based on a nationwide deployment of WRI, would you foresee reviewing multiple pass WRI's for a particular vehicle or driver?

Interviewee: Yeah, I could see that.

Interviewer: I know in Tennessee, these guys down here, forgive me because there are so many acronyms in this project and I cannot keep them straight. But the truck score, here in Tennessee and maybe in Kentucky, can go in and see carrier and carrier safety rating. Ya'll have some sort of similar, if not the same?

Interviewee: Yes we have that here. We can go in and see what the safety rating is.

Interviewer: Right. But then this would allow you, WRI could allow you to pinpoint that further to find a certain truck or certain driver within a certain carrier.

Interviewee: Yeah, so that would be a great addition.

Interviewer: Do you foresee being able to carry out interventions successfully should you need to do so?

Interviewee: Yeah. I think so.

Interviewer: What are ways you would use to ensure trucks are using the WRI system. That is not applicable to ya'll because you will be screening every truck that comes through there.

Interviewee: Yeah, I wouldn't know how to answer that.

Interviewer: Do you support the WRI system?

Interviewee: Yeah, I like it.

Interviewer: You did have... did you ever see the user interface for the WRI? Did you see the slides of it?

Interviewee: Yeah, he showed us the slides of it.

Interviewer: Did anything stick out in your mind as really good about that or maybe something you thought needed to be different? Again, this is a pilot test so this is the first version.

Interviewee: With the brief encounter I have had, I don't see any problems. Everything I saw on those slides looks like it will greatly help us. We can use it. I think it's all good.

Interviewer: What about, say theoretically if these could be put out on the Interstate at speed where the drivers didn't have to have this to pull in at all. Is that something you would be interested in or less interested in?

Interviewee: Oh yeah, that would be good. We work in the scale house, I'm in here 1 or 2 days a week and then I'm on the road too. We work both. It would be a great help out there too I think.

Interviewer: And there anything else that sticks out as this technology progresses, certainly people are trying to find any good suggestion particularly from ya'll out there on the front line. Do you think there is anything you think maybe could be added that we haven't covered?

Interviewee: Not that I can tell right off. Like I say, it's going to take more time and working with the system to see how well it's going to do in the long run.

Interviewer: Right.

Interviewee: Don't have any suggestions at this time. Everything so far that they've shown us and we've experienced on it, it looks like it's going to be really good.

Interviewer: Great.

Interviewee: And I'm really excited about it.

Interviewer: Great. I think we were also at some point going to talk to, up there at [Name] and [Name]. Are they there today?

Interviewee: No, they are out working the road today.

Interviewer: Okay. I didn’t necessarily want to speak with them now but I was going to try to see if we maybe could reschedule this. I really apologize for the mix-up.

Interviewee: That's okay, it happens. Do you need me to get in contact with them and have them call you or something?

Interviewer: Well, I'm going to be out of town for about a week. Do you know when, if I call back at this number say at the end of next week, do you think I might be able to get a hold of them or at least set up a time to talk to them again?

Interviewee: She's going to be going on vacation I think on the 31st. If you can hold on a minute, I can call her on my cell phone and find out what her schedule is.

Interviewer: Okay. We'll try that. Thanks.

Interviewee: Hold on just a second and let me call her. I'll let you know what she says.

Interviewer: Okay, great.

Interviewee: Okay, I didn't get an answer.

Interviewee: Okay, I'm not getting back in town until Thursday. If she's going on vacation on the 31st that only sort of leaves Friday. So I think we're just not going to worry about it.

Interviewee: Okay.

Interviewer: We'll try to talk to these other officers. Hope it don't hurt her feelings too bad.

Interviewee: Alright.

Interviewer: Thanks a lot [Name]. I really appreciate it.

Interviewee: I appreciate it too. It was good talking to you.

Interviewer: Have a good day. Bye.

[End interview]

Enforcement Personnel 2 (Universal ID)

Interview date: 2011-01-31

Interviewer: As you know we are conducting the evaluations for the wireless roadside inspection project. Part of this is to interview people that have had experience in the commercial motor vehicle enforcement field and also after having viewed the Webinar; we want to get your opinion on some things.

I should let you know we are recording this call, but nothing will ever be attributed to you because we will remove your name when we print out the transcript.

Could you speak up a little bit more somehow maybe?

Interviewee: Yeah I can try that. I'm only half way through my second cup of coffee but I can do that.

Interviewer: That's better because our recording device is a little less than the technology as WRI.

Interviewee: Okay. Alright.

Interviewer: In this interview, we should be able to wrap it up in 20 minutes or so depending on how much you would like to add. I'm assuming you saw the list of questions we sent out.

Interviewee: Yes I have.

Interviewer: Have you had any pilot test experiences?

Interviewee: All I have seen is the user interface that was set up at the [Law Enforcement Office] scale. This is where I do work at most often. I have been here and seen the license reader. I have gotten on line and played with a little bit of the back office system.

Interviewer: Great. I spoke with some of the Kentucky officers and they have done some of the vehicle pull-ins from this perhaps. Were you involved with any of those?

Interviewee: I was involved with some of the earlier ones when we were having issues or updates from the states.

Interviewer: But they were talking about something they had found, license plates that were out of date, then actually began pulling in some trucks based on that.

Interviewee: Yeah, that was way back in the early stages. It would tell us we had an expired tag, and we would pull it in and verify the tag. I doubt that either it was in a grace period or the data was old and they have since renewed.

Interviewer: Right. We can go ahead and jump into these questions. What data are most critical to assess and collect in a WRI in your opinion?

Interviewee: The accurate expiration date from the state. I know that's beyond the scope of the collector and anything that relates directly to out-of-service orders for either the company or if we have against the level of the driver of the company.

Interviewer: How do you imagine you would use WRI results?

