



## CENTRAL FLORIDA TSM&O CONSORTIUM MEETING SUMMARY

**Meeting Date:** December 8, 2022 (Thursday)

**Time:** 10:00 AM – 12:00 PM

**Subject:** TSM&O Consortium Meeting

**Meeting Location:** Teleconference

### I. OVERVIEW

The purpose of this recurring meeting is to provide an opportunity for District Five FDOT staff and local/regional agency partners to collaborate on the state of the TSM&O Program and ongoing efforts in Central Florida. Jeremy Dilmore gave a short introduction and outlined the meeting agenda.

### II. TSMCA EXHIBIT E AMENDMENT

Jeremy Dilmore gave a brief update on the Traffic Signal Maintenance and Compensation Agreement (TSMCA) Exhibit E Amendment (FDOT District Five) and the TSMCA Update (FDOT Central Office).

- TSMCA Exhibit E Amendment
  - District Five has been coordinating with local agencies to clarify roles and responsibilities, based on each agency’s capabilities and preferences
  - The District received feedback during Districtwide and one-on-one meetings with local agencies, as well as via the maintenance task spreadsheet
  - A table of generalized maintenance categories was created to identify which agency is responsible for each category
  - During conversations, agencies indicated concerns relating to replacement for end-of-life devices, reimbursement for safety improvements, workforce development, and loop replacement
- Central Office TSMCA Update
  - CO is updating the main TSMCA documentation
  - CO is proposing 6 new devices and increased rates for 3 current devices
    - TrMC – Traffic Monitoring Camera (not speed camera)

Exhibit “E” Traffic Signal Maintenance and Compensation Agreement Roles and Responsibilities	
The following table describes the roles and responsibilities, as agreed to by the Department and Maintaining Agency, for general maintenance tasks associated with the Traffic Signal Maintenance and Compensation Agreement.	
Maintenance Category	Responsible Agency
Traffic Signals	Maintaining Agency
Signal Interconnection and Monitoring	Maintaining Agency
Intersection Control Beacon	Maintaining Agency
Pedestrian Flashing Beacon	Maintaining Agency
Emergency Fire Department Signal	Maintaining Agency
Speed Activated Warning Display	Maintaining Agency
Illuminated Street Name Signs	Maintaining Agency
Blank Out Sign	Maintaining Agency
Traffic Warning Beacon	Maintaining Agency
Travel Time Detector	Florida Department of Transportation
Uninterruptible Power Supply	Maintaining Agency
Connected Automated Vehicle Devices	Florida Department of Transportation
Pedestrian Hybrid Beacon	Maintaining Agency
Arterial Dynamic Message Sign	Florida Department of Transportation
Passive Pedestrian Detection	Maintaining Agency
Traffic Monitoring Camera	Maintaining Agency
In-Roadway Warning Lights	Maintaining Agency
Closed-Circuit Television	Maintaining Agency
Metadata	Florida Department of Transportation
Mid-Block Microwave Detection	Florida Department of Transportation
Signal Preemption	Maintaining Agency
Firewall	Florida Department of Transportation
Servers	Florida Department of Transportation

- CO is also proposing changes to timelines
  - Damage invoice must be submitted within 60 days of completed repair
  - Submission deadline of annual report extended from June 30<sup>th</sup> to July 15<sup>th</sup>
  - All vehicle detector repairs to be addressed within 30 days
- Damage Reimbursement process has been streamlined with fillable, auto-populating forms

Device	Current FY24	Proposed FY24
Illuminated Street Name Signs	\$0	\$391
Pedestrian Hybrid Beacon	\$0	\$2,645
Arterial Dynamic Message Sign	\$0	\$2,027
Passive Pedestrian Detection	\$0	\$1,644
Traffic Monitoring Camera	\$0	\$688
In-Roadway Warning Lights	\$0	\$658
Traffic Signal	\$3,773	\$3,910
Interconnected and Monitored Traffic Signal	\$5,421	\$5,558
Blank Out Sign (inc. Lane Control Signs)	\$381	\$419

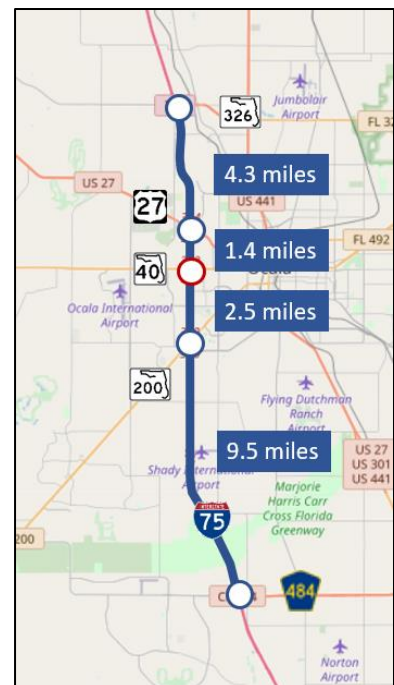
**Discussion:**

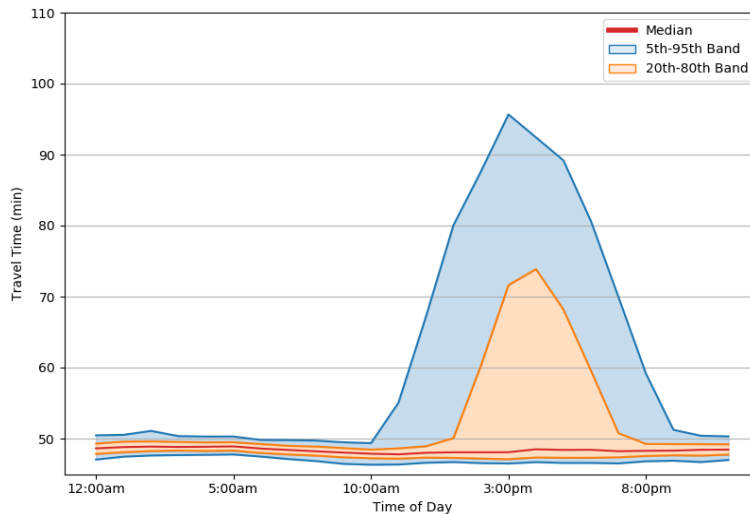
- Jon Cheney – FDOT and FACERS are negotiating costs; Jon wants to ensure FDOT and FACERS is speaking to locals to confirm these costs/reimbursements are similar to what they are seeing

**III. I-75 RAMP METER STUDY**

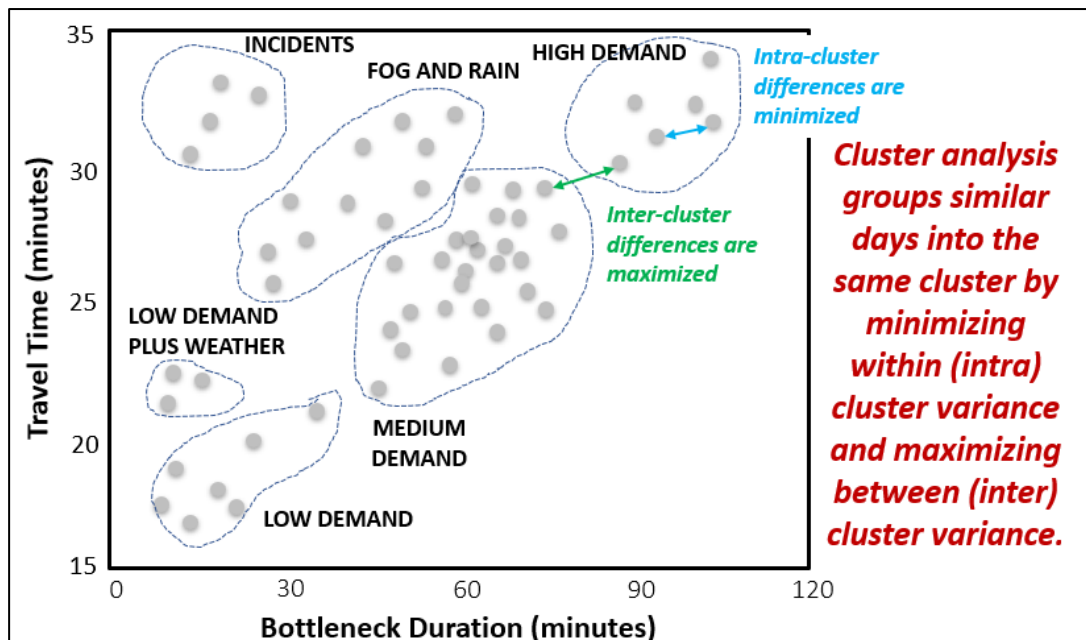
Jeremy Dilmore discussed the findings of the I-75 Ramp Metering Study.

- Motivated by the question, What is the process by which we capture effects of TSM&O within planning? Is there a method for quantifying benefits that can be used by practitioners?
- The Ramp Meter Study explored the feasibility, benefits, and challenges of evaluating TSMO strategies within the planning process
- Case study examining an 18-mile segment of I-75 in Marion County
  - During peak hours, operates at free flow
  - During afternoon weekend days, high delays occur ~5% of the time
  - Travel-time reliability is an issue
    - On weekend afternoons, travelers must budget an extra 50 minutes if they want to ensure on-time arrival for 95% of their trips





- The case study looked at reliability of corridors and different ways to characterize them
- Instead of just AM/PM peak, looked at demand on daily basis
- Separated days based on volume, separated further by conditions (e.g., weather, seasonal effects)
- FHWA developed a framework where instead of promoting a single demand case, you classify different categories based on a given scenario
- Cluster Analysis examines various data (e.g., demand, weather, incident, transit, work zone, special event, freight, bottleneck throughput, travel time) and clusters similar days by minimizing variance within each cluster (see graph)



- Cluster Analysis + Determining frequency of each condition = determine the probability of each scenario playing out
- Then practitioners and the public can decide how many hours of harsh congestion they

are willing to deal with

- By knowing the probability of each scenario and how they impact congestion and delays, TSM&O strategies can be deployed to target those scenarios
- Cluster Analysis is very useful, but requires lots of data (ATSPM, RWIS, crash data)
- Based on lessons learned and findings from the case study, we are now looking at a segment of I-4 within the southern portion of the District

#### Discussion:

- **Q:** Have there been any lessons learned from I-4 Ultimate Ramp Metering?
  - **A:** Did some analysis of what impacts queues would have. Current research is overly optimistic or overly pessimistic on ramp metering.
  - Jeremy: LYNX identified need that we don't slow down the bus
    - If TSP is present at Ramp Meter, it flushes the queue and keeps the bus moving. This approach seems to work.
  - Jeremy: also identified issue with left-turn into ramp, with queue overflowing into arterial

#### IV. CONNECTED VEHICLE APPLICATIONS – EVP, TSP, FSP

Jeremy Dilmore provided a brief overview of current District activities relating to Emergency Vehicle Preemption (EVP), Transit Signal Priority (TSP), and Freight Signal Priority (FSP).

