Office of Operations Research and Development

Research & Technology Coordinating Committee

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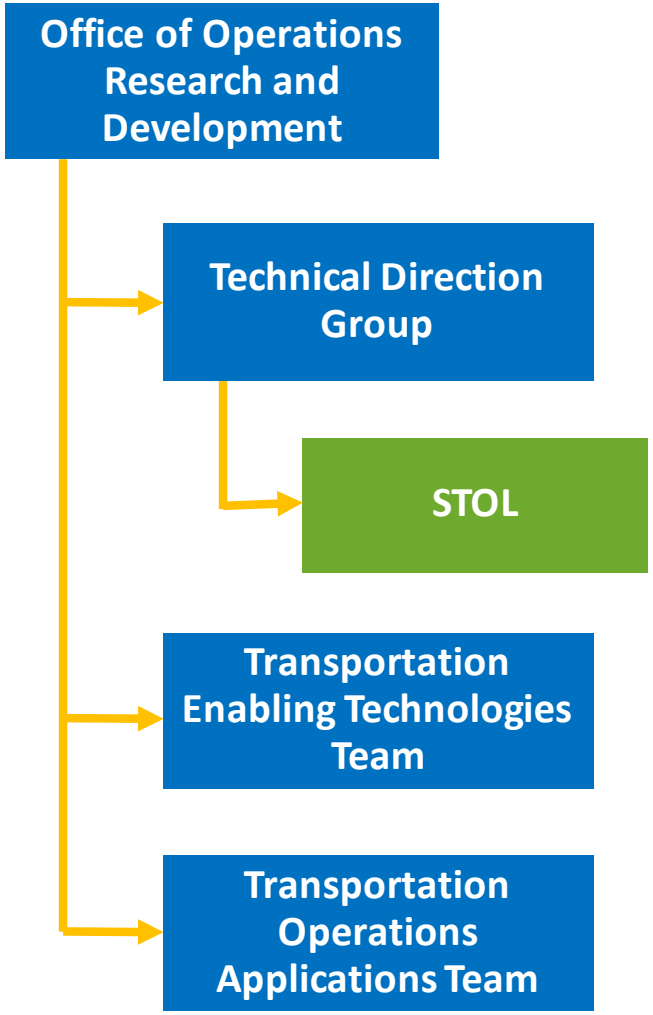
U.S. Department of Transportation
Federal Highway Administration

Mission

The Office of Operations Research and Development (R&D):

- Continually improves operations-related technology through research, development, and testing.
- Operations provides for the safe and efficient movement of people and goods on the Nation's highways, and seeks to:
  - Find solutions that address congestion;
  - Find ways to increase the number of people and goods able to safely travel on different road types; vehicle–infrastructure interactions;
  - Develop and deploy new intelligent transportation systems; and
  - Understand the impact of automated vehicles on the surface transportation system.

Organizational Structure



Federal Staff – 12 on-site, 1 selectee, 1 vacancy
Contract Staff – 1 Admin Aide, ~20 FTE for Contract Research

Provide corporate support for HRDO, to include: coordinate development of Annual Modal Research Plan, maintain budget, process Procurement Requests, maintain website, and manage Saxton Transportation Operations Lab (STOL).

Enable research, development, and validation of new concepts prior to committing to larger scale research.

Conduct research on development and integration of advanced technologies that enable transportation system mobility and safety improvements, with an emphasis on automated vehicles.

Conduct research related to the application of new technologies in the areas of ITS, connected vehicles, and cooperative automation to improve transportation operations.

Funding

- FY 18
  - HRD/TIDP – $5.62 million
    - $499,000 carryover
  - ITS JPO – $12.5 million
  - EAR – $126K
- FY 19
  - HRD/TIDP – $4.2 million
    - $600,000 carryover
  - ITS-JPO – $10.0 million
  - EAR – $966K

Focus Areas

Analysis, Modeling, and Simulation (AMS):

- Introduction of Connected and Automated Vehicles (CAV) will impact the system.
- AMS tools must be updated in order to assess the impacts (CAV AMS).

Next Generation Traffic Management Systems (NextGen TMSs):

- New technologies provide opportunity to transform traffic management.
- Guidance needed to help public agencies plan for the transition.

