

CAT Coalition Technical Resources Working Group Quarterly Meeting

February 12, 2020
11:00-12:30 (Eastern)

Agenda

- 11:00-11:05 Welcome and Introductions
- 11:05-11:20 Outreach and Knowledge Transfer,
Resources Recap, CAT Coalition Updates
- 11:20-11:30 Partner Reports from USDOT, ITSA, ITE
- 11:30-11:40 Data Hub and Code Hub Resources
- 11:40-12:00 CV Deployment Environment
- 12:00-12:25 NEMA TS 10 Standard for CV Infrastructure
- 12:25-12:30 Next Webinar, Member Updates, Closing

Outreach and Knowledge Transfer, Resources Recap, CAT Coalition Updates

Jeremy Schroeder

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
 - ❖ SPaT deployment, related to the full V diagram
 - ❖ OBU deployment documentation for Connected Fleet Challenge
 - ❖ Cybersecurity and network security resources
 - ❖ New or planned SPaT deployments, or updates

Resources WG Recap

- Communications 101 Resource by AV I-I WG
 - Objective: to provide IOO executives and decision makers a common understanding about communications needs, technology options, and CAT/CAV terminology
 - Draft content shared with Resources WG members for feedback
 - AV I-I WG continues to advance the resource based on comments received

Resources WG Recap

- CV Deployment Environment Resource
 - Discussed first drafted chapter on CV and ITS Systems
 - Volunteers will review and provide input to each section before sharing with WG members
- CV Procurement State of the Practice
 - Resource Noblis developed for USDOT ITS JPO to document current practices

Connected Work Zones: Mapping Toolchain Overview Webinar

- Slides and recording available on NOCoE webpage: <https://transportationops.org/ondemand-learning/connected-work-zones-mapping-toolchain-overview>
- Toolchain available from CAMP: <https://www.campllc.org/software-tools>
 - Webinar presents availability of the software toolchain and logistics of how to access and use the tool
 - Encourage the testing and use of the software in order to provide feedback and input to the developers and the CAT Coalition
 - Understand potential use of the software to support DOTs in creating work zone data to support connected work zones

Connected Fleet Webinar #2

- Slides and recording available on the SPaT Challenge Webinar Series webpage:
<https://transportationops.org/spatchallenge/webinarseries>
 - SPaT Challenge & Connected Fleet Challenge Background and Update
 - Blaine Leonard, Utah DOT
 - Data Collection and OBU Installation Lessons Learned
 - Bob Rausch, Transcore
 - Testing V2I Broadcasts for Compatibility with On-board Applications
 - Jay Parikh, CAMP
 - Installation of CV2X OBUs – Panasonic experiences in CO and UT, including dual DSRC-cellular units
 - Rob Zimmer, Panasonic

Connected Fleet Webinar #3

- Slides and recording available on the SPaT Challenge Webinar Series webpage:
<https://transportationops.org/spatchallenge/webinarseries>
 - SPaT Challenge Background and Update
– Jeremy Schroeder, Athey Creek
 - Caltrans Deployment of OBUs, Transit Signal Priority, Kapsch Tool Testing and District 11 AV Experiences
– Asfand Siddiqui, Caltrans
 - OBU Installation Lessons Learned
– Rafal Ignatowicz, Brand Motion
 - Wyoming DOT CV Pilot Experiences and Lessons Learned
– Tony English, Naeara Consulting
 - Q&A