- Current RSU Projects implementing EVP/TSP
  - PedSafe Deployment – 116 Siemens RSU deployment for future EVP in Seminole County
  - I-75 FRAME – 104 Commsignia RSU deployment along I-75 and arterials in Marion and Sumter counties
  - Iteris Midblock Deployment
    - 206 RSUs installed at key locations for TSP/EVP and BlueTOAD Traffic information
    - Groome Fleet OBU deployment – 14 total busses with conditional TSP
  - SODA TOP (Smart Orlando Downtown Advanced Traffic Operations Performance)
    - Deploying devices for TSP in Downtown Orlando area
- EVP and TSP Status
  - Successful EVP and TSP deployments using Iteris and Commsignia RSUs
    - Currently testing/troubleshooting Siemens RSUs
  - Successful EVP and TSP calls were performed with Intelight and Econolite controllers
  - Currently testing Cubic/Trafficware controllers running newest firmware (85.4) on a v6 board
  - OBU → Signal Request Message → Signal → Signal Status Message → OBU
- Jeremy explained two flowcharts illustrating the process for EVP/TSP calls and FSP calls
  - TSP/EVP
    - If bus is behind schedule, the cell modem asks the web relay if they can make a priority call to the signal; if yes, it gives the OBU clearance to call the RSU
      - Need cell modem because CV2X doesn't accept over-the-air updates
  - FSP
    - Identifying very select corridors (ILC nearby)

- 3% truck volume is not a valid justification
- Web services exist that give AVL info of trucks; we're not asking truckers to install anything
- MVDS (or a beam-break system) tracks height
  - Lengths and axles are very hard to determine
- Logic lives in the cloud on software
- Web relay is the only new component added to enable the system
  - Network connection is either fiber or cell

#### Discussion:

- **Q:** For intersections that don't have TSP/EVP, will you consider deploying RSUs to them?
  - **A:** Currently trying to scale out RSUs; doing OBUs in pilot
- **Q:** For legacy Opticom systems, what is the transition like? Many were installed by County Fire Departments.
  - **A:** We're conducting a pilot with Seminole Fire to look into this
- **Q:** What are the corridors for FSP?
  - **A:** likely in Marion and Sumter counties where ILCs are located
  - Testing on John Young Parkway first
  - If you think of other locations, please let us know.

#### V. AUTOMATED TRAFFIC SIGNAL PERFORMANCE MEASURES (ATSPM) UPDATE

Jeremy Dilmore briefly discussed ATSPM within the region.

- Current Efforts
  - Establish connectivity with a greater number of controllers, especially those outside Orlando metro area
  - Reach maturity with our Kafka environment and associated features
  - Establish performance history baseline with statis timing patterns
- Channel Checker
  - Can identify when changes arise in configurations
    - FDOT can confirm change with agency and adjust things on our end
    - This should not affect anything maintaining agencies are doing
  - Enhancements to channel checker will make things more efficient on the FDOT side and limit effect on locals' side
- Next Steps
  - Standardize process to quantify changes in performance from static retiming
  - Standardize process to quantify changes in performance during ICM operations
  - Create action plan to improve underperforming signal patterns

#### Discussion:

- **Q:** Different form effort in Miovision?
  - Katie: in parallel with the system. The Kafka seems to work effectively.
  - We are hoping to hold a training soon on the dashboards/insights

- Q: What is the timeline?
  - Katie: anticipated completion in April, but will know soon if that can be accelerated

## VI. LATEST ON AUTOMATED VEHICLES

David Williams gave a brief summary of the FHWA *Automated Vehicles Comprehensive Plan* and the current status of AV in the United States.

- AV Comprehensive Plan
  - Published in 2021, built off previous AV reports/studies
  - Vision for ADS– “prioritize safety while preparing for the future of transportation”
  - Three broad goals to achieve this vision
    - Promote Collaboration
      - Engage with stakeholders to monitor trends, issues, needs
      - Provide guidance to industry to encourage transparency and adoption of best practices
      - Facilitate information sharing
    - Modernize Regulatory Environment
      - Streamline paths to deployment
      - Update existing regulations to remove unnecessary barriers
      - Conduct appropriate safety oversight of ADS
    - Prepare the Transportation System
      - Conduct targeted technical research
      - Provide funding for ADS-focused demos, pilots, deployments
      - Update infrastructure standards to reflect ADS technologies
  - The AV Comprehensive Plan describes several examples of USDOT actions supportive of ADS development
- Current Federal AV Policies
  - In 2021, Standing General Orders were issued identifying certain reporting requirements for ADS/ADAS-involved crashes
  - SELF DRIVE Act
    - In 2017, the SELF DRIVE Act was first introduced but stalled in Senate Committee
    - In 2021, the bill was reintroduced but stalled in House subcommittees
  - During 118<sup>th</sup> Congress (2023-24), it is anticipated the bill will be reintroduced
  - Purpose – to clarify Federal role
  - Features
    - Federal authority in AV design, construction, and performance
    - Establishes safety standards for ADS
    - Requires a Rulemaking and Safety Priority Plan within 1 year that would accommodate the development of ADS
    - Establishes *Cybersecurity of ADS* subsection in 49 USC Chapter 301
    - Requires research on public outreach related to ADS
    - Establishes Highly Automated Vehicle Advisory Council under NHTSA
    - Requires Privacy Plan from manufacturers
- Current Florida AV Policies

- In 2016, HB 7027 was signed into law, making it the first AV-related legislation in Florida
  - No human operators needed for testing
  - Exempted AVs from certain regulations such as electronic displays
  - Authorized licensed individuals to operate AVs
  - Required AVs have a system in place for transitioning to manual control
- In 2019, HB 311 was signed into law
  - Removes requirement for human operator in fully autonomous AVs
  - Allows for teleoperations of AV
  - Established insurance requirements
- In 2021, HB 1289 was signed into law, allowing for low-speed autonomous delivery vehicles on low-speed roadways

## VII. CURRENT INITIATIVES

Tushar Patel and David Williams briefly provided an update on the current work efforts throughout District Five.

- **I-4 Ultimate Express Lanes** – Waiting on primary structures for WWD installations at direct ramps
- **Wekiva Parkway** – Estimate received for WWD installs on Wekiva 6
- TSMCA Update – coordinating revisions/signatures with maintaining agencies
- Event Management II – received verification camera housing; working with maintenance to install before Daytona 500 for remote Blank out sign verification
- SunStore – held training with Confluent last week; implementation of Kafka and Confluent cloud underway
- RITSA Change Request – cycle for implementing change requests closed on October 28, but we are still accepting change request forms for the next cycle
- AV Shuttle – Electrical upgrades amendment fully executed
- Kiosks at UCF – software running in O&M; holding field visit to assess how to make kiosks more user-friendly
- I-4 FRAME – procurement of devices is ongoing

## VIII. NEXT MEETING

- February 9, 2022

## IX. ATTACHMENTS

- A – Presentation Slides
- B – Meeting agenda

## END OF SUMMARY

*This summary was prepared by David Williams and is provided as a summary (not verbatim) for use by the Consortium Members. The comments do not reflect FDOT's concurrence. Please review and send comments via e-mail to [dwilliams@vhb.com](mailto:dwilliams@vhb.com) so the meeting summary can be finalized.*

# Welcome to the TSM&O Consortium Meeting December 8, 2022





# Meeting Agenda

1. Welcome
2. Traffic Signal Maintenance and Compensation Agreement (TSMCA)
3. Ramp Metering Study
4. CV Applications – EVP, TSP, FSP
5. Automated Traffic Signal Performance Measures (ATSPM) – Update
6. Latest on Automated Vehicles
7. Current Initiatives

# Traffic Signal Maintenance and Compensation Agreement

Jeremy Dilmore, FDOT District Five

# TSMCA Exhibit E Amendment – District Five

- Coordination with Maintaining Agencies to clarify responsibilities
- Received feedback on maintenance tasks spreadsheet
- Held multiple Districtwide and one-on-one meetings
- Preference for generalized categories over a detailed maintenance task list for a TSMCA amendment

**Exhibit "E"**  
**Traffic Signal Maintenance and Compensation Agreement**  
**Roles and Responsibilities**

The following table describes the roles and responsibilities, as agreed to by the Department and Maintaining Agency, for general maintenance tasks associated with the Traffic Signal Maintenance and Compensation Agreement.

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Closed-Circuit Television	Maintaining Agency
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Mid-Block Microwave Detection	Florida Department of Transportation
Signal Preemption	Maintaining Agency
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# TSMCA Amendment – District Five

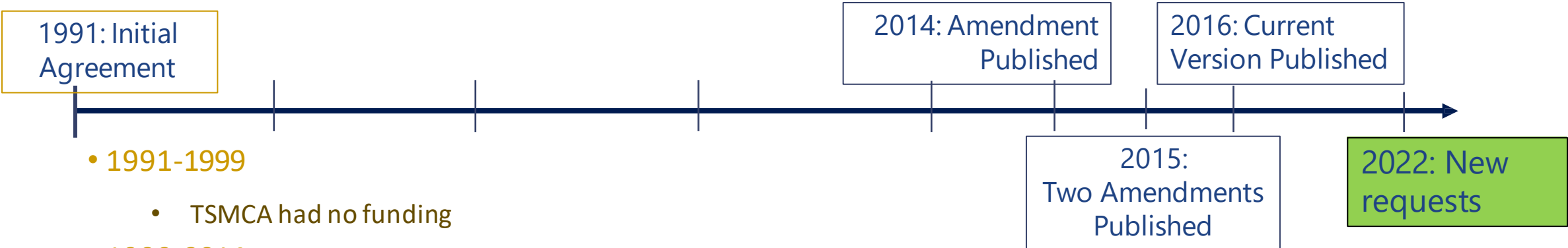
## Maintenance Categories

- Traffic Signals
- Signal Interconnection & Monitoring
- Intersection Control Beacon
- Pedestrian Flashing Beacon
- Emergency Fire Department Signal
- Speed Activated Warning Display
- Illuminated Street Name Signs
- Blank Out Sign
- Traffic Warning Beacon
- Travel Time Detector
- Uninterruptable Power Supply
- Connected and Automated Vehicle Devices
- Pedestrian Hybrid Beacon
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- Traffic Monitoring Camera
- In-Roadway Warning Lights
- Closed-Circuit Television
- Metadata
- Mid-Block Microwave Detection
- Signal Preemption
- Firewall
- Servers

# TSMCA Amendment – District Five

- Maintaining Agencies indicated concerns relating to:
  - Device End of Life Replacement
  - Reimbursement for Safety Improvements
  - Workforce Development

