Connected Vehicles and Public Infrastructure

Connecting vehicles to each other and public infrastructure

Citizens Advisory Committee -- Technology and Innovation Ad Hoc Committee

Must-Know Acronyms

- V2V = Vehicle to vehicle
- V2I/I2V = Vehicles to infrastructure
- V2P = Vehicles to pedestrians
- V2X = Vehicles to everything
- DSRC = Dedicated short-range communication
- NHTSA = National Highway Traffic Safety Administration

Connected and Autonomous

- In the future, most vehicles will be connected to infrastructure in some way

- This presentation focuses on connected vehicles and public infrastructure

Today

Connected

Autonomous

Future

Connected

Public Infrastructure Changes

Autonomous
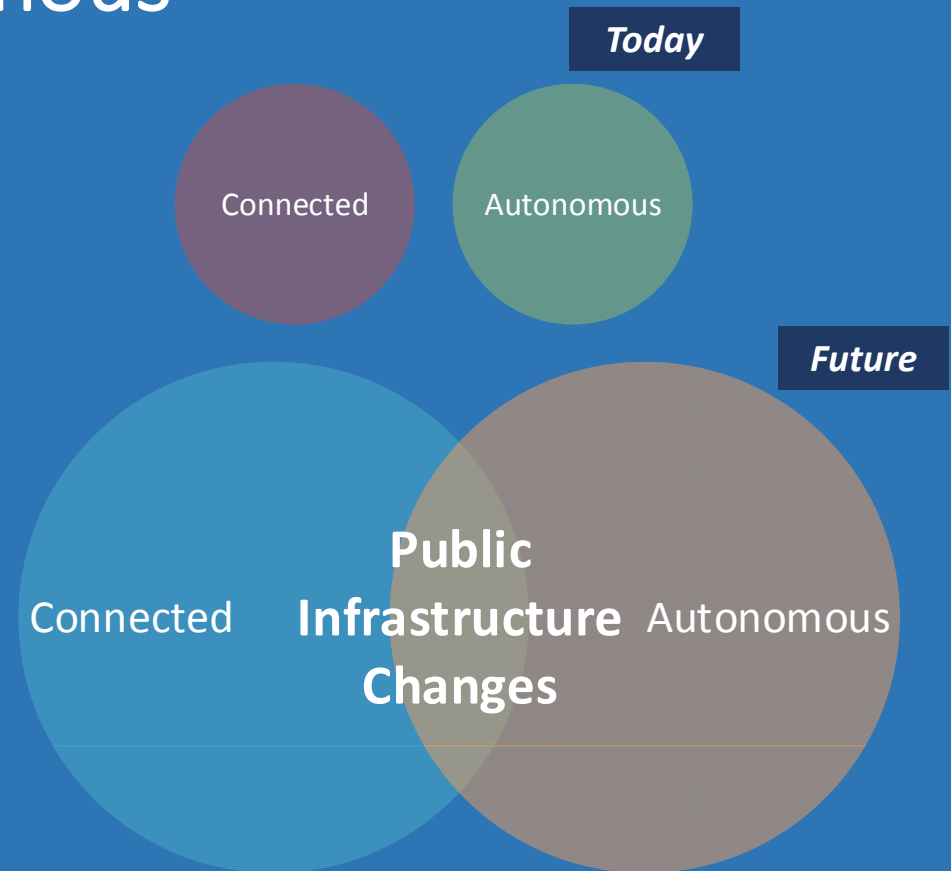
Background

- V2V
  - Ability to vehicles to wirelessly push and pull information to each other about the speed and position of surrounding vehicles (e.g., safety warnings)

- V2I and I2V
  - Ability of vehicles to pull information from public infrastructure (e.g., signals)
  - Ability of public infrastructure to push information to vehicles (e.g., safety warnings)

- Infrastructure requires public approvals

- All of the above require connected vehicles

Roadside equipment and standardized in-vehicle devices support V2V and V2I

Today's Situation

- Auto manufacturers focused on sensors for detection and cellular for communications (not V2V)

- No current requirement today for in-vehicle (V2V) equipment

- Federal rulemaking
  - *Federal Motor Vehicle Safety Standards; V2V Communications (December 2016)*

"…safety applications enabled by V2V and V2I could eliminate or mitigate the severity of up to 80 percent of non-impaired crashes, including crashes at intersections or while changing lanes."

