DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

Travel Time Detector Installation and Integration on US 50 in District 3

Installing Bluetooth detectors to display travel times to destinations along US 50 on Caltrans' changeable message signs and Quick Map website.

Transportation Safety and Mobility

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Project Title:
Travel Time Detector Installation and Integration on US 50 in District 3

Task Number: 2839

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WHAT IS THE NEED?

This project was initiated in direct response to a request from the Tahoe Metropolitan Planning Organization and the City of South Lake Tahoe to improve traveler information for motorists in the South Lake Tahoe region planning to travel toward Sacramento. The city wanted visitors to make an informed decision when to begin their trip home along US 50. If estimated travel times back to the Sacramento area were lengthy, perhaps visitors would delay their departure and stay a few hours longer before heading home.

WHAT WAS OUR GOAL?

Improve traveler information for motorists in the South Lake Tahoe region by displaying accurate travel times to western destinations on US 50 on Caltrans' changeable message sings and Quick Map web site. Procure, install, configure and test detection devices capable of recognizing wireless transmissions from individual vehicles on the US Route 50 corridor. Process the time-stamped data, using the known distances between detectors, to determine average travel times between detector pairs. Integrate the travel time information into Caltrans' Performance Measurement System (PeMS) for subsequent processing by Caltrans' Advanced Transportation Management System (ATMS) software to compile and display travel time messages on changeable message signs along Route 50 and on Caltrans' Quick Map website.

WHAT DID WE DO?

Due to the rural nature of the US 50 corridor and the lack of conventional inductive loop based vehicle detection stations, determining travel times for this project required a new approach. The solution was to detect wireless transmissions from individual vehicles and re-identify them at various locations. In this case, Iteris Velocity Bluetooth signal readers were selected based on price, simplicity, and value-added software. Caltrans District 3 determined that 23 locations would yield enough data to accurately determine travel times. The Bluetooth reader devices were installed in existing facilities along US 50. Site selection was based on the requirement that they have existing power and communications and that they be less than 100 meters from the roadway in order to be in range of the Bluetooth transmissions.

District 3 staff carefully engineered the installation of the Bluetooth reader system, which consists of the Iteris Bluetooth detector unit, a radio transmission device, an RF cable and an antenna. A simple, yet elegant mount was developed to attach to the antenna a standard 334 cabinet utilizing the existing holes left by removing one of the lifting eyelets. This required that only one small hole be drilled through which to pass the RF cable. The installations used a version of the Iteris detector designed to plug into the input file and receive DC power from the backplane.

District 3 staff configured communications from the Iteris field devices to the Caltrans District 3 Traffic Management Center using the existing Field Element Network, which uses many different backhaul methods to home the data. These methods include fiber, cellular radio, microwave, frame relay and DSL.

In order to compute average travel times from the Bluetooth reader data, District 3 staff installed and configured Iteris Velocity server software on an HP Proliant clustered virtual environment running on Windows 2008 server with Internet Information Services, along with Microsoft .NET Framework.

Working with consultants, District 3 staff wrote a new module for the Advanced Transportation Management System (ATMS) software that receives the computed average travel times between all consecutive pairs of Bluetooth readers from the Iteris Velocity server. It then sums all the travel times to generate the total segment travel time.

It also performs various checks to eliminate anomalous travel times that can be caused by too few samples or communications failures. Finally, it compiles the travel time messages and transmits them to the changeable message signs in the field and to the Quick Map web server.

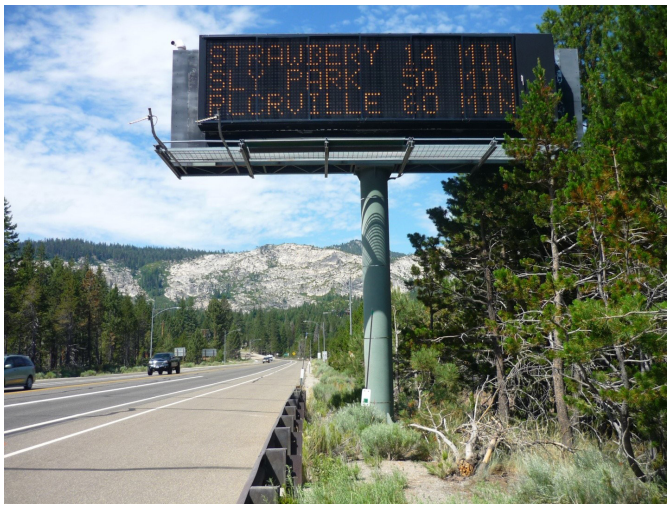
WHAT WAS THE OUTCOME?

As is evident from this project, detection of wireless transmissions from individual vehicles, in this case from MAC addresses transmitted from Bluetooth devices, can be an effective way to determine travel times in rural areas that lack inductive loop detection infrastructure. Detectors of Bluetooth, as well as “WiFi,” i.e. IEEE 802.11 wireless local area network, transmissions are commercially available. As was the case in this project, vendors often include software to interpret data from the field detectors into useful travel time information.

The system has been in continuous operation since it was turned on and has generally performed very well. The number of detector to detector matches that have been seen, and hence the number of true travel times available to display, has been satisfactory considering the volume of traffic along westbound US 50 through El Dorado County.

WHAT IS THE BENEFIT?

Motorists can usually see what their travel times will be from the changeable message signs as they head west toward Sacramento from South Lake Tahoe. They can also check real time travel times on the Caltrans Quick Map website before deciding to leave. The City of South Lake Tahoe has responded favorably to the travel time displays, and District 3 has received several positive comments from the public.



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