

 Oct 28-29, 2025

 Orlando, FL



## Connected & Automated Vehicle




**Christine Shafik, PE, PMP®, CPM, FCCM, FCCN, CGB**  
State Connected Mobility & Technologies Engineer

**Omar Faruk, PE, PTOE, CVP**  
Connected Mobility and Technologies Program GEC

Transportation Symposium Website



SCAN ME

1

# Objectives:





**Overview of FDOT's CAV Program**



**CAV History and Aspirations**



**Deployment Considerations  
Example Best Practices**



2

2

## Why CAV?

### - CAV Program Supports Target Zero

Target Zero focuses on influencing change in specific behaviors **before a crash occurs**.

CAV Program is a tool in FDOT's toolbox to prevent crashes.

Influence driver awareness with situational alerts to avoid crashes.



3

TRANSPORTATION  
SYMPOSIUM

3

## What are Automated Vehicles (AV)?

AV



### SAE (Society of Automotive Engineers) J3016 Standard

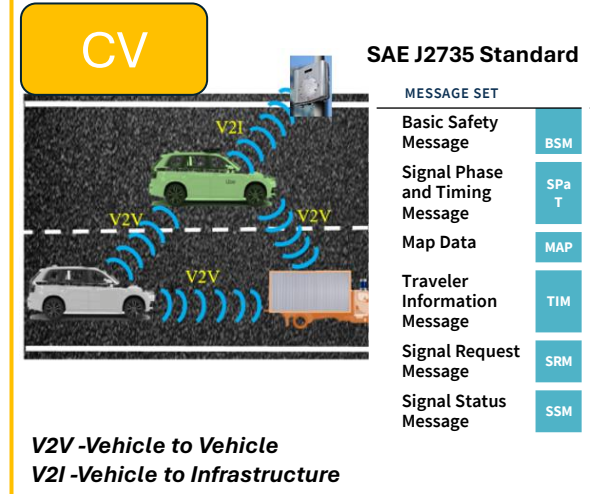
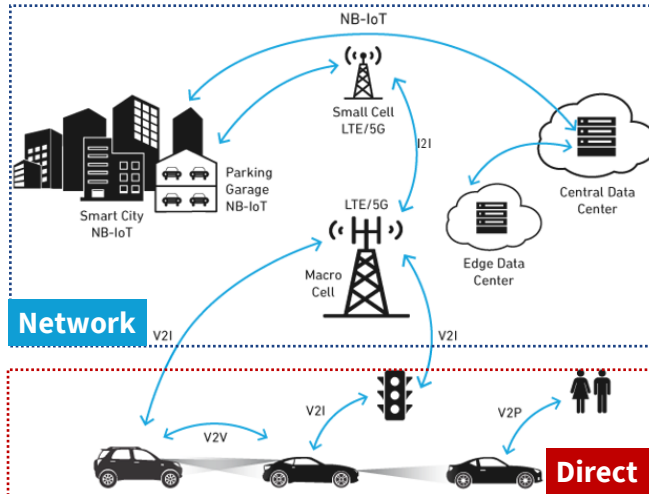
SAE LEVEL 0™	SAE LEVEL 1™	SAE LEVEL 2™	SAE LEVEL 3™	SAE LEVEL 4™	SAE LEVEL 5™
0	1	2	3	4	5
No Autonomy	Driver Assistance	Partial Autonomy	Conditional Automation	High Automation	Full Automation

4

TRANSPORTATION  
SYMPOSIUM

4

## What are Connected Vehicles (CAV)?



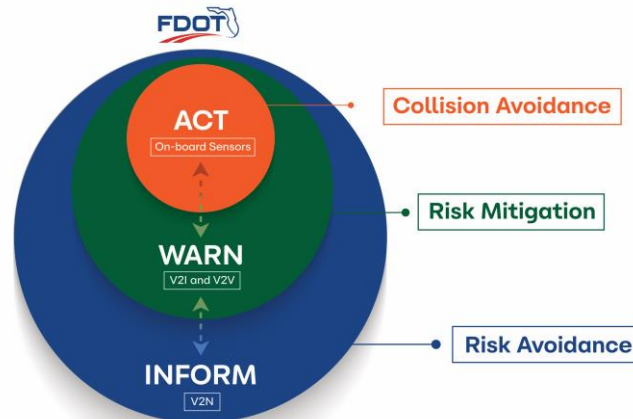
5

TRANSPORTATION  
SYMPOSIUM

5

## What Is Vehicle-to-Everything (V2X) Communication?

V2X provides the communication technologies for CAV.

