TSMO CONSORTIUM MEETING SUMMARY

Meeting Date:	December 5, 2019 (Thursday)	**Time**: 10:00 AM – 12:00 PM
Subject:	TSMO Consortium Meeting	
Meeting Location:	FDOT District Five - RTMC 4975 Wilson Road Sanford, FL 32771 Turing Conference Room	

I. OVERVIEW

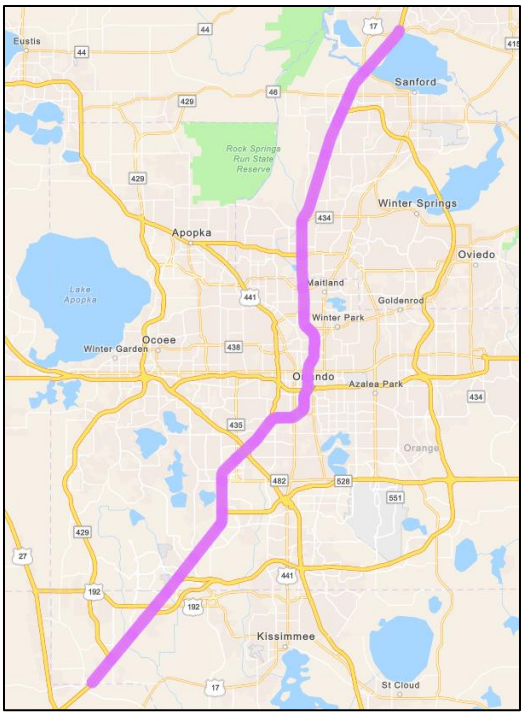
The purpose of this recurring meeting is to provide an opportunity for District Five FDOT staff and local/regional agency partners to collaborate on the state of the TSMO Program and ongoing efforts in District Five. David Williams gave a short introduction and outlined the meeting agenda.

II. R-ICMS – DIVERSION ROUTE COORDINATION

Kevin Miller, The Kapsch Group, provided insight into the Regional Integrated Corridor Management (R-ICMS) Response Plan Development and Agency Profiles.

- The purpose of the R-ICMS Program is to, in the event of a traffic incident on I-4, develop efficient detour routes to divert traffic around the impacted area of I-4 and back onto the interstate.
    - Developing transit bridging routes for SunRail in the event of a train incident is also being developed.
- The R-ICMS program is based on several operational processes:
    - Data Collection, from numerous sources
    - Incident Detection and Response:
        - Detect incidents in the transportation network, specifically non-recurring congestion on freeways and arterials and recurring congestion in arterials
        - Develop a diversion route response plan
            - Repository of response plans having diversion routes which have been developed by Kapsch
            - Rules engine mapping event attributes to response plans
            - Use as many available resources as possible for an efficient diversion route:
                - Traffic signal timing changes - “flush plans” along adjacent corridors
                - Connected Vehicle Traveler Information Messages
                - DMS, 511, and other information dissemination channels
                - Ramp Metering (future)
                - Hard shoulder running (future)
                - Managed lanes pricing deactivation (future)

        - Run Time:
            - Rules Engine Selects response plan for active incident
            - Mesoscopic simulation engine predicts measures of effectiveness 30 minutes into future
            - Operator and Agency Approval obtained prior to activation – the proposed response plan must be fully vetted before implementation
    - Signal Optimization Tool
        - If multiple potential detour routes are developed using the same intersections, a different signal plan must be evaluated for each detour route. For example, if one detour route option travels straight through an intersection and another takes a left turn through the same intersection, then the signal timing plan for each route must be evaluated as part of the decision process for choosing which detour route is the best.
- The I-4 response plan corridor extends along I-4 from the Osceola-Polk County line in the south to exit 108 in the north, just south of Deltona:



- I-4 Response Plan Development:
    - Response Plan Content
        - Based on event location on I-4 and queue upstream of event
        - Will include several device types:
            - DMS
            - Traffic Signals
            - Ramp Meter (future)
            - Connected Vehicle (future)
            - Managed Lane Pricing (future)
        - Queue based detour routes - As part of a response plan, the queue length can be utilized to determine where to prompt drivers to exit a highway.

- Detour Routing:
    - Minor Severity
        - Only a couple short, direct detour routes that do not deviate much from the main corridor.
    - Medium Severity
        - Begin to consider exit options further upstream to direct traffic off the highway before it is impacted by the incident.
        - This severity may have about 3 to 5 routes deviating a little further from the corridor.
    - Major Severity
        - Continue to look further upstream of the incident location for additional detour routes.
        - The distance upstream can be determined by evaluating the traffic queueing due to an incident.
        - This severity may have up to around eight routes, some of which may deviate significantly from the highway.
- Will be meeting with individual agencies to determine R-ICMS operations for each jurisdiction
- Response plan review needs:
    - From Agencies:
        - Review Detour Routes – Detour routes are based on driving routes and looking for most likely routes that can be controlled
        - Note any issues with Signals along routes – no communication, not central control, etc.
        - Note any issues with route – political, community issues
    - Response Plan Review
        - GIS Format can be provided – or ArcGIS Online to review, or
        - Printed versions for each link along I-4 with multiple detour routes.
- R-ICMS Agency Profile Needs
    - Agency Profiles:
        - Devices operated/ maintained (vs. owned)
        - What events to be notified for (all events in corridor, only events which include response plans in their jurisdiction, etc.)
        - Hours of Operations
        - Who to notify in off-hours?
        - Can other agencies (FDOT) change devices during off-hours?
    - User Profiles:
        - Using LDAP for Users
        - Need list of users within organization who will use the R-ICMS or be notified by the system
        - Roles of Users
            - Admin – add/ delete agency users
            - Operators – accept/ reject response plans
            - Managers – notified of events

Discussion

- Q: Is the decision to initiate detour routes determined by the queues developing on I-4?
    - A: Yes and no; the mesoscopic model works with real time information and a set of business rules to determine the best detour routes. In doing so, Measure Of Effectiveness

(MOE) is determined based on both the freeway operations and on arterial operations – the ultimate goal of the model is to reduce delays through the entire region in the event of an incident on I-4. Additionally, any detour route has to be approved by the local authorities before the information is disseminated to drivers.

- Q: Are there plans to expand the model to cover other local freeways (SR 417, SR 429, etc.)?
  - A: Because of all of the geospatial references required to operate the mesoscopic model, expanding it beyond I-4 and SR 408 is highly unlikely. Instead, the possibility of replacing it with a mathematical model (similar to one used by New York University to develop evacuation routes) is being explored, as a mathematical model does not require geospatial references and so can be expanded much more easily.
- Q: How do you plan to send all of the detour information to users?
  - A: The easiest place to begin is through DMS. FDOT is currently looking into changing their policy to allow specific route recommendations to be disseminated through DMS. As connected technology comes more into play with vehicles and infrastructure, 511 will likely be used. Apps such as Waze have been considered and approached regarding this, but their implementation of this technology will not even be considered until they can do it on a national (or even continental) scale. The major drawback of this system currently is not being able to communicate to all drivers, as well as not being able to fully predict how drivers will respond to detour instructions. We don't necessarily want all travelers on the interstate to divert onto the local network.
- Q: Is there a way for the Turnpike (FTP) to be an active partner in congestion management?
  - A: Both FTP and CFX have been great partners thus far; they want to help as best as they can, but due to the current legislature, tolls cannot easily be waived simply to help with congestion and so we are partnering to determine the best way to move forward with them.