# TSMCA Growth History

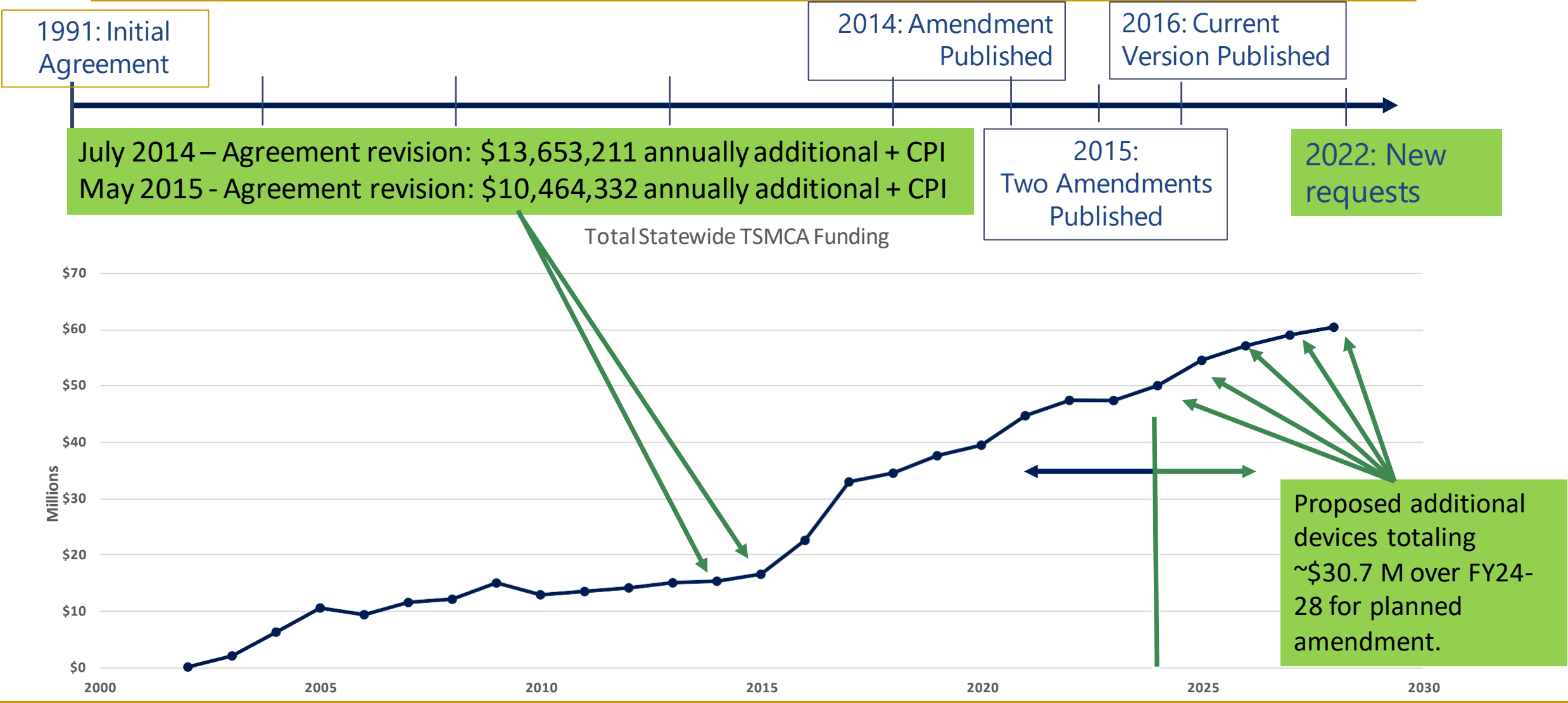


- 1991-1999
  - TSMCA had no funding
- 1999-2014
  - Single rate for signalized intersections
  - Only state approaches were covered
- 2014
  - IMTS reimbursed at a rate 50% higher than TS
- 2015
  - New devices added
  - All approaches covered
- Today
  - IMTS represents ~75% of signals
  - FY23- TS: \$3,670; IMTS: \$5,273



Exhibit A										
Compensation for Maintaining Traffic Signals and Devices for FY										
Effective Date: from _____ to _____										
Intersection Location	Traffic Signals (TS)	Traffic Signal - Interconnected & monitored (IMTS)	Intersection Control Beacon (ICB)	Pedestrian Flashing Beacon (PFB)	Emergency Fire Dept. Signal (FDS)	Speed Activated Warning Display (SAWD) or Blank Out Sign (BOS)	Traffic Warning Beacon (TWB)	Travel Time Detector	Uninterruptible Power Supplies (UPS)	Compensation Amount (using Unit Rates from Exhibit B)

# Traffic Signals Maintenance and Compensation Agreement (TSMCA) History



# TSMCA Proposed Expansion

6 new devices

Increase rate for 3 devices

Device	Current FY24	Proposed FY24
Illuminated Street Name Signs	\$0	\$391
Pedestrian Hybrid Beacon	\$0	\$2,645
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Interconnected and Monitored Traffic Signal	\$5,421	\$5,558
Blank Out Sign (inc. Lane Control Signs)	\$381	\$419



Blank out Sign



Traffic Monitoring Camera



Passive Pedestrian Detection



# TSMCA – Current; Proposed

## Devices Currently Covered

1. Traffic Signals (TS)
2. Interconnected & Monitored Traffic Signals (IMTS)
3. Intersection Control Beacon (ICB)
4. Pedestrian Flashing Beacon (PFB)
5. Emergency Fire Department Signal (FDS)
6. Speed Activated Warning Display (SAWD)
7. Blank Out Sign (BOS) [inc. Lane Control Signs]
8. Traffic Warning Beacon (TWB)
9. Probe Data Detection System (PDDS)\*
10. Uninterruptible Power Supplies (UPS)
11. Connected and Automated Vehicle Device (CAVD)

❖ Note: CAVD made available in 2020

\*Previous categorized as Travel Time Detector (TTD)

## Devices in Proposed Amendment

### Compensation Adjustment

- Traffic Signals (TS)
- Interconnected & Monitored Traffic Signals (IMTS)
- Blank Out Signs (BOS)/Lane Control Sign

### New Devices Added

1. Illuminated Street Name Signs (ISNS)
2. Pedestrian Hybrid Beacons (PHB)
3. Passive Pedestrian Detection (PPD)
4. In-Roadway Warning Lights (IRWL)
5. Arterial Dynamic Message Signs (ADMS)
6. Traffic Monitoring Cameras (TrMC)

# Summary of Major Changes to TSMCA

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## Revised Timelines

- Damage invoice must be submitted within 60 days of completed repair
- Submission deadline of the annual report: revise from June 30<sup>th</sup> to July 15<sup>th</sup>

## Detection Repair

- **Current:** Side street and major street left turn detectors to be addressed within 90 days
- **Proposed:** All vehicle detectors to be addressed within 30 days

## Other Revisions

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- Provided New Device Definitions
- Clarified Process for Damage Reimbursement
- Defined Declared Emergencies
- Clarified Maintenance Roles: Device Specific
- Preventative maintenance details provided
- Defined detection related repair window
- Added PHBs to preventative maintenance inspection cycle
- New devices added to Exhibit A
- Exhibit C provides link to the streamlined Damage Reimbursement Procedure



# Questions?

# I-75 Ramp Metering Study

Jeremy Dilmore, FDOT District Five

# I-75 Ramp Meter Study

What is the process by which we capture effects of TSM&O within Planning?



FDOT TSM&O  
Transportation Systems Management & Operations

Project Development and Environment (PD&E) Study  
Scope of Services – TSM&O Language

The CONSULTANT will evaluate a broad range of systems as it relates to the PD&E study, such as Connected Vehicle, Autonomous Vehicle, traffic signal system, communication system, travel time systems, Transit Signal Priority (TSP), Adaptive Signal Control Technologies (ASCT), Signal Controller Technology, Integrated Corridor Management, and other Advanced Traveler Information Systems and Advance Traveler Management Systems. The CONSULTANT shall utilize the TSMO Strategy Guide<sup>1</sup> for preliminary screening. The CONSULTANT will review existing master plans from the MPO, FDOT, and municipality (where applicable) to determine existing and planned Intelligent Transportation Systems (ITS) infrastructure. Engineering judgment and corridor knowledge shall be applied to develop a recommended list of TSMO strategies to complement, postpone, or replace roadway improvements. Subsequently, the CONSULTANT shall meet with FDOT TSMO for review and concurrence. Alternatives will then be coordinated with the County Traffic Engineer and the City Transportation Engineer concerning existing and proposed ITS and Advanced Traffic Management System (ATMS) infrastructure. Roles and responsibilities shall be determined during this coordination and shall be documented within the Concept of Operations (ConOps).

The CONSULTANT shall complete the Systems Engineering documentation in accordance with Code of Federal Regulations Rule (CFR) 940<sup>2</sup> and Department Systems Engineering Management Plan (SEMP) guidance.<sup>3</sup> As part of the Systems Engineering process, the CONSULTANT will assess the risk for proposed strategies, using the Project Risk Assessment and Regulatory Compliance Checklist (Form 750-040-05).<sup>4</sup> For low-risk elements, the completed Project Risk Assessment document will satisfy the systems engineering documentation requirement. For high-risk elements, the Systems Engineering Project Checklist (Form 750-040-06)<sup>5</sup> shall be completed, including a Project Systems Engineering Management Plan (PSEMP) along with the ConOps and Architecture updates, to satisfy CFR Rule 940 requirements. Architecture updates shall be completed by the CONSULTANT on the District's then-current software.

The CONSULTANT will evaluate the need for improvements or modifications to the existing TSMO system in relation to the alternatives being considered. This includes reviewing TSMO alternatives in combination with capacity improvements. The CONSULTANT will develop a high-level cost estimate for the changes necessary to the infrastructure in order to meet project TSMO needs and goals. Cost shall include operations and maintenance phases. These items will be documented in the ConOps.

Welcome to the FDOT District 5

FDOT TSM&O Strategy Guide

What type of Facility is it?

Where is the issue located?

Please select a symptom

\*Use the up/down arrow keys to view full list of symptoms

Is the symptom Recurring or Non-Recurring?

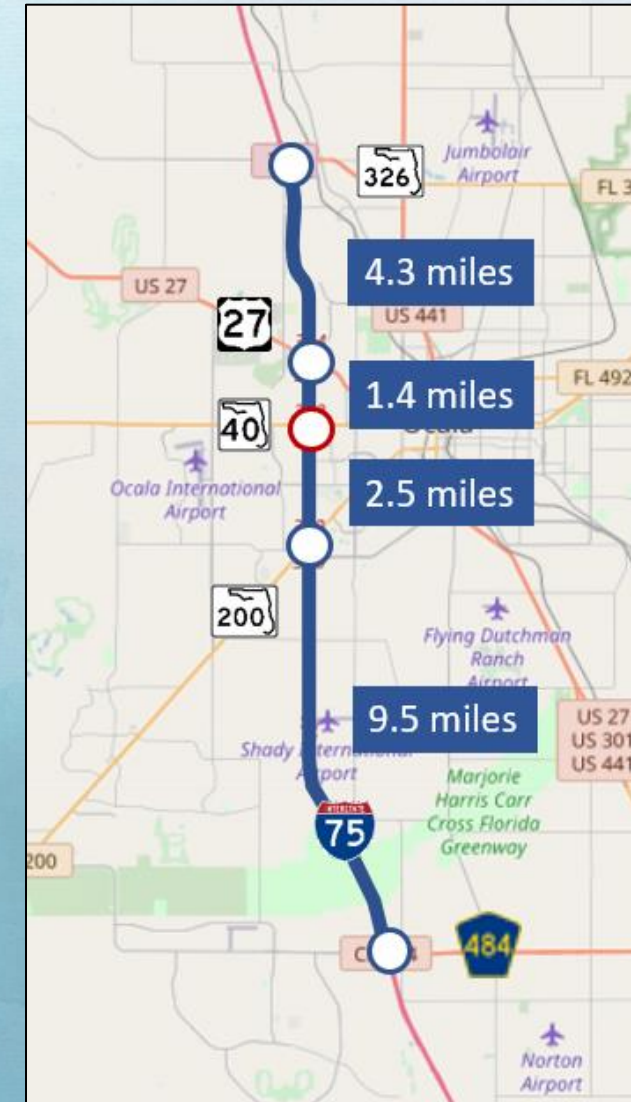
[GET TSM&O STRATEGIES](#)

Is there a method for quantifying benefits that can be used by practitioners?



