CAT Coalition – AV Infrastructure-Industry Working Group
July 24, 2018 Meeting Notes

Attendees:

Tracy Larkin-Thomason (WG Co-Chair)	Ray Derr	Chris Armstrong
	Roger Berg	Paul Carlson
James Zizelman (WG Co-Chair)	Scott Belcher	Ken Moshi
	Fred Bergstresser	John Corbin
Tyler Svitak	Maynard Factor	James Gray
Richie Beyer	Ed Bradley	Peter Sweatman
Patricia Hendren	Katy Salamati	Jeremy Schroeder
Keith Wilson	Dan Veoni	Venkat Nallamothu

Action Items:

- Venkat: To share presentations and meeting summary with the group.
- Tracy: To coordinate with Venkat and Jim to develop and complete strawman of CAV terms and definition, and share with the WG as outlined in the work plan.
- All: Give Venkat your ideas for presentations for future meetings.

Introductions and Opening Remarks

- Venkat welcomed everyone and provided some context to the attachments that were shared in the meeting invitation, which included a Draft Work Plan and the Agenda (enclosed).
- The WG co-chairs Tracy Larkin and Jim Zizelman welcomed attendees and provided opening remarks related to the working group activities.
- Jim commented on the work plan, noting that he appreciated the dates associated with various activities and its comprehensive nature. Tracy also reviewed the work plan and concurred with the outline.

Presentation: Nation's First Legal Autonomous Work Zone Vehicle – An update on the Autonomous Impact Protection Vehicle

- Fred Bergstresser of Royal Truck & Equipment and Maynard Factor of Kratos Unmanned Systems Division led this presentation, beginning with a video that provided some background information on the autonomous truck mounted attenuator (ATMA)
- Maynard presented an update about the use of these vehicles in the UK. The system is currently being tested by Highways England and is expected to be approved by the end of the year for deployment, and it is expected that these autonomous systems will be implemented as other trucks are phased out through attrition.

- The technology uses a leader-follower V2V technology that allows the ATMA to follow the navigational path of the lead vehicle using an IP datalink, with a variety of safety-conscious mechanisms that allow the ATMA to be stopped, if needed, with a human-in-the-loop.
- The technologies in the ATMA are derived from systems developed for the US military that have been extensively tested.
- Plans to add frequency hopping capabilities if there is interference or jamming that are affecting the communications link in order to prevent issues. This uses a narrow, unlicensed bandwidth (2.4 GHz) and the frequency hopping capability was added to alleviate concerns. For the next 10 years, anticipate sufficient bandwidth and have options to switch to DSRC spectrum if needed, but similar issues could occur there.
- Working to develop a network in the US and abroad. The system is fully functional right now, without the need for any infrastructure changes, and new capabilities are being added as the system is being used in more locations.
- The system is being used in Colorado now, Missouri is currently adding the technology to two vehicles, there are plans to implement it in the UK, and additional commercial contractors are considering it. The CDOT deployment is working with the Connected Vehicle Pooled Fund to address issues and questions identified by other agencies.
- Regulatory issues prohibit use of vehicle without a driver in some states, as well as how close a vehicle can follow. The CDOT legislation allows an autonomous vehicle to operate if it can meet all state and Federal laws, and if not (which this vehicle does not), it is referred to a CDOT Task Force for review.

Presentation: Connected Transportation – An update on CDOT and Panasonic's CAV deployment activities

- Tyler Svitak of CDOT and Chris Armstrong of Panasonic described the partnership between CDOT and Panasonic, and the phases of deployment that are intended to lead to an open and interoperable V2X System on 90 miles on I-70 with over 2500 vehicles following the execution of six phases. This includes on-board equipment for vehicles, roadside equipment, and a V2X data ecosystem that is a plug-and-play system.
- The contract includes a one-time payment for software and updates, as well as technology and hardware updates for OBUs and RSUs, central procurement and vendor management, and an agile process for iterative development of V2X software on a quarterly basis.
- Hope to have all 100 RSUs deployed by the end of 2018, currently 5 RSUs and 6 OBUs are installed. V2I applications include crash notification and road conditions, and potential I2V applications include re-routing, dynamic weather alerts, red light violations, and snowplow priority.
- C-V2X was deployed and tested at the Panasonic campus using PC5 to help understand the functionality and potential benefits compared to DSRC. he 1609 security layer, message layers, application layers, and J2735 are largely the same as those used for DSRC.

