

State of Play of Connected and Automated Vehicles Part 2



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June 27, 2017

The current dynamics of CAV

- The OEM's (i.e. GM, Ford, Audi,...)and Tech companies (i.e. Google, Uber, Tesla,...) are racing fiercely to have AV and maybe CAV to market
 - **Connected vehicles becoming hot topic**
 - **High automation is proving harder than anticipated – will not be achieved without connectivity**
- Federal, state, and local agencies are making good faith effort to do their part in infrastructure readiness and prepare for Automation (i.e. SPaT Challenge, Guidelines, Standards, rulemakings, pilot deployments, etc.)

The current dynamics of CAV

- Auto OEMs have maintained – and maybe increased – their clout relative to tech companies
- Auto OEMs don't want to publicly rely on V2I (just like tech companies were saying a few years ago)
- There is a sense that Uber, Waymo, Ford, General Motors and others, all of whom have targeted around 2021 for the unveiling of fleets of ride-hailing focused self-driving cars, are developing vehicles with sensors and mapping systems that won't rely on roadway upgrades.

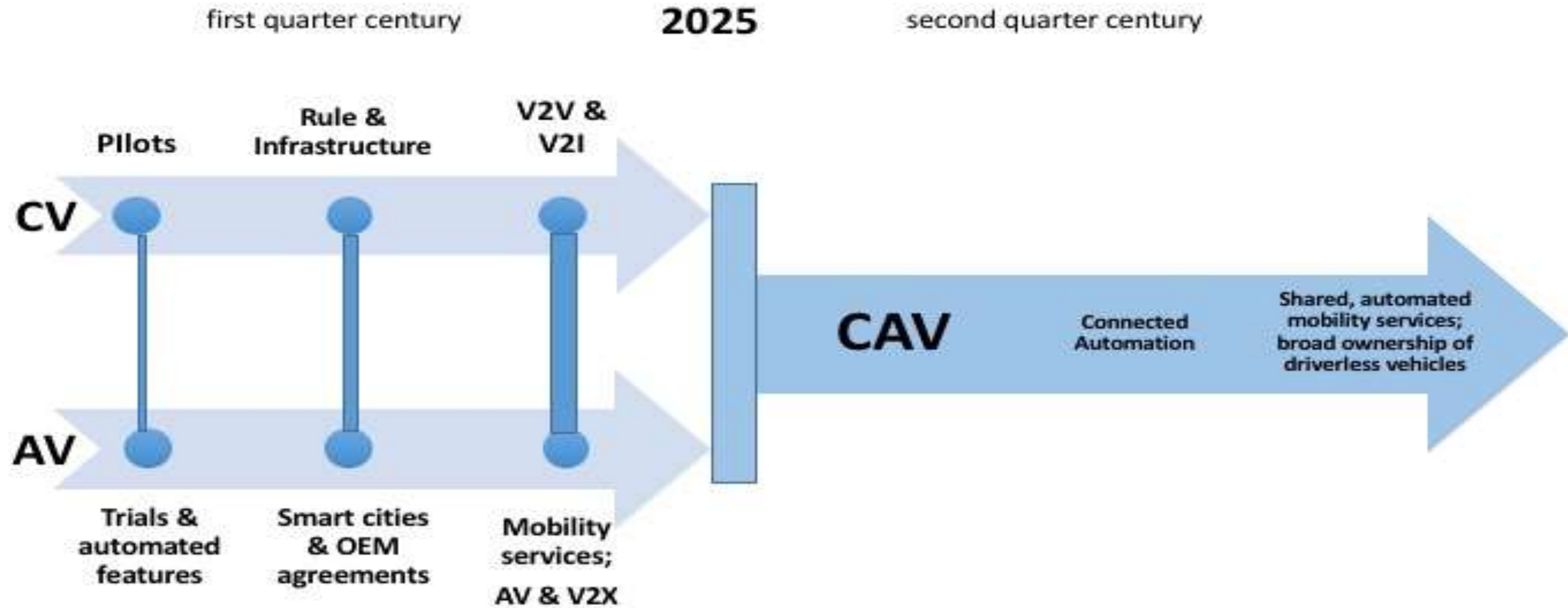


The current dynamics of CAV

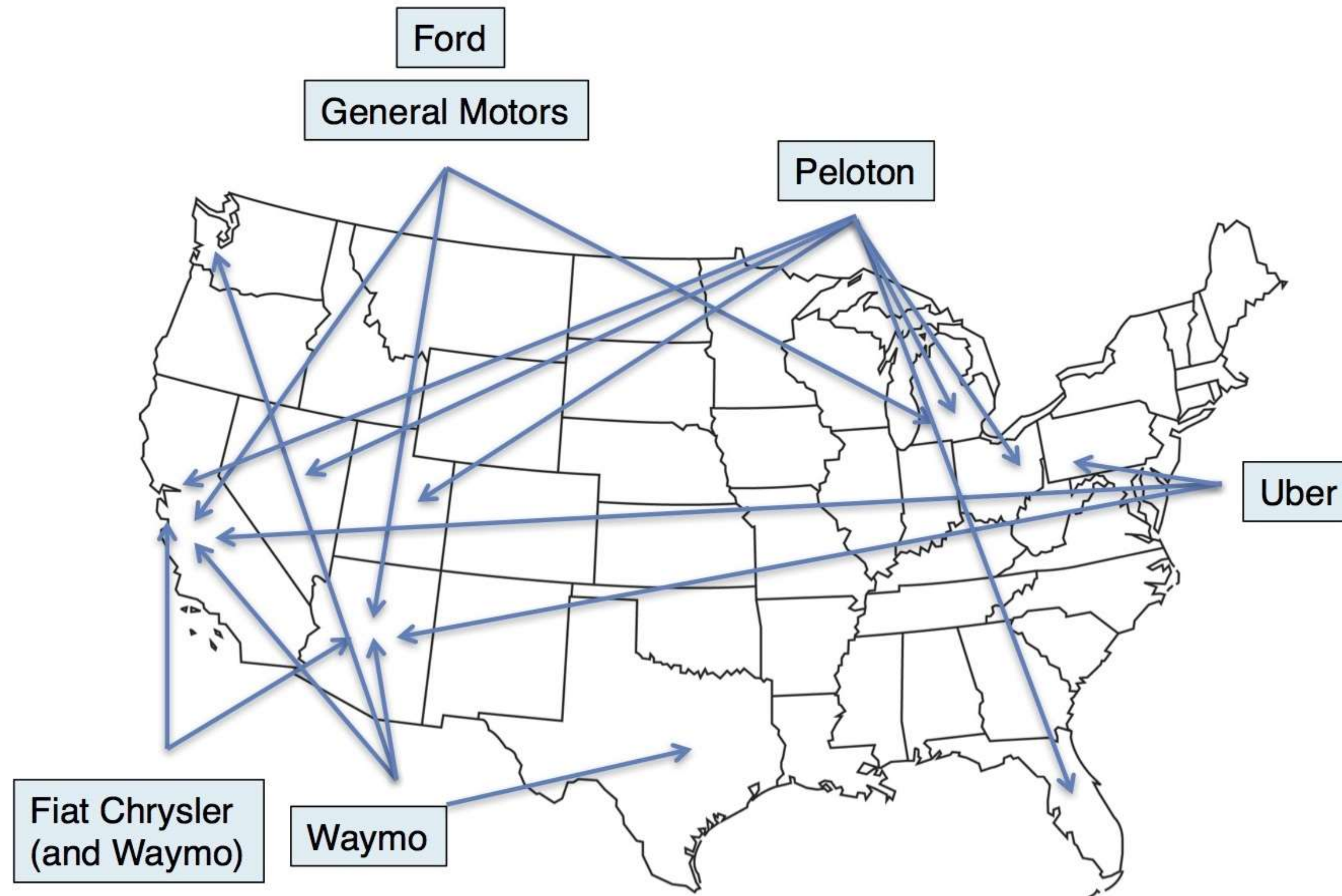
Ken Washington, Ford's vice president of research and advanced engineering, says *smart roadways* would make self-driving cars even more capable, but "you can't count on that being there, which is why our technical approach is to **build the capability completely on the vehicle.**"

"We are working very closely with a lot of cities, states and the federal government, but we need to make sure the technology is able to work in the current environment," GM President **Dan Ammann** said in February. "So **we're not depending on an improvement in infrastructure.**"

