Florida

Department of Transportation

Intelligent Transportation Systems Program

Annual Report

Fiscal Year 2011-2012

INSIDE

WELCOME

Florida Department of Transportation

RICK SCOTT
GOVERNOR

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ANANTH PRASAD, P.E.
SECRETARY

Dear Reader:

On behalf of the Florida Department of Transportation (FDOT) Intelligent Transportation Systems (ITS) Program, we are pleased to present this Annual Report for fiscal year 2011-2012. These past few years have challenged us to maximize our dollars in a soft economy and provide our traveling public with a safe transportation system that ensures "the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities."

This resonates in the Transportation Systems Management and Operations (TSM&O) Program, which will help us to address congestion and improve travel time reliability in the coming years. A relatively new program in Florida, FDOT established TSM&O as a program in 2010. Since then, we have worked actively to adopt, integrate, and implement TSM&O concepts and strategies, beginning with a deliberate planning process that builds on operational and management strategies already in place. More can be found on page 14 about TSM&O.

Florida 511 (FL511) advanced traveler information systems is undergoing change. Much has happened in the past year, which you can read about on page 16. Also, as covered in Delivering Florida's 511 on page 18, you can read about how FL511 is moving into the future by using our assets to offset costs.

Since its first release in 2005, SunGuide® software has evolved to stay current with changing technologies. This past fiscal year, a major improvement to SunGuide software was enabling it to support the connected vehicle initiative, which FDOT successfully demonstrated at the 18th World Congress on Intelligent Transport Systems (page 26). SunGuide software touches many aspects of the ITS Program. Articles relating to the software can be found throughout this annual report.

Speaking of connected vehicle, we successfully showcased its operation at the World Congress by collecting and archiving probe data from vehicles equipped with special devices, and we were able to send messages out to these specially equipped vehicles. Read about this exciting program on page 12.

The ITS Program's Telecommunications Program is also moving forward. Highlight articles in this annual report include information on satellite-based wind speed monitoring on bridges (page 28), the WiFi® mobile communications trailer (page 30), and ITS facility management (page 32).

Again this year, we have provided news from the Florida Traffic Incident Management and Commercial Vehicle Operations Programs (pages 38 and 40) as well as the Traffic Engineering Research Laboratory (page 35) in this report.

I hope this quick overview of the information provided in this annual report entices you to take more time to read about our accomplishments. We have a great program that we are excited to share with you!

Elizabeth Birriel

Elizabeth Birriel, PE
Deputy State Traffic Operations Engineer
ITS Program Manager
Florida Department of Transportation

VISION AND MISSION

FDOT's Vision

Serving the people of Florida by delivering a transportation system that is fatality and congestion free.

FDOT's Mission

Provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities.

FDOT's ITS Program

The ITS Program endeavors to provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities.

Area Descriptions and Major Accomplishments

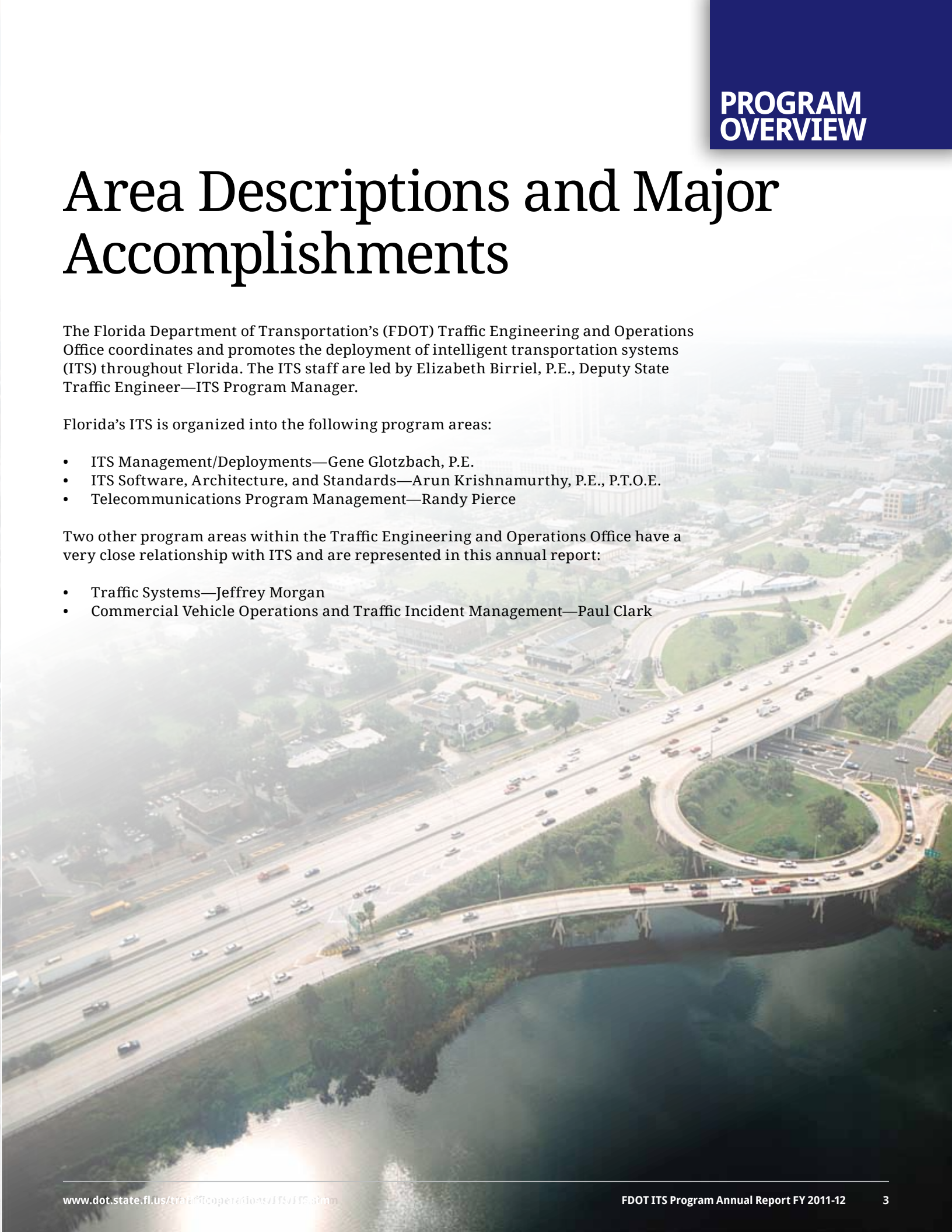
The Florida Department of Transportation's (FDOT) Traffic Engineering and Operations Office coordinates and promotes the deployment of intelligent transportation systems (ITS) throughout Florida. The ITS staff are led by Elizabeth Birriel, P.E., Deputy State Traffic Engineer—ITS Program Manager.

Florida's ITS is organized into the following program areas:

- ITS Management/Deployments—Gene Glotzbach, P.E.
- ITS Software, Architecture, and Standards—Arun Krishnamurthy, P.E., P.T.O.E.
- Telecommunications Program Management—Randy Pierce

Two other program areas within the Traffic Engineering and Operations Office have a very close relationship with ITS and are represented in this annual report:

- Traffic Systems—Jeffrey Morgan
- Commercial Vehicle Operations and Traffic Incident Management—Paul Clark



ITS Management/Deployments

Program Description

- Promote intelligent transportation systems (ITS) deployments on Florida's limited-access roadways.
- Deploy Florida's 511 (FL511) advanced traveler information systems.
- Manage the *Ten-Year ITS Cost Feasible Plan*.
- Develop supplemental data sources to support FL511 in rural areas.
- Support the I-95 Corridor Coalition through the Travel Information Services Program Track Committee.
- Support the National 511 Coalition Working Group.
- Develop opportunities to disseminate transit information to the public.
- Develop and update standards and specifications for ITS devices.
- Manage the ITS general consultant contract.
- Manage marketing efforts for FL511.
- Manage deployment of a video aggregation system to support the State's Emergency Operations Center.
- Support development of the Florida 511 Annual Progress Report and the ITS Program Annual Report.

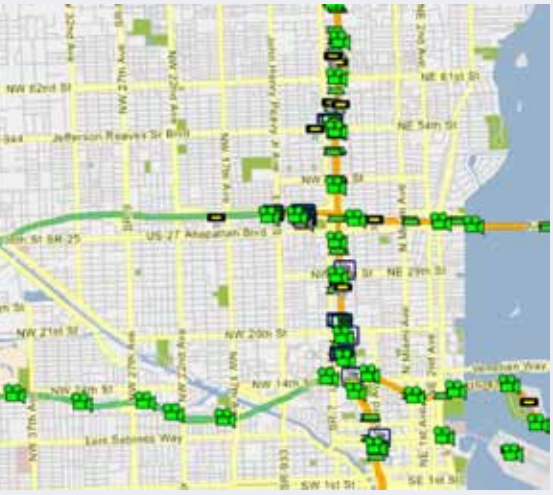
Major Accomplishments

- Updated the *Ten-Year ITS Cost Feasible Plan*.
- Updated the operations and equipment replacement information to allocate funds to the Districts for the operation of their transportation management centers and replacement of ageing equipment.
- Provided information on funding budgeted for the ITS Program for the next five-year work cycle to support development of the Florida Transportation Commission's annual report.
- Implemented enhancements to FL511 to provide a better user experience.
- Amended the contract to provide streaming video to the State Emergency Operations Center to support evacuations.
- Managed the marketing efforts for FL511 and developed the year's work plan.
- Provided an ITS Program exhibit at the 18th World Congress on Intelligent Transport Systems in Orlando.
- Deployed a connected vehicle demonstration project for the 18th World Congress on Intelligent Transport Systems.
- Negotiated and executed a contract to deliver a new traveler information system.
- Produced *Florida's 511 Progress Report for 2011—Building for the Future*.
- Extended the contract with the University of Maryland for traffic flow data on I-10 and the northern portion of I-75 for the use of INRIX data for the next year.
- Validated the accuracy of probe data provided by NavTeq and TrafficCast.
- Continued to provide support to District Traffic Operations and Work Program staffs to manage their portions of the *Ten-Year ITS Cost Feasible Plan*.
- Continued to support and provide quality assurance to the Traffic Engineering and Research Lab (TERL) and the ITS lab to test ITS equipment operability using the SunGuide® software.
- Continued to support the Change Management Board and process engineering change proposals.
- Continued to produce the *SunGuide Disseminator* (the Traffic Engineering and Operation's monthly newsletter).
- Continued to produce the ITS Program's annual report.
- Continued to develop ITS specifications and maintain existing specifications based on field experience with deploying various ITS devices (Sections 780 through 785).
- Performed technical reviews and provided support for project-specific requests related to specification modifications (modified special provisions).

ITS Software and Architecture

Program Description

- Manage the SunGuide® software development process, including support and maintenance of the software at transportation management centers (TMC).
- Manage the Florida Department of Transportation (FDOT) ramp metering firmware software used to control and monitor ramp meters.
- Manage the smart phone (Android™) application for Road Rangers used to collaborate with TMC personnel.
- Develop and maintain the Statewide ITS Architecture (SITSA) to promote an integrated ITS; assist in development of District, regional, and corridor ITS architectures to ensure SITSA conformance.
- Develop and promote the use of the systems engineering management and configuration management processes to the FDOT Districts.
- Coordinate ITS training to enhance the quality of the state's ITS workforce.
- Coordinate ITS research with the Districts to identify the needs, priorities, and applicability of emerging ITS concepts.
- Coordinate traffic operations and ITS support for public-private partnerships and managed lanes projects.



Major Accomplishments

- Conducted SunGuide software release 5.1 factory acceptance testing on August 2-5, 2011, for the connected vehicle software module.
- Conducted SunGuide software release 5.1 independent verification and validation in Orlando on August 24-26 and September 7-9, 2011, and in Tallahassee on August 29 to September 1, 2011. This software testing was primarily for the SunGuide software connected vehicle module.
- Demonstrated SunGuide software and the connected vehicle module at the 18th World Congress on Intelligent Transport Systems in Orlando in October 2011.
- Conducted software testing to confirm vendor product integration with SunGuide software for Activu video wall controllers on December 9, 2011, and the Wavetronix high definition driver on April 25, 2012.
- Developed the concept of operations and software requirements for SunGuide software release 6.0. This release will include Microsoft® SQL server compatibility, support color dynamic message signs (DMS), and will have the ability to schedule travel times on DMSs.
- Conducted SunGuide software design meetings in March and May 2012.
- Coordinated with Florida International University and University of Florida to assist with FDOT-sponsored research projects using SunGuide software.
- Supported the Districts with the creation and updates of various SunGuide software report templates.
- Developed and provided SunGuide software operator and administrator training at all Districts.
- Managed the legal protection of the SunGuide logo and the SunGuide software source code by registering it as a registered trademark with federal copyright.
- Maintained the SITSA and regional ITS architectures to promote integrated ITS.
- Coordinated with SunGuide users/members of the Change Management Board to ensure SunGuide continues to meet their needs through ongoing enhancement.
- Collaborated with the FDOT Planning Office to procure a central data warehouse system from the University of Maryland. This project kicked-off in May 2012.
- Coordinated with FDOT Districts to organize Federal Highway Administration training for systems engineering at three locations in Florida.

Telecommunications Program

Program Description

- Guide deployment of a communications backbone to serve ITS deployments on major corridors.
- Implement and manage the statewide ITS wide area network (WAN) to support ITS deployments.
- Manage the operations and maintenance program for the statewide ITS telecommunications network to support ITS deployments, motorist aid call boxes, and various ITS research and development initiatives.
- Manage all of the Florida Department of Transportation's (FDOT) Federal Communications Commission radio licenses (over 600 licenses).
- Manage the Wireless General Manager Agreement, a resource-sharing public/private partnership, which places commercial wireless carriers on FDOT rights-of-way with Lodestar/American Tower.
- Develop operations standards and equipment specifications to support District telecommunications initiatives in their ITS, Maintenance, and Traffic Incident Management programs.

