Connected Automation

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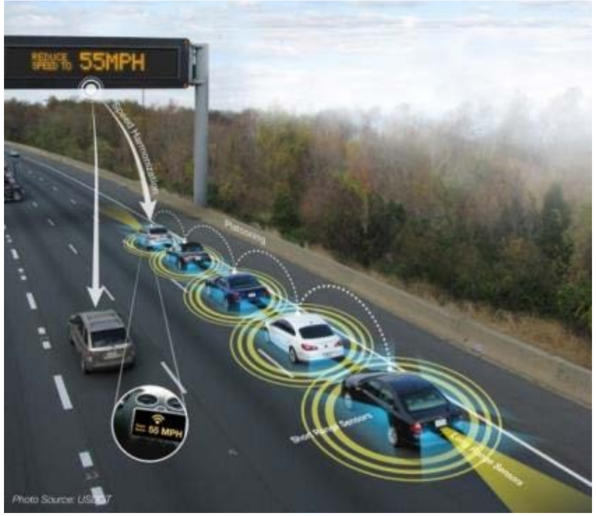
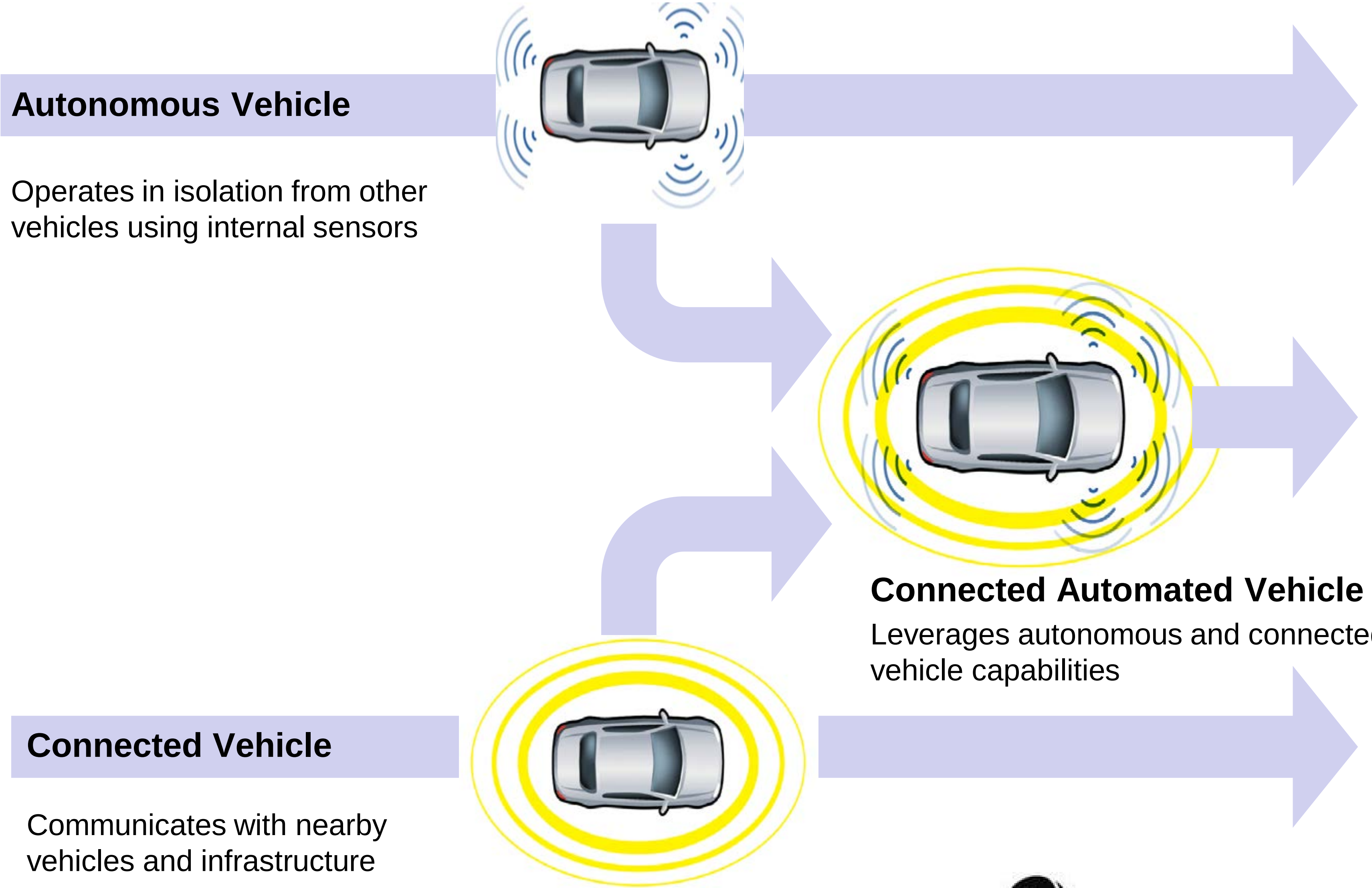
Automation Can Be a Tool for Solving Transportation Problems

