
Moving from R&D to Successful and Lasting Deployments

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**Division of Traffic
Operations**

Caltrans HQ

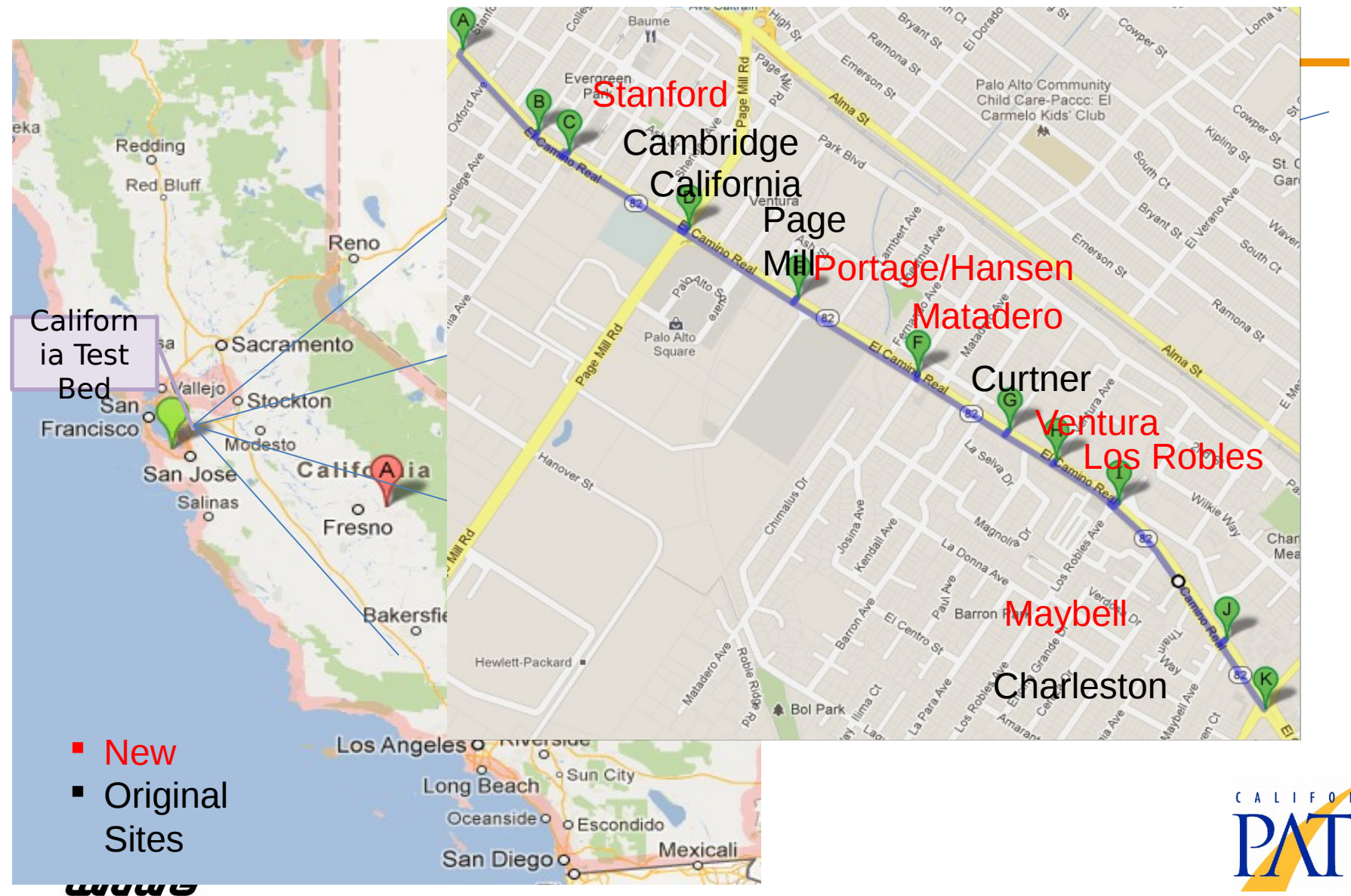


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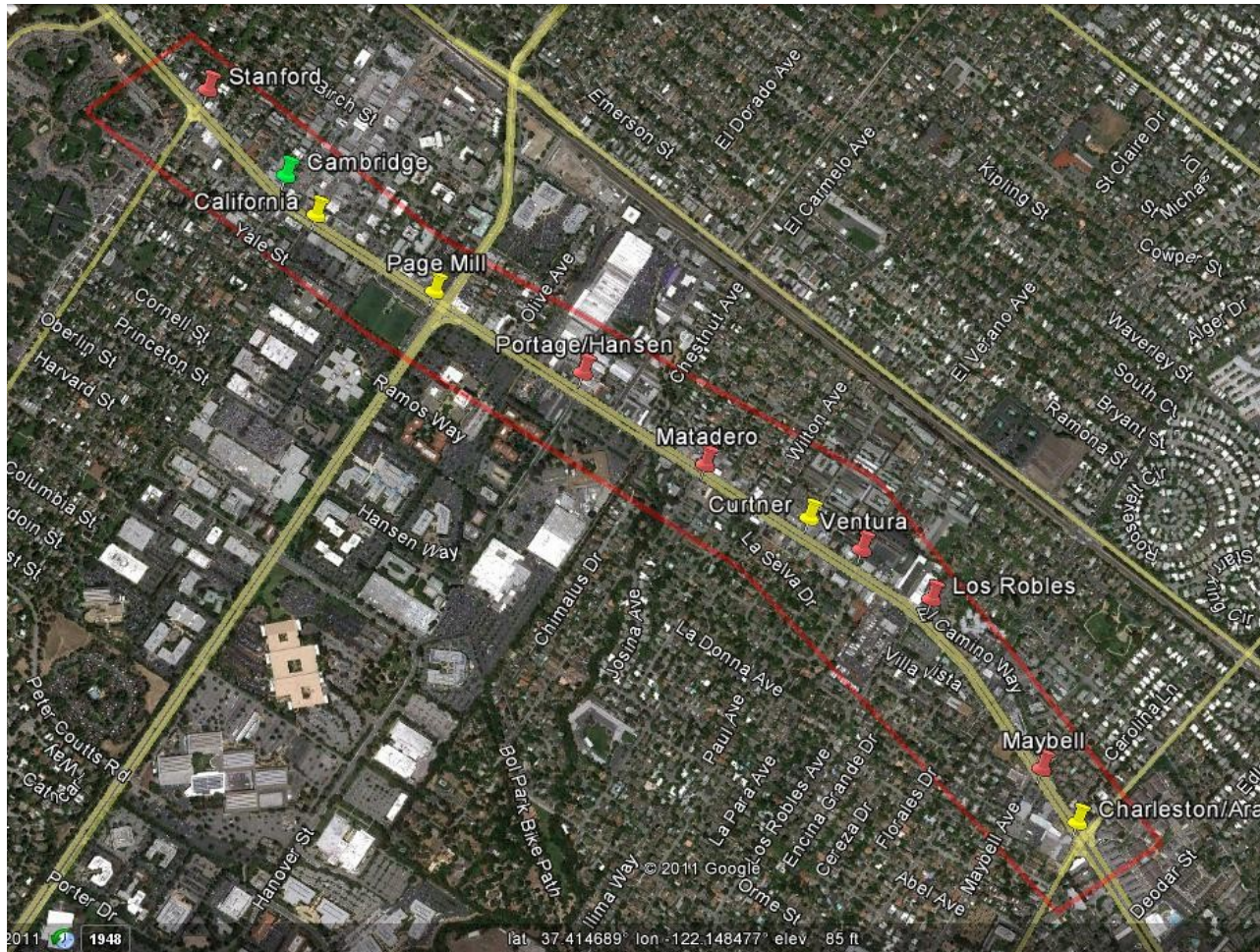
- California Connected Vehicle Test Bed
- MMITSS (Multi-Modal Intelligent Traffic Signal Systems)
- Adaptive Transit Signal Priority
- SPaT Challenge
- Standards
- Potpourri



California Connected Vehicle Test Bed



California Connected Vehicle Test Bed



1. Stanford
2. Cambridge
3. California
4. Page Mill
5. Portage/Hansen
6. Matadero
7. Curtner
8. Ventura
9. Los Robles
10. Maybell
11. Charleston

Example Installation



Actual Installation (Page Mill Road and El Camino Real)





