Connected and Autonomous Vehicles
<table>
<thead>
<tr>
<th>Time</th>
<th>Topics</th>
<th>Duration</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td>Introduction</td>
<td>5 min</td>
<td>This portion of the roundtable session sets the stage for presentations, discussions and next steps. Moderator: 5 min</td>
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<tr>
<td></td>
<td>By FR an US delegations Leads</td>
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<tr>
<td>10:05</td>
<td>Part 1: Autonomous vehicles</td>
<td>50 min</td>
<td>This portion of the roundtable session sets the stage for presentations, discussions on key areas of interest and ongoing Policy and Regulation activities and deployment initiatives related to AV</td>
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<tr>
<td>10:55</td>
<td>Part 2: Connected vehicles</td>
<td>25 min</td>
<td>This portion of the roundtable session sets the stage for discussions on key areas of interest and ongoing policy and deployment activities related to CV.</td>
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<tr>
<td>11:20</td>
<td>Part 3: Research on CV and AV</td>
<td>25 min</td>
<td>This portion of the roundtable session is to share and exchange updates on ongoing research in CV and AV areas.</td>
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<tr>
<td>11:45</td>
<td>Conclusions and next steps</td>
<td>15 min</td>
<td>Both US and FR identify continuing next steps and action items for 2018.</td>
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<td>12:00</td>
<td>Adjourn</td>
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Part 1
Part 1: Autonomous vehicles  
Total Time = 45 minutes
This portion of the roundtable session sets the stage for presentations, discussions on key areas of interest and ongoing Policy and Regulation activities and deployment initiatives related to AV.

FR Discussion Lead: 
10 Minutes
Xavier DELACHE (remotely) MTES - DGITM Sub-Director for Economic Studies, Prospective and Technical Policy.

US Discussion Leads: 
10 minutes
King Gee, Director, Engineering Services, AASHTO and
Deb Curtis, TFB, FHWA

Roundtable Discussion: 
25 minutes
Part 1 - Policy Level updates on Connected and Automated Vehicles (CAV)

AASHTO Updates at US-FR RT Session
January 10, 2018
Discussion Topics

• National Perspective
  ◆ CAV Activities
  ◆ CAV Policy Working Groups
  ◆ CAV Executive Leadership Team (CAV-ELT)
STSMO Survey

July 2017 CTSO Survey

- Surveyed members of AASHTO Committee on Transportation System Management and Operations (STSMO)
- Completed by DOT Traffic Operations leaders
- Respondents rated traffic operations topics in terms of importance

Survey Results

- Connected & Automated Vehicles - Highest priority topic
- Majority of respondents who rated CAV as high priority also stated it is important for their CEOs to receive a briefing on this topic
CAV Policy

State Level

- Many States have legislative, regulatory, and policy frameworks in place or in progress for:
  - Connected and Automated Vehicles
  - Autonomous Vehicles

Autonomous Vehicle Legislation

- 18 states have passed legislation related to autonomous vehicles
- Governors in Arizona, Massachusetts, Washington and Wisconsin issued executive orders related to autonomous vehicles
Autonomous Vehicle Policy Status

Legislative Database

NCSL has a **NEW autonomous vehicles legislative database**, providing up-to-date, real-time information about state autonomous vehicle legislation that has been introduced in the 50 states and the District of Columbia.

States with Enacted Autonomous Vehicle Legislation

Policy Approaches

Examples of State Approaches:

- **California**: Allows testing but requires registration with DMV and reporting of traffic incidents.
- **Florida**: Requires no additional license, permit, or approval for driverless operations.
- **Michigan**: Allows complete Autonomous operations.
- **Nevada**: First jurisdiction to authorize use of AVs; requires special license for test vehicles.
- **Tennessee**: Prohibited local governments from banning the use of AVs and established a per mile tax structure.
- **Louisiana**: Defined terms (e.g. autonomous technology, driving mode, dynamic driving task).
- **Alabama, North Dakota, and Utah**: Authorized study committees.
- **Virginia**: 2015 proclamation declared the Commonwealth "open for business"; 2017 established the Autonomous Systems Center of Excellence.
Policy & Implementation: Federal and State Responsibilities for CAV Readiness

