Assessing Network and Policy Readiness

Steering Connected and Automated Mobility in the Right Direction
The 10th Annual UCLA Downtown Los Angeles Forum on Transportation, Land Use and the Environment

April 2017
Agenda

Technical Overview
National, State, and Local Policy and Regulatory Context
Infrastructure Network Readiness
Case Studies
Looking Forward to CAV Readiness
TECHNICAL OVERVIEW
Connected and Autonomous Vehicles

- At least some aspect of control occurs without driver input
- May be automated or connected
- Implications for safety, convenience, and physical environment
Each vehicle is a node with the ability to send and receive critical safety + mobility information to other vehicles
Vehicles are able to send and receive information to surrounding infrastructure
Vehicles can communicate with other vehicles, infrastructure, and other users of the public right-of-way.
Levels of Autonomy

- **Level 0**: No vehicle autonomy. Driver has control.
- **Level 1**: Vehicle provides driver info/warnings. Driver has informed control.
- **Level 2**: Vehicle integrates detection response. Driver ready to take control.
- **Level 3**: Vehicle fully autonomous. Driver takes control in emergency.
- **Level 4a**: Vehicle fully autonomous. Occupants do not need ability to drive.
- **Level 4b**: Vehicle connected, cooperating. Optimized system operation and passive driver experience.

Source: NHTSA’s levels of autonomy graphic by Vox
34% Improvement in lane-keeping (AAA)

Source: Ryan Automotive
4 years until there will be autonomous vehicles on the road (Ford)

~40 years for full fleet conversion (Victoria Transport Policy Institute)
90% reduction in accidents (AAA)

$190b saved per year in U.S. by 2050 (McKinsey)
90% reduction in accidents (AAA)

$190b saved per year in U.S. by 2050 (McKinsey)

50 minutes saved per day (McKinsey)

2,200 square miles of parking need reduced (McKinsey)
80% fewer cars (MIT/NY, ITF/Lisbon, VDV/Stuttgart)
80% fewer cars
(MIT/NY, ITF/Lisbon, VDV/Stuttgart)

OR

Impacts to goods movement/deliveries
Induced demand
New market of riders
NATIONAL, STATE, AND LOCAL POLICY AND REGULATORY CONTEXT
Federal Regulatory Guidance: Vehicle to Infrastructure Communications

Lays out the eligibility for federal aid for V2I technology under programs to address safety, mobility, congestion and air quality.
Federal Regulatory Guidance: Vehicle to Vehicle Communication

- Requires automakers to include V2V technologies in all new light-duty vehicles
- Proposes requiring V2V devices to “speak the same language” through standardized messaging developed with industry.
Federal Regulatory Guidance: Federal Automated Vehicles Policy

- Vehicle Performance Guidance
- Model State Policy
- Current Regulatory Tools
- New Tools and Authorities
Chao’s stances on emerging technologies:

– **Chao wants to start a “national conversation”** about how to regulate autonomous vehicles and eliminate burdensome regulations;

– **She promised to “work as a catalyst”** for the safe implementation of technology;

– **And agreed to work with all public and private stakeholders** to craft evidence-based policies.

“We are now seeing the advent of autonomous vehicles, artificial intelligence, smart cars, and also drones.

While the benefits are very much known, there are also concerns about how they will continue to develop, and I will work with this committee and the Congress to address many of these concerns. But we need to do so in a way that will not dampen the basic creativity and innovation of our country.” –Elaine Chao
State Regulatory Context

- Since 2012, 34 states and Washington D.C. have considered legislation related to autonomous vehicles
- Eleven states have passed legislation
- Several states are moving forward with testing in the absence of enacted regulation

STATES WITH ENACTED AV LEGISLATION

Source: National Conference of State Legislatures
California Regulatory Context

- Testing of Autonomous Vehicles
- Deployment of Autonomous Vehicles for Public Operation
Local Policy Context

