



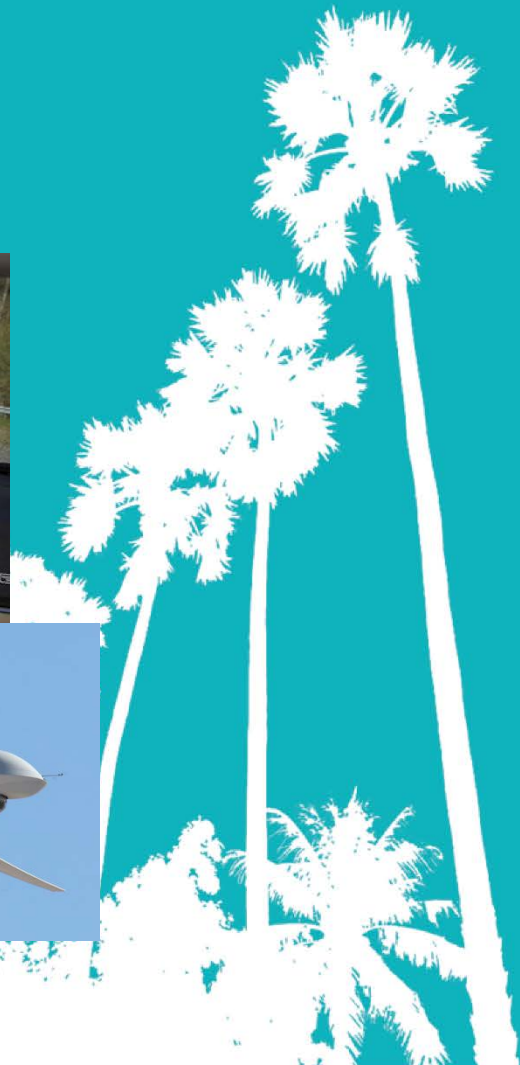
# Automated Vehicle Technology – *Our Future*

February 2016





# Automated Vehicles





# Connected Vehicles



## Data Gathering/ Information Exchange

- Vehicle-to-Infrastructure (V2I)
- Vehicle-to-Vehicle (V2V)
- Vehicle-to-Bike/Ped/Other (V2X)

Safety critical functions of the vehicle (steering/throttle) **not affected** (operator is in control at all times)

## Enhanced Situational Awareness





# Connected Vehicles

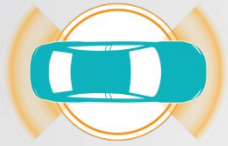


## Specific Applications FDOT has Developed and/or Integrated from USDOT into SunGuide

- Wrong Way Driver Detection and Alert
- Over-height Detection and Alert
- Emergency Braking
- Emergency Vehicle Alert
- Red Light Violation Warning

## Demonstration from 2014 FAV Summit



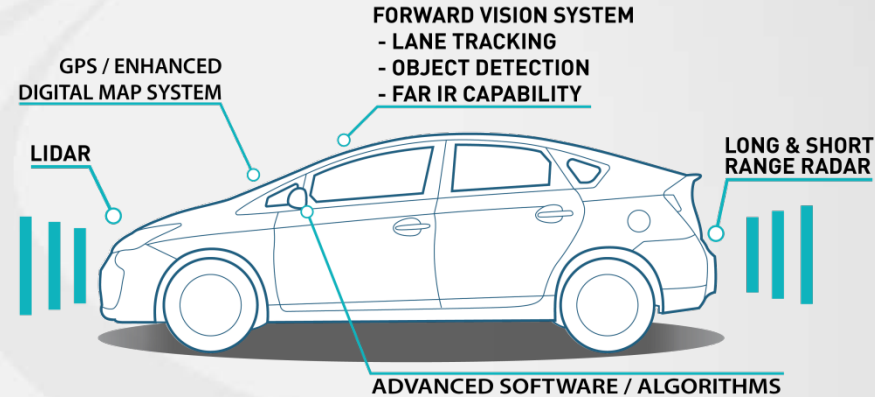


# Autonomous Vehicles



## Levels of Automation (as defined by NHTSA)

- **0 – No Automation**, but advanced collision warnings, blind spot monitoring, etc.
- **1 – Function Specific**, such as adaptive cruise control or active lane centering (but not at same time)
- **2 – Combined Function**, such as adaptive cruise control and active lane centering working at same time (must still be actively engaged in operation of vehicle)
- **3 – Limited Self-Driving**, Driver is not expected to monitor vehicle movements for limited time in limited situations (driver operates vehicle during part(s) of trip)
- **4 – Full Self-Driving**, No human operator expected to control safety-critical functions of the vehicle