III. WHAT'S NEW IN CAV

David Williams presented on the Accessible Autonomous Vehicle Pilot Project in Silicon Valley and on AV Passenger Loading Zones in Chandler, Arizona. Jeremy Dilmore discussed CAV Definitions and CV spectrum legislation and regulation, as well as FAV Summit Takeaways.

Accessible Autonomous Vehicle Pilot Project – Mobility On-Demand in Silicon Valley

- Santa Clara Valley Transportation Authority (VTA) is developing the Accessible Autonomous Vehicle (AAV) Pilot Project
- Goals:
  - Test accessible AV technologies for specialized transportation service
  - Focus on serving individuals with disabilities
    - Palo Alto VA Hospital's staff, visitors and clinic patients
  - Determine how to improve AVs to benefit all users
  - Determine how to improve effectiveness of paratransit service
- Service:
  - VTA believes primary issue for individuals with disabilities is boarding/alighting, not the travel itself.
    - Anticipates 20% of AV shuttle users will require human support

    - VTA will dispatch **support person** to AV users at their origin or destination, as needed
        - Support person can arrive early to help individual, improving wait times for all
    - AVs will serve both paratransit and first-/last-mile customers
    - Streamlining transit system
        - Standard buses concentrated along core routes
        - Each MOD AV would cover ~1 square mile; provide connections to core routes
            - Targeting wait times of 3-5 minutes for AV calls
        - Reduce wait times for customers
        - Reduce negative experiences (e.g., missing bus)
- Timeline:
    - **Spring 2020** – First vehicle trial
    - **Over next 2 years** – Develop technology, features, and program
        - The VTA envisions a MOD program with 100's of AV shuttles feeding the core transit system while providing enhanced paratransit service
        - VTA coverage area is ~300 square miles
            - VTA hopes to deploy ~400 AVs at full scale
- The Shuttle Design:
    - 3d-printed, 12 passenger *cognitive* shuttle
    - Electric vehicle
    - Travel speed: 15 - 18 mph
    - Human-Machine Interface that will be able to identify and comprehend sign language
    - Audio and visual communications w/users
    - Retractable ramp for wheelchair access
    - Partnership with IBM Watson allows for communication with users using both regular language and sign language.
    - 3mph crash test shows the vehicle bouncing off the wall with minimal damage
    - 25mph crash test show the windows shattering, but the structure of the shuttle maintaining its integrity. The vehicle used in the 25mph crash test was not equipped with the shatter-proof glass which will be installed on all deployed vehicles.
- For more information about the Pilot Project:
    - www.Viodi.com
    - Search YouTube: "VTA Mobility on Demand"
- For more information about the 3d-printed *Olli*:
    - https://localmotors.com/meet-olli/
    - Search YouTube: "Olli AV"

Discussion

- **Comment:** More research is needed into provisions for physically disabled users of AV public transit systems. One major concern with this deployment plan, however, is that each disabled trip will require a service person to arrive at their location in a separate vehicle, follow the shuttle, and help them off at their destination, thus creating two vehicle trips for every one disabled trip.
- **Q:** The shuttles look like glorified golf carts, which are not street-legal, and having vehicles in traffic with a maximum speed of 18mph will require significant signal timing adjustments. Are these shuttles intended for use on multiuse streets or on shared paths?

- A: The VTA has not addressed these concerns publicly yet.

AV Passenger Loading Zone in Chandler, Arizona

- Overview:
  - In June 2019, City of Chandler and Waymo launched AV ride-hailing program for select city employees
  - In November 2019, City unveiled passenger loading zone for AV ride-hailing cars
  - Located in front of City Hall off to the side, in support of the employee ride-hailing program
    - Added goal of improving acceptance of AV technology
  - The City has made a major push in support of passenger loading zones (both AV and standard)
- 2018 Zoning Amendment:
  - Up to 40% reduction of parking requirements for developments based on impact of proposed passenger loading zone space(s), contingent on parking demand study findings
    - The number of parking spaces required may be reduced by 10% for each passenger loading zone space provided, up to 40%
  - Cannot cause increased demand for parking on nearby businesses
  - Passenger Loading Zone standards
    - Located within ~50ft of entrance of a stand-alone use
    - Separate from fire lanes
    - Design – ingress/egress designed for forward-motion only
    - Pedestrian amenities provided nearby, as determined by zoning administrator
    - Comply with City's Building Code accessibility requirements
- For more information on the amendment:
  - Go to Chandler, AZ *Municode* website
    - Search: "autonomous"
    - Section 35-1807 Parking Reductions
    - Section 35-1808 Passenger Loading Zones
  - Search: Chandler, AZ Passenger Loading Zone

Discussion

- Note: This is not a presentation of the right or wrong way to integrate rideshare vehicles/AVs into traffic operations; it is an example of one of the first full scale integrations of AVs into everyday traffic.
- Comment: Orange County has been looking at the Chandler regulations for the AV drop off/pick up zones. It's useful to apply to the growth in ridesharing traffic, even without AVs, and highlights the importance of curbside management.

CAV Definitions

- Communications:
  - 5G/4G/LTE/Cellular – Currently most communication is run on 4G/LTE with a general movement towards using 5G. It works by connecting cellular devices via cell towers. Latency issues caused by the cell tower communication means that these cannot be used

for safety communications/applications in vehicles. It remains to be seen how much latency issues will be improved with the influx of 5G communications.
    - Sidelink/C-V2X – This technology allows direct communication between CVs and infrastructure without the use of cellular infrastructure, allowing for much lower latency than 4G/LTE technology. This has not yet been approved by the FCC, though they are allowing agencies to obtain experimental/provisional permits in certain cases.
    - DSRC – Similar to Sidelink/C-V2X, this tech also allows high speed direct communication between CVs and infrastructure without the use of cellular infrastructure.
- Levels of Automation - three new definitions for levels of automation have been developed to make the concept easier to discuss with members of the general public:
    - Safe Driving / ADAS* – Hands on wheel, feet on pedals at all times
        - *ADAS – Advanced Driver Assistance System
    - Self-Driving Car – Hands off wheel, feet off pedals some of the time
    - Driverless – Car drives itself

Discussion

- Q: Are the original five levels of automation being discarded in favor of these new terms?
    - A: No, these new terms have only been developed for the general public to better facilitate discussions about the differences between different levels of automation.
- Q: Was there clarification about whether driverless vehicles will have a steering wheel or not:
    - A: No, there was no discussion on that point.