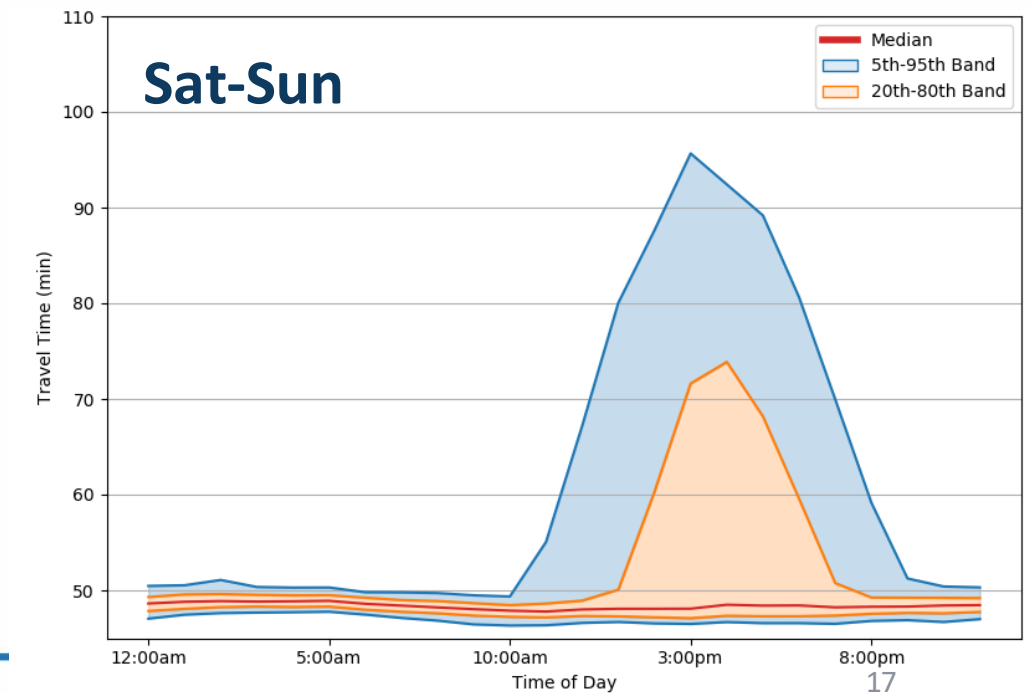
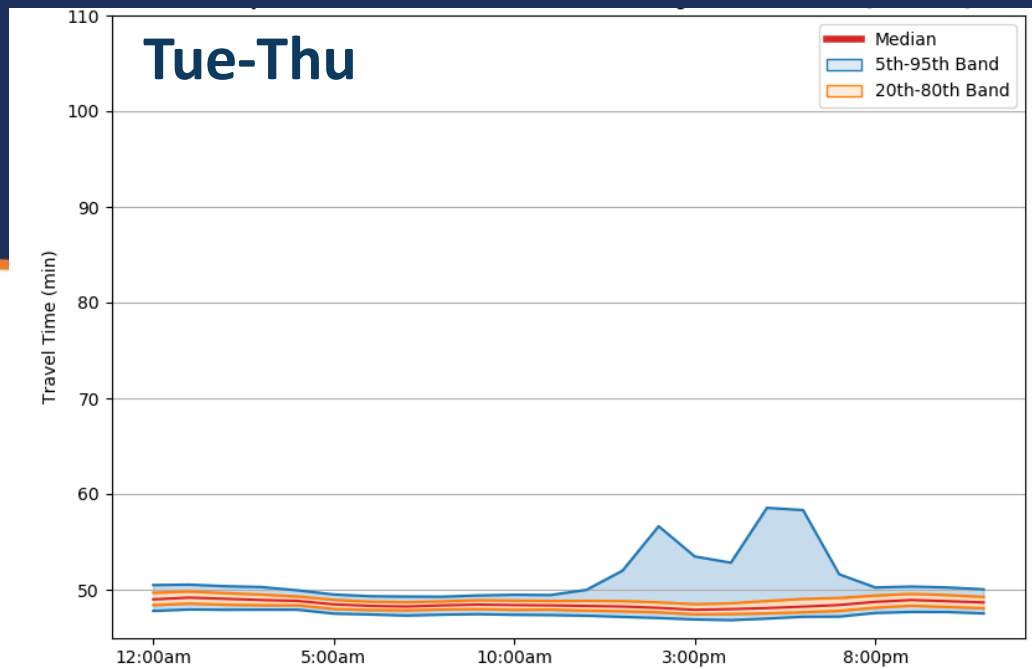
# I-75 Ramp Meter Study

- Explored the feasibility, benefits, and challenges of evaluating TSMO strategies within the planning process
- Case study: 18-mile segment of I-75 in Marion County
  - During peak hours, generally operates at or near free flow with no recurring bottlenecks
  - However, during the afternoon portion of weekend days, high delays occur roughly 5% of the time
  - Travel-time reliability a concern (next slide)



# Travel Time Reliability

- It is at the extreme of the travel time distribution (95<sup>th</sup> percentile and above) that the corridor starts showing long delays
- On weekend afternoons, travelers must budget approximately **50 extra minutes** if they want to ensure on-time arrival for 19 out of 20 trips



See report Figure 18 for northbound version



# I-75 Ramp Meter Findings

- Looked at reliability (graphs) of corridors and different ways to characterize
- Instead of just AM/PM peak, looked at demand on daily basis
- Had categories for Monday-Thursday, Friday, Saturday & Sunday
- Separate conditions into different categories based on seasonal effects, weather, etc.

# I-75 Ramp Meter Findings

- We can quantify various factors
  - Bad weather – this corridor experiences bad weather 25% of the time
  - Incident – this corridor experiences non-recurring traffic incident 20% of the time
- Using Cluster Analysis plus determining frequency of each condition, we can determine the probability of each scenario playing out
- “I’m willing to deal with harsh congestion how many hours out of the year?”
- By knowing the probability of each scenario occurring, TSMO strategies can be deployed to target those scenarios

# FHWA Probabilistic Approach

- Cluster Analysis examines various data:
  - Demand
  - Weather
  - Incident
  - Transit
  - Work Zone
  - Special Event
  - Freight
  - Bottleneck  
Throughput
  - Travel Time
- This probabilistic approach requires lots of data
  - ATSPM characterization of data
  - RWIS data
  - Crash data
- There is a short-term intermediary while we wait for data to get organized

# I-75 Ramp Meter Findings

- Based on lessons learned and findings from the I-75 case study, we are now examining a portion of I-4 within the southern portion of the District

# Connected Vehicle Applications EVP, TSP, FSP

Jeremy Dilmore, FDOT District Five

# CV Applications

- **Emergency Vehicle Preemption (EVP)** – safely interrupts normal signal operations to transfer right-of-way to direction of approaching emergency vehicle
- **Transit Signal Priority (TSP)** – adjusts signal timing at intersections to support bus movements as they approach
  - Applied conditionally (e.g., bus behind schedule) or unconditionally
- **Freight Signal Priority (FSP)** – adjusts signal timing at intersections to support freight movements approaching the intersection
  - Improves mobility of freight vehicles
  - Can also provide safety benefits (e.g., high-speed truck in dilemma zone)

# Current RSU Projects Implementing EVP/TSP

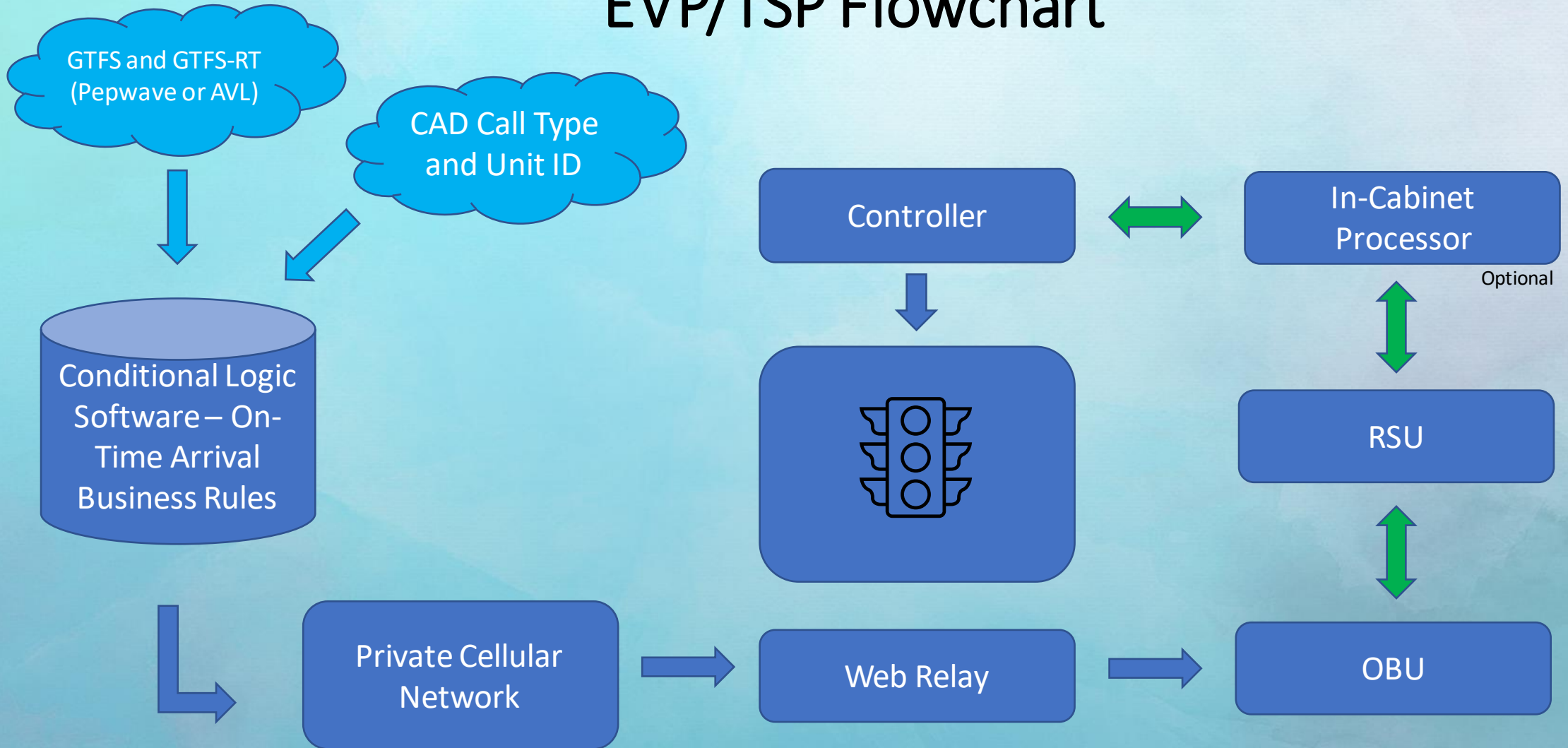
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  - 206 RSUs installed at key locations for TSP/EVP applications and BlueTOAD traffic information
  - Groome Fleet OBU deployment; 14 total busses with conditional TSP
- SODA TOP (Smart Orlando Downtown Advanced Traffic Operations Performance)
  - Deploying devices for TSP in Downtown Orlando area

# EVP and TSP Status

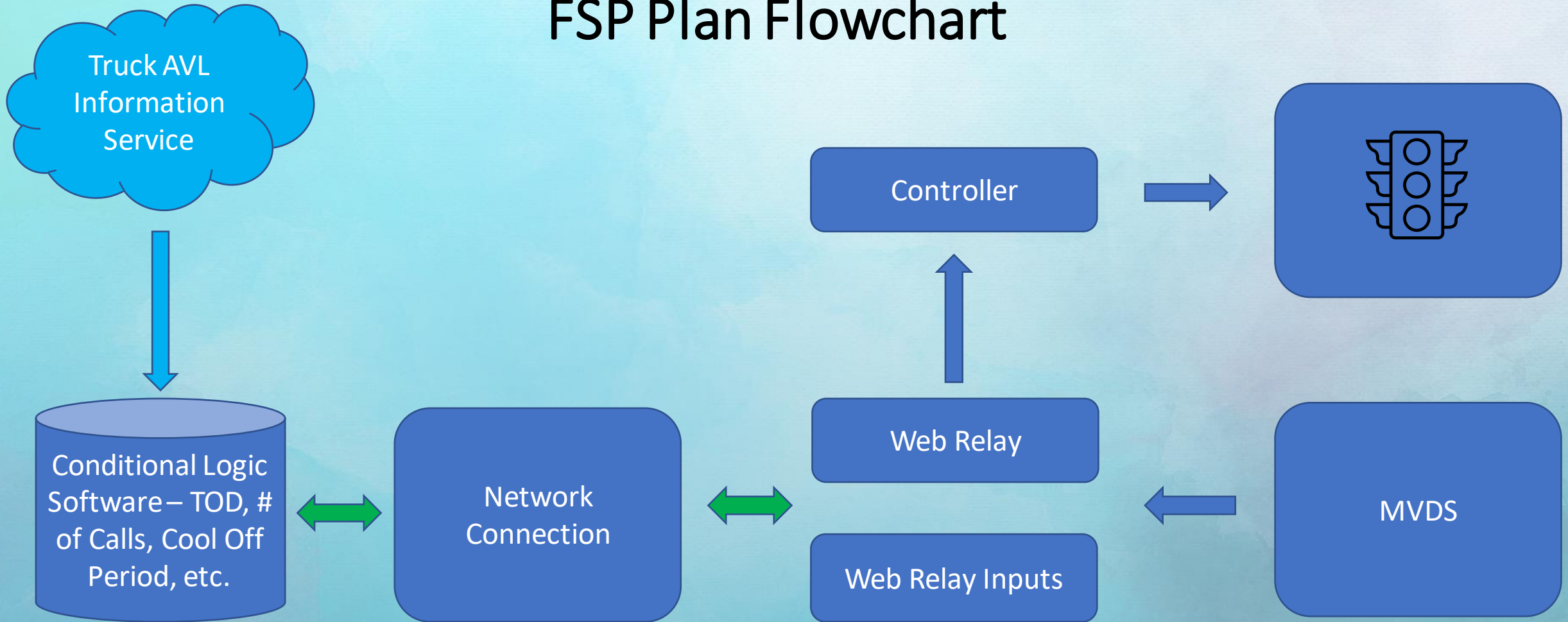
- Successful EVP and TSP deployments using Iteris and Commsignia RSUs
  - Currently underway with testing and troubleshooting Siemens RSUs
- Successful TSP and EVP calls were done with Intelight and Econolite Controllers
  - With the Intelight Maxtime-CV module, successful calls were made with the CV2x Standard Format (J2735 Immediate Forward) in addition to an NTCIP Conversion Tool hosted on an in-cabinet processor
  - Econolite Cobalt ATC was tested with the NTCIP Conversion Tool hosted on an in-cabinet processor
- Currently underway testing Cubic/Trafficware controllers running newest firmware version 85.4 on a v6 board