Cooperative-Automated Driving System (CADS) Applications:

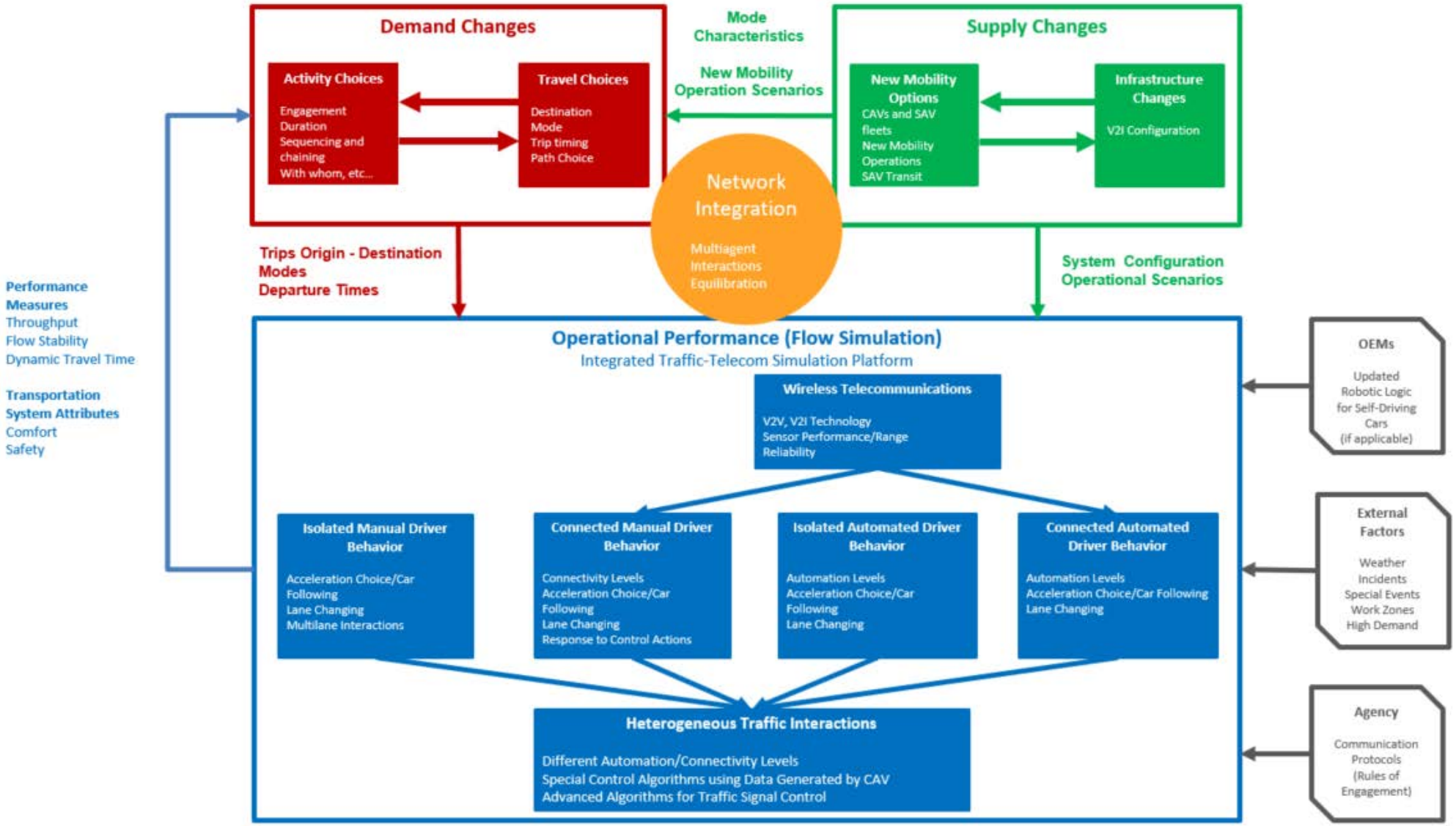
- Introduction of Connected and Automated Vehicles will impact the system.
- AMS tools must be updated in order to assess the impacts.

