



Developing Analysis, Modeling, and Simulation (AMS) Tools for Connected and Automated Vehicle (CAV) Applications

Presentation for HCQSC Simulation Subcommittee
January 7th, 2018



U.S. Department of Transportation
FEDERAL HIGHWAY ADMINISTRATION



Project Overview and Understanding



- CAV AMS Phase I: Framework
- CAV AMS Phase II: Develop applications & case studies
 - Low levels of automation
- CAV AMS Phase III & IV (future)
 - Higher levels of automation
- Today's presentation: CAV AMS Phase II overview

Phase II Objectives



- Develop AMS tools for prominent CAV applications.
- Implement tools within existing AMS commercial frameworks for validation and testing.
- Conduct a few real-world case studies.
 - Practical implementation scenarios
 - Real-world transportation networks

Phase II Overview

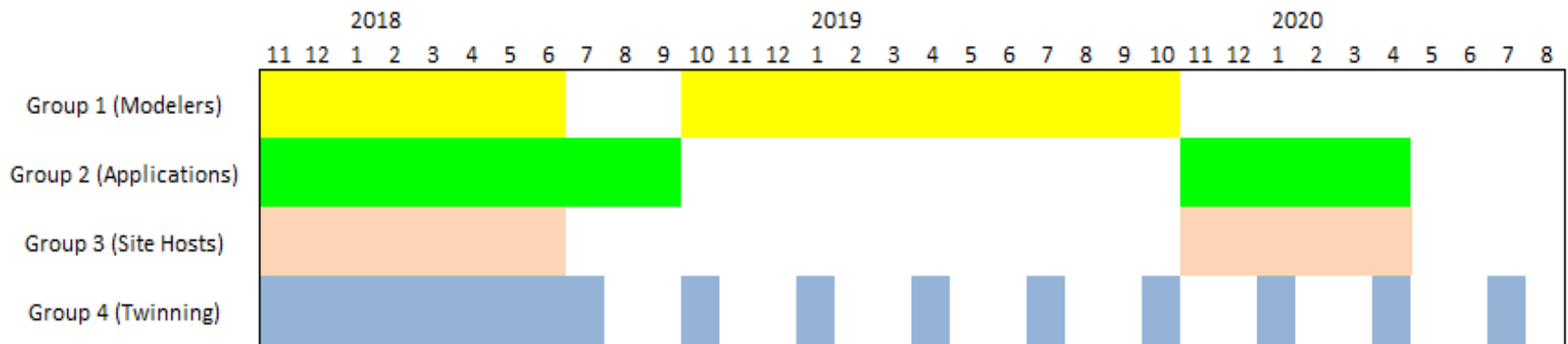


- Current AMS tools not suited to evaluating CAV
- Some high-priority gaps:
 - Behaviors of CAVs in traffic
 - Fine-grained interactions of other drivers with CAVs
 - Demand models that capture decisions about CAVs as an alternative to other modes
 - Supply/demand models to represent newer services
 - Highly automated shuttle, taxi, and shared ride services

Task 2: Stakeholder Engagement



- Four stakeholder groups
 - Modelers, Application Developers and Deployers, Potential Host Sites for Case Studies or Field Tests, European Twinning Partners
- Stakeholder meeting at TFHRC (Feb 6th, 2018)
- European Twinning Partner: CoExist Project
- Webinars



Developing Analysis, Modeling, and Simulation (AMS)
Tools for Connected and Automated Vehicle (CAV)
Applications

Task 3: Identification of CAV Applications and Case Studies



- Selecting CAV applications and case studies
 - Define criteria
 - Establish ranked lists
 - Stakeholder meeting
- Identify ~5 potential CAV applications.
- Identify ~5 potential case study sites.

Task 4: Model Development Plan



- Identify opportunities to update/enhance models.
 - Demand for CAV & new mobility services
 - Supply of new mobility services & shared fleet use
 - Operational flow aspects
 - Network modeling & integration
- Prioritization within resource constraints, based on CAV application importance, needed model fidelity, prior availability of models and data

Task 5: Model Development



- Select two CAV applications for detailed modeling
- Collect data (if required)
 - Adaptation/transformation of existing data streams
- Develop model algorithms/logic
- Validate model for a specific local use case
- “Truth model” surrogate representations of reality

Task 6: Conduct Case Studies



- Three case studies chosen from candidates identified earlier
- Selection Criteria
 - Importance to stakeholders, commitment from the specific state or local agency to support the case study activities, availability of existing network data, type of facility, and ability to draw broader conclusions about national impacts
 - Use of current or recently completed USDOT funded projects that include CAV AMS components tied to real-world calibrated networks

Potential CAV Applications for Consideration/Discussion



- Eco-traffic signal control using V2I/I2V (from MMITSS)
- Eco- cooperative ACC adjusting arterial speed profiles based on SPaT data
- I2V freeway speed harmonization/variable speed limit
- Highway cooperative ACC for light-duty vehicles
- Heavy truck cooperative ACC/platooning for highway driving
- Highway merge coordination (V2V and I2V/V2I)
- Low-speed “driverless” urban shuttle vehicles for first-mile/ last-mile access to line-haul transit
- Automated bus rapid transit on busways
- Low-speed urban TNC services (Uber/Lyft) using highly automated vehicles
- Others.....

Potential Case Studies Based on Current FHWA Projects



- High Performance Vehicle Streams project with PATH
- Eco Approach and Departure project with CAMP
- Managed Lanes for bundled CAV applications (CACCC, Speed Harmonization and Cooperative Merging)
- Multi-Modal Intelligent Traffic Signal Systems (MMITSS)
- Others...

Potential Case Study Sites for Consideration



- I-66 and Transurban HOT lanes in Virginia
- Ann Arbor Safety Pilot
- SR-99 in Sacramento
- I-15 in San Diego
- I-210 in Los Angeles/Pasadena
- US-101 in San Mateo County, CA
- I-80 and I-880 in San Francisco East Bay
- I-710 Long Beach – Los Angeles
- Arizona CV testbed (Anthem, AZ)

QUESTIONS?



Developing Analysis, Modeling, and Simulation (AMS)
Tools for Connected and Automated Vehicle (CAV)
Applications