Major Accomplishments

- Continued a project to expand the ITS WAN with a gigabit Ethernet connection between the FDOT Traffic Engineering Research Laboratory (TERL) and the State Emergency Operations Center (SEOC) in Tallahassee. The connection will support the SEOC with streaming video and data from the District regional transportation management center (RTMC) during emergency operations as needed over FDOT's private networks. The fiber optic connection will be provided by the City of Tallahassee traffic systems fiber infrastructure.
- Continued work to install the ITS WAN in Districts One and Seven. Optical path tests and performance parameter measurements are being made to assure reliable long-distance communications. Equipment installation and circuit activation are scheduled for early fiscal year 2012/2013.
- Connected the Florida Highway Patrol's computer-aided dispatch system, the Florida advanced traveler information system, and the video aggregation system with the ITS WAN. This allows FDOT to decommission leased telecommunications services where the ITS WAN is connected to RTMCs and provides associated cost savings.
- Connected the District Three Pensacola RTMC to the ITS WAN. The District Two RTMC will post District Three information to FL511 and operate District Three ITS devices overnight and on weekends when the District Three RTMC is not staffed.
- Continued implementation support of the ITS facility management (ITS-FM) system to better enable FDOT Districts to manage their overall telecommunications networks, field system configuration, and components.

- Developed ITS-FM software upgrade requirements to add new devices, features, and capabilities to the software. Byers Engineering is under contract to implement the modifications in early fiscal year 2012/2013.
- Supported District Six in collecting and populating all ITS facilities within the ITS-FM. This includes approximately 70 miles of fiber optic cable and conduit system, 70 miles of power distribution system, 75 wireless radio sites, and 500 ITS equipment sites. This work will fully implement the ITS-FM District-wide and will be completed after the software upgrade project. This effort was made possible through the use of District Six funds.
- Designed a 4.9 GHz wireless freeway management system (FMS) along I-75 north of Tampa for District Seven. This system consists of four closed-circuit television pole sites that are integrated into the statewide microwave system and transmitted to the Tampa Bay SunGuide® Center through the statewide telecommunications network infrastructure. Similar design efforts are underway for I-75 south of Tampa.
- Experienced a reduction of three wireless collocation subleases under the Lodestar/American Tower Wireless General Manager Agreement as a result of obsolescence of wireless paging technology. Five new wireless collocation subleases were added as a result of expansion of the wireless industry and deployment of wireless broadband technology.
- Completed a contract for deployment of permanent emergency generator power systems at the Caryville statewide ITS telecommunications network locations to provide continuity during power outages.
- Awarded a contract for deployment of additional permanent emergency generator power systems at the Madison, Marianna, and Quincy statewide ITS telecommunications network locations to provide continuity during power outages.
- Completed contract work for multicast repeater deployments for FDOT's radio system in Districts One, Five, and Seven.
- Procured 224 mobile radios in the second year of a five-year program to replace up to 2,570 mobile radios in FDOT's radio system. Districts are completing the installation of these mobile radios.
- Awarded a contract to erect a tower, recovered from another project in District Two, at the Perry maintenance site. The tower will house a multicast repeater for FDOT's radio system filling a gap in radio coverage.
- Trained District Five trainers in the operation of the new mobile radios and their operation in the new repeater network.
- Optimized Districts One and Seven wide area radio systems with new microwave technology, eliminating the need for dedicated telephone lines.
- Continued reporting weather data from eight field weather stations in continued support of the Federal Highway Administration's (FHWA) Clarus initiative, a program to provide information to all transportation managers and users to alleviate the effects of adverse weather (e.g., fatalities, injuries, and delays).
- Installed equipment and completed work on the Clarus Connection Incentive Program, an FHWA-funded grant, to provide weather observations and metadata to the Clarus system.
- Completed design work and awarded a contract for two ground stations for use in conjunction with the National Oceanic and Atmospheric Administration satellite-based "data collection service" to deliver bridge sensor data. District Two completed a contract for bridge wind speed sensor installation at various field locations.
- Maintained WiFi® internet access in four welcome centers, which has served over 115,000 users to date with an average of 500 log-in events per week.
- Deployed the WiFi internet access mobile trailer to the Plant City weigh-in-motion facility to investigate whether such locations could defer truck traffic from crowded rest areas.

Traffic Systems

Program Description

- Operate the Traffic Engineering Research Laboratory (TERL).
- Develop, maintain, update, and publish minimum specifications for traffic control signals and devices; evaluate and certify/approve these devices for use in Florida.
- Develop, implement, and maintain the Approved Product List (APL) vendor quality system program and product approval programs. These programs are used to list equipment on the Florida Department of Transportation's (FDOT) APL to ensure a uniform system of traffic control devices in Florida.
- Develop, update, and support standard specifications, standard drawings, and payment methods for traffic control device installations.
- Provide testing, verification, and validation services for ongoing development of the FDOT SunGuide® software, Florida's advanced traveler information system, and other statewide transportation software and system applications.
- Provide support services and infrastructure for intelligent transportation systems (ITS) telecommunications and central data warehouse functions.
- Provide technical assistance and training relating to the design, implementation, and operation of traffic control signals and devices used in Florida.
- Provide statewide specifications and standards support for red-light running camera equipment and testing.
- Represent Florida on national technical advisory groups that develop traffic control and ITS device standards.
- Maintain and update traffic operations asset inventory.

Major Accomplishments

- Maintained the statewide APL vendor quality system program to evaluate traffic control signal and device manufacturers requesting listing of their products on the APL – accepted 25, seven of which were part of the Quality Product List to APL transition, and six were re-accepted manufacturers.
- Maintained a statewide APL product approval program to certify/approve traffic control signals and devices used in Florida – reviewed 187 request for product consideration forms, reviewed 110 APL applications and approved over 30 new products.
- Developed and updated multiple FDOT contract documents, including updates to 11 installation and equipment specifications for the *FDOT Standard Specifications for Road and Bridge Construction* (*SSRBC*).
- Performed content review, updated, and published 15 specifications for inclusion in the FDOT *Minimum Specifications for Traffic Control Signals and Devices* (*MSTCSD*).
- Established and implemented revision control and document routing system for TERL-authored FDOT requirements (*SSRBC* and *MSTCSD*) using Microsoft® SharePoint system.
- Revised the FDOT specifications for dynamic message signs to incorporate minimum requirements for color signs and allow use of graphics and various types of sign housing designs.
- Tracked and addressed nonconformance reports received from end-users and issued corrective actions to APL vendors.
- Coordinated statewide submittal reviews and structural approvals for red light running cameras.
- Performed end-to-end system testing of various SunGuide software components, interfaces, and field devices, including independent verification and validation testing.
- Represented the American Association of State Highway and Transportation Officials on the Joint Committee on the National Transportation Communications for ITS Protocol (NTCIP) and the NTCIP DMS Working Group regarding the development and deployment of NTCIP requirements for traffic control signals and devices.
- Developed and implemented operational processes and procedures to increase the TERL efficiency, using the International Organization for Standardization guidelines for product certification bodies.
- Managed and/or supported research projects for the following subjects:
  - Development of automated testing tools for traffic control signals and devices;
  - Managed lanes operations, including time-of-day versus dynamic pricing;
  - Human factors research, regarding pedestrian buttons, illuminated street name signs, DMS character sizes, and additional traffic signal heads; and
  - Hurricane survivability of traffic signal attachment hardware.

Commercial Vehicle Operations

Program Description

- Promote commercial motor vehicle safety as it relates to commercial vehicle operators as well as the traveling public.
- Chair and manage the Commercial Motor Vehicle Review Board representing the Florida Department of Transportation (FDOT) Secretary as required by the Florida Administrative Code.
- Manage Florida's Commercial Vehicle Information Systems and Networks (CVISN) program, a nationwide program under the direction of the Federal Motor Carrier Safety Administration, by focusing on safety enforcement resources on high-risk commercial operators; integrating federal and state regulatory systems to improve access to, and verification of, operating credentials; improving efficiency through electronic screening of commercial motor vehicles; and enabling online application and issuance of operating credentials.

Major Accomplishments

- Continued the research project for truck parking at rest areas and weigh stations throughout the state. Also deployed a truck parking monitoring system at the I-10 Leon County east and west bound rest areas.
- Continued working with the FDOT Maintenance Office on modifying Florida's overweight and over-dimensional permitting system, known as PAS.
- Completed modifications to Florida's Electronic Freight Theft Management System in cooperation with Florida Highway Patrol.
- Started developing Florida's commercial vehicle container number database system for tracking container/vehicle movements and presenting this data graphically. Ancillary data will include location of container and time-stamp.
- Started a port of entry study to investigate the feasibility of adding additional credentialing capability to the online e-credentialing system at certain commercial vehicle weigh stations.

TIM

Traffic Incident Management

Program Description

- Provide technical support and assistance to the Florida Deprtment of Transportation's (FDOT) District Offices and other partners in regards to traffic incident management (TIM).
- Develop policies and procedures for FDOT's Road Ranger and Rapid Incident Scene Clearance (RISC) Programs.
- Support the I-95 Corridor Coalition's Incident Management track.
- Assist the State Emergency Operations Center with evacuation management.
- Collect TIM- related data to determine areas of improvement for future planning.

Major Accomplishments

- Prepared and published the RISC Annual Report – August 2011.
- Prepared and published the Road Ranger Comment Card Annual Report - September 2011.
- Facilitated/participated in the Federal Highway Administration Executive Traffic Incident Management workshop in Tallahassee, Florida, on May 17, 2012.
- Completed the Road Ranger cost benefit analysis research project – January 2012.
- Prepared the third Annual Road Ranger Responder Survey.
- Supported the www.FloridaTIM.com web site.
- Enhanced outreach to District TIM programs – ongoing, bi-monthly video conferences.
- Continued deployment of the Statewide Law Enforcement Radio System with ongoing training and support to the Districts.
- Coordinate the revision and updating of the *Open Roads Policy*, in cooperation with the Florida Highway Patrol.

Ten-Year ITS Cost Feasible Plan

Reaching Completion

By Gene Glotzbach, FDOT

The Florida Department of Transportation (FDOT) has been very busy over the last ten years deploying intelligent transportation systems (ITS) projects around the state. Every FDOT District has deployed ITS and established a regional transportation management center (TMC) from which their limited-access facilities are managed. FDOT's ITS Program received an initial shot of funds, as recommended in the *ITS Strategic Plan* and approved by the Executive Board, to deploy ITS statewide. The initial amount of funds allocated to deploy ITS was $496 million and was distributed to Districts in accordance with the *Ten-Year ITS Cost Feasible Plan*, developed in 2002.

Prior to development of the *ITS Strategic Plan* and allocation of funds by the Executive Board, Districts utilize their own funds to deploy ITS. These funds had to compete with funding for other programs and construction projects. Districts in northeast, central, and south Florida managed to carve out funding to deploy ITS on I-10 in Jacksonville, I-4 in Orlando, and I-95 in Miami, respectively. These deployments were managed out of makeshift control rooms in existing facilities. In addition, Florida's Turnpike Enterprise did not received any funds from the *Ten-Year ITS Cost Feasible Plan* and have utilized their own funds to deployed ITS on their roadways.

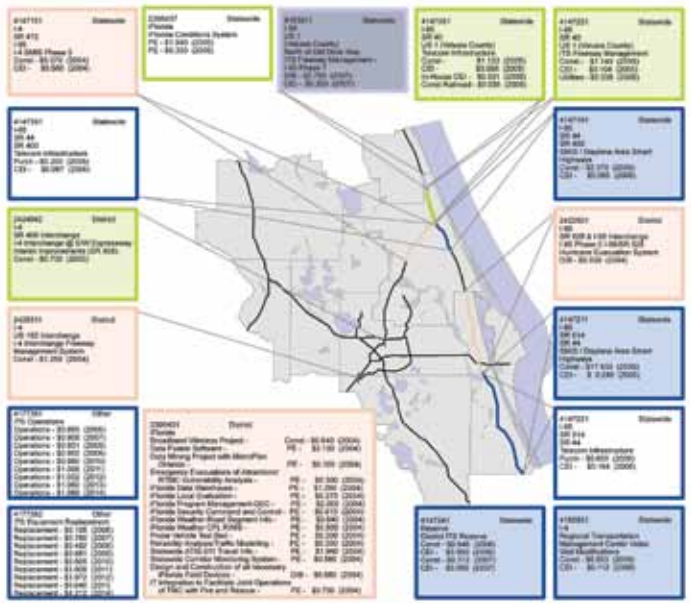
Once the dedicated funds were allocated for the ITS deployment and the *Ten-Year ITS Cost Feasible Plan* was finalized and approved by the Executive Board, funds were provided to the Districts and ITS deployments in Florida really accelerated. Florida became the state to which others looked as an example of the best.

The deployment of projects slated for current fiscal year letting will bring Florida to an approximate 80 percent completion of projects listed in the *Ten-Year ITS Cost Feasible Plan*. Projects currently on the table in Jacksonville, Tallahassee, and southwest Florida will build out FDOT's ITS deployment in those areas. FDOT has made significant strides in the build-out of ITS in the Tampa Bay area, but due to the downturn in the economy and the loss of funds from a reduction in revenue, Tampa Bay was hit the hardest. Although the loss of funds slated for Tampa Bay was minimized, the result of the reduction in revenue was that projects had to be pushed farther out in the work program, where funds were available.

Districts in central and southeast Florida have built out ITS utilizing their allotment of funds from the *Ten-Year ITS Cost Feasible Plan*. As a matter of fact, these District have also used District-allocated funds to expand their ITS beyond what was allocated through the *Ten-Year ITS Cost Feasible Plan*.

In addition to the deployment of ITS equipment and devices along our limited-access facilities, the *Ten-Year ITS Cost Feasible Plan* supports the deployment and maintenance of the SunGuide® software, Florida's statewide transportation management software, which TMC operators use to monitor and manage traffic. Additionally, the *Ten-Year ITS Cost Feasible Plan* also helped support the deployment of regional and statewide 511 traveler information systems as well as improvements to the Traffic Engineering Research Lab, which houses a one-of-its-kind facility for testing ITS devices and equipment.