- CDOT uses the name "Internet of Roads". Current planned deployments for C-V2X are not a connected network in Stage 0, and worked through questions of where to deploy based on safety, mobility, and freight issues to eliminate gaps and develop a Stage 1 deployment network that is expected to cost $17M and be operational in 2020. Stages 2 and 3 have also been planned.
- Additional considerations and applications are being considered for signalized corridors. Beginning with five intersections that are expected to be operational in summer 2018, with additional intersections planned for the SPaT Challenge.
- Tyler also presented on the Build Grant that was recently submitted, and the benefit cost analysis and crash modification factors that were used in that application.
- The OBUs are beginning with between 100-500 CDOT Fleet Vehicles by the end of 2018, but expect to have a diverse range of local municipality and transit fleets, commercial fleets, and potentially the public, who operate on these corridors. Creating a runway to scale up aftermarket installations, where Tier 1 involves Ford with direct access to the CAN.
- Security is an important topic, and this is being viewed as attack surfaces that are each being addressed. This includes various monitors, controls, and security systems in place for the physical infrastructure and networks, vehicle access, and the cloud.
- Vehicles are currently being outfitted with DSRC and Panasonic has fitted some of their vehicles with C-V2X technologies, but no decisions have yet been made about which direction CDOT will go until these technologies have been tested.

USDOT Updates

- John Corbin provided the USDOT update on AV 3.0, anticipated AV funding, and the National Dialogue.
- AV 3.0 is anticipated to be released before September 2018, which is expected to be a more robust statement about the administration views on national readiness for AV systems.
- The Consolidation Appropriation Act was signed into law in March 2018 and is expected to reallocate $100M for AV activities, including $30M for research, $1.5M for impacts on labor for commercial motor vehicles, and $60M for demonstration grants. No website is active at this time for more information.
- The National Dialogue on Highway Automation is ongoing. August 1-2 is the next event in Seattle with a focus on digital infrastructure and data. The outcomes for these events are likely to be of interest to this working group, with possibilities for this working group "owning" some of those findings.
- On August 27 in Atlanta ahead of TRB and AASHTO meetings, there will be a workshop with a guided session on the National Dialogue on Highway Automation (AASHTO CTSO Annual Meeting, Agenda Enclosed).
- The remaining National Dialogue events are Chicago (Freight and Supply Chain Focus, September 5-6), Phoenix (Transportation Operations, October 24-25), and Austin (week of December 3rd). One activity that this working group could consider is the idea of a

National Highway Automation Readiness Framework that could explore the similarities and differences in the concepts at both the national and state levels.

- James added that there has been an interest in truck platooning, and a project is beginning that will make updates to various standards and guidance to facilitate truck platooning.

Roundtable discussion – Work Group Activities and Outputs

- Tracy noted the need to get the strawman of definitions completed. Tracy will work with Venkat to set this in motion and get this out to begin moving with the following activities.
- Venkat requested everyone contribute ideas for presentations for future meetings.
- Paul Carlson said he is struggling to link the three Work Plan activities to the sub-groups that are identified for them. Tracy noted that these three items were identified in the Detroit meeting as the things that were needed to be completed within the first year to create a foundation for the working group. The three items are broken out with the sub-groups on the last page of the work plan, with sub-groups mirroring the themes that the working group wishes to execute over the long-term.
- Ray Derr noted that the Connected Vehicle Pooled Fund Study developed a glossary, which would be a place to start. SAE also has a number of terms defined to contribute to this activity. Tracy noted that this definition is also intended to be a crisp boundary to clarify where the working group is focusing.
- Ken Moshi noted that it may be beneficial to involve other CAT Coalition groups for everyone to be speaking the same language. Tracy responded that the idea was more about defining the boundaries of this working group.
- Barry Einsig has taken the lead on developing the deliverable for the presentation / training course on wireless communications for CAVs.

(Follow-up clarification regarding the Primer on Infrastructure: Jim Zizelman noted that the WG needs to define the specific boundaries for infrastructure for this working group, in addition to talking about what is needed to establish infrastructure that supports future mobility. For example, road signage/communications, road markings, construction zone signage/communication, traffic signaling/communication, general communication technologies, mobility on demand facilities, platooning facilities, etc. might all be considered. For areas that the WG agrees upon, we can develop our plan for the future that includes what must be in place today for high-quality Level 2 performance, and a vision for the longer-term plan to support Level 4 and 5 vehicles, both in the AMOD and consumer spaces.)

The next WG meeting is September 25, 2018.