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CDASim

An Open-source Cosimulation Tool to Support Cooperative Driving Automation (CDA) Research

FACT SHEET

The U.S. Department of Transportation (USDOT) Federal Highway Administration's (FHWA) CDA Program focuses on advancing research to enable seamless integration between infrastructure, connected and automated vehicles, and other road users. The program aims to enhance transportation system safety and efficiency through improved connectivity and automation.

The CDA Program operates at the intersection of multiple industries, requiring complex interactions between vehicles and infrastructure. The transportation community leverages simulation tools to accelerate the development and testing of CDA applications in a physically risk-free environment. To support these development and testing efforts, FHWA has developed CDASim, a modular simulation tool that integrates different types of simulators, two of which are shown in Figure 1.[1] CDASim assists the transportation community by offering research tools to advance the development, testing, and evaluation of their CDA applications.

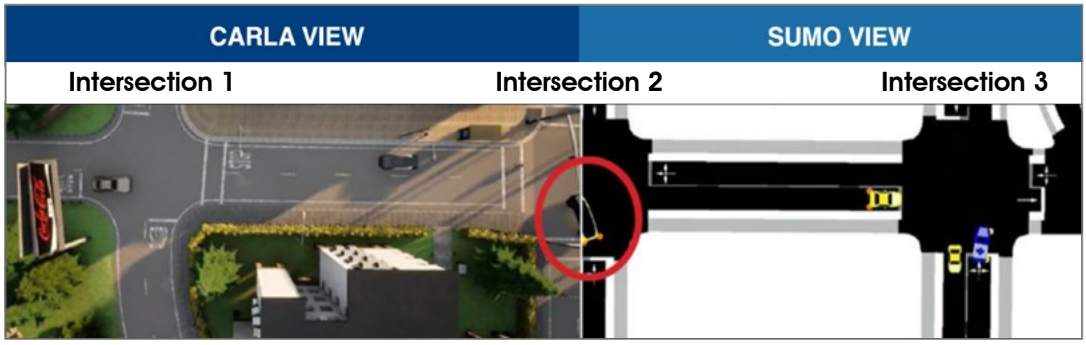

Figure 1. Image. Rendering of CARLA® and SUMO™ cosimulation environments.

KEY BENEFITS

Accelerates development and testing: Dramatically speeds up the development and testing of CDA algorithms and applications. CDASim users report up to an 80-percent reduction in testing time compared to traditional field-testing methods, significantly cutting down development cycles and costs.[1]

Enhances safety and control: Safely assesses and refines software and algorithms within a highly controlled virtual environment before any real-world deployment. This approach minimizes risk and ensures robustness by identifying and addressing potential issues early in the simulation phase.[1]

Offers customization and flexibility: Provides extensive flexibility for users to customize the CDA simulation environment to their specific needs. This flexibility includes optional use of FHWA's CARMA℠ suite of tools or adapting the environment to fit unique research requirements, thus supporting a wide range of CDA research and development activities.[1,2]

SYSTEM DESIGN

CDASim is an open-source cosimulation environment designed to support the development and testing of CDA and vehicle-to-everything (V2X) applications.[1] The modular architecture of CDASim allows users to select and combine different modules in the software-in-the-loop simulation, with the flexibility to separately integrate and swap simulators as they choose (figure 2).

CDASim can be downloaded through GitHub at https://github.com/usdot-fhwa-stol/cdasim.[1]

SAXTON LABORATORY
U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank Highway Research Center

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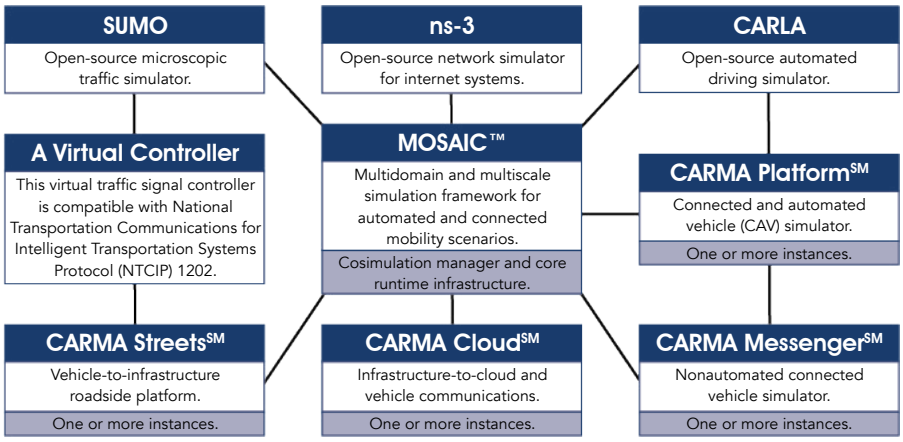

Source: FHWA.

Figure 2. Diagram. Components of the CDASim tool. (see references 1—11)

RESOURCES AND THE USER COMMUNITY

The CDA program aims to build a community of researchers and support them with open-source tools and training and technical interchange meetings to share research developments and findings. To join the community, email cavsupportservices@dot.gov. Community members will be able to do the following:

- Learn about and access CDASim training materials as they become available. Training materials have been created for the SUMO, CARLA, and ns-3 simulators.[4,5,6]
- Join user meetings to discuss tool development, exchange technical information, and swap ideas about testing and development.
- Access technical support for any issues encountered when installing or using the tool.

COMPONENTS

MOSAIC™: A simulation manager that centrally manages time and data flows among the components of CDASim.[1,3]

CARLA: A vehicle driving simulator providing virtual driving environments and simulating sensors and vehicle dynamics.[4]

SUMO: A microscopic traffic simulator that models the behavior of nonautomated, human-driven vehicles.[5]

ns-3: A simulator replicating V2X communications.[6]

CARMA Platform℠: A cooperative automated driving system vehicle control simulator.[7]

CARMA Streets℠: A simulator of current and future connected infrastructure.[8]

NTCIP-Compatible Virtual Traffic Signal Controller: A virtual traffic signal controller that follows NTCIP 1202.[9]

CARMA Cloud℠: A simulator of current and future Traffic Management Centers.[10]

CARMA Messenger℠: A simulator of human-driven connected vehicles.[11]

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