**Safety critical functions of the vehicle (steering/throttle) are affected without direct driver input**



# GM Announced 'Super Cruise' at ITS World Congress (2014)



## Semi-automated driving technology and Vehicle-2-Vehicle (DSRC) communications

- 2017 Cadillac CTS

## Hands free, feet free (*not mind free*) driving

- Highway cruising speeds
- Stop-and-go congestion

*"Through technology and innovation, we will make driving safer."*  
– Mary Barra, GM CEO



ITS World Congress 9/8/2014

# General Motors Invests in Lyft



GM announced in January (2016) that they've invested \$500M in ride-sharing startup Lyft.

Teaming to create a "network of on-demand autonomous vehicles."

*"We see the future of personal mobility as connected, seamless, and autonomous."*

– Dan Ammann, GM President

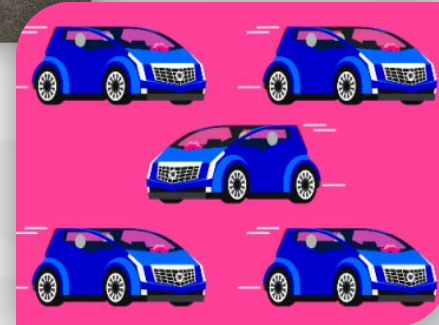


Image courtesy of Wired.com

# Tesla Provided Over-the-Air Auto-Pilot Update



Models sold after October 2014 optional “Auto Pilot Hardware” (cameras and radar sensors), but software was not included at time of sale.

Approximately 70,000 Model S vehicles currently have Auto-Pilot capability.

Software 7.1 Update (1/10/2016):

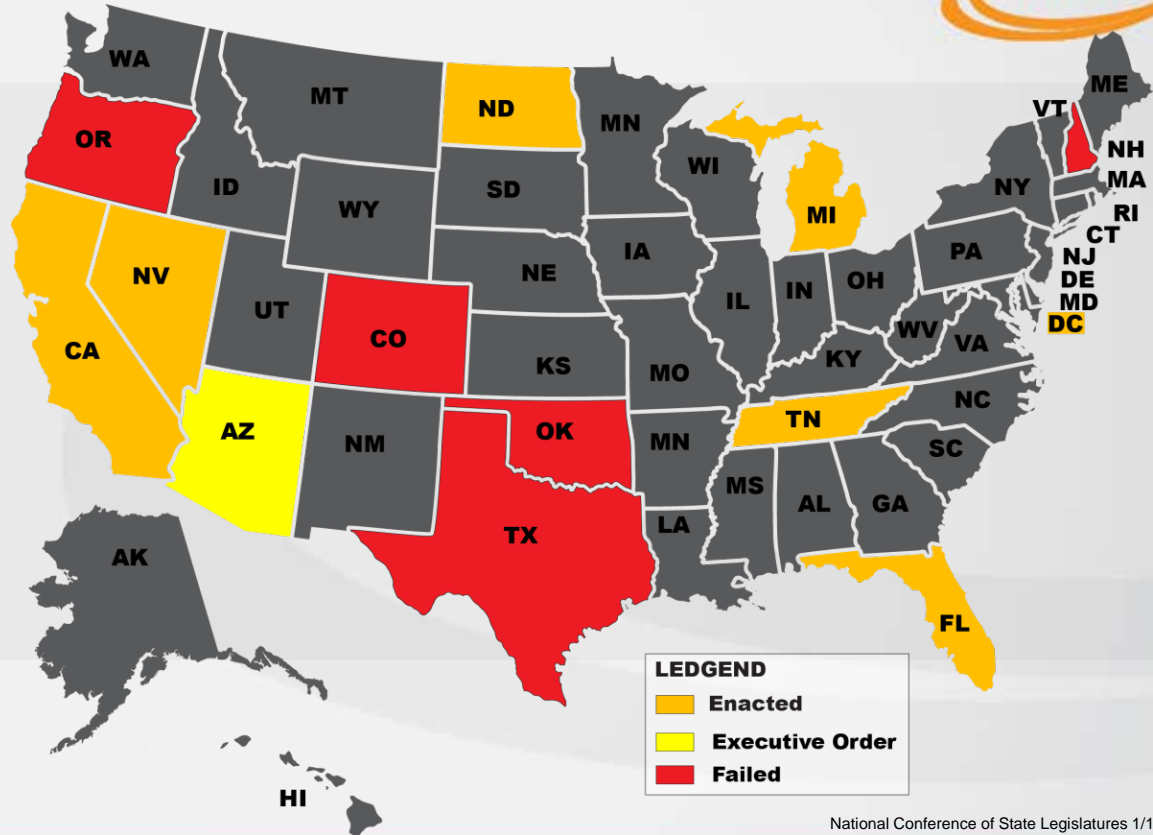
- Auto-Pilot
- Auto-Steer (20-85 mph)
- Use turn signal to change lanes
- Auto-Summon on private property



