FLORIDA DEPARTMENT OF TRANSPORTATION

TSM&O DISSEMINATOR

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

July - August 2020

Traffic Data Monitoring Dashboard

Turnpike Enhances Technological Capabilities at FHP Dispatch Center

I-75 FRAME - Connected Vehicle Deployment Update

FLORIDA DEPARTMENT OF TRANSPORTATION'S
TRAFFIC ENGINEERING AND OPERATIONS PUBLICATION

FDOT TSM&O
Transportation Systems Management & Operations

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FDOT TRAFFIC ENGINEERING AND OPERATIONS MISSION AND VISION STATEMENTS

MISSION

Provide leadership and serve as a catalyst in becoming the national leader in mobility.

VISION

Provide support and expertise in the application of Traffic Engineering principles and practices to improve safety and mobility.

Looking to be a Contributor for the Next Issue of the TSM&O Disseminator?

Email Jennifer Langford (Jennifer.Langford@dot.state.fl.us) with your story subject and title.

We would love to have your contribution be a part of the next edition.

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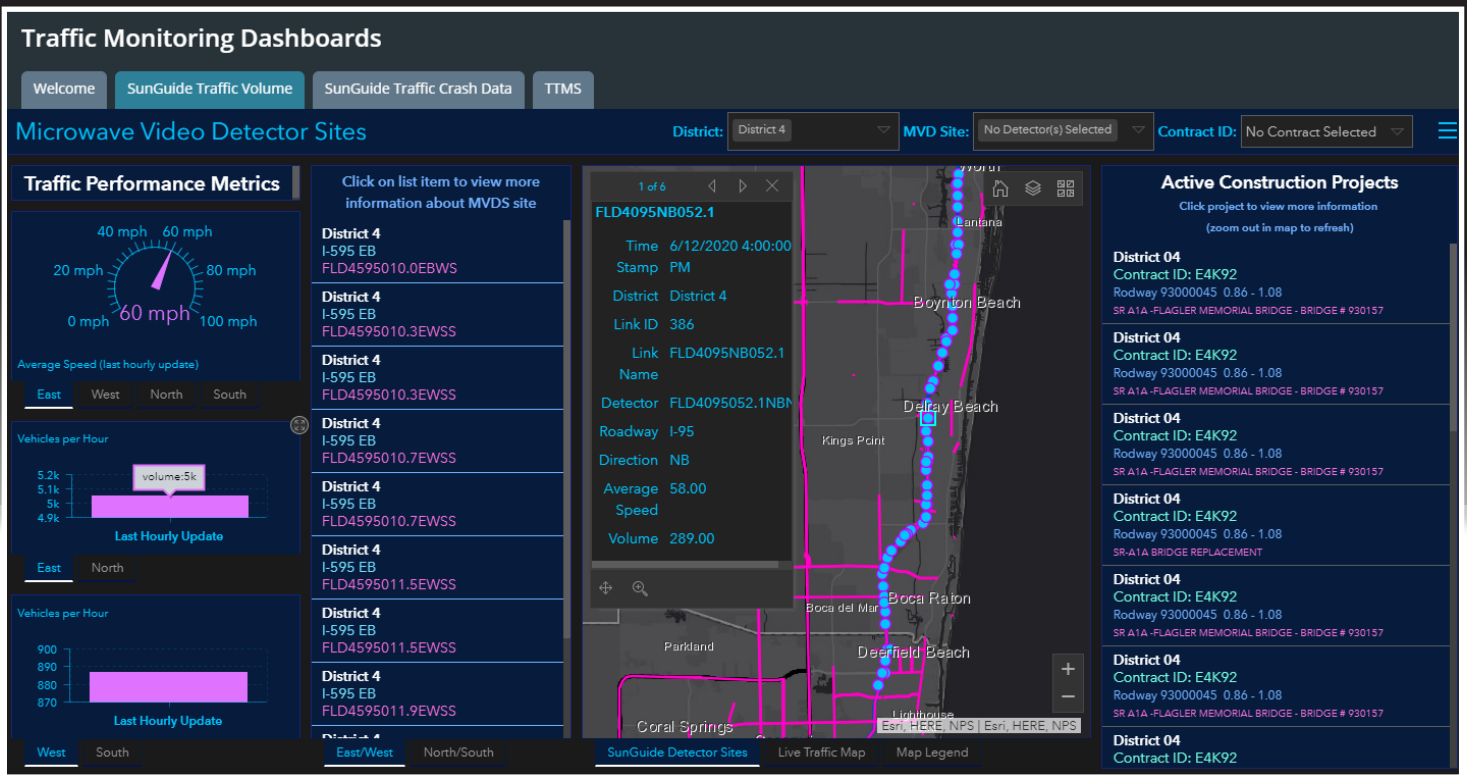


The Traffic Monitoring Dashboard reports a wide variety of current traffic volume data. The dashboard can also integrate active construction project information and SunGuide crash data.

Traffic Data Monitoring Dashboard

By Trey Tillander, Director, Traffic Engineering and Operations Office, FDOT; Christine Shafik, State ITS Software Engineer, FDOT; Mark Dunthorn, HNTB Corporation; Philip Blaiklock, Atkins; Brian Ritchson, Atkins

The Covid-19 pandemic has affected everyone around the world, including those in the state of Florida. During the spring of 2020, Florida Department of Transportation (FDOT) Secretary Kevin J. Thibault implemented emergency orders to enhance movement of emergency goods. The FDOT also identified the opportunity to accelerate existing construction projects across the state, as traffic volumes were falling due to public awareness of the pandemic, stay-at-home orders, and related measures. To facilitate identification of projects to accelerate, FDOT Traffic Operations has developed a Traffic Data Monitoring Dashboard. This advanced system integrates traffic data from across the state into a slick graphical front-end tool.

The Dashboard leverages the existing statewide infrastructure managed by the SunGuide® Software. All seven Districts, along with Florida's Turnpike Enterprise (FTE), provide traffic data including volume, speed, and occupancy from critical links. The data is available over the Statewide ITS Communication Network via the center-to-center framework (C2C).