<table>
<thead>
<tr>
<th>Federal Responsibilities</th>
<th>State Responsibilities</th>
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<tbody>
<tr>
<td>• Setting safety standards</td>
<td>• Licensing (human) drivers and registering motor vehicles</td>
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<tr>
<td>• Enforcing compliance with safety standards</td>
<td>• Enacting and enforcing traffic laws and regulations</td>
</tr>
<tr>
<td>• Investigating and managing the recall and remedy of motor vehicle defects</td>
<td>• Conducting safety inspections, when State chooses to do so</td>
</tr>
<tr>
<td>• Communicating with and educating public</td>
<td>• Regulating motor vehicle insurance and liability</td>
</tr>
<tr>
<td>• Issuing guidance to achieve national safety goals</td>
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*Source: NC CAV Activities Roadmap Executive Summary. (Nov 2016)*
CAV - Estimated Timeline

When will CAV become a reality?

Source: “State of Play of Connected and Automated Vehicles - Part 2” presentation, Abbas Mohaddes, Econolite (June 2017)
High Level Policy Needs and Initiatives

2017 AASHTO Automated Vehicle Public Policy Roundtable:
Identified the following key initiatives:

- **Education** – different needs for Public Officials, the General Public, Drivers at different phases of deployment

- **Scenario Planning** – understanding various deployment or evolutionary pathways and how to maximize benefits and minimize negative impacts

- **Mixed Fleet Operations** – operational needs of current drivers and other road users with AVs on the roads

- **Minding the Public Interest** – recognition and management of the benefits and risks of AVs from the public interest perspective

- **Workforce Development** – identification and development of specialized skills and knowledge of professionals working in the AV space

- **Law Enforcement and Emergency Responders** – operational needs of policemen, firemen, EMS and other emergency responders
CAV Executive Leadership Team (CAV-ELT)

Meeting since 2005, Original Focus:
• Provide strategic guidance
• Recommend policies and national deployment approaches
• Provide critical program reviews
• Assess the risks associated with deployment
• Commit the resources of their organizations
• Educate their organizations and supporting institutions

Reconvened in 2016 - Examine Focus Areas & Members
CAV Executive Leadership Team (CAV-ELT)

Purpose

- To discuss and develop policies that accelerate deployment of AV, in convergence with CV
- Be proactive and be the voice of our ultimate customers – the roadway user
- Provide strategic guidance and recommend policies and national deployment approaches
CAV Executive Leadership Team (CAV-ELT) High-Priority Policy Issues

- CAV-ELT has identified 7 high-priority policy issues:
  - National Guidelines
  - Early-Stage Risks
  - Interoperability
  - Industry-Government Information Exchange
  - Data Access Provisions
  - Public Outreach and Education
  - Planning Scenarios

- Policy issues are documented in white papers, proposed for accelerated research, or in scope development
USDOT Remarks
USDOT Remarks

- Automated Driving Systems: A Vision for Safety 2.0
  - Released September 2017
- Federal Automated Vehicle Policy 3.0
  - 2018 release planned
- Draft Guiding Principles on Voluntary Data Exchanges
  - https://www.transportation.gov/av/data
- Near- and Long-term implications for Cooperative Automation and AVs
- Planning and Policy Scenario Planning for Connected and Automated Vehicles
- USDOT Automated Vehicles Activities
  - https://www.transportation.gov/AV
Part 2
Part 2: Connected vehicles

This portion of the roundtable session sets the stage for discussions on key areas of interest and ongoing policy and deployment activities related to CV. Specific focus is on reporting latest developments as related to SPaT and MAP initiatives.

