CVISN Safety Information Exchange for Commercial Vehicles in Connecticut

A Case Study

Increasing Inspection Efficiency Through Wireless Data Access at the Roadside

September 2004

Notice

The Federal Highway Administration provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Foreword

Dear Reader,

We have scanned the country to bring together the collective wisdom and expertise of transportation professionals implementing Intelligent Transportation Systems (ITS) projects across the United States. This information will prove helpful as you set out to plan, design, and deploy ITS in your communities.

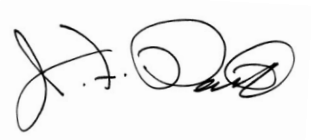
This document is one in a series of products designed to help you provide ITS solutions that meet your local and regional transportation needs. We have developed a variety of formats to communicate with people at various levels within your organization and among your community stakeholders:

- **Benefits Brochures** let experienced community leaders explain in their own words how specific ITS technologies have benefited their areas.
- **Cross-Cutting Studies** examine various ITS approaches that can be used to meet your community's goals.
- **Case Studies** provide in-depth coverage of specific approaches being taken in communities across the United States.
- **Implementation Guides** serve as "how to" manuals to assist your project staff in the technical details of implementing ITS.

ITS has matured to the point that you are not alone as you move toward deployment. We have gained experience and are committed to providing our state and local partners with the knowledge they need to lead their communities into the future.

The inside back cover contains details on the documents in this series, as well as sources to obtain additional information. We hope you find these documents useful tools for making important transportation infrastructure decisions.

Sincerely,



Jeffrey F. Paniati
Associate Administrator for Operations
Acting Program Manager, ITS Joint Program Office
Federal Highway Administration

Mary Powers-King
Office Director
Research and Technology
Federal Motor Carrier Safety Administration

Preface

The following case study provides an in-depth view of the deployment of the safety information exchange components of the Commercial Vehicle Information Systems and Networks (CVISN) technology program in Connecticut. It describes successful practices and lessons learned in operations and management from the point of view of an early-adopting CVISN state. This case study emphasizes qualitative accomplishments and the firsthand accounts of CVISN developers and end users in state government and the private sector.

This case study reflects information gathered from interviews and observations at the Connecticut Department of Motor Vehicles (DMV), as well as a site visit to a state weigh and inspection station. The authors appreciate the cooperation and support of the Connecticut DMV and the Motor Transport Association of Connecticut, Inc., in the development of this document.

Contents

LIST OF FIGURES

Contents

LIST OF TABLES

Introduction

For more than 10 years, the Connecticut DMV has been a leader in the development and deployment of safety information exchange technologies for roadside enforcement of motor carrier regulations. Connecticut DMV was the first in the U.S. to deploy a statewide wireless communication system that provides inspectors with real-time access to carrier safety information. Past inspection records, numerical safety ratings, out-of-service orders, vehicle registration information (via the National Law Enforcement Telecommunications System) and commercial driver license (CDL) information are now available wirelessly. In-state data for assessing a carrier's current operating credentials—including International Registration Plan (IRP) registrations, International Fuel Tax Agreement (IFTA) licenses, and oversize/overweight permits—are soon to be available on-line wirelessly (via the Commercial Vehicle Information Exchange Window, or CVIEW).

The DMV, working in concert with the state's Department of Public Safety and other agencies, is currently integrating this robust wireless system with the latest technologies for electronic screening and credentialing. Figure 1 shows one of the weigh and inspection stations in Connecticut that is applying many CVISN technologies for safety, efficiency, and enforcement.

Figure 1 – The Union Weigh and Inspection Station on I-84 in Northeast Connecticut

The CVISN program, under the direction of the Federal Motor Carrier Safety Administration (FMCSA) within the U.S. Department of Transportation (U.S. DOT), is part of Connecticut's statewide ITS deployment. In 1996, Connecticut became one of ten pilot/prototype states that began field operational testing of CVISN technologies. The goal of CVISN is to foster a national network of compatible technologies, achieved through a common architecture.

"Each commercial vehicle inspector is a mobile site. In their patrol cars, inspectors are all connected wirelessly with each other, with other state agencies, and with Federal databases."

– Bud Roberts
Connecticut
DMV

CVISN emphasizes three main deployment areas: credentials administration, electronic screening (weigh station bypass), and safety information exchange. Because of Connecticut's advanced approach to roadside enforcement, this case study is focused on safety information exchange capabilities as they relate to the overall CVISN deployment in Connecticut. Safety information exchange is the electronic exchange of current and historical safety data and supporting credential information regarding commercial carriers, vehicles, and drivers.

The main objective of the safety information exchange deployment in Connecticut is to enable state DMV Commercial Vehicle Safety Division (CVSD) and Department of Public Safety commercial vehicle (CV) inspectors to concentrate their efforts on those motor carriers with poor or unknown safety records, while allowing the trucks of safer, known carriers to continue safely down the road. Throughout the process, Connecticut has sought to establish and maintain an integrated statewide safety and credentials data exchange network that can be linked with regional and national data sources.

The most significant accomplishment to date has been the statewide deployment of 68 specially equipped laptop computers, known as mobile data terminals (MDTs), one of which is shown in Figure 2. The MDTs give inspectors access to updated information on a motor carrier's safety, out-of-service, license, and credential records, as well as information on specific commercial vehicles and drivers. The vehicle-based MDTs—and comparable equipment in the state's fixed-site weigh stations—make the inspectors' jobs more efficient.

Figure 2 – A CVSD Inspector Using an MDT to Run a Wireless Query on a Hazardous Cargo Carrier

As Connecticut enters a new phase of CVISN deployment, the state is enhancing its roadside enforcement program through the integration of electronic screening and electronic credentialing capabilities. This integration will give the inspectors a fuller, more timely, and usable picture of the motor carriers and commercial vehicles traveling the highways of the state.

The deployment of safety information exchange in Connecticut has been funded in part through a cost-sharing partnership agreement with the U.S. DOT's ITS Joint Program Office (JPO). FMCSA manages the CVISN program with support from the JPO.

System Origin

Electronic safety information exchange functions have been available to inspectors in Connecticut since about 1992, when the first "pen-based" laptop computers (the forerunners to today's MDTs) were deployed in enforcement vehicles. At first, ASPEN inspection data were transferred from the field to a central office using floppy diskettes, and from there the data were uploaded to SAFETYNET. (See pages 3-3 and 3-4 for a description of these systems.) Later upgrades in technology for roadside enforcement included dial-up modems connected to an electronic bulletin board, cell phone dial-up, touchscreen laptops, and, starting around 1994, wireless transmission.