CV Spectrum Legislation and Regulation

- Wi-Fi to share space with DSRC
    - C-V2X portion of current band and separation to be used for Wi-Fi
- The current DSRC projects did not receive approval from the FCC, so the District Five DSRC radios cannot yet be turned on.

Discussion

- Q: Does this signal the end of DSRC?
    - A: Probably not. The next generation of DSRC will likely be what ultimately receives approval from the FCC and comes into use.
    - Further Discussion: The space surrounding this technology is pretty complicated right now. ITE has taken a position against C-V2X and so the FCC will not approve C-V2X radios. Until approval comes through, you can only receive a trial permit for C-V2X radios. However, C-V2X and DSRC are separate technologies and each one is being developed at a different rate. I-75 has switched over to dual-band units and is seeking permits for both; it remains to be seen what a base permit for a C-V2X radio will entail. Currently, only three manufacturers produce dual-band units, and their antennas are oriented so that DSRC and C-V2X are in phase with each other, the units cannot be used for both simultaneously. If a unit is developed with antennas oriented out of phase with one another, then the units will only require a firmware update to function with both technologies simultaneously.

- Q: Will making a wrong decision at this stage mean that you are left with hardware that has no salvage value?
    - A: Currently all decisions that benefit one tech over the other are wrong; District Five is focusing on getting the infrastructure (other than radios) and software ready, as that is an investment with known future value and will be able to function with either tech.
- Q: Are there C-V2X devices that have been lab tested?
    - A: Yes. When looking for them be sure to specify "Sidelink" rather than "C-V2X," as vendors will often try to lump C-V2X in with 4G/5G/LTE/Cellular.
- Q: How ready is District Five to connect to AV's?
    - A: The Department is waiting for the fight in the private sector to be decided in favor of either DSRC or C-V2X. Once that is decided, staff will need to be trained in the new tech and operations will be scaled out. Ultimately, this fight is anticipated to make future growth and changes in this area happen much more smoothly than they would otherwise.
        - This was a necessary component in CV communications policy development. With the fight occurring now rather than later, the hope is this will protect agencies from investing too heavily in a losing technology.
- Q: Is there any knowledge about how this private sector argument is affecting the businesses that need this tech now?
    - A: No, we do not have that information currently.

FAV Summit Takeaways

- Connected and Autonomous Vehicles were shown to be a state priority – Governor Ron DeSantis attended the summit.
- Freight stakeholders want *crash potential*.
    - knowing the likelihood of a crash before it occurs (i.eg., UCF's research/data efforts) can help freight vehicles avoid potentially hazardous situations or costly delays
    - currently working with UCF on *Safety Data Initiative* Grant
- Silos are still in effect, but the line between private and public research, resources, and communication is slowly fading.
- SunTrax is gaining a lot of interest
    - The 2.25-mile oval track is complete
- Flying taxis:
    - The revenue model is sustainable and is based mostly on people's need for central control & connectivity
    - The two main companies offering this are Lilium and EmbraerX
    - They were looking for reduced regulations on take-off and landing zones with the argument that since their vehicles are electric, they won't need the same hazmat protection. However, since electric vehicles run on lithium ion batteries, the hazmat protections still need to be kept in place so they are currently considering helipads for take-off and landing.
- Florida's regulatory approach is generally supported by the industry

- Ford's approach: Their discussion focused much more on autonomous & ride-hailing vehicles rather than individual vehicles. They are moving away from selling vehicles and towards selling a service.
- ADAS testing showed interesting results. All of the tested vehicles hit the simulated child that walked out behind them, so clear limitations of the software were demonstrated.
- LiDAR appears to be making progress. Major changes as far as intersections switching from camera detection to LiDAR detection are not anticipated in the short term but may begin to come in five years or so.

Discussion:

- Q: Why is there a need to switch to LiDAR when radar-based detection can accomplish most of the same functions?
    - A: Most radar manufacturers are unwilling to work with us, with the exception of Rhythm with their Hawkeye product. We are currently trying to get LiDAR and microwave testing set up at UCF to determine the viability of the product.
- Comment: One particularly interesting point to come out of the summit was the expectation that in the future EV charging stations will be as prolific as gas stations are today, and that many gas stations will end up closing or changing their business model to primarily be a convenience store (some are already doing this today, e.g. Wawa).
    - Comment: There is already a push from the Governor to increase the availability of charging stations around public buildings
    - Comment: Orange County is also looking into providing more charging spaces and focusing on ensuring that everyone has equal access to EV charging. Currently, multifamily housing typically has much less access to charging facilities than single family housing. Winter Park is also looking into this; it would be a good idea to have a regional discussion on this topic.

IV. ITS FUNDING REQUEST LIST - UPDATE

Jeremy Dilmore gave an update on the ITS Funding Request List.

- MPO/TPO identified Priority Projects List, including ITS/TSM&O projects (most from Master Plans)
- From May to June: District combined ITS/TSM&O priority projects into one list
- From July to August: Submitted to Central Office
- In September: Central Office selected projects for funding
- The following projects received funding:
    - Daytona Area Event Management Phase 2 (436325-2) – FY 2021
    - Pushbutton #16 – Orange County Bluetooth Expansion – FY 2025
    - Lake County – Initial ITS Deployment – FY 2025
    - Lake County – Fiber Infrastructure – FY 2025

V. LOCAL AGENCY PROJECT FUNDING UPDATE

Jeremy Dilmore presented on local agency project funding from Central Office.

- Central Office has allotted additional funds towards local projects
- Starting in FY 2021:
  - Additional $2 million per year made available, for 5 years
  - Candidate projects:
    - Must include a 50/50 match from locals. This is an advantage for District Five because of the good communication within the region.
    - Must be on state roadway system.
    - Must be CV-related.
- We're looking to bring $8M of the $10M into District Five. When you find projects that you want to apply to this, please contact either Jeremy Dilmore or Tushar Patel.

Discussion

- Q: Can the match be made with federal funds?
  - A: Yes.
- Q: Can 'In Kind' projects be used as a match?
  - A: We've asked and are still waiting for an answer. We're anticipating an in-kind match will not be accepted.

VI. CURRENT INITIATIVES

Jeremy Dilmore led a discussion on current initiatives in D5.