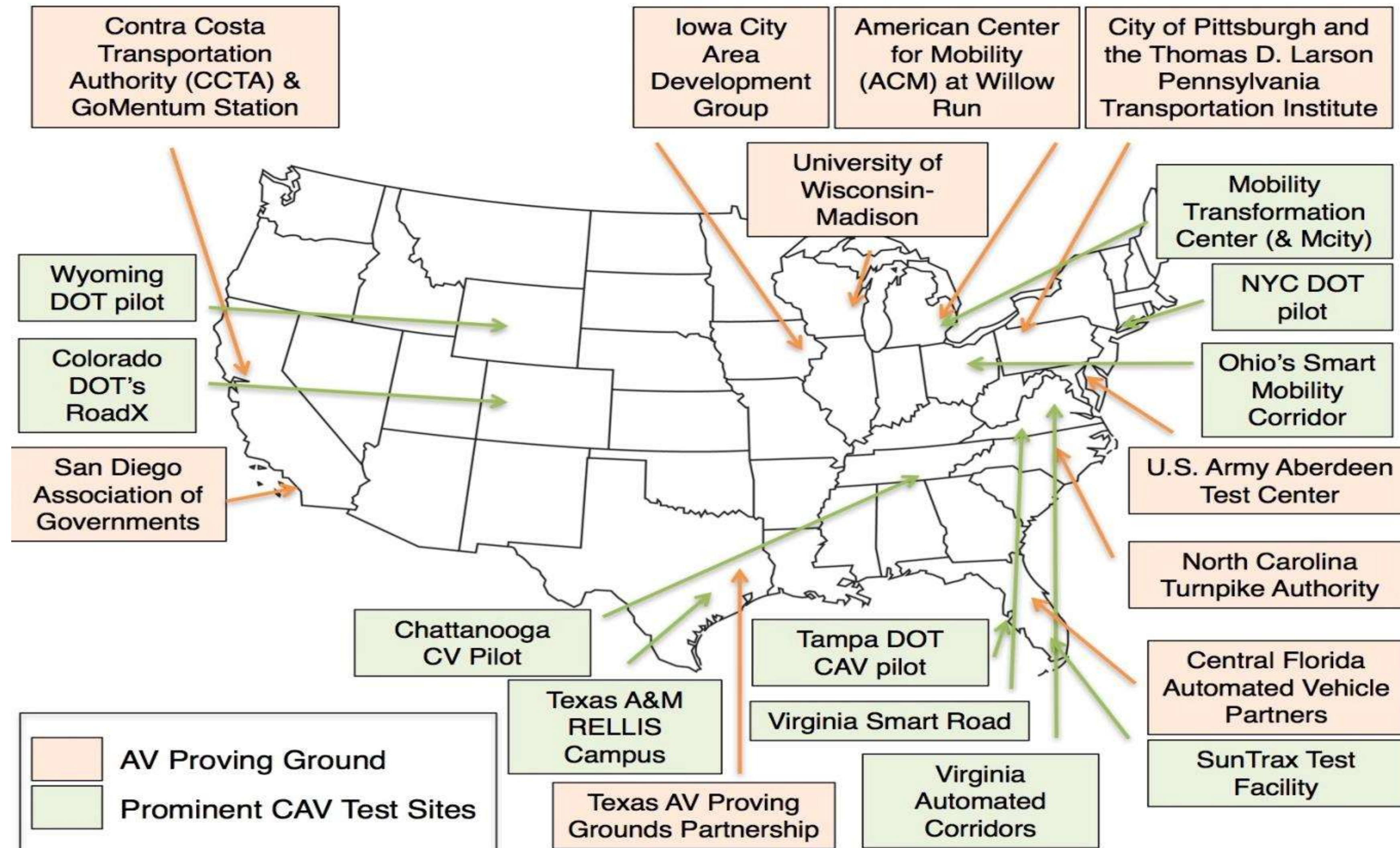
Convergence of CV and AV paths “Connected Automation”



AV Testing On Public Roads



CAV Consortia



Emerging CV Standards and Specifications

- **Significant progress is made in this arena!**
 - **Communication**
 - **Road Side Unit (RSU)**
 - **Functional**
 - **Physical**
 - **Environmental**
 - Emerging DSRC certification testing procedures being developed by consortium lead by OmniAir, DanLaw and others.
 - RSU specification includes testing requirements to confirm compliance with the specification. These includes tests to confirm that the RSU meets the Power, Environmental, and Physical requirements of the RSU specification.