Throughout the deployment of these technologies and others, the state has worked closely with the Connecticut Motor Carrier Advisory Council (MCAC), which was established in 1992 by state statute. The role of the MCAC is described in more detail below. Connecticut became a pilot state for Federally supported field tests of CVISN technologies starting in 1996.

The CVISN team in Connecticut developed a Project Plan in October 1997, and obtained the buy-in of all state agencies with responsibility for regulating the motor carrier industry. Table 1 lists some of the responsibilities of various Connecticut agencies involved.

Motor carrier industry representatives, specifically the American Transportation Research Institute (formerly the American Trucking Associations Foundation) and the Motor Transport Association of Connecticut, Inc., also helped lead the CVISN project planning.

Connecticut's Project Plan is comprehensive, covering summaries of the system designs; organizational responsibilities; division of work; project milestones; estimated effort; unresolved issues; and a number of external dependencies on which the success of the project hinged. Examples of these external factors include the availability of interoperable systems, continued Federal funding, and dedicated short-range communication (DSRC) standards development.

The Connecticut MCAC has served as the Steering Committee for the CVISN project since 1996. The MCAC Chair, representatives from the six regulatory agencies having regulatory authority over motor carrier activity in Connecticut (see Table 1), and the President of the Motor Transport Association of Connecticut reviewed and approved the Connecticut CVISN Project Plan. MCAC representatives continue to review accomplishments, provide direction, and resolve issues regarding the CVISN Project.

"The CVISN project has long benefited from a high level of dedication within the Connecticut state government and the motor carrier industry."

– Carolyn Temperine
FMCSA Technical
Programs Manager

"It helped that our CVISN design was driven upward from the roadside. We asked what the roadside personnel needed, and then made sure that these needs were accounted for and built into the system."

– Bud Roberts
Connecticut DMV

State Agency	Responsibilities
Department of Motor Vehicles	• Issue IRP, intrastate, and Single-State Registration System (SSRS) credentials; trip permits • Issue CDLs • Serve as Motor Carrier Safety Assistance Program (MCSAP) Lead Agency, including conduct of MCSAP safety inspections • Assign interstate and intrastate U.S. DOT numbers • Update MCS-150 (motor carrier ID) data upon IRP renewals processing • Perform regulatory enforcement • Conduct size/weight inspections
Department of Revenue Services	• Process quarterly IFTA returns • Administer IFTA licenses • Collect motor carrier road taxes
Department of Transportation	• Issue oversize/overweight (OS/OW) permits and radioactive materials permits
Department of Public Safety (State Police)	• Conduct size and weight inspections • Conduct MCSAP safety inspections • Enforce regulations and general laws
Department of Environmental Protection	• Issue hazardous waste permits
Department of Information Technology	• Procure, maintain, and support computer and networking technology • Provide technical consultation

Table 1 – State Agencies Responsible for the Motor Carrier Industry in Connecticut

The MCAC also serves as a forum for motor carrier representatives to confer on other issues with representatives of the state agencies active in regulating the commercial transportation industry.

Beyond its role on the MCAC, the motor carrier industry has been closely involved in other aspects of the CVISN deployment from the outset. Michael Riley, President of the Motor Transport Association of Connecticut, Inc. and the motor carrier industry CVISN Project Manager, says that the state has welcomed the industry's input. In his view, Connecticut's state government has made extraordinary efforts to design the CVISN system so that it is beneficial to industry as a whole. He also notes that the design process encouraged industry to point out approaches and methods that were new to the state.

Specifically, industry input encouraged the incorporation of oversize/overweight permits, the sharing of intrastate vehicle registration data, and credentials administration-related electronic payment capabilities into the Connecticut CVISN Project Plan.

System Design

The Connecticut system was designed to comply with the national CVISN architecture specifications, while adapting the specifications to the state's business needs, technology infrastructure, institutional relationships, and statutory requirements. The following sections describe the overall structure of the safety information exchange system, the system's current and future technical capabilities, methods used to promote data security and data quality, and an account of the organizations involved in planning and directing the CVISN deployment in the state.

Data Structure

Inspectors at the roadside have available a wealth of information on the motor carriers, vehicles, and drivers operating in the state. The information is provided to the roadside through a series of networked databases and integrated telecommunication facilities, enabling inspectors to navigate through a set of menus and user interfaces to obtain an appropriate level of detail for each situation they face in the field.

The types of current and historical data needed to support a commercial vehicle inspection are numerous. Figure 3 illustrates the wide scope of information as well as the routes of communication between roadside inspection and enforcement personnel (in patrol cars or at fixed-site weigh and inspection stations) and state and national databases.

One of the greatest benefits of safety information exchange in Connecticut is the relatively quick turnaround for queries of current data. As soon as new data are uploaded or refreshed in a Federal or in-state database, for example, officers using their MDTs are able to see and use the data.

All network connections to and from the MDTs in the patrol vehicles use wireless cellular digital packet data (CDPD) modems. All computer network connections used in the scale houses to support inspections are also wireless CDPD, with the exception of the Union station, which is connected to the state's network via frame relay. The following section describes how the complex processes shown in Figure 3 support safety information exchange in Connecticut.

The inspector at the roadside can use a direct wireless connection from the MDT to query the Safety and Fitness Electronic Record (SAFER) System, housed at the John A. Volpe National Transportation Systems Center, a Federal research center in Cambridge, Massachusetts. The SAFER System stores information on recent inspections for prompt access.

Within the SAFER System are search and retrieval functions such as the Inspection Selection System (ISS), which uses inspection, crash, driver, and compliance review data to classify carriers based on their relative safety risk; and the Past Inspection Query (PIQ) process, which provides inspectors immediate access to recent vehicle inspections performed throughout the country.

Using wireless links to the Connecticut DMV Communication Server, inspectors can take part in electronic message exchanges with their counterparts at other stations or in other enforcement vehicles. These messages can include e-mail attachments and instant message functions.