CAV AMS

Source: FHWA

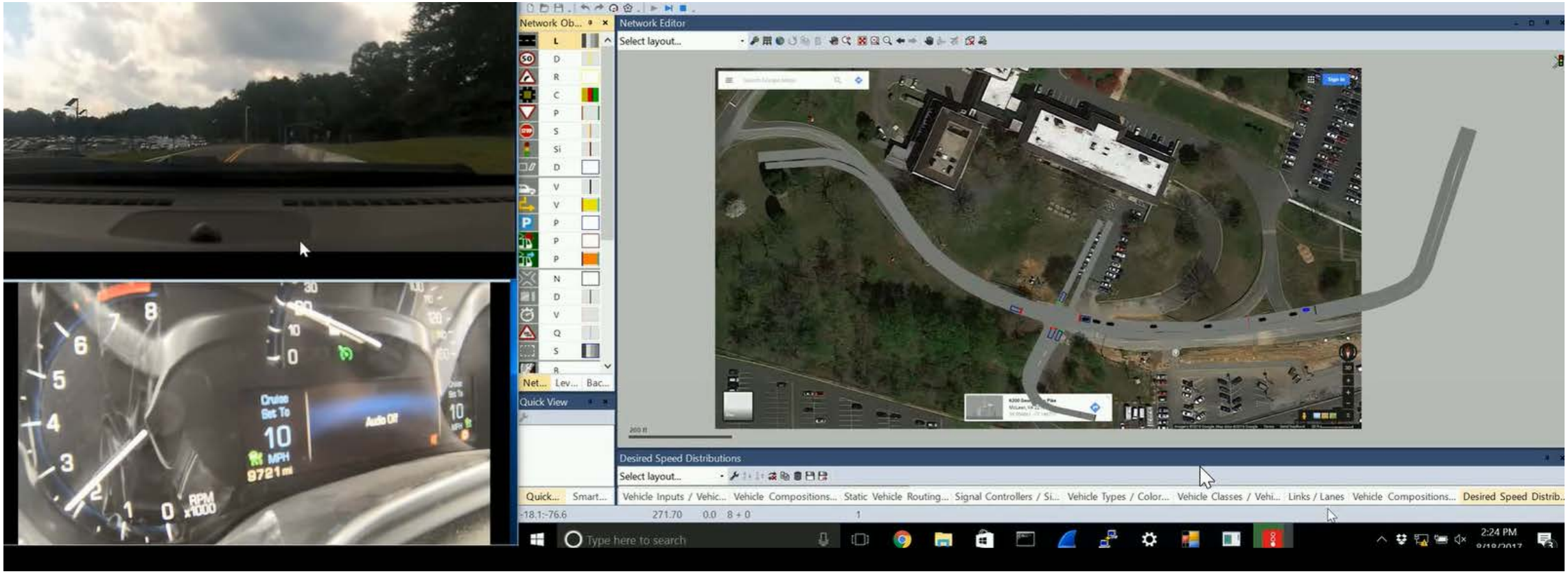
Mission: Develop and disseminate AMS tools that incorporate CAV technologies and increase the appropriate application of these tools through guidance.

CAV AMS – Framework



SAV: Shared automotive vehicles. V2I: Vehicle-to-infrastructure. CAV: Connected automated vehicles. OEMs: Original equipment manufacturer. V2V: Vehicle-to-vehicle