Emerging CV Standards and Specifications

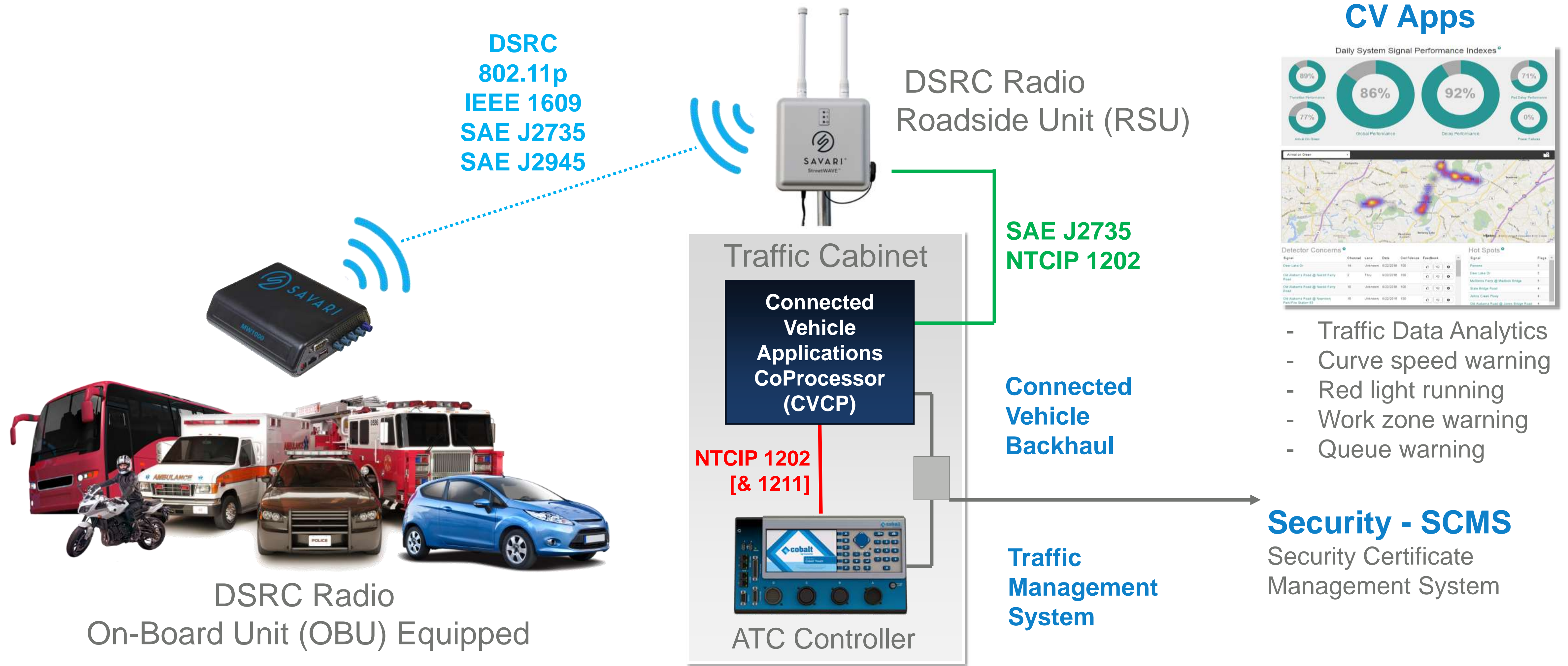
- **SAE J2735**
Dedicated Short Range communications (DSRC)
- **SAE J2945/1**
Onboard Minimum Performance Requirements for V2V Safety Communications
- **IEEE 802.11**
IEEE 802.11 is a set of Media Access Control (MAC) and Physical Layer (PHY) specifications for implementing Wireless Local Area Network (WLAN) computer communication in the 900 MHz and 2.4, 3.6, 5, and 60 GHz frequency bands.
- **IEEE 1609.2**
Standards for Wireless Access in Vehicular Environments (WAVE) – Security Services for Applications and Management Messages
- **IEEE 1609.3-2016**
Standards for WAVE – Networking Services
- **IEEE 1609.4-2016**
Standard for WAVE Multi-Channel Operations
- **IEEE 1609.12-2016**
Standards for WAVE- Identifier Allocations
- **Specification** - RSU (FHWA-JPO-17-589)

Example RSU Testing



Sample RSU Vibration Test
Video

The Connected Vehicle Intersection



SPaT Challenge Requirements

- Selection of Compatible Corridor ~ 20+ Intersections
- Controllers that Support J2735 2016 SPaT Broadcast
 - *May require V2I HUB*
- DSRC Roadside Units Certified to v4.1 or Higher Specification
 - *Includes needed cabinet modifications to support RSUs*
- Support for J2735 2016 SPaT/MAP Broadcasts



SPaT Challenge Requirements

- MAP/GID Data for Each Intersection
- FCC DSRC Licenses
- RTCM GPS Correction
 - *May depend on applications*
- Plan for Security Certificate Management System integration
 - *Includes backhaul communication that support IPv 6*
- Application Plans and Areas



Steps to Respond to the SPaT Challenge

- **Select** a corridor/area/network
 - Identify partners & stakeholders
 - Determine infrastructure needs/site survey – RSUs, OBUs, controllers, cabinet upgrades, backhaul, etc.
 - Determine Budget needs
- **Identify** initial V2I applications to be deployed/tested
- **Project Plan/Design/Procurement**
 - DSRC equipment, controllers/upgrades, cabling, antennas, infrastructure
 - Application development
- **Install/Maintain**
 - Equipment integration & installation
 - DSRC Licensing
 - Develop MAP data
 - Application deployment
 - Test and verification
 - Training
 - Operate and Maintain (for up to 10 years)



Reminder of the Challenges WE are Tackling

Safety

- 32,675 highway deaths in 2014
- 6.1 million crashes in 2014
- Leading cause of death for ages 11, 16-24



Mobility

- 6.9 billion hours of travel delay
- \$160 billion cost of urban congestion



Environment

- 3.1 billion gallons of wasted fuel
- 56 billion lbs of additional CO₂



Source:
USDOT



Thank You