- Solving for Safety Visualization Challenge
  - UCF's submission for the Safety Visualization Challenge was declared the winner. A video was shown to the Consortium stakeholders explaining the project.
  - https://www.youtube.com/watch?v=Y_BhAGW2L6E
- Signal ID – Update
  - Effort underway to develop cross-reference sheet. The index database will cover five different systems.
  - Once SIIA is released, additional data can be obtained and catalogued
    - The changing of any controller ID will break that connection, so when changing a signal controller, please either maintain the same ID or send the information about the change in as soon as possible.
- ADS Demonstrations Grant Application
  - Name: **Project Delta Demonstration**
  - Five Key Components:
    - Interoperability
    - Human-Machine Interface (HMI)
    - Automated MAP Message Generation
    - Electromagnetic Interference (EMI)
    - Cybersecurity
  - The application did not win; however, Central Office is considering funding projects based on the Interoperability, Automated MAP Message, and Cybersecurity components of the application
  - ADS Grant Awardees:
    - **Texas A&M –** AVA: Automated Vehicles for All
      - Develop and test ADS for rural roads without high-definition maps and no or low-quality signage/markings
    - **University of Iowa –** ADS for Rural America
      - ADS Transit for transportation-disadvantaged rural area
    - **Virginia Tech –** Safely Operating ADS in Challenging Dynamic Scenarios
      - Examine/Troubleshoot ADS vehicles in dynamic scenarios (edge cases)
    - **Virginia Tech –** Trucking Fleet ConOps for Managing Mixed Fleets
      - Provide clear guidelines on transitioning to ADS fleets
    - **Ohio DOT –** D.A.T.A in Ohio: Deploying Automated Tech Anywhere
      - Rural ADS; focus on data collection and storage
    - **Penn DOT –** Safe Integration of AVs in Work Zones
      - Safe integration of ADS in work zones via connectivity, visibility, and high-definition mapping technologies
    - **City of Detroit, MI –** Michigan Mobility Collaborative
      - Integrate CARMA Level 3 software platform for demonstration, focusing on mobility, safety, and endurance
    - **Contra Costa –** ADS Demonstration Program
      - Shared on-demand, wheelchair accessible ADS vehicles
    - For more information or to review the winning applications, visit https://www.transportation.gov/av/grants or search: *FHWA ADS Grant*

- ATCMTD Rebranding Underway
  - 

  - Various logos, color schemes, and figure layouts were shown for the new branding.

Discussion

- Comment: The asset management systems used by different agencies are not consistent, so please email your agency's asset management system to David Williams.
- Comment: There are five criteria for an intersection to be CV ready:
  - Perform data collection through SIIA
  - Use ATC controller
  - Connectivity with ATMS
  - Detection must be able to provide trajectory info
  - Use Type 6 Cabinet

VII. NEXT MEETING

- February 6, 2020

VIII. ATTACHMENTS

- A – Sign in sheets
- B – Presentation Slides
- C – Meeting agenda

END OF SUMMARY

This summary was prepared by Amanda Johnson and 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 *so they can be finalized for the files.*

TSM&O Consortium Meeting
December 5, 2019

NAME	AGENCY	E-MAIL ADDRESS
Kevin Miller	Kapsch	Kevin.Miller@Kapsch.net
Chirayu Amin	AECOM	Chirayu.Amin@AECOM.com
Aung Thurain	RK&K	athurain@RKK.com
Renato A. Coletti	RK&K	rcoletti@RKK.com
Frank Alvarez	VOTRAN	FAlvarez@Volusia.org
Christy Flickinger	FDOT	christy.flickinger@dot.state.fl.us
Todd Davis	Protean	tdavis@proteandg.com
Alex Hinkle	PROTEAN	AHinkle@proteandg.com
Nicole Heck	Kimley-Horn	Nicole.Heck@kimley-horn.com
Steven Bostek	SCTPO	Steven.Bostek@brevardfl.gov
Lara Bouck	Metroplan Orlando	LBouck@metroplanorlando.org
Noel Steyer	Seminole County	Nsteyer@seminolecountyfl.gov
Bryan Homayouni	CFX	bryan.homayouni@cfxway.com

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NAME	AGENCY	E-MAIL ADDRESS
Charlie Wetzel	Seminole Co.	cwetzel@seminolecountyfl.gov
Crystal Mercedes	R2CTPO	cmercedes@r2ctpo.org
Clay Packard	VHB	cpackard@vhb.com
ALISSA TORRES	ORANGE COUNTY	ALISSA.TORRES@OCFL.NET
Doug Jamison	LYNX	djamison@golynx.com
ERIC HILL	M&TPO Plan Orlando	EHILL@METROPLANORLANDO.ORG
Benton Bonney	Orlando	benton.bonney@orlando.gov
Claudia Pastelmatches	INNOVO PARTNERS	CPASTELMATCHES@INNOVOPARTNERS.COM
Melina Gross	INNOVO PARTNERS	MGROSS@INNOVOPARTNERS.COM
MARK TOBIN	City of Orlando	mark.tobin@cityoforlando.org
Juan G. Calderon	City of Orlando	Juan.Calderon@cityoforlando.org

Welcome to the TSM&O Consortium Meeting

December 5, 2019

Transportation Systems Management & Operations

Meeting Agenda

1. Welcome
2. R-ICMS – Diversion Route Coordination
3. What's New in CAV
4. ITS Funding Request List
5. Local Agency Project Funding
6. Current Initiatives

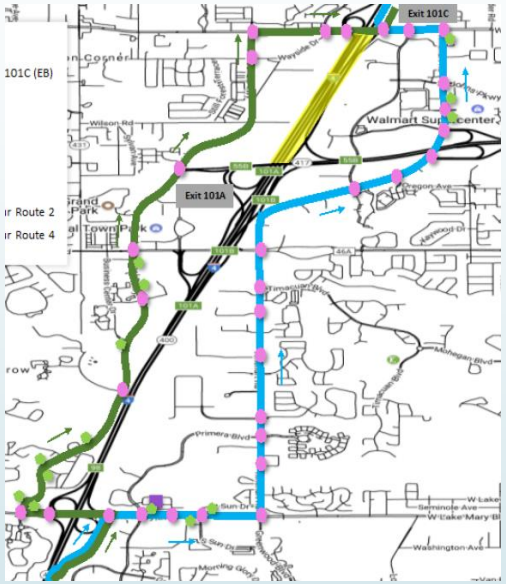
R-ICMS Response Plan Development & Agency Profiles

