CAT Coalition Technical Resources Working Group Quarterly Meeting

August 11, 2021

11:00-12:30 (Eastern)

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Agenda

11:00-11:05	Welcome and Introductions, Outreach and Knowledge Transfer
11:05-11:10	Resources Recap
11:10-11:35	IOO/OEM Forum RSZW Working Group Update on Products
11:35-12:05	Connected Intersections Update on Testing and Findings
12:05-12:20	Resources WG Completed Work Plan Activities and Impact
12:20-12:30	Partner Reports (USDOT, ITS America, ITE, Other Partners)
12:30	WG Meeting Schedule, Member Updates, Closing

Ongoing Commitment to Outreach & Knowledge Transfer

- Suggestions from WG Members on Ways to Enhance Impact:
  - Proposed new WG Members
  - Communications with/involvement in other initiatives
  - Knowledge resources to include on CAT Coalition website

Resources WG Recap

Jeremy Schroeder, Athey Creek

Resources WG Recap

- Update on USDOT/ITE Connected Intersections Effort
- New Resource: CI Consistent Procedures for Operations
- New Resource: Practical Considerations for Deployers of V2X Roadside Equipment in Light of the Recent FCC Ruling

Presentations and notes posted on Resources WG website:

https://transportationops.org/CATCoalition/technical_resources_WG

IOO/OEM Forum RSZW WG Update on Products:

Summary of Connected Work Zone Needs and Standardization Activities

Enabling Connected Work Zones: Needed Activities and Proposed Next Steps

Jeremy Schroeder, Athey Creek

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Existing Work Zone Event Data Efforts

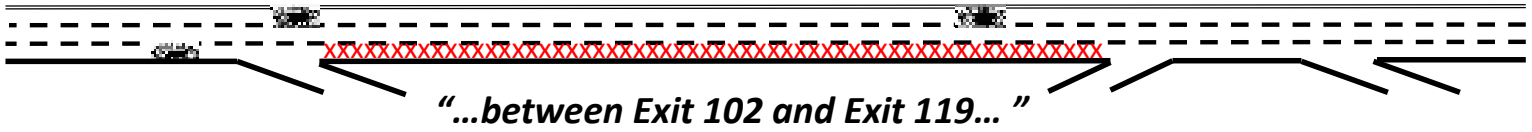
- USDOT's WZDx Specification
  - Goal is to standardize IOO work zone event data for ease of consumption by third parties and across jurisdictions
  - Includes OEMs, traffic and mapping providers
  - Iterative process to incrementally expand data elements
  - Emphasis on traveler information use case for apps (Waze or Google Maps)

- SAE Road Safety Message (RSM)
  - V2I message standard developed to communicate anomalies on the roadway, like work zone activities, from infrastructure to connected vehicles

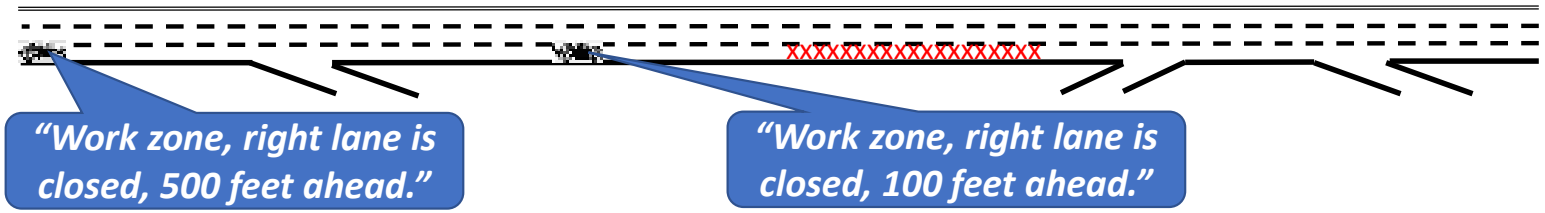
Understanding Work Zone Data Needs and Types