- **Improving safety**
  - Reduce and mitigate crashes
- **Increasing mobility and accessibility**
  - Expand capacity of roadway infrastructure
  - Enhance traffic flow dynamics
  - More personal mobility options for disabled and aging population
- **Reducing energy use and emissions**
  - Aerodynamic “drafting”
  - Improve traffic flow dynamics



*…**but connectivity is critical to achieving the greatest benefits***

Connected Automation for Greatest Benefits



Example Systems at Each Automation Level

SAE Level	Example Systems	Driver Roles
1	Adaptive Cruise Control OR Lane Keeping Assistance	Must drive other functions and monitor driving environment
2	Adaptive Cruise Control AND Lane Keeping Assistance Traffic Jam Assist	Must monitor driving environment (system nags driver to try to ensure it)
3	Traffic Jam Pilot Automated parking Highway Autopilot	May read a book, text, or web surf, but be prepared to intervene when needed
4	Closed campus driverless shuttle Valet parking in garage 'Fully automated' in certain conditions	May sleep, and system can revert to minimum risk condition if needed
5	Automated taxi Car-share repositioning system	No driver needed

Source: California PATH

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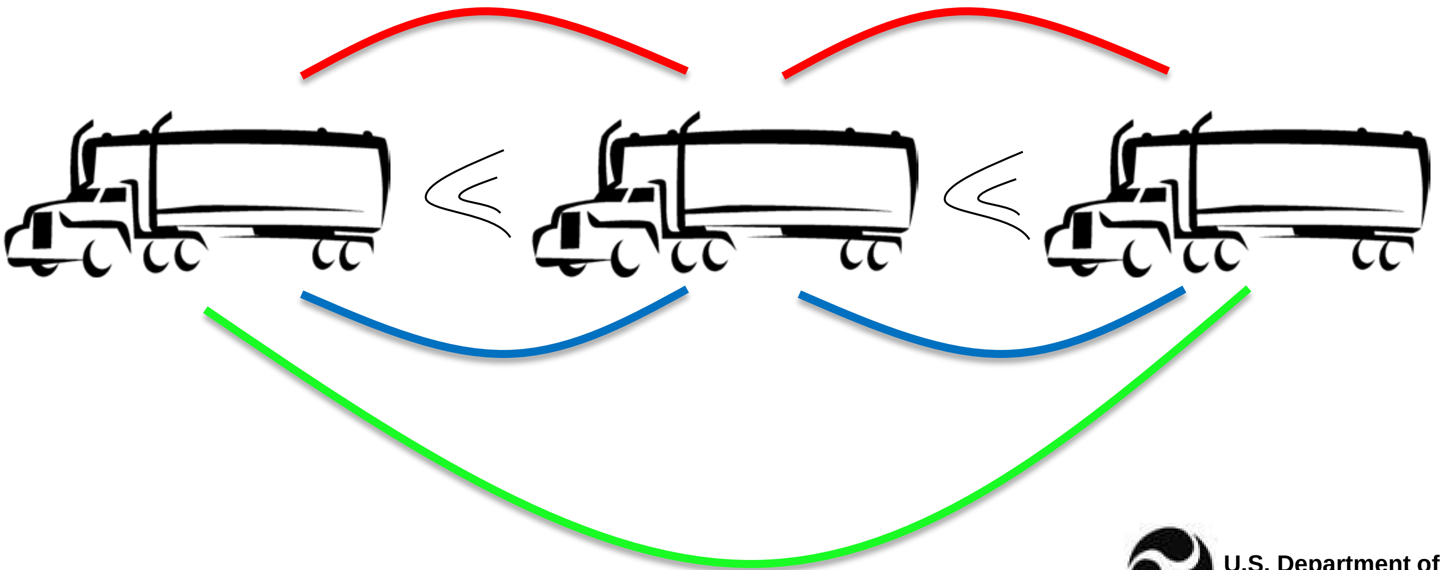
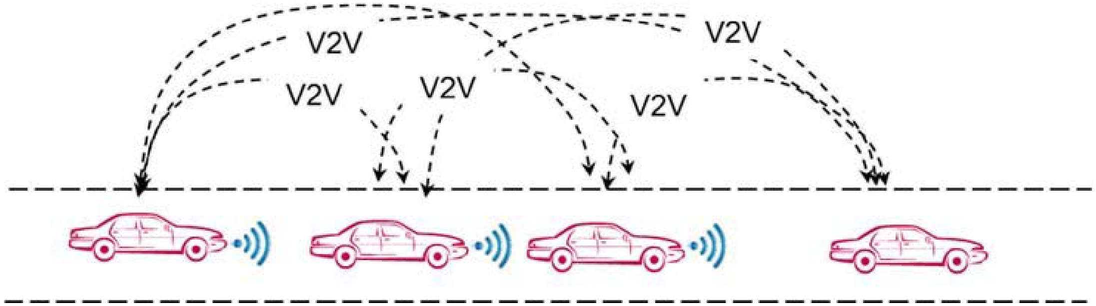
Current L1 Connected Automation R&D