The FDOT's immediate need was a graphical display of the statewide volumes, with a comparison against the same volumes a year ago. To provide live data, the team utilized an existing application, the C2C Reader. This application retrieves traffic data from a single District and writes the data, along with summary rollups, to a database. Several instances running simultaneously can retrieve and store statewide traffic data into a single database.

Traffic Data Monitoring Dashboard, continued from page 3

To render the data, the team initially utilized the Grafana framework to generate plots, including the critical comparison to volumes from a year ago. There were two principal challenges that needed to be overcome at this early stage of the project. The first was identifying possible data loss in the data pipeline, and the second was creating a historical dataset for comparison from SunGuide data.

To address the first issue of data loss, it was necessary to determine whether reductions in volume were due to the pandemic, or due to data loss in the communication pipeline. The team worked together to examine each interface in the communication pipeline. In the end, the data loss was discovered and corrected through improvements to the message handling in the C2C Reader. The second immediate need was for a reliable, long-term historical dataset for comparison. In SunGuide, the identifier for each roadway segment can change many times over the lifetime of a detector. For example, the device at a given location may be replaced or repaired. This meant that for most detectors historical data would only extend into the past a year or less, whereas many years would be required for a reliable historical average to be produced. Ultimately, another identifier was discovered that sufficiently tracked history for a given location. It was then possible to create the multiyear history the project required for analysis of current volumes.

At the same time, the team worked to enhance the C2C Reader application providing the data. In addition to the fixes to the message handling, database connectivity from separate helper scripts was integrated into the application. This back-end application has been running and recording data statewide since mid-April.

The FDOT has since implemented a Dashboard GUI using ArcGIS Online. It consumes the data produced by the system described above and displays it in a convenient and familiar GIS framework available to anyone with an FDOT account.

The Dashboard reports total volumes grouped by direction of travel, along with average speeds. The scope of this data updates with the map extent. When an individual microwave detector is clicked, its average speed and most recent hourly volume are displayed. The Dashboard also integrates active construction projects. The contract ID, length, start and end dates, cost, and description of each project are available with a mouse click. Nokia HERE data, as a live traffic map, can also be retrieved. SunGuide crash data may be viewed as well on a zoomable map. This interface allows the user to view information on each collision, along with a plot of crashes per day synchronized to the map extent.

Finally, the Dashboard allows the user to compare current traffic volume against the seasonal norm for regions of the state, on individual links, and more. As of early June, volumes have started rising again but remain below seasonal norms. The Central Office is continuing to build out this infrastructure, with an emphasis on gaining access to District data as quickly and efficiently as possible, with no impact on District operations. The success of the Dashboard, which was only made possible by the extraordinary efforts of the Districts to quickly react to our data needs, reflects the "One FDOT" approach championed by the Department. This robust, versatile application is sure to realize many additional benefits as Florida emerges from the pandemic and enters the 2020 Hurricane Season.

For more information, please contact Christine Shafik at (850) 410-5615 or by email at Christine.Shafik@dot.state.fl.us.

District Six Begins Managing Traffic Signals in City of Key West

By Javier Rodriguez, District Six TSM&O Program Manager, FDOT

The District Six Transportation Systems Management and Operations (TSM&O) Office expanded the Monroe County Traffic Signal System (MCTSS) with the commencement of operations and maintenance of the traffic signals along the State Highway System in the city of Key West.

System operations began July 1 on 17 signalized intersections, five High-Intensity Activated Crosswalks (HAWKs), and one emergency signal for an area that spans approximately 4.4 miles along US 1. This expansion brings the MCTSS to a total of 34 signalized intersections since the FDOT took over operations in 2018 after several municipalities opted out of their Traffic Signal Maintenance and Compensation Agreement with the FDOT.

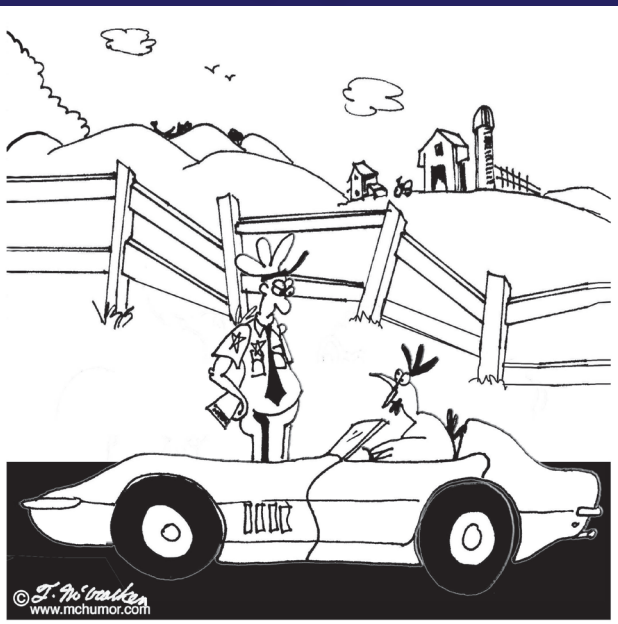
The District built upon its existing efforts in the county and customized its plan to meet the signal needs for the City of Key West. It worked for more than a year on this transition and met with area stakeholders to develop an operational continuity plan that ensured zero down time for drivers.

A major part of this plan was upgrading the city's traffic signal infrastructure to meet today's standards. The District performed a comprehensive assessment of the previous system and identified the best equipment and solutions that would meet the area's traffic needs. The team worked internally with the traffic operations, construction, and consultant management offices to complete this task. The result was a corridor with upgraded traffic signal controllers, new wireless routers, and backup power supply systems for each signalized intersection. The District created a post-launch plan that included team meetings, field visits, and monitoring.

The District worked together despite setbacks caused by COVID-19 to launch by the July 1 deadline. They held virtual meetings to track project progress and ensure continued collaboration. The result is a corridor that is "future ready" to meet the safety and mobility goals for the City of Key West.