# EVP/TSP Flowchart



# FSP Plan Flowchart



# ATSPM

Jeremy Dilmore, FDOT District Five



Transportation Systems Management & Operations



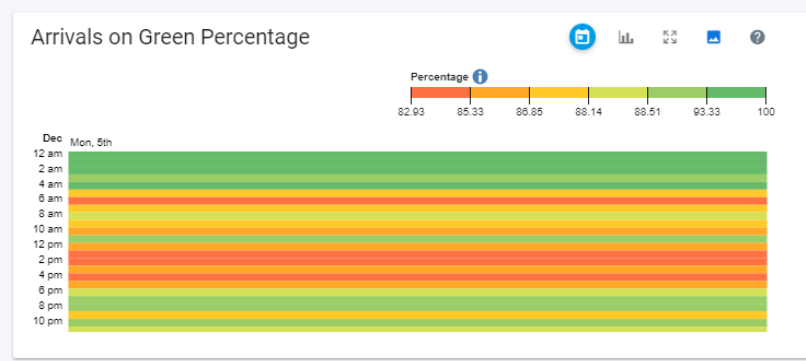
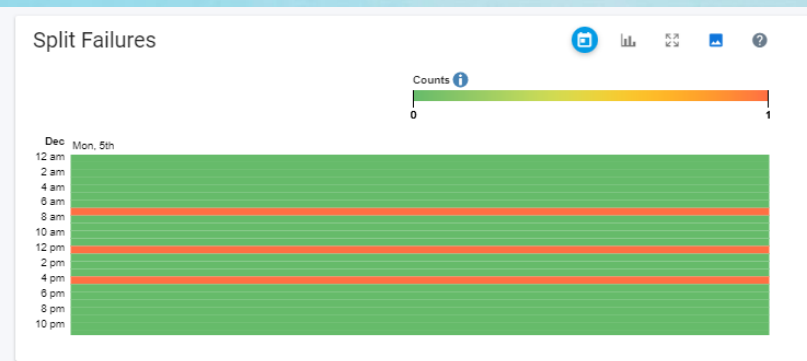
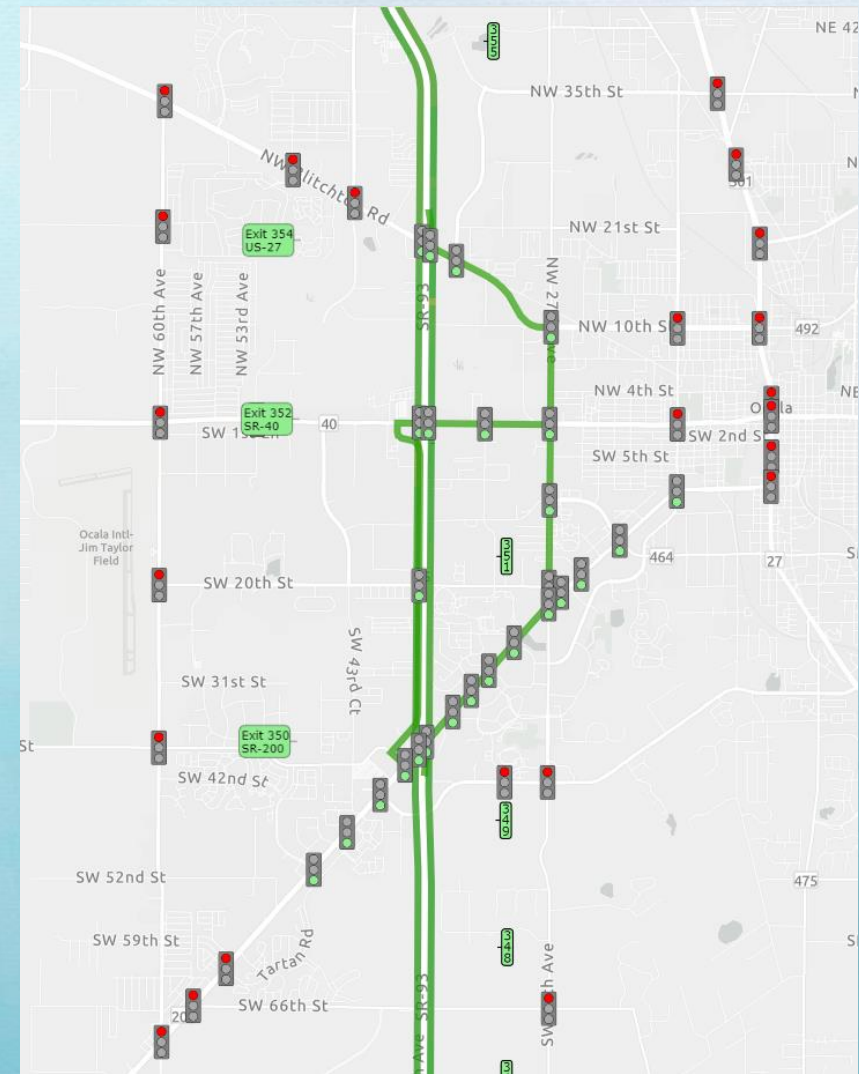
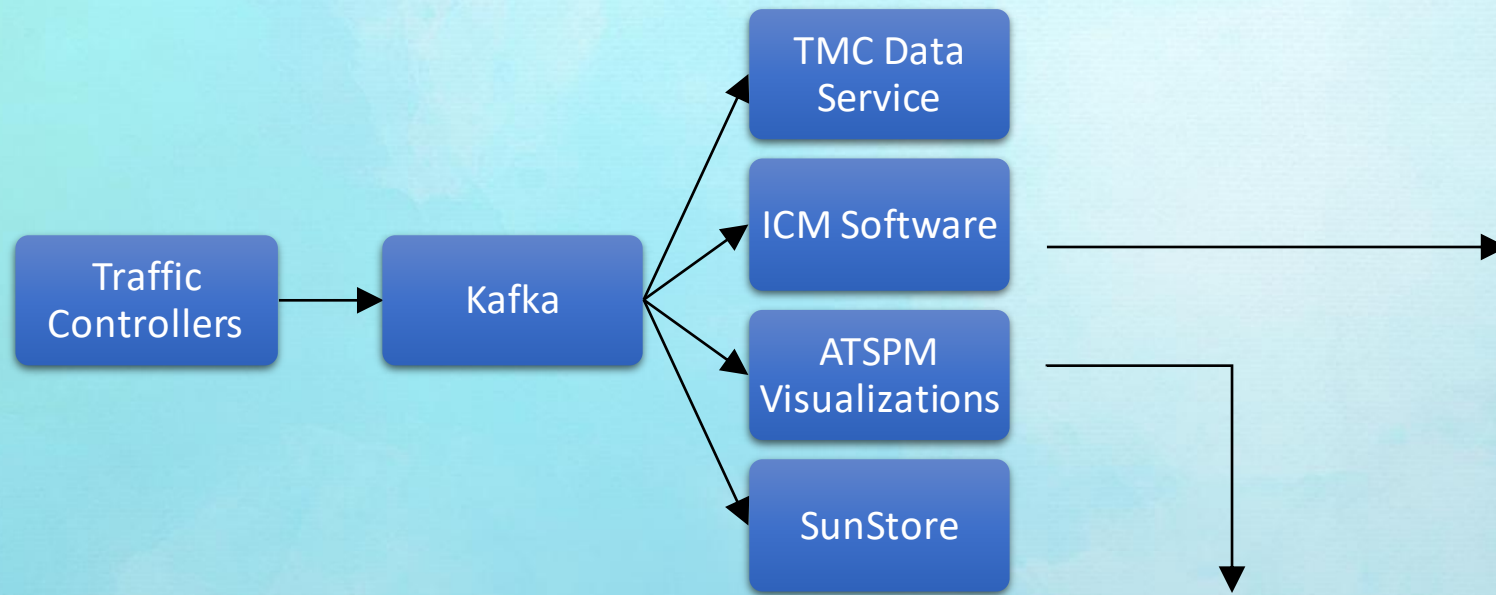
# ATSPM Status

- Current Efforts

- Establish connectivity with a greater number of controllers, especially those outside Orlando metro area
- Reach maturity with our Kafka environment and associated features
- Establish performance history baseline with static timing patterns

