CAT Coalition – AV Infrastructure-Industry Working Group
August 20, 2020 Meeting Summary

Action Items:

- Jeremy: Send invitation to Infrastructure-Industry (I-I) Working Group (WG) members for the next meetings – October 29, 2020, 2:00-3:30p ET and December 17, 3:00-4:30 pm ET.
- IOOs: The IOO-OEM Forum members are requesting IOOs to download and use the USDOT Work Zone Data Collection Tool and provide feedback about which work zones are well supported and which work zones do not work well with the tool. Feedback can be shared with Jeremy or Venkat

Notes:

Opening and Ongoing Commitment to Outreach and Knowledge Transfer
- The role of this group is to: 1) support pre-competitive industry research that will advance infrastructure development and maintenance; 2) Connect IOOs with industry; 3) Support the natural evolution of infrastructure to accelerate CAVs; and 4) Clarify terms, definitions and target audiences.
- Tracy noted the need to expand membership and share available resources with members. Members are asked to email any suggestions to Ed, Tracy, Venkat, or Jeremy.
- Nick Hegemier said that Ohio DOT is participating in a new AV Pooled Fund Study, which just kicked off in August and would like to engage with this WG and industry.

Quick Update from Focus Area WG: IOO-OEM Forum – Connected Work Zones

Dean provided a quick overview of the IOO-OEM Forum working groups before focusing on the work regarding Connected Work Zones. He described the evolution of work zone data specificity and need from relatively high-level traveler information to more details for driver information to even more lane-level details for the driver warning level. He noted that work zone information (e.g. details describing lane closures, reduced speeds, workers presence) is a data element that vehicles cannot collect autonomously, and AV Developers are looking to IOOs to provide this information. Additionally, many IOOs intend to migrate beyond Traveler Information data to more accurate and timely "CAT Ready Work Zone Data". IOOs need a better understanding of "CAT Ready Work Zone Data", including an understanding of what is required, how difficult it is to create and update the data, the likely costs of creating the data, and technical resources required to create the data. The Work Zone Data Collection (WZDC) Tool is an FHWA product that can help IOOs create the map data. He quickly provided an overview of the tool and made a request that IOOs use this tool to learn about Connected Work Zones to: gain an understanding of the user interface, data needs, Work Zone Data Exchange (WZDx), and roadside safety message (RSM) generators and also test this tool on various work zone configurations. The IOO-OEM Forum members would like feedback about which work zones are well supported and which work zones do not work well with the tool. Feedback can be shared with Jeremy or Venkat.

Partner Reports: US DOT, ITS America, ITE, and Other Partners
- USDOT: John Corbin provided several updates.
  - The NCHRP 20-102 panel will transition out, however there is a need to create and sustain strategic research focus on this topic and this is still being organized.
  - AV Test is a NHTSA led initiative supported by various groups at USDOT as a common platform to exchange data, information, and experiences around AV testing. It provides an interactive and accessible application look for both IOOs and private sector and academic institutions.

There is a set of webinars coming up on this topic that are open for a national audience. The I-I WG has an opportunity to support and influence but also collaboratively own what this platform is doing. More information is at: https://www.nhtsa.gov/automated-vehicles-safety/av-test.

- o The work this WG members have done in guiding and educating FHWA on the National Roadway Automation ConOps is very beneficial and impactful. There are plans to engage this WG again to report back how the effort has adapted and been influenced by input from the CAT Coalition members.

- AASHTO: Venkat noted several updates:
  - o There are new participants in various CAT Coalition WGs.
  - o AASHTO, ITSA, and ITE have worked together to develop Guiding Principles and a technical memorandum is available. This is expected to be a reference for agencies working to pilot and deploy these technologies. The link to the technical report is: https://systemoperations.transportation.org/wp-content/uploads/sites/22/2020/02/GuidingPrinciples_Feb2020-1.pdf.
  - o The National Strategy on Roadway Automation has a newly broadened focus for transportation automation. Efforts are underway to continue moving this initiative forward.
  - o NCHRP 20-102 has been underway for 6 years and developed 20 products. Exciting new developments and technologies in the field have emerged that necessitate a new vision and program that incorporate these new items like MaaS/MOD, for example. King noted the four internal working groups: CAVs (led by Nevada); Unmanned Aerial Systems (UAS) / Unmanned Aerial Mobility (UAM) (led by North Carolina); mobility as a service (MaaS), mobility on demand (MOD), and shared mobility (led by Washington State), and electric vehicles (led by Minnesota). All of these WGs should converge in an integrated system but are still advancing in separate tracks. AASHTO is hoping for better engagement on policy and deployment issues.