Partner Reports from USDOT, ITSA, ITE

Request for Feedback on USDOT SPaT/MAP Resource

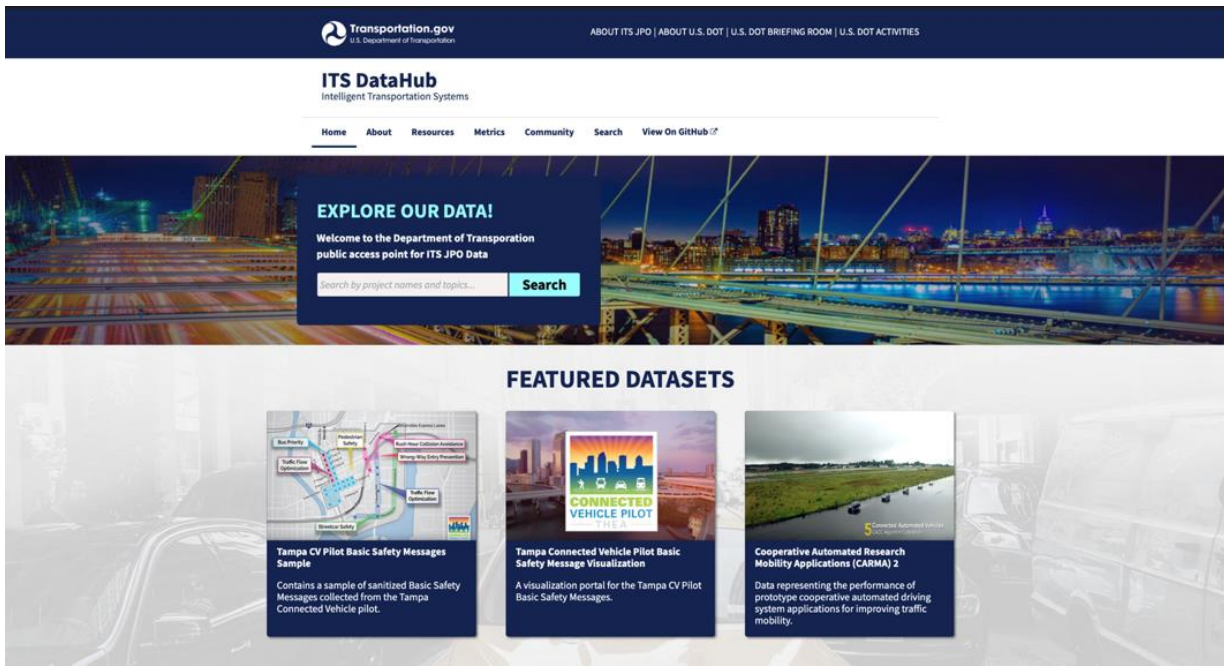
- The ITS Joint Program Office has developed a SPaT/MAP Fact Sheet and Implementation Chart that follows the systems engineering life-cycle.
- These resources were developed for deployers who would like to explore detailed information of the processes, resources and tools, and standards for implementing SPaT/MAP.
- Let Faisal or Jeremy know if your agency is interested in providing feedback in a small group 1-hour walkthrough.
- Materials will be updated based on feedback, then presented at the May 13 Technical Resources Working Group.

Data Hub and Code Hub Resources

Eleanor Berlyn and Adam McCormick, Booz Allen Hamilton

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) DATAHUB

<https://www.its.dot.gov/data/> **SEARCH**



Discover:

- Reusable, open ITS data
- New, developing ITS research projects
- Data management tools
- Community interaction
- ...and more!

Contribute:

- Users can directly contribute to ITS open data to:
 - Host new data on ITS DataHub
 - Create data visualizations
 - Download data
 - Recommend improvements

The ITS DataHub provides a single point of entry to discover ITS research datasets in near-real time and decrease the time from research to insight.

ITS DATAHUB FEATURED DATASETS – CVP AND CARMA

Tampa Connected Vehicle Pilot (CVP) Basic Safety Messages Sample

- Generates data from the interaction between vehicles and infrastructure.
- Consists of **Basic Safety Messages (BSMs) generated by** participants and public transportation **vehicles' onboard units (OBU)** which are then transmitted to **road-side units (RSU)** located throughout the Tampa CV Pilot Study area.
- This dataset is a flattened sample of the most recent Tampa Connected Vehicle Pilot (CVP) BSM data, updated nightly.
- One of three CVPs (Wyoming, Tampa, New York City)
- **See on the front page of [https://www.its.dot.gov/data/!](https://www.its.dot.gov/data/)**