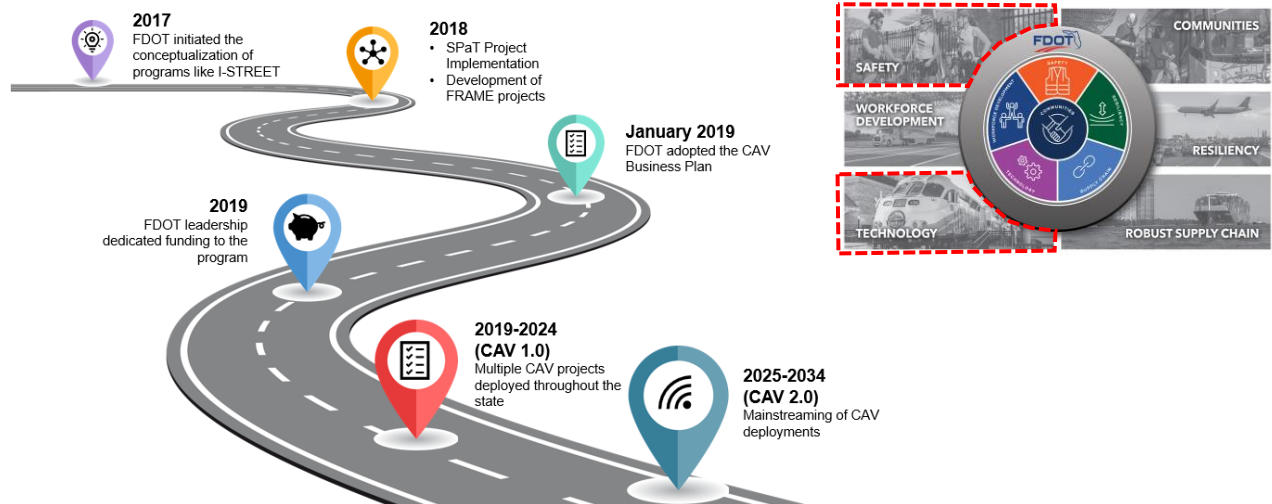


6

TRANSPORTATION  
SYMPOSIUM

6

# CAV Implementation Roadmap



7

TRANSPORTATION  
SYMPOSIUM

7

## CAV Projects in Florida

### Projects/Initiatives

#### Statewide Project/Initiative

##### FDOT Led Projects

##### Partner Agency Led Projects

##### Legacy/Retired

- 1 Near Miss Identification Safety System (NMISS)
- 2 Gainesville AV Shuttle
- 3 Osceola County CV Signals
- 4 CAV Projects (ATMA)
- 5 Downtown Tampa Autonomous Transit
- 6 HART AV
- 7 AV Shuttle at PSTA

##### Planning

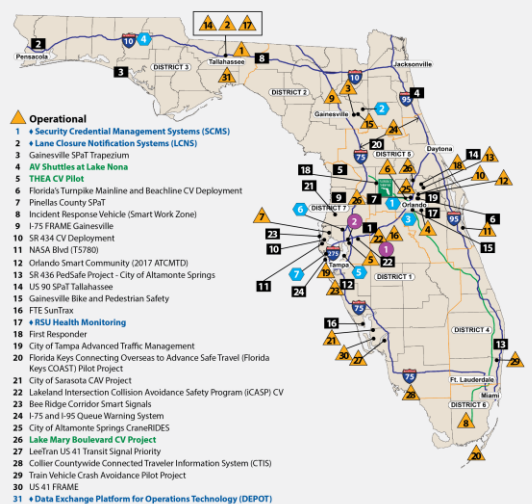
- 1 District 1 CV Master Plan
- 2 Connected Vehicle Priority and Preemption System (CVPP)

#### Design/Implementation

- 1 I-4 FRAME (2019 ATCMTD)
- 2 Davis Highway CAV
- 3 US 90 Smart Bay
- 4 Smart St. Augustine
- 5 Bicycle Detection Pilot Program
- 6 State Road 423 Freight Signal Priority
- 7 SODATOR (E59A5) - Smart Orlando Downtown Advanced Traffic Operations Performance
- 8 I-10 Smart Road Ranger
- 9 District 7 Integrated Corridor Management
- 10 Pinellas SR 60 West Coast Smart Signal Corridor Project
- 11 Pinellas County Smart Community (2020 ATCMTD)
- 12 Sarasota County - SR 780 Fruitville Rd and US-41 Tamiami Trail
- 13 SR-869/SW 12th Street Connector TSMMS SWZ
- 14 US-17-92 Connected Vehicle Deployment
- 15 Ped/Safe II U.S. 441/State Road 50
- 16 SR 29 Wildlife Detection
- 17 Bluetooth to RSU Conversion in Orange and Osceola Counties
- 18 CV Smart Signal - Lake County
- 19 FL511 Mobile App CV
- 20 SR-40 ITS Safety Deployment (E54F0)
- 21 Pasco County SMART US-19
- 22 Hillsborough County Connected Vehicle Priority and Preemption System
- 23 City of Clearwater Pedestrian Warning System
- 24 City of St Petersburg Smart Signal Corridor Project