# AV Legislation



States with Enacted AV Legislation



Sixteen states introduced legislation related to autonomous vehicles in 2015, up from 12 states in 2014, nine states and D.C. in 2013, and six states in 2012.

National Conference of State Legislatures 1/19/2016

# Implementation Challenges of Automated Vehicles



## Rapidly Changing Business Models

- Requires new benefit/cost analysis to support deployment decisions
- Needs systematic & strategic approach

## New Investments Needed

- Funding sources
- Infrastructure requirements
- Staffing needs

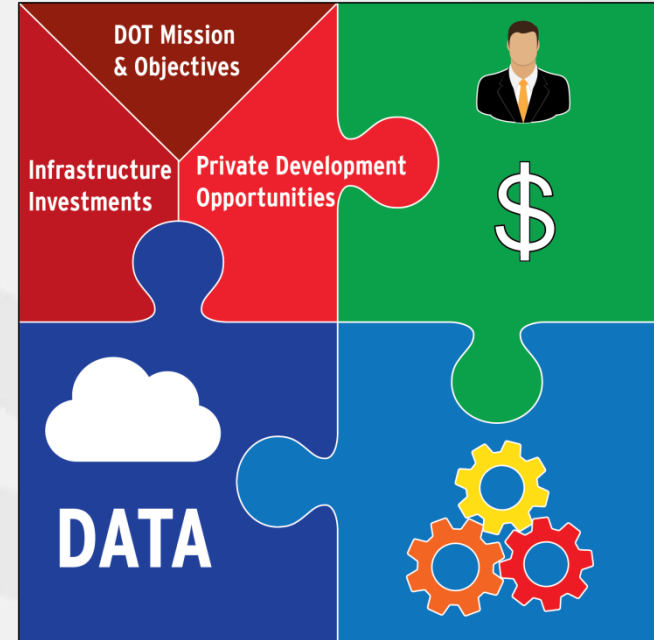
## Data Issues

- Ownership
- Privacy/security
- Access & support

## Interoperability

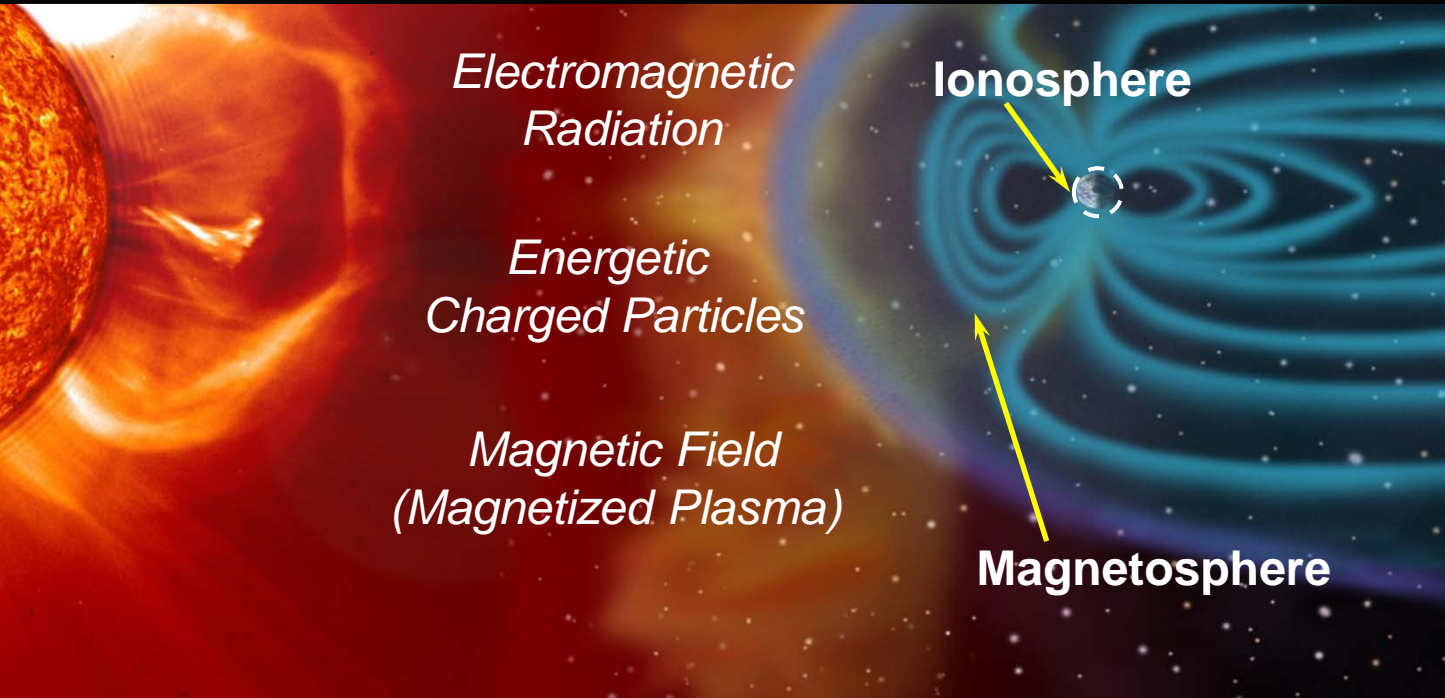
- Local, regional, national – multiple protocols
- Multi-jurisdictional testing and pilot agreements