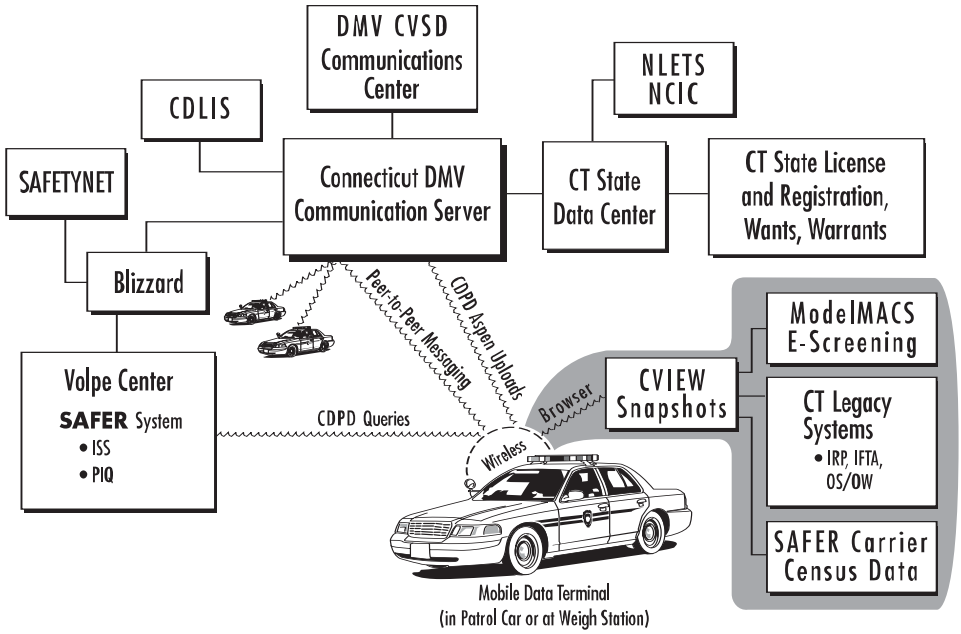


Figure 3 – Data Structure Available to Support Roadside Decisions by Commercial Vehicle Inspectors Using Wireless Data Terminals (shading indicates new functions being added)

The same link to the Connecticut DMV Communication Server provides a route for inspectors to upload inspection reports prepared at the roadside using the ASPEN software installed on the MDTs.

Connecticut currently uses CDPD wireless modems for data exchange between the roadside MDTs and state and Federal databases. The CDPD provider has notified the state that support of this technology will soon be phased out. In the near future, the state plans to change over to code-division multiple access (CDMA) modems, to provide roadside personnel with higher rates of data exchange. The server also gives inspectors access to the Commercial Driver License Information System (CDLIS) and the state's internal DMV CVSD Communications Center.

Through a BLIZZARD facility (special software used to process, route, and "echo" data), the Connecticut DMV Communication Server sends copies of inspection data received from the roadside to the SAFER Data Mailbox at the Volpe Center (for Past Inspection Queries) and to the

state's SAFETYNET System. The inspection data are then sent daily via the state's SAFETYNET system to SAFER for integration into the Motor Carrier Management Information System (MCMIS). SAFETYNET is also used for long-term storage, retrieval, tracking, and analysis of past inspection reports for safety improvement.

A pass-through link from the Connecticut State Data Center to the communication server gives inspectors access to the National Law Enforcement Telecommunications System (NLETS), for secure exchange of interstate and international criminal justice information; and the National Crime Information Center (NCIC), a computerized index of criminal justice information operated by the Federal Bureau of Investigation. The State Data Center is also linked with Connecticut's database of in-state license and law enforcement information.

New Capabilities

The wireless functions already available in the state are now being augmented by wireless access to the state's new CVIEW system, as shown by the shading in Figure 3. "CVIEW" is a generic CV-related system designed to share and store vehicle data, carrier credentials, and safety information. The system was initially developed by U.S. DOT through research and programming performed by the Johns Hopkins University Applied Physics Laboratory. CVIEW refers to the database storage and the integrated software operating system, including network connections to state and Federal databases.

Connecticut's CVISN Project Plan provided for a customized, state-specific version of the CVIEW software. CVIEW functions as a proxy for systems that generally are not accessible directly. In Connecticut, the CVIEW has been designed to support the three CVISN core capability areas: credentials administration, electronic screening, and safety information exchange. The FMCSA certified Connecticut's CVIEW in September 2003, and, as of April 2004, CVIEW has moved into production.

The CVIEW system in Connecticut:

- Provides instantaneous credentials and safety-related data for electronic screening, allowing certain trucks to bypass weigh and inspection stations at mainline speeds. The screening decision algorithm resides in a related system, known as the Mainline Automated Clearance System (ModelMACS). Screening data used in automatic clearance decisions (bypass versus pull-in) include DSRC signals transmitted to and from in-vehicle transponders, automatic vehicle classification, weigh-in-motion data, carrier and vehicle identifiers, IRP and IFTA status values, out-of-service information, and Performance and Registration Information Systems Management (PRISM) data.
- Sends and receives safety, credentials, and transponder data, sharing with the national SAFER and PRISM systems.

- Will provide carrier and vehicle snapshots wirelessly, using a browser-based interface, to support roadside enforcement inspections. Examples of the data included in the snapshot include IRP, IFTA, and OS/OW permit data. The capability is expected to be available by December 2004.

CVIEW is designed to allow authorized state officials and motor carriers to view current carrier and vehicle information in snapshot format, as illustrated in Figures 4 and 5. A motor carrier can view only its own company's information. Motor carriers applying for new online access have their identity independently verified by a member of the state CVISN/PRISM team before access to the snapshot is granted.

The snapshots usually present two or three computer screens of up-to-date information per carrier or vehicle. The snapshots also provide access to historical safety-related data, including ISS scores, Motor Carrier Safety Improvement Process (MCSIP) levels, Out-of-Service (OOS) data, and other information that credential administrators can view and inspectors can use to make quick, accurate decisions in the field. The system provides carrier OOS information, plus any vehicle OOS information that is downloaded from SAFER. Driver OOS information is not available through these snapshots.

Customized snapshots will provide different users (for example, snapshots for use by central office OS/OW permit administrative staff and motor carrier licensing personnel versus snapshots for use by roadside CV inspectors) with different views or subsets of the information in the CVIEW system. In this way, users can save time by focusing first on the data oriented toward their specific tasks.

Figure 4 – A Portion of Carrier Information Snapshot in Connecticut CVIEW

Figure 5 – A Portion of Vehicle Information Snapshot in Connecticut CVIEW

Requirements of the Federally sponsored PRISM program were integrated into the CVISN deployment beginning with the development of the CVISN/PRISM request for proposals, through Connecticut's CVIEW and IRP credentials processing systems. The state's CVIEW receives and processes data from numerous sources, as indicated in Table 2.