- Cooperative Adaptive Cruise Control (CACC) development
- Traffic Operations Applications
- Eco-Approach and Departure from Signals
- Truck Platooning



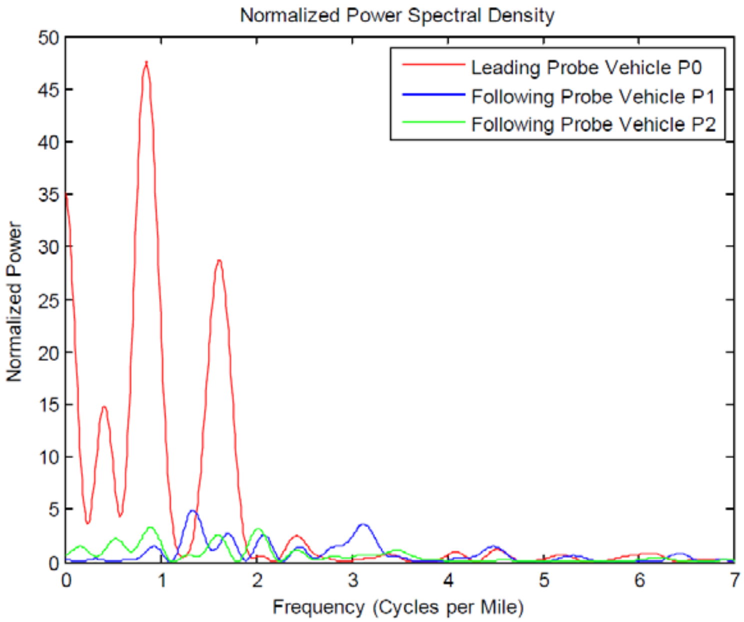
CACC Development Projects

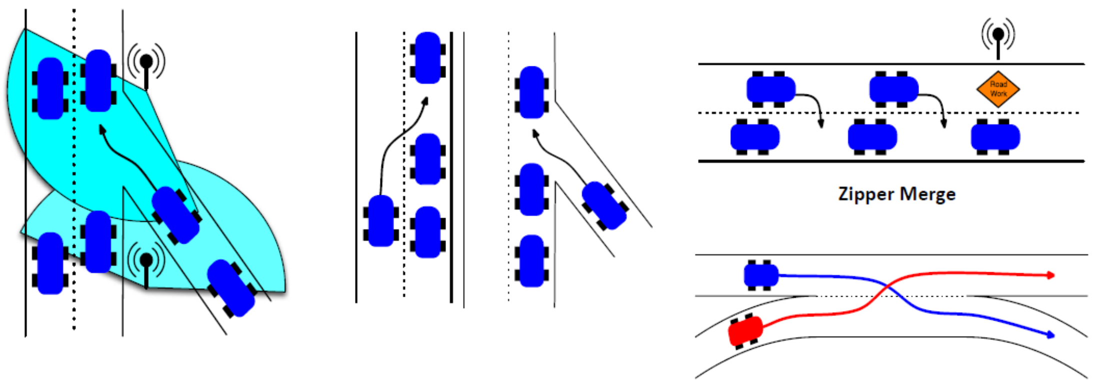
- Enabling CACC High Performance Vehicle Streams