## Public Sector Perspective



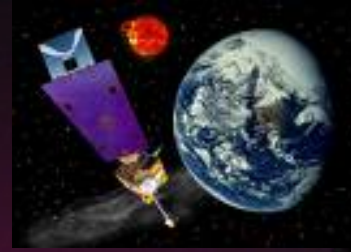
# Space Weather

Space weather refers to the variable conditions on the Sun and in space that can influence performance and reliability of space and ground--based technological systems, and endanger life or health.



# Geomagnetic Storm Impacts

Impacts from geomagnetic storms are wide-ranging with potentially significant consequences.



Satellite Operations



Manned Spaceflight



GPS



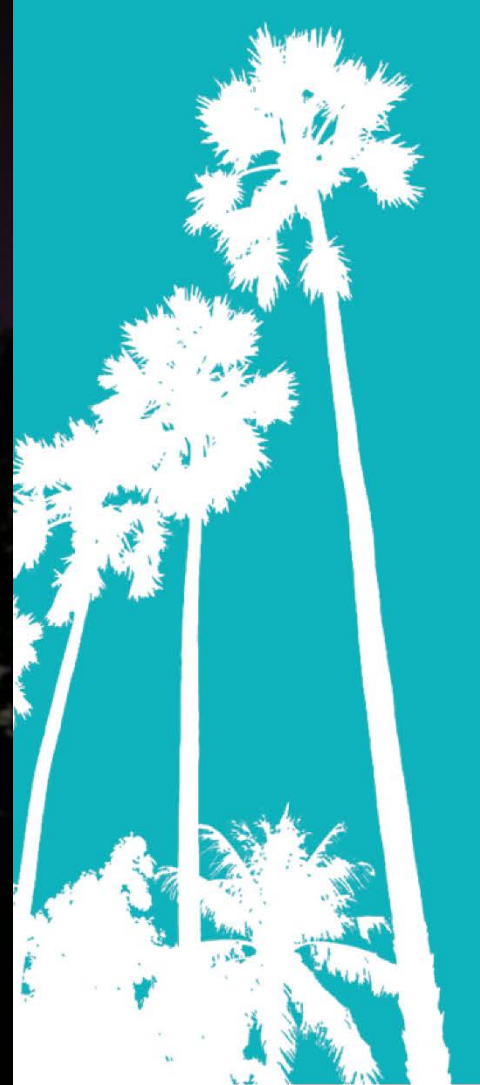
Power Grid Operations



Rail



Aircraft Operations



# Potential Effects of AV on Design Criteria



## Lane Width

- Potential less lane widths required for AV only lanes
- For long life span projects (bridges/urban facilities) - combine small increases in paving now with reduced AV-only lane footprint for an extra lane in the future
- Dedicated lanes for freight/transit