Different Data Needs for Different Applications

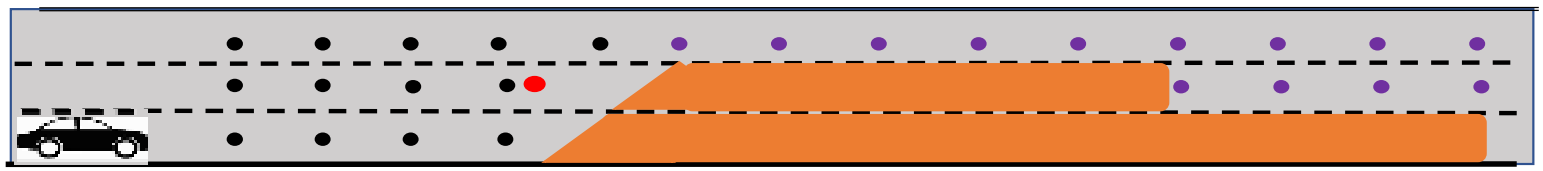
Traveler Information Level



Driver Information Level

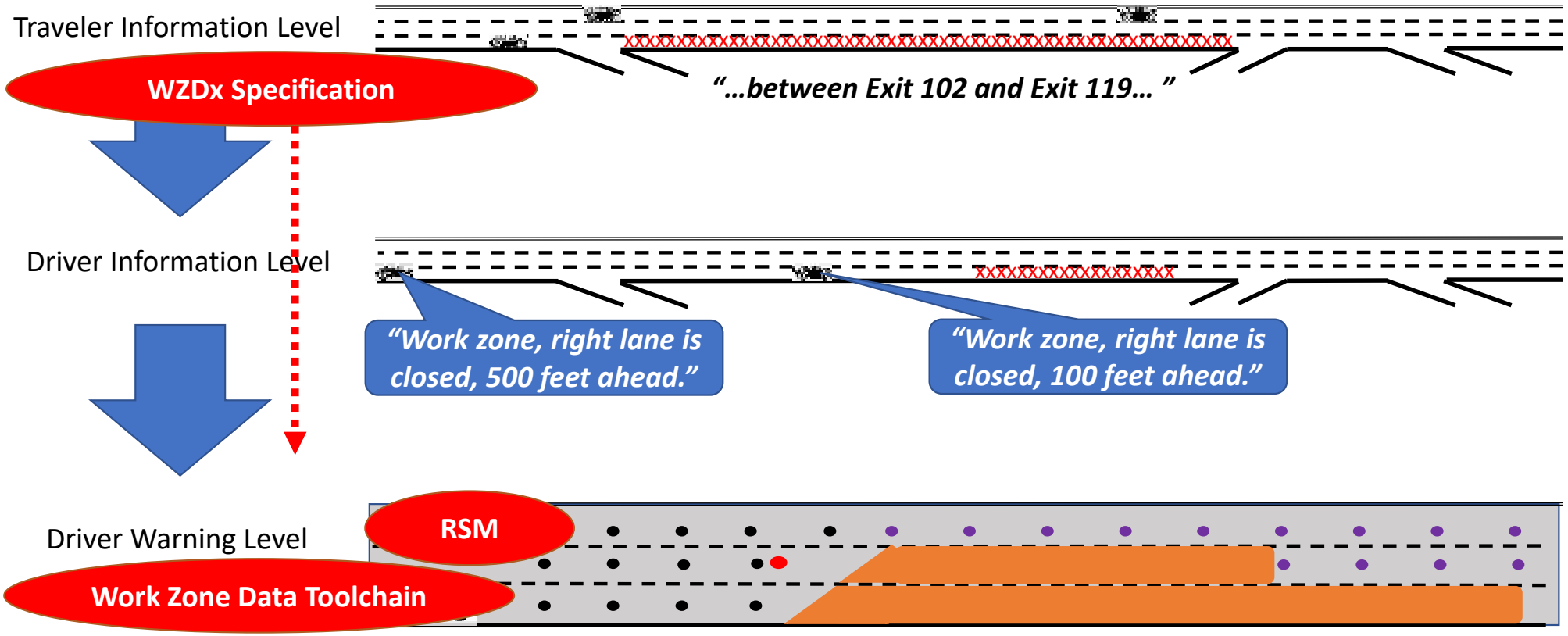


Driver Warning Level



Understanding Work Zone Data Needs and Types

Evolution to Better Work Zone Data Over Time



Summary of Connected Work Zone Needs and Standardization Activities (version 2)