Although not technically a part of the *Ten-Year ITS Cost Feasible Plan*, funds have been allocated to support TMC operations and to replace equipment that has reached the end of its useful life. These funds are tracked separately, but are directly related to the Districts ability to operate their limited-access facilities. Together with the *Ten-Year ITS Cost Feasible Plan* funds, the operations and equipment replacement funds are major components of FDOT's ITS Program.



Florida's Connected Vehicle Effort

Making the Most of Multi-modal, Transformational Applications

By Elizabeth Birriel, FDOT, and Stephen Novosad, Atkins

In the early to mid 2000s, the United States Department of Transportation (USDOT) began a research initiative focused on vehicles communicating with vehicles and vehicles communicating bi-directionally with infrastructure. This initiative was known as the vehicle integration initiative (VII). Over the last seven years, VII underwent many modifications and enhancements to emerge as what it is today—connected vehicle.

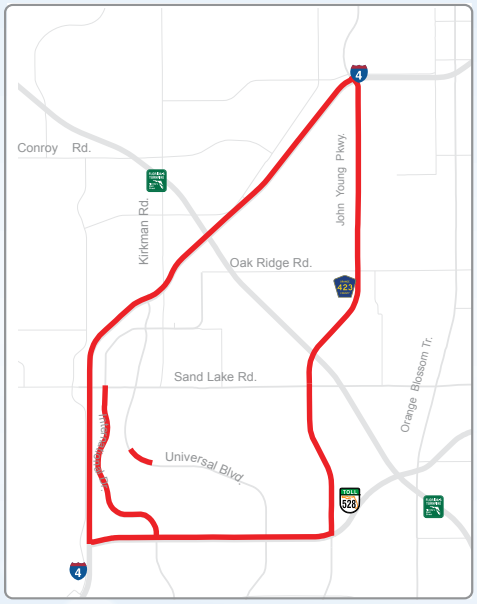
The goal of today's connected vehicle program is the development and deployment of a fully connected transportation system that makes the most of multi-modal, transformational applications and requires a robust, underlying technological platform. The platform is a combination of well-defined technologies, interfaces, and processes that, combined, ensures safe, stable, interoperable, reliable system operations to minimize risk and maximize opportunities.

The goal of today's connected vehicle program is to develop and deploy a fully connected transportation system that makes the most of multi-modal, transformational applications and requires a robust, underlying technological platform.

When Orlando was announced as the host city for the 2011 World Congress on Intelligent Transport Systems (World Congress), the Florida Department of Transportation (FDOT) began planning for a connected vehicle deployment unlike any other in the country. All other connected vehicle deployments are considered test beds, where devices and applications can be tested. FDOT's connected vehicle deployment used communications between vehicles and FDOT District Five's regional transportation management center (RTMC) as part of the District's production RTMC activities.

One of the highlights of the World Congress was the technology showcase that featured over 26 demonstrations of varying connected vehicle technology and applications. FDOT played significant roles in the technology showcase by coordinating the connected vehicle activities including:

- Installation and maintenance of roadside equipment (RSE);
- Installation of the vehicle awareness devices in Lynx transit vehicles, I-Ride Trolleys, FDOT maintenance vehicles, and technology showcase demonstrator vehicles;
- Implementation and installation of the SunGuide® software, FDOT's statewide advancement transportation management software, including a connected vehicle subsystem;
- Integration and testing of the connected vehicle systems; and
- Operation and support of the connected vehicle systems for the duration of the World Congress.



During the year prior to the World Congress, FDOT enhanced the SunGuide software, enabling it to integrate with connected vehicle technology. The enhancement included collecting and archiving probe data from vehicles equipped with vehicle awareness devices and on-board equipment (OBE) as well as sending traveler advisory messages to OBE-equipped vehicles. The software integrated these components into the existing paradigm of traffic management and operations, integrating the probe data into the existing traffic data subsystem and the traveler advisory messages into the existing event management subsystem whereby these messages are automatically recommended for dissemination in response to events already entered into the system.

Twenty-eight RSE devices, functioning as hotspots connecting FDOT's intelligent transportation systems network via fiber and the vehicles via digital short-range communications (DSRC) 5.9 GHz channel, were deployed in the region surrounding the convention center. The RSE units were deployed by FDOT District Five and integrated into the SunGuide software, the first transportation management software in the nation to integrate connected vehicle technology. These RSE units were deployed in a demonstration loop along Interstate-4, State Road 528, International Drive, John Young Parkway, and Universal Boulevard. There were 11 RSE units on I-4, eight along International Drive, and three on John Young Parkway that were configured for and integrated with the SunGuide software.

Vehicle awareness devices installed in vehicles sent probe data through the RSE units, which was then forwarded to SunGuide software. These vehicle awareness devices contain a DSRC 5.9 GHz radio for communications with the RSE units as well as a global positioning system receiver used to generate probe data. The generated probe data contained the latitude, longitude, heading, and a timestamp. This data was packaged into what is known as a basic safety message. These messages were broadcast from each vehicle ten times per second. FDOT deployed 42 vehicle awareness devices for the World Congress on vehicles that regularly drove the demonstration route providing data to the SunGuide software. Through the use of these equipped vehicles and the RSE units, SunGuide software captured over nine million probe data records during the World Congress.

Since the conclusion of the World Congress, FDOT has continued to operate and maintain the connected vehicle infrastructure and vehicle awareness devices. FDOT has expanded the number of FDOT vehicles equipped with vehicle awareness devices and has extended the agreements with Lynx and I-Ride Trolley to continue to operate the vehicle awareness devices.

FDOT is currently working with USDOT to establish a memorandum of understanding to share the connected vehicle data, which has been archived as well as the data that is currently being generated. FDOT is developing a five-year vision for its connected vehicle program. Expanding the Orlando deployment, deploying connected vehicle technology in other strategic locations throughout the state, solidifying the USDOT relationship, creating a mobility test bed, and preparing to compete for USDOT-funded regional model deployments are all being considered as part of FDOT's connected vehicle future.

Embracing TSM&O

Managing and Operating for an Efficient Transportation System

By Elizabeth Birriel, FDOT, and Ingrid Birenbaum, Atkins

The Florida Department of Transportation (FDOT) has embraced the concept of transportation systems management and operations (TSM&O), a systemic approach to manage congestion and maximize transportation network operations. Rather than depending solely on traditional capacity projects, which add lane miles, TSM&O addresses congestion and improved travel time reliability by making efficient and effective use of existing transportation assets. Key TSM&O components include:

- A strategic multi-modal focus,
- Application of technology solutions,
- Cost-benefit analyses, and
- Performance measurement.

This operations-focused program made many forward strides in Florida during fiscal year 2011-2012.

FDOT's Executive Board formally endorsed TSM&O as a program in 2010, and initial efforts focused on strategic planning. The TSM&O *Strategic Plan* was finalized in March 2012. It presents a high-level structure for maintaining the TSM&O Program by encompassing a wide variety of functions and operations solutions available within FDOT, spanning planning and development, construction, systems operations, and maintenance. When combined with FDOT's TSM&O *Tier 2 Business Plan*, which identifies activities, performance indicators, targets, progress, and responsibilities, these two documents ensure that TSM&O implementation of operational solutions occurs concurrently throughout FDOT's different processes. The *Strategic Plan* provides a three-year timeline to implement recommended actions with assigned responsibilities. It also describes example activities and actions needed to deploy TSM&O, including:

Current

- Ramp signals – regulate traffic flow entering highway
- Advanced traffic management systems – enhance signal coordination
- Managed lanes – manage roadways in response to changing conditions
- Incident management, including use of rapid incident scene clearance and severe incident response vehicle – provide quick, safe clearance of incidents on roadway through performance-based contracts
- Traveler information – provide real-time information to travelers
- Arterial management – manage traffic on arterial roadways
- Traffic responsive signals – accommodate demand fluctuations
- Work zone traffic management – provide better traffic flow
- Weather information – provide weather observations to travelers

Future

- Active traffic management – dynamically manage traffic flow and provide information using intelligent transportation systems
- Vehicle miles traveled – estimate congestion, air quality, and potential gas tax revenues

Performance measurement is critical to TSM&O. The TSM&O Task Team created a draft dashboard that highlights system performance elements that are important to external and internal users. External elements include mobility, incident clearance, and incident duration. Internal elements focus on organizational performance, including cost-benefit and District involvement. System performance relates to travel time reliability, incident durations, and other metrics that are used to describe how well the transportation network is performing; information that is valuable both internally and externally. Organizational performance looks at activities such as outreach efforts, business plan development, policy/procedure amendment, and cost-benefit of operations and maintenance. These are excellent internal indicators of progress. The dashboard is still under development as data sources and appropriateness of displayed measures are evaluated; it will be completed in the next fiscal year.

As they go through their regular review/amendment cycles, policies, procedures, guidelines, and manuals are being reviewed and revised to include language on how TSM&O integration should be accomplished. As each item comes up for review, TSM&O Task Team members review items for inclusion of TSM&O language.

Finally, the latter half of the fiscal year was spent planning and holding District TSM&O workshops, which provided executive-style briefings, staff-level discussions, and District-specific exercises to assist in beginning or continuing TSM&O activities. Each workshop was tailored to District-specific needs. Additionally, participants varied from one location to the next: some were all FDOT, and others included external TSM&O stakeholder agencies. By the end of June, seven of eight workshops were held with the last planned towards the end of summer. The workshops will be followed by a statewide workshop in the next fiscal year; future workshops are planned to be held biennially to introduce new staff and stakeholders to FDOT's TSM&O Program.

These combined actions have built on FDOT's strategic approach to implementing TSM&O, a program that builds on FDOT's performance-driven approach to systems management.

System performance relates to travel time reliability, incident durations, and other metrics that are used to describe how well the transportation network is performing

TSM&O
Transportation Systems Management & Operations
Managing and Operating for an Efficient Transportation System

Organizational performance looks at activities such as outreach efforts, business plan development, policy/procedure amendment, and cost/benefit of operations and maintenance; these are excellent internal indicators of progress.

Florida 511

What's Happened During the Past Year?

By Gene Glotzbach, FDOT

Florida's traveler information system, known as FL511, has seen substantial change since June 2011. The greatest change was the addition of a mobile application (app) for the iPhone, iPad, and iPod touch, allowing users to get traveler information on these devices. This app went public in June 2011, and provides the same real-time traffic information as the 511 dialing code. This is an improvement over the 511 dialing code in that users of the mobile app don't need to make a phone call; the app reaches out to the user to alert them of any issues near their location.

The app uses the mobile device's global positioning system to provide information that is near the user. Drivers can set the app to provide information within a range of up to 200 miles. When a user gets within a pre-set range of an incident, the mobile app sends the user a notification. The app provides real-time traffic information in three different ways: an audible alert, an on-screen list, and a map. Users can also manually search for traffic information, much like the FL511.com web site.

Since its launch, a feature was added to the app that allows a user to also view images from a camera nearby an incident. This feature was added in August 2011 to allow users to better assess the impact of an incident by providing a view of the problem and the associated traffic backup.

Another major change to FL511 was the addition of 12 Twitter accounts. Traffic information from around the state is now available to the public by following FL511 on Twitter. The Twitter accounts are set up similar to the FL511.com web site. There are accounts for six regions in the state and a statewide account; there are also accounts for

Florida's interstate facilities and Florida's Turnpike Enterprise. Twitter accounts are available from the FL511 home page at FL511.com by selecting the Twitter icon at the bottom right corner of the page.

Other improvements have been implemented in the past fiscal year that affect the FL511 operation and provide a better experience for users. From feedback provided by system users, coupled with information from bi-annually conducted tuning reports, a number of system tweaks have been made to provide better recognition of user commands. As patterns of system misuse have emerged, modifications have been made to the call flows and grammars to enable the FL511 system to better recognize a caller's intended request and provide the correct information back to the caller. One such modification was to accept commands that a caller would string together, such as providing a roadway and a county in one strung-together command. Previously, this type of command would invariably send FL511 into an error-handling mode, which was very frustrating to the caller. Since the modification, FL511 now accepts these strung-together commands and treats the call as if only the roadway was requested.

An additional improvement was implemented in October 2011, which allows operators at Florida's transportation management centers to enter unconfirmed event. This allows FL511 to get information out to the public quicker. The operator can post an event, if they are reasonably sure that the event has happened, while they are still going through the verification process. The event will go out with an unconfirmed tag to alert users of a possible problem. Once the event is confirmed, the operator pulls the unconfirmed tag off the event description.

The Florida Department of Transportation (FDOT), through its various contractors and consultants, continues to monitor system feedback to see where improvements are needed. From the results of the user feedback, combined with the results from tuning reports, the system vendor is able to make modifications to FL511 to provide a better user experience. The effort to monitor feedback and conduct tuning exercises has been a valuable tool in FDOT's effort to continuously improve the system.

Watch for an improvement near you.

Examples of the views available from the mobile app for the iPhone, iPad, and iPod touch.

Delivering Florida's 511

Offsetting Costs by Using FDOT Assets

By Gene Glotzbach, FDOT

In fiscal year 2011-2012, the Florida Department of Transportation (FDOT) made a decision to pursue revenue generation to offset costs for a new traveler information system intended for launch in 2013. The contractor selected to deliver the new traveler information system has proposed a comprehensive approach to generating revenue using FDOT assets. Although the idea of revenue generation is relatively new, the concept seems to be picking up steam around the country.

Revenue generation is not new to FDOT's contractor team, who were assembled to deliver the new traveler information system. Team members have experience in Georgia, where they have been utilizing a revenue generation model to provide funds to support the operation of Georgia's 511 traveler information system for the past couple of years.

The team's experience gained in Georgia will provide a running start for FDOT's revenue generation efforts. The team has proposed the following approaches to revenue generation:

1. Sponsorship on 511 phone system,
2. Banner messages on web site,
3. Skyscraper ads on web site,
4. Sponsorships on 511 roadside signs,
5. Couponing,
6. Nearby services, and
7. Sponsorship messages on mobile devices.