#### Operational

- 1 • Security Credential Management Systems (SCMS)
- 2 • Lane Closure Notification Systems (LCNS)
- 3 Gainesville SPaT Tripartite
- 4 AV Shuttles at Lake Nona
- 5 THEA CV Pilot
- 6 Florida's Turnpike Mainline and Beachline CV Deployment
- 7 Pinellas County SPaT
- 8 Incident Response Vehicle (Smart Work Zone)
- 9 I-75 FRAME Gainesville
- 10 SR-434 CV Deployment
- 11 NASA Blvd (T5780)
- 12 Orlando Smart Community (2017 ATCMTD)
- 13 SR-436 PedSafe Project - City of Altamonte Springs
- 14 US 90 SPaT Tallahassee
- 15 Gainesville Bike and Pedestrian Safety
- 16 FTE SunTrax
- 17 • RSU Health Monitoring
- 18 First Responder
- 19 City of Tampa Advanced Traffic Management
- 20 Florida Keys Connecting Overseas to Advance Safe Travel (Florida Keys COAST) Pilot Project
- 21 City of Sarasota CAV Project
- 22 Lakeland Intersection Collision Avoidance Safety Program (ICASP) CV
- 23 Bee Ridge Corridor Smart Signals
- 24 I-75 and I-95 Queue Warning System
- 25 City of Altamonte Springs CaneRIDEs
- 26 Lake Mary Boulevard CV Project
- 27 LeeTran US 41 Transit Signal Priority
- 28 Collier Countywide Connected Traveler Information System (CTIS)
- 29 Train Vehicle Crash Avoidance Pilot Project
- 30 US 41 FRAME
- 31 • Data Exchange Platform for Operations Technology (DEPOT)



As of 08/14/2025

8

TRANSPORTATION  
SYMPOSIUM

8

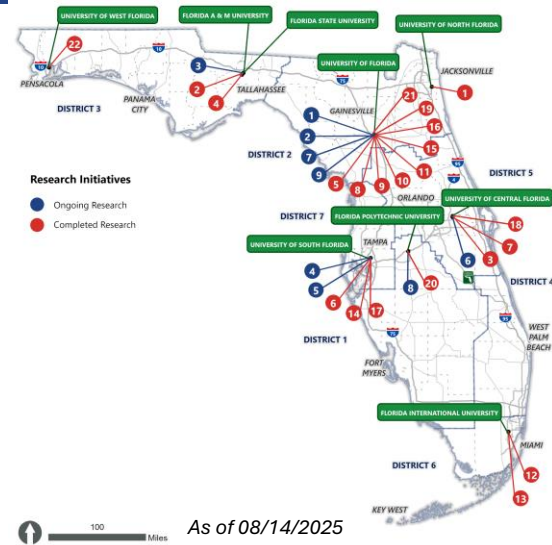
## CAV Research Projects in Florida

**9**

**On-going Projects**

**22**

**Completed Projects**



9

TRANSPORTATION  
SYMPOSIUM

## CAV Accomplishments (2017-2024)



### Regional Integrated CAV Projects

- I-75 FRAME
- I-4 FRAME
- US 41 FRAME



### Signal Phase and Timing (SPaT)

- Partnership with Traffic Signal Maintaining Agencies



### Statewide Projects

- DEPOT
- SCMS



### Local Agency Partnership Programs

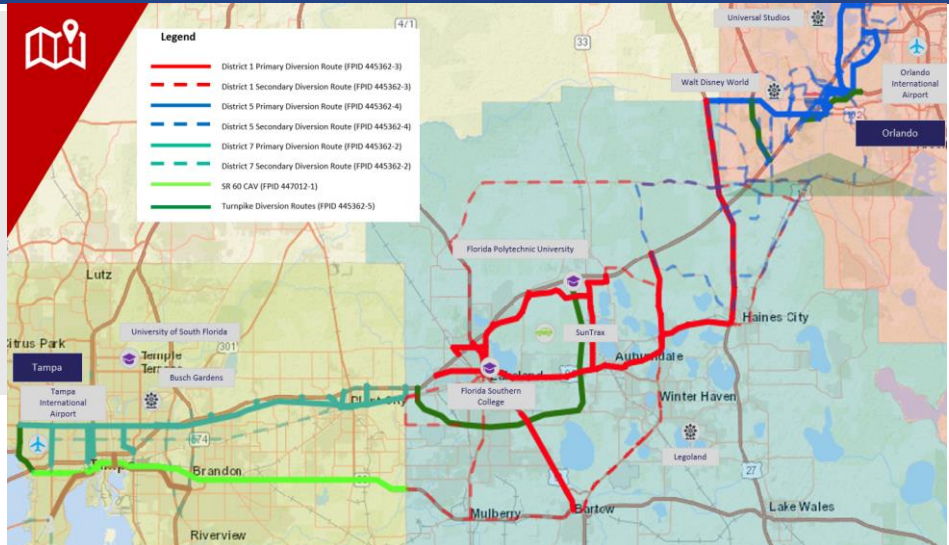
- Technology Application Partnership with Local Agencies (TAPs-LA)