Cooperative Automated Research Mobility Applications (CARMA) 2

- The Cooperative Automated Research Mobility Applications (CARMA) 2 datasets represent the performance of prototype cooperative automated driving system applications for improving traffic mobility.
- CARMA was created to **encourage collaboration** with the goal of **improving transportation efficiency and safety**.
- Includes the integrated highway prototype consisting of **vehicle platooning, speed harmonization, and automated lane changing**.
- **See on the front page of [https://www.its.dot.gov/data/!](https://www.its.dot.gov/data/)**



INTELLIGENT TRANSPORTATION SYSTEMS (ITS) CODEHUB

<https://www.its.dot.gov/code/>

SEARCH

Discover:

- Reusable, **open ITS software code**
- New, developing ITS research projects
- Community interaction tools
- ...and more!

The screenshot shows the ITS CodeHub website. At the top, there is a navigation bar with links for Home, About, Explore, Insight, and Resources. A search bar is prominently displayed in the center, with the text "Search for project names and languages...". Below the search bar, a message reads: "The U.S. Department of Transportation's public portal for open-source, reusable ITS software code. Enabling innovation through open-source collaboration." There are two buttons: "JOIN OUR COMMUNITY!" and "CONNECT YOUR REPO".

The main content area is divided into three sections: "FEATURED PROJECTS", "MOST POPULAR PROJECTS", and "HEALTHIEST PROJECTS". Each section displays a project card. The first card is for "CARMAPLatform" (Java), the second is "cvrm" (CSS), and the third is "smdm" (CSS). Each card includes project statistics such as stars, watchers, releases, forks, contributors, commits, downloads, and viruses. A "Show README" button is present at the bottom of each card. A "Want more: Code?" pop-up is visible over the "smdm" card, containing a mailing list sign-up form with an email address field and a "SIGN UP" button.

Contribute:

- Developers can directly contribute to ITS open code to:
 - Customize ITS tools
 - Transform the ITS landscape
 - Expand ITS research
 - Improve ITS code

The goal of ITS CodeHub is to increase interoperability and transparency, accelerate high-quality software deployment, lower ITS research and development costs, and decrease the time from research to insight.

ITS CODEHUB FEATURED SOURCE CODE – CARMA AND ODE



CARMAPlatform

Java

FEATURED

- Cooperative Automated Research Mobility Applications (CARMA) Project
- Uses **open source software** enabling cooperative automated driving plug-ins.
- Provides **navigation** and **guidance** functions to host vehicle.
- Provides SAE level 2 autonomy with **speed** and **steering control**.
- Advances **automated driving technology** safety, security, data, and artificial intelligence.
- **See on the front page of** [https://www.its.dot.gov/code/!](https://www.its.dot.gov/code/)

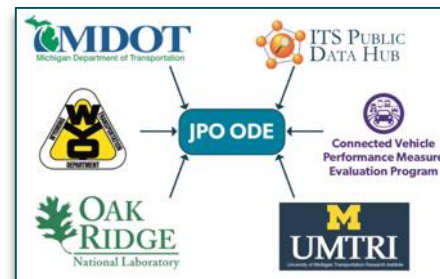


jpo-ode

Java

FEATURED

- Operational Data Environment (ODE) Project
- **Real time** virtual data router that ingests and processes operational data from connected devices.
- **Distributes data** to other devices and subscribing transportation management apps.
- Increases **data fluidity** and **interoperability** while meeting operational needs and protecting user privacy.
- **See on the front page of** [https://www.its.dot.gov/code/!](https://www.its.dot.gov/code/)