For a small fee, companies can get their sponsorship messages on the 511 phone system and the FL511.com web site. Sponsorship messages on the 511 phone system would be part of the opening greeting with a quick reference to the sponsor. Banner messages would appear at the top of the web site page and could appear on multiple pages. In addition, skyscraper ads, which are very tall banner-type ads, could appear on the right side of the web page. Sponsorships and advertisements on the 511 phone system and web site can be delivered through a method called a carousel where different messages appear on different pages.

Sponsorships on 511 roadside signs, couponing, and provision of nearby services show the most promise for generating significant amounts of revenue. Adding a small panel below the 511 roadside sign provides the opportunity to get a sponsorship message out to a large number of people. In larger urban areas, roadway

facilities can carry in excess of 100,000 vehicles a day, making the roadside signs very attractive for companies wishing to put their name in front of the public. The cost for a sponsorship panel would vary, depending on the average daily traffic passing a sign, with signs in larger urban areas commanding a greater amount of money.

Couponing allows a company to pay a fee to have an electronic coupon displayed on a mobile device. The coupon provides a discount for a product or service in real-time, based on the traveler's location, making the information relevant to the traveler. Nearby service information is similar to couponing; rather than providing a coupon for a product or service, information on service availability is provided to the traveler based on their location. The nearby service feature provides an alternative to the logo sign panel found prior to an interchange, particularly when the panel is full. The static logo sign panel can only hold six logos, whereas the nearby service feature, is theoretically limitless. Companies would pay to have their information provided to the traveler as the traveler approaches an interchange where the company's services are located.

Mobile applications, such as the current iPhone application, can support sponsorship messages or a small advertisement as well. Mobile applications are becoming increasingly popular with the public and more attractive to companies for sponsorship messages or advertisements. Some revenue can be generated through the sale of space and time on mobile applications.

The amount of revenue that can be generated is directly related to the popularity of the traveler information system. For a revenue generation program to be successful and maximize the revenue that can be brought into FDOT, the system has to be utilized. It cannot be overstated that a good marketing effort has to be implemented in parallel with the revenue generation effort. In order for revenue generation to be successful, the traveling public needs to know about the traveler information system and find it useful to maximize the amount of revenue that can be generated.

Evaluating Third-Party Travel Time Data

Obtaining Travel Time Data in Rural Areas

By Gene Glotzbach, FDOT

The Florida Department of Transportation (FDOT) desires a cost-effective method of receiving current traffic information, particularly travel time information, on major portions of the interstate and state road networks throughout Florida. Deploying traditional intelligent transportation systems roadside equipment to gather traffic information for roadways in many rural areas of the state is currently impractical and cost-prohibitive. One alternative to deploying the roadside equipment needed to produce travel time data is to subscribe to travel time data from commercial data providers. In 2011, FDOT approached two commercial data providers with a desire to receive their travel time data on a trial basis. This provided FDOT the unique opportunity to test commercial travel time data from two vendors simultaneously.

Commercial traffic and travel time data is now available from a number of private companies, which can mitigate the need for agencies to deploy and maintain communications infrastructure, vehicle detectors, and other equipment necessary to gather traffic data. This travel time data, which is sold to agencies on a subscription basis, is typically collected from various sources, such as mobile global positioning systems (GPS) on fleet vehicles, or wireless communications devices carried on-person by the public at large.

The potential use of commercial travel time data along rural interstates, rural and urban non-interstate highways, and urban arterial roads is particularly attractive since these facilities rarely include traditional roadside sensors. The Tallahassee area in FDOT District Three provided a good environment to evaluate the effectiveness of the commercial travel time data supplied by NAVTEQ and TrafficCast. This area includes both urban and rural segments of I-10, urban and rural non-interstate highway segments, and arterials. INRIX currently provides travel times/speeds to FDOT through the use of probe data on I-10.

NAVTEQ and TrafficCast data were compared against other data sources for selected roadways in the Tallahassee area. Data for comparison included “ground truth” data from drive tests along selected road segments from four FDOT-provided probe vehicles, travel time data generated from roadside sensors by SunGuide® software (Florida’s statewide advanced traffic management software), travel time data from INRIX, and test data provided by NAVTEQ and TrafficCast.

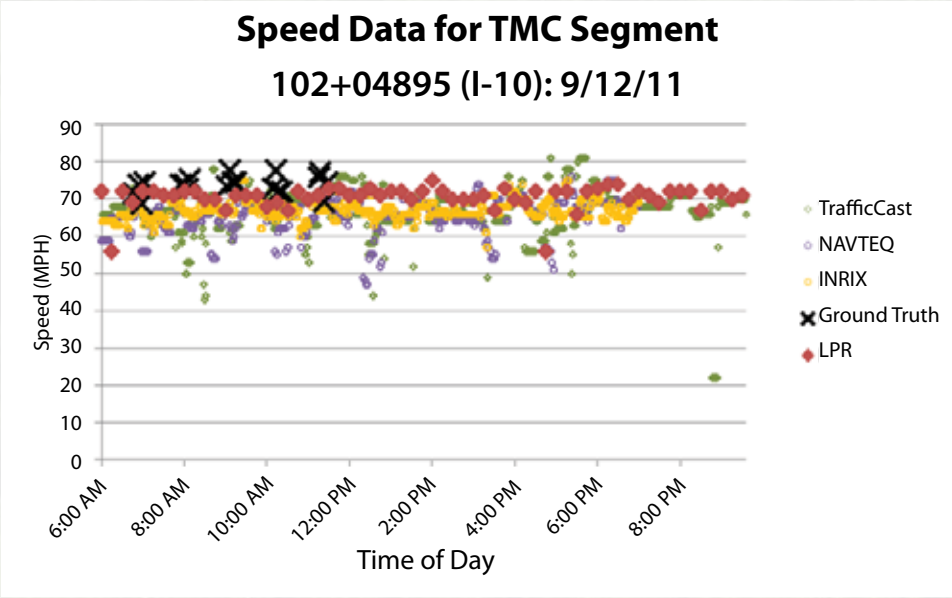
Data was analysed for the tested roadway segments over a four-day period on September 12-15, 2011. During the same four-day period, FDOT drivers traveled these roadway segments and provided floating car travel time data for data comparison. The data for the test was collected along four separate routes:

- I-10, including the length of road in FDOT District Three between Exits 192 and 209, consisting of approximately 20 miles.

- US 27 from downtown Tallahassee (South Pensacola Street) to the Georgia state line, consisting of approximately 18 miles.
- US 319 from Capital Circle to the Georgia state line, consisting of approximately 13 miles.
- Capital Circle from US 319 to West Orange Avenue, consisting of approximately 16 miles.

Ground truth data was obtained using vehicles equipped with GPS loggers that traveled each of the four routes during peak and off-peak conditions. These vehicles were driven along the test routes at speeds representative of the surrounding traffic, following the floating car methodology specified in FDOT's *Manual on Uniform Traffic Studies*.

The goal of this data analysis was to evaluate the data based on several factors. For the data to be trustworthy, it not only needed to be accurate at a given point in time, but it also needed to be consistent over time. This called for a series of quantitative and qualitative methods. Quantitative comparisons of the vendor data to floating vehicle ground truth tests identified the accuracy of each vendor's data in both peak and off-peak conditions. Other qualitative metrics were used to identify the reliability of data over time and spot potential issues with data refresh intervals.



The Speed Data for TMC Segment figure provides an example of typical speed data reported for a typical traffic message channel (TMC) segment on I-10. The three vendor data sources were fairly consistent with each other and with the spread of ground truth speeds that were recorded. The data set labeled "LPR" (license plate reader) represents speeds obtained from FDOT's existing travel time sensors on this stretch of I-10.

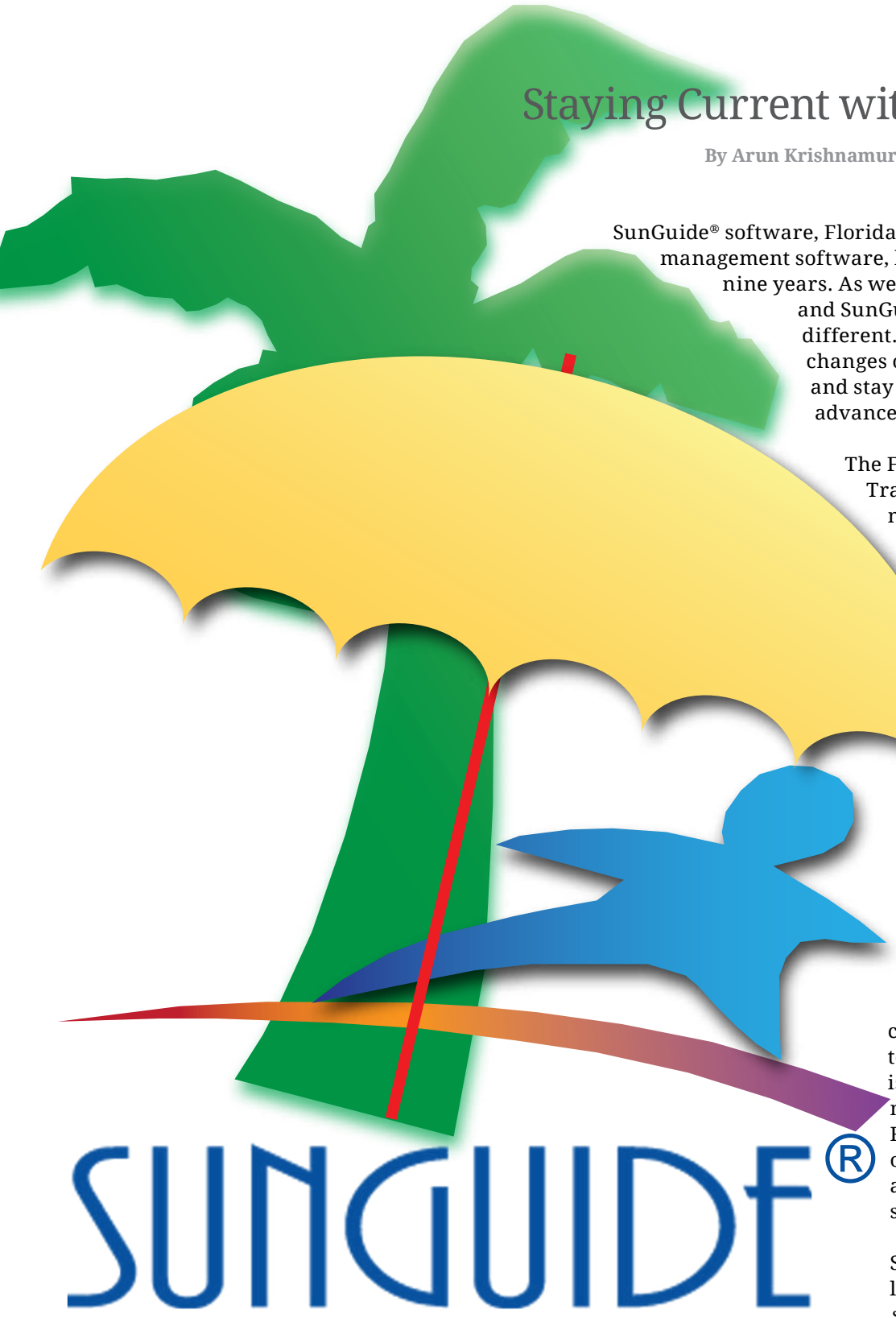
Some of the routes spanned heavily-signalized urban arterials, which created high variability on some of the associated TMC location segments. This variability was confirmed in the corresponding ground-truth readings as well. When consecutive TMC segments were combined into longer urban segments, the variability in the average speed was noticeably reduced. This reduction in variability makes intuitive sense when driving along a signalized arterial, particularly during coordination when some platoons of vehicles travel within the green band and others don't. These characteristics tend to even out the overall average speed over a long segment.

When the aggregated data metrics were compared, very little difference between the travel time accuracy of NAVTEQ, TrafficCast, and INRIX data was observed. Care should be taken before applying these results to other locations, as the quality of the underlying travel time data may differ by region, depending on the data coverage of each provider and their sources. For this reason, it is important for agencies to evaluate third-party data before purchasing, either by performing a test similar to the one above or by utilizing Bluetooth readers over an established corridor, as others have done. Understanding how data accuracy compares between vendors in a region makes an agency a more informed customer and better able to select an appropriate vendor to provide the right balance of price and accuracy.

Under the SunGuide® Software Umbrella

Staying Current with Advancements

By Arun Krishnamurthy, FDOT, and Clay Packard, Atkins



SunGuide® software, Florida's statewide advanced traffic management software, has evolved over the past nine years. As we know, change is inevitable and SunGuide software has been no different. The software has undergone changes over time to meet users' needs and stay current with technological advancements.

The Florida Department of Transportation (FDOT) makes modifications to SunGuide software based on input or feedback from stakeholders. These modifications typically range from need for support of new devices, to improvements in user functionality, to modifications to user interface. Typically, FDOT receives several modification requests; therefore, it is critical to prioritize the requests. FDOT carefully reviews each request, which are then reviewed by the Change Management Board (CMB). The CMB meets quarterly to discuss changes that need approval prior to implementation. Each change is vetted before a decision is made. Once a change is approved, FDOT goes through the process of prioritizing the change and allocating it to an upcoming software release.

SunGuide software is currently looking at release 6.0, which is scheduled for release in early 2013. This release includes some significant enhancements and some minor defect fixes.

One key enhancement being pursued is support for color dynamic message signs (DMS) within SunGuide software. Color DMSs are becoming popular in Florida as they offer increased ease of message recognition and the ability to convey information using pictures that traditionally cannot be conveyed due to space restrictions. This enhancement will include compliance with the most recent version of National Transportation Communications for ITS Protocol (NTCIP) standard. SunGuide software is currently compliant with the earlier version of NTCIP, which was used by amber DMSs. As the message template on the color DMS can be different from the amber DMS when pictures are included in the message, so the software will be enhanced to support creating color DMS templates for commonly occurring event types. This will help transportation management center (TMC) operators, as they would not have to design messages for each event, allowing quicker information dissemination.