- City of Los Angeles DOT

- Funded by Goldhirsh Foundation fellowship and Mayor’s Fund of Los Angeles

- How to manage public right-of-way, provide and partner to offer services, and understand how to meet city needs.
INFRASTRUCTURE NETWORK READINESS
Infrastructure and Network Readiness: Infrastructure Assets and CAVs

- Communications
- Structures
- Roads

Framework adapted from RAC Foundation
Infrastructure and Network Readiness: Infrastructure Assets and CAVs- Communications

- Roadside communication
- Fiber optic networks
- Traffic signals
- Road markings, signals, signage
- Toll roads
Infrastructure and Network Readiness: Infrastructure Assets and CAVs - Structures

- Parking facilities
- Fueling and power distribution
- Segregated infrastructure
- Street lighting
Infrastructure and Network Readiness: Infrastructure Assets and CAVs - Roads

- Maintenance
- Autonomy-enabled roads
- Road geometry
- Geotechnical features
- Drainage
Infrastructure and Network Readiness

1. Self-parking structures/lots
   - Low to medium speeds; controlled driving parameters
   - Automation: vehicle system control only within range of self-parking infrastructure network
   - AV-only parking sections/floors to accommodate early stages of self-park technology rollout

2. Dedicated AV highway lanes
   - Driver cedes control of primary vehicle functions when entering connected highway; regains control upon lane exit
   - Commuter "trains" or "platoons" of AVs in AV-only, connected highway lanes

3. Connected urban centers
   - Driver enters AV network within city center; cedes control of primary vehicle functions
   - Automation: vehicle system control within networked urban centers
   - Low to medium speeds; controlled driving parameters

4. Public AV transportation
   - AV taxi, busing services, shuttle services
   - Ride-share, car-share services
   - First mile/last mile mobility services

5. Expanded AV highways
   - AVs function at higher speeds
   - Commuter AV "trains"/"platoons" navigate AV lanes with independently operated AVs
   - Driving restrictions shift to human-operated vehicles – limited/no access

6. Fully AV ecosystem
   - AV networks expand to suburban areas
   - Urban centers and suburban networks "attached" by connected highways
   - Driving restrictions shift to human-operated vehicles – limited/no access

Source: EY
CASE STUDIES
Readiness for Connected and Automated Vehicles

Project

- Literature review of technical requirements and assessment of technical readiness for automation.

Objective

- Establish New Zealand’s state of readiness for the introduction of connected and autonomous vehicles.

Goals

- Determine requirements for CAVs
- Assess infrastructure gaps
- Identify infrastructure needs for deployment
Connected Vehicle Data Applications for TMCs

Project

• Study for Michigan DOT addressing Connected Vehicle Data Applications for Transportation Management Centers (TMC).

Objective

• Evaluate and determine how data sets from Connected Vehicle Program may support the function of TMCs.

Goals

• Support execution of incident management, system performance monitoring, and ITS performance
• Accurate and reliable travel data
Connected and Autonomous Vehicle Policy Plan

Project

• Trend analysis and development of policy plan to incorporate connected and autonomous vehicles into Tennessee DOT’s Long-Range Transportation Plan.

Objective

• Develop state-specific policy recommendations for how CAVs can support state’s mobility, sustainability, and equity goals.

Goals

• Assess regulatory environment and state of industry. Provide recommended policies.
Autonomous Bus Pilot

Project

• Evaluate vehicle manufacturers and select a site location to conduct testing of an autonomous bus for transit use.

Objective

• Test autonomous vehicle capabilities in cold weather conditions.

Goals

• Identify challenges and solutions to using autonomous vehicles in cold weather conditions.
LOOKING FORWARD TO CAV READINESS
Looking Forward to CAV Readiness

- Policy, Regulations
- Pilot Projects
- Infrastructure
- Partnerships
THANK YOU

Veronica Siranosian, AICP, LEED GA
Senior Project Manager
AECOM Ventures
veroica.siranosian@aecom.com
Selected References


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