

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes



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DRISI provides solutions and knowledge that improves California's transportation system.

Maintenance, Operation and **Enhancement of Cellular Vehicle-to-Everything (C-V2X) Communication** Infrastructure Phase III

California Connected Vehicle Testbed Maintenance – Phase 3

WHAT IS THE NEED?

U.S. Department of Transportation (U.S. DOT), in the past, has provided financial and technical support to the California Department of Transportation (Caltrans) for developing the, now defunct, Dedicated Short Range Communication (DSRC) communication infrastructure on its Testbed site along El Camino Real (ECR) in Palo Alto. The Testbed is fully operational but needs to be maintained and supported so that it will be useful for other Caltrans projects, as well as for projects to be conducted by a variety of other public and private sector organizations in the region.

DSRC at 5.9 GHz (75 MHz Bandwidth) has been rendered obsolete by Federal Communication Commission (FCC) and a new standard has been introduced called Cellular Vehicleto-Everything (C-V2X). This new standard has introduced new challenges for the Testbed as the existing hardware now needs to be replaced and the new hardware needs to be purchased to replace the existing obsolete hardware. The new hardware also needs to be integrated to the existing traffic controllers which is quite challenging. The Testbed provides a unique capability to deliver time-critical, safetycritical messages between the roadside infrastructure and vehicles with high reliability and low latency. This new 30 MHz band has been allocated by Federal Communication Commission (FCC) for Intelligent Transportation System (ITS) use. Caltrans, in conjunction with private and academia, is in the process of developing applications based on connected vehicle technology.

This task is a part of the Connected and Automated Vehicle (CAV) Infrastructure Development project. The primary goal of this project is to develop the hardware and applications

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and to keep the Testbed fully functional so that various applications can be developed in the CAV area. These applications include, but are not limited to, Curve Over Speed Warning System, Traffic Probe Data Processing, Intersection Safety and Mobility Applications, etc.

WHAT ARE WE DOING?

This task will take care of the following activities.

- 1. Upgrade the Testbed to the new C-V2X standard
- 2. Regular maintenance of the Testbed including special setup requests from various users
- 3. Support to new users
- 4. Provide ligison to national network of Testbeds
- 5. Increase the awareness among the possible users of the Testbed
- 6. Regular upgrades and enhancement of Testbed capabilities
- 7. Providing demonstrations to the other states and agencies.

WHAT IS OUR GOAL?

The end goal of this task is to have a fully functional Testbed with complete support to its users.

WHAT IS THE BENEFIT?

This Testbed will provide a platform for software developers who will be developing transportation applications that will help drivers in reducing travel times, saving fuel, and drive with augmented safety. Caltrans will be the primary beneficiary as the developed applications will help Caltrans to manage the traffic flows better while reducing the carbon footprint.

WHAT IS THE PROGRESS TO DATE?

January 1, 2025 – March 31, 2025

Task 1. Upgrade the Testbed to the New C-V2X Standard

The 22-intersection (16 regular + 6 HAWK) devices have been delivered to District 4 for hardware mounting. The firmware of RSUs have been upgraded.

PATH and District 4 engineers conducted an on-site observation regarding the following tasks:

- Checked if the facility components are complete for both the 16+6 intersections to be updated at Palo Alto and the 15 at Mountain View.
- Verified the status of the network connection in the cabinets.
- Identified the status of device activation, such as RSPs and RSUs, for both the old DSRC-only and DSRC C-V2X dual-mode intersections.

Task 2. Testbed Regular Maintenance including Special Setup Requests from CV Application **Developers**

A CV-Testbed website has been set up to show the status of the Testbed in real time for all the 31 intersections. But only 10 out of the 31 intersections are operating due to the preparation of the facility upgrade activity.

Task 3. Provide Technical Support to New Users

Provided support to District 4 engineers in resolving technical issues associated with the 2070 traffic controller, RSUs and RSPs.

No new user in this quarter.

Task 4. Provide Liaison to National Network of Testbeds

No activities in this quarter.

Task 5. Increase the Awareness among the Possible Users of the Testbed

No activities in this quarter.

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Task 6. Regular Upgrade and Enhancement of **Testbed Capabilities**

The new model of C-V2X RSUs without external antennas have been upgraded. The new RSUs will be installed and tested at ECR Testbed in November.

Task 7. Provide Demonstrations to Other States and Agencies

No activities in this quarter.

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