Actual Installations



Front

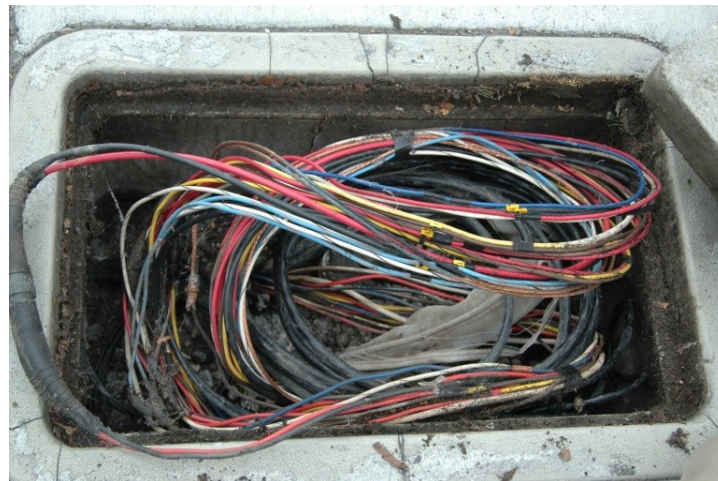
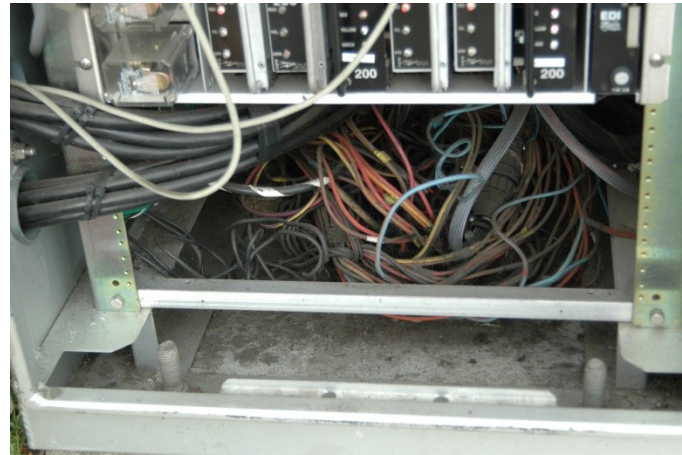


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Actual Installations



Actual Installations



MMITSS (Multi-Modal Intelligent Traffic Signal Systems)

- Funded through the Connected Vehicle Pooled Fund Study, led by Virginia DOT
- Additional funding from USDOT Dynamic Mobility Applications (DMA) program
- University of Arizona and University of California PATH Program
- Phase I: March 2012- June 2013 (Concept of Operations, System Requirements, Preliminary Design)
- Phase II: October 2013 – December 2015 (Implement, Test, Demonstrate, and Evaluate)