**FR Discussion Lead:**

Thibaut LIMON, MTES - DGITM Transport Economics, sub-Directorate for Economic Studies, Prospective and Technical Policy.

**US Discussion Leads:**

Blaine Leonard, Utah DOT
Dean Deeter, Athey Creek
Deb Curtis, TFB, FHWA

**Key Observations by Roundtable**

Total Time = 30 minutes

10 Minutes
Part 2 – V2IDC Updates – Focus on SPaT Challenge Initiative

AASHTO Updates at US-FR RT Session
January 10, 2018
National Perspective – CAV-ELT and V2I DC

AASHTO Connected Automated Vehicle CAV Working Group

Connected Automated Vehicle Executive Leadership Team (CAV-ELT)

- Policy Level Feedback
- Technical Findings & Questions

V2I Deployment Coalition

Vehicle to Infrastructure Deployment Coalition Executive Committee

- Input
- Feedback & Guidance

V2IDC Technical Working Groups (TWGs)

- Collaborate on Technical Work (Input level actions)

Recommend Policies and Strategic Direction

Guidance to V2IDC on Technical and Institutional Issues
Major tactical issue for agencies:

- How do we deploy? Where do we start?
- Need for technical resources and support

- Vehicle to Infrastructure Deployment Coalition (V2I DC) is a single point of reference for a broad range of stakeholders involved in V2I deployment

- Coordinated by USDOT – collaborative efforts of AASHTO, ITS America, ITE

- Initial CV Deployment Focus Areas:
  - Intersections ==> SPaT Challenge
  - End of queue warnings
  - Work Zone Management
  - Curve Warning Systems
V2I Deployment Coalition

V2I Deployment Coalition Phase 1 (Complete)

V2IDC Executive Committee

TWG 1: Deployment Initiatives
TWG 2: Deployment Research
TWG 3: Infrastructure Operator, OEM, and Supplier Partnerships
TWG 4: Deployment Guidance
TWG 5: Deployment Standards

V2I Deployment Coalition Phase 2

V2IDC Executive Committee

V2I DC Strategic Initiatives TWG
V2I DC Guidance TWG
V2I DC Peer Exchange / Outreach TWG
V2I Deployment Coalition
SPaT Challenge

- Challenged state and local public sector transportation infrastructure owners and operators to:
  - Deploy DSRC infrastructure to broadcast intersection-specific signal phase and timing (SPaT) and geometry (MAP) information
  - Deploy SPaT broadcasts on least one corridor or network (approximately 20 signalized intersections) in each of the 50 states by January 2020

- Resolution approved by AASHTO Board of Directors at 2016 Annual Meeting
V2I Deployment Coalition - SPaT Challenge

SPaT Challenge Activity Tracking:

www.transportationops.org/spatchallenge
V2I Deployment Coalition - SPaT Challenge

SPaT Challenge Activity Tracking:

www.transportationops.org/spatchallenge
V2I Deployment Coalition - SPaT Challenge

• Broad interest (excitement) in SPaT Challenge
  ▪ State and local agencies
  ▪ Consultants and vendors

• Workshops and webinars
  ▪ AASHTO CAV / ITE / ITS America Chapters
  ▪ NOCoE Peer Exchange / Lessons Learned – Feb 2018
  ▪ V2I DC Webinar Series – 5 events / March – June 2018

• Benefits
  ▪ Learning curve for agencies
  ▪ Prepare for additional applications

• Next Step: Connected Fleet Challenge
Utah DOT Updates

- Foundations for technology:
  - Fiber optic network – 2200 miles, half with PPP
  - 88% of Traffic Signals Connected (statewide, all jurisdictions)
  - Data – Signal Performance Metrics, purchasing HERE probe data

- Automated Vehicles
  - Changed Law to Allow Truck Platooning Testing (Operation pending)
  - Performed AV/CV Study for Legislature