Data Type	Data Source
In-State	
Interstate vehicle registrations for Connecticut-based carriers	IRP System
IFTA licenses and decals	In-state Master Business Database (MBDB)
Delinquent property tax, registration suspension, insurance compliance, and parking ticket violation (DRIP) information	In-state dedicated database
Transponder registrations	MACS Central (credentialing interface to ModelMACS)
Screening and clearance information	ModelMACS
OS/OW permits	OS/OW System
Out-of-State	
Revoked IFTA licenses	IFTA Clearinghouse
Motor carrier census and safety information	SAFER system
Credentials data from other jurisdictions	SAFER system
PRISM census and target files	FMCSA

Table 2 – Data Types and Sources Used in the CVIEW/PRISM System in Connecticut

Additional data-sharing functions are planned for future releases of the CVIEW system in Connecticut:

- Intrastate commercial vehicle registration data
- SSRS credentials
- Intrastate motor carrier road tax registrations and Connecticut-only waivers
- Web-based transponder registrations.

Some of the functions that could have been provided by CVIEW were already available to the state's roadside enforcement officers through wireless MDTs in their patrol cars, using technology that was developed previously to—or concurrently with—the CVISN deployment. As illustrated in Figure 3 (above), in addition to accessing the new CVIEW-provided information identified above, roadside enforcement officers also use wireless MDT units for accessing SAFER information, such as PIQ and ISS data, as well as CDLIS data.

Data Security and Quality

One of the reasons that Connecticut elected to keep these existing MDT functionalities separate from the new wireless CVIEW functionalities was the necessity to restrict access to the NCIC, NLETS, and Connecticut On Line Law Enforcement Communications Teleprocessing (COLLECT) data. Not all users of CVIEW are authorized to access this kind of sensitive data. The decision to continue to utilize existing methods for accessing restricted data (and to exclude CVIEW from certain safety information exchange functions) will help ensure that restricted data continue to be available only to properly authorized users.

To protect the quality of the data, Connecticut's CVIEW system incorporates authoritative source rules, which can resolve discrepancies when multiple values for the same database element (record and field) are received from multiple sources. For example, a single motor carrier company might appear to have more than one Federal Employer Identification Number (FEIN) on record when comparing the IRP and IFTA systems. In such conflicts, the IFTA version would govern. The authoritative source rules can be updated in the software as circumstances change. Such discrepancies or conflicts affect only a small fraction (less than 10 percent) of the fields in the full set of CVISN-related databases.

The CVIEW system runs data integrity checks automatically, and flags and logs the errors found. For example, early in 2004 a column of expected data was dropped from the file sent from the IFTA Clearinghouse to CVIEW. This produced import errors when the IFTA Clearinghouse legacy system interface (LSI) attempted to load the data, and administrators were able to reimport the corrected file.

In addition to validating the incoming file structures and formats, the LSIs also check the type, size and, in some cases, content of the individual fields. Most errors of this type are identified during a daily manual review of the LSI log files. Other types of checks and error-trapping routines (e.g., file not found) are run automatically. The system generates status e-mail messages, which are in turn sent to a CVIEW administrator for action and resolution.

Role of Contractors in System Design

The information technology, engineering, and computer programming aspects of the Connecticut CVISN deployment were carried out almost entirely by contractors, working under the direction of the state. Three contractors are currently cooperating on the development of CVISN systems in Connecticut, as shown in Table 3. All contractors have specific tasks for integrating their systems with those of the other contractors.

Contractor	Responsibilities
Cambridge Systematics, Inc.	• Project management • Development and integration of a Credentialing Interface/CVIEW (CI/CVIEW) System • Development, modification, and integration services for DMV Systems, including the IRP System, the SSRS, and the DRIP System • Development and integration services for Department of Revenue Services (DRS) Systems, including the IFTA System, the IFTA Quarterly Tax Payments System, and the Intrastate Motor Carrier Road Tax Credentials System • Systems development and integration services for: - Connecticut Department of Transportation OS/OW Credentials System - Connecticut's ModelMACS (for weigh station bypass) - Federal systems, including the SAFER system - Connecticut Motor Carrier Prescreening System (for carriers to register their own transponders online)
Affiliated Computer Services, Inc.	• IRP Commercial Vehicle Registration System • Integration services for the exchange of: - Safety and credentials data with the CI/CVIEW System - IRP credentials-related information with the IRP Clearinghouse - PRISM-related functionalities
C.W. Beilfuss & Associates, Inc.	• An OS/OW commercial vehicle permitting system, with bridge rating and automatic routing functionality • Integration services for the exchange of safety and credentials data with the CI/CVIEW System

Table 3 – Responsibilities of Private-Sector Contractors Supporting CVISN Deployment in Connecticut

System Operation

In support of CV enforcement, Connecticut operates five fixed sites (Union, Middletown, Greenwich, Danbury, and Waterford) for CV weighing and inspections. Most of the fixed sites are near points of entry into the state, as shown in Figure 6. The state also has 90 inspection vehicles, many equipped with mobile scales, so that safety inspections and size/weight inspections can be conducted across the state. State MCSAP officers use 68 of these vehicles, while the remainder are used by state weight inspection technicians. The state conducts approximately 20,000 MCSAP-reported commercial truck inspections per year.

All weigh/inspection sites and all mobile units operated by the DMV and the State Police are connected with the electronic safety, credentials, and other enforcement data available from the state and national systems. MDTs have become standard issue for all DMV and State Police CV inspectors.

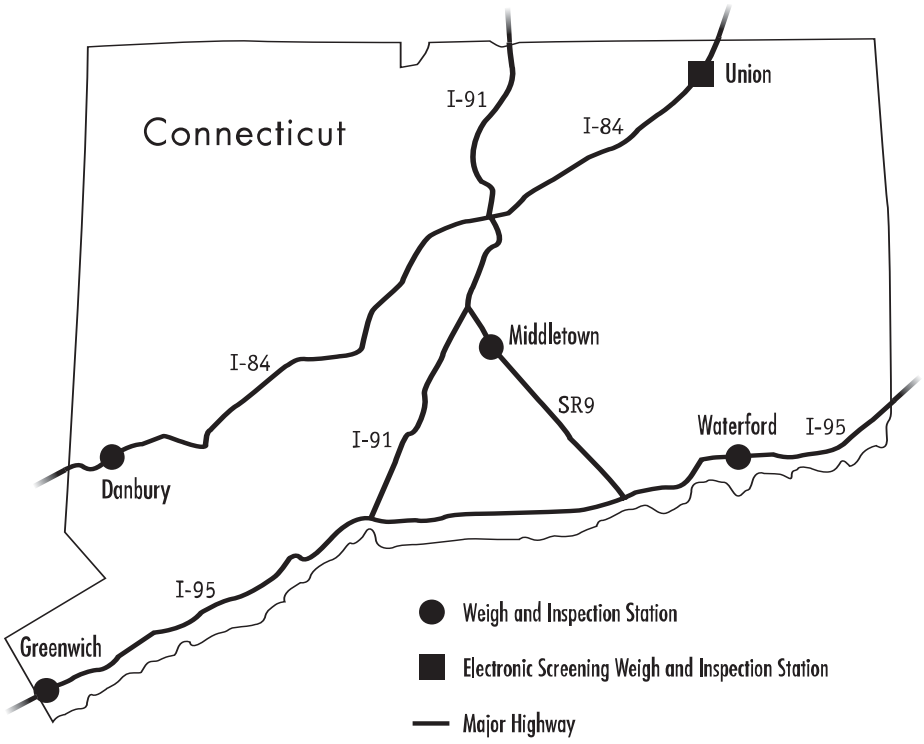


Figure 6 – Connecticut's State-Operated, Fixed-Site Weigh and Inspection Stations