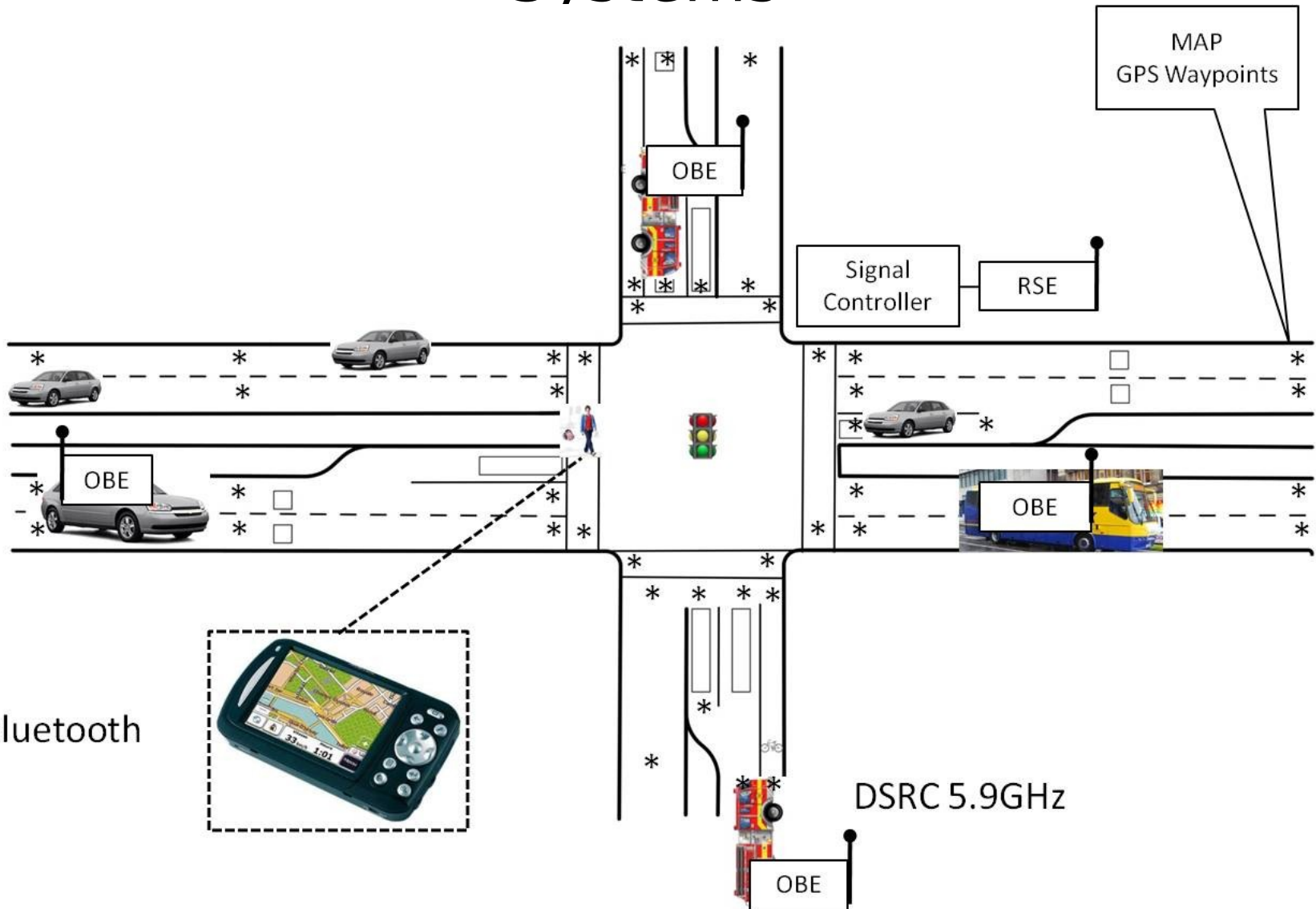


MMITSS Suite of Applications

- Intelligent Traffic Signal System (ISIG)
 - Signal actuation
 - Coordinated section of signals
 - Congestion control
- Emergency Vehicle Signal Preemption (EVP)
- Transit Signal Priority (TSP)
- Freight Signal Priority (FSP)
- Pedestrian Mobility



Multi-Modal Intelligent Traffic Signal Systems



Wifi,Bluetooth

DSRC 5.9GHz

PATH Software Development

- MMITSS signal priority applications are implemented with software developed by PATH
- Soft-call timing
 - Sends priority request call every 50 ms until either a cancel priority request is received or the priority phase has been terminated (for extended green) or has turned to green (for early green)
 - Sends vehicular phase actuation/extension call every 50 ms until either the vehicle has passed the intersection or the phase green has terminated

Status of California MMITSS Project

- The CA MMITSS signal priority and Intelligent Traffic Signal is built upon a signal priority algorithm
- The algorithm was thoroughly tested using 3G based communication network (emulating transit Advanced Communication System)
- MMITSS traffic and priority control software modules were developed and tested at the Richmond Field Station intersection
- Caltrans HQ Traffic Ops has modified 2070 TSCP software
- Field testing was conducted in October 2015; final demo held for FHWA in mid-November



Adaptive Transit Signal Priority

Improves on conventional TSP to provide:

- Reduced number of stops for red
- Reduced bus delay at intersections
- Reduced average waiting time per stop for red
- Reduced average bus travel time
- No statistically significant impacts on overall traffic intersection delays



The AASHTO SPaT Challenge

A challenge to achieve:

- Deployment of Signal Phase and Timing (SPaT) DSRC transmissions operating on a corridor of at least 20 intersections in 50 States by 2020
- Commitment to operate and maintain for at least 10 years

The AAHTO SPaT Challenge

Why would we do this?

- It will give DOTs an entry into V2I deployment and operations (valuable experience with procurement, installation, operations)
- It will help promote future (more advanced) V2I deployments
- It will show a commitment to OEMs that we intend to deploy

Possible Resources to be Developed

1. Guidelines for selecting corridors
2. Procurement guidance (specifications?)
3. DSRC licensing information
4. Installation guidance
5. Estimated costs (installation, operation, and maintenance)
6. Identification of existing funding sources that agencies may consider

Standards to Ensure Interoperability

Hardware and Physical Layers:

- IEEE 802.11p (frequency; bandwidth; channels)
- IEEE 1609.0-.4 (architecture; security)

Message Sets and Performance:

- SAE J2735 (DSRC\WAVE)
- SAE J2945/X

Communications between Roadside Systems:

Potpourri

- V2I Deployment Guidance from FHWA
- V2I Deployment Coalition (AASHTO, ITE, ITS America)
 - Red-Light Violation Warning
 - Reduced Speed in Work Zones
 - Eco-Approach and Departure
- DMV Automated Vehicle Regulations
- Transportation Funding

Discussion

For more information, please visit:
www.dot.ca.gov/research

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integrated, and efficient transportation system
to enhance California's economy and livability*