- CACC Field Tests
- OEM Assessment of CACC concepts and prototype
- Driver Acceptance of L1 Applications



Freeway Traffic Operations Applications

- Freeway Speed Harmonization
- Lane Change/Merge Operations





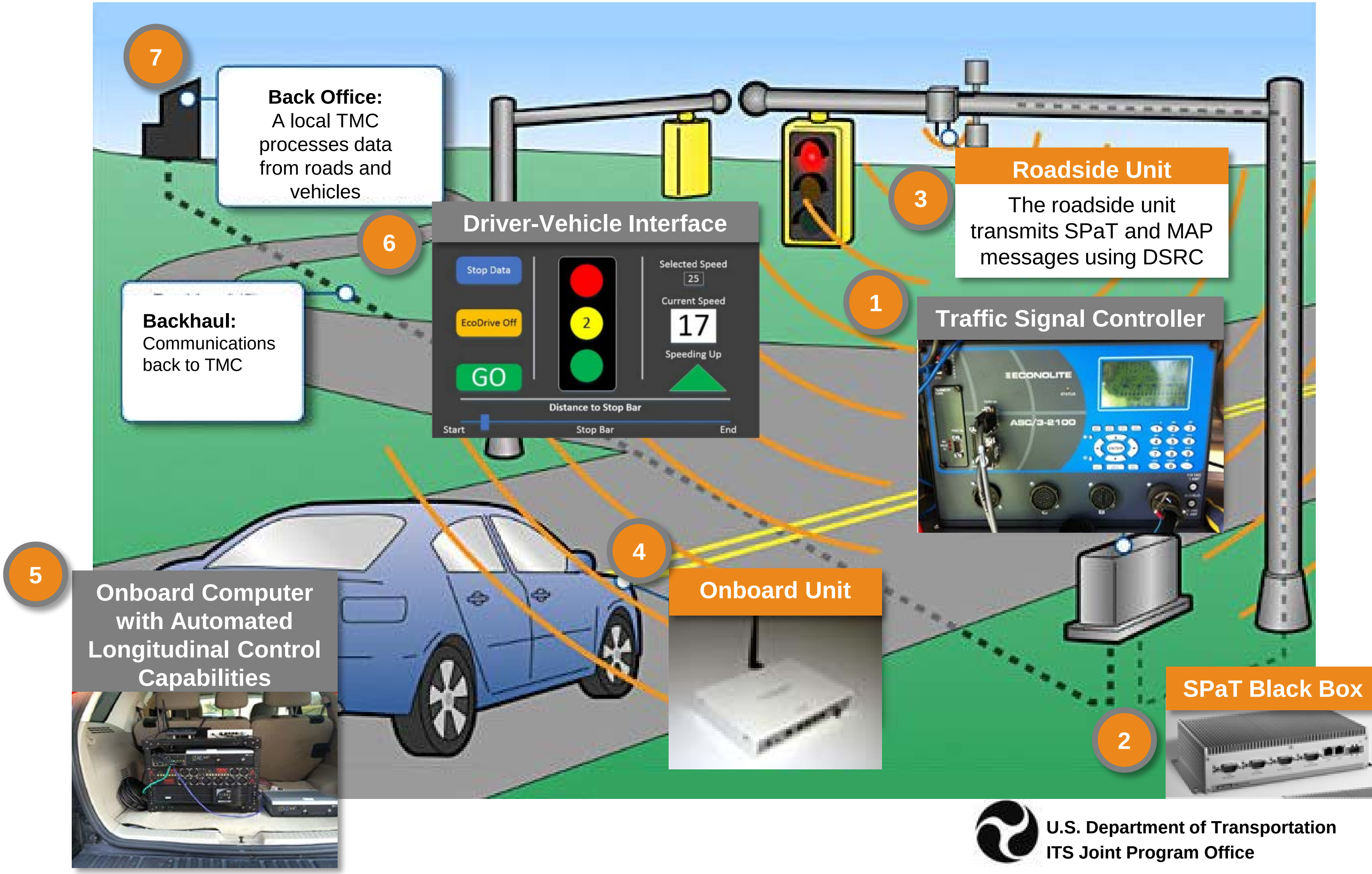
Freeway Entrance with Infrastructure Support