10

TRANSPORTATION  
SYMPOSIUM

## Major CV Project Example: I-4 FRAME

- 77 miles of Interstate, 122 miles of arterial routes
- Four counties and Four FDOT Districts
- Integrated Corridor Management (ICM) with vehicle-to-infrastructure (V2I) technologies.
- 689 roadside units (RSUs) and nearly 400 On-board Units (OBUs).
- Four regional universities (USF, UCF, Florida Poly, and UF) helping in research

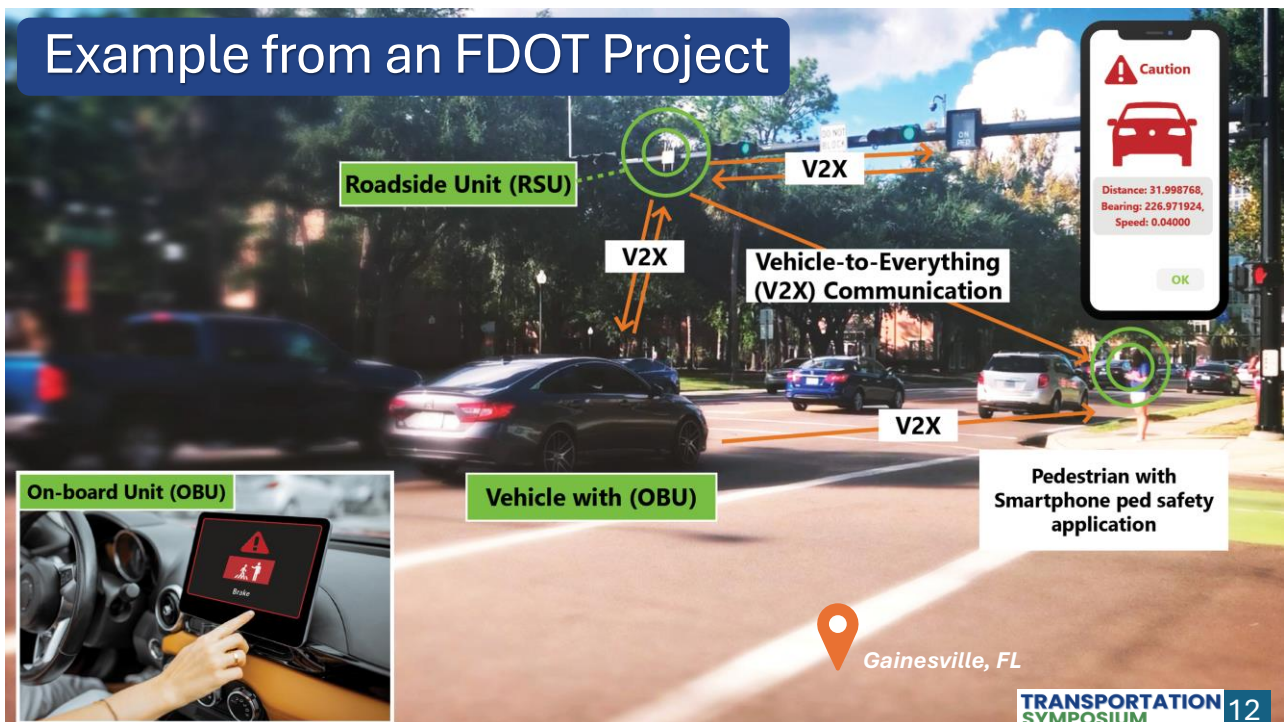


11

TRANSPORTATION  
SYMPOSIUM

11

## Example from an FDOT Project



12

# Central Office Systems for CAV



13

TRANSPORTATION  
SYMPOSIUM

13

# SunTrax Testing

FDOT testing facility that focuses on testing of CV and emerging technologies in a controlled environment.



- 1 FTE Tolls Buildings
- 2 Infield Entry Campus
- 3 Workshops & Warehouses
- 4 Roadway Geometry Track
- 5 Loop Tracks
- 6 High-Speed Oval
- 7 All-Electronic Toll Gantries
- 8 Urban & Suburban
- 9 Pick-Up & Drop-Off
- 10 Sensor Test Chamber
- 11 Braking & Handling
- 12 Technology Pad

14

TRANSPORTATION  
SYMPOSIUM

14

# I-STREET Research

## I-STREET

A research hub (living lab) within the University of Florida to evaluate and test Emerging Transportation Technology