Interviewee: Just like any other supplementary tool. You take what you see with your own eyes to what you pull from the database systems. It won't be the be-all, end-all, but it will be another valuable thing for knowing those things we can't see just by looking up the trucks like expired plates.

Interviewer: Based on the Webinar and any test pilot experiences you may have had, how do you think the WRI system will affect your role as an inspector?

Interviewee: I don't know right off hand that it's going to make that much change until we see some further development with it.

Interviewer: What would it need to do before you could give more of an opinion?

Interviewee: Each of us in the enforcement vehicle world, we use our own criteria that we have developed for knowing what vehicles we are going to inspect. From an auto selection to take priority over what we have learned on our own, some of us look at the vehicle, some the driver and some the company, We need to be accurate and almost certain that we are going to go out and look and find what it is telling us we are going to find.

Interviewer: Has is your role as an inspector... Tennessee doesn't have inspectors they just have law enforcement. How is your role different?

Interviewee: When I hit the end of the weigh station ramp I'm a civilian. I have citation authority and inspection authority at the scale house facilities.

Interviewer: But no law enforcement.

Interviewee: I can issue citations and be called to court for those but I have no arresting authorities.

Interviewer: You are looking more at the vehicle from the safety and not necessarily looking for criminal activity per say?

Interviewee: That's a secondary priority.

Interviewer: How will nationwide deployment of WRI capabilities affect out-of-service violations in your opinion?

Interviewee: Are we looking at current implementation or things that are coming down the road?

Interviewer: Things coming down the road from the Webinar. If the things from the Webinar were "perfected" per say, how do you think that would affect out-of-service violations?

Interviewee: It would probably go up in safety violations. I'm particularly excited about the brake stroke, if you can get that data, the tire data.

Interviewer: Can you expand on that a little bit?

Interviewee: The brake stroke, the brakes that are out of adjustment on the push [can't understand - 6:49] measurements and the tires that you can have some sort of tire over-heating sensor that would apply both the tires and the brakes [can't understand - 7:06]. That is stuff that is difficult to judge when they are driving by at 20 miles per hour.

If that data can be collected through some measurement system, through the WRI, that will up the chance of catching those vehicles.

Interviewer: How will nationwide deployment of WRI again in your opinion, affect non-out-of-service violations?

Interviewee: You only find what you look for. I'm not what non-out-of-service violations you can find.

Interviewer: Based on a nationwide deployment of WRI, to what degree will traditional inspections themselves take less or more time to perform if traditional inspections follow the WRI?

Interviewee: It will depend on well the WRI interfaces with our current inspection system. If the WRI can pre-fill those things that are more or less paperwork like company name and DOT, that can increase the speed. If there are accuracy problems with the WRI, then it's actually increasing the time for inspections. Now, not only do we have to look for the things it's telling us to look for but we also have to verify everything the computer is telling us is wrong.

Interviewer: Do you foresee there being any changes to your electronic screening program that is presently in use? I guess NORPASS in Kentucky as a result of WRI deployment?

Interviewee: Don't know. [Name] handles all of that.

Interviewer: Do you have any dealings with NORPASS?

Interviewee: No, occasionally it will send a NORPASS vehicle to the scales but it is not clearly communicated which vehicle is the NORPASS vehicle. So at that point they are just another truck. We don't know if they have a NORPASS vehicle or not.

Interviewer: Okay. Based on a nationwide deployment of WRI, how would commercial motor vehicle safety be affected?

Interviewee: Hopefully it would be safer but it all comes down to compliance.

Interviewer: How would you ensure that people were complaint?

Interviewee: I don't know that there's much that we can do here other than what we are already doing: issue the safety, issue the violations, issue citations where appropriate. If you want a buy-in with the companies, the company is going to have to have some incentive such as discounted insurance rate or something. I don't know. You got to hit them in the money in order for them to buy in to it.

Interviewer: Or if they are running or getting hammered by out-of-service violations, that could... one of the thoughts is that violations would initially peak and then yeah, fall off after people realize that they are going to have to comply. Do you think that is a valid thought process perhaps?

Interviewee: Possibly. I also see an increase in driving around the scales, bypasses.

Interviewer: One of the Tennessee systems is deploying these geo-points where that would basically become impossible.

Interviewee: I like that idea.

Interviewer: Everybody seems to like that idea except the driving companies perhaps.

Based on the nationwide deployment of WRI, do you think fleets will be more likely to keep vehicles up to required standards?

Interviewee: Again, it comes back to how hard they get hit with it.

Interviewer: Right. In the context of the pilot tests, are there any potential inadequacies with the WRI system of which you are aware?

Interviewee: The ones that I'm aware of are already in the process of being remedied. For instance not taking in to account the company's grace period for these states that have expired registrations.

Interviewer: Okay. We are looking for feedback to make this system better, not to get you to... that's the goal of this question in particular.

Interviewee: When a violation is discovered, it has to be clearly and obviously communicated to your enforcement office.

Interviewer: Do you find that, with the government backed office to be the case now?

Interviewee: The government back office system, as far as the website goes, right now is something that we get on when we have time and we don't have anything else going on. It doesn't fit easily into the work day.

Interviewer: What is your opinion of the user interface? Keep in mind it is a preliminary design. It's not the final model. Do you have any suggestions for the improvement of it?

Interviewee: Does that mean the back office system website interface or the system that is up on the display computer here?

Interviewer: The system that's up on the... where you go in and see the WRI trucks and all.

Interviewee: We have a screen up that shows us the photograph of the plate, gives us some information about the company and lists the violations that were discovered if there were any. The only thing on that is it would be nice to hit a space bar and pause the scroll on the screen.

Interviewer: Because?

