Connected and Automated Vehicle (CAV) Technologies Supporting Integrated Corridor Management (ICM) in Hillsborough County -FDOT District 7





Presentation Outline

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What is ICM?

- Integrated Corridor Management (ICM) is an operational approach that proactively manages multimodal and multijurisdictional transportation systems to optimize the flow of traffic and minimize congestion.
- ICM seeks to optimize the use of existing and advanced technologies to manage traffic flow and inform travelers about different travel options.
- Benefits
 - Improved travel time reliability and predictability
 - Increased corridor throughput and mobility
 - Improved incident management
 - Increased value of transportation investments



CAV Technologies being Deployed

Roadside Units (RSU)

- Wireless communication between the roadway infrastructure and the vehicles that are equipped with OBUs
- Communicates on the 5.9 GHz DSRC band or C-V2X to transmit and receive CV messages





On-board Units (OBU)

 Device installed on the motor vehicle to allow communication (transmitting/receiving) with other OBUs or RSUs

Integrated V2I Prototype (IVP) Hub

- A small form-factor computer
- Handles the processing of CV applications
- Allows the RSU to perform "radio" functions only
- Utilized at locations where additional edge processing is needed (i.e., passive pedestrian detection locations)





Projects Overview



City of Tampa ATMS Overview (Design-Build)

- **Project Limits:** City wide deployment with approximately 529 intersections
- The project includes city-wide cabinet replacements, fiber expansion, wireless communication expansion, installation of vehicle detection, CCTVs, UPS, Flood sensors, and 39 RSUs







City of Tampa ATMS Project Schedule

- Construction Letting Date: 01/31/2020
- Notice to Proceed Date: 04/30/2020
- Construction Begin Date: 04/30/2020
- Percent Complete: 84.4%
- Est. Construction Completion: Spring 2024
- Construction Budget: \$38.35 Million









I-4 FRAME Overview (Systems Manager)

- **Project Limits:** I-4 from Tampa to Orlando and adjacent arterial roadways
- Installing CV and ITS technologies that will allow vehicles to talk to traffic signals and other vehicles, while improving traffic and alleviating traffic congestion.
- Devices being installed include RSUs, CCTV cameras, Bluetooth detectors, Blank out signs, ATC Controllers, and video and radar vehicle detection











District 7



I-4: 25 miles Arterials: 80 miles





I-4 FRAME Project Schedule

Contract 1: T7483 445362-2, 447012-1 (District 7)

- Construction Letting Date: 02/23/2022
- Construction Begin Date: 11/02/2022
- Percent Complete: 37%
- Est. Construction Completion: Summer 2024
- Construction Budget: \$9 Million

Contract 2: E7P15 445362-3, -4, -5 (District 1, 5, Turnpike)

- Construction Letting Date: 07/13/2022
- Construction Begin Date: 03/15/2023
- Percent Complete: 12%
- Est. Construction Completion: Summer 2025
- Construction Budget: \$10.1 Million



I-4 FRAME Construction Pictures



I-275 ICM Overview (Design-Build)

- **Project Limits:** Six (6) major corridors in Hillsborough County
 - SR-574/W MLK Blvd
 - USB-41/SR-685/Florida Ave/Tampa St
 - US-41/SR-45/Nebraska Ave
 - SR-60/Kennedy Blvd
 - US-92/SR-580/SR-600/Hillsborough Ave
 - SR-616/Spruce Street/Boy Scout Blvd
- The project includes fiber expansion, vehicle detection, CCTVs, Bluetooth, and 33 RSUs





I-275 ICM Project Schedule

- Construction Letting Date: 05/27/2022
- Notice to Proceed Date: 07/28/2022
- Construction Begin Date: 03/20/2023
- Percent Complete: 47.6%
- Est. Construction Completion: Summer 2024
- Construction Budget: \$29.2 Million





Integration Activities – Systems Manager

- I-4 FRAME has configured roughly 251 out of 544 RSUs between the two contracts.
- I-4 FRAME has configured 600+ ITS devices (CCTVs, Switches, web relays, RPMUs, Bluetooth Devices, wireless modems, etc.).
 Anticipating an additional 800+ devices to be configured for contract 2.
- City of Tampa ATMS has configured 1100+ devices

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Data Overview



Data being Transmitted and Received - CV

- RSUs
 - Receiving basic safety messages (BSMs) from OBUs
 - Transmitting Traveler Information Messages (TIM) to OBUs
 - Transmit Signal Phasing and Timing (SPaT) information to OBUs
- OBUs
 - Initially will transmit BSM with position, speed, heading, and location information
 - In future, additional information such as brake status, acceleration status, windshield wiper status, etc. can be gathered as systems progress.





Automated Signal Performance Measures (ATSPM) Data

ATSPM Data being gathered:

- Signal Phasing and Timing (SPaT)
- Traffic Volumes
- Queue Lengths
- Travel Times
- Delay (approach, pedestrian, preemption)
- Split Failures
- Yellow/Red Actuations



Data Frequency ~every 1/10th Second



Data Volume ~10MB per signal, per day



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High Level Architecture

- Data will flow from field device to local agency TMC to FDOT District 7 RTMC.
- CV Data will also be pushed to FDOT Central Office V2X Data Exchange Platform (V2X DEP).
- Data aggregation location and storage is currently still being determined based on the statewide V2X DEP Project development.
- The local agencies can have a client of SunGuide or some other CV application within their respective TMCs, to assist with viewing the CV data in order to make informed decisions on response plans.



High-Level Architecture of Data Flows between the Local Agency TMC and FDOT.



Data for Operations and Planning

ATSPM Data will be accessible at the local TMC and RTMC

- Local agencies can utilize this data to optimize signal timing
- Ability to monitor and remotely manage signal timing plans in real time
- RTMC has access for after hour assistance or per SOPs/SOGs agreed upon
- TMC and RTMC will be able to run reports as needed for transportation planning needs

CV Data will be accessible at the local TMC, RTMC, and V2X DEP

- Local agencies to have client of SunGuide in order to access CV data
- Ability to monitor and remotely manage response plans based on CV data received
- RTMC and TMC will operate based on SOPs/SOGs
- TMC and RTMC will be able to run reports as needed for transportation planning needs
- V2X DEP will disseminate real-time CV data to OEMs



Decision Support System for ICM

- A Decision Support System (DSS)
 - Monitors real-time data to assess current transportation network conditions
 - Recommends preapproved strategies and response plans when events occur
 - Analyzes and predicts response plan benefits
 - Evaluates response plan results
- District 7 is looking into options for a fully functional DSS that will focus on making decisions that benefit the corridor as a whole versus the individual networks/jurisdictions.





Open Discussion