15

TRANSPORTATION  
SYMPOSIUM

15

## Focus Areas (2025 onward)



Leverage V2X Technologies for Safety and Mobility



Continued Evaluation Testing and Research



Education, Outreach and Partnerships



Mainstreaming and Data Sharing




Infrastructure Preparedness for ADS and AV

16

TRANSPORTATION  
SYMPOSIUM

16

# Updating Standards FDM 233.12.3

High Level Overview	Connected Vehicle Infrastructure
<b>2019 to 2024 Version</b> <ul style="list-style-type: none"> <li>General Overview, and <b>Single</b> Section</li> <li>CV as an <b>emerging</b> TSM&amp;O strategy</li> <li>Specifications from <b>referencing National Standards</b></li> <li>Uses <b>DSRC</b> and Cellular</li> </ul>	<b>2025 Version</b> <ul style="list-style-type: none"> <li><b>Additional Sub-sections</b> developed (8 subsections) <ul style="list-style-type: none"> <li>233.12.3.1 – Systems Engineering</li> <li>233.12.3.2 – Networks</li> <li>233.12.3.3 – SCMS</li> <li>233.12.3.4 – MAP Data</li> <li>233.12.3.5 – FCC</li> <li>233.12.3.6 – Legacy Systems</li> <li>233.12.3.7 – Supporting Technology</li> <li>233.12.3.8 – Operations and Maintenance</li> </ul> </li> <li><b>Mainstream CV Infrastructure deployment</b></li> <li><b>FDOT's Developmental Specifications</b></li> <li><b>Leverages networked</b> (i.e., LTE-V2X) and <b>direct communication</b> <ul style="list-style-type: none"> <li>Removes <b>DSRC</b> altogether.</li> </ul> </li> </ul> 

17

TRANSPORTATION  
SYMPOSIUM

17

TRANSPORTATION  
SYMPOSIUM

18

18

# What is an RSU and OBU?

**Roadside Units (RSU)**



**Onboard Units (OBU)**



19

TRANSPORTATION  
SYMPOSIUM

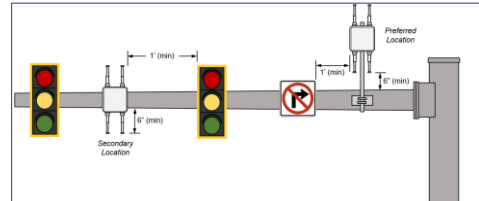
19

## What is an RSU?

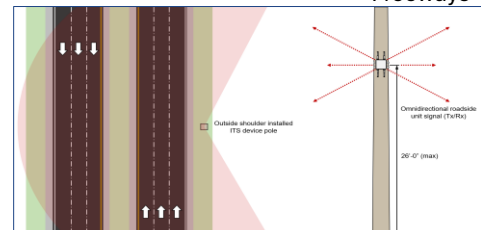
**Roadside Units (RSU)**



**Arterials**



**Freeways**

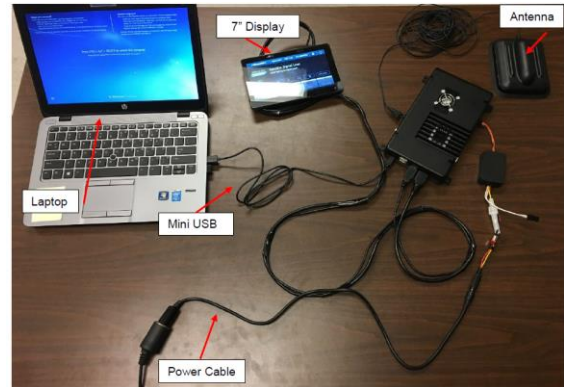


20

TRANSPORTATION  
SYMPOSIUM

20

# What is an On-Board Unit (OBU)?



21

TRANSPORTATION  
SYMPOSIUM

21

## CAV Planning Steps Considerations

### Planning

- Establish Goals and Objectives
  - Long Range Transportation Plans
  - ITS/TSMO Master Plans
  - Projects
- Tie outcomes to applications
- Obtain Stakeholder Buy-in
- FDOT or local agency maintenance agreement
- **Plan integration needs:**
  - FCC site registration
  - SCMS certificate support
  - DEPOT integration
- **Local agency coordination for network access**



*FCC: Federal Communications Commission  
SCMS: Security Credential Management System  
DEPOT: Data Exchange Platform for Operational Technology*