DRAFT Product posted online and available for feedback:

https://transportationops.org/sites/transops/files/Summary%20of%20Connected%20Work%20Zone%20Needs%20and%20Suggestions%20for%20Standards%20Coordination%20-%20v1.0%2004192021.pdf

Enabling Connected Work Zones: Needed Activities and Proposed Next Steps

Cooperative Automated Transportation Coalition

Infrastructure Owner Operator / Original Equipment Manufacturer (IOO/OEM) Forum

Reduced Speed Zone Warning (RSZW) Working Group

August 2021

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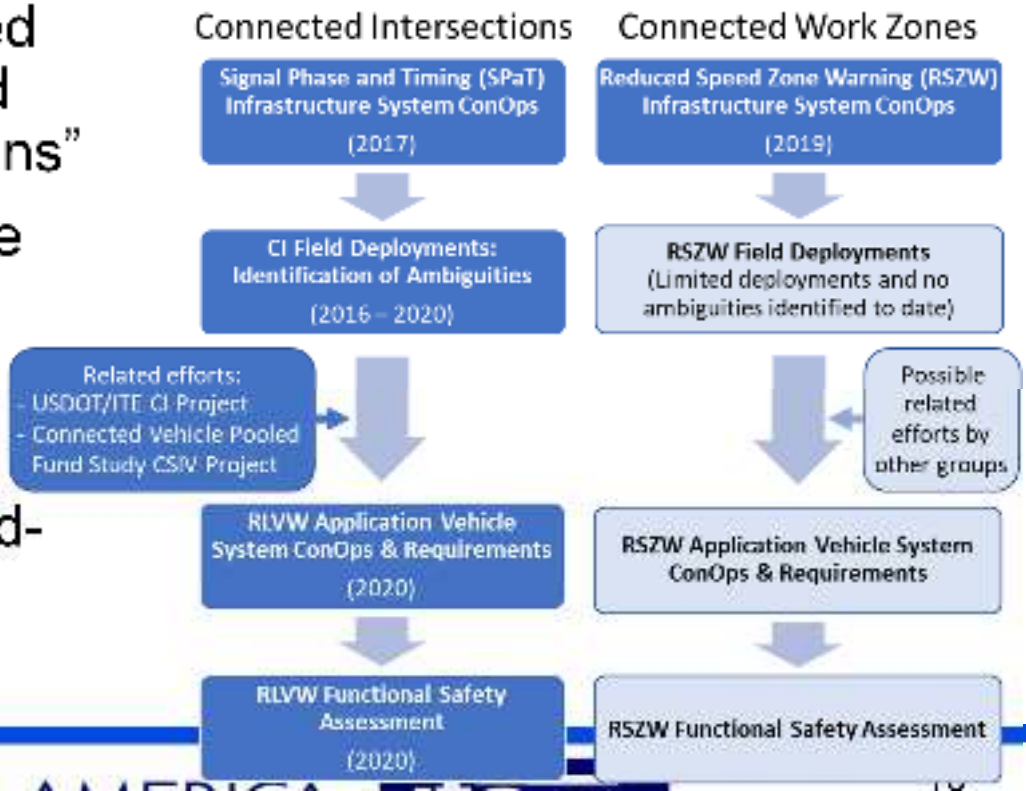
Purpose of this Document

- To advance connected work zones by leveraging experiences and lessons learned from activities conducted to date;
- Describe additional activities that are recommended to advance connected work zones; and
- Summarize next steps the industry should consider when advancing towards connected work zones.

Connected Work Zones: Needs and Goals

Identified 3 needs and 11 associated goals that inform a work plan based on “Enabling Connected Intersections”

- Need #1: Broader IOO Experience with RSZW Field Deployments
- Need #2: OEM and Third-Party Engagement
- Need #3: Ongoing IOO/OEM/Third-Party Engagement.