Another planned modification is to add support for Microsoft® SQL Server 2012. Currently, SunGuide software supports only one database product, Oracle. Several SunGuide software users are embracing the concept of having the freedom to choose a database platform, rather than being limited in their options. This is also in alignment with FDOT's vision to be vendor agnostic, as long as the product meets FDOT's needs. To add this support, the business logic will be removed from the database and will be implemented in the SunGuide software. This will make it much easier to maintain support for multiple database products by simplifying the scope of the database to storing data and not executing business logic. Thus, the business logic currently embedded in the database will be removed, rather than duplicating it into the new database product being supported, which will make it easier to add support to another database engine in the future.

FDOT is also planning on tackling travel time scheduling for DMSs. TMC operators post travel time by default if no other information is available to be posted. The Federal Highway Administration also requires that the travel time be the default message on the signs unless more critical information is available. As FDOT has several hundred signs on its limited-access facilities, the scheduling feature needs to be comprehensive to accommodate the ability to schedule for travel times on all DMSs. This enhancement of overhauling the scheduling feature within the software will not only include travel time scheduling, but also scheduling of camera tours.

This is just a glimpse in the future of software modifications currently being worked on. As we discussed, the software undergoes careful review before new changes are approved. These changes are a critical aspect of the software development and maintenance process. FDOT will continue to maintain the software and ensure that it meets Florida's traffic management needs.

Central Data Warehouse

Making Use of the "Cloud"

By Arun Krishnamurthy, FDOT, and Clay Packard, Atkins

A few years back, if the Florida Department of Transportation's (FDOT) Planning Office needed traffic counts on limited-access facilities, they would contract with consulting firms to lay traffic counters on the facility and collect data. FDOT is now looking at redefining how traffic data is collected and shared with their various offices. In the past few years, with the advent of intelligent transportation systems (ITS), FDOT has deployed vehicle sensors along its limited-access facilities. FDOT uses these vehicle sensors for operational purposes in their transportation management centers (TMC) to track the traffic speed and volume throughout the day. This allows TMC operators to recognize if an incident occurred when the speed on the facility sharply decreases. This data is typically stored at the local TMC, and the data files are quite large. Therefore, any office needing the information would have to find a way to obtain the files, which are not easily transmitted using conventional methods, such as email. FDOT plans on solving this size issue by procuring a central data warehouse system to store the traffic data files, making them available to any FDOT personnel to download by accessing a public internet web site.

FDOT will use a central data warehouse system, the Regional Integrated Transportation Information System (RITIS), developed by the University of Maryland. Other state departments of transportation are already using RITIS and FDOT hopes to have it available for use in Florida in fall 2013. FDOT will send all traffic data collected from vehicle sensors in Florida to RITIS. This information will be available through a password-protected web site—www.ritis.org, a cloud-based solution hosted, maintained, and enhanced by the University of Maryland.

Moving forward, FDOT's Planning Office will be able to access and download traffic data available from RITIS without requesting it from another agency. Therefore, the Planning Office should be able to use the ITS Program's traffic data collected on roadways with vehicle sensors as an alternative to deploying tube counters. This inter-office relationship will potentially save FDOT significant funds. The Planning Office may not be able to completely eliminate the need to use tube counters to collect traffic data, but they can reduce the amount of information that they would need to collect. As a matter-of-fact, based on preliminary estimates, FDOT would save significant funds by not needing to deploy as many tube counters over the years.

Another advantage for FDOT is that by storing traffic data in RITIS, TMCs would not have to store the data for long periods of time. The proposed solution provided by RITIS includes redundant data storage so, if one data storage devices fails, a redundant device that stays synchronized will come on-line and provide information or store additional information being transmitted to the system. As these high-availability, redundant systems are typically expensive to host and maintain, FDOT could potentially save funds just by not having to invest in additional significant redundant storage systems, since RITIS will already provide the redundancy.

Traffic data stored in the central data warehouse system will undergo data quality checks to ensure that bad data is not mixed with good data. Based on our experience, FDOT realizes that vehicle sensors sometimes do not provide accurate information. This could be due to vehicle sensor malfunction or communications issues or data processing issues. So, data quality checks on vehicle sensor-provided data is important to ensure the integrity of information stored in the central data warehouse. FDOT will incorporate data quality checks based on the Federal Highway Administration's recommendations in the Mobility Monitoring Program in 2003. This also allows the user to analyze data to determine how traffic behaves during peak hours and detects actual traffic peak hours for each roadway segment. Having traffic data allows infinite possibility for data analysis.

The RITIS web site at www.ritis.org provides an impressive set of analysis tools—congestion scanner, bottleneck ranking, tool to download massive amounts of data, and a dashboard that provides easy access to the traffic conditions on any roadway segment. This will help FDOT to better understand the traffic conditions at different times of day and days of the week.

FDOT is planning to also store incident data that is tracked and managed at TMCs. This will allow FDOT to review past incidents and understand how incidents can be handled more efficiently. FDOT's Safety Office currently relies on the Florida Highway Patrol and local sheriff departments' data to access incident data and to determine safety measures to implement at highly prone incident locations. RITIS will also offer incident data with details captured at the TMCs. This will provide the Safety Office with details that they could not conveniently access in the past.

The central data warehouse is an important tool for FDOT. It will provide easier access to traffic and incident data and, will not only save money, but also reduce the effort involved in collecting traffic data. Additionally, it will provide access to historical data that can help FDOT with analysis and better understanding of traffic.

SunGuide® Software at the 2012 World Congress

Integrating Connected Vehicle Operations

By Arun Krishnamurthy, FDOT, and Clay Packard, Atkins

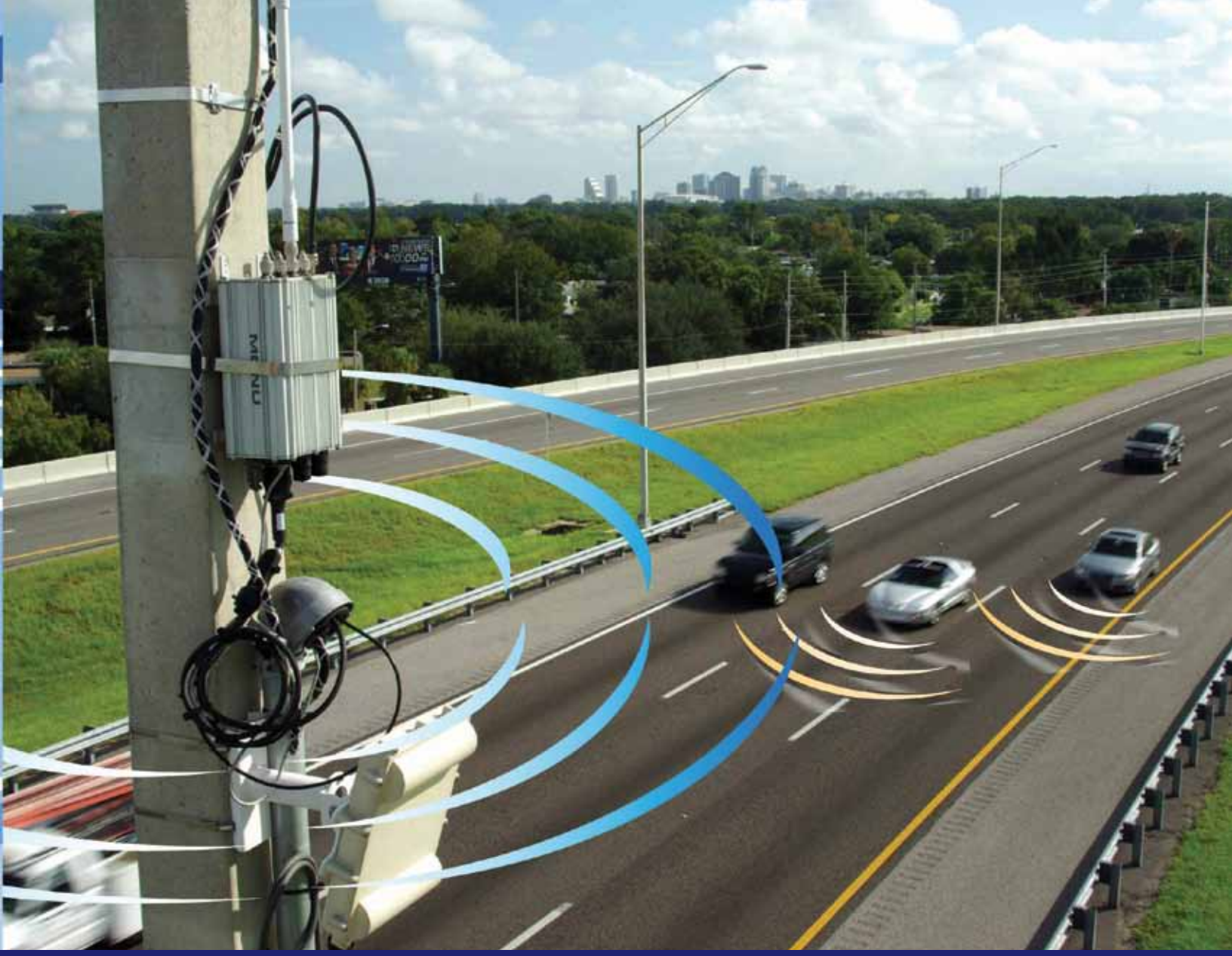
It was a long and challenging, but exciting road taken to bring connected vehicle operations into the SunGuide® software for the 18th World Congress on Intelligent Transport System in Orlando last October! As the saying goes, "there was never a dull moment" as the Florida Department of Transportation (FDOT) demonstrated their live transportation management center (TMC) operations to about 7,000 attendees using SunGuide software, the first advanced traffic management software to integrate connected vehicle technology. This also made FDOT the first department of transportation to use the "technology-of-tomorrow"—connected vehicle—today for day-to-day TMC operations. After months of planning, FDOT District Five deployed 29 roadside equipment (RSE) devices, 43 vehicle awareness devices, and two on-board equipment (OBE) units to demonstrate connected vehicle operation in the SunGuide software. Tying this all together at the conference exhibits kept everyone busy, both at the inside exhibit hall and the outside technology showcase.

FDOT's display in the exhibit hall provided a glimpse into District Five's live TMC operations in the Orlando area. Two large LCD displays and four monitors had constant, live streaming video provided through SunGuide software, connected via fiber from the District Five intelligent transportation systems (ITS) roadside network to their TMC. This display connection provided a look at the connected vehicle RSE devices and data, together with data from existing traffic detectors as well as other ITS devices in operation. A District Five TMC operator provided software demonstrations and information on how the software is used in operations for incident management, ITS device monitoring, and performance measures reporting.

But, that was only half of the story; the connected vehicle operations technology showcase was right outside the exhibit hall…

After Elizabeth Birriel, FDOT ITS Program Manager, cut the ribbon to the technology showcase, the connected vehicle technology showcase, with 26 demonstrations and seven active safety systems, was revealed. Another District Five TMC workstation was on display in the technology showcase with personnel to demonstrate the hardware used for connected vehicle along with how it works in the SunGuide software.

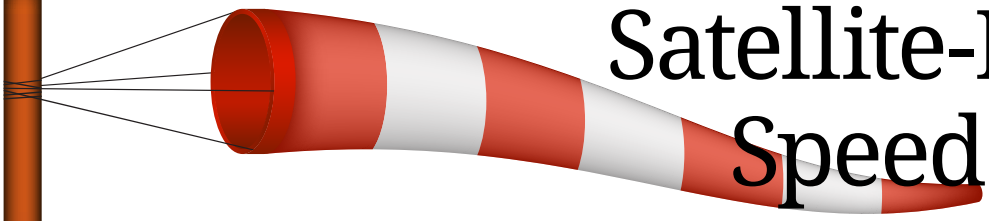
A multiband configurable networking unit RSE, four different vehicle awareness devices, and an OBE prototype was on display. The OBE was able to simulate its geographical position as moving around the Orlando area. It showed traveler advisory messages that were intended to be displayed when the OBE was in each particular geographical position. The workstation revealed each RSE deployed, how they were configured, and the aggregation of all the probe data collected by the vehicle awareness devices and RSE devices to show traffic conditions on an operator map.



This achievement was no accident—there was tremendous design, building, and planning to prepare for the World Congress. Almost a year before the World Congress began, FDOT created the conceptual design of how the SunGuide software would use connected vehicle technology in operations. As the software was modified, hardware was deployed. The SunGuide software operator map displayed the 29 deployed RSE devices, including one on the rooftop of the Orange County Convention Center. Forty-three vehicle awareness devices were deployed in busses and trolleys providing a consistently traveled route along International Drive.

After the SunGuide software was tested at the factory and the hardware was initially installed, operational testing occurred to resolve several configuration and environmental challenges. As the connectivity depended on a new wireless technology to operate, signal coverage testing was critical to the success of the demonstration. Once SunGuide software was in place, a field-testing strategy was used to calibrate the wireless coverage of the RSE devices. Each update would be matched to the RSE receiving the update. The coordinates of the update and the RSE location would be compared for distance. The maximum distance update received in all directions of the roadway from the RSE would provide an indication as to whether the RSE coverage area was sufficient for operational coverage. With this great coverage in place, FDOT has received over 9 million updates in the SunGuide software database archive, which will be extremely valuable for data analysis of the connected vehicle technology.

One of the key factors to the success of this program was the incredible team effort at FDOT where everyone worked hard and supported each other, providing this achievement. FDOT's ITS Program takes great pride in providing excellent traffic operational support for Florida's motorists to ensure the mobility of people and goods, enhance economic prosperity, and preserve the quality of our environment and communities.