Interviewee: We stay fairly busy all day long. When a WRI violation is discovered, odds are pretty good that we are already in another interaction with the driver. We hear the sound go off. Then 5 or 10 minutes later, the driver comes in, possibly 2 sometimes and at that point we are looking over at the screen and its 20 or 30 trucks down. We are already in the middle of this inspection with this other driver. That is when the officer tells the other driver that just came in to wait while we finish our other inspection. At this point we don't even know if it's an actual violation because we have not been able to verify it yet. Where we interrupt an inspection in progress to go and discover what might be wrong with this other guy.

Interviewer: Do you have any suggestions for solutions to these issues?

Interviewee: The first thing would be that when we hear that sound for it to automatically select that truck on the display screen or to give us the option of hitting a button to pause on that violator. Then we can turn around immediately and look.

Interviewer: Based on a nationwide deployment of WRI, do you foresee reviewing multiple pass WRI's for a particular vehicle and/or driver?

Interviewee: Explain what you mean by that.

Interviewer: This is lacking some terminology but in Tennessee and I'm pretty sure Kentucky has this system to where there's this ongoing database of trucking companies that have scores from 1-100. This would be something similar to that except I think that system, which has a name or some acronym as well, only breaks it down as far as a carrier. The WRI would have the capability to break it down steps further so you could look at specific drivers or trucks and have an ongoing history of them. Is that something you would see using in your day-to-day routine?

Interviewee: That is something we would probably initially attempt. Depending on the results we have found with from those investigations would determine if we could continue to use it or not. The present system that we have now, it will kick out 3 different types of vehicles depending on the severity of the violation. It basically tells us that this company has a higher percentage of violations. After you do a dozen of those and you don't discover the violations that you are expecting, you start ignoring that system and go back to what your own eyes tell you.

Interviewer: Hopefully this would move past, because you have good gravures and bad drivers, they have 99 good drivers and 1 bad driver that's bringing everybody else down. This would allow you to focus in on one driver or one specific truck.

Interviewee: Again, as long as it can pick them out and we can expect to find something when we look at them. After 2 or 3 inspections of nothing found, we are going to fall back on what our own selection criteria are.

Interviewer: I certainly understand that. The years of experience of the officers I have spoken with, I have had more interactions with the THP and their experiences, you just can't move past that on some level. The sixth sense of knowing what's going on. We are certainly mindful of that.

What are ways you would use to ensure that trucks are using the WRI system?

Interviewee: All we have available to us is spot checks.

Interviewer: Do you support the implementation of the WRI system?

Interviewee: Yes but I'd like to see some guarantee that we will get to these equipment related issue we saw in the Webinar.

Interviewer: Are there other equipment issues that you think are crucial to our program?

Interviewee: Some sort of tire infrared brake and brake stroke detectors. That is going to require a huge company buy in. Nobody wants to put a tabulator on the truck that tells us when something is wrong. Those are the most critical safety issues we see here.

Interviewer: Do you see a significant number of those?

Interviewee: No. Not many at all actually.

Interviewer: With the understanding, what are your impressions of the WRI technologies?

Interviewee: I think the technology is fairly impressive. It doesn't do so well through snow, ice, and salt. We have already encountered that here. But during the warmer weather it's pretty accurate.

Interviewer: That's good to know.

Well, I sure do appreciate your time this morning. Do you have anything else you would like to add?

Interviewee: Not off the top of my head. I do know there was something about getting drivers identified on this WRI system? Is that talking about pulling data directly from automatic logs? Is that what we are looking at eventually?

Interviewer: I don't know exactly how it will be done. But basically you would be able to, hopefully be able to, a truck would pull through there and you would know who is driving the truck.

Interviewee: Now that would go over easier with some of these companies. When you start getting the hours of service, even with the automatic logs now, which make it more difficult for a driver to be in violation, they are increasingly more protective of that data.

Interviewer: Because?

Interviewee: I have no idea. I think it's about as much big-brother as they can stand for me to come out here and look at their automatic log. I think once, if that is implemented, that will really spike your number of scale bypasses. A driver can come by here and not know their brakes are out of adjustment. With an automatic log, he'll know before he gets to the scale whether or not he needs to shoot this scale and take that risk of getting caught. Which as that approaches a certainty, he's more likely to take the chance of getting caught bypassing.

Interviewer: So you are saying if a driver knows that he has an error or something is wrong whether with his truck or hours of service, and if he knows that he's going to be looking at having to stop the truck at your weigh station, if this WRI system is implemented, you think it's likely he will then bypass the scale entirely and risk not getting...?

Interviewee: Yes. It's a basic risk calculation that everybody does automatically. What are my odds of getting caught versus what's the severity of getting caught? Drivers know if they come across the scale with that logbook that they only have maybe a 12 or 15 out of 2,000 chance of getting caught. Now, once you put the system in place that guarantees they will get caught. Even though there's a higher severity for bypassing, there's a lower probability to getting caught. They do it all the time now when they know they are overweight.

Interviewer: It's good to have some feedback from you. We really appreciate your time this morning. Thank you very much. Have a good day.

[End interview].

Enforcement Personnel 3 (Universal ID)

Interview date: 2011-02-02

Interviewer: I appreciate you taking the time today. I think you are the last officer we are going to speak with in the Kentucky state patrol. I appreciate ya'lls help with this. Did you get the list of questions?

Interviewee: Yes. [Name] sent me an email, and I printed them out.

Interviewer: I will go through them for the most part, but I will skip around a bit. We are using this for the evaluation of the WRI project. Input from you guys on the ground is one of the most critical points, as far as I'm concerned, for determining if this thing goes forward and what things need to be addressed as it moves forward or before it moves forward. You guys are the hands-on for this whole ultimately project. We appreciate this.

I should let you know we are recording this phone conversation. These phone calls are being transcribed, but you will never be identified with any of this.

Interviewee: I'm aware of this.

Interviewer: I'm teasing everyone we will call you Officer #1.