CAV AMS – Next Step



Source: FHWA

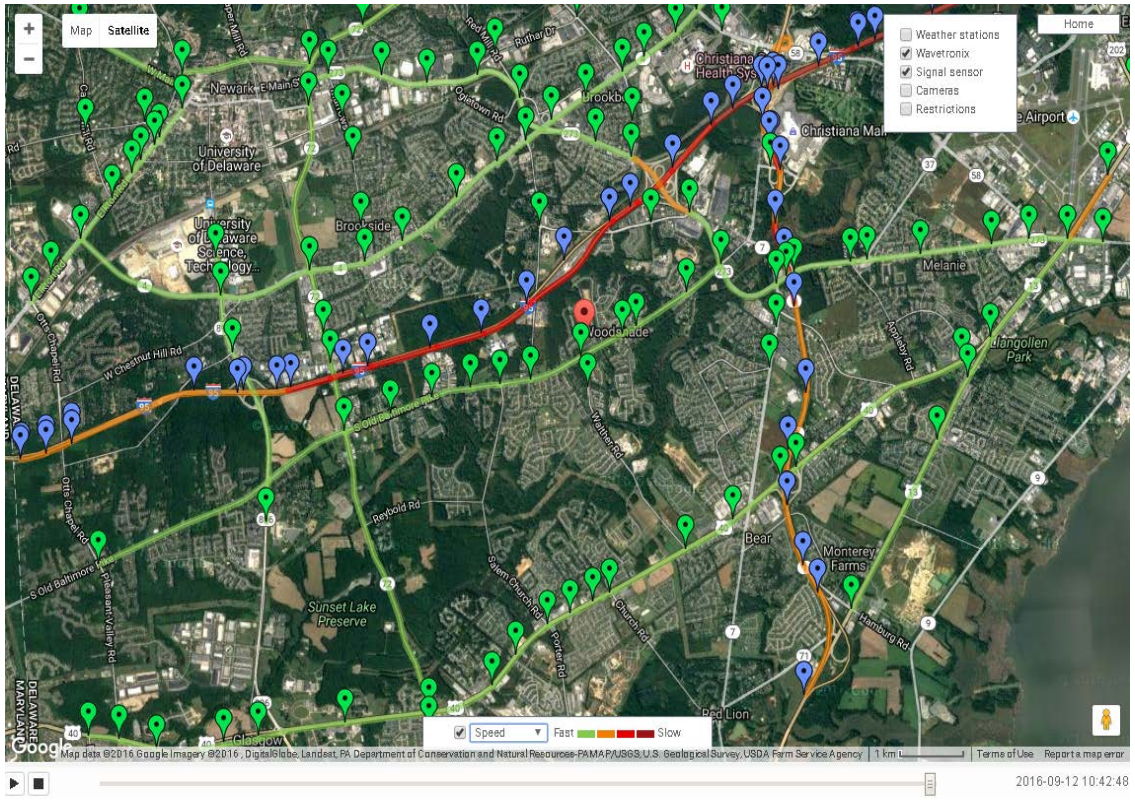
NextGen TMS

Source: FHWA

Mission: To transform the active management and operation of the surface transportation system by using emerging sources of data, enabling technologies, and the next generation of traffic management systems and centers.

NextGen TMS – AI

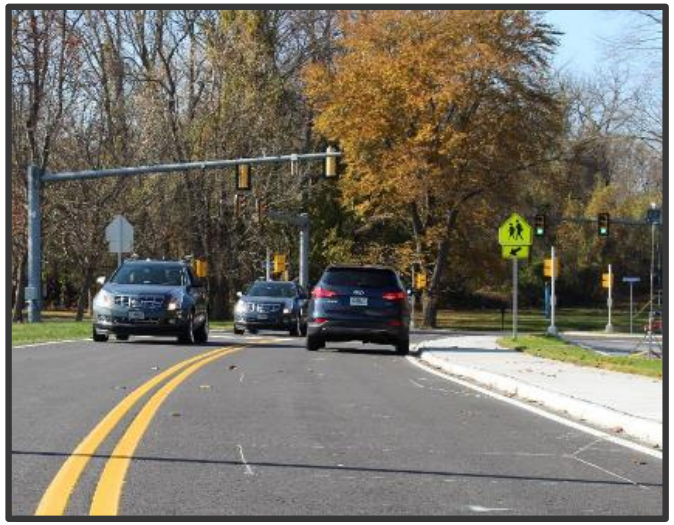
Traffic Management	Use AI incident detection and data collection versus conventional algorithms.
Sensor Detection	Datasets that offer continuous video and sensor reading data.
Pedestrian Accessibility	Explore AI machine learning to enable independent mobility for people with disabilities.
Automation	Equip vehicles and infrastructure with the ability to enable safer and more efficient movement of people and goods.



Source: FHWA

CADS Applications

Mission: To lead the R&D of *freeway and arterial* applications for cooperative automated driving technologies.



Use V2I communication to enable vehicles to travel along signalized arterials more efficiently, reducing fuel consumption at intersections by 20%.

Truck platooning can lead to 10% fuel savings.

More than double capacity of existing lanes with light vehicle platooning.

Source: FHWA

CADS Applications - CARMA

CARMA Platform

"Automated Vehicles working together"

Vehicle based platform built on Autoware

CARMA Cloud

"Infrastructure Supporting or Enabling Automation"

Infrastructure based platform built in a Cloud Environment

Cooperative Automation

TSMO USE CASES and SCENARIOS

1 Basic Travel

Source: FHWA.

Example scenarios:

- Engage in a platoon defined by a geofence.
- Leader maintains safe time gap.
- Followers maintain interplatoon time gap.
- Platoon size of two to five cars per lane.
- Possible maneuvers with other CADS-equipped vehicles.

2 Work Zones

Source: FHWA.

Example scenarios:

- Reduced command speed entering work zone.
- Defined by a stationary geofence.
- Lane change assignment prior to entering work zone.
- Maintain safe time gap thought the work zone.
- Possible maneuvers with other CADS-equipped vehicles.

3 Weather

Source: FHWA.