Table 4 shows the total number of inspections completed in 2003 by MCSAP-certified officers from four agencies:

- DMV Commercial Vehicle Safety Division
- Department of Public Safety, Division of State Police
- Town of Enfield Police
- Town of Trumbull Police.

Type of Inspection	Numbers of Commercial Trucks (Excluding Buses)	
	Non-HazMat	HazMat
Level 1. Standard: Driver/Credential/Vehicle	6,452	600
Level 2. Walk-Around Driver/Vehicle	8,458	1,073
Level 3. Driver/Credential	3,900	151
Level 4. Special Inspection	0	0
Level 5. Vehicle-Only	337	20
Level 6. Radioactive Shipment	0	0
TOTAL	**19,147**	**1,844**

Table 4 – MCSAP-Reported Inspection Activity in Connecticut in 2003

Day-to-Day Operations

As an example of cooperation among departments in the Connecticut deployment, the roadside weigh and inspection stations are owned by the Connecticut DOT, but they are generally staffed on an alternating schedule by State Police officers or by state DMV CVSD inspectors. The State Police officers emphasize truck weight and size enforcement, whereas the DMV inspectors focus more on safety, with oversize/overweight review being one aspect of the overall inspection process. Figure 7 shows a commercial vehicle inspector conducting a routine credentials/safety check at a roadside location.

Connecticut inspectors run a PIQ and several other wireless queries on nearly every truck selected for inspection. Inspectors use hand-held optical scanners (bar code readers) in their cars to identify credentials and commercial driver licenses, saving time in data entry and improving data accuracy during the completion of ASPEN inspection reports.

Users access data from the CVISN databases by either of two means: queries or subscriptions. Queries are direct interrogations of a database to support cross-checking or roadside enforcement decisions. For example, when a carrier applies for an OS/OW permit, the state OS/OW permit administrator will use a CVIEW query to verify that the carrier is registered to operate in Connecticut before issuing the OS/OW permit.

Subscriptions transmit predefined data between the CVISN system and certain users and systems at preset time points. Subscriptions result in automatic updates that are triggered by specific events. Each subscription is structured to transmit or receive data on a specific set of carriers, vehicles, and data fields. The data are then sent from the source

to a specified user or system, according to a transfer protocol. Subscriptions always reside in the source database and "push" data from the source to the recipient.

In Connecticut, subscriptions are used to update the SAFER database (operated by the Volpe Center) with the state's data and to pull the latest census, safety, and credentials data from SAFER to Connecticut's CVIEW. Subscriptions are also to be used by CVIEW to update the ModelMACS electronic screening and clearance system for use at the Union weigh and inspection station. E-screening uses vehicle-mounted, short-range radio transponders, weigh-in-motion (WIM) scales, and high-speed data transfer hardware and software to signal selected vehicles to bypass open weigh and inspection stations without having to exit the highway.

Figure 7 – A Connecticut CV Inspector Giving Directions to a Driver During a Routine Credentials/Safety Check

To augment the static scales at the fixed sites, low-speed (sorter or exit lane) WIM scales are in use at the Greenwich and Union sites, which are ports of entry from New York and Massachusetts, respectively. The Union site also has a high-speed WIM used to support CVISN e-screening.

Two motor carriers operating in Connecticut, United Parcel Service (UPS) and Guida-Seibert Dairy, have been the first to participate in pilot testing of the state's CVISN e-screening system. To date, the state has distributed 14 vehicle-mounted transponders for use in this test. These vehicles now receive a green light for bypass, if appropriate, at the Union weigh station. Safety data from CVISN data sources are factored into the automated red-light/green-light bypass decision algorithm. Connecticut plans to replicate the e-screening technology at other sites in the future.

Connecticut was the first state to deploy a two-lane e-screening system for CVISN. Transponder readers are located above the two right-hand lanes of a three-lane interstate highway upstream of the Union weigh station.

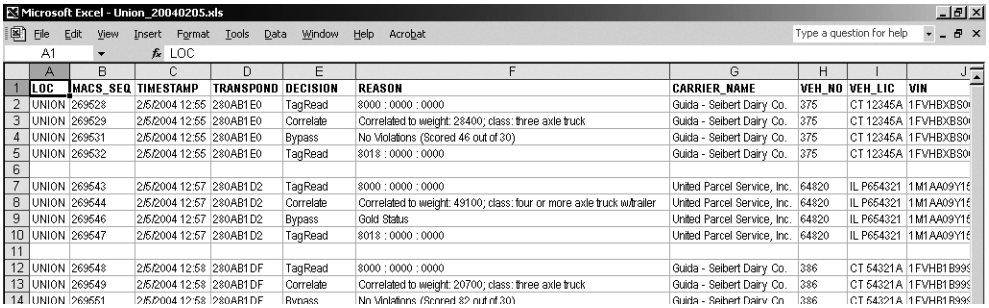
Figure 8 shows a Connecticut DMV inspector checking with a UPS driver. UPS is one of two motor carriers currently testing the state's CVISN electronic screening technology at the Union weigh station. The vehicle pictured on the static scale had not yet received its screening transponder.

Figure 9 shows a sample of the kinds of data that are logged and displayed by the ModelMACS electronic screening (bypass) system in Connecticut. The figure illustrates the data that are available in real time at the weigh station. Each screening event normally generates several records in the database log:

- An initial identification at the upstream transponder reader location
- A correlation of the transponder identification code (ID) with the mainline WIM scale reading
- A record of the automatic decision to signal the vehicle to bypass or report to station
- A confirmation or compliance reading of the transponder ID, in case the vehicle received a red (pull-in) signal and failed to enter the inspection station.