Interviewee: I'm a big Tennessee fan, I'm good with that.

Interviewer: Good. You should have seen our presentation, you saw the Webinar with the UT truck roll through there. I was proud of the UT truck; that was my doing.

Have you had any pilot test experiences? Have you been on the Web site or interacted with the Web site at all in its working format?

Interviewee: Not much. The only thing I got to interact with was a couple weeks ago when I was up north at the [Law Enforcement Location] scales and went over it and explained a little bit about how it worked and how the system was operated. Other than that I haven't had any experience with it.

Interviewer: You did see the Webinar, correct?

Interviewee: Yes, yes I did.

Interviewer: In your opinion, what are the most critical data to collect and assess in a WRI?

Interviewee: Well, from what I take of it, obviously you are going to be able to get the expired tags. I may be wrong, but in the future if it can implement when it gets a tag number, be able to show if the DOT number is active, is the KYU number active, I think that's probably going to be the most important for us right now. We have a lot of trucks that come through that KYU, that have not paid their taxes. When it sees a tag and runs the tag, if it can show the information with that too.

Interviewer: What about hours of service or mechanical issues?

Interviewee: I don't foresee. Right now it's hard to tell for mechanical issues. It's hard to see. In the future, if you can get something to look at the brake strokes or hours of service. We talked about up there about how if there could ever be a way, because a lot of these trucks are going to electronic logs now days. A big thing is if all companies get on board with this and do it, when they come through, if we could read what was on their electronic logs, that would be a huge advantage.

Interviewer: You mentioned the brake stroke and another one of your officers mentioned the brake stroke. That's really the first time that this has come across my radar. But again, I'm the low man on the totem pole, and I'm certainly not a commercial motor vehicle expert. But what is it that you find so crucial? The Tennessee system for example, and there's the system in New York, where they are looking at some things such as tire pressures, hours of service, weight with sensors on the thing. I'm sure somebody has talked about brakes, but I'm curious that two of you guys in Kentucky have mentioned brakes.

Interviewee: If you can see certain ways when you look at a brake stroke, you can automatically tell it's an out of service issue on the truck. I think that's what I'm referring to when I say brake strokes. With the naked eye you can see it, and it's obvious it's an out of service issue.

Interviewer: Okay. I participated in a Level 1 inspection up there at the [Law Enforcement Location]. station with the THP, and they wanted to put the guy out of service for a brake stroke issue. That's what we are looking for in these interviews is finding what you guys think is important.

How do you imagine you would use WRI results?

Interviewee: I'm not exactly sure. Other than if it gives you an expired tag, you always want to make the job easier and quicker. It will kick the trucks off. Every truck that comes through the scales, we don't have time to see them or run all the tags or DOT numbers. If I'm involved with an inspection or in the middle of an inspection with one truck, the system is automatically going to kick a guy off and pull them over for me as opposed, I'm not going to be able to do that.

Interviewer: Would you want some kind of audio or visual alert to that?

Interviewee: Yeah, definitely. If my back is turned to the system, I need something keying it off saying it's this truck and this is what is going on with it. The way it is up here, we are so outnumbered, we are out-manned. We have 1 or 2 people at the scales at the most. For most part of the day when officers are there, we are tied up throughout the day. It would be a huge advantage if the system does say here's the truck and what's wrong with it and parks it.

Interviewer: I'm no expert, but I have spent some time up there at the [Law Enforcement Location]. station and realized it is non-stop and that you guys have... and everybody is moving 60 miles per hour; it's a quick thing for sure.

How do you think, based on the Webinar and any pilot test experiences you have had, how do you think the WRI system will affect your role as an enforcement officer?

Interviewee: It will definitely make it a lot quicker as far as the safety inspections. For example, a Level 1, the average time it takes us is 50 minutes to an hour, Level 2 is 30 to 40 minutes, Level 3 paperwork inspection is 20 to 25. When this thing, when it gets in full effect and if it starts doing what I was mentioning earlier, if we can get it to read electronic logs and get all the driver information, that's going to take at least 10 minutes off an inspection. A big advantage right now is that it’s going to be a lot quicker inspections and allow us to do a lot more inspections.

Interviewer: How do you think a nationwide deployment of WRI capabilities would affect out-of-service violations?

Interviewee: I think, the biggest thing for one, the companies are going to have to get on board. That's the biggest thing. If most of your companies get on board, I think it will affect it pretty good. But to me that's the biggest thing, getting everybody on board and making sure companies do this.

Interviewer: I think what we're, this question is more aimed at if there was required participation, if it was the law. One of the thoughts was that it might be an initial spike in out-of-service violations, and then it might taper off. Do you see that being a possibility?

Interviewee: Yeah, I could see it tapering off more than a spike. At the [Law Enforcement Location scales, I worked up there yesterday, ever since we have had that system in up there, we have had drivers come through and actually stopped and come in and ask. They see all these cameras and system when they are rolling in. It kind of scares them. It's gotten their attention. They know there's not much they can hide on their trucks.

Personally I think it's going to help it in the long run. People have the idea they can't hide from the violations, so when they go through the scales they need to be squared away.

Interviewer: How long after that equipment do you think you started having these types of questions where truckers were coming in and trying to figure out what you were doing?

Interviewee: It was immediately. Some of the other officers up there, it was the week after that these questions were coming in. They are still coming in. I was up there yesterday, and I had 2 different trucks stopped and asked.

Interviewer: Can you tell me specifically what they were asking?

Interviewee: Just what the system was, what it did, and why we had it. We told them it reads license. We explained it to our ability what it was capable of doing.

Interviewer: Did they give any feedback as to what their thoughts were on that?

Interviewee: No. They didn't give any feedback. I think it was more or less they were just curious about what it would do. But you could tell, the visualization and looking at them in the eye and their body chemistry, they were concerned. It's more they will have to do to their trucks to make sure they are up to date.