- Connected Vehicles
  - 30-intersection DSRC Corridor for Conditional Transit Signal Priority
  - One of nation’s first DSRC Installations in Daily Operational Use
  - Meeting SPaT Challenge with this Corridor
  - Another 45-intersection TSP Corridor – August 2018
Georgia DOT Updates

• CV Pilot – in Atlanta
  ▪ 2 major streets, installing RSU’s at existing signalized intersections
  ▪ Interstate locations, also, for back-of queue
  ▪ Over 50 sites total

• CV Commercial Vehicle pilot under development on I-85 in central GA
USDOT Remarks
USDOT Remarks

- Connected Vehicle Pilots nearing completion of Design/Build/Test Phase
  - NYC and Tampa/THEA deployments include intersections
- Supported establishment of V2X industry devices certification
- NTCIP 1202 v3 to support signal controller connectivity
- Reference Implementation of V2I Hub - 2016 standards
- SPaT/MAP validation (CAMP V2I)
Roundtable Q/A and Discussion - All
Hot Issues at US/AASHTO

1. Education and Workforce Development
   - Workforce Development – Identification and development of specialized skills and knowledge of workforce
   - Many DOTs are creating CAV working groups to accelerate advancement
   - Need for best practice sharing – policies, partnerships, data

2. Planning and Coordination
   - Planning Scenarios – understanding various deployment pathways
   - Need for National Guidelines for Deployment
   - Industry-Government partnerships and coordination
   - Define roles of federal/state/local agencies and private sector
   - Early Stage Risks
Hot Issues at US/AASHTO Contd.

3. Operational Issues:
   - Mixed Fleet Operations – operational needs of current drivers and other road users with CVs and AVs on the roads
   - Law Enforcement and Emergency Responders – unique operational needs
   - Interoperability
   - Need to begin planning to capitalize on vast amounts of data to be available; consider other data uses

4. Institutional Issues:
   - Stakeholder Education – different needs for Public Officials, the General Public, Drivers at different phases of deployment
   - How to Embrace CAV and shift attitudes to acceptance
Key findings from CAV Workshop at AASHTO Conference on Performance-Based Planning, Financing and Management

Key Take-Aways

- Many DOTs are creating CAV working groups to accelerate advancement
- Embrace CAV – shift attitudes to acceptance
- Begin planning to capitalize on vast amounts of data to be available from CAV vehicles - consider other data uses (e.g. infrastructure maintenance needs)
- Need to further define roles of federal/state/local agencies and private sector
- Need for best practice sharing – policies, partnerships, data
Part 3
Part 3 : Research on CV and AV  
Total Time = 25 Minutes

This portion of the roundtable session is to share and exchange updates on ongoing research in CV and AV areas.

FR Discussion Lead:  
Nour-Eddin ELFAOUZI, IFSTTAR, Deputy Director of COSYS Department, Head of Traffic Engineering Lab (LICT).

US Discussion Lead:  
Ray Derr, Senior Management, TRB  
Deb Curtis, TFB, FHWA

Key Observations by Round Table  
5 Minutes
Part 3 – Research and Development in Connected and Automated Vehicles (CAV) - Updates

AASHTO Updates at US-FR RT Session
January 10, 2018
Impacts of CVs and AVs on State and Local Transportation Agencies
NCHRP Project 20-102
December 2017

The National Cooperative Highway Research Program (NCHRP) is the Transportation Research Board’s program addressing problems faced by state and local transportation agencies. It is funded by the state departments of transportation. NCHRP Project 20-102 began in December 2014 to tackle emerging CV/AV issues and has $6M funding to date. Selection of tasks and conduct of research is being coordinated with U.S. DOT and private sector efforts. Search for NCHRP 20-102 or contact Ray Deir (rdeir@usc.edu) for more information.

Reports Available

Advancing Automated and Connected Vehicles: Policy and Planning Actions for State and Local Transportation Agencies [NCHRP Report 645]
The report and accompanying briefing document present potential societal outcomes of these technologies along with SB policy and planning strategies that agency and legislative decision-makers could apply to align AV and CV technologies with public policy interests more effectively.