**QUESTIONS, COMMENTS, HAVE ITS DATA
OR CODE TO SHARE?**

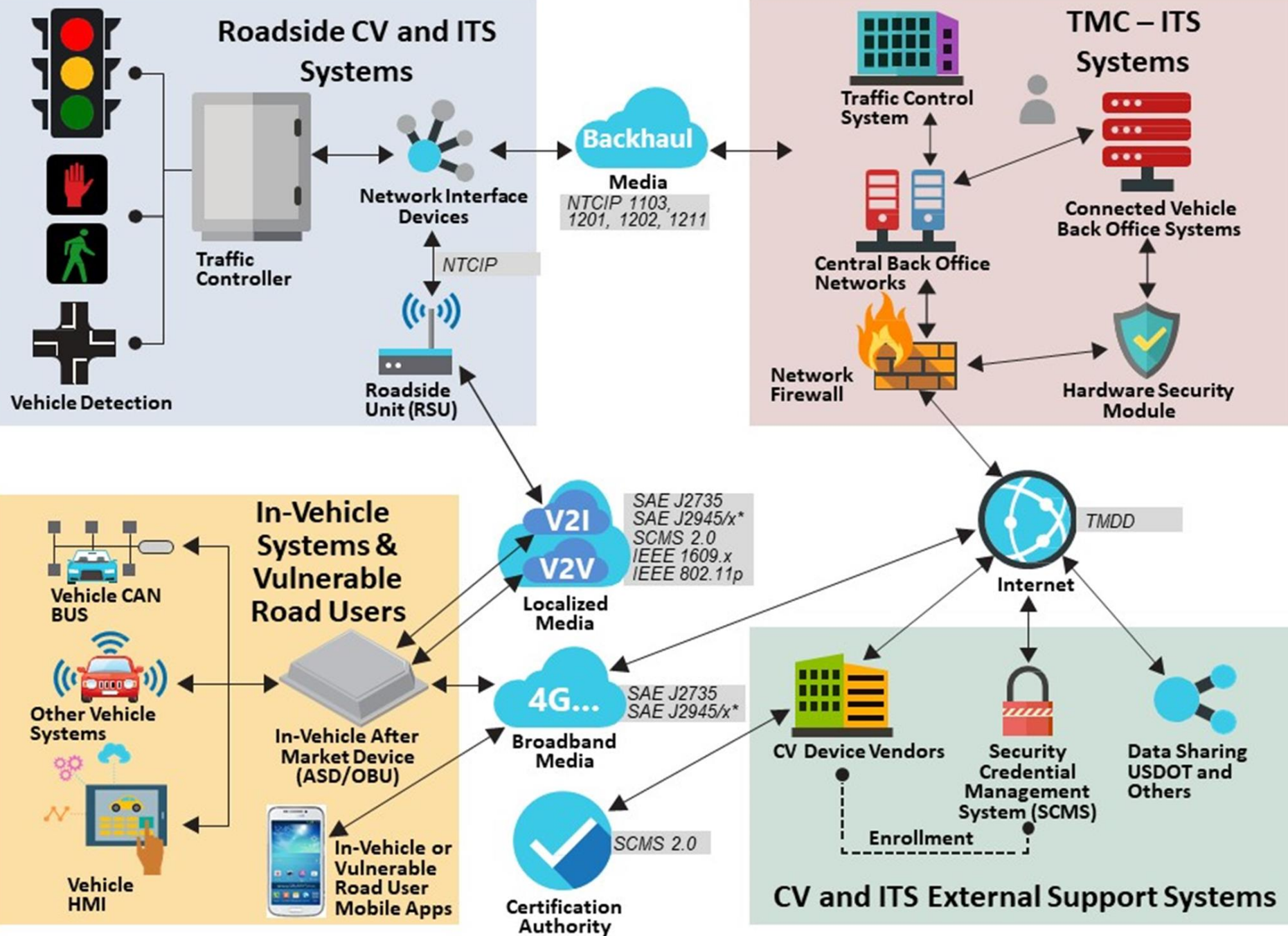
CONTACT US AT DATA.ITSJPO@DOT.GOV

CV Deployment Environment Discussion

Jeremy Schroeder, Athey Creek

CV Deployment Environment

- Resource Objective
 - Provide a full-picture, high-level overview of the CV environment.
 - Leverage experiences from CV deployers to document what is needed for an interoperable CV deployment:
 - ❖ Systems, including lifecycle considerations
 - ❖ Connections
 - ❖ General considerations
 - ❖ Reference to standards and other resources, where possible