Interviewer: So, how would a nationwide deployment of WRI capabilities affect non-out-of-service violations, in your opinion, obviously?

Interviewee: I don't know if it would affect it much at all. I can't see it affecting it too much on the non-out of service except on the tags. You will get those. But the biggest thing we had talked about, I know this ain't part of the question, but if the WRI in the future could ever be able to read the trailer tags, it would be a huge advantage. That is the biggest thing we have here in Kentucky. I know that Tennessee and other states probably have it too. But 9 out of 10 times if you have a stolen vehicle, it's going to be on the trailer rather than the tractor. That's a big thing. We touched on that with [Name] up there a lot. That's just something for you guys to be aware of for the future if it could happen. That's huge. We have so many stolen trailers that we put out of service. When they are going through the scales, we can't see their tags until they are bypassing and leaving the scales.

Interviewer: What if this kind of system were on the Interstate at speed where nobody had to drive in or slow down?

Interviewee: It would be amazing. It would be excellent. Trust me. It would make the job a whole lot easier. When these trucks are going through and we can see the trailer tag and we run that tag, by the time we get information back they are already exiting the scales. We have to get in our cars and chase them down if something is wrong. It would be definitely huge.

Interviewer: Do you foresee any changes to your current electronic screening program? I'm talking about the NORPASS, as a result of WRI deployment?

Interviewee: I don't see any changes.

Interviewer: What are your opinions of NORPASS?

Interviewee: I think it's good in some ways. It's obviously good for the company. It rewards them for keeping their safety up. But a lot of times, we don't know what's in that truck when they bypass the scales. That truck is a part of the company, so they may be on a NORPASS system so they can pass but who’s to say that driver out there in that truck is not behind on their log book. Or they could be a dirt bag benefiting from the goods of other drivers. That's the only thing I have against NORPASS.

Interviewer: Based on a nationwide deployment of WRI, how do you think commercial motor vehicle safety will be affected?

Interviewee: I think it will affect it in a positive way. Like we mentioned earlier, the word is going to get out there, and drivers are going to be more apt to make sure that their log books are up, make sure they are doing their pre-trips, and make sure they are trying to stay down on violations and out-of-service violations. I think it will affect it in an extreme positive way. I do.

Interviewer: Okay. Do you think fleets will be more likely to keep vehicles up to required standards if there were full scale deployment of the WRI system?

Interviewee: Yeah I do. Mainly because of the CSA2010 being hit so hard. You are still going to have your companies that doesn't want to comply with it and chooses to bypass the scales and take non-routes. We have that a lot up here in Kentucky. For every scale facility we have, there's a back road. It's a non-designated road close to the scale that a lot of companies take to bypass the scales.

Interviewer: One of the systems being tested in Tennessee has movable geo points where that would become impossible. You couldn't really bypass these things. That would be something I'm hearing you say would be positive.

Interviewee: Yes it would. We have so much up here, people bypassing the scales. They are bypassing for one reason, they have mechanical issue or log books or something.

Interviewer: In the context of the pilot tests, are there any potential inadequacies of the WRI system in which you are aware?

Interviewee: Not that I'm aware of. The only issue I had with it, I was telling [Name], if this thing could get to where it read trailer plates and get it connected to where we can see electronic logs and we could have the information when it got it, to me it's 100%, and I think it's going to be excellent. Anything to take down the time on my inspections I think is outstanding.

Interviewer: Do you foresee reviewing multiple past WRI's for a particular vehicle or driver?

Interviewee: Yeah I could. But I think that's just part of it.

Interviewer: Do you foresee being able to carry out interventions successfully should you need to do so?

Interviewee: Yeah, identification.

Interviewer: What are ways to ensure that trucks are using the WRI system?

Interviewee: That's a good question. I don't know. That's one of the things, I think it should be mandatory. Companies should have to do it. The federals should make it mandatory for them to do it. Otherwise they should face penalties.

Interviewer: The guys in Tennessee, they said even though everyone is super busy, a lot of the same trucks are coming through there day to day. They seem to think they could visually keep up with things.

Interviewee: Right. When you are at the scales, 90% of the trucks are what you see every day. You will get the 1 or 2 every now and then that's different. But that's right; you know the trucks that come through there, the biggest part of them.

Interviewer: The user interface for this was designed for the pilot test. I don't know if you saw it more than in the Webinar, but if you did, do you have any suggestions or improvements and what your opinions are for the interface?

Interviewee: What I seen was just on the Webinar. I don't have any suggestions. I think it was good for what I seen. I had limited time.

Interviewer: Right. We understand that. We are certainly weighing in that factor.

Interviewee: From what I seen I don't have any suggestions for improvement. I thought it was a pretty squared away system.

Interviewer: In general, what are your impressions for the WRI technologies?

Interviewee: I'm pretty impressed with it. Like I said, anything that can make our job easier and cut down on the paperwork for us, it has the potential to be a huge impact as far as information as a whole.

Interviewer: Well, I sure do appreciate your time this morning. A lot of good insight. Really, it's always great to hear... you have touched on a few things that others didn't. That's always a big help because we want to make sure all the bases are covered. Again, I appreciate your time.

Interviewee: Ya'll have a good day.

Interviewer: Alright, thank you sir.

[End interview]

Enforcement Personnel 4 (Universal ID)

Interview date: 2011-01-21

Interviewer: One of the things we're doing is going out and talking to the guys like yourself that are on the front lines of this thing and see what is going on. And try to get ya'lls opinions of the way things are and get your opinions of how this system could operate and pick up any kind of thoughts or ways to maybe improve it.

Also let you know we are recording this call. It will put into the evaluation but you are not going to be quoted. Everybody will be, I keep telling officers I will call you Officer #1.

Interviewee: That's fine.