22

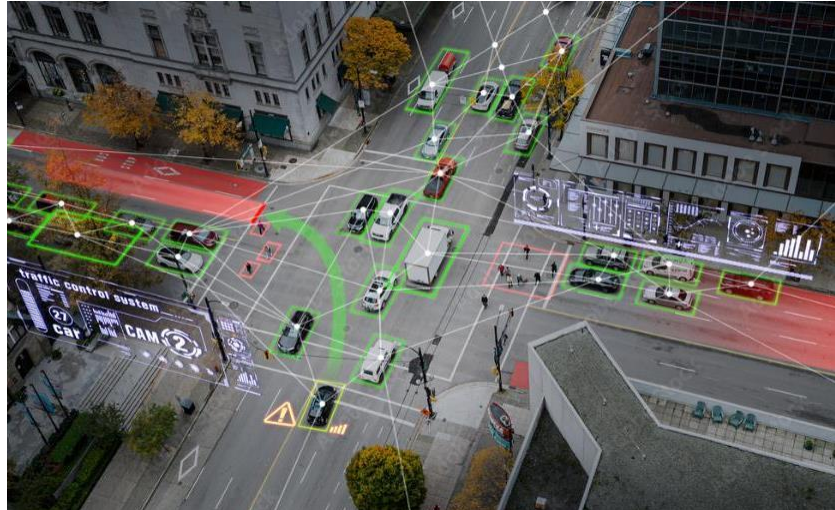
TRANSPORTATION  
SYMPOSIUM

22

## CAV Design Steps Considerations

### Design

- Contracting Method
- Freeway systems:
  - Physical support infrastructure and connectivity should be already in place
- Arterial systems:
  - Controller type
  - Controller firmware version
  - Cabinet space
  - Connectivity to the TMC
- Network configuration specifics
- FCC site registration data collection