Satellite-Based Wind Speed Monitoring

Bridging the Gap for Public Safety

By Randy Pierce, FDOT, and Brian Kopp, The Semaphore Group

During severe weather events in Florida, law enforcement personnel close bridges under high-wind conditions. Currently, law enforcement personnel are staged at bridges in advance of an approaching storm, typically with handheld anemometers to measure wind speeds to determine when driving conditions are unsafe. Local public safety officials review these measurements to help determine when to close the bridge to vehicle traffic.

This technique is problematic for several reasons. First, it puts the law enforcement personnel at risk as they wait in the right-of-way for an extended period of time, collecting wind speed measurements. Second, during the approach of a severe weather event, public safety resources are usually in high-demand; therefore, using law enforcement personnel to monitor wind speeds is not necessarily an efficient use of their time. And third, the wind speed data collected by local law enforcement personnel is usually only readily available to the local jurisdiction and not to neighboring communities or to regional transportation management centers (RTMC), where the information is also needed. An additional, significant reason that this current technique is not optimum is that the data collected is not as accurate as it could be. Law enforcement personnel are not always able to position themselves in the best location to obtain the necessary measurements, which can lead to errors in the collected data.

The principal challenge was how to collect and disseminate the wind threshold information to stakeholders. The classic approach urban environments has been to use either telephone modems or cell phone modems. In the case of bridge wind speed monitoring, the installation of telephone lines along bridge spans to the monitors is cost prohibitive. While cell phone modems reduce these installation costs, they have high monthly operational costs. Also, when the circuits are needed the most (during a severe weather event, such as a hurricane), the public telecommunications infrastructure may also become overloaded, or a service outage may occur.

The Florida Department of Transportation (FDOT) is assisting the public safety community in providing a safe, cost-effective, and accurate alternative for measuring wind speeds and disseminating information to stakeholders. FDOT is finishing installation of a pilot project to monitor wind speeds on bridges during severe weather events and provide real-time information to RTMCs and the public safety community. The project uses a National Oceanic and Atmospheric Administration (NOAA) satellite-based data collection system to relay wind speed threshold alarm information from bridges up into space and then down to earth. Data dissemination to RTMCs is provided through the reliable, secure, internal FDOT statewide intelligent transportation systems (ITS) network. This is a joint effort with FDOT's Central Office ITS Program and District Two.

Since initiation of this project in fall 2011, installations have been completed on over 20 bridges in northeast Florida. Data will be collected and made available to RTMCs, where it will be disseminated to the local public safety community. The intent of the project is to accurately collect real-time wind speed data and disseminate information to the appropriate stakeholders when high wind speed thresholds are exceeded (and also when they are no longer being exceeded).

A Different Approach

FDOT decided to take a different approach to this challenge and enlisted NOAA's help to deliver the wind speed data via satellite to a central location in Florida. From this central location, FDOT can use its own redundant and robust, statewide ITS network to deliver the data to the District Two RTMC in Jacksonville. The District Two RTMC is collocated with the Florida Highway Patrol (FHP) in the Jacksonville Regional Communications Center. This collocation will help ensure that public safety stakeholders are well informed regarding dangerous wind conditions on area bridges during this pilot project.

FDOT was granted ten assignments to monitor wind speed data from road bridges using the NOAA Data Collection System (DCS). Since that time, FDOT has received 20 additional assignments. Assignments permit FDOT to monitor wind speed data in two ways. First, wind speed data can be monitored as often as once an hour, providing a means to verify that the bridge monitoring equipment is operational. This is necessary because the DCS implementation FDOT

is using does not permit two-way communications with the bridge sites. The second way FDOT will use the assignments is by permitting the devices on the bridges to transmit alarms whenever a wind threshold is exceeded (or when winds begin to diminish). This second method allows FDOT to monitor bridges for unsafe wind conditions in real-time.

The monitoring equipment installed on the bridges, called data collection platforms, sends wind speed data to the NOAA satellite, which relays the data down to a satellite ground station. For many DCS customers, the ground station used to retrieve their data is NOAA's own facility at Wallops Island, Virginia. Customers using this facility must use the public internet to access NOAA databases where their down-linked data is stored. Some DCS customers do not use the NOAA ground station facility and instead elect to build their own satellite ground station to streamline data collection. Since FDOT needs the ability to retrieve and disseminate data during occasions when internet access may not be available, it was decided to build a satellite ground station at the FDOT Lake City facility and connect it to the statewide ITS network to disseminate the wind speed threshold alarm information.

Project Description

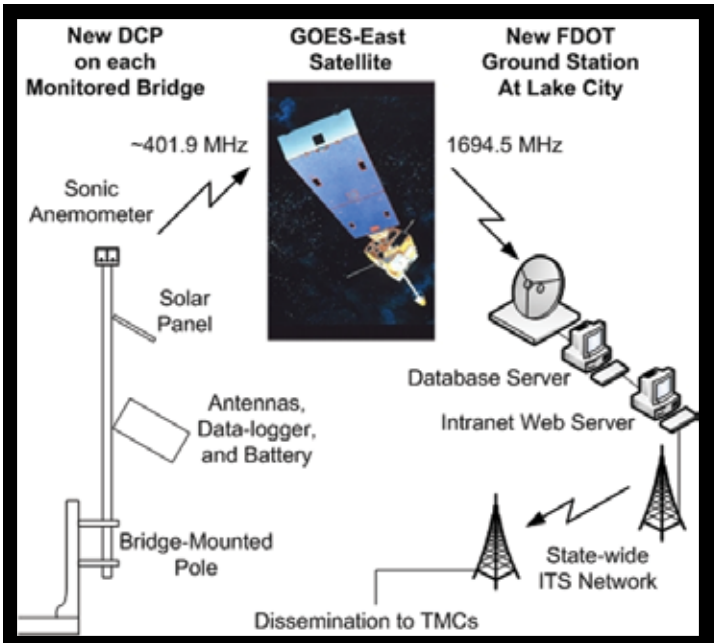
In this joint effort, District Two procured and installed the field equipment, while the Central Office ITS Program will provide the ground station and appropriate equipment. District Two outfitted approximately 22 bridges in Nassau, Duval, St. Johns, and Clay Counties with wind speed monitors. These sites include most of the Intracoastal Waterway bridges in the area as well as downtown Jacksonville bridges and highway bridges on I-95 and the I-295/SR-9A loop around the city.

In parallel with the installation of bridge monitors, the Central Office ITS Program awarded a contract for installation of the ground station at the District Two maintenance facility in Lake City. The contract includes construction of the satellite receiving antenna as well as installation of computer equipment that will be used to store and disseminate the wind-speed data. Lake City was chosen because, first of all, it is an inland site and among one of the few locations in Florida that have the lowest wind speed ratings associated with hurricanes. The second reason it was chosen is that the location is a strategic hub on the FDOT statewide ITS network, which will facilitate the dissemination of information to any FDOT location in Florida.

Along with the site in Lake City, FDOT's Traffic Engineering Research Laboratory in Tallahassee was chosen as a back-up ground station. This back-up ground station also permits FDOT to investigate system changes and new ideas for sharing wind speed data without risking the on-line live system or the security of FDOT's statewide ITS network. Discussions are underway to interface this back-up ground station with FDOT's SunGuide® software and the Federal Highway Administration's Clarus initiative, which works to share road weather information to reduce the impact of adverse weather conditions on surface transportation users.

Data Dissemination

Once the ground station in Lake City is complete, the wind speed data will be available to the District Two RTMC. District Two is providing a computer in their RTMC that will use a web browser to view the wind speed data in real-time. Hourly data as well as wind speed threshold alarm data will be available. Customization will permit the user to display the data in either map or table format. Visual and audio alarms will be used to indicate when a threshold has been exceeded.



FDOT ITS Bridge Wind Speed Monitoring Project

District Two has been working closely with the FHP on this project to ensure that public safety personnel are aware when wind speed thresholds are exceeded. During the pilot project, it is hoped that protocols will be developed between the District Two RTMC and local law enforcement and county emergency managers to share this new wind speed data and respond to it.

This is a first of its kind project in Florida and appears to be the first of its kind to use NOAA's DCS program. The various benefits of the project, combined with the novel and inexpensive use of satellite technology, have created an exciting concept. There is already interest from other FDOT Districts to become involved with the program even as the pilot project begins.

Status Update: FDOT's WiFi® Service

A Proven Success

Randy Pierce, FDOT

The Florida Department of Transportation's (FDOT) WiFi® pilot project is no longer really a "pilot project." After three years of operation, the project has proven itself a success. With well over 100,000 log-ins by travelers who encounter the WiFi internet service at welcome centers, or wherever the one-of-a-kind mobile WiFi-equipped hotspot trailer is located, the service continues to attract a significant number of users. In fact, a second, follow-on contract was awarded in December 2011, to allow FDOT to continue providing this service. The future for FDOT's WiFi service is exciting as the FDOT Maintenance Office is poised to move forward with a plan to install WiFi statewide at all of Florida's rest areas.

Looking back over the last five years since the pilot project was conceived, there have been some interesting and exciting accomplishments and certainly some lessons learned.

The WiFi pilot project was started to investigate whether WiFi is a worthwhile service to offer travelers at Florida's interstate rest areas and turnpike travel plazas. It is currently operational at four welcome centers across north Florida. When travelers arrive at a welcome center, they can use their laptop or smart phone to connect to the internet through the WiFi service provided by FDOT. Travelers log on through an FDOT welcome page, take a brief survey, and are then connected to the internet. This initial step advertises the presence of the FDOT service to travelers, enables FDOT to log statistics about the service, and also helps manage the service.

The WiFi hotspots with satellite-based internet services were installed at the four welcome centers and are monitored and maintained, 24-hours a day, ensuring the service is reliable. FDOT receives daily and weekly system performance reports to monitor the service's status.

Early in the project, FDOT included the idea of a creating a mobile WiFi hotspot mounted on a trailer already owned by FDOT. This WiFi-equipped trailer is a mobile version of the fixed WiFi hot spots installed at Florida's welcome centers. Temporarily deploying the trailer at different locations provides FDOT with information as to whether the WiFi service should be provided at a particular location, without going to the expense of a permanent installation.

To date, the mobile WiFi-equipped trailer has been located at three rest areas and a weigh-in-motion station. In all cases, travelers responded very favorably to the service. In fact, the trailer recorded some of the highest daily system log-in rates of any location at the rest areas. During the Christmas holiday weekend in 2009, the mobile WiFi-equipped trailer set a daily record with more than 100 log-ins at a rest area. It is important to note that there are no advertisements other than a small sign on the mobile WiFi-equipped trailer, so travelers who enter a rest area where the trailer is located are not aware before arriving that the rest area has WiFi service. The mobile WiFi-equipped trailer and the entire system continue to show strong usage statistics indicating that the service is well-liked by the traveling public. Recently, the four welcome centers and the mobile WiFi-equipped trailer have been averaging approximately 550 log-ins per week.

One of the most interesting stories about how traveler usage of the WiFi service increases over time comes from the Plant City weigh-in-motion station. When the mobile WiFi-equipped trailer was first deployed at that location, there were very few daily log-ins to the service. But slowly, over several months, the usage began to increase. By the time the mobile WiFi deployment at the weigh-in-motion station was over (approximately nine months later), there were a significant number of daily users, often exceeding the log-in totals from several welcome centers.

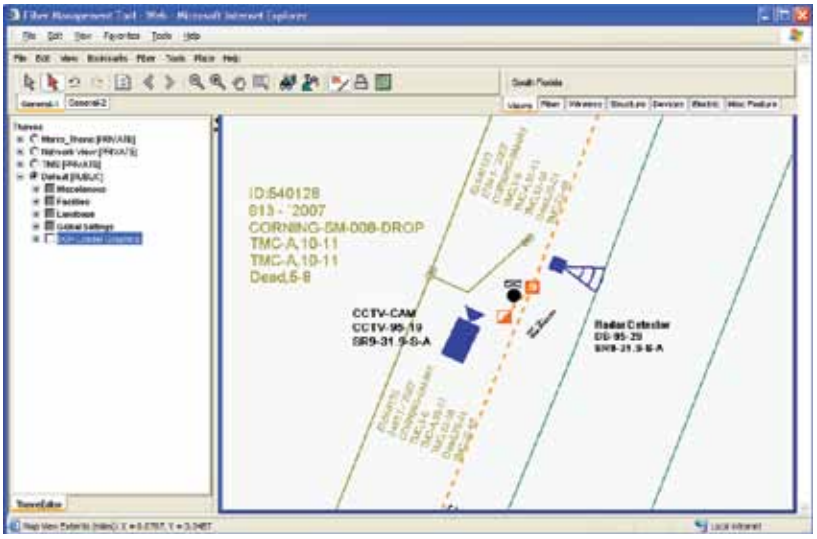
The mobile WiFi-equipped trailer was also deployed in an important public safety duty. The mobile WiFi-equipped trailer has three remote monitoring cameras that can be used to monitor traffic or other special events. In addition, on different occasions the trailer has been outfitted with a weather station, voice radios, and a special high-resolution infrared camera. These additional features have enabled the trailer to support a statewide emergency communications exercise at Camp Blanding that featured state and federal agencies. The most significant public safety event the mobile WiFi-equipped trailer participated in was the clean-up of the Deepwater Horizon oil spill. With the use of its cameras, the mobile WiFi-equipped trailer provided remote monitoring of the construction of an oil barrier across the St. Andrews inlet at Panama City. Beach goers at the St. Andrews inlet state park took advantage of the WiFi service as well!

In late 2011, FDOT made the commitment to extend the WiFi service at the welcome centers and onboard the mobile WiFi-equipped trailer. A new service contract was advertised and awarded to the original installer and service provider for the WiFi system. At the same time the current project was being extended, a new WiFi project was being created by the FDOT Maintenance Central Office. The FDOT Maintenance Central Office developed an exciting project to provide WiFi service at all Florida rest areas. The idea behind the project is to partner with a vendor who will install the WiFi service at no charge to FDOT. In exchange, the vendor will be permitted to sell sponsorships for the WiFi service and install right-of-way signage at rest areas. It is hoped that the value of the right-of-way signage sponsorships will attract significant advertisers in the tourist-related industries and finance the WiFi service. In fact, FDOT is hopeful that the service will turn a profit through the sponsorships! Eventually, it is hoped that this new service model will replace the current welcome center WiFi systems. However, the mobile WiFi-equipped trailer will still be maintained and deployed by FDOT's ITS Program.