Interviewer: Okay. Anything you wish to say off the record, you are certainly welcome to do so.

Interviewee: Okay.

Interviewer: This gets transcribed then immediately erased. It doesn't go to anyone but us.

Have you had any experience with the WRI systems during this pilot test?

Interviewee: Well, very minimal. I was at the [Law Enforcement Office] scales a couple of weeks ago. They were installing a license plate reader when I was up there. If that's going to be part of it, which was kicking some trucks over off the scales and at least letting us... I was there with [Name] and we were looking at it and stopping trucks that were kicked over once that system was up and running. Just at a glance.

Interviewer: We take that in to account. We realize you'll have a limited exposure with this. I talked to [Name] this morning and he said, and I don't know if he was there when you were there but, that they had been pulling over some trucks based on the preliminary screening.

Interviewee: Right. Just taking a closer look, comparing what I get with the paperwork to my computer to what the system is doing. But yeah, just a very minimal exposure. I don't have a...

Interviewer: You have viewed the Webinar?

Interviewee: Yes.

Interviewer: Ok I thought you had done that. And did you get this list of questions?

Interviewee: I don't have them in front of me but I read over them when I received them.

Interviewer: They are pretty cut and dry. I will skip around them a little bit.

Interviewee: However you want to do it.

Interviewer: In your opinion, what data are the most [important] to collect and assess in a WRI?

Interviewee: I can't say for certain. What is set up and what I have used in the Webinar seems to be on track for accomplishing the goal that it's going to be set up for. It seems like it would be a good idea. There's just so many things to take in to account. I think it would be great for getting things like registrations on the vehicles and taxation issues and stuff like that. Our mileage and hours is what they touched base on when I was up there. Exploring what it can do in the future with the transponders maybe.

Interviewer: Here in Tennessee they are exploring some options with weight and mechanical issues as well with sensors on the truck. Whereas in Kentucky with the license plate reader, there's not going to be any sensors on the vehicle.

Interviewee: I can't remember word-for-word what he was saying about the volunteer companies that are up here that are getting readings from where their drivers are, at what times of day is what they were looking at up north. A couple of companies up there were helping them test it out.

I don't have anything to add to that aspect of it. I don't know too much about it. I'm not educated about the entire system to know what can be added.

Interviewer: How do you imagine you would use WRI results? If you got back a WRI inspection report, how might you use that?

Interviewee: Right now I would assume it would be the same way I did when I was up there with [Name]. We took it as a base jumping off point to maybe as you're wondering through or reading through the paperwork. It's a ton of paperwork they have to hand you to do an inspection. You might use it to guide your attention along with what the system is giving you and look more in the aspect of that. It was giving us expired plates when I was in KY northern region. If they were expired plates, there's so many things you have to look at when going through the paperwork that you could miss something like an expiration date on a registration sheet they bring you.

Interviewer: When you use the license plate results that were expired, y'all wound up violating, giving him some kind of ticket. Is that correct?

Interviewee: Not in my situation. There may have been officers that did that. The first one I stopped was from Iowa. That was the first one that [Name] had seen also. We have to manually, the way it is set up in [Law Enforcement Office] the bypass lane is for trucks that are not overweight; and they go on one side of the scales. The static scale lane where they come up and get their static weight is for trucks that are off balance or over weight.

For trucks with expired tags that are not overweight, they will continue through the bypass lane, and I would manually have to stop that truck with the installation of the red light at the scale. I did stop them manually, and they came in and we looked over paperwork. It was expired, but if you are looking at a different state's registration system, you have to play it by ear.

On their registration from Iowa, it has the expiration date for the truck tractor itself. It was December 31st for example. The enforcement date would be 90 days after that. For the state of Iowa, they would not enforce the expiration date of the registration of that vehicle until after the 90 day expiration date. Everyone in Iowa would be abiding by that rule of thumb saying our trucks are expired, but we have until March or whatever to get them re-registered. I didn't take any enforcement at that time on that vehicle. California, I believe, is that same way.

In Kentucky, if it is expired, it's expired. We give you a date it has to be re-registered and if you go past that date, then you are in violation. But from these states, if the truck company has 100 trucks, I guess they give them time. I don't know.

Interviewer: So, based on the Webinar and your limited exposure, how do you think the WRI system will affect your role as an enforcement officer?

Interviewee: I think the concept is fantastic. I think eventually you can even get inspections done just through the WRI and the company itself. But on the side of the road, just everything is getting so computerized and wireless that you may be able to stop a truck from... We have the bypass system here where they have the transponder in the truck. Every so often it will pull them in just to go through the scales instead of going on the highway. Just in my mind, I can see something like that happening where it says pull over to a station that is un-manned on a static scale on the side of the road without a scale facility like we run with officers and civilian employees to weigh it and check the registration.

Eventually I envision everyone will go to a wireless logbook or a paperless logbook. It keeps drivers from getting in violations when you have logbook violations. If everyone goes to a computerized logbook, you can send that to a station and have a level 3 inspection done with no interaction. If you had a violation just being between the company and whoever is going to be in charge of the WRI system.

But there are two different schools of though. I don't know how Tennessee is, but here in Kentucky there are two different schools of thought with our commercial vehicle enforcement. I'm of one and some guys are of the other. But when you look at a truck and we are looking at stopping vehicles for inspections, the major portion of it is the safety aspect of it; are the brakes working properly, are the tires inflated and have enough tread on them. Just the safety aspects of everyone on the road; are they tired or over hours and things like that.

Two different schools of thought is one focuses on the truck company and is the truck company doing everything right. If the hazardous material bills of lading filled out correctly. The other school of thought is focused on criminal aspects of commercial vehicles. Are they hauling large quantities of dope or money? You have to give one way or the other if you are going to focus on one. If you focus in on tax violations or safety issues of the truck, is there a light out or something like that, you focus more on the vehicle itself. Whereas if you are doing interdiction you are focused totally on the driver and what are cues the driver is giving you.