- NHTSA, December 2016

Federal Rulemaking by NHTSA

- Requires V2V equipment for new vehicles
  - Dedicated short-range communication
- Phased-in over time (probable start in 2021)
- Safety emphasis
- Message details and authentication
- Detection and reporting
- Security and privacy
- Co-benefits to infrastructure

DSRC on-board device example (multiple manufacturers today)

NHTSA – Safety Emphasis

- Digital Basic Safety Message (BSM)
- Intersection Movement Assist (IMA)
- Emergency Electronic Brake Light (EEBL)
- Forward Collision Warning Forward Collision Warning (FCW)
- Blind Spot Warning (BSW)
- Lane Change Warning (LCW)
- Do Not Pass Warning (DNPW)

V2I – Public Infrastructure

- DSRC roadside units (at intersections and other locations to enhance safety)
- New hardware unit in traffic controller
- Backhaul communications to traffic management center (optional)
- Map data for intersections with GPS corrections
- All of the above … available now
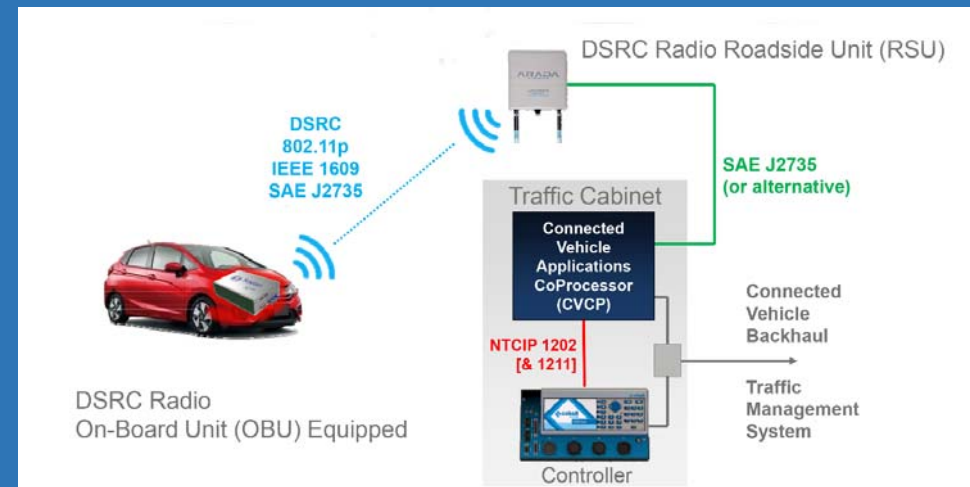
Short-term Opportunities/Issues

- Technology exists today and costs declining
- V2I relies on broad deployment of V2V
- Current federal rulemaking can accelerate V2I efforts
- Each local agency has authority and responsibility for its own transportation infrastructure
- Competing priorities an issue for many local agencies today
- *Maintaining striping and signage improves safety for all vehicle types included connected, autonomous, and others*

Potential Scenarios

- Trajectory Now
  - Increased deployment of standard V2V systems in early 2020s
  - Increased installation of V2I infrastructure concurrent with vehicle systems
  - Deployment of higher-speed cellular systems support auto manufacturer needs (map and software updates)

- Detour Possible
  - No standard V2V system finalized
  - Vehicle manufacturers focus on cellular connections to own systems (no V2V)
  - Reserved radio spectrum for DSRC released for other uses

Emerging OCTA Roles

- Monitor V2V rulemaking and V2I implementation efforts by local agencies

- Help shape V2I technology choices by local agencies

- Evaluate V2I opportunities with local agencies and consider as part of M2 competitive funding (under way)

- Continue dialogue through Technical Advisory Committee and Traffic Forums

- Selectively implement appropriate V2I technologies