Joining into Car Convoy - Lane Change/Merge

Weaving (Cloverleaf Enter/Exit Lane)

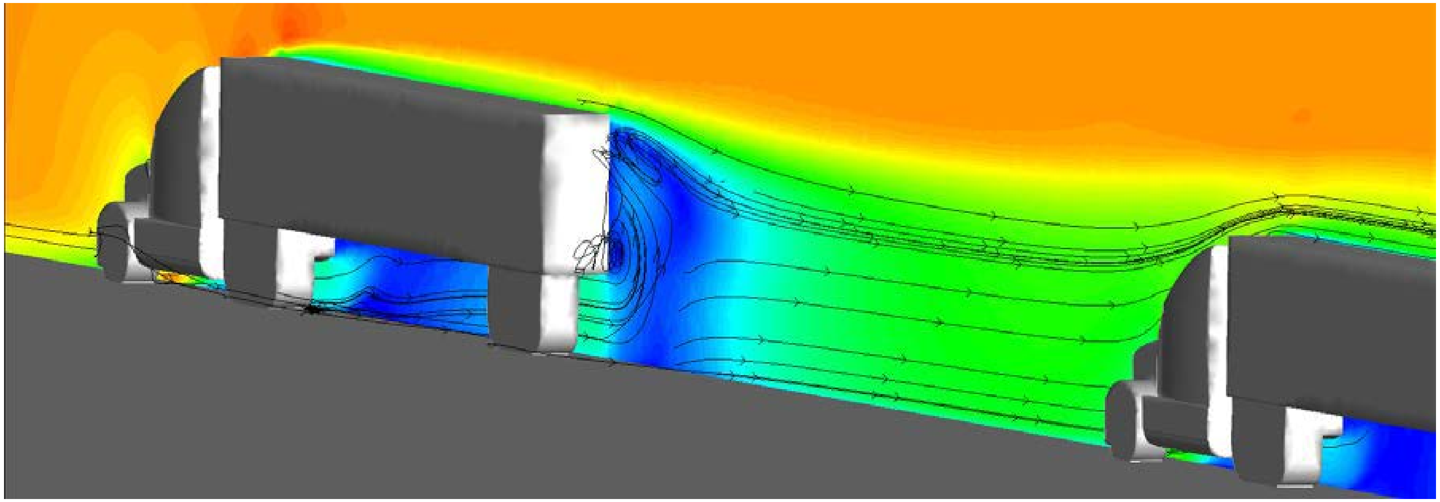
Lane change, merge, and weave maneuvers

Eco GlidePath at Signalized Intersections

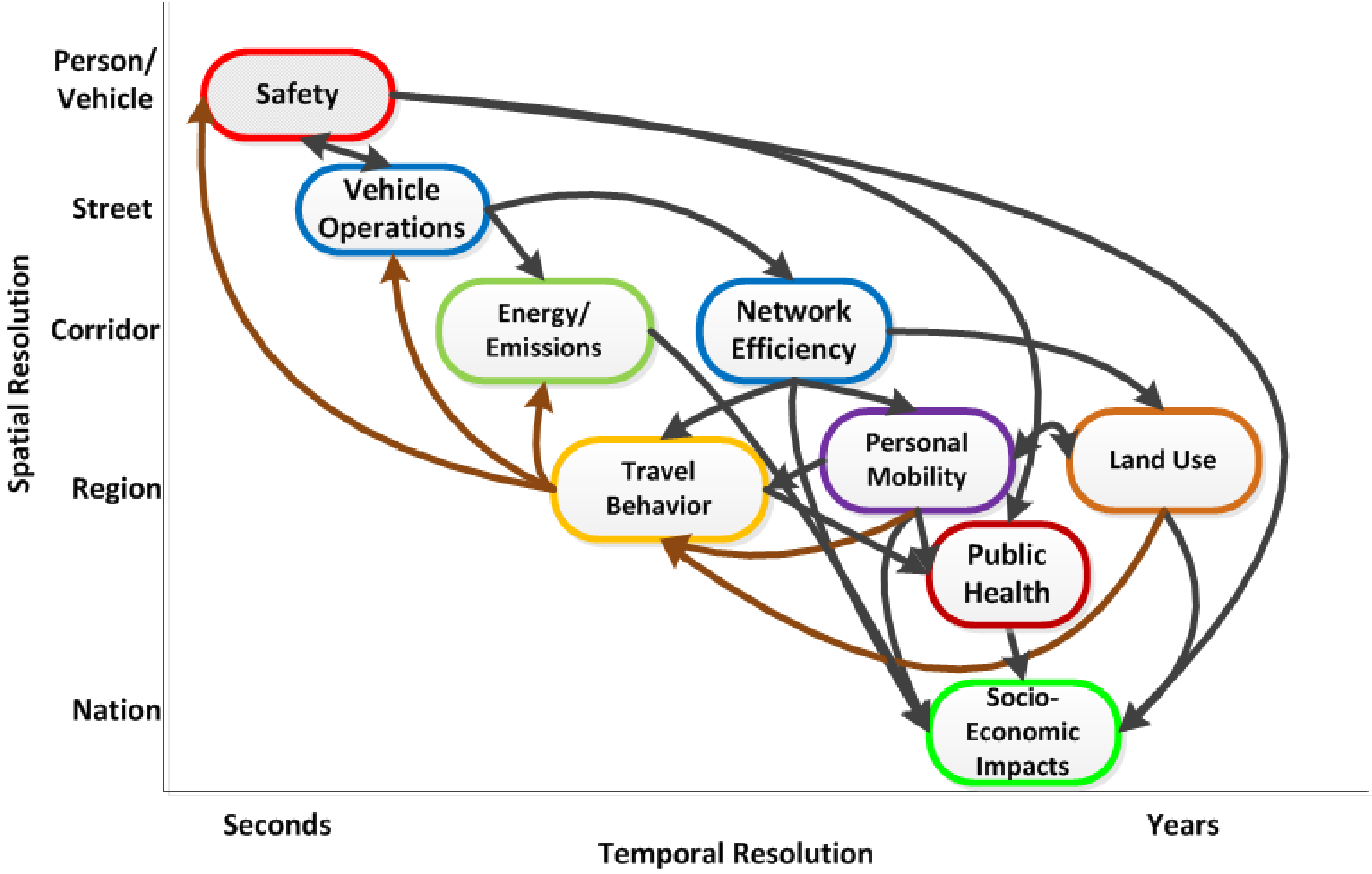


Truck Platooning

- Two projects underway
  - Auburn U/Peterbilt (2-truck platoons)
  - Caltrans/UC Berkeley/Volvo (3-truck platoons)
- Concept: longitudinal control only; all drivers steer



Assessing the Impacts of Automation



Impact Mechanism Example

Vehicle operations and road capacity

- Car following
  - *Affects lane capacity for an uninterrupted facility*
  - Human driver: minimum safe headway, speed variation
  - Autonomous: reduced speed variation
  - Connected / automated: may enable reduced headways with real-time information from lead vehicle(s)
- Gap acceptance
  - *Affects intersection capacity*
  - Human driver: depends on perception and judgment
  - Autonomous: may have less variability than humans
  - Connected / automated: possibility of cooperation with other vehicles
- Interruptions to traffic flow
  - *Affects link and intersection capacity*
  - Connected / automated: possibility of cooperation with infrastructure (GlidePath), and with other vehicles to reduce interruptions

Plans for 2016-2017

- Identify data sources and automation applications for initial modeling
- Examine linkages between micro and regional mobility models
- Develop AV impact models
  - Start with Safety, Mobility and Environment
  - Continue to other areas
- Coordinate with U.S. and international evaluation efforts