District 5 Regional Integrated Corridor Management System

R-ICMS Program

Regional Integrated Corridor Management System

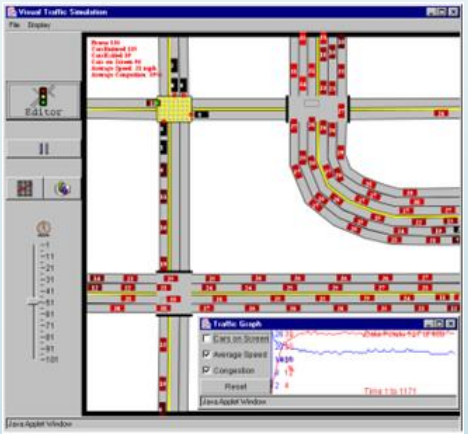
Incident Detection



Response Plan
w/ Diversion Route

Data Fusion Environment

Signal Timing
Plan Selection and
Optimization



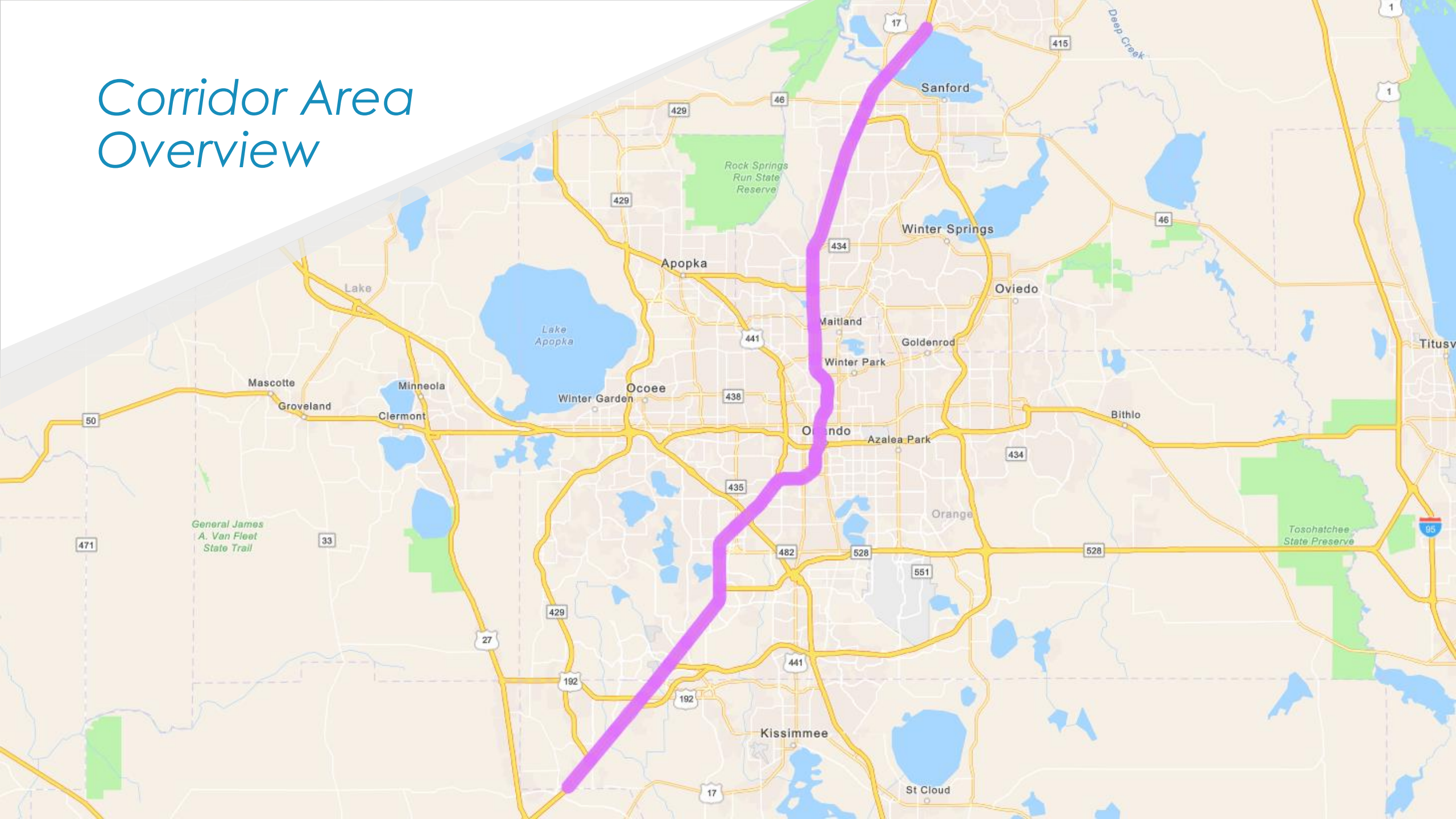
Mesoscopic
Simulation for
Realtime 30
Minute
Forecasting

Non-Recurring Incident Detection & Response

- Design Time:
  - Repository of Response Plans having Diversion Routes
  - Rules engine mapping event attributes to response plans
- Run-Time:
  - Rules Engine Selects response plan for active incident
  - Mesoscopic simulation engine predicts measures of effectiveness 30 minutes into future
  - Operator and Agency Approval obtained prior to activation