*SAE J2945/1 and SAE J2945/2 are for V2V communications; SAE 2945/9 is for communications with vulnerable road users; SAE J2945/x includes cross-cutting information for communications

CV Deployment Environment

- Status and next steps
 - **Roadside CV and ITS Systems** section sent to WG members for additional review and comments with **Executive Summary** section
 - **In-Vehicle Systems and Vulnerable Road Users** reviewed by volunteer group, will be shared with WG members for additional input
 - **TMC-ITS Systems** to be shared with volunteer group
 - **CV and ITS External Support Systems** and **Communications** sections being drafted

NEMA TS 10 Draft Standard for Connected Vehicle Infrastructure

Steve Griffith and Alan Clelland

NEMA TS 10

Connected Vehicle Infrastructure

Roadside Equipment

CAT Coalition Technical Resources Working Group

February 12th, 2020

Who is NEMA?



Mission

Help Member Companies....

- Expand market opportunities
- Mitigate barriers and costs
- Enhance business performance

By...

- Developing Standards and promoting code adoption and use
- Advocating for Members and their products
- Providing exclusive industry data, customized research and economic forecasts
- Educating Members on evolving technologies, industry trends and legislative/regulatory conditions

NEMA Transportation Management Systems & Associated Control Devices (3TS) Section



Section Vision

The NEMA 3TS Section and its members are a principal source of technical, training, and educational information essential to the specification and manufacture of reliable transportation management products and their installation, performance, maintenance, and inspection.

NEMA TS10 Goals/Objectives

- Give Infrastructure Owners and Operators (IOOs) the confidence to proceed with “future proof” infrastructure deployment for CV.
- Procure on the basis of user needs and associated requirements
- Give effect to USDOT policy:
 - Preserve the spectrum...
 - Technology neutral...
 - Let the private sector figure it out and get on with deployment...
- Ensure Day One applications include Infrastructure applications

NEMA TS 10 Goals/Objectives

Support Infrastructure Owner/Operator Procurements

RSU device proposed is:

- Designed for extensibility
- Designed to implement future wireless technologies and applications without the need for replacement within RSU service life
- Aimed at reducing Long-Term Total Cost of Ownership

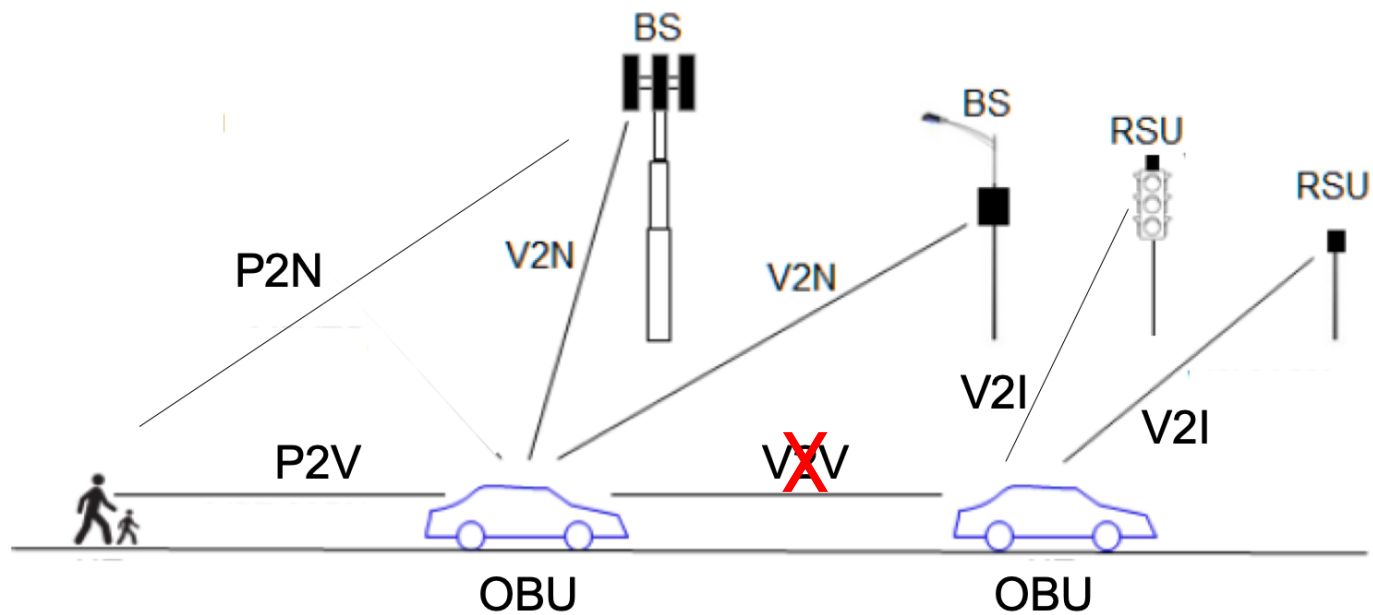
Standard recognizes there are multiple configurations of the RSU device depending on a user agency's procurement needs

