



CARMA TOOLS

To advance cooperative driving automation (CDA) research and design, the U.S. Department of Transportation developed CARMA tools. CARMA focuses on improving the transportation system by leveraging emerging automated driving technology and vehicle-to-everything (V2X) technology to enable increased safety, operational efficiency, and sustainability in moving people and goods.

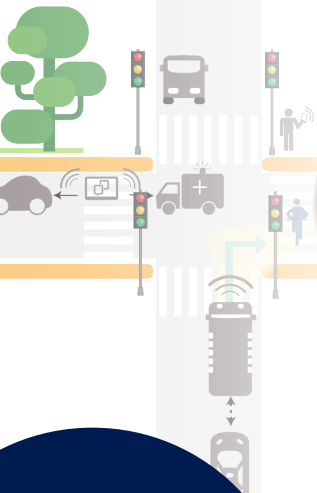
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U.S. Department
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**Federal Highway
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Through collaboration and open-source software (OSS) development, CARMA tools enable researchers and engineers to research, develop, test, and evaluate CDA features on infrastructure and vehicles equipped with driving automation features.



CARMA PRODUCTS
The CARMA product suite consists of five OSS tools that provide the necessary software for conducting CDA research and testing.

CLOUD

CARMA Cloud is a set of cloud-based, OSS services enabling communication and cooperation between cloud services, vehicles, infrastructure, and road users. It will allow the application of Transportation Systems Management and Operations (TSMO) CDA strategies through rules for road users to help manage the flow of traffic.

PLATFORM

CARMA Platform is a vehicle-based platform that uses the information from CARMA Cloud to enable automated vehicles to interact and cooperate with road elements, including vehicles, infrastructure, and vulnerable road users with mobile devices.

STREETS

CARMA Streets is an infrastructure-based application for automated vehicles to share information and planned trajectories with one another and with the infrastructure to enable cooperative actions that improve transportation operations and safety.

MESSENGER

CARMA Messenger is a vehicle-based application for manual or nonautomated vehicles, and it enables communication with other participants to engage in CDA. This new capability will support research with first responders and encourage transit participation in CDA.

SIMULATION

CDASim is a cosimulation-based tool for advancing CDA development and evaluation by establishing everything-in-the-loop (XiL) capabilities using open-source software.

Source: FHWA.



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