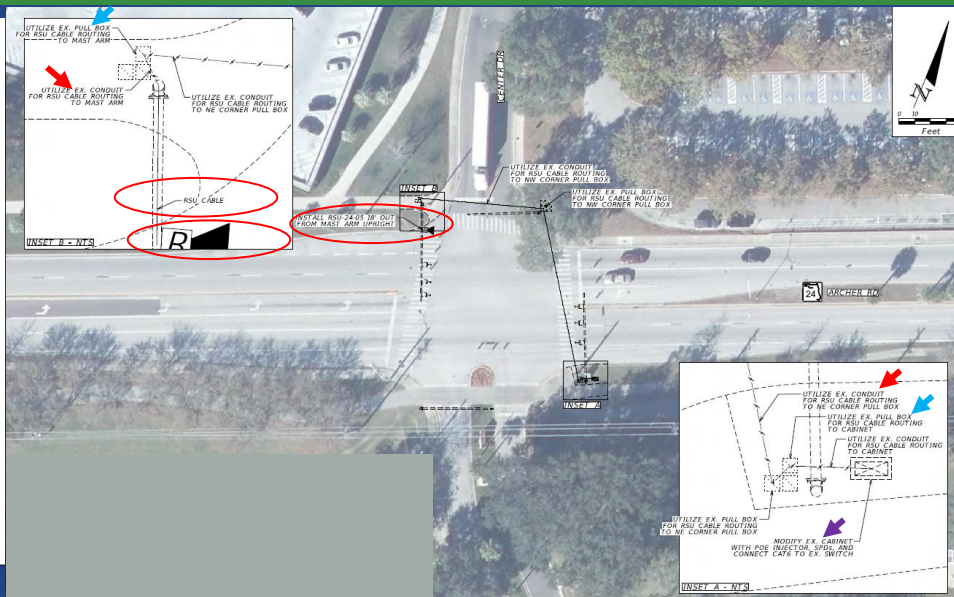


23

TRANSPORTATION  
SYMPOSIUM

23

## Typical RSU Design Considerations

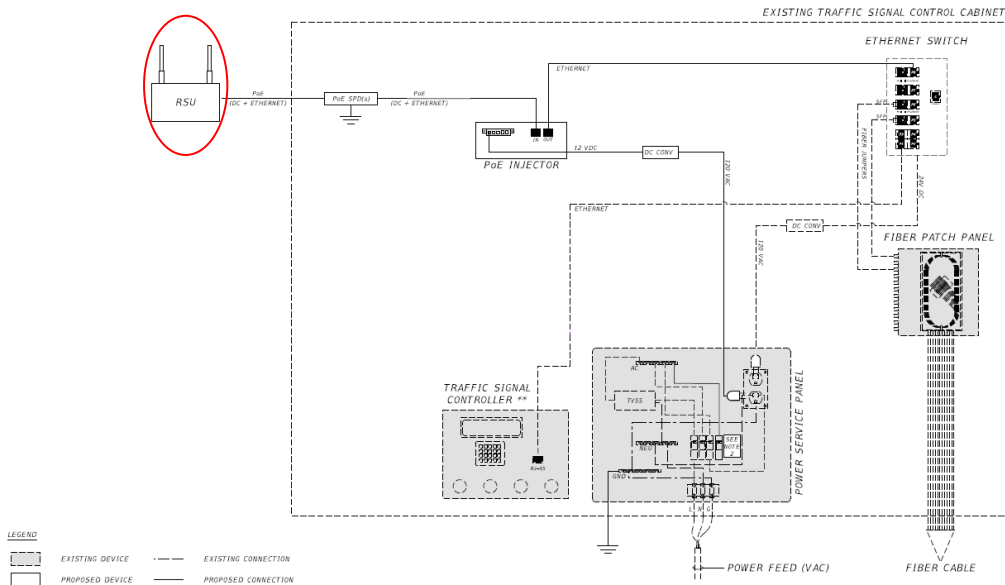


24

TRANSPORTATION  
SYMPOSIUM

24

# Typical Wiring – Existing Traffic Signal Cabinet



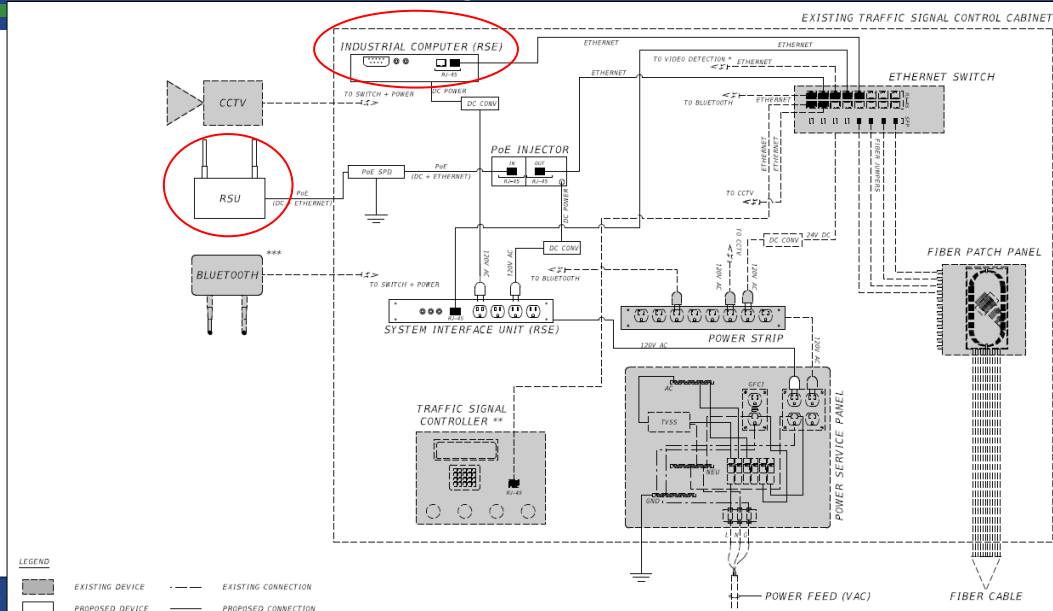
NSPORTATION  
POSIMUM

25

25

# Typical Wiring – Existing Traffic Signal Cabinet

## Industrial Computer Running Multiple Applications



26

26

NSPORTATION  
POSIMUM



## CV Design – Typical Design Staff Hour Estimate

### Task 33 (ITS Analysis)

#### 33.1 (ITS Analysis):

Connected and Automated Vehicle (CAV) Subsystem: 4-8 hours per site

### Task 34 (ITS Plans)

#### 34.5 (Typical & Special Details):

- Typical and Special Details Sheets (4-8 hours/detail)
  - Block diagrams
  - Wiring diagrams
  - Special mounting details

29

TRANSPORTATION  
SYMPOSIUM

29

## CAV Implementation Considerations in Construction and O&M

### Construction

- Systems integration – **Who?**
- Project acceptance testing
- Burn-in period

### Operation and Maintenance

- Hardware and software needs
- On-going maintenance of the accurate MAP
- Keep the FCC site registration up-to-date
- Network configuration and trouble-shooting
- Software licensing
- Monitor the status of the devices and data flow



30

TRANSPORTATION  
SYMPOSIUM

30

# Test Plan for Project Acceptance

Contractor to develop and submit to the Engineer for consideration and approval

- 1 Verify physical construction and wiring
- 2 Verify proper voltages for all power supplies and related power circuits
- 3 Verify that the power LEDs on roadside equipment illuminates
- 4 Log in to CV equipment and verify access UI
- 5 Verify the configuration of CV equipment network interfaces
- 6 Confirm the RSU can communicate with the FDOT SCMS
- 7 Verify RSU broadcasts to and from vehicles equipped with an OBU capable of message display
- 8 Verify local functionality of CV applications

31

**TRANSPORTATION**  
 SYMPOSIUM

31

# FCC Site Registration - Process



## Site Registration Update Criteria



Link to the ULS: [ULS License - Intelligent Transportation Service \(Public Safety\) License - WQBS407 - Florida, State of \(fcc.gov\)](https://www.fcc.gov/licenses/Intelligent%20Transportation%20Service%20Public%20Safety%20License-WQBS407-Florida)