The time stamp field shows that for most bypass events, all five steps occur within one minute, at mainline speed.

Figure 8 – A Connecticut CV Inspector Checking with a UPS Driver



Microsoft Excel - Union_20040205.xls

File Edit View Insert Format Tools Data Window Help Acrobat — Type a question for help

A1 — LOC

	A	B	C	D	E	F	G	H	I	J
1	LOC	MACS_SEQ	TIMESTAMP	TRANSPOND	DECISION	REASON	CARRIER_NAME	VEH_NO	VEH_LIC	VIN
2	UNION	269528	2/5/2004 12:55	280AB1E0	TagRead	8000 : 0000 : 0000	Guida - Seibert Dairy Co.	375	CT 12345A	1FVHBXBS0
3	UNION	269529	2/5/2004 12:55	280AB1E0	Correlate	Correlated to weight: 28400; class: three axle truck	Guida - Seibert Dairy Co.	375	CT 12345A	1FVHBXBS0
4	UNION	269531	2/5/2004 12:55	280AB1E0	Bypass	No Violations (Scored 46 out of 30)	Guida - Seibert Dairy Co.	375	CT 12345A	1FVHBXBS0
5	UNION	269532	2/5/2004 12:55	280AB1E0	TagRead	8013 : 0000 : 0000	Guida - Seibert Dairy Co.	375	CT 12345A	1FVHBXBS0
6										
7	UNION	269543	2/5/2004 12:57	280AB1D2	TagRead	8000 : 0000 : 0000	United Parcel Service, Inc.	64820	IL P654321	1M1AA09Y1
8	UNION	269544	2/5/2004 12:57	280AB1D2	Correlate	Correlated to weight: 49100; class: four or more axle truck w/trailer	United Parcel Service, Inc.	64820	IL P654321	1M1AA09Y1
9	UNION	269546	2/5/2004 12:57	280AB1D2	Bypass	Gold Status	United Parcel Service, Inc.	64820	IL P654321	1M1AA09Y1
10	UNION	269547	2/5/2004 12:57	280AB1D2	TagRead	8013 : 0000 : 0000	United Parcel Service, Inc.	64820	IL P654321	1M1AA09Y1
11										
12	UNION	269548	2/5/2004 12:58	280AB1DF	TagRead	8000 : 0000 : 0000	Guida - Seibert Dairy Co.	386	CT 54321A	1FVHB1B99
13	UNION	269549	2/5/2004 12:58	280AB1DF	Correlate	Correlated to weight: 20700; class: three axle truck	Guida - Seibert Dairy Co.	386	CT 54321A	1FVHB1B99
14	UNION	269551	2/5/2004 12:58	280AB1DF	Bypass	No Violations (Scored 82 out of 30)	Guida - Seibert Dairy Co.	386	CT 54321A	1FVHB1B99

Figure 9 – Sample of Connecticut ModelMACS Bypass Database Log

Previous Field Research

A previous U.S. DOT report described Connecticut's extensive and advanced use of information technologies for roadside safety information exchange, which continues to the present. For example, the majority of the state's safety inspection results are uploaded to the national SAFER Data Mailbox system upon completion. The widespread use of wireless MDTs allows inspectors to perform PIQs routinely when conducting vehicle inspections. Connecticut is thus a high-volume user of the PIQ system. At the time of the earlier U.S. DOT report, approximately 50 PIQs were being performed each day in 18 states, and Connecticut alone was performing 20 of the PIQs per day.[1] Current usage logs from the SAFER system confirm that Connecticut continues to be a high-volume user of the PIQ capability.

A related U.S. DOT-sponsored field study of inspection effectiveness was also conducted in Connecticut.[2] In that study, investigators compared vehicle OOS rates with and without the use of ISS scores to aid in vehicle selection and simulated the effects of electronic screening combined with the use of ISS. The study demonstrated one of the tangible benefits of CVISN: it helps the inspectors focus on higher-risk carriers, in turn increasing vehicle OOS rates. Over time, this inspection selection efficiency is expected to increase highway safety by removing more unsafe vehicles and drivers from the road, and reducing the number of crashes. The study found that combining ISS with electronic screening should increase the efficiency of the inspection selection process by more than 11 percent. That is, when a state is using electronic screening and safety information exchange technologies, its inspectors can be expected to issue 11 percent more OOS orders than before, relative to the total number of vehicles inspected.

Connecticut officials note that both administrative/licensing and physical/mechanical/safety-related OOS orders have an effect on overall highway safety, in that both types of orders tend to reduce the numbers of unsafe or poor-performing carriers on the road.

---

[1] U.S. DOT (2002). *Evaluation of the I-95 Commercial Vehicle Operations Roadside Safety and SAFER Data Mailbox Field Operational Tests.* http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13787.html, EDL #13787.

[2] U.S. DOT (2002). *Evaluation of the Commercial Vehicle Information Systems and Networks (CVISN) Model Deployment Initiative.* http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13677.html and http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13699.pdf, EDL# 13677 and 13699.

Benefits

Benefits from the deployment of CVISN safety information exchange and other CVO-related technologies have been realized by the state, as well as the motor carrier industry in Connecticut.

- **State government officials** value the real-time data, access to data from other jurisdictions at the roadside, and access to additional credentials data (IFTA, OS/OW, SSRS, etc.).

  For example, new IRP data are now transferred to CVIEW and available at the roadside within 15 minutes, compared with weekly transfers of IRP data to the state DMV mainframe, on which the roadside inspectors have relied in the past. Data are available without inspectors having to swap diskettes or connect to a land-line modem for downloading and uploading data.

- **Inspectors and officers** appreciate having ready access to live data on the vehicles they inspect, and indicate that the MDTs make the inspection reporting process more efficient. This observation confirms similar accounts received during an earlier ITS field evaluation of CVISN deployment along the I-95 corridor.[3]

  Giving inspectors current information on CDL class or endorsement violations, or improper hazardous material credentials, should help to improve safety for carriers and the general public.

- **State DMV inspectors** also use the system to select and inspect commercial vehicles for excessive emissions by analyzing engine exhaust in periodic roadside inspections. The method of testing is based on the Society of Automotive Engineers J1667 "Snap-Acceleration Smoke Test Procedure" for measuring exhaust opacity.[4] The state's commercial diesel testing program is described in a brochure issued by the DMV.[5]

  To support these environmental protection activities, inspectors compared the pass/fail emission test results with ISS ratings for individual carriers. Although not a scientifically controlled study, anecdotal reports from inspectors indicate that the vehicles that fail the emission test are much more likely to be operated by carriers with poorer numerical ISS safety ratings. This illustrates one way that access to comprehensive, real-time safety data at the roadside—as provided in part by the CVISN deployment—may yield public environmental and health benefits beyond the traditional measures of highway safety and credentials enforcement.