The report describes a roadmap of activities by industry, legislators, federal government, and others to facilitate automated transit deployment and accelerate the societal benefits. These activities address technology, safety, workforce, operating policies, laws and regulations, and implementation of research findings.

Challenges to CV and AV Application in Truck Freight Operations [NCHRP Web-Only Document 231]
The report describes freight environments and challenges for connected and highly automated technologies, identifies public and private sector barriers to implementation, and proposes next steps for addressing challenges.

Coming in 2018

Road Markings for Machine Vision (Task 6) is developing information on the performance characteristics of longitudinal pavement markings (i.e., center lines, lane lines, edge lines, and dashed lines across freeway ramps) that affect the ability of machine vision systems to recognize them. This information will be used by the AASHTO/SAE Working Group as they develop guidelines and criteria. The report is expected in Q1 2018. Further work will be done on contrast markings and the effects of glare on two-lane roads.

Implications of Automation for Motor Vehicle Codes (Task 7) will provide state departments of transportation and motor vehicle departments with guidance and resources to assist with the legal changes that will result from the roll out of connected and automated vehicles. The project is being coordinated with related efforts by the American Association of Motor Vehicle Administrators. The final report is expected in Q2 2018.

Dedicated Lanes for Priority or Exclusive Use by CVs and AVs (Task 8) will identify conditions amenable to dedicated CV/AV lanes and identify obstacles to building them. Ways to measure benefits to CV/AV users and operating agencies, as well as possible dis-benefits to non-users will be described. This work is being coordinated with work underway by the Crash Avoidance Metrics Partnership (CAMP) on cooperative adaptive cruise control. The final report is expected in Q2 2018.

Providing Support to the Introduction of CV/AV Impacts into Regional Transportation Planning and Modeling Tools (Task 9) will provide a conceptual framework and applicable guidelines to support state DOTs and regional MPOs as they begin to incorporate CVs and AVs into their planning, modeling, and forecasting tools. The final report is expected in Q2 2018.

Other Work Underway

- Connected Road Classification System (CRCS) Development [NCHRP 20-24(112)]
- Cybersecurity of Traffic Management Systems [NCHRP 03-127, includes 20-102(10)]
- Business Models to Facilitate Deployment of CV Infrastructure to Support AV Operations [NCHRP 20-102(12)]
- Mobility-on-Demand and Automated Driving Systems: A Framework for Public-Sector Assessment [NCHRP 20-102(13)]
- Impacts of Connected and Automated Vehicle Technologies on the Highway Infrastructure [NCHRP 20-102(15)]
- Framework for Managing Data from Emerging Transportation Technologies to Support Decision Making [NCHRP 08-116, includes 20-102(04)]
- Impact of Transformational Technologies on Land Use and Transportation [NCHRP 08-117]
- Planning Data Needs and Collection Techniques for CV/AV Applications [NCHRP 20-102(13)]
- Data Management Strategies for CV/AV Applications for Operations [NCHRP 20-102(14)]

New Projects

- Preparing Traffic Incident Management (TIM) Responders for Connected Vehicles and Automated Vehicles [NCHRP 20-102(16)]
- Deployment Guidance for CV Applications in the Open Source Application Development Portal [NCHRP 20-102(17)]
- Minimum Safety Data Needs for Automated Vehicle Operations and Crash Analysis [NCHRP 20-102(18)]
- Update AASHTO’s Connected Vehicle/Automated Vehicle Research Roadmap [NCHRP 20-102(19)]
USDOT Remarks
USDOT Remarks

- Federal Automated Vehicles Policy 3.0
- Security Credential Management System Proof of Concept (POC)
  - Identify needs, policies, procedures
- Continuing broader examination of geospatial needs beyond intersection MAP message
- Traffic Operations in a CAV environment
- Decision Support for Agencies
- Major FHWA/USDOT Activities
  - Safety, Infrastructure, Operations