- ITS America: Carlos said that ITSA is working with USDOT to implement a targeted national campaign to raise awareness of the Work Zone Data Exchange (WZDx), specifically for IOOs to directly engage with the project, but also construction companies, mapping companies, and OEMs. This is hoped to generate feedback, have the community be more in tune with WZDx efforts, and get involved. Additionally, ITSA will soon announce programming for the ITS World Congress virtual event next month, which includes a number of CAT sessions. It will be free to attend for any public, academic, or non-profit organization, and incur a minor fee for other attendees.

- TRB: Ray Derr noted that NCHRP 20-102 selected new tasks and an announcement should be released in coming weeks for panel members.

Challenges and Opportunities in Automated Driving

John Leonard described some of the challenges with automated vehicles (AVs). He opened with headlines that speak of the promise of AVs, as well as some of the concerns or questions about timelines and reliability of AVs. His experiences in the 2007 DARPA Urban Challenge, specifically a collision between two AVs on the course. Since that time, the Google self-driving car project made a lot of major advancements in a short period of time leading up to 2014. The major investments in AV is driven by the tremendous benefits that are possible.

Ultimately, the technology still has many challenges, including interaction with other drivers or law enforcement, sensor issues, etc. He noted that both SAE Levels 2 and 3 of Automation requires the human driver to serve as a guard to the artificial intelligence. He also noted the challenges in social interactions when a driver is turning left in heavy traffic and has to almost negotiate with other drivers. Another example is when a police officer is manually directing traffic to perform maneuvers that

contradict with either a red or green signal at an intersection. Difficult weather conditions are yet another example of where self-driving cars experience challenges; when the road surface is covered with snow, the vehicle loses its positional capabilities required to navigate the vehicle using high-definition map.

Big technical challenges remain for AVs when it comes to maintaining maps, adverse weather, interactions with people, and getting truly robust computer vision that has perfect detection and no false alarms. Questions remain about whether humans can actually be trusted to take control when necessary (i.e. Levels 2 and 3 of automation). Similarly, stepping to Level 4 transfers liability to the manufacturers, which will require near-perfect detection.

John described the creation of the Toyota Research Institute and all the facets of the automated driving team, including vehicle hardware, vehicle software, safety and system engineering, mapping and localization, perception and prediction, planning and control, and vehicle operations. The automated driving approach is to have one system with two modes: "Guardian" and "Chauffer", which reflect the distinctions between Levels 2 / 3 and Levels 4 / 5. The institute is working on Guardian first where "AI guards the human" to help the vehicle stay on the road, does not get hit, and does not hit things. John also described the Chauffer project, which involves building maps of the world that are compatible for larger areas.

John concluded by saying he believes AV timelines remain unrealistic for mass deployment, with a key question being "where" and not "when" with incremental deployment in limited areas.

A common national framework would be helpful to industry if IOOs and agree on common regulations. Different regions will have different compatibilities with the technology. IOOs in a region should begin having dialogue with technology providers. There are different driving styles, environments and weather, and other local factors in different regions that all parties will have to overcome.

An outstanding question is whether the map is pre-loaded or being built in real-time, and how those are validated or verified. Can all the information that humans meticulously put into maps be correctly created by a robot? That said, over time as more systems cover an area, the map should get better and better.

Institute of Automated Mobility's AV Safety Assessment
The Institute of Automated Mobility (IAM) is relatively new, and was established following a directive by the Arizona Governor. IAM's objective is for Arizona to lead in the commercial development of AVs in a safe manner. The hope is that the collaboration that is happening in Arizona is a competitive advantage. The role of IAM is to provide technical guidance and coordination to assure <u>safe</u> and <u>efficient</u> automated mobility for testing and coordination, research and development, collaboration and influence, and policy and infrastructure requirements. This has manifested through efforts to develop a Safety Assessment Methodology, Roadway Infrastructure as a Service (RIaaS) concept, Situational Awareness Capability, and Individualized Active Traffic Management (IATM) concept.

A Metrics Project is underway to develop and validate a comprehensive and concise set of measures to allow for effective driving safety performance assessments for ADS-equipped vehicles. He showed a video that demonstrated how selected metrics are implemented at a real-world intersection.

A Naturalistic Driving Behavior Project will determine appropriate values in Arizona for subjective assumptions and thresholds that were derived in the Metrics Project. Results are expected to be compared with those developed by other DOTs in the United States, Europe, and China.

A Network Safety Project will automate video feed monitoring for events of interest and possibly driving safety performance metrics for analysis that leverages Arizona DOT's statewide video surveillance system on freeways and state routes in the state, particularly in the Phoenix metropolitan area.

Tracy asked about how State Farm is contributing to the effort. State Farm is working with IAM, and has provided telematics data, as well as crash data, which is interesting in how it differs from Arizona crash data. Near-miss incidents are also of interest; these are flagged by IAM and shared with Arizona DOT and State Farm to help everyone understand the causes and frequency.

Next WG meetings and Adjourn
The next meetings for this working group will be:
- October 29, 2:00-3:30 pm ET, and
- December 17, 3:00-4:30 pm ET.

Attendees:
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