"Connecticut maintained the perseverance and drive necessary to overcome institutional, technical, personnel, and funding issues, and to make the CVISN initiative a success."

– Carolyn Temperine
FMCSA Technical
Programs Manager

[3] U.S. DOT (2002). *Evaluation of the I-95 Commercial Vehicle Operations Roadside Safety and SAFER Data Mailbox Field Operational Tests*. http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13787.html, EDL #13787.

[4] Society of Automotive Engineers (1996). *Snap-Acceleration Smoke Test Procedure for Heavy-Duty Diesel Powered Vehicles*, SAE Standard J1667, issued by the Truck and Bus Engine and Vehicle Performance Subcommittee.

[5] Connecticut Department of Motor Vehicles (2003). *Connecticut's Heavy Duty Diesel Emissions Program.* http://www.ct.gov/dmv/lib/dmv/20/29/emidesl.pdf.

"The resources that some carriers put into maintenance and safe operation are returning a financial benefit to their companies."

– Michael Riley, President
MTAC

- **Other states and jurisdictions** have benefited from Connecticut's leadership and knowledge sharing from Connecticut, in areas such as issuing U.S. DOT numbers to intrastate carriers, deploying MDTs, and participating in the SAFER Data Mailbox project.[6]
- **Motor carriers** have been positive toward the CVISN deployment in Connecticut. The President of the Motor Transport Association of Connecticut, Michael Riley, says his industry likes to see safer trucks getting a break.

[6] U.S. DOT (2002). *Evaluation of the I-95 Commercial Vehicle Operations Roadside Safety and SAFER Data Mailbox Field Operational Tests*. http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13787.html, EDL #13787.

Lessons Learned

State officials and others noted a number of ideas for improvement of the CVISN system, and lessons learned in the course of deployment.

- Connecticut makes good use of the credentials data from the relatively few other states that currently pass IRP and IFTA data to the SAFER system, and hopes that more states will soon begin transferring such data to make the credentials and safety tracking system more national in its coverage. CVIEW is currently downloading IRP data from Arizona, Oregon, and Washington via SAFER and is downloading IFTA data from Arizona via SAFER.
- Connecticut has found that integrating CVISN and PRISM can bring both benefits and challenges. For example, a recent decision to modify the standard report for motor carrier identification (MCS-150), driven by the PRISM program, also now affects corresponding data fields and database structures in the CVIEW system. These unanticipated changes ripple through CVIEW and other downstream systems, requiring software changes. Despite the challenges, however, Connecticut officials believe that the operational benefits gained by the linking of these programs far outweigh the obstacles.
- The system in Connecticut was developed almost exclusively by contracted software programmers, rather than by in-house programmers. The state was able to make this kind of deployment work by negotiating carefully with vendors between the time of the request for proposals and the contract award, to specify how the various contractors would collaborate and who was responsible for what. This careful negotiation prevented many problems with software and hardware incompatibilities, and lack of coordination seen in other jurisdictions where major aspects of the infrastructure deployment were contracted out.
- The only substantial concern voiced by the motor carriers is skepticism on the part of some segments of the industry that increasingly automated data collection by the state will result in greater, disproportionate scrutiny or taxation for carriers who participate in electronic screening and safety improvement programs. The state counters these predictions by noting that e-screening and roadside safety information exchange promise to make the highways safer and more efficient for all vehicles, and add no special burden or cost on the majority of fleets, which are well maintained and operate safely.
- As seen in other jurisdictions deploying CVISN technologies, Connecticut found that institutional issues tended to be more difficult to resolve than most of the technical issues faced by the team. For example, funding roadblocks delayed initial development and deployment efforts.

"All agencies want the same thing—safer highways—but there can be different perspectives on what constitutes a safe carrier."

– Brad Wright
Cambridge Systematics

- Participating contractor Brad Wright of Cambridge Systematics, Inc. points to institutional challenges as one of the greatest hurdles in CVISN deployment. Mr. Wright observed that the agreements and organization established at the inception of the program in Connecticut have helped the agencies work together toward the same goals.

  One example of interagency cooperation was the identification of business requirements for the design of the carrier and vehicle snapshot. These snapshots are accessible by authorized state agency personnel. Individual agency needs for information sharing were discussed at great length in order to arrive at a single snapshot that provides necessary data for users from multiple agencies.

  On a related issue, each agency involved in the CVISN deployment may have a slightly different perspective on what constitutes a "safe carrier" and may rely on different indicators. Mr. Wright notes that "the State Police may be looking at indicators such as out-of-service history, safety rating, etc., while the State DOT OS/OW permitting administrative staff may be more interested in whether the carrier has had repeat OS/OW permit violations, is properly registered, etc. During the CVISN requirements and design process, it is important to capture the needs of many different system users and to reconcile and reflect these needs in the systems that are deployed."

- From a data management viewpoint, a fundamental and significant issue (which is not unique to Connecticut) is the lack of a recognized, unique identifier for every vehicle and every motor carrier. Unlike some jurisdictions, Connecticut issues U.S. DOT numbers to intrastate carriers. Despite this practice, some CVISN-related legacy systems in the state do not capture U.S. DOT information and are unable to supply this information to CVIEW. This deficiency makes it difficult for the state to receive all of a given carrier's information from different agencies or systems. Connecticut has approximately 1,800 carriers with IRP accounts, representing approximately 12,000 interstate vehicles based in the state. The state also registers approximately 31,000 intrastate commercial vehicles.

Conclusions and Next Steps

Connecticut has been successful in building on its longstanding commitment to electronic technologies to make commercial vehicle operations more efficient. Before CVISN started, the state had been exploring and deploying infrastructure—and training its staff—to take advantage of information technologies. The state's systems were then integrated with the national CVISN architecture.

Now that the Federally sponsored CVISN program is growing nationwide, Connecticut is in a good position to take advantage of next-generation systems that electronically link jurisdictions for sharing and using even more data to the benefit of the state, the motor carriers, and the public. The state has also set up the maintenance and support services necessary to help ensure continuity, and looks forward to expanding and improving its safety information exchange capabilities as future ITS funds become available.

According to Carolyn Temperine of FMCSA, the critical leadership of states such as Connecticut "has helped make the CVISN program a reality throughout the country."