There's still an enforcement aspect of it, and it's a technical game is what it boils down to. You can go out here and stop a bunch of trucks and not find safety violations and be done for the day. Or you can sit there and concentrate on where these trucks are coming from and where they are going to and what the driver is telling you and get into the criminal suppression aspect of it. That's the school I come from. I'm out here to get people who, number one, don't need to be in commercial vehicles.

As a whole, in law enforcement, truck commercial vehicle get a pass. They really do. If you are talking about a city department or a county sheriff's deputy, you will hardly ever see them stop a truck. That's nationwide. Trucks don't get as much attention as passenger vehicles do for speeding or anything really. That is why you have Tennessee highway patrol has their guys who focus on commercial vehicles and Kentucky has their commercial division. That was what we focus on, just commercial vehicles. They need extra attention a lot of times. Like I said, they won't get it from city departments.

So the WRI would be a great place, like I said, as a base jumping off point for inspections. I can take that and focus my attention for example, these trucks that are in tax violations in Indiana. They don't need to be operating so we hold their trucks until they settle their debt and tax issue with Indiana. That would be the tool, the way I would use it as another tool to try to accomplish the main goal and get these trucks as safe as possible and squared away as possible.

Interviewer: What are your feelings about NORPASS?

Interviewee: I don't really have any... I guess the NORPASS works for what it is. A driver could maybe get away with more violations if they had NORPASS particularly. I'm not sure. I guess they have to be audited and given a score to begin with. Then they get their NORPASS. I'm not sure how that works out. That goes back to the enforcement issue, that doesn't have anything to do with him going 80 miles an hour in a 70 mile an hour zone as he bypassed the scale because he has a NORPASS. That's not a violation that NORPASS would be able to fix. I can't say one way or another if it will help or hurt.

Interviewer: In your opinion, how do you think WRI capabilities might affect out-of-service violations? Do you think out-of-service violations go up, go down or maybe spike then go down?

Interviewee: There's a lot that maybe could catch. I don't know if it would do anything to out-of-service drivers. It would catch a lot of those vehicles out-of-service issues. It just depends on what you are concentrating on. I'm sure companies adapt to anything. The federal regulations change quite often also. The companies might get sighted for new federal regulations that come out. Then they get wise to it and just start doing whatever they have to do.

So, yeah it might spike in the beginning for violations for out-of-service.

Interviewer: What about non-out-of-service violations?

Interviewee: I'm trying to think off the top of my head what an example of something like that would be. I guess if one brake is out of adjustment wouldn't put them out-of-service. Then it would get a violation but wouldn't be out-of-service. I really couldn't say one way or another.

Interviewer: Based on a nationwide deployment of WRI, to what degree in your opinion, would traditional inspections themselves take less or more time to perform if the traditional inspections follow the WRI?

Interviewee: Being so new, I feel like I would need to see it.

Interviewer: Okay, I understand.

Interviewee: But based on what I have seen, it would probably take about the same amount, possibly less. It again, just depends on what you are looking for, what you get into once you start. If it's just an expired tag and what you got from the WRI report, you stop the truck and go through the basics, look it over and see that it's the only violation; then it will be a lot quicker because it's been brought to your attention and you already know which direction to go with it. There's no telling just yet.

Interviewer: How do you think CMV safety will be affected if there's a nationwide deployment of WRI?

Interviewee: I think there's the possibility of the safety CMV's improving or getting better with the possibility of catching more violations like that. It also would have to have somebody to check out who is operating the vehicle. You can have the safest vehicle in the world and somebody who doesn't need to be behind the wheel; then you got a dangerous situation.

It definitely improves the safety of the trucks. We have to concentrate on those drivers out there.

Interviewer: What I'm gathering from you, this is sort of the first time we have understood what you thought about it too much is that you can have the safest truck in the world and you have a criminal driving the thing, that's the concern.

Interviewee: Correct.

Interviewer: In fact, if you were a criminal, you might not want to drive no attention to yourself and make sure everything is...

Interviewee: Right. I have been in law enforcement for 7 years. It's different in every state. Like I said before, it's pretty much nationwide that commercial vehicles get less attention than passenger vehicles. It's an easier stop as a law enforcement officer to stop a speeding car. I can see in the compartment and see if there's anything unusual, I can see everybody's hands. I can get a ticket typed out on my computer in about 8 minutes, beginning to end for just a speeding car with no suspended license or anything like that. That's 8 minutes and I'm done with that person unless we see each other again in court.

On a commercial vehicle, it's no less than 15 minutes for just a paperwork check. If I go further than a paperwork check, we're talking 20, 30, 45 minutes. So we're talking less attention. In

Canada, they focus solely on the safety of the vehicle. The national commercial vehicle inspection competition that we sent a representative to said that Canadians are engineers and mechanics, and they focus on the mechanics of the vehicles. They don't even carry guns up there. When they are doing inspections, they are not worried about this guy having a warrant because they don't carry a gun and won't take him to jail anyway. They are focused on the safety of the vehicle.

So when you have those two schools of thought, my sergeants and my captain are responsible for some of the biggest money and drug seizures in the state of Kentucky. That's just from driver interviews. They didn't even go out and look at the truck. The truck had 2,000 pounds of marijuana on it and they got that strictly from interviewing the driver. There are also cases where the driver was wanted for murder, got into the trucking industry and didn't get pulled over for 10 years. That aspect of it is important to me, who is behind the wheel. When I take my family out, I'm thrilled to know that the vehicle is safe. You are also looking at who is driving these vehicles and how often they get inspected.

Interviewer: Do you think fleets would be more likely to keep their vehicles up to required standards?

Interviewee: Who is it?

Interviewer: Fleets.

Interviewee: Like all the trucks for one company?

