



U.S. Department of Transportation
Federal Highway Administration

Office of Operations
Research and Development

HARDWARE IN THE LOOP (HIL) TESTING OF CONNECTED AND AUTOMATED VEHICLE (CAV) APPLICATIONS

HIL testing of Eco-Approach and Departure (EAD) and Cooperative Adaptive Cruise Control (CACC) with model development based on HIL field tests

INTRODUCTION

The Federal Highway Administration (FHWA) has led the research and development of innovative applications of connected automation which offer the potential of significant mobility, safety, and environmental benefits. One of the major challenges in testing and demonstrating the benefits of these innovative technologies is the small number of test vehicles available for experiments. This leads to a lack of CAV field data for the development of valid CAV modeling tools for State and local transportation agencies.

One approach to overcoming these challenges is to use emerging HIL tools that allow real test vehicles to interact with virtual vehicles from traffic simulation models, providing an evaluation environment that can replicate actual deployment conditions at early stages of CAV development.

STUDY DESCRIPTION

FHWA kicked off an effort to conduct HIL testing of EAD and CACC in late 2016. The effort will:

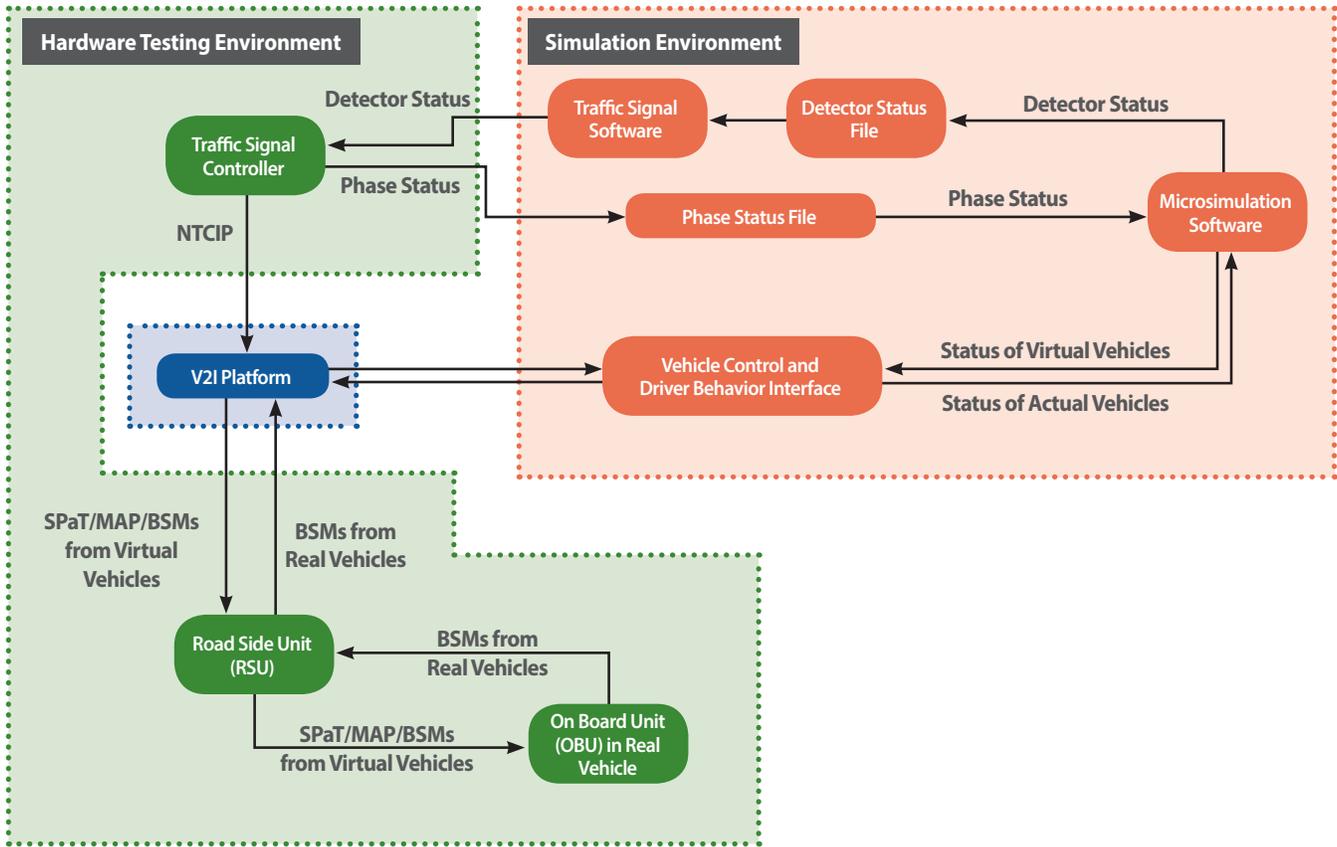
1. Continue to assess the potential impacts of CAV applications—specifically EAD and CACC—using emerging HIL tools.
2. Conduct closed field tests at Turner Fairbank Highway Research Center (TFHRC) and outside facilities (potentially the Federal Law Enforcement Testing Center, etc.).
3. Develop microsimulation models and model logic to accurately emulate CAV hardware and performance based on the HIL tests and analysis. Calibrated network(s) and specialized interface software needed to simulate CACC and EAD applications will be combined with an HIL platform. This will allow CACC- and EAD-equipped test vehicles to operate through interaction with virtual traffic and traffic control signals.

ANTICIPATED RESULTS

Additional information on the results of the HIL field tests and model development will be periodically available as the project progresses. Final research results will become available in early 2019.

The Turner-Fairbank Highway Research Center (TFHRC) has more than 24 laboratories for research in the following areas: safety operations, including intelligent transportation systems; materials technology; pavements; structures; and human centered systems. The expertise of TFHRC scientists and engineers covers more than 20 transportation-related disciplines. These laboratories are a vital resource for advancing this body of

knowledge created and nurtured by our Researchers. The Federal Highway Administration's Research, Development, and Technology Service Business Unit operates and manages TFHRC to conduct innovative research to provide solutions to transportation problems both nationwide and internationally. TFHRC is located at 6300 Georgetown Pike, McLean, VA. Information on TFHRC is available on the Web at www.tfhrc.gov.



Data flowchart of the proposed HIL platform implementation at TFHRC (Source: FHWA).

For more information on the project, please contact:

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