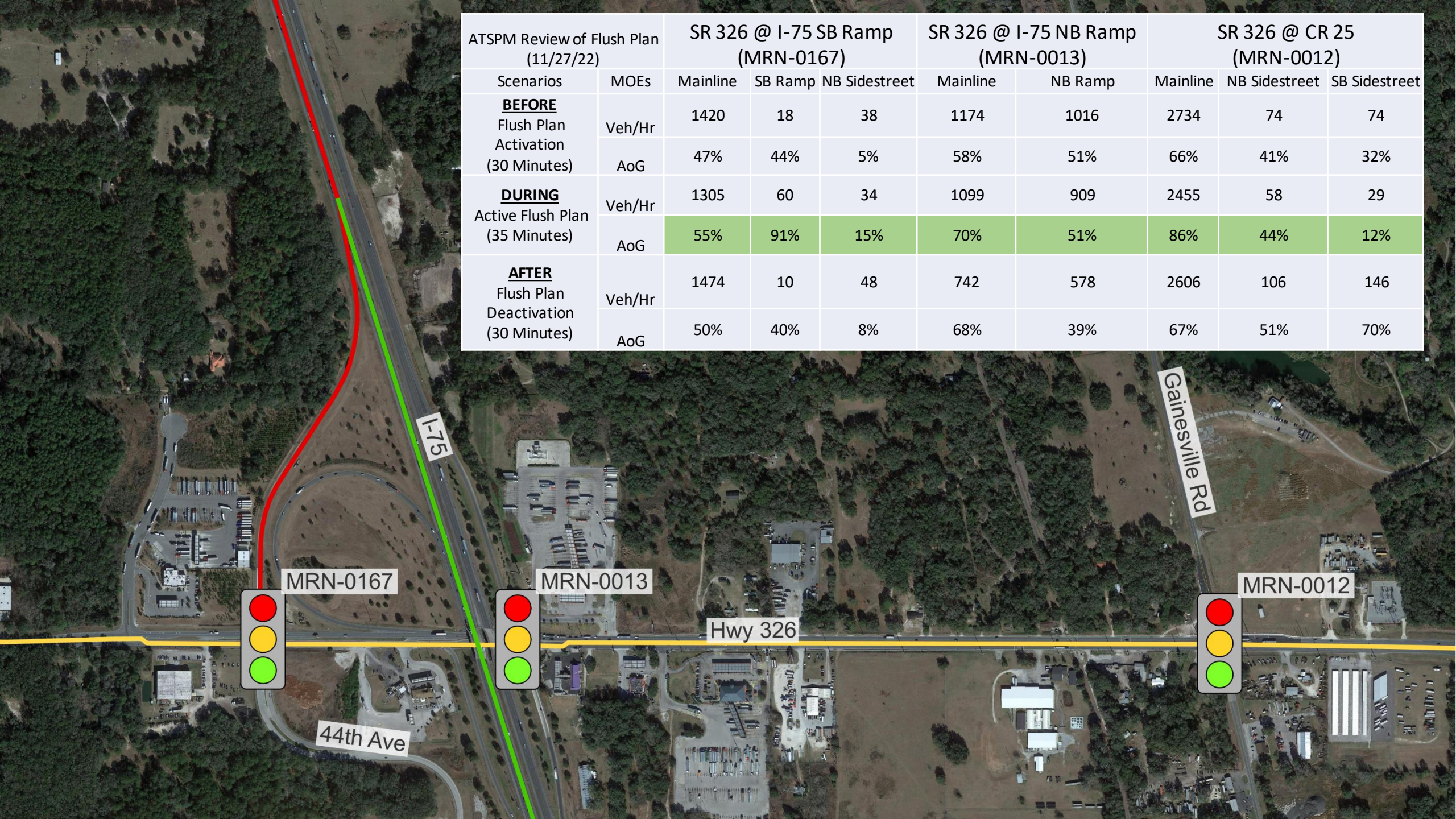
ATSPM  
flowchart





Example ICM flush plan →

ATSPM Review of Flush Plan (11/27/22)		SR 326 @ I-75 SB Ramp (MRN-0167)			SR 326 @ I-75 NB Ramp (MRN-0013)		SR 326 @ CR 25 (MRN-0012)		
Scenarios	MOEs	Mainline	SB Ramp	NB Sidstreet	Mainline	NB Ramp	Mainline	NB Sidstreet	SB Sidstreet
<b>BEFORE</b> Flush Plan Activation (30 Minutes)	Veh/Hr	1420	18	38	1174	1016	2734	74	74
	AoG	47%	44%	5%	58%	51%	66%	41%	32%
<b>DURING</b> Active Flush Plan (35 Minutes)	Veh/Hr	1305	60	34	1099	909	2455	58	29
	AoG	55%	91%	15%	70%	51%	86%	44%	12%
<b>AFTER</b> Flush Plan Deactivation (30 Minutes)	Veh/Hr	1474	10	48	742	578	2606	106	146
	AoG	50%	40%	8%	68%	39%	67%	51%	70%



# ATSPM

- Channel Checker
  - Can identify when changes arise in configurations
    - FDOT can confirm change with agency and adjust things on our side
    - Should not affect anything maintaining agencies do on their end
  - Enhancements to channel checker will make things more efficient on the FDOT side and limit effect on locals' side of things

# ATSPM Status

- Next Steps

- Standardize process to quantify changes in performance resulting from static retiming
- Standardize process to quantify changes in performance during ICM operations
- Create action plan to improve underperforming signal patterns



# Latest in Automated Vehicles

David Williams, VHB

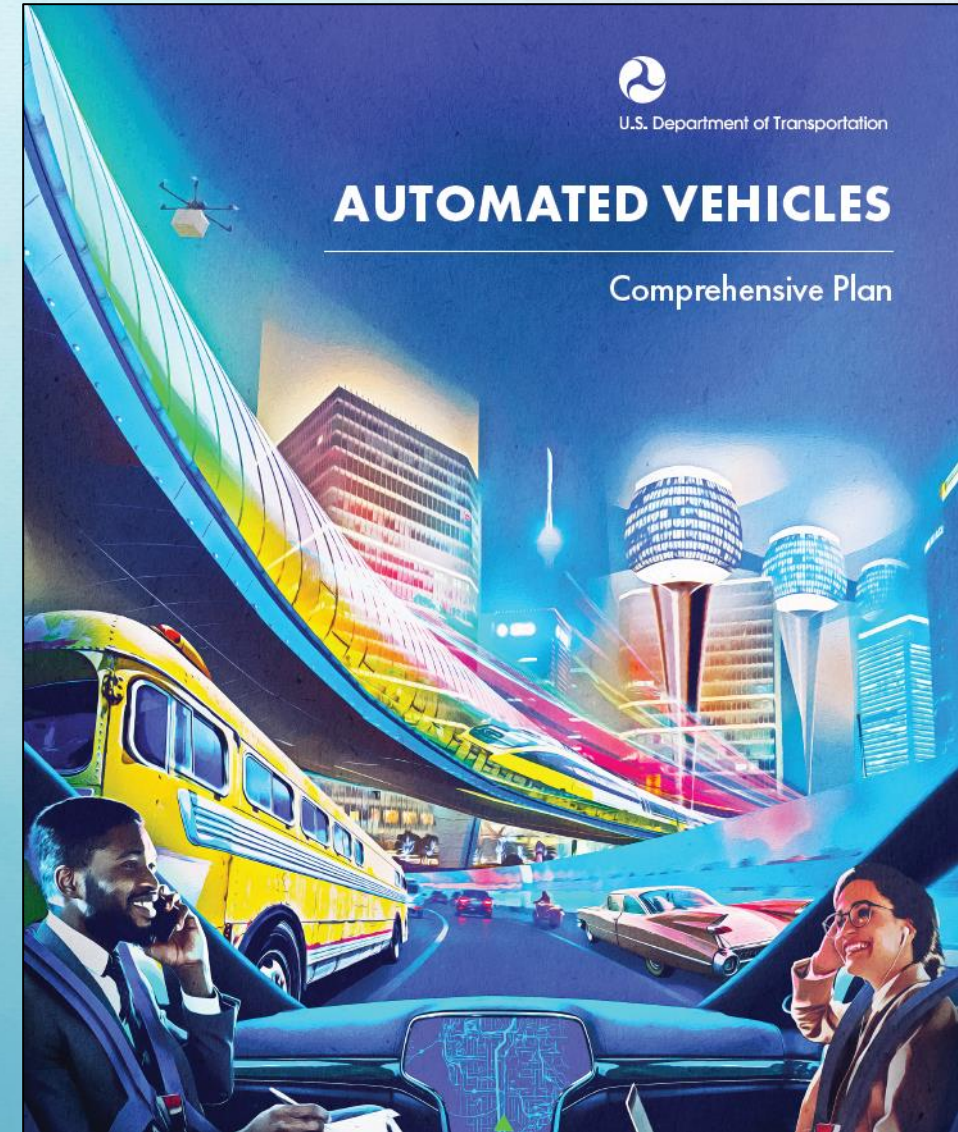
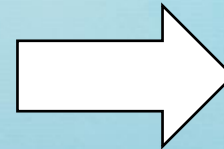
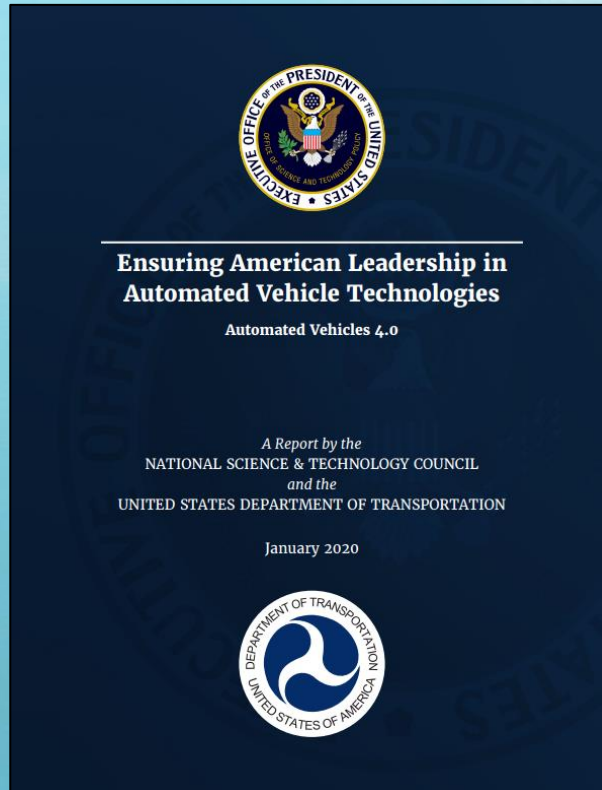
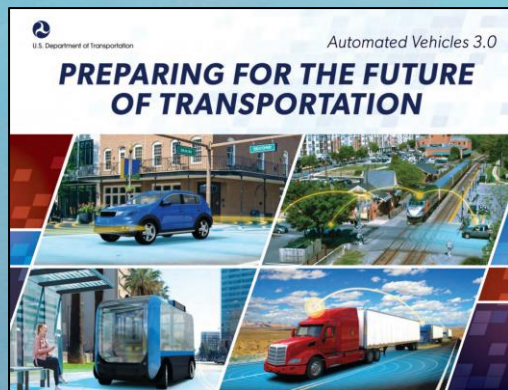
# Latest in Automated Vehicles

1. Policy
2. Law
3. Industry



# AV Update – Policy

- AV Comprehensive Plan
  - Published January 2021
  - Built off previous AV reports



# AV Update – Policy

## US Government AV Technology Principles

### I. Protect Users & Communities

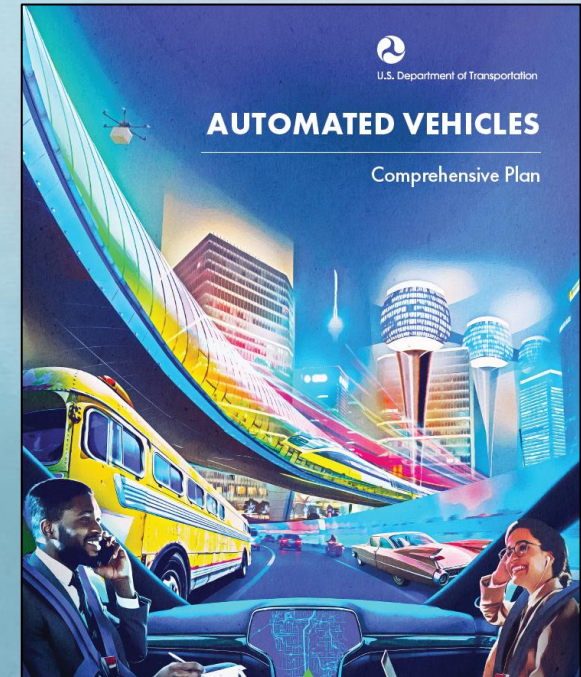
1. Prioritize Safety
2. Emphasize Security & Cybersecurity
3. Ensure Privacy & Data Security
4. Enhance Mobility & Accessibility

### II. Promote Efficient Markets

5. Remain Technology Neutral
6. Protect American Innovation & Creativity
7. Modernize Regulations

### III. Facilitate Coordinated Efforts

8. Promote Consistent Standards and Policies
9. Ensure a Consistent Federal Approach
10. Improve Transportation System-Level Effects