## Criteria that may become less of an issue

- Sight distances
- Road signs

## Materials

- Materials may need to be updated to prevent 'rutting' if cars drive within >10 cm of lane center
- Markings may need changes for improved machine-read as opposed to human read



# Potential Effects of AV on Urban Planning



## Parking Space Size

- Reduced width (doors don't need to open)
- Varied sizes to fit specific vehicle types

## Parking Lot Location

- No spaces within 300' of building entrances?
- On-street parking repurposed
- Passenger drop off/pick up lanes at building entrance (similar to airport design)
- Remote lots to make better use of urban land

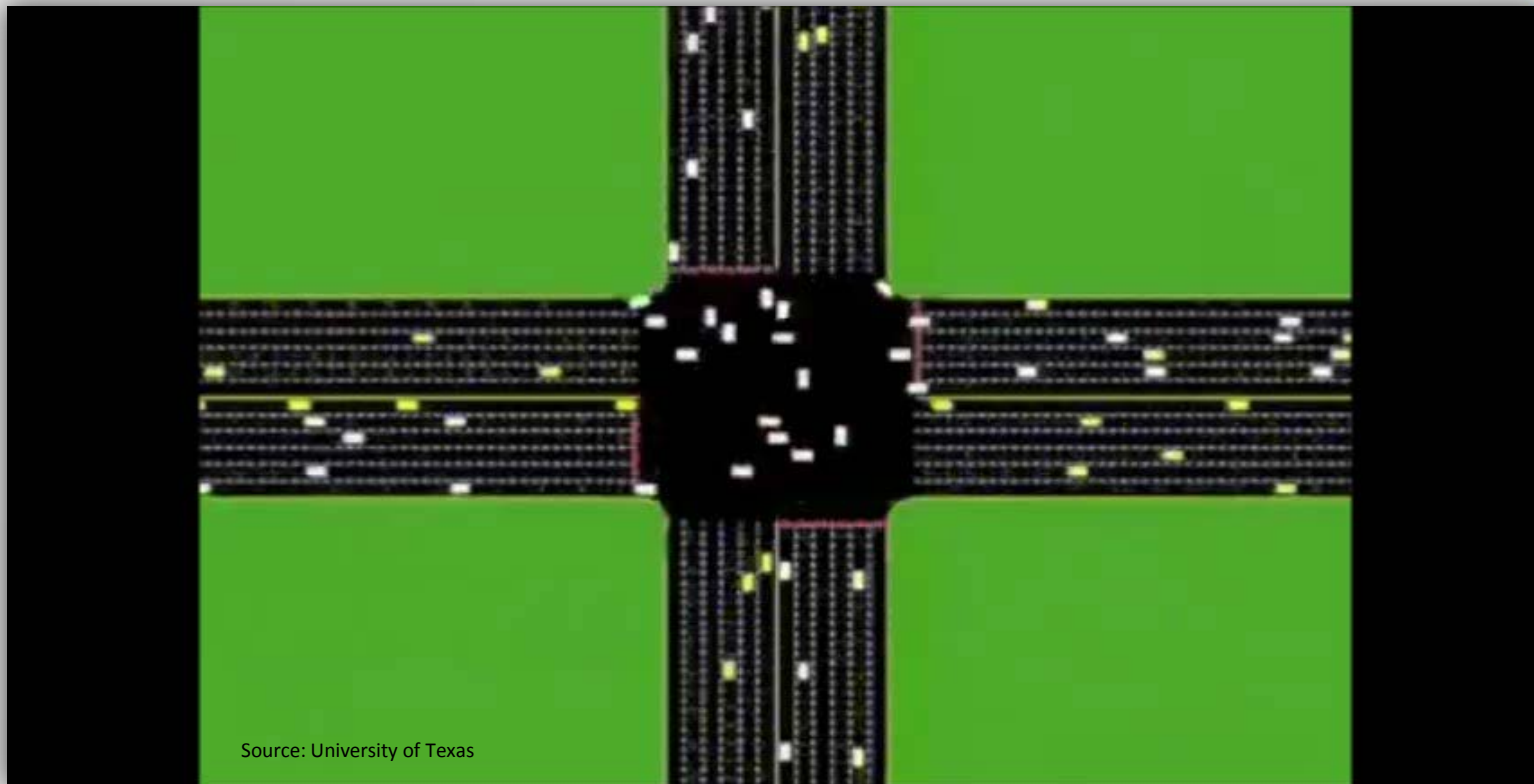
## Development Patterns

- Higher density requirements may be more attainable
- Driveway placement and design
- Building setbacks
- Greater focus on bike/ped improvements

