New Roles in Transformational Technology

Peter Sweatman
Principal, CAVita LLC
Anaheim, CA

California PATH at 30
February 16 & 17, 2017
Agenda

1) Transformational technology impacting mobility services, policy and research
   • Brought about by CAV and shared mobility (SM)

2) The new role of research
   • Deploy and learn

3) How do we get to CAV?

4) New roles for universities
A technological tipping point

• Connected vehicles and infrastructure (CV)
• Automated vehicles (AV)
• Surrounded by:
  – Shared Mobility (SM), Alt-Fuel Vehicles, Big Data, Cybersecurity, Internet-of-Things, Smart Cities

• Enabled by:
  – Sensors, software, cloud services, computation, robotics, artificial intelligence, consumer electronics
Century-old transportation system

• Drivers, vehicles and infrastructure
• Tremendous incremental progress
  – For example, crash rates continue to decline
• But not sustainable for another century
• New technologies cut right across the old silos
  – Safety, traffic efficiency, emissions, energy, economics
• The 21\textsuperscript{st} Century mobility system is connected, automated, shared and electrified
the new role of research
High rate of change

• Conventional R&D model is linear: research, prototyping, testing, modification, deployment
• We now need rapid learning cycles based on large deployments
  – This has been the successful model of the auto industry
  – Commercially successful products require multiple cycles of deployment with increasingly large groups of users
• The same model applies to CAV; in addition it becomes a public-private activity, or set of activities
  – There is no rule book for “public-private learning cycles”
  – Current examples include pilots, demos, model deployments, field operational tests, challenges, etc
The process of deployment

- Model deployments (eg. Safety Pilot, Ann Arbor)
- Fake cities
  - Mcity
  - Willow Run (MI), RELLIS (Tx), GoMentum (CA)
- CV pilots
  - NYC, Tampa, Wyoming
- Public-private consortia
  - Safety Pilot, Mobility Transformation Center (MTC), American Center for Mobility (ACM), RELLIS (Tx), GoMentum, Virginia Automated Corridors, I70 Mountain Pilot
- Smart City Challenge
  - $50M prize
  - One winner out of 78 cities: Columbus
- Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) awards
- National Automated Vehicle Proving Grounds
  - Larson Institute PA
  - Texas AV Proving Grounds Partnership
  - Aberdeen MD
  - GoMentum Station CA
  - San Diego Assoc of Governments CA
  - Iowa City
  - University of Wisconsin-Madison
  - Central Florida AV Partners
  - North Carolina Turnpike Authority
  - American Center for Mobility (ACM) MI
RELLIS Campus at Texas A&M
The American Center for Mobility

With:
- DSRC,
- 4G LTE,
- 5G,
- Cyber,
- Cloud
CV and AV are proceeding independently on parallel paths

CV support for AV will create “CAV”
Path to CV

<table>
<thead>
<tr>
<th>Connected Vehicles</th>
<th>Connected Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Voluntary fitment of V2V and I2V by OEMs</td>
<td>• V2I guidance from FHWA</td>
</tr>
<tr>
<td>• Aftermarket fitment</td>
<td>• V2X pilots (NYC, Tampa, Wyoming)</td>
</tr>
<tr>
<td>• Introduction of V2V rule</td>
<td>• Actions by State DOT’s, MPOs and cities</td>
</tr>
<tr>
<td>• Significant penetration by 2025</td>
<td>• Significant penetration of signalized intersections by 2025</td>
</tr>
</tbody>
</table>
Roadside Equipment (RSEs)

- 5,000 Safety critical signalized intersections
  - 2017 - 2021
- 30,000 Intersections and curves
  - 2019 - 2024
- 90,000 Initial vehicle mandate
  - 2021 - 2024
- 150,000 Full vehicle mandate
  - 2024 - 2026

150,000 in 2030
### Path to AV

#### Automated Features
- Voluntary fitment of automated features by OEMs
- Fitment of automated features under NHTSA agreements
- Significant penetration by 2025

#### Highly Automated Vehicles (HAVs)
- Rules of the road at state level
- NHTSA issuing AV interpretations of FMVSS
- NHTSA guidance for HAVs
- HAV performance & security standards
- Smart cities deployments
- On-demand fleets in precincts and cities
- Readiness for on-demand mobility services by 2025
Continuing issues for AV

• Occasional engagement of human driver
• Liability
• Cybersecurity & privacy
• Compliance with federal motor vehicle standards

• No national roadmap to HAV deployment
• Too many questions, inhibiting collaboration
Convergence of CV and AV paths

"Connected Automation"

First quarter centu

2025

Second quarter century

CV

AV

Pilots

Rule & Infrastructure

V2V & V2I

CV

AV

Trials & automated features

Smart cities & OEM agreements

Mobility services; AV & V2X

CAV

Connected Automation

Shared, automated mobility services; broad ownership of driverless vehicles
New roles for universities

- Independent convenor and holder of datasets
  - HAV requires sharing of data within privacy and competitive constraints
- “Sleeves rolled up” research model
  - Research based on deployment
  - Rapid learning cycles with real users on public roads
  - Accelerated process: redirection, immersion, rapid-fire products
- Working with agencies at all levels
  - History with state DOTs (but not other state agencies)
  - Federal funding – “at source” model
  - No history with regional and local agencies
    - City as a “platform”
    - Impacts of Smart Cities programs
- Assisting economic development of states, regions, counties
  - “Non-scientific” stance