I-4 Response Plan Corridor Overview

Corridor Area Overview

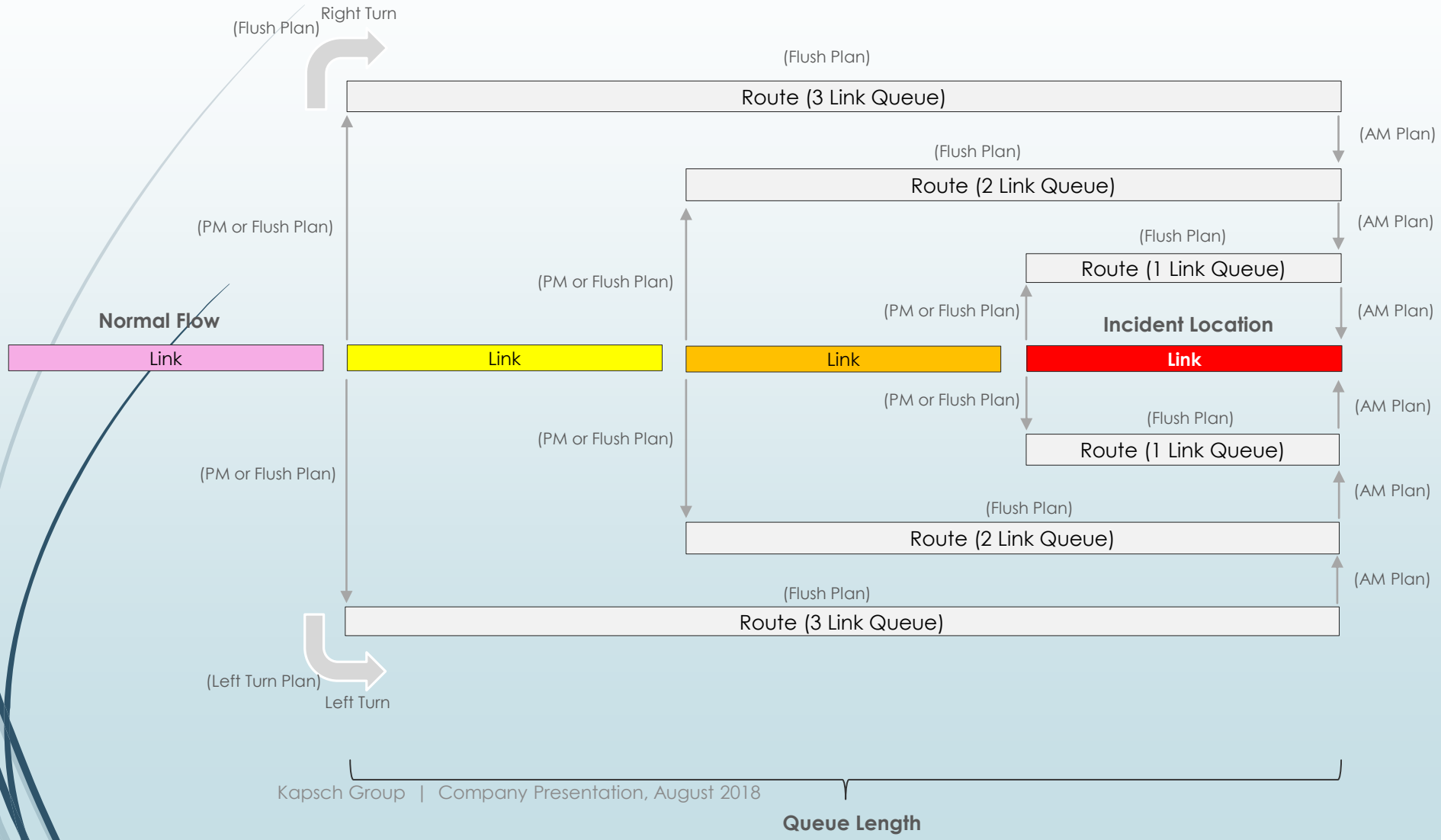


I-4 Response Plan Development

Response Plan Content

- Base on event location on I-4
  - Queue upstream of event
- Will include several device types
  - DMS
  - Traffic Signals
  - Ramp Meter (future)
  - Connected Vehicle (future)
  - Managed Lane Pricing (future)

Queue Based Detour Routes

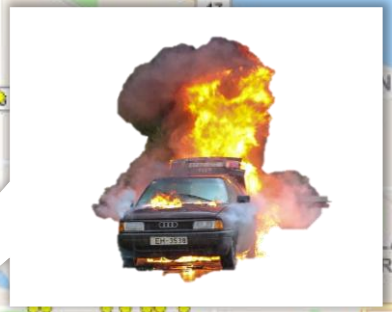


Detour Routing

Minor Severity

Detour Routing

Medium Severity



Detour Routing

Major Severity

Response Plan Review Needs

Needs from Agencies

- Review Detour Routes – Detour routes are based on driving routes and looking for most likely routes that can be controlled
- Note any issues with Signals along routes – no communication, not central control, etc.
- Note any issues with route – political, community issues

Response Plan Review

- GIS Format can be provided – or ArcGIS Online to review, or
- Printed versions for each link along I-4 with multiple detour routes.

R-ICMS Agency Profile Needs

Agency and User Profiles within the R-ICMS

R-ICMS Agency Profile

- Devices operated/ maintained (vs. owned)
- What events to be notified for (all events in corridor, only events which include response plans in their jurisdiction, etc.)
- Hours of Operations
- Who to notify in off-hours
- Can other agencies (FDOT) change devices during off-hours

User Profiles

- Using LDAP for Users
- Need list of users within organization who will use the R-ICMS or be notified by the system
- Roles of Users
  - Admin – add/ delete agency users
  - Operators – accept/ reject response plans
  - Managers – notified of events

What's New in CAV?

David Williams, VHB
Jeremy Dilmore, District 5 TSM&O

Transportation Systems Management & Operations

Accessible Autonomous Vehicle Pilot Project
Mobility On-Demand in Silicon Valley

FDOT TSM&O
Transportation Systems Management & Operations

Transportation Systems Management & Operations

CENTRAL FLORIDA TSM&O CONSORTIUM

Accessible Autonomous Vehicle Pilot Project

- Santa Clara Valley Transportation Authority (VTA) is developing the **Accessible Autonomous Vehicle (AAV) Pilot Project**
- Goal: test accessible AV technologies for specialized transportation service
- Focus on serving individuals with disabilities
  - Palo Alto VA Hospital's staff, visitors and clinic patients
- How to improve AVs to benefit all users?
- How to improve effectiveness of paratransit service?

Accessible Autonomous Vehicle Pilot Project

- VTA believes primary issue for individuals with disabilities is **boarding/alighting**, not the travel itself
  - Anticipates 20% of AV shuttle users will require human support
- VTA will dispatch **support person** to AV users at their origin or destination, as needed
  - Support person can arrive early to help individual, improving wait times for all

AccessibleOlli (2019)

- AVs will serve both paratransit and first-/last-mile customers

Accessible Autonomous Vehicle Pilot Project

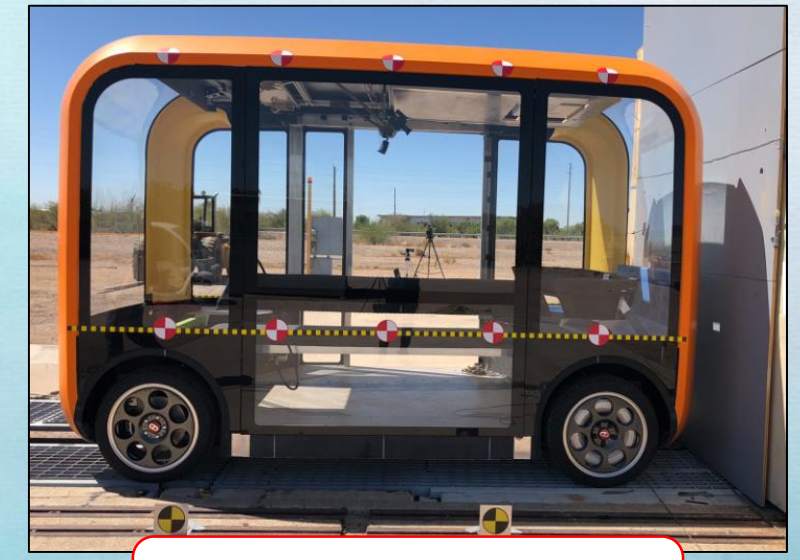
- Streamlining transit system
  - Standard buses concentrated along core routes
  - Each MOD AV would cover ~1 square mile; provide connections to core routes
    - Targeting wait times of 3-5 minutes for AV calls
  - Reduce wait times for customers
  - Reduce negative experiences (e.g., missing bus)
- **Spring 2020** – First vehicle trial
- **Over next 2 years** – Develop technology, features, and program

Local Motors (2016)

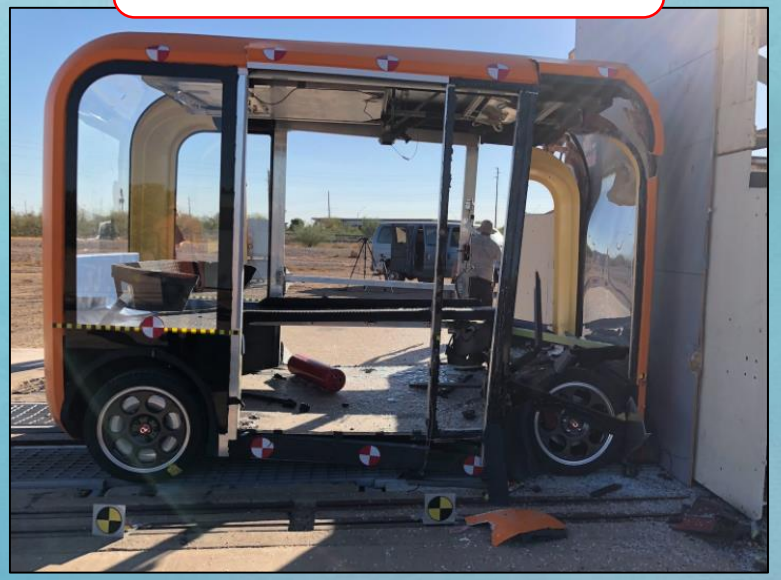
AccessibleOlli (2019)