NEMA TS 10 supports present and future mobility

Scope of NEMA TS 10

- Describes the following attributes of roadside equipment
 - Physical: hardware platform, mechanical and environmental
 - Software: communications stack, security and minimum set of standard messages
 - Interfaces: terrestrial and wireless
 - Performance: latency and computational capacity

The CV Architecture



Gaps Addressed Via NEMA TS 10

- A Standard for procurement of roadside units (RSUs) that meets identified user needs
- Standardizing a minimal set of messages with a uniform interpretation for safety applications
- Standardizes RSU functions needed by vehicles and vulnerable road users (VRU's)
- Harmonizes communication protocols from the RSU to the central system
- Supports multiple radios simultaneously

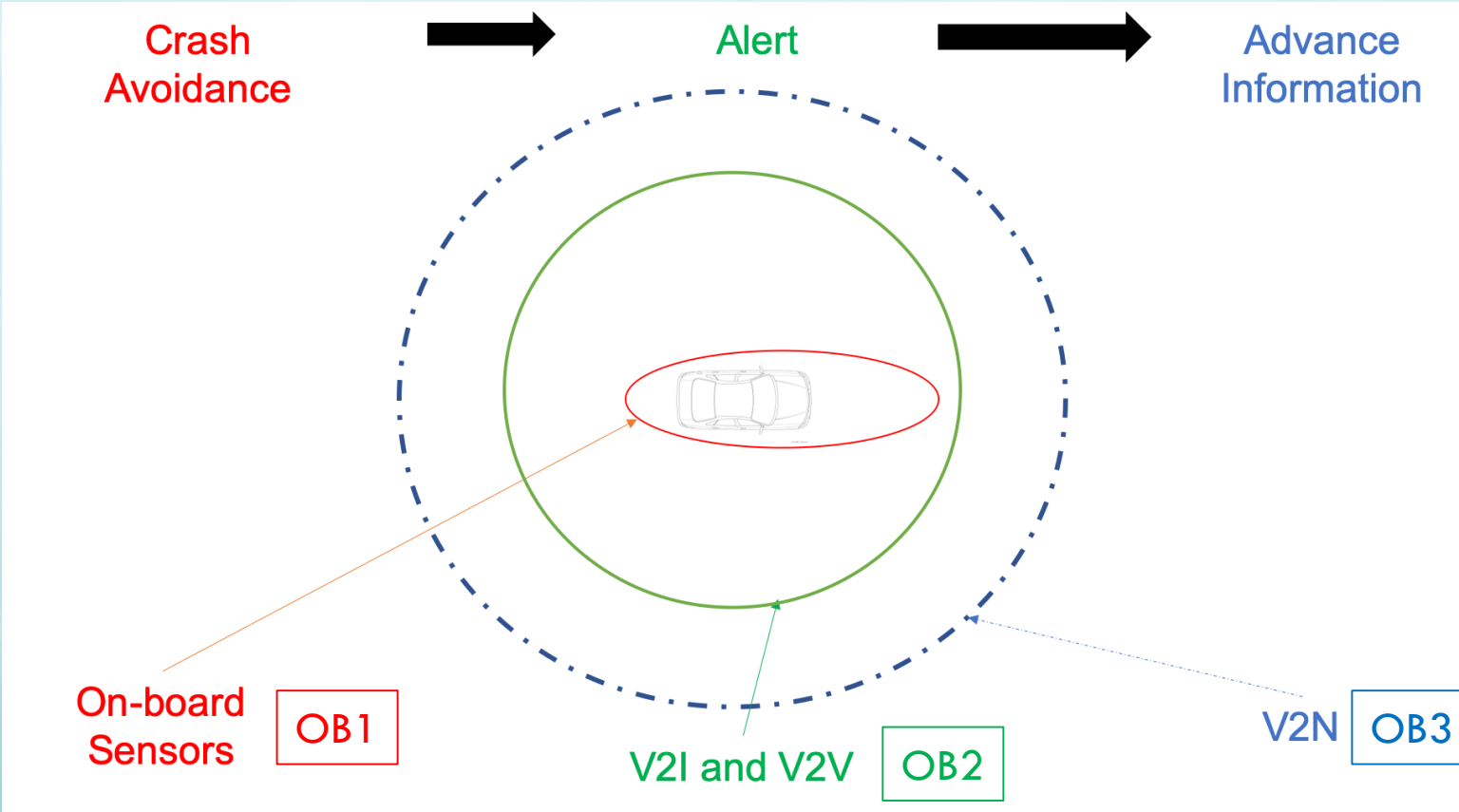
Example User Needs in NEMA TS 10

- Automatic emergency vehicle signal preemption
- Red light violation warning
- Pedestrian crossing ahead
- Collision avoidance
- Entering school zone
- Entering work zone
- Wrong way alert
- Slow speed zone alert
- Flooding ahead alert

Functional Requirements in NEMA TS 10

- Requirements traceability matrix back to the corresponding user need
- Minimum level of functionality requirements to support safety applications in a common message format
- Can be used by mobile devices
- Each requirement includes a prior state and a post state

Operational Boundaries



Operational Boundaries: Relating to Data Flows