ITS Facility Management

Ready for Prime Time

By Randy Pierce, FDOT, and Tim Sapp, Telvent



The Florida Department of Transportation's (FDOT) Intelligent Transportation Systems Facility Management (ITSFM) is a centralized, collaborative asset system designed to help FDOT's Districts and the Central Office manage their overall intelligent transportation systems (ITS) network, system configuration, and components (assets). This includes communications assets from both the District fiber optic networks and the statewide microwave system. The ITSFM has gained acceptance from the Districts and the number of miles populated within the ITSFM continues to grow and offer many benefits for the users.

The ITSFM is a geographical information system-based web application designed to manage outside plant facilities based on their latitude/longitude coordinates. All point features (camera poles, dynamic message sign [DMS] structures, splice vaults, etc.) encoded into the ITSFM are based on actual global positioning system (GPS) latitude/longitude coordinate values to provide all stakeholders with the ability to accurately locate equipment statewide.

ITSFM Software Upgrade

An ITSFM software upgrade, version 3.0, is scheduled to deploy in late summer 2012, and will offer many new benefits, including improved ease of use and the following subsystems:

Fiber Optic Communications

- Geographic location and facility attributes for communications conduits, duct banks, pullboxes and splice vaults;
- Fiber cable type, size, and termination;
- Fiber utilization (i.e. working, defective, reserved, etc.);
- Fiber patch panel assignments;
- Circuit trace; and
- Outage locate.

Statewide Telecommunication (New for 2012)

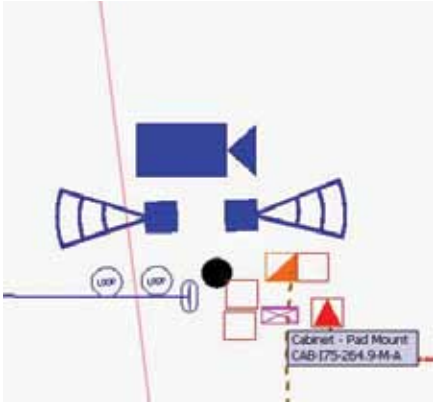
- Geographic location and facility attributes for wireless shelters;
- Supporting electrical equipment, including DC power supplies, batteries, surge protection, and stand-by generators;
- Tower attributes, including coordinates, antennas, cables, and warning lights;
- Radios and Federal Communications Commission license management; and
- Wireless path attributes, including span length, frequency band, and polarization.

Equipment Facilities

- Regional transportation management centers;
- Communications facility sites; and
- Field equipment sites.

ITS and Signal

- Geographic location and attributes for traffic signal (intersection or ramp) and the following ITS device types:
  - ◊ Closed-circuit television camera,
  - ◊ Vehicle detection system:
    - ¤ Radar detection sensors,
    - ¤ Video detection sensors,



- ¤ Pavement detection sensors (New for 2012), and
- ¤ Telemetered traffic monitoring site (New for 2012);

◊ DMS,
◊ Highway advisory radio (HAR) transmitter,
◊ HAR sign,
◊ Roadway weather information system,
◊ Electronic feedback speed sign (New for 2012),
◊ Warning beacon (New for 2012),
◊ Trail blazer (New for 2012),
◊ Safety barrier cable system (New for 2012), and
◊ Travel time system.

Electrical

- Geographic location and attributes for electrical cable and cabinets (load center, meter point, and service point);
- Electrical circuits association to equipment cabinets; and
- Utility service demarcation sites, including utility company service information.

Version 3.0 will further increase the functionality by allowing users to easily generate 24 standardized reports that will assist with decreasing maintenance response time and provide improved security to the facility owners with more user access and roles options.

Features can be entered into the database through individual entries or in mass by using the predefined ITSFM import templates. FDOT has defined a methodology for importing primary point feature based on their latitude/longitude coordinates entered into specially designed ITSFM import templates produced in Microsoft® Excel.

This process also allows the mass import of subfeatures, such as fiber optic, communications, and electrical equipment, directly into a specified equipment location (i.e. regional transportation management center, equipment cabinet, utility demarcation site, etc.).

ITSFM Web Site

An ITSFM web site was established to support the system operation and maintenance. The web site makes useful system information available, including

- An introduction to new users;
- Information about the management responsibilities of the Central Office ITS Program, the Districts, and regional partners;
- A detailed description of the different types of user roles and access rights;
- ITSFM standards;
- System history; and
- The ability to download quality construction checklists, data collection forms, custom import templates, and training materials.

This site is routinely updated to ensure users have access to the most current versions of the ITSFM standards, forms, templates, and database code list. The web site is available at www.dot.state.fl.us/trafficoperations/ITS/Projects_Telecom/ITSFM/ITSFM.shtm.

User Training

ITSFM system training is available, free of charge, for all users and is highly encouraged. Training programs have been established for the maintainer/technician, ITS engineering staff, and District managers. Training provides two very important functions:

1. Every ITSFM system user will have the same training and understanding of how to use the system, the capabilities of the system, and the benefits that can be expected from the system.

2. Each District will learn the same ITSFM data entry and reporting methods (and associated standardized terms/notations), thereby ensuring uniformity while still maintaining District autonomy with respect to desired ITSFM functionality.

Implementation Update

The Central Office ITS Program continues to work with the Districts and regional partners to support statewide implementation. The recent focus has been to encode previous survey and cabinet inventory as-built information to create sample areas in some Districts; this provides an example of how information should be presented in the system and allows users to be trained on actual District data, which is more meaningful.

District One has 20-miles of sample area facilities in the ITSFM, including: conduit, fiber, electrical, ITS, and communications devices, structures, communications, splicing, and fiber connectivity. The attributes for these facilities will be expanded after ITSFM version 3.0 is released. User training is expected in the fall.

District Two has 60-miles of facilities in the ITSFM, including fiber and electrical conduits and access points, support structures, various ITS devices, fiber devices, communications equipment, and fiber splicing. Six miles of these facilities encompass the sample area. This area will be updated after the software release and user training is also expected this fall.

District Three is compiling cut sheets and GPS survey information for approximately 40 miles of installed facilities in the Pensacola area. This data will be used to mass-populate features in the ITSFM via custom import templates. Central Office will provide field inventory training and support the data encoding for this sample area.

District Six funded the FDOT Central Office Telecommunications general consultant to collect and populate ITS facilities district-wide in the ITSFM. This task includes approximately 70 miles of fiber optic cable and conduit system; 70 miles of the power distribution system; 75 wireless radio sites (mostly in the Florida Keys); and 500 ITS device equipment sites. This task was performed to support the latest release of the ITSFM and is scheduled to be complete in September 2012

District Seven has been very active with implementing the ITSFM with more than 70 miles of fiber optic cable currently in the system and an additional 40 miles of facilities being surveyed and inventoried. They are also validating previously encoded data and adding more as needed to meet their operational needs.

Miami-Dade Expressway Authority (MDX) added ITS, communications, and electrical facilities along SR-112, SR-924, SR-878, and SR-874 to the ITSFM. The extent of the MDX network consists of over 40 route miles and 112 equipment sites. The installed facilities were documented by GPS surveys and equipment inventories then encoded into the ITSFM.

New and recycled fiber optic cable.
Courtesy of FDOT District Seven

FDOT's Traffic Engineering Research Lab

Keeping Pace with FDOT's Needs and New Technology

By Jeffrey Morgan, FDOT, and Ron Meyer, Atkins

Embracing New Technology to Empower Traffic Operations

The Florida Department of Transportation (FDOT) Traffic Engineering Research Laboratory (TERL) strives to ensure that Florida implements a safe and uniform traffic control system. A major part of that mission is the evaluation and certification of traffic control signals and devices. In 1997, FDOT established the TERL to meet the goals and requirements of *Florida Statute* 316.0745 - Uniform signals and devices. This statute requires that FDOT certify all official traffic control signals and devices before their purchase and installation in the state of Florida. The TERL supports this mandate by developing and updating specifications, standards, test and internal operational procedures, and testing capabilities used to evaluate and certify equipment used in traffic control systems.

As part of these activities, the TERL has embraced and supported many efforts dealing with various types of equipment to address issues and needs identified by Florida's transportation management center operators and traffic operations practitioners.

Evaluation and Approval of Graphical, Full-color Dynamic Message Signs

For many years, the TERL has made considerable strides in advancing the adoption and use of various technologies relating to dynamic message signs (DMS). Florida was one of the first states to develop and publish Federal Highway Administration- (FHWA) approved minimum requirements for intelligent transportation systems (ITS) equipment, including DMSs. Florida was an early adopter and champion in the development and implementation of the National Transportation Communication for ITS Protocol. Florida was also an early adopter of light-emitting diode (LED) display technology, mandating LED displays soon after their introduction to the market in order to reduce maintenance costs and reliability issues with previous sign technologies.

Sample DMS being tested at the TERL.

For years, cost and other factors have limited DMSs to the familiar amber color, text-only, dot-matrix-style displays that are commonly seen along roads. However, LED technology has now advanced to a point where red, green, and blue LEDs are able to operate effectively and reliably under extreme outdoor conditions. Similar advancements in manufacturing and the widespread use of LEDs in a variety of applications also led to cost reductions for various color LEDs. This, in turn, has allowed DMS manufacturers to develop competitively priced, full-color, graphical outdoor displays for budget-conscious transportation agencies.

Full-color graphical displays are considered advantageous for a number of reasons. They are capable of mimicking the look and operation of current amber, text-only displays. In addition, they are able to display messages that look almost identical to what is commonly seen on static sign panels and prescribed by national standards for uniformity and content, such as the Manual on Uniform Traffic Control Devices (MUTCD). The text and graphics in the MUTCD are widely recognized and were specifically designed for effective communication to motorists, with emphasis on message legibility, consistency, and interpretation. This is especially important in a state with significant tourism and elder driver populations. Deploying color signs may also be considered a means to future-proof designs, as these devices allow almost infinite options with respect to message design and signing plans.

In order to support early deployments of full-color, graphical DMS in central and south Florida during fiscal year 2011-2012, staff at the TERL completely overhauled the published minimum requirements for these devices with input from multiple stakeholders and worked proactively with DMS manufacturers to ensure that their signs met national and state requirements prior to installation. Over the course of these activities, the updated specification was refined and ultimately published and approved by the FHWA. Full-color DMSs submitted for consideration and approval over the last year were evaluated against the draft specification as well as the current published minimum requirements at the time of submittal. Several issues with equipment were identified, documented, and corrected during product evaluations, preventing product issues and problems that would have otherwise been encountered during project construction and resulted in project delays/costs. A few issues identified by the TERL evaluations and corrected by manufacturers as a result could have resulted in significant failures in the field. Fortunately for all, they were addressed and remedied as part of the standard Approved Product List (APL) evaluation process performed by the TERL.

In the end, operators and designers now have additional options available to them for selection and deployment of DMSs. They can opt for the traditional amber signs or full-color signs in a variety of sizes and form factors, such as walk-in, front-access, or embedded (attached to traditional static sign panels). These options allow greater flexibility in a common set of minimum requirements that uphold FDOT goals concerning consistency, predictability, and repeatability. Variable, project-by-project requirements are not necessary since the state specification now addresses a broader range of signs and has been vetted through the FDOT specification development and the APL product evaluation processes.

Updates to Vehicle Detector Specifications

Inductive loops were the standard and only reliable option for vehicle detection for decades. Multiple vehicle detection technologies have come of age in the last 15 years that are viable alternatives to the traditional inductive loop. Most notably, systems using video analytics and radar have proven to be attractive options for presence detection and data collection. For many years, FDOT has evaluated a variety of detection technologies for intersection control against the requirements it published for loop detectors. While evaluating video and radar detectors against loop specifications has been relatively effective, FDOT management recognized that a better approach would be to transform the published requirements for “Inductive Loops” into functional requirements for a variety of detection technologies.

This work is now well underway, spurred forward also by FDOT activities and goals for consolidation of specifications with similar functional requirements. For instance, data collection detectors that are currently defined by FDOT *Specifications for Intelligent Transportation Systems and Traffic Monitoring Sites* have significant similarities when it comes to their functional and performance requirements. They also have similarities with detection systems used for vehicle presence detection at intersections. In some cases, the products themselves are identical. With this in mind, the old FDOT “Inductive Loop” specification is being updated to become a functional specification for presence detectors and data collection detectors. The new specification also addresses minimum requirements for additional emerging technologies that have proven effective for travel time determination. Systems using Bluetooth®, toll tag and license plate readers, and other probes to match vehicle detections are a few examples of a new category of detection devices that have been defined as “automatic vehicle identification detection systems.”

Additional review and stakeholder input will be required before final publication and implementation of the new specification, currently titled "Vehicle Detection Systems." Significant progress has been made this year on the technical content and it is an effort worth noting. It is yet another example of how the TERL has actively worked to keep pace with FDOT's needs and new technologies.

Migration of Temporary Traffic Control Devices from the Qualified Products List to the APL

FDOT's APL is a well-known and a commonly used resource for designers, contractors, inspectors, and others needing to know the certification status of traffic control devices per *Florida Statute* 316.0745. FDOT also maintains a Qualified Products List (QPL). The APL is concentrated on traffic control devices and ancillary equipment associated with traffic control systems; the QPL contains all other materials outside the scope of the APL that require FDOT approval (poles, epoxies, pavement markings, sign sheeting, and a myriad of others).

Temporary traffic control devices have long been evaluated by the TERL and listed on the APL; although in recent years they were only listed on the QPL. Given that these products are categorized as traffic control devices and are electronic, in 2009, FDOT made the decision to transition electronic and electrical devices described in FDOT *Standard Specifications* 102 and 990-3 from the QPL to the APL. Significant portions of this activity came to a successful completion during fiscal year 2011-2012.