The Accessible Autonomous Vehicle

- 3d-printed, 12 passenger *cognitive* shuttle
  - Up to 50% reduction in manufacturing costs
  - Up to 90% reduction in manufacturing duration
- Electric vehicle
- Travel speed: 15 - 18 mph
- Human-Machine Interface that will be able to identify and comprehend sign language
- Audio and visual communications w/users
- Retractable ramp for wheelchair access
- Partnership with IBM Watson



25 mph crash test



The Verge (2019)

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Accessible Autonomous Vehicle Pilot Project

- For more information about the Pilot Project:
  - www.Viodi.com
  - Search YouTube: “VTA Mobility on Demand”

Santa Clara Valley Transportation Authority

Local Motors (2019)

Accessible Autonomous Vehicle Pilot Project

- For more information about the 3d-printed *Olli*:
  - https://localmotors.com/meet-olli/
  - Search YouTube: “Olli AV”

Local Motors (2019)

AV Passenger Loading Zone in Chandler, Arizona

Transportation Systems Management & Operations

AV Pick-up and Drop-Off Location in Chandler, AZ

- In June 2019, City of Chandler and Waymo launched AV ride-hailing program for select city employees
- In November 2019, City unveiled passenger loading zone for AV ride-hailing cars
- Located in front of City Hall off to the side, in support of the employee ride-hailing program
  - Added goal of improving acceptance of AV technology
- The City has made a major push in support of passenger loading zones (both AV and standard)

City of Chandler, Arizona (2019)

Google Streetview (2018)

Google Streetview (2018)

AV Pick-up and Drop-Off Location in Chandler, AZ

- 2018 Zoning Amendment
  - Up to 40% reduction of parking requirements for developments based on impact of proposed passenger loading zone space(s), contingent on parking demand study findings
  - Cannot cause increased demand for parking on nearby businesses
  - <u>Passenger Loading Zone standards</u>
    - Located within ~50ft of entrance of a stand-alone use
    - Separate from fire lanes
    - Design – ingress / egress designed for **forward-motion only**
    - Pedestrian amenities provided nearby, as determined by zoning administrator
    - Comply with City's Building Code accessibility requirements

AV Pick-up and Drop-Off Location in Chandler, AZ

- The number of parking spaces required may be reduced by 10% for each passenger loading zone space provided, up to 40%

Zoning	Loading Zone Spaces
Commercial	1 Loading Zone Space Per 50,000 sq. ft.
General Office	1 Loading Zone Space Per 100,000 sq. ft.
Industrial	1 Loading Zone Space Per 200,000 sq. ft.
Institutional / Medical	1 Loading Zone Space Per 50,000 sq. ft.
Multi-Family	1 Loading Zone Space Per 150 units

AV Pick-up and Drop-Off Location in Chandler, AZ

- For more information on the amendment:
  - Go to Chandler, AZ *Municode* website
    - Search: “autonomous”
    - Section 35-1807 Parking Reductions
    - Section 35-1808 Passenger Loading Zones
  - Search: Chandler, AZ Passenger Loading Zone

CAV Definitions

CAV Definitions

COMMUNICATIONS

- 5G / 4G / LTE / Cellular
- Sidelink / C-V2X
- DSRC

LEVELS OF AUTOMATION

- Safe Driving / ADAS* – Hands on wheel, feet on pedals at all times
- Self-Driving Car – Hands off wheel, feet off pedals some of the time
- Driverless – Car drives itself

*ADAS – Advanced Driver Assistance System

CV Spectrum
Legislation and Regulation

CV Spectrum – Where We Stand

- WiFi to share space with DSRC
- C-V2X with current band and separation

FAV Summit Takeaways

FAV Summit – Key Takeaways

- Connected and Autonomous Vehicles a priority (Governor attended)
- Freight stakeholders want *crash potential*
- Silos still in effect
- SunTrax is gaining a lot of interest
  - **Oval complete**

Bergeron Land Development, Inc. (2019)

FAV Summit – Key Takeaways

- **Flying taxis** – revenue model; need for central control & connectivity
  - Lilium
  - EmbraerX
- Florida's regulatory approach is generally supported by the industry
- Ford's approach – Autonomous & ride-hailing; not individual vehicle
- ADAS testing – interesting results; showed limitations
- LiDAR making progress

ITS Funding Request List

Jeremy Dilmore, District 5 TSM&O

FDOT TSM&O
Transportation Systems Management & Operations

Transportation Systems Management & Operations

CENTRAL FLORIDA TSM&O CONSORTIUM

ITS Funding Request List – Update

1) MPO/TPO determined Priority Projects List, including ITS/TSM&O projects (most from Master Plans)

May - June

2) District combined ITS/TSM&O priority projects into one list

July - August

3) Submitted to Central Office

September

4) Central Office selected projects for funding

ITS Funding Request List – Update

- Daytona Area Event Management Phase 2 (436325-2) **FY21**
- Pushbutton #16 – Orange County Bluetooth Expansion **FY25**
- Lake County – Initial ITS Deployment **FY25**
- Lake County – Fiber Infrastructure **FY25**

Local Agency Project Funding Update

Jeremy Dilmore, District 5 TSM&O

Local Agency Project Funding

- Central Office has allotted additional funds towards Local Agency projects
- Starting in FY 2021:
  - Additional $2 million **per year** made available, for 5 years
  - Candidate projects:
    - Must include a 50/50 match from locals
    - Must be on state roadway system

Current Initiatives

Jeremy Dilmore, District 5 TSM&O

Solving for Safety Visualization Challenge
University of Central Florida

Transportation Systems Management & Operations

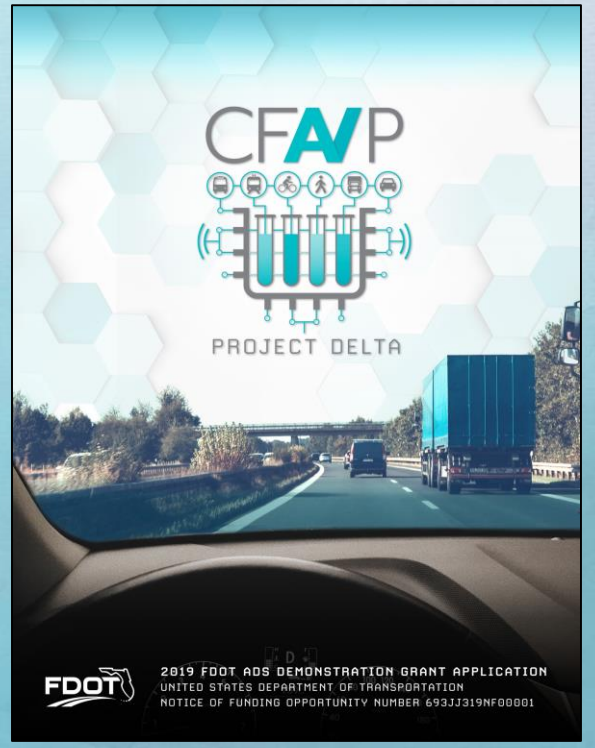
Signal ID – Update

- Effort underway to develop cross-reference sheet
- Once SIIA is released, additional data can be obtained and catalogued