Example scenarios:

- Reduced command speed entering low visibility weather.
- Defined by a dynamic geofence.
- Engage in larger time gap.
- Maintain lane guidance.
- Possible maneuvers with other CADS-equipped vehicles.

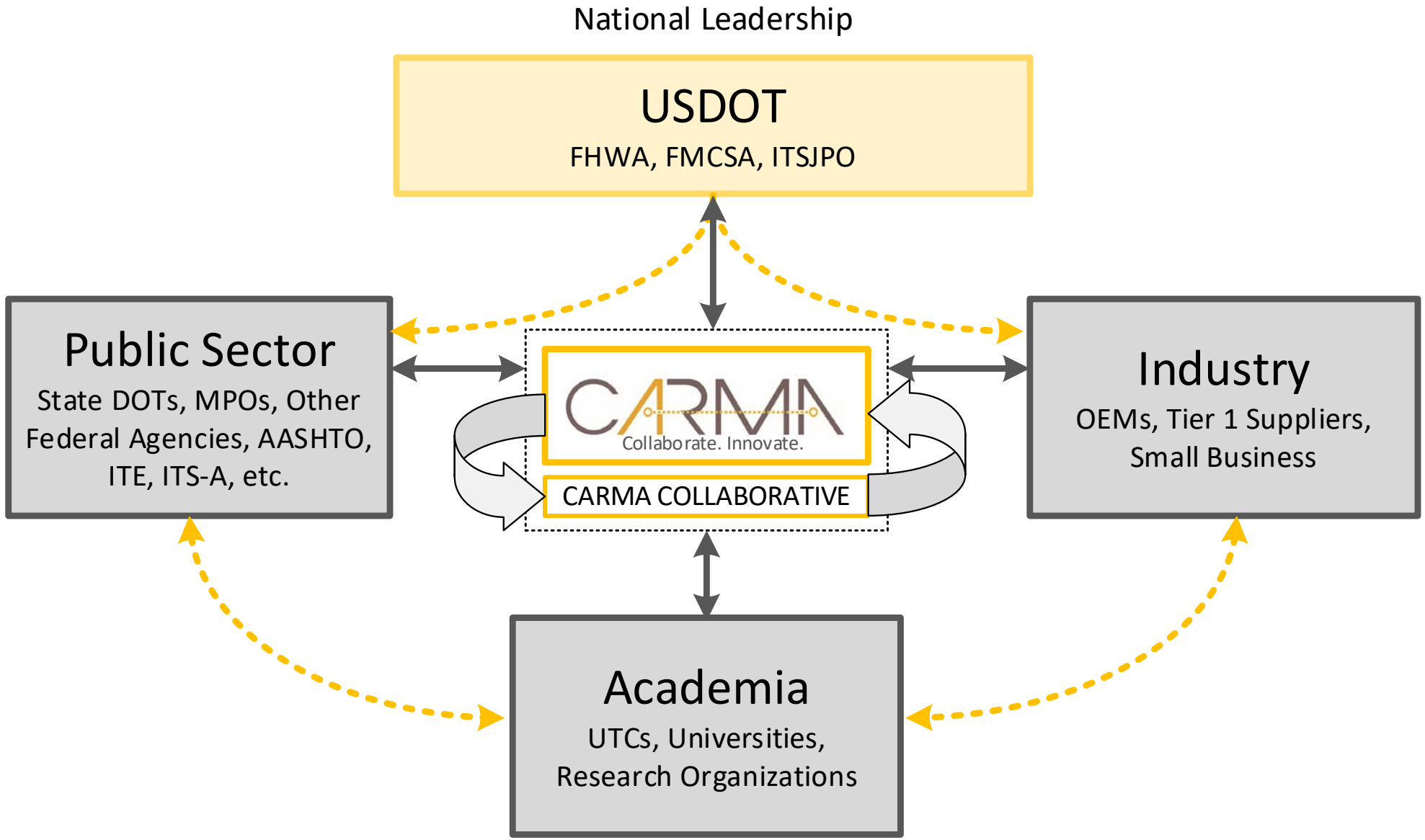
4 Traffic Incident Management (TIM)

Source: FHWA.