For more information, please contact Javier Rodriguez at (305) 640-7307 or by email at Javier.Rodriguez2@dot.state.fl.us.

Break Time



"JUST BECAUSE I DON'T KNOW HOW TO FLY, DOESN'T MEAN I DON'T KNOW HOW TO DRIVE."

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INTEGRATE
METRIC
MILESTONE
CREDENTIAL
SPECTRUM
FRAME
CONTROLLER

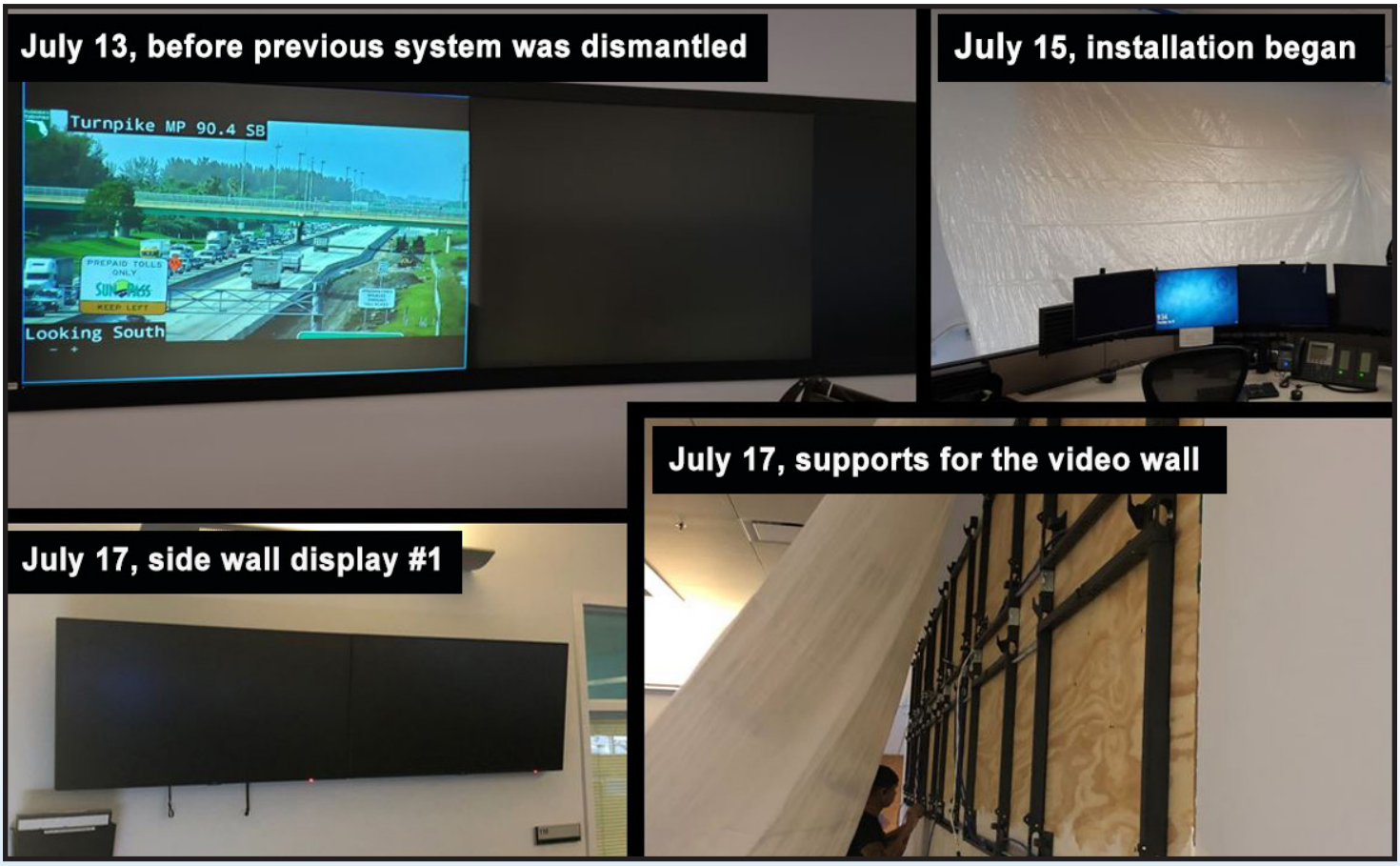
The new digital video wall at FHP's Lake Worth Regional Communication Center can be customized in a multitude of different views combining both live camera streams and dashboard metrics.

Turnpike Enhances Technological Capabilities at FHP Dispatch Center

By: Mary Lou Veroline, TSM&O Technical Writer, Florida's Turnpike Enterprise

Florida's Turnpike incident response efforts are greatly enhanced by the opportunity to co-locate TMC Staff at the Florida Highway Patrol's Lake Worth Regional Communication Center (LWRCC), located next to the West Palm Beach Service Plaza at Mainline Mile Post 94.

These operators, officially called "FHP Liaisons", sit shoulder-to-shoulder with Florida Highway Patrol Dispatchers, and as their name would indicate, ensure seamless communication between the FTE and FHP.



Turnpike Enhances Technological Capabilities at FHP Dispatch Center, continued from page 6