When asked to predict the next steps in CVISN deployment in Connecticut and elsewhere, the DMV officials on the CVISN team foresee a number of CVO-related technology improvements on the horizon:

- An enhanced Mainline Automated Clearance System
- A single, universal in-vehicle transponder that is convenient to register and that is interoperable among states and among local toll authorities (highways, bridges, tunnels). An early example of this universal transponder capability is the BestPass program in the Northeast, offered through the New York State Motor Truck Association.
- Radiological sensors at weigh stations, to help in homeland defense
- Infrared technologies for detecting brake problems on trucks
- More accurate high-speed (mainline) weigh-in-motion systems
- Smart card technology to help identify individual drivers during inspections
- "Virtual" weigh and inspection stations, with in-ground or mobile facilities away from fixed-site weigh stations, for better enforcement of weight, size, and credentialing regulations. These are sometimes called "plug-and-run" facilities.

From the point of view of the Motor Transport Association of Connecticut, the greatest return on the state's investment in CVISN in the future would be an electronic permitting system for overdimension (OS/OW) vehicles. The state issues approximately 100,000 single-trip permits per year. An Internet-based, 24-hour service that motor carriers could use to apply for, pay for, and receive permits would help motor

carriers, whose variable working schedules often fall outside the state office's customer service hours. Such a system is currently under development in the state and is expected to be available in mid-2004.

Cambridge Systematics is working with CVISN/PRISM project staff and the state's motor carrier industry to offer carriers secure, convenient access to the electronic screening data (dates, times, places, results, etc.) for their own transponder-equipped vehicles, for the carriers to use in business and route planning and general fleet management.

Connecticut is one good example of advanced wireless technology being put to use improving motor carrier safety on the highways. The deployment promises to continue returning savings to the state, through less time spent on inspection tasks, greater concentration of effort devoted to inspecting potentially high-risk carriers, and better roadside access to the kinds of usable interstate data provided by CVISN partners.

References

U.S. DOT (2002). *Evaluation of the I-95 Commercial Vehicle Operations Roadside Safety and SAFER Data Mailbox Field Operational Tests*.
http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13787.html,
EDL #13787.

U.S. DOT (2002). *Evaluation of the Commercial Vehicle Information Systems and Networks (CVISN) Model Deployment Initiative.*
http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13677.html and
http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13699.pdf, EDL# 13677 and 13699.

Additional Resources

Connecticut Department of Motor Vehicles

Keith Kennedy
CVISN/PRISM Project Manager
Phone 860-263-5376
keith.kennedy@dmvct.org

LT. Rudolph Supina
CVISN/PRISM Screening and Clearance
Phone 860-263-5445
rudolph.supina@dmvct.org

Laurent (Bud) Roberts
CVISN/PRISM Roadside Information Exchange
Phone 860-263-5466
bud.roberts@dmvct.org

Dennis Walsh
CVISN/PRISM Management Coordinator
Phone 860-263-5486
dennis.walsh@dmvct.org

Motor Transport Association of Connecticut, Inc.

Michael Riley
President
Phone 860-520-4455
cttruck@aol.com

Cambridge Systematics, Inc.

Brad Wright
Vice President
Phone 617-354-0167
bwright@camsys.com

Federal Motor Carrier Safety Administration

Jeff Secrist
Phone 202-385-2367
jeff.secrist@fmcsa.dot.gov

Carolyn Temperine
Phone 518-431-4239 x270
Carolyn.Temperine@fmcsa.dot.gov

Federal Highway Administration Resource Center Locations

Baltimore, MD
10 S. Howard Street
Suite 4000
Baltimore, MD 21201
Phone 410-962-0093

Atlanta, GA
61 Forsyth Street, SW
Suite 17T26
Atlanta, GA 30303
Phone 404-562-3570

Olympia Fields, IL
19900 Governors Drive
Suite 301
Olympia Fields, IL 60461
Phone 708-283-3500

San Francisco, CA
201 Mission Street
Suite 2100
San Francisco, CA 94105
Phone 415-744-3102

Federal Motor Carrier Safety Administration Service Centers

Eastern Service Center
802 Cromwell Park Drive
Suite N
Glen Burnie, MD 21061
Phone 443-703-2240

Midwestern Service Center
19900 Governors Drive
Suite 210
Olympia Fields, IL 60461
Phone 708-283-3577

Southern Service Center
61 Forsyth Street, SW
Suite 17T75
Atlanta, GA 30303
Phone 404-562-3600

Western Service Center
201 Mission Street
Suite 2100
San Francisco, CA 94105
Phone 415-744-3088

This Document Is One in a Series of Products That Address ITS Issues Pertinent to a Variety of Audiences

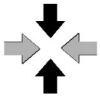
Elected and Appointed Officials • Senior Decision Makers
Transportation Managers • Technical Experts

Representing:

States • Cities • Counties • Motor Carriers
Licensing and Registration Service Bureaus • Law Enforcement
Public Utilities/Commercial Vehicle Enforcement
Additional Transportation Stakeholders

Products Available in This Series

Benefits Brochures quote how ITS technologies have benefited specific areas.



Cross-Cutting Studies present current data from related ITS applications.

Case Studies provide in-depth coverage of ITS applications in specific projects.

Technical Reports include results from various Field Operation Tests.

Implementation Guides assist project staff in the technical details of implementing ITS.

ITS Topics Addressed in This Series:

- Commercial Vehicle Operations
- Emergency Services
- Enabling Technologies
- Emissions Management
- Freeway and Arterial Management
- Planning and Integration
- Real-Time Traveler Information
- Transit, Toll, and Rail Management
- Weather Information for Travelers and Maintenance
- Work Zones

For a current listing of available documents, please visit our website at:
http://www.its.dot.gov

ITS Web Resources

ITS Joint Program Office:
http://www.its.dot.gov

ITS Cooperative Deployment Network (ICDN):
http://www.nawgits.com/jpo/icdn.html

ITS Electronic Document Library (EDL):
http://www.its.dot.gov/itsweb/welcome.htm

ITS Professional Capacity Building Program:
http://www.pcb.its.dot.gov

Federal Motor Carrier Safety Administration:
http://www.fmcsa.dot.gov

Intelligent Transportation Systems

U.S. Department of Transportation
400 7th Street SW
Washington, DC 20590

Federal Highway Administration
Room 3416, HOIT-01
Phone: 866-367-7487
Facsimile: 202-493-2027

Federal Motor Carrier Safety Administration
400 Virginia Avenue, Room 600, MC-RTT // M31200
Phone: 202-385-2367
Facsimile: 202-385-2422

FHWA-JPO-04-030 EDL# 13981 FMCSA-RT-04-002