# AV Update – AV Comprehensive Plan

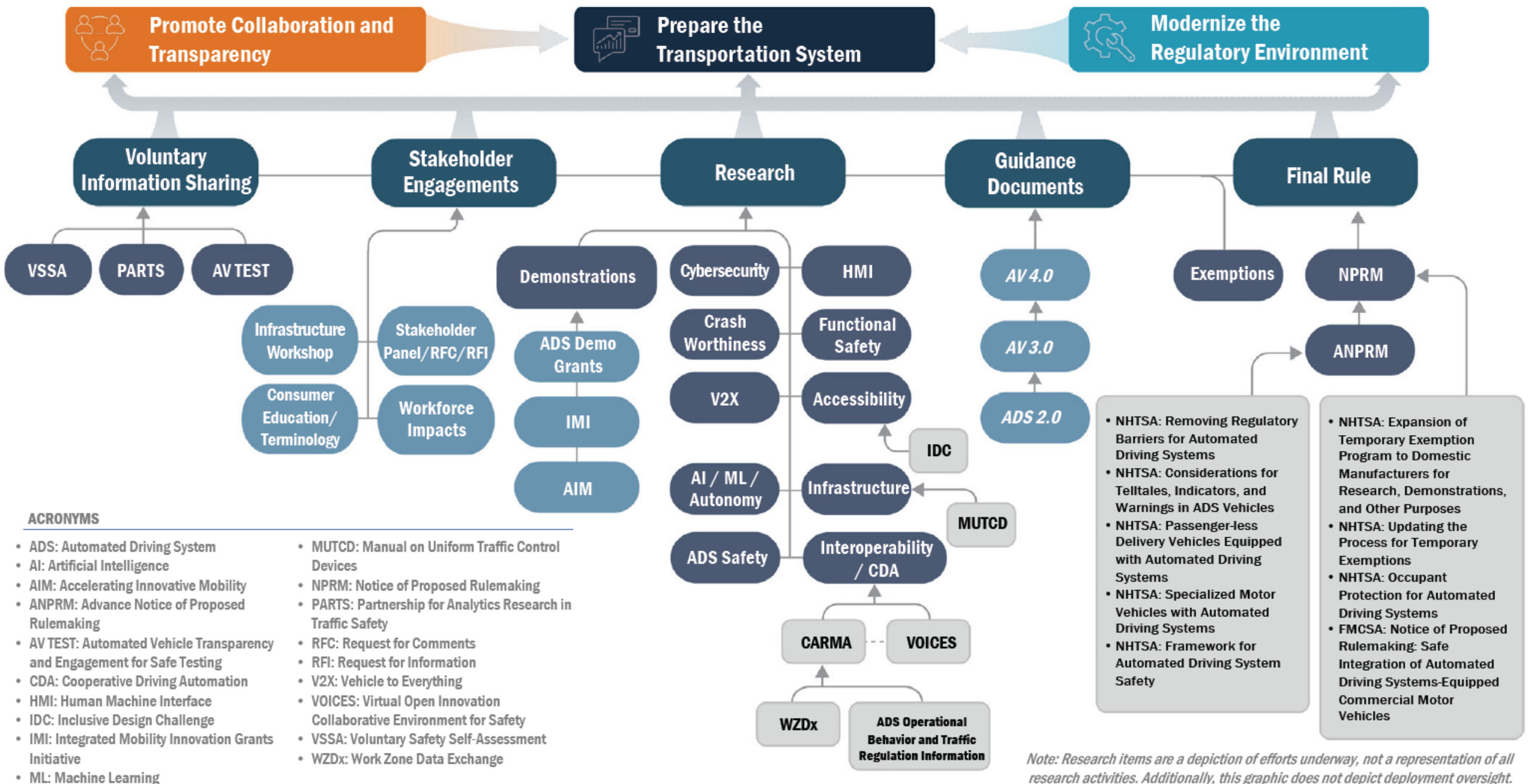
- Developed to help stakeholders understand ADS activities across USDOT
- Fulfills recommendation from Congress for a “comprehensive plan to better manage departmental initiatives related to automated vehicles.”
- USDOT Vision for ADS – “prioritize safety while preparing for the future of transportation”
- Three broad goals to achieve Vision for ADS:
  1. Promote Collaboration
  2. Modernize the Regulatory Environment
  3. Prepare the Transportation System

# How Will USDOT Achieve its Vision for ADS?

- Goal 1: Promote Collaboration & Transparency
  - Engage with stakeholders to monitor for emerging trends, issues, needs
  - Provide guidance to industry to encourage transparency/adoption of best practices
  - Facilitate information sharing
- Goal 2: Modernize the Regulatory Environment
  - Goal 2A – Streamline Paths to Deployment
  - Goal 2B – Update Existing Regulations to Remove Unnecessary Barriers
  - Goal 2C – Conduct Appropriate Safety Oversight of ADS

# How Will USDOT Achieve its Vision for ADS?

- Goal 3: Prepare the Transportation System
  - Conduct targeted technical research
  - Provide funding for ADS-focused demonstrations, pilots, and deployments
  - Update infrastructure standards to reflect ADS technologies





# How Do USDOT Actions Support ADS Development? (Examples)



Occupant-less Low-Speed Vehicles



Passenger Vehicle  
Conditional Driving Automation



Passenger Vehicle ADS



Automated Trucking Operations



Low-Speed Passenger Shuttle

# How does USDOT Work with Stakeholders on ADS

- Cross-Government Partnerships
- International Collaboration
- Public Engagement

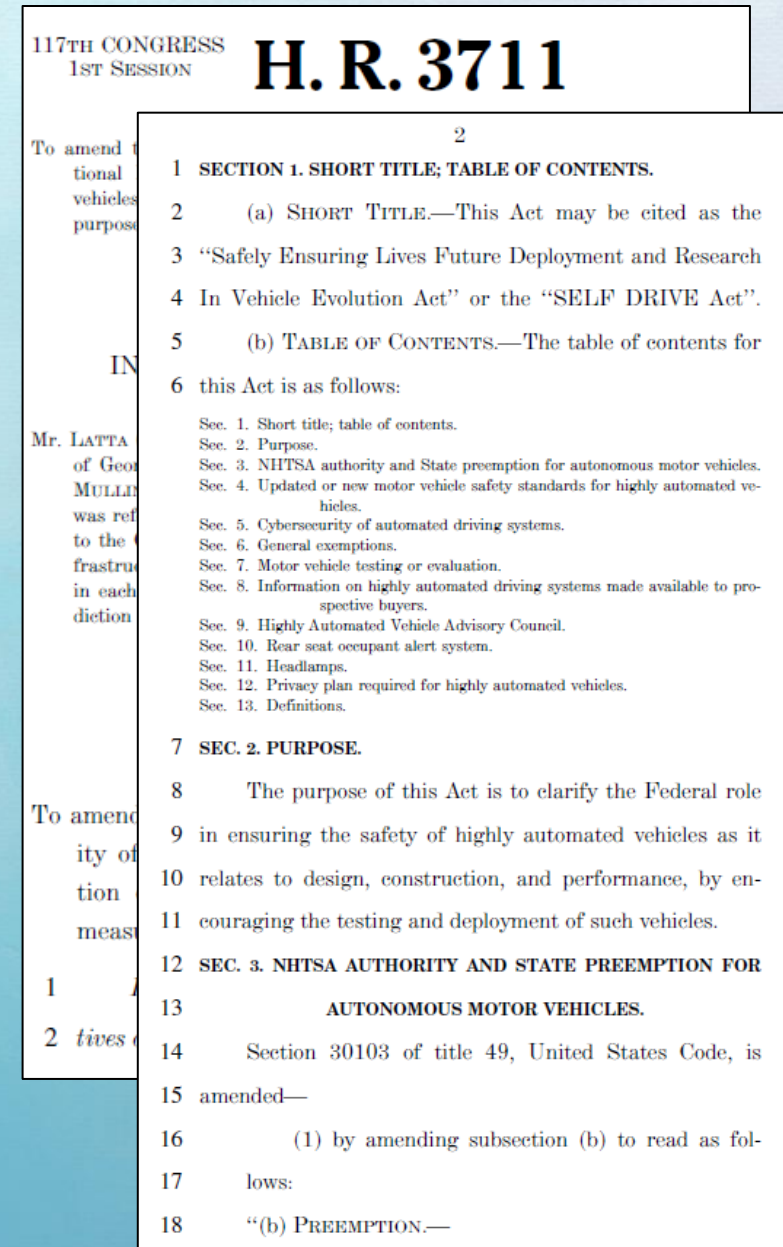
Selected U.S. DOT Automation Public Input Activities		
Events		Federal Register Requests
	<b>2020</b>	
<p><b>SEP:</b> AV TEST Initiative Test Tracking Tool Launch Event</p> <p><b>JUL:</b> AV TEST Virtual Event: State and Local Governments</p> <p><b>JUN:</b> AV TEST Initiative Launch Events</p> <p><b>JUN:</b> Inclusive Design Challenge Informational Webinar</p> <p><b>MAY:</b> <i>Increasing Worker and Driver Safety through Access to Work Zone</i> Virtual Event</p>		<p><b>DEC:</b> FHWA MUTCD Notice of Proposed Amendment</p> <p><b>NOV:</b> NHTSA ANPRM on Framework for Automated Driving System Safety</p> <p><b>APR:</b> AV 4.0 RFC Docket closed</p> <p><b>JAN:</b> Inclusive Design Challenge RFI closed</p>
<p><b>NOV:</b> NHTSA Research Public Meeting</p> <p><b>OCT:</b> Access and Mobility for All Summit</p> <p><b>MAR:</b> AV Workforce Event</p>	<b>2019</b>	<p><b>DEC:</b> AV 3.0 Docket closed</p> <p><b>DEC:</b> NHTSA ANPRM: Pilot Program for Collaborative Research on Motor Vehicles With High or Full Driving Automation</p> <p><b>NOV:</b> AV Workforce docket closed</p> <p><b>MAY:</b> FMCSA RFC Concerning Federal Motor Carrier Safety Regulations (FMCSRs) Which May Be a Barrier to the Safe Testing and Deployment of Automated Driving Systems-Equipped Commercial Motor Vehicles on Public Roads</p>
<p><b>NOV:</b> FHWA National Dialogue in Dallas</p> <p><b>OCT:</b> FHWA National Dialogue in Phoenix</p> <p><b>SEP:</b> FHWA National Dialogue in Chicago</p> <p><b>AUG:</b> FHWA National Dialogue in Seattle</p> <p><b>JUL:</b> FMCSA public meeting on Federal Motor Carrier Safety Regulations Which May Be Barrier to Safe Integration of Automated Driving Systems in Commercial Vehicle Operations</p> <p><b>JUN:</b> FHWA National Dialogue in Detroit</p> <p><b>JUN:</b> FHWA National Dialogue in Philadelphia</p> <p><b>JUN:</b> FMCSA listening session on Federal Motor Carrier Safety Regulations (FMCSRs) Which May Be a Barrier to the Safe Integration of Automated Driving Systems (ADS) in Commercial Motor Vehicle (CMV) Operations</p> <p><b>MAR:</b> AV 3.0: Public Listening Summit</p> <p><b>MAR:</b> NHTSA Public Meeting on Removing Regulatory Barriers for Vehicles with Automated Driving Systems</p>	<b>2018</b>	<p><b>MAY:</b> FRA RFI on Automation in the Railroad Industry</p> <p><b>MAY:</b> PHMSA RFI on Regulatory Challenges to Safely Transporting Hazardous Materials by Surface Modes in an Automated Vehicle Environment</p> <p><b>MAR:</b> NHTSA RFC on Removing Regulatory Barriers for Automated Driving Systems</p>
<p><b>DEC:</b> Roundtable on Data for Automated Vehicle Safety</p> <p><b>NOV:</b> Listening Session on Automated Driving Systems 2.0: A Vision for Safety</p> <p><b>OCT:</b> Automated Driving Systems: Voluntary Safety Self-Assessment Public Workshop</p>	<b>2017</b>	<p><b>MAR:</b> FHWA RFI on Integration of Automated Driving Systems (ADS) into the Highway Transportation System</p> <p><b>MAR:</b> FTA RFC on Automated Transit Buses Research Program</p> <p><b>MAR:</b> FTA RFC on Removing Barriers to Transit Bus Automation</p>