Work Plan

Need #1
Goals 1-6

Goals	Actions	Outcomes
Need: Broader IOO Experience with RSZW Field Deployments		
1. **Integrate Connected Work Zones into Established Work Zone Activities of Associations.** This will be done at the national, state, and local levels to address outstanding challenges and issues to standardize practices for deployment sooner than later.	1.1 Engage associations such as AASHTO, ITS America, ITE, and SAE.	Focus existing activities on connected work zone challenges to initiate standardization activities sooner.
2. **Establish and Operate Connected Work Zones.** Build on available resources like the WZDC Toolchain and WZDx specification to better understand needs and ambiguities.	2.1 Develop practical guidance about what elements to include in a connected work zone procurement to support IOO deployment. 2.2 Use the WZDC Toolchain or another tool to collect or assemble data and generate messages containing work zone information. 2.3 Broadcast the messages with roadside units and/or network communications. 2.4 Update the messages with new information as work zones change, including updated location, lane impacts, and closures.	Better understand connected work zones from the infrastructure perspective, identify ambiguities and inconsistencies, and address questions about where connected work zones are used and how they operate.
3. **Establish a Nationally Consistent Approach for Managing and Communicating Work Zone Data.** Coordinate existing work zone data efforts to generate an agreed-upon, nationally consistent approach for generating and disseminating work zone data for CAVs.	3.1 Coordinate related work zone data activities being conducted by USDOT, CAV Coalition, and SAE, including the Work Zone Data Initiative (WZDI), Work Zone Data Exchange (WZDx) Specification, RSZW Working Group, Connected Work Zones, and SAE J2945. 3.2 Develop a common approach for leveraging the WZDI data dictionary, WZDx specification, and SAE J2945 to manage data in a nationally consistent data format. 3.3 Identify any gaps in these data formats to support CAVs and/or the generation of associated messages (e.g. Road Safety Messages [RSMs] and Traveler Information Messages [TIMs]). 3.4 Develop guidance for creation of work zone MAP messages.	Consistent and interoperable standard(s) for work zone event data and procedures for creating messages.

Goals	Actions	Outcomes
Need: Broader IOO Experience with RSZW Field Deployments		
4. **Understand Tradeoffs for Local Versus Network Broadcasts of Work Zone Information.** Expand testing efforts to examine the comparative advantages of different communications approaches.	4.1 Conduct tests of broadcasting messages (e.g. RSMs and TIMs) containing work zone information via both local and network broadcasts. 4.2 Compare relative functionality and effectiveness of the messages received by vehicles and identify tradeoffs, including timeliness. 4.3 Identify relative cost for each approach examined.	Better understand what technology and communications solutions are most cost-effective at providing needed work zone information.
5. **Validate Message Exchange.** Test and analyze work zone data in CAV messages to understand how to accurately convey actual work zone conditions.	5.1 Conduct tests of receiving and processing messages (e.g., RSMs and TIMs) containing work zone information. 5.2 Compare interpretations of these messages to the actual work zone activities and conditions in the field. 5.3 Identify how to better incorporate work zone information into messages for improved accuracy.	Better understand message exchange, interoperability issues, and how to describe work zone conditions in work zone messages.
6. **Understand the IOO Business Case.** Leverage experiences from test deployments to better understand relative costs, benefits, and level of effort that will inform how feasibility for deploying connected work zones.	6.1 Examine potential IOO business models for percentage of work zones that might be 'connected' in the near-, mid-, and long-term future under various conditions (i.e. CAV releases and penetration rates). 6.2 Examine both technical aspects and business processes involved in operating connected work zones. 6.3 Examine possible benefits and challenges of connectivity.	Business case and understanding of where and how to deploy connected work zones.

Work Plan

Needs #2 Goals 7-9

Goals	Actions	Outcomes
Need: OEM and Third Party Engagement		
7. **Understand needs and operational concepts for RSZW vehicle application for connected work zones.** Develop ConOps that reflects the vehicle system perspective.	7.1 Engage OEMS to assemble a consortium around connected work zones to collaborate in a systems engineering application development process. 7.2 Identify user needs, system needs, and operational concepts for how and where an RSZW Application operates.	Connected Work Zone RSZW Application Vehicle System Concept of Operations
8. **Understand requirements for RSZW vehicle application for connected work zones.** Generate requirements document that reflects the vehicle system perspective.	8.1 Continue OEM connected work zone consortium collaboration and build on ConOps to generate RSZW application vehicle system requirements. 8.2 Facilitate IOO and OEM coordination to understand data needs for the application.	Connected Work Zone RSZW Application Vehicle System Requirements
9. **Understand risks and safety hazards of RSZW vehicle application for connected work zones.** Conduct functional safety analysis.	9.1 Continue OEM connected work zone consortium collaboration to support a functional safety analysis for the proposed RSZW application vehicle system that also incorporates associated infrastructure and data.	Connected Work Zone RSZW Application Vehicle System Functional Safety Analysis that identifies hazards not previously considered and advances the safety of the concept.