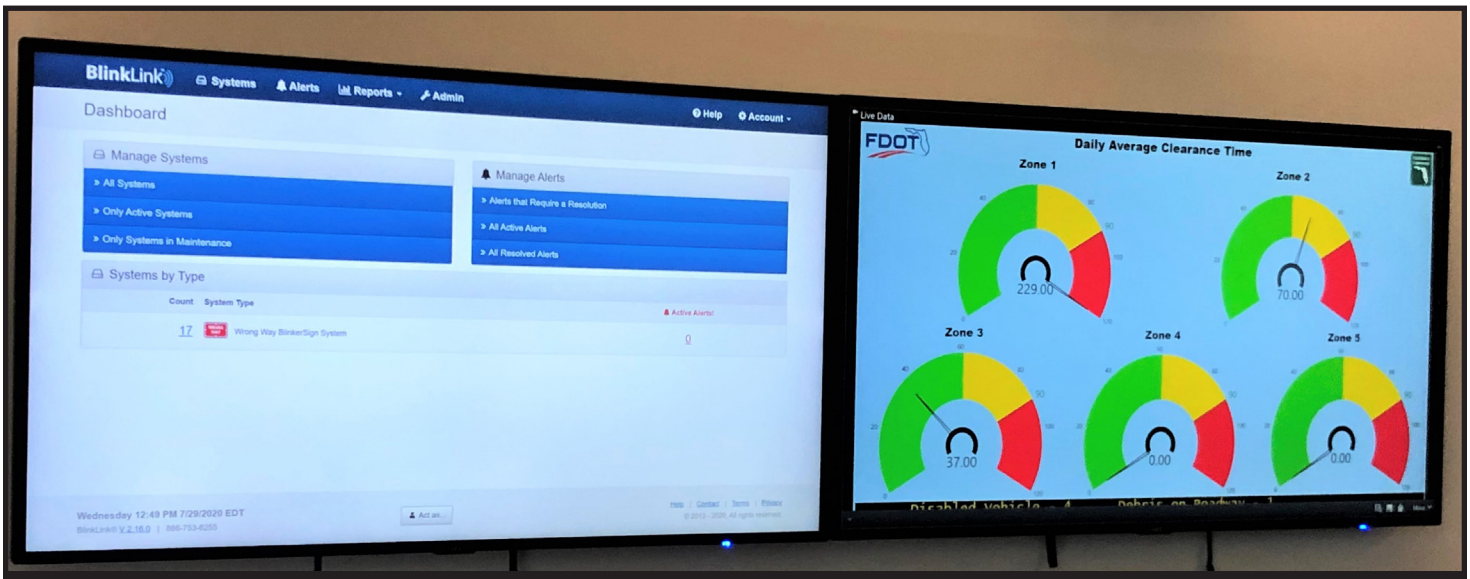
The staff at the LWRCC rely heavily on real-time video from Turnpike CCTV cameras to get an accurate understanding of incident scenes and to assist in locating vehicles subject to law enforcement alerts (wrong-way drivers, Amber or Silver alerts, etc.).

The video wall that had been used for this purpose for 10-plus years was nearing its end of life, leaving the LWRCC in need of an up-to-date replacement. The FTE's ITS technology staff worked diligently to source a new system that would not only be up to the task now but also allow for growth and expansion as complimentary services and applications are brought online in the future. Once the desired system was identified and the components procured, installation took place over a one-week period in mid-July 2020.

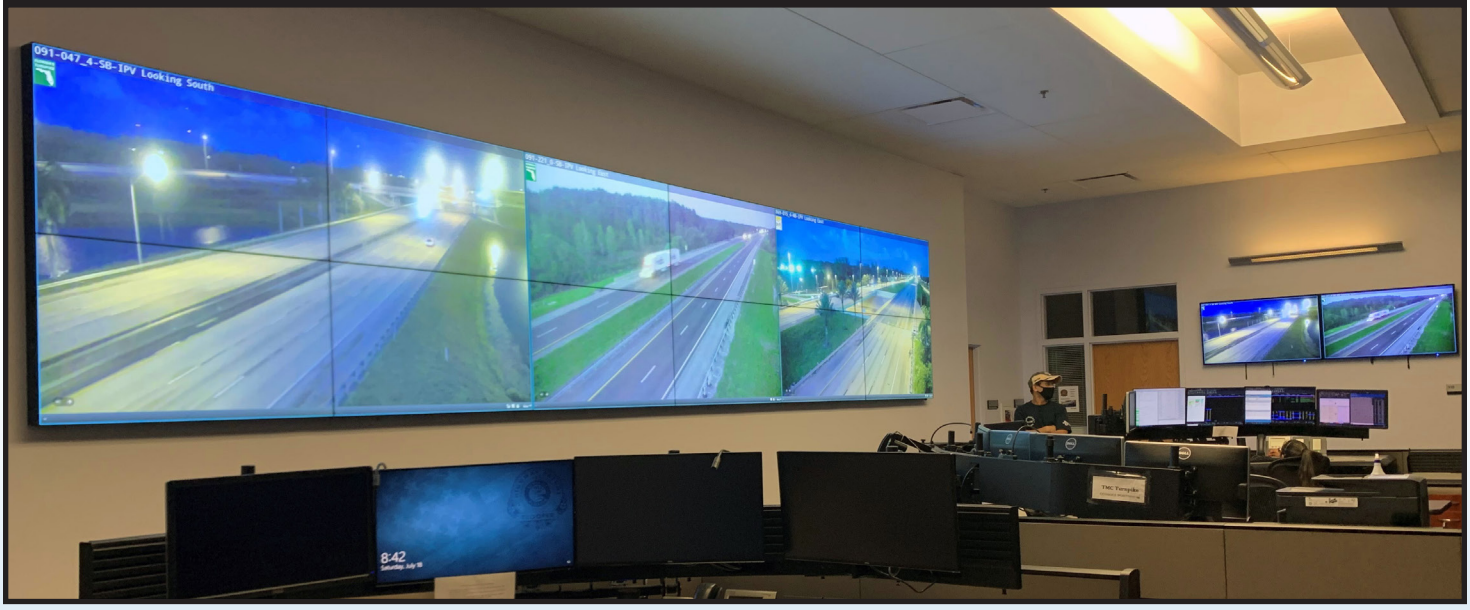
The new video wall, approximately twenty percent larger than its predecessor, is made up of twelve high-definition LCD screens. The old setup had three individual projectors, each limited to displaying only a single camera stream. The new system runs from a single server capable of sending streams to each of the twelve LCD screens in virtually unlimited viewing formats. The system utilizes Milestone Smart Wall Technology allowing operators to drop video streams into the display with a simple click, in addition to customizable dashboard metrics to suit the dispatch center's needs.

The FTE also installed four side-wall units with embedded PC technology that will allow video, performance measures, and other online content dedicated to Turnpike incident response to be displayed, each as an individual workstation.