Interviewer: Yeah. Do you think the company itself would make a push to keep all their vehicles up to required standards?

Interviewee: Yes. I see that now days. If we would catch more violations for mechanical aspects of the vehicle, the company, they have full time people that get paid full-time salaries to keep those trucks in line. That is a concern of theirs. I'm sure they would comply. That's the experience I have had here in Kentucky: if there's a problem with the truck they have somebody on it immediately. A lot of those drivers, they will fix it immediately or whatever if I get them for the violation.

Interviewer: Yeah, but before they get a violation.

Interviewee: That's true. You run the gamut with companies. There are people out there that are straight shooters and squared away, and there are people that really don't need to be on the road at all.

Interviewer: Are there any potential inadequacies of the WRI system that you are aware?

Interviewee: No, not right now. I'm not familiar with anything that would be inadequate about the system. I really do see it as being something potential huge. In the commercial vehicle game, for the fact that you can almost do an unmanned inspection and send a truck on if it doesn't hit any cues on the system. You have checked 10 criteria through the system and they have been check off and cleared, possibly you could do those unmanned.

Interviewer: What are your thoughts on an at-speed license plate detector?

Interviewee: What is it now?

Interviewer: An at speed license plate detector?

Interviewee: Oh, like on the road?

Interviewer: Yeah.

Interviewee: I have limited experience with those too. I have seen them placed in cruisers in different states where they just drive up and down the WM parking lot, and it reads it or it hits off the license plate that it reads. I don't have a lot of experience with that, which can possibly be something too.

Interviewer: I was even talking more about there at your station where there might be a reader on...

Interviewee: On the outskirts of it out on the highway.

Interviewer: Out on the Interstate.

Interviewee: Yeah, that's good. That would be definitely good. We'd have to stay on top of it. We would have to stay on top of it if that were the case. We could have a hit at 70 miles per hour. You would really have to do some, you would have to be on the ball.

Sometimes when there's 3 or 4 inches of snow on the ground and I'm here at the scales and I need to get some inspections done, the way ours is set up, I'm looking at the lanes of traffic here right now. At the [Law Enforcement Office] scales here, we have two lanes going in front of the building. When I stop the truck, I turn my back to the road away from the traffic and start typing on this paperwork and concentrating on the driver in front of me. If I got a hit on something like that, stolen vehicle out of Wichita Kansas or something like that, then I'm the only one here. I'd have to jump up and scramble and figure out which truck it was.

Interviewer: But if there was some sort of audio alarm or I'm trying to think off the top of my head. I've been to one of the weigh stations here in Tennessee up on I-81 I have limited exposure but I have some rough idea what it's like to sit in there by yourself with hundreds and hundreds of trucks going by. What those guys talked about was putting up some kind of audio signal that you could turn around and that thing was highlighted as the prepass is with this scrolling thing.

Interviewee: It would be worth it to me just to have that. Probably get a lot more than you think that's out there. Stolen trailers is a big business in the trucking industry. I have recovered one of those myself. But even with stolen vehicles, you have to be on top of it. I have been on traffic stops where it's a stolen vehicle and we ended up determining that the owner had reported it stolen after a football game in Tennessee and then recovered it that night and brought it back home. The department in Tennessee didn't take it out of the system as stolen, so it stayed in the national database as a stolen vehicle. We did a traffic stop on it as a stolen vehicle and it was the actual owner in it as the driver. You take it as it comes but that would definitely be something worth having. The audio cues would help that situation also.

Right now we have 9 officers for 21 counties. If we had that today, each situation would be different. Or if I'm arresting someone to take them to jail and the cue went off, I'm not sure how I'd... radio I guess. But they are traveling 68-70 miles per hour, and I'm starting from 0 and if I have something going on. But it would definitely be worth it.

Interviewer: Do you foresee carrying out interventions successfully should you need to do so based on using WRI systems and reports?

Interviewee: Say it again, I'm sorry.

Interviewer: Based on the WRI system, say you are getting some reports, do you foresee being able to carry out interventions successfully should you need to do so? You just spoke to that.

Interviewee: Certainly. We certainly take any violation... we have people on the road that call us just a family of four or a commuter that sees something wrong with a truck, and they call it in to us and we have to act 5 or 10 miles away. We have to react to that. We don't have a problem with doing that. If there's a violation, we'll take care of business and get that done. I don't see there being a problem if the WRI report comes in and says this, we'll definitely do something about it. We wouldn't just let it fly.

Interviewer: Do you support the implementation of the WRI system?

Interviewee: Yeah, I don’t see why not. But like I said, in every situation it's different. You just have to take it as it comes. More information is always better.

Interviewer: Well, I think we have about run through all the questions here. We sure do appreciate your time. I'm the only other person there we had our miss-communication and our UT Conference call system was not working. Do you have an idea when [Name] might be available?

Interviewee: Now. The best thing I can do is, our state communication system on our computers is the only way... he's not in today. The only way I can get a hold of him is call him or leave a message for him.

Interviewer: It's not that important in the grand scheme of things. I will be out of town for a week or two. If I called up there next Friday, do you think somebody would be around that could track him down?

Interviewee: Somebody will certainly be around. He's a good connection to talk to also. He's been, like me, he came from a city department then went up to the state and focused in commercial vehicles. He's also been a trooper in [State] so he's done work in other states too. He's been around it a long time.

Interviewer: We'd like to talk to him.

Interviewee: Yeah. I would try. Just try. I'd shoot him an email too. You have his email address.

Interviewer: Okay, I'll do that.

Interviewee: Shoot him an email, he'll be happy to talk to you. Catching us is hard. I'm sure he'll have time to talk to you if you can work it out.

Interviewer: Great. Thank you so much for your time.

Interviewee: Thank you sir.

Interviewer: Have a good day.

[End interview]

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