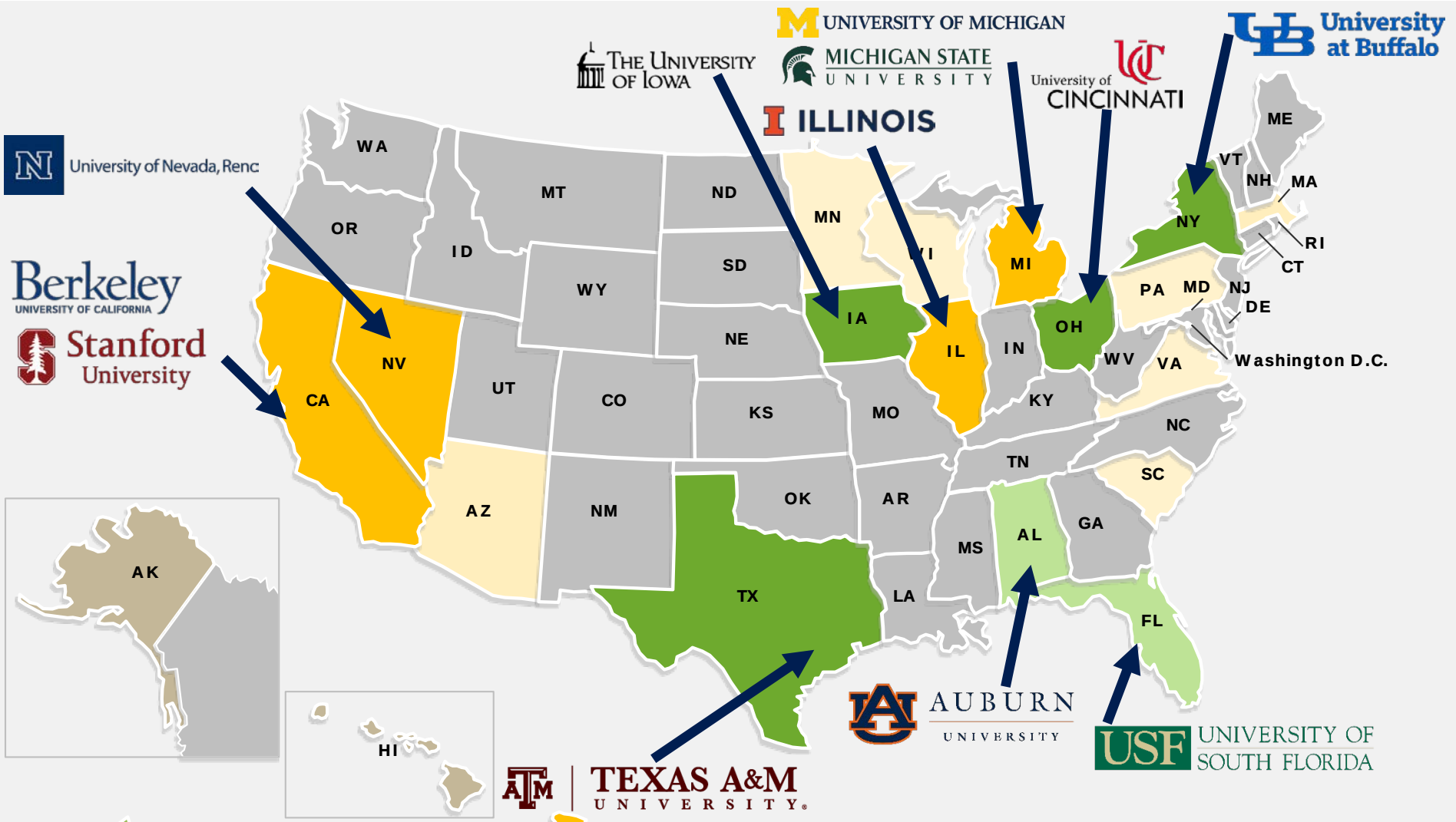
Example scenarios:

- Reduced command speed entering traffic incident event.
- Determined by infield geofence.
- Lane change to provide space for first responders.
- Possible maneuvers with other CADS-equipped vehicles.

CADS Applications – CARMA Collaborative



CARMA 2020 Target: 12 users of CARMA/Autoware from 10 states



Engaging New Users

- The University of Arizona
- Clemson University
- Carnegie Mellon University
- University of Central Florida
- Florida Atlantic University
- University of Florida
- Massachusetts Institute of Technology
- University of Pittsburgh
- University of Minnesota
- The Ohio State University
- Wisconsin – University of Wisconsin–Madison
- Iowa State University
- UC Riverside – University of California
- VirginiaTech – Invent the Future

States with or committed to acquiring CARMA on their automated vehicle

States with research vehicles that are CARMA-compatible

States engaging FHWA to learn more about CARMA with interest add to research program

Adds 14 users +7 New States

Questions?

Source: FHWA