For more information, please contact John Easterling at (954) 934-1620 or by email John.Easterling@dot.state.fl.us.



Installation of the video wall and side displays was completed on July 18, 2020. Operators now have a wealth of viewing options at their fingertips.



As District One's iVDS Reaches End of Life, Upgrades and Outreach Bring Enhanced User Experience

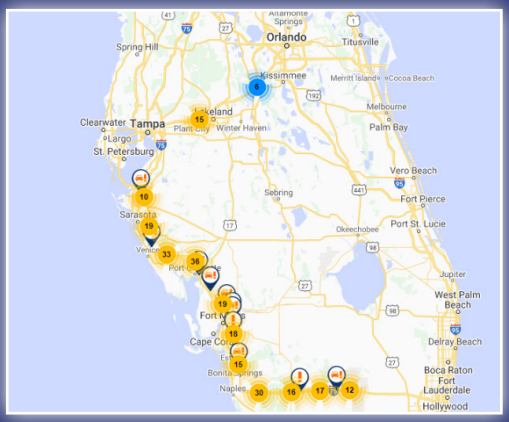
By Mark Mathes, TSM&O Program Engineer, FDOT; Chrissie Collins, FMS/AMS Specialist IV, FDOT; Mike Braun, IT Project Manager, Kyra Solutions

District One's original Inter-agency Video Distribution System (iVDS) was installed in spring 2013. Until replacement in spring 2020, the system was supported by 11 Hewlett-Packard servers running Windows 2008. With every bit of service life squeezed out of the previous setup, Microsoft's discontinuation of Windows 2008 support necessitated an upgrade. The upgrade provided an opportunity to enhance the system, but it was a top priority of the District to ensure no disruption in service for current iVDS users. Several mitigating measures were put in place.

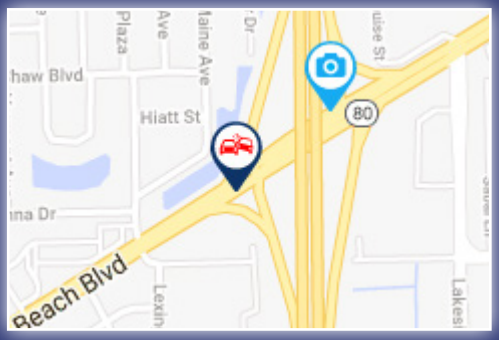
IBI Group was the selected contractor to provide a turnkey iVDS upgrade solution. Installation originally scheduled for April 2020 was postponed due to COVID-19 travel restrictions. The postponement condensed the deployment schedule, which was planned to go live on July 29, 2020. Once the go-live date was solidified, a flyer was created and distributed to all of the current iVDS users. The flyer announced the new system with instructions and a link to access via the new URL. In addition, a splash page at the old iVDS URL provided a link to the new site and users were asked to complete a questionnaire which allowed the district to update their contact information. The IT staff and the contractor worked diligently to update existing user information in the new system to ensure users were able to seamlessly maintain access, especially with Hurricane Isaias threatening Florida in late July, just as the cutover was underway.

The contractor arrived on-site in late May to install and configure five new Dell servers to replace the previous HP servers. An in-place operating system (OS) upgrade to Windows 2012 was completed which provided continuous OS updates until the system was replaced. To further ensure availability of iVDS for users throughout the upgrade, Microsoft Hyper-V was used to complete virtual configuration of the new servers. Hyper-V provides hardware virtualization which means each virtual machine runs on virtual hardware.

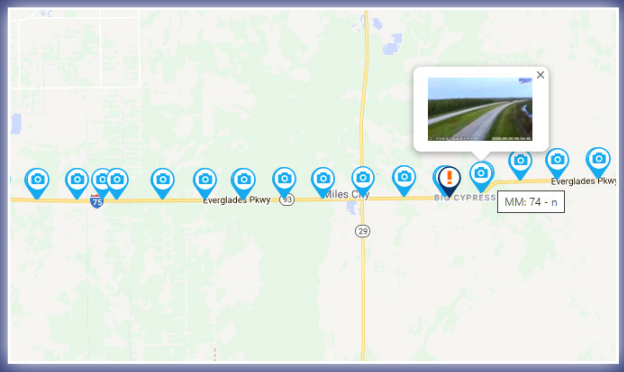
The new District One iVDS contains several enhancements and is scalable to grow with the District One TSM&O Program. Specifically, the system livestreams video from 231 closed-circuit television (CCTV) cameras along I-75 and 41 cameras along I-4 which comprise 99 percent of District One's interstate cameras. Other enhancements include the following:



SW Florida map



Intersection map



Crossroads map

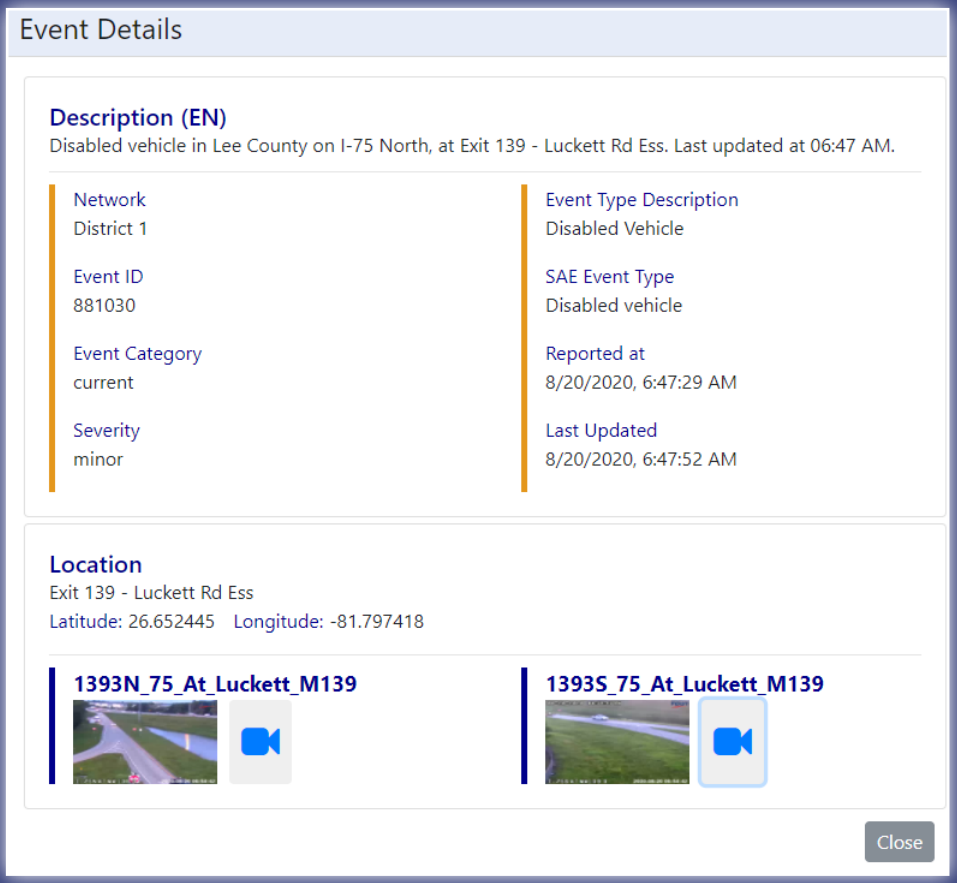
As District One's iVDS Reaches End of Life, Upgrades and Outreach Bring Enhanced User Experience, continued from page 8

- Streaming video that generates snapshots for FL511
- Ability to ingest local municipal and county CCTV streams
- Includes congestion information for local routes with red, yellow, and green mapping
- Users can save preferred viewing locations
- Provides information on the status of all CCTV stream availability
- Allows for individual CCTVs to be blocked from distribution
- Provides health and performance status reports
- Users can enable map view or list view
- List views can be sorted by District, County, Highway, and Blockage
- Scalable to support over 1,000 camera feeds

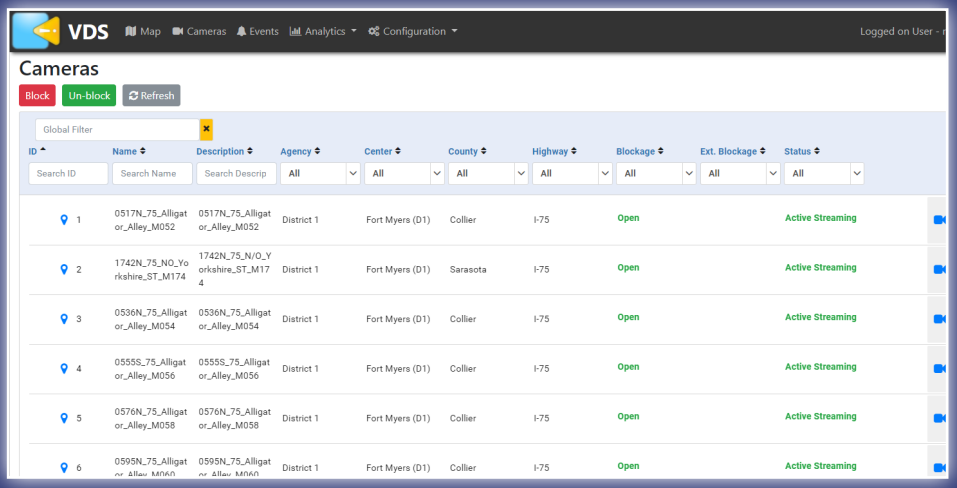
The iVDS is a public safety tool for first responders, media, municipal partners, and others. Live video streams and details of road conditions, such as closures and congestion, allow police, fire, and rescue to perform their jobs more effectively. Feedback regarding the new system has been overwhelmingly positive which is expected to lead to a growing number of users through word-of-mouth marketing. Although most of the services provided by the traffic management center are behind the scenes, the new and improved iVDS investment is front and center for partners to help move the needle on safety and mobility in District One.

For more information, please contact Mark Mathes at (863) 519-2490 or by email at Mark.Mathes@dot.state.fl.us.

Traffic Lights



Event Details



VDS Information

I-75 FRAME

Connected Vehicle Deployment Update

By Jeremy Dilmore, District Five TSM&O Program Engineer, FDOT
and Adam Storm, District Two TSM&O Embedded Staff Member, FDOT

Interstate 75 (I-75) serves as a freight corridor in Florida, connecting directly to the Ports of Tampa and Miami via Florida's Turnpike. The city of Gainesville, home of the University of Florida, and the city of Ocala – a rural community known as the "Horse Capital of the World"– are all located along a portion of I-75 in Florida Department of Transportation (FDOT) District Two. The average annual daily traffic count is 63,000 with an average of 20 percent truck traffic. The corridor is also known for crashes that result in closing all lanes. On average there is one crash every nine days in each direction that results in complete lane closure for that direction.

