DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Virtual Roadside Unit Pilot

Demonstrate connected vehicle concepts to deliver alert messages to drivers using mobile device applications

Advanced Research

November 2025

Project Title: Connected and Automated Vehicle (CAV) Application Development

Task Number: 4506

Start Date: July 1, 2025

Completion Date: September 30, 2026

Task Manager:

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WHAT IS THE NEED?

California Department of Transportation (Caltrans) is seeking innovative solutions to improve roadway safety and traffic management through the use of connected vehicle (CV) technologies. Traditional deployments of CV systems often rely on physical roadside infrastructure, such as RSUs (Roadside Units) operating on the 5.9 GHz spectrum. However, these systems can be costly, limited in coverage, and slow to scale. There is a growing need for a more flexible, scalable, and cost-effective approach that leverages existing mobile networks and modern cloud-based platforms to deliver real-time information to drivers and collect valuable vehicle data.

In response to this need, Caltrans is piloting a project that utilizes cellular communications and the Verizon Intelligent Message Platform (IMP) to deliver Traveler Information Messages (TIMs) and collect Basic Safety Messages (BSMs) from mobile devices. This approach eliminates the dependency on physical infrastructure and enables broader geographic coverage, faster deployment, and real-time data exchange. The project aims to demonstrate how mobile applications can serve as virtual RSUs (vRSUs), providing timely alerts to drivers and supporting Caltrans' broader goals of enhancing roadway safety and operational efficiency.

WHAT ARE WE DOING?

Caltrans, in partnership with Mergent Systems and subcontractors Verizon, Trihydro, and Neaera Consulting, is implementing a pilot deployment of a connected vehicle system that uses mobile applications and cloud-based services. The project integrates the Verizon IMP with Caltrans' ActiveITS system to deliver geofenced TIMs to drivers and collect BSMs from their mobile devices. These messages include alerts for work zones, queue warnings, curve speed advisories, chain restrictions, and weather hazards.

Caltrans

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Each subcontractor plays a key role: Verizon provides the IMP service and geofencing capabilities; Trihydro integrates the IMP with its Corvus system to generate and manage TIMs; and Neaera develops both a message generator and a mobile application for iOS devices. The mobile app will receive TIMs, display alerts to drivers, and send BSMs back to the system. The project also includes the development of secure data servers, quality assurance protocols, and remote support infrastructure to ensure smooth deployment and operation.

WHAT IS OUR GOAL?

The goal is to demonstrate a scalable, infrastructure-light connected vehicle system that delivers real-time alerts to drivers and collects vehicle data using mobile devices and cellular networks, ultimately enhancing roadway safety and operational awareness.

WHAT IS THE BENEFIT?

This pilot project offers several key benefits. First, it reduces the need for costly roadside infrastructure by leveraging existing cellular networks and mobile devices. This makes the system more scalable and easier to deploy across a wide geographic area. Second, it enables real-time, two-way communication between vehicles and traffic management systems, improving the timeliness and relevance of alerts delivered to drivers.

Additionally, the data collected from mobile devices—such as speed, heading, and location—can be used by Caltrans to better understand traffic patterns, detect hazards, and plan maintenance activities. The use of geofencing and cloud-based message filtering ensures that only relevant messages are delivered to drivers, reducing distraction and improving safety. Overall, the project supports Caltrans' mission to enhance mobility, safety, and sustainability through innovation.

WHAT IS THE PROGRESS TO DATE?

Project progress: July 1, 2025 – September 30, 2025

During this reporting period, the project team has made significant strides in system integration and development. Verizon has finalized access to the Intelligent Message Platform and demonstrated its geofencing and message delivery capabilities. Trihydro has deployed its Corvus Client Hosted System in District 3 and successfully integrated it with the Verizon IMP and Caltrans ActiveITS system. The system is now capable of generating and managing TIMs for various test scenarios.

Neaera has developed and tested its message generator and mobile application. The iOS app has been configured to receive TIMs, display alerts, and send BSMs using the Verizon IMP. The app has also been tested for latency and message accuracy, with logs confirming successful message delivery and reception. Additionally, the project team has conducted kickoff meetings, submitted monthly progress reports, and maintained regular communication with Caltrans stakeholders. All deliverables are on track, and the system is being prepared for live demonstrations and further testing in the next phase.