Flow	Source	Destination	Operational Boundary ID (OB#)	Message	Standard
F1	CU	RSU	-	TSCBM	NTCIP 1202 v3
F2	RSU	Mobile Equipment	2,3	MAP	SAE J2735 2016
F3	RSU	Mobile Equipment	2,3	SPaT	SAE J2735 2016
F4	RSU	Mobile Equipment	2,3	TIM	SAE J2735 2016 SAE J2540-2 2009
F5	RSU	Mobile Equipment	3	PSM	SAE J2735 2016

Testing/Conformance Evaluation in NEMA TS 10

- Requirements to Verification Traceability
 - Is the justification/basis for the requirement clear and valid?
 - Is the requirement well-formed?
 - Is the requirement unambiguous?
 - Is the requirement feasible
 - Is the requirement verifiable
 - Verifiable by what method?

Summary and Key Takeaways

- NEMA TS 10 represents an industry lead effort by the private sector to advance the widespread adoption of connected vehicle infrastructure
- Addresses maintainability, connectivity, communications interoperability, and the ability to address future advances in communications
- Enables the coexistence of multiple communication technologies
- First draft of NEMA TS 10 was completed mid December
- Comments and feedback are welcomed
- Comment period is open until Friday February 28th, 2020
Tuesday, March 31st

Thank You

Steve Griffith

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NEMA Transportation Systems Division

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Alan Clelland

Chair, TS10

Vice President, Applied Information

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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

May 13, 2020

11:00-12:30 (Eastern)