Need #3 Goals 10-11

Goals	Actions	Outcomes
Need: IOO/OEM/Third-Party Engagement		
10. **Engage with OEMs and Third Parties that have prototype or operational applications that rely on connected work zone data.** Demonstrate one or more applications with connected work zone data with one or more IOOs in various settings.	10.1 Identify one or more OEM or third-party applications that are either a prototype or operational, which are available for testing. 10.2 Facilitate IOO, OEM, and third-party coordination to understand testing and verification needs for the application. 10.3 Identify one or more IOOs that will support testing activities for the prototype RSZW vehicle application(s) for connected work zones in various settings and configurations. 10.4 Identify and document challenges and lessons learned regarding IOO connected work zone data needs and application performance in various work zone types and locations.	Demonstrate Prototype Connected Work Zone RSZW Application(s)
11. **Support forums for ongoing IOO/OEM/Third-Party collaboration**, which may leverage or build on existing working groups or result in new initiatives.	11.1 Determine whether an existing working group like the RSZW Working Group in the CAT Coalition IOO/OEM Forum would be appropriate for ongoing discussions. 11.2 Determine whether one or more new initiatives sponsored by USDOT, the Connected Vehicle Pooled Fund Study, standards development organizations (SDOs) like SAE, professional associations like ITE, or other entities are needed to complete various actions.	Ongoing IOO/OEM collaboration to support all other actions to support deployment and development of connected work zones.

