## CAV Technology Team Members

**30 Members, 25 Sections and Districts, Multidisciplinary**

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CAV Technology Team Mission

- Develop and maintain a working knowledge of advancements in CAV technology,
- Monitor and share industry activity,
- Determine state and local transportation agency roles in supporting CAV technology,
- Formulate DOTD policy,
- Advise local governments of what we believe their roles and responsibilities are, and
- Identify CAV applications for use within DOTD.
Transportation Challenges

**Safety**
- 40,200 highway deaths in 2016
- 6,296,000 crashes in 2015
- Leading cause of death for ages 4, 11-27

**Mobility**
- 5.5 billion hours of travel delay
- $121 billion cost of urban congestion

**Environment**
- 2.9 billion gallons of wasted fuel
- 56 billion lbs. of additional CO₂
CAV – Maximizing Benefits

**Autonomous Vehicle**
Operates in isolation from other vehicles using internal sensors

**Connected Vehicle**
Communicates with nearby vehicles and infrastructure

**Connected Automated Vehicle**
Leverages autonomous and connected vehicle capabilities

**Vehicle to Vehicle (V2V)**
Vehicles communicating with each other

**Vehicle to Infrastructure (V2I)**
Vehicles communicating with infrastructure

**Vehicle to Everything Technology (V2X)**
Vehicles communicating to all technologies

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Communications Technology

• Dedicated Short-range Communications (DSRC) at 5.9GHz
• Cellular networks provide high-bandwidth data communications – 4G and 5G (future)
• Other wireless technologies such as Wi-Fi, satellite, and HD radio may have roles to play
DSRC Technology: How it Works

Data is transmitted 10 times/sec (300m range)

Wi-Fi adapted for vehicle environment

Privacy built-in (vehicle location NOT intended to be recorded or tracked)

US: FCC originally allocated spectrum at 5.9 GHz for vehicle communications
DSRC Benefits

• Low latency compared to other wireless options, thus well-suited for safety / emergency messaging

• Reduces/eliminates potential interference compared to privatized wireless options
DSRC Challenges

• All vehicles and all roadside infrastructure need to be equipped and standardized to gain maximum benefit

• Cost of infrastructure installation and management expected to be mainly public sector

• Limited private acceptance (i.e., Cadillac, BMW)
Where are we headed with wireless?

- USDOT, AASHTO and states currently demonstrating and testing DSRC with focus on safety and direct traffic management applications
- Private communications entities see a much broader market in providing services to vehicles
- 5G has potential to support low-latency data, but not yet demonstrated
SPaT Challenge

AASHTO – 20 by 2020

• Overcome “Chicken and Egg” problem
  – Vehicles need equipped infrastructure
  – Infrastructure needs equipped vehicles
  – Signals are early opportunity

• Deploy DSRC (V2I) with SPaT in at least one corridor or network (approximately 20 signalized intersections) in each of the 50 states by January 2020

https://www.transportationops.org/spatchallenge/resources
SPaT Challenge

• Design & Deploy RSUs, connect to signals

• Typical applications
  – Adaptive signal operations
  – Transit signal priority
  – Signal performance measures
Questions/Comments

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