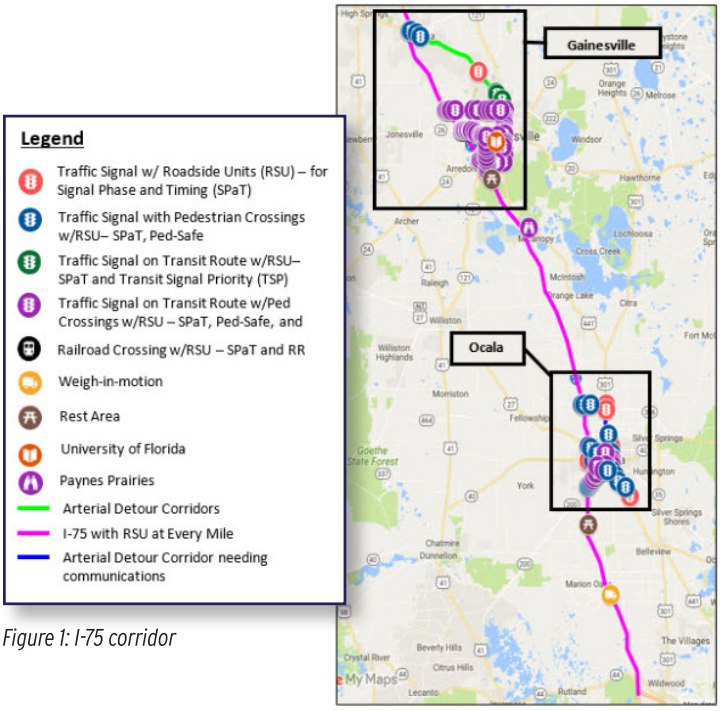


Figure 1: I-75 corridor

In response to this recurring congestion, FDOT Central Office, led by Dr. Raj Ponnaluri, developed the I-75 Florida's Regional Advanced Mobility Elements (FRAME) project. The project utilizes integrated corridor management strategies and connected vehicle (CV) technologies as a future tool for providing information on alternative routes and improving signal timing on those routes. Additionally, the project implements signal phasing and timing (SPAT), MAP, emergency vehicle preemption, and transit signal priority as CV applications. Onboard units will be deployed on some public fleets to utilize these applications.

The project straddles District Two to the north and District Five to the south, including deployment of CV roadside units (RSU) along I-75 and key arterial corridors around Gainesville and Ocala. Both Districts took up the challenge of implementing the projects by securing a consultant to work with the FDOT as a systems manager to perform vendor outreach, evaluate preliminary technologies, produce construction plans, and assist with system configuration, deployment, and integration.

Along with this project's technical challenges, the regulatory uncertainty of the Federal Communication Commission (FCC) came into play shortly after the design phase and during early construction. The FDOT also continued to build its CV capacity during project implementation with the acquisition of its statewide Security Credential Management System (SCMS). Both of these developments had direct impacts on FRAME by requiring project teams to remain flexible, adjust to changing regulatory conditions, and accommodate new integration activities while continuing to meet the original project goals.

I-75 FRAME Product Evaluation and Selection

Project teams from both District Two and District Five worked cooperatively to perform vendor outreach, evaluate CV devices, and select products for their respective projects. District Two selected a particular product while District Five permitted three different RSU vendors to be utilized - after conducting proper compatibility testing. In addition to supporting the vision established by the FDOT Central Office for FRAME by providing core CV functionality along I-75 and local arterials, the system design in District Two sought to upgrade and expand the travel time and origin/destination systems already in use for arterial corridor monitoring and management in the area.

Based on the outcome of these initial project demonstrations, equipment was selected for deployment on the District Two portion of FRAME (D2 FRAME). After going through a TERL evaluation, an FDOT Traffic Control Device Permit application was submitted and approved for the CV equipment used on the D2 FRAME. District Two procured material directly, while their system manager consultant developed project plans, details, and specifications to advertise a construction project for installation of the FDOT furnished devices. Figure 1 illustrates a high-level diagram of the resulting D2 FRAME