32

**TRANSPORTATION**  
 SYMPOSIUM

32

## SCMS Enrollment Process

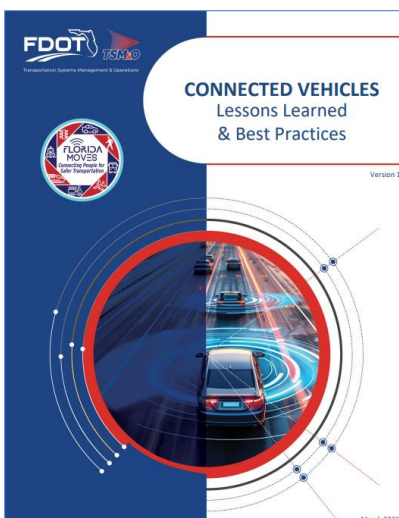


33

TRANSPORTATION  
SYMPOSIUM

33

## CAV Lessons Learned & Best Practices



- The 2025 (First Edition) of the E-Book is available online in the CAV SharePoint
- Ask your District TSM&O team for a copy.

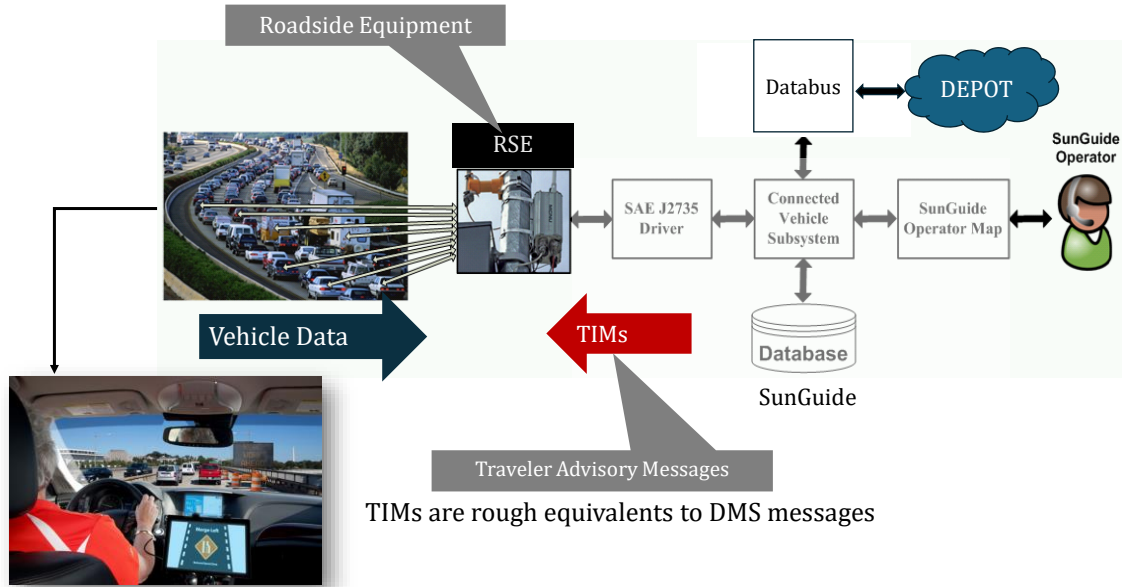
34

TRANSPORTATION  
SYMPOSIUM

34

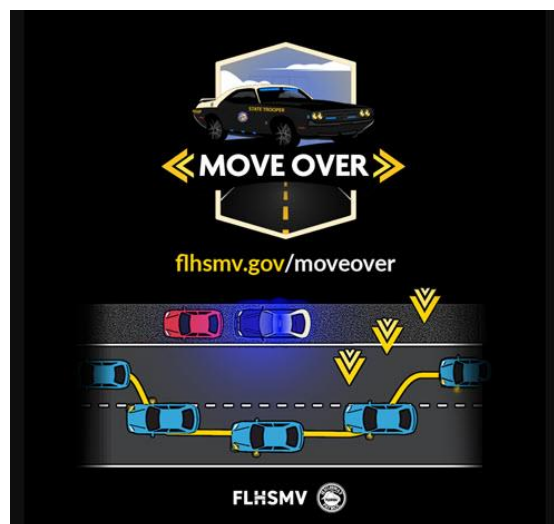
## Connected Vehicle Systems in Traffic Operations

RSEs are the collection points for connected vehicle data



35

# Thank you!



36

TRANSPORTATION  
SYMPOSIUM

## Contact Us

### **Christine Shafik, PE, PMP®, CPM, FCCM, FCCN, CGB**

State Connected Mobility & Technologies Engineer  
State Traffic Engineering & Operations  
Florida Department of Transportation  
Email: [christine.shafik@dot.state.fl.us](mailto:christine.shafik@dot.state.fl.us)  
Phone: 850-410-5615

### **Omar Faruk, PE, PTOE, CVP**

Connected Mobility & Technologies Program GEC  
Email: [mdomar.faruk@dot.state.fl.us](mailto:mdomar.faruk@dot.state.fl.us)

**TRANSPORTATION**  
SYMPOSIUM