As of this writing, 16 out of the 19 vendors (84 percent) have satisfied the requirements necessary for them to be listed on the FDOT Traffic Systems Acceptable Quality System List. These vendors have demonstrated that their internal quality systems meet industry standard best practices prescribed by the International Organization for Standardization. In the upcoming year, their products will be evaluated to ensure that they still meet current product specifications in order to fully complete the QPL to APL transition. With these 16 vendors currently on the APL, each device category defined by specifications has at least one associated approved product.

Through approval and listing, FDOT acknowledges its confidence in vendors and, ultimately, the compliance of their products with applicable requirements. It indicates that the vendor has demonstrated their capabilities, accountability, and product compliance. It reduces risk and recurring administrative burden on end-user agencies and the vendor community alike. For instance, centralized approval removes or reduces the need for project-by-project local submittals, reviews, approval, and administration. At the same time it provides a visible and convenient resource for those who need to know quickly and with certainty what products are known to meet applicable (and often generic) functional requirements as specified in standard contract documents.

The Traffic Systems Section and its TERL staff look forward to another year of continuing to support the needs of FDOT and the people of Florida by effectively and efficiently evaluating vendors and products against the published national and statewide requirements that help ensure a safe and uniform traffic control system.

Commercial Vehicle Operations in Florida

Promoting Commercial Vehicle Safety

By Paul Clark, FDOT

During fiscal year 2011-2012, the Florida Department of Transportation's (FDOT) Commercial Vehicle Operations (CVO) Program continued to promote commercial motor vehicle safety as it relates to commercial vehicle operators as well as the traveling public. FDOT did this by working cooperatively with our partners.

There were several changes in FDOT's CVO Program during the past fiscal year due to the Office of Motor Carrier Compliance's (OMCC) move from FDOT to the Florida Highway Patrol (FHP) Commercial Vehicle Enforcement (CVE) unit.

In the past, the Florida Administrative Code required that OMCC represent the FDOT Secretary as the Chair of the Commercial Motor Vehicle Review Board (Board). Since the OMCC transition to FHP CVE, FDOT continues to Chair the Board and also manages all the day-to-day activities related to processing citation protests. This includes ensuring the protest meets the requirements to be reviewed before the Board; replying to protests regarding agendas, scheduling, and holding the meetings; and providing final dispositions of protest to protestors. This past year the Board reviewed 862 protest, granting full or partial relief to 281 citations for a total relief in excess of $223,000.

The CVO Program also manages Florida's Commercial Vehicle Information Systems and Networks (CVISN), a nationwide program under the direction of the Federal Motor Carrier Safety Administration. The CVISN program focuses on safety enforcement resources on high-risk commercial operators; integrating federal and state regulatory systems to improve access to, and verification of, operating credentials; improving efficiency through electronic screening of commercial motor vehicles; and enabling online application and issuance of operating credentials.

Some of the on-going projects during fiscal year 2011-2012 included:

- Continued working with the FDOT Maintenance Office on modifying Florida's over-weight and over-dimensional permitting system, known as the Permit Application System (PAS). Upon completion of this work, customers will be able to apply for an over-weight or over-dimensional permit by navigating FDOT's web site to either apply for or gather more information as to the requirements for getting a permit. The developed tools, as part of this project, will allow customers to determine their needs or to design their vehicle for a specific map. Once the appropriate map is determined, the customer would be able to determine if a route is possible and, finally, apply for a permit. The new PAS will allow the customer to submit this application online and check for status updates. Once approved, the customer could pay online and with additional enhancements receive their permits immediately. These upgrades will enhance the customer's experience and improve both efficiencies and customer service.
- Started developing Florida's commercial vehicle container number database system for tracking container/vehicle movements and presenting this data graphically. Ancillary data will include container location and time-stamp. This project will develop a database for storage and query of container numbers and ancillary data (from the Department of Agriculture and Consumer Service's system), plus license plate reader system data (from the Motor Carrier Size and Weight system), and develop software for tracking the container/vehicle movements and presenting this data graphically.
- Began a port of entry study to investigate the feasibility of adding additional credentialing capability to the online e-credentialing system at certain commercial vehicle weigh stations. This project is researching the history behind Florida's current non-port-of-entry status with regard to interstate commercial vehicle operations. Tasks included are:
  - ◊ Identifying which department is responsible for this status;
  - ◊ Conducting a review of what would be required legislatively to change this status;
  - ◊ Identifying best practices with regard to port-of-entry;
  - ◊ Determining the costs and benefits of changing to port-of-entry status; and
  - ◊ Providing recommendations.

  It will also include evaluating options for issuing an International Registration Plan and International Fuel Tax Agreement Trip Permits at weigh stations by automated methods (i.e. online, kiosk at weigh stations near port-of-entry) rather than having an officer issue the permit. The study will also evaluate and recommend weigh station locations for required credentials/permits issuance capability.

This year the CVO Program completed modifications to Florida's Electronic Freight Theft Management System in cooperation with FHP. This system allows for monitoring of stolen freight by law enforcement officers.

The CVO Program continues to move forward with innovative ideas regarding freight. Florida's transportation system will continue to see an increase in commercial vehicle traffic in the next several years. The high percentage of freight transported by trucks shows how significant and important Florida's roadway network is as it relates to just-in-time deliveries. With the increase of commercial vehicle traffic, it is imperative to ensure accurate and timely processing at our weight and agricultural stations so commercial carriers can make their deadlines while FDOT ensures the safety and compliance of carriers.

Truck Parking Facilities in Florida

Safely Moving Goods Through Florida

By Paul Clark, FDOT

The safe and efficient movement of commercial vehicles in Florida is crucial to the state's economy and the well-being of the entire southeastern United States; successfully moving goods through Florida impacts adjacent and nearby states, including Alabama, Mississippi, Louisiana, and Georgia. A critical element of the safe and efficient movement of commercial vehicles is the ability for drivers to get the long-term rest mandated by federal regulations. Through this research project, the Florida Department of Transportation (FDOT), in cooperation with Florida International University (FIU), sought ways of keeping drivers on the road and moving freight when the schedule dictated, but also getting them off the roads and resting when they should be. This research project used:

- Intelligent transportation system to improve the use of existing capacity;
- Existing resources and infrastructure to deliver critical information; and
- A modest investment in new technology endorsed by industry to affect far-reaching impact.

FDOT performed the project in two phases. The objective of the first phase was to determine commercial motor vehicle parking trends at rest areas and weigh stations throughout the state. FDOT identified facilities used by commercial vehicle operators and to what capacity, and the time-of-day usage. With this information, FDOT was able to determine where areas of abuse (i.e. parking on the shoulders, etc.) were occurring.

The second phase of this project was to determine the suitable type of smart parking technology for commercial vehicles and deploy that technology at a test location. FDOT intends to utilize parking trend and sensor information collected from parking locations to estimate when the facility will be full in order to provide operators with capacity information so they can find an alternate location to park rather than on the shoulder at these locations.

During this fiscal year, FIU completed the first phase of the research project. They visited pre-identified rest areas and weigh stations to determine parking trends and areas of abuse. FIU performed these site visits in the evening hours—the peak time of commercial vehicle parking. In most cases, FIU personnel also conducted interviews with nighttime security staff to identify issues that may not have been present during their site visit. FIU then compiled these visits into a ranking of high, medium, or low for the level of parking capacity.

Since completing the first phase of this project, a wireless parking occupancy detection platform was installed at the I-10 Leon County east and west bound rest areas. Due to the large size of the commercial vehicle parking spaces, three sensors per space were installed.

The wireless parking occupancy detection platform and software installed at facilities will collect and amalgamate occupancy data, returning that

data in real-time to the SunGuide® software, Florida's statewide advanced traffic management software. SunGuide software will integrate that data with existing 511 advanced traveler information channels, and return useful information that will answer questions, such as:

- How many parking spaces are available at the next facility on my route?
- How many parking spaces are available at the next several facilities on my route?
- What are the traffic conditions between my current location and the next several parking facilities?
- What is the estimated travel time to the next facility?

Guidance can then be provided to commercial vehicle drivers through several methods, including:

- FDOT's 511 travel information phone system and web site;
- Existing strategic dynamic message signs, Citizens Band radio advisory units for which FDOT has a Federal Communications Commission license; and
- Information portals to which commercial vehicle dispatchers subscribe, text alerts, and applications for mobile devices.

This truck parking research project will allow FDOT to review the outcomes and determine how to utilize the data for possible future developments regarding commercial vehicle parking systems. It will help to improve the efficiency of the existing transportation network by using technology to make better use of the capacity that already exists rather than building more parking spaces. Capacity will be identified and information delivered to those who need it, with the simple goal of getting more trucks into more available spots.

Traffic Incident Management

Working Together Cooperatively in Florida

By Paul Clark, FDOT

It's hard to believe that another year has passed for the Florida Department of Transportation's (FDOT) Traffic Incident Management (TIM) Program. Fiscal year 2011-2012 has been very busy as usual. We continue to grow our local TIM teams to ensure that state and local agencies work together cooperatively and are assisted by our partners at the Federal Highway Administration (FHWA).

The FDOT Central Office TIM Program provides technical incident management support and assistance to FDOT's District Offices and other partners by participating in local District TIM meetings. Currently, there are 22 TIM teams, involving 40 Florida counties, managed by FDOT Districts and Florida's Turnpike Enterprise. While we did not attend all of the meetings this year, each one that we attended was definitely a learning experience. We use the information gathered at these meeting to determine areas of need where the Central Office TIM Program can assist. This could be developing and modifying existing policies and procedures for FDOT's Road Ranger and Rapid Incident Scene Clearance Programs.

The TIM Program is often called upon to assist and advise the State Emergency Operations Center (SEOC) with evacuation management. While this is a small portion of our function, it is extremely important. Our goal within the SEOC is to provide accurate information to ensure that decision makers have all the facts to make informed decisions in support of mass evacuations. While we have not had any major evacuations this year, we continue to support exercises to ensure that the state's level of preparedness is where it should be.

Another of the Central Office TIM Program's major functions is collecting TIM-related data. This year we were able to use that data to produce and publish the following reports:

- Rapid Incident Scene Clearance Annual Report – August 2011
- Road Ranger Comment Card Annual Report - September 2011
- Annual Road Ranger Responder Survey – June 2012

These reports are important in that they provide us with a year-to-year comparison on how our TIM Program is performing and they help us determine areas of improvement for future planning.

Rapid Incident Scene Clearance
Courtesy of FDOT District Seven

Also, on May 17, 2012, the TIM Program helped facilitate and participate in FHWA's Executive Traffic Incident Management workshop held in Tallahassee, Florida. This was the conclusion of all the workshops that the FHWA had conducted in Florida. This workshop provided an overview of what is occurring around the state to the Florida Highway Patrol (FHP) and FDOT executive leadership. The workshop concluded on a very positive note, showcasing the state's accomplishments with various Florida TIM programs.

Research Project BDK 84 977-15, "Review and Update of Road Ranger Cost Benefit Analysis," was also completed in January 2012. This research performed a comprehensive analysis of the Road Ranger program at the state and

Road Ranger stopping to help a motorist on I-95
Courtesy of FDOT District Four

District levels. The benefits (delay and fuel savings) for the Road Ranger program were about $134 million in total, while the costs (contract) were about $20 million. Overall, the statewide combined Road Ranger program achieved a benefit-to-cost ratio of 6.68. While the primary goal of this research was to identify the benefit-to-cost ratio of Florida's Road Ranger program, we cannot ignore the fact that the analysis did not quantify some benefits. Often, Road Rangers are the first to arrive at an incident and provide assistance before law enforcement or other responders are able to reach the location. Their prompt arrival to the incident scene provides reassurance to the traveler, emergency assistance when needed, and allows for placement of advance warning devices to notify approaching drivers of the hazard ahead. Due to their quick response and life saving actions, it is difficult to quantify their total benefit to emergency responders and the traveling public.

A revision and updating of Florida's "Open Roads Policy" is currently in progress. This policy defines basic roles and responsibilities for FDOT and FHP during an incident; it also establishes a 90-minute clearance goal. Originally written in 2002, this policy has never received an update until now. This update does not modify the core of the policy; it just adds more information as to its need. The modifications are complete and waiting on final signatures from leadership.

While updating this policy will be beneficial, it is imperative to realize that this is just a piece of paper. The key to a truly effective TIM Program that the responder realizes and understands the importance of quick clearance and how it affects everyone—firemen, law enforcement officers, emergency medical services, wrecker operators, FDOT maintenance, transportation management center operators, and the list goes on. Responders are Florida's TIM Program; what they do or do not do determines our success.

Road Ranger on I-95
Courtesy of FDOT District Four

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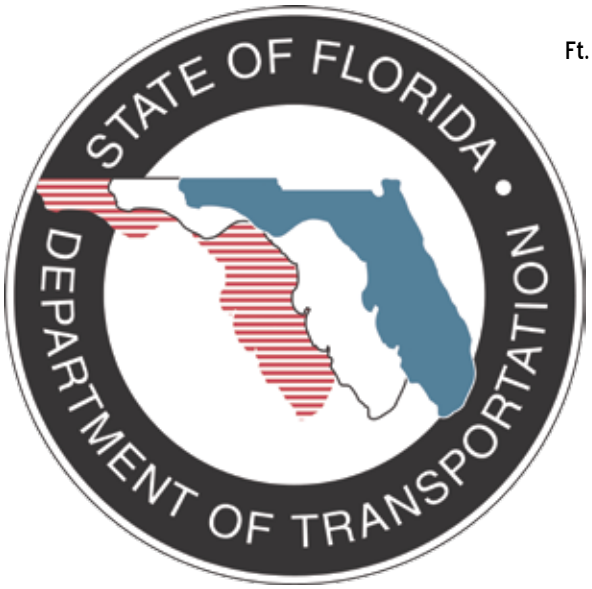

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