**Blue Polygons = Parking**



# Autonomous Intersection Management



Source: University of Texas



# Florida Automated Vehicle Initiative Steering Committee



- Develop a Strategic Plan
- Draft Design Standards for Major Infrastructure Investments
- Initiate additional testing facilities
- Form new non-traditional partnerships
- Prioritize investment locations
- Include AV/CV in all state planning documents
  - Long Range Transportation Plans
  - Strategic Highway Safety Plan
- Further enhance 2015/2016 accomplishments

## **FAV Steering Committee Members**

Chair - Assistant Secretary Rich Biter (Intermodal Systems Development)

Assistant Secretary Brian Blanchard (Engineering & Operations)

Assistant Secretary Rachel Cone (Finance and Administration)

Chief Engineer – Tom Byron

State Transportation Development Administrator – Jim Wood

District 7 Secretary – Paul Steinman

Florida's Turnpike Enterprise Executive Director –  
Diane Gutierrez-Scaccetti

Director of Transportation Statistics – Ed Hutchinson

Director of TSM&O Office – Mark Wilson

Working Groups Chairs

Dana Reiding (Policy)

Ed Coven (Transit)

Fred Heery (ITS)

# Stakeholder Working Groups



## Policies & Legal Issues

## Infrastructure/Technology

- Roadway improvements
- Engineering & design standards
- Infrastructure investment

## Modal Applications

- Transit
- Freight
- Inspections



# University Research Partnerships



**Universities in Florida have been conducting research on AV/CV/ITS technologies for >10 years**

- Policy – Metropolitan Planning Organizations and Long Range Transportation Plans (UF)
- Connected Vehicle Messaging (UCF)
- Autonomous Technologies for Mobility Solutions for the Aging and Disabled Populations (FSU)
- Visioning Future Cities with AV Technologies (FSU)
- Unmanned Aerial Vehicles (FIT) and Unmanned Surface Vessels (FAU) for Bridge Inspections
- AVs for DOT Maintenance Vehicles (ERAU)

# Pilot Projects



Assessing Advanced Driver Assistance Systems in District 7 (Safety)

Assessing Connected Vehicle Technologies for Miami's Perishable Freight Industry (Freight Mobility)

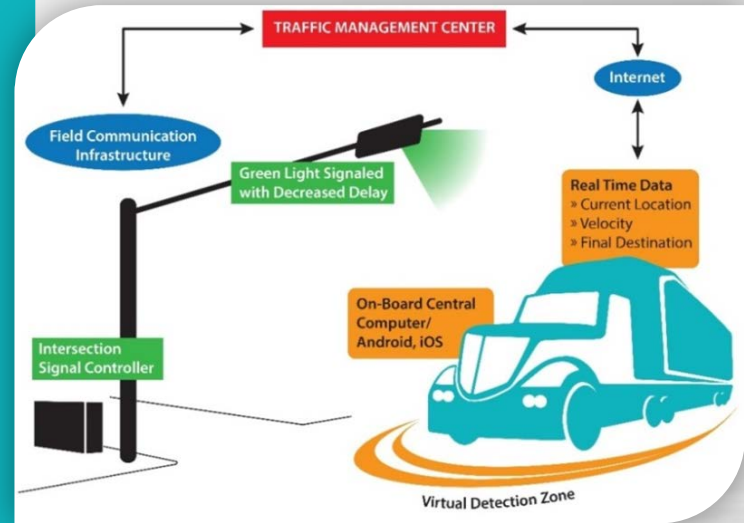
USDOT Connected Vehicle Deployment in District 7 with the Tampa Hillsborough Expressway Authority

- Focused on reducing the frequency and severity of crashes (Safety)

Potential Pilot Projects (in planning):

- Autonomous Attenuator Truck (Work Zone Safety)
- Autonomous Low Speed Electric Shuttle for First/Last Mile Solutions (Mobility for Transportation Disadvantaged and Aging Populations)

Improving Safety and Mobility



# Questions?

Email questions/comments to:  
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[www.AutomatedFL.com](http://www.AutomatedFL.com)