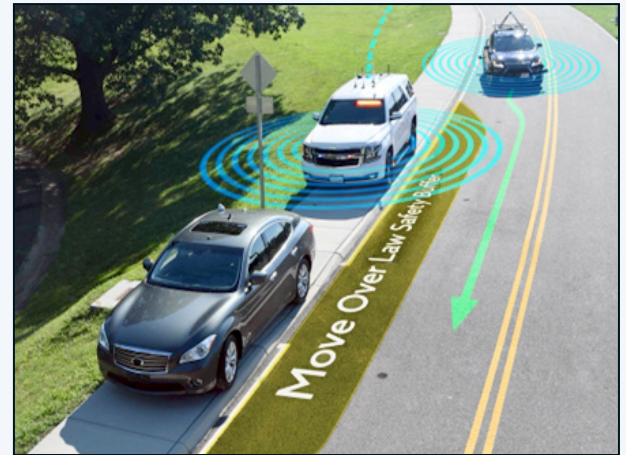




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Move Over Law for Traffic Incident Management Using Cooperative Driving Automation (CDA)

The intent of a move over law⁽¹⁾ feature aims to protect first responders as they respond to an incident. When first responders are positioned near or in active travel lanes, they and their vehicles may be put in harm’s way due to the close proximity of other vehicles. All 50 States have some form of a move over law, whereby approaching users are required to slow down and move over to ensure the safety of first responders. This CDA feature allows emergency response vehicles (ERVs) to broadcast a vehicle-to-everything (V2X) message containing the Global Positioning System point of the incident, along with a desired speed reduction and desired safety margins for the passing vehicles. Surrounding vehicles would receive and interpret this information to avoid the lane (or space, as shown in figure 1) adjacent to the ERV and reduce their speed when passing.



Source: Federal Highway Administration.

Figure 1. Image. Developed feature demonstration at Turner-Fairbank Highway Research Center.

BENEFITS TO TRANSPORTATION

IMPROVED FIRST-RESPONDER SAFETY



Cooperative automated driving system-equipped vehicles can safely navigate the traffic incident location, reduce the likelihood of a crash, and improve emergency responder safety by providing connected ERVs with the capability to broadcast traveler information messages. These messages describe restricted travel paths and require vehicles to either slow down or move over.

IMPROVED MOBILITY



By notifying vehicles and drivers of an upcoming road rule change due to the presence of an incident, CDA-enabled vehicles can proactively adjust to closed lanes, slow down, and make other possible changes to support a continued smooth traffic flow at the incident site.

USE CASE ARCHITECTURE

CARMA Platform^{SM(2)} and CARMA Messenger^{SM(3)} operate in tandem to enable CDA technology to work. CARMA Messenger broadcasts the V2X message to any vehicles within communication range, and CARMA Platform interprets the message and controls the vehicle to operate within the parameters set in the broadcasted message.

STANDARDS

This technology uses the following standards established by SAE International®:

- SAE® J3216_202107™: *Taxonomy and Definitions for Terms Related to CDA for On-Road Motor Vehicles.*⁽⁴⁾
- SAE® J3016_202104™: *Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.*⁽⁵⁾

EVALUATION OF THE CONCEPT

Independent evaluators from the U.S. Department of Transportation Volpe National Transportation Systems Center tested this system, in the planned scenario, using the following criteria:

1. The pulled-over ERV can broadcast messages using CARMA Messenger⁽³⁾ that describe its current location and the length of the road affected by the incident.
2. A CDA vehicle using CARMA Platform⁽²⁾ can receive the messages from the ERV and appropriately modify its route by changing lanes away from the lane immediately adjacent to the ERV and also reduce its speed when passing through the affected region.
3. The CDA vehicle using CARMA Platform changes back to its original lane and increases its speed to the normal speed limit after exiting the incident.
4. The CDA vehicle smoothly and correctly follows both the normal speed limit as well as a reduced speed throughout the use case.

CARMA Platform and CARMA Messenger operate in tandem to enable this technology to work. CARMA Messenger broadcasts the V2X message to any vehicles within communication range. CARMA Platform interprets the message and controls the vehicle to operate within the parameters set in the broadcasted message and exit the location transmitted by the ERV.

RESULTS AND LESSONS LEARNED

While the system met the criteria for item 1 and item 2 in the Evaluation of the Concept section, the Volpe Center recommended that the CARMA Platform⁽²⁾ system used by the CDA vehicle be tuned for smoother vehicle acceleration and deceleration when both approaching and exiting the location transmitted by the ERV.

CONCLUSIONS

Move over laws⁽¹⁾ proved that documented benefits could be achieved through the application of CDA traffic incident management scenarios and helped provide a better understanding of its advantages. Through data collection and analysis, the research team outlined some suggested improvements, and potential for future work remains. The next steps for the feature are as follows:



Collaborate with industry partners and emergency responders to determine best practices pertaining to the messaging of traffic incident-related information and use this information to propose new standardized messages.



Develop more robust software. Build out software to be more robust for a larger set of situations and have fewer software bugs.



Conduct more testing, since only one use case was tested. Further testing can involve a larger set of situations, more simulation testing, and more complicated incidents for vehicles to respond to.

TO LEARN MORE AND FOLLOW UPDATES:

CARMA Platform

<https://github.com/usdot-fhwa-stol/carma-platform>



CARMA Messenger

<https://github.com/usdot-fhwa-stol/carma-messenger>



¹ USDOT. n.d. "Move Over: It's the Law" (web page). <https://www.nhtsa.gov/move-over-its-law>, last accessed November 21, 2023.

² FHWA. n.d. "carma-platform" (software and configuration files in GitHub repository). <https://github.com/usdot-fhwa-stol/carma-platform>, last accessed April 12, 2023.

³ FHWA. 2023. *CARMA Messenger* (software). Version 4.4.0.

⁴ SAE International. 2020. *Taxonomy and Definitions for Terms Related to Cooperative Driving Automation for On-Road Motor Vehicles*. SAE J3216_202107. Warrendale, PA: SAE International. https://www.sae.org/standards/content/j3216_202107/, last accessed July 16, 2021.

⁵ SAE International. 2018. *Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles*. SAE J3016_202104. Warrendale, PA: SAE International. https://www.sae.org/standards/content/j3016_202104/, last accessed May 30, 2023.