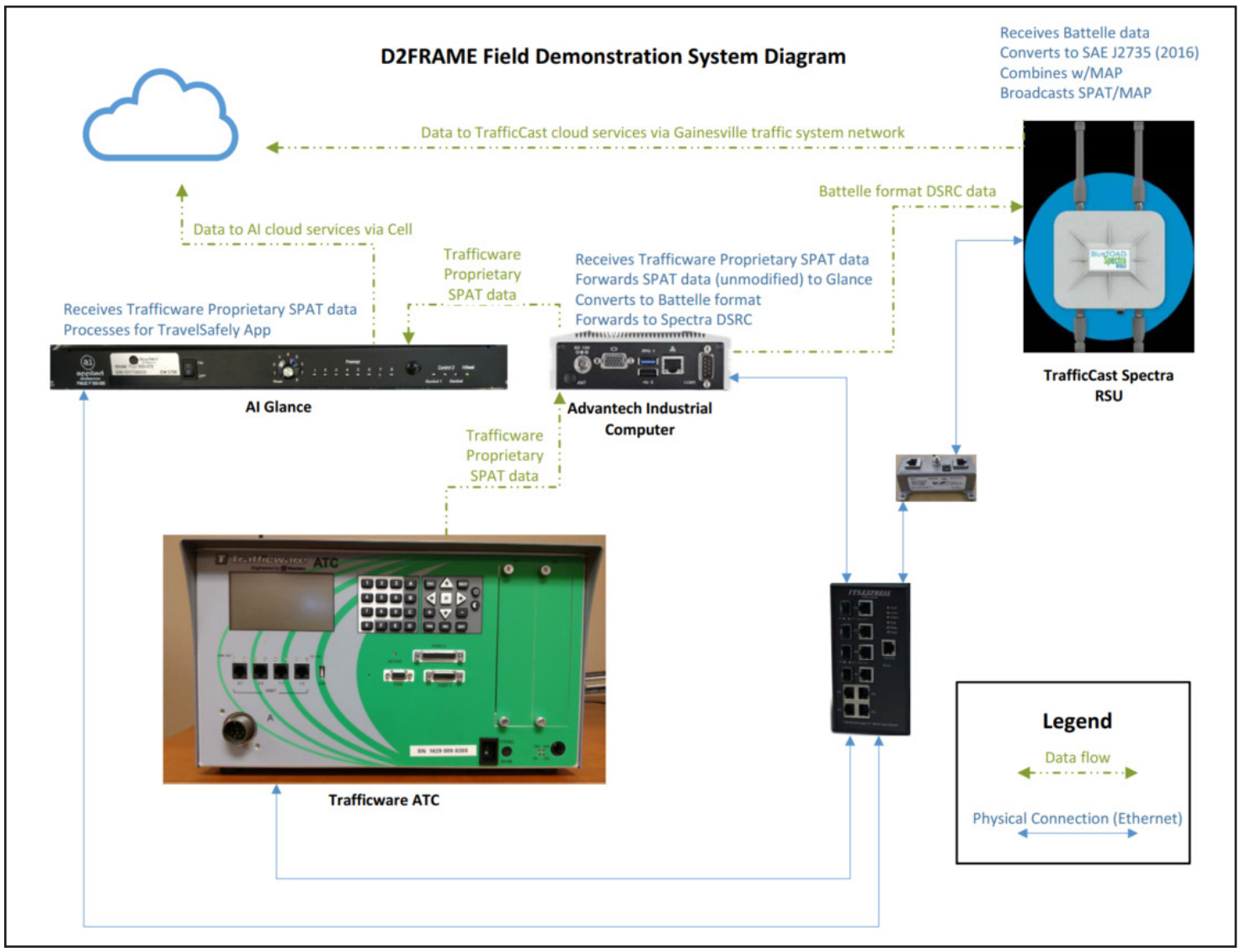


Figure 2: Summary of Initial Product Evaluations for core D2FRAME CV Functions (2018)

field equipment deployment architecture.

The TrafficCast Spectra RSU was ultimately selected for the D2 FRAME deployment since it met project requirements for dedicated short-range communications (DSRC) CV functionality, while also providing the traditional functionality of an automatic vehicle identification system. The City of Gainesville and FDOT District Two already had a substantial deployment of BlueTooth detectors for 24/7/365 travel time monitoring and periodic origin-destination analysis. Currently CV equipment is limited by the very small number of vehicles equipped to communicate via DSRC. However, adding Spectra RSUs into existing systems provides immediate operational value due to their ability to function as an additional detector while also providing a platform for emerging CV applications.

The D2 FRAME construction project was awarded to Traffic Control Devices, Inc. (TCD) and managed by Brandon Smith of FDOT's District Two Gainesville Construction office. Overall, the project execution went well and according to plan. The RSU and RSE devices were purchased by FDOT and delivered to the City of Gainesville Signal Shop. There, technical staff from FDOT's system manager consultant worked closely with City of Gainesville personnel and the vendors to bench-test and pre-configure devices for installation. The TCD construction crew, managed by April Andrews, was an instrumental part of the overall project team and worked diligently to provide good results and overcome challenges.

Installation began at the sites along I-75 and before transitioning onto local arterials. Once TCD completed a few installations and were familiar with the equipment, their crews were completing three to five interstate RSU installations daily. Installation times at intersections requiring lane closures took slightly longer.

The District Five project proceeded quite differently. The project included significant upgrades to communication that were on the critical path. During this period, a Supplemental

RSUs being provisioned with MAP, other applications, and credentials for the SCMS.

Agreement to change RSUs from DSRC to dual-band DSRC and C-V2X was processed. RSUs were shipped without applications. Later the RSU vendor added the applications at the testing office via a VPN connection before working with the SCMS vendor to join all the units to the State's SCMS. Every device and application was tested for functionality FCC approval for DSRC Channel 180 broadcast and a license for experimentation for C-V2X was obtained for each device location. To date, approximately 30 of 103 RSUs have been successfully deployed. Current modifications to FDOT, city, and county firewalls are underway to allow updates for these devices to be received. Even though District Five's physical deployment lags behind, the functionality of the devices has been verified.

Spectrum Allocation and Regulation Challenges

The current situation with FCC spectrum allocation in the 5.9GHz band is perhaps one of the biggest ongoing challenges to the I-75 FRAME projects and many others. The FCC announced a temporary freeze on acceptance and processing of new and expanded use applications in the 5.9GHz band on December 19, 2019. While the FRAME project teams submitted site registration applications for use of all DSRC channels in October 2019, those applications have been left in a "pending" state by the FCC since their submission. Currently, the FCC will only process and accept site registrations requesting operation exclusively in the 5895-5905MHz (aka, Channel 180) portion of the 5.9GHz band.

This is problematic because the United States government, and in particular the US Department of Transportation, had encouraged industry to develop CV equipment for public safety using DSRC technology in compliance with nationally recognized standards that have been established for such purposes, including USDOT DSRC Roadside Unit Specifications as well as Institute of Electrical and Electronics Engineers (IEEE) and Society of Automotive Engineers (SAE) standards - all of which require DSRC devices to use channels outside of the 5895-5905MHz frequency band. Fortunately, the Spectra RSUs deployed on D2 FRAME can be configured to operate using Channel 180 exclusively. However, doing so makes these RSUs incompatible with other legacy DSRC equipment previously authorized by the FCC.

The project team is currently working through the impact of this unexpected shift in FCC regulations on D2 FRAME and the impact that it has on equipment functionality. The reduced bandwidth associated with single channel operation may very well reduce system functionality, capacity, or both. The exact impact has yet to be determined. In working through this issue, it is apparent that many agencies and equipment manufacturers find themselves in similar situations and are doing their best to work with these recent regulatory impediments. Fortunately, the RSUs deployed on the project provide operational value as automatic vehicle identification detectors regardless of challenges involving DSRC, C-V2X, or the 5.9GHz band.

Best Practices and Lessons Learned

A best practice adopted and promoted by the D2 FRAME project team was to achieve success on a small scale before widespread implementation, especially when dealing with firmware or configuration changes. A few intersections along SW 16th Avenue (SR-24A) were used throughout the project as field evaluation sites. This was done to evaluate system operation following any modifications, ensure the proper function of equipment, and work with manufacturers to resolve any unexpected issues introduced as a result of changes. The reality is that all CV system components are still relatively new and still under development. As such, agencies must be prepared to work through projects in partnership with equipment manufacturers to establish reliable fundamental operation before methodically expanding into more advanced CV applications from that baseline.

Lessons learned from both projects are being documented and shared amongst the Districts, Florida's Turnpike, and Central Office to improve the agency's capacity to deliver CV projects quickly and successfully. While neither project has reached completion, important lessons on testing, provisions, channel assignment, mounting, compatibility, and acquisition have all been learned as part of the effort. More information on Florida's Connected Vehicle effort is available at https://www.fdot.gov/traffic/its/projects-deploy/cv/connected-vehicles.

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