Connected Intersections Update on Testing and Findings

Jay Parikh, CAMP

Resources WG Completed Work Plan Activities and Impact

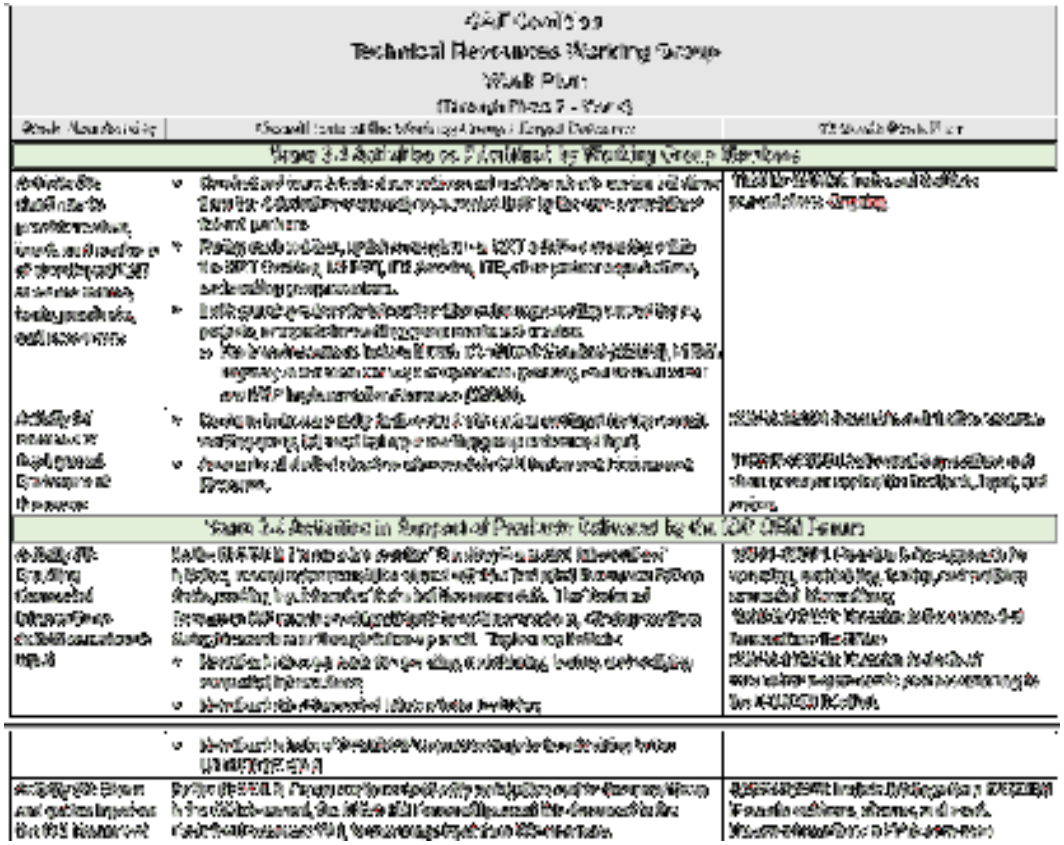
Faisal Saleem, MCDOT

Purpose of this Working Group

- Initiated as part of the original V2I Deployment Coalition in 2015.
- Focuses on identification of CAT gaps, resource needs, and institutional challenges, such as workforce development.
- Provides review, input, and analysis of developed CAT documentation, tools, products, and resources, such as deployment guidance and IOO-OEM Forum outcomes.

CAT Coalition Focus Areas and Structure

2019 Work Plan



Work Plan Activities – Developed Products

- ✓ **White Paper on CAT Resources and Lessons Learned**
  - Developed and published in 2018
  - https://transportationops.org/sites/transops/files/Resources%20-%20White%20Paper%20v2.0%2012052018.pdf
- ✓ **Identified resource gaps**
  - Within primary CAT focus areas on signalized and unsignalized intersections, work zones, curve warnings, and end of queue, as well as general CAT issues. These were added to the list of other gaps identified during monthly webinars.
  - Included in White Paper on CAT Resources and Lessons Learned
- ✓ **CV Deployment Environment Resource**
  - Developed 2019-2020 and published in 2020
  - Updated in 2021
  - https://transportationops.org/sites/transops/files/Resources%20-%20CV%20Deployment%20Environment%20Version%201.2.pdf

Work Plan Activities – Webinars and Review

- ✓ **Hosted presentations on Cellular V2X (C-V2X)**
  - Enable discussions around technical deployments.
  - Presentations and updates by Jim Misener and Alan Clelland
- ✓ **Introduction of MaaS/MOD**
  - Discussion with invited speakers and members surrounding the increasing role of MaaS/MOD in CAT
  - Engagement and presentation by ITS America on this topic
- ✓ **Review, input, and analysis of developed CAT documentation, tools, products, and resources**
  - CAT Coalition – IOO/OEM Forum, Infrastructure-Industry WG, Strategic Initiatives WG, SPaT Resources WG
  - Other entities – USDOT, NEMA, ITE, NCHRP

Support and Interaction with Other Groups

- CAT Coalition
  - SPaT Infrastructure System ConOps & Requirements
  - RSZW Infrastructure System ConOps
  - SPaT Challenge Resources
  - Clarifications for Consistent Implementation
  - Connected Intersections Consistent Procedures for Operations
  - Preliminary Verification Resource
  - CAT Primer of Terms
- ITE
  - Connected Intersections Effort
  - RSU Standard
- USDOT
  - Roadway Automation Concept of Operations
  - Data Hub and Code Hub
  - CV Procurement State of Practice
  - V2I Benefits-Cost Assessment Tool
  - CARMA Overview
  - AV Guidance 3.0
  - CV Pilot updates
- NCHRP Project 08-120
- NEMA TS-10 Standard
- NTCIP 1218 Standard
- CAT CMM Tool

Feedback from WG Members

- How should these activities and accomplishments be highlighted or included for the final CAT Coalition compendium?
- What value have you gained from these activities?
- How have you used these products?
- Have you distributed these products or webinars to others?

- *As one example of use and value, the CV Deployment Environment diagram appears in NCHRP report titled "Business Models to Facilitate Deployment of Connected Vehicle Infrastructure to Support Automated Vehicle Operations"*

Partner Reports from USDOT, ITSA, ITE

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Closing Remarks

Any deployment updates or lessons learned to share with the group?

Any other closing comments or questions?

Next Resources WG Meeting

November 10, 11:00-12:30 (Eastern)