# AV Update – Federal Policy

- In June 2021, NHTSA released a *Standing General Order on Crash Reporting for ADS*
  - ADS Manufacturers and Operators must report crashes involving vehicles that had L3+ ADS engaged within 30 seconds of the crash
    - From June 29, 2021, through May 15, 2022, NHTSA received incident reports for 130 ADS-equipped vehicle crashes
- As a separate *Standing General Order on Crash Reporting for Level 2 ADAS* was also released at the same time
  - There were 392 ADAS-equipped vehicle crashes during the same reporting period

# AV Update – Federal Law

- *Safely Ensuring Lives Future Deployment and Research in Vehicle Evolution (SELF DRIVE) Act*
  - First introduced as HR 3388 in 2017
    - Passed the House on voice vote; stalled out in a Senate Committee
  - Reintroduced as HR 3711 in June 2021
    - Stalled out in 2 House subcommittees
  - Rep. Latta has indicated he will reintroduce this bill in the 118<sup>th</sup> Congress (2023-2024)
  - **There is still no comprehensive Federal law or regulation in place for AV/ADS**



# SELF DRIVE Act

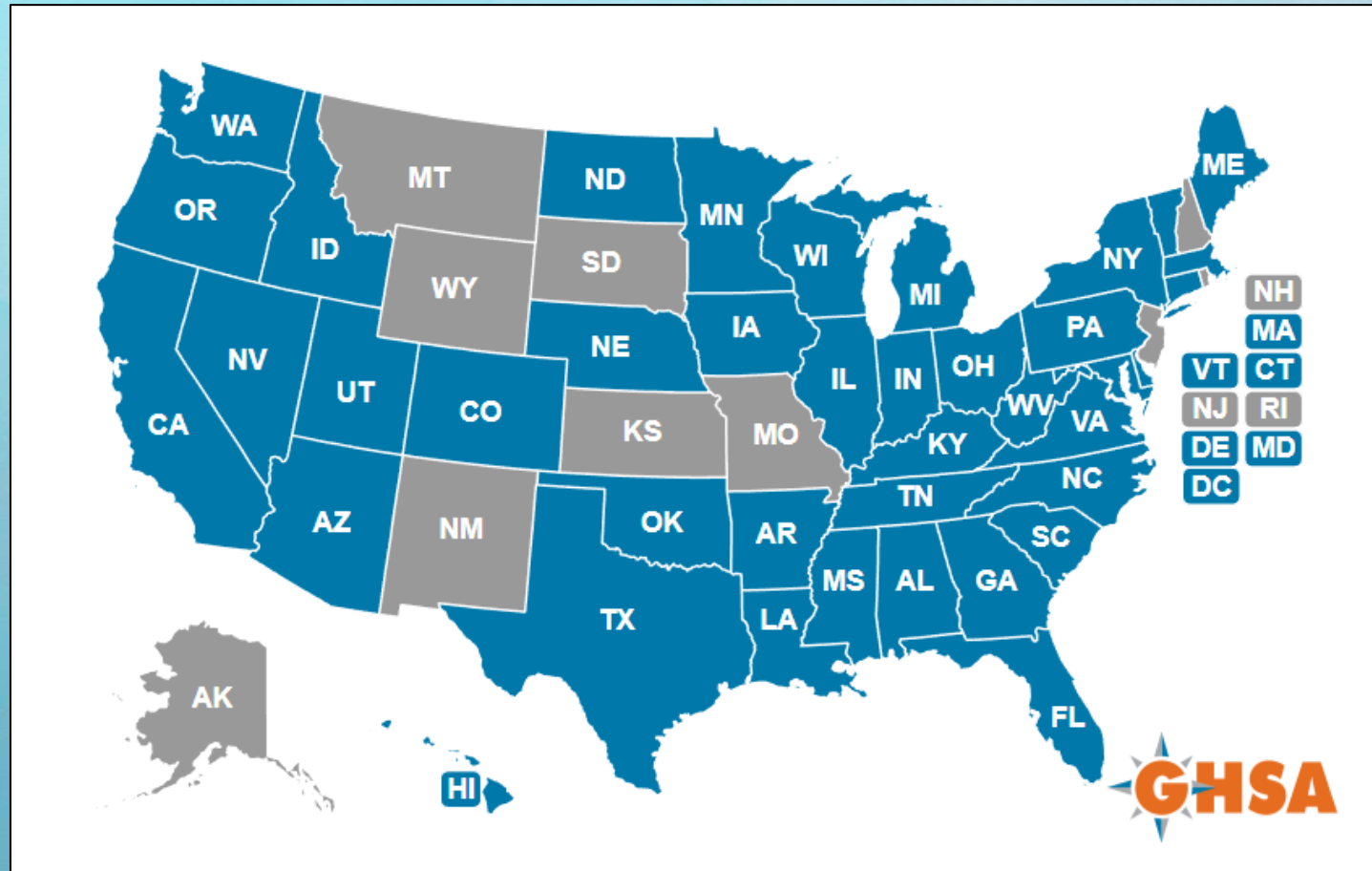
- **Purpose** – to clarify Federal role in ensuring the safety of highly automated vehicles as it relates to design, construction, and performance
- **Features of HR 3711**
  - Establishes Federal authority in AV design, construction, and performance
  - Establishes motor vehicle safety standards for highly automated vehicles
    - Requires Safety Assessment Certification from all ADS vendors within 2 years
    - Requires further research on motor vehicle safety standards within 180 days
  - Requires a Rulemaking and Safety Priority Plan within 1 year that would accommodate the development of ADS and ensure safety/security

# SELF DRIVE Act

- Requires NHTSA to identify areas that may require performance standards
- Establishes *Cybersecurity of ADS* subsection in 49 USC Ch. 301
  - Requires manufacturers have a **Cybersecurity plan** for detecting and responding to cyber attacks; identification of company officer as POC; controls on employee access to ADS
- Requires research on most effective method/terminology for informing consumers about capabilities & limitations of each ADS vehicle
- Requires establishment of the *Highly Automated Vehicle Advisory Council* under NHTSA
- Requires **Privacy Plan** from manufacturers

# AV Update – Florida Law

- Still no comprehensive law at Federal level
- 38 states have enacted AV legislation or executive orders



# AV Update – Florida Law

- In 2016, **HB 7027 Department of Transportation** was signed into Florida law



- Authorized individuals with a standard license to operate an AV in autonomous mode on roadways
- Removed language that an AV could only be operated on roads for testing purposes
- Removed requirement for human operator to be present for testing purposes
- Exempted AVs from certain regulations (e.g., electronic displays)
- Required AVs have a system in place to safely alert driver and transition to manual control when necessary



# AV Update – Florida Law

- In 2019, **HB 311 Autonomous Vehicles** was signed into Florida law
  - Allowed for exemptions from certain regulations pertaining to human operators
  - Removed requirement that a human operator be present for a fully autonomous vehicle to operate in autonomous mode
  - Allowed for teleoperations of AV by a remote human operator
  - Established insurance requirements
    - The ADS is defined as the operator when operating in fully autonomous mode
  - Empowered FTE to enter into agreements to fund, construct, and operate facilities for the advancement of CAV technologies

# AV Update – Florida Law

- In 2021, **HB 1289 Autonomous Vehicles** was signed into Florida law
  - Allows for low-speed autonomous delivery vehicles on roadways with speed limit of 35mph or less
    - Travel along 45mph roads is permitted under certain conditions
  - Establishes that Florida's motor vehicle equipment laws or regulations that relate to motor vehicle operation by a human driver do not apply to fully autonomous vehicles



# AV Update – Industry

- The AV market is known for its optimistic timelines
- Some OEMs are now shifting focus from fully autonomous vehicles (Level 4/5) to Level 2/3 advanced driver assistance systems (ADAS) features that have gained more traction with customers
- Ford and Volkswagen shut down their joint self-driving car effort, **Argo AI**, in October 2022
  - “profitable, fully autonomous vehicles at scale are a long way off and we won’t necessarily have to create that technology ourselves” – Ford CEO Jim Farley

# AV Update – Industry

- Waymo kicked off the industry in 2009
- The Waymo Driver system has logged over 20 million miles on real roads, and more than 20 billion miles on simulated roads
- California DMV releases annual data on reported AV miles driven. For 2021:
  - Waymo had the most autonomous time on public roads, 2.3 million miles
  - Cruise drove ~876,000 miles
  - Poni.ai reported ~306,000 miles
  - Zoox drove ~155,000 miles
  - Apple reported ~13,000 miles

\*The California DMV does not track Tesla's Full Self-Driving (FSD) data because the system still requires a human driver to monitor the vehicle. The DMV is revisiting this decision.

# AV Update – Industry

- Truck Platooning / Convoy Trucks
  - Two or more freight vehicles connected through V2V technologies; one truck is piloted by a driver while other truck(s) follow behind without the need for an active driver
    - Enables downtime for drivers
    - Significant step between driving and full automation
  - Peloton Truck Platoon Pilot on Florida's Turnpike in 2017
  - Locomotion has developed their *Autonomous Relay Convoy* system (L2)

# AV Update – Industry

- Autonomous Freight
  - Walmart is testing driverless trucks from a warehouse to a store in Arkansas
  - Torc Robotics, part of Daimler Truck, will soon test autonomous 18-wheelers
    - Pilot program will test Level 4 trucks on the road with real freight, starting in 2023
    - Will focus on routine hub-to-hub transport (a few hours or less travel time)



# Questions?

# Current Initiatives



# Current Initiatives

- RITIS Training
  - Training anticipated in Spring 2023
  - We are coordinating the training with RITIS staff and Central Office

# Current Initiatives

- I-4 Ultimate – Express Lanes
  - Waiting on primary structures for WWD installations at direct ramps (anticipate one per week during month of January)
- Wekiva Pkwy
  - Estimate received for WWD installs on Wekiva 6



# Current Initiatives

- TSMCA Update
  - Coordinating revisions/signatures with Maintaining Agencies
- Event Management II
  - Received verification camera housing; working with maintenance to install before Daytona 500 for remote blankout sign confirmation
- SunStore
  - Held training with Confluent last week; implementation of Kafka and Confluent cloud underway
- RITSA Change Request
  - Cycle for implementing change requests closed on October 28<sup>th</sup>
  - D5 is still accepting change request forms but updates won't be seen until the next cycle

# Current Initiatives

- PedSafe II
- AV Shuttle
  - electrical upgrades amendment fully executed
- Kiosks at UCF
  - software running in O&M; will hold field visit to assess how to make kiosks more user-friendly
- I-4 FRAME (led by District 7)
  - procurement of devices is pending

# THANK YOU!

Next Consortium – February 2, 2023



Transportation Systems Management & Operations





# TSM&O Consortium Meeting

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## MEETING AGENDA

Teleconference or  
FDOT District 5 RTMC (4975 Wilson Rd, Sanford, FL 32771)

*December 8, 2022*  
*10:00 AM-12:00 PM*

- 1) WELCOME
- 2) TRAFFIC SIGNAL MAINTENANCE AND COMPENSATION AGREEMENT – UPDATE
  - David Williams, VHB
- 3) LATEST ON AUTOMATED VEHICLES
  - David Williams, VHB
- 4) I-75 RAMP METERING STUDY
  - Jeremy Dilmore, District Five TSM&O
- 5) CAV APPLICATIONS (EVP, TSP, FSP) – UPDATE
  - Jeremy Dilmore, District Five TSM&O
- 6) AUTOMATED TRAFFIC SIGNAL PERFORMANCE MEASURES (ATSPM) – UPDATE
  - Jeremy Dilmore, District Five TSM&O
- 7) CURRENT INITIATIVES
  - Jeremy Dilmore, District Five TSM&O