ADS Demonstrations Grant Application

- Name: **PROJECT DELTA DEMONSTRATION**

- Five Key Components
  1. Interoperability
  2. Human-Machine Interface (HMI)
  3. Automated MAP Message Generation
  4. Electromagnetic Interference (EMI)
  5. Cybersecurity



ADS Grant Awardees

- **Texas A&M –** AVA: Automated Vehicles for All
  - Develop and test ADS for rural roads without high-definition maps and no or low-quality signage/markings

- **University of Iowa –** ADS for Rural America
  - ADS Transit for transportation-disadvantaged rural area

- **Virginia Tech –** Safely Operating ADS in Challenging Dynamic Scenarios
  - Examine/Troubleshoot ADS vehicles in dynamic scenarios (edge cases)

- **Virginia Tech –** Trucking Fleet ConOps for Managing Mixed Fleets
  - Provide clear guidelines on transitioning to ADS fleets

ADS Grant Awardees

- **Ohio DOT –** D.A.T.A in Ohio: Deploying Automated Tech Anywhere
  - Rural ADS; focus on data collection and storage

- **Penn DOT –** Safe Integration of AVs in Work Zones
  - Safe integration of ADS in work zones via connectivity, visibility, and high-definition mapping technologies

- **City of Detroit, MI –** Michigan Mobility Collaborative
  - Integrate CARMA Level 3 software platform for demonstration, focusing on mobility, safety, and endurance

- **Contra Costa –** ADS Demonstration Program
  - Shared on-demand, wheelchair accessible ADS vehicles

ADS Grant Awardees

For more information or to review the winning applications, visit:

https://www.transportation.gov/av/grants

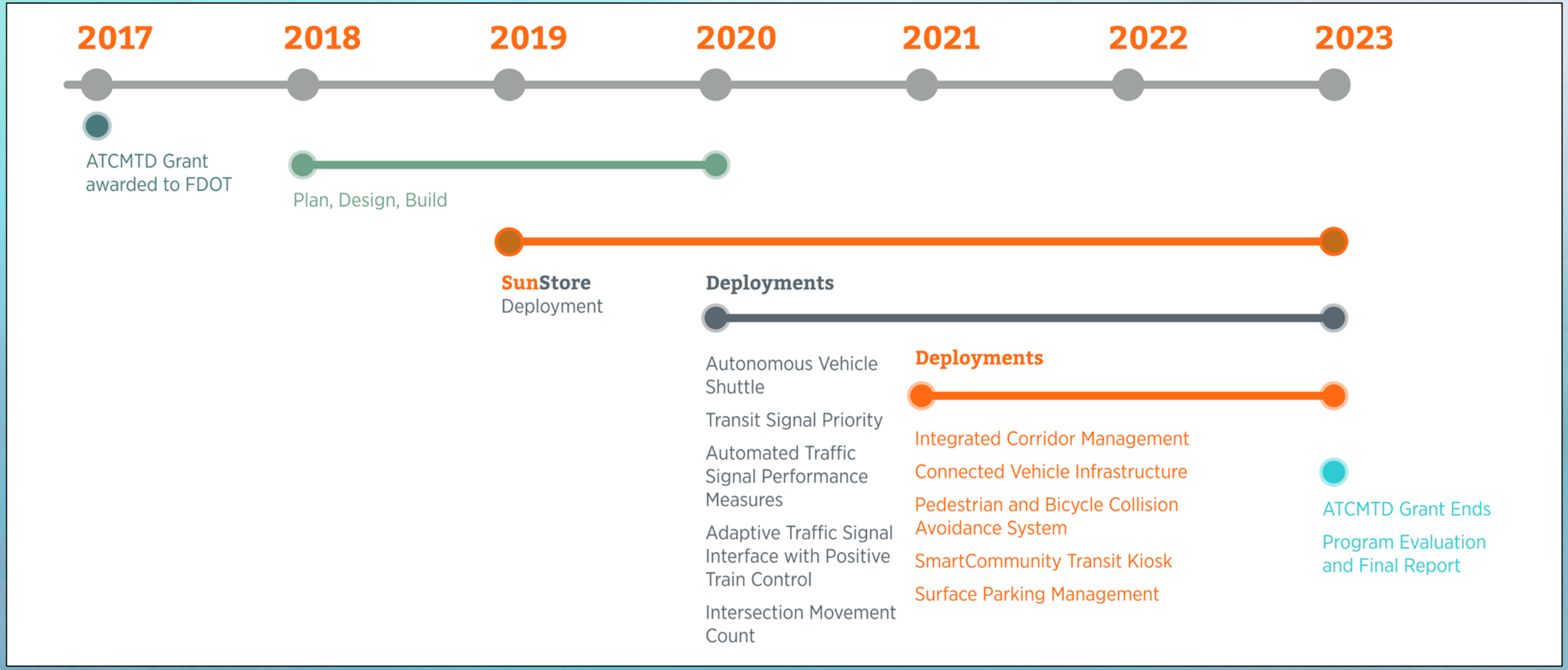
or search: *FHWA ADS Grant*

ATCMTD Rebranding Underway

ATCMTD Rebranding Underway

ATCMTD Rebranding Underway

ATTAIN Central Florida – Schedule




COAST P-1
COAST
AUTONOMOUS


SR 434 (ALAFAYA TRAIL)
UNIVERSITY BLVD
GEMINI BLVD
UCF

THANK YOU!

Next Consortium – February 6, 2019

TSM&O Consortium Meeting

MEETING AGENDA

FDOT RTMC
4975 Wilson Rd.
Sanford, FL 32771
Turing Conference Room

December 5, 2019
10:00 AM-12:00 PM

1) WELCOME

2) REGIONAL INTEGRATED CORRIDOR MANAGEMENT (R-ICMS) – DIVERSION ROUTES COORDINATION

   - Kevin Miller, Kapsch

3) WHAT'S NEW IN CAV?

   - David Williams, VHB
   - Jeremy Dilmore, District Five TSM&O

4) ITS FUNDING REQUEST LIST – UPDATE

   - Jeremy Dilmore, District Five TSM&O

5) LOCAL AGENCY PROJECT FUNDING

   - Jeremy Dilmore, District Five TSM&O

6) CURRENT INITIATIVES

   - Jeremy Dilmore, District Five TSM&O