

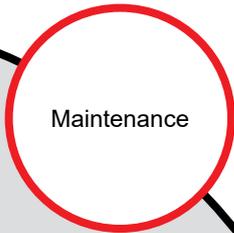


Caltrans Division of Research,  
Innovation and System Information

# Research



# Results



Maintenance

## MAY 2019

**Project Title:**

Mobile Real-Time Information System for Snow Fighter Supervisors- System Design and Test

**Task Number:** 2299

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## Mobile Real-Time Information System for Snow Fighter Supervisors- System Design and Test

Research cost-effective and reliable communications in challenging environments. The target application is communications between Caltrans snowplows and supervisor vehicles.

### WHAT IS THE NEED?

Snow removal operations (also referred to as snow fighting or winter maintenance) are an important maintenance activity for Caltrans. It often must be done in communications-challenged areas. Snow fighting, for all but routine storms, is an unplanned incident requiring careful resource management and clear communications to effectively respond. As such, snow fighting has high communications and resource management requirements, but occurs in communications-challenged or deprived areas. There is a need for a mobile communications system that can meet these requirements under these challenging constraints.

### WHAT WAS OUR GOAL?

The primary goal of this research project was to investigate cost-effective and reliable communications in challenging environments. The target application is communications between Caltrans snowplows and supervisor vehicles.

### WHAT DID WE DO?

Caltrans Division of Research, Innovation and Systems Information in partnership with the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center at UC Davis investigated cost-effective and reliable communications to assist Caltrans snow fighting activities. This included information to support situational awareness for snowplow operators and the supervisor, sensor data (e.g. snowplow location history, air and road temperature, plow blade



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up or down, and spreader on or off), and any coordinating information from the supervisor to the operators. This sensor data was provided by a prototype Mobile Real-Time Information System (MRTIS), which was developed under a previous research project between DRISI and AHMCT.

The target application for this research was communications between Caltrans snowplows and supervisor vehicles. Messaging and mapping applications were designed based on a store-and-forward architecture to address intermittent data communications. The sensing information would be passed between vehicles, and displayed as vehicle state in the mapping application. The research included migrating from a personal computer-based (PC-based) MRTIS system to appropriate current technology, specifically using an Android-based tablet as the user interface, also called the Human Machine Interface (HMI). This effort included development of targeted apps to provide the needed functionality. To clarify the need for the system, the researchers also surveyed and mapped all Caltrans snow-affected routes to determine cellular signal coverage. The detailed communications coverage maps generated from the survey influenced the subsequent system design update.

The research task evolved significantly in April 2014. Caltrans Maintenance began investigating commercial off-the-shelf (COTS) systems to see if they could realize a sufficient subset of the capabilities that would be provided by MRTIS. At this time, all development on MRTIS was halted.

AHMCT along with Caltrans held discussions with two different commercial vendors on possible solutions to providing data similar to what the MRTIS system would provide. One of the vendors was Delcan (now owned by Parsons) and the other vendor was Networkfleet (now owned by Verizon). The Delcan system would be able to provide more

information than the Networkfleet system, but the Networkfleet system was cheaper, and Caltrans was already working with Networkfleet to install their systems on heavy fleet vehicles.

Based on identified needs of Caltrans Maintenance, system capabilities, and system cost, Caltrans began pursuing a pilot study with Verizon. This decision was at least in part based on an anticipated easy integration with the Verizon/ Networkfleet system already being installed on the Caltrans heavy fleet vehicles. Since the Verizon/ Networkfleet system has limited data gathering abilities compared to some other systems (both COTS and AHMCT-developed), Caltrans is also considering a separate future pilot study of the Delcan system. Both of these pilot studies would start after the end of the current research effort.

## WHAT WAS THE OUTCOME?

The original direction of this research changed during the middle of the task. Caltrans decided that the technology for mobile data collection has matured to the point where research into development is no longer needed. Any future work in this area would include evaluation of a commercially available mobile data collection system.

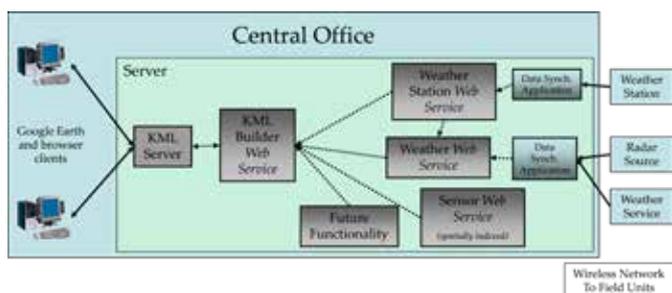
## WHAT IS THE BENEFIT?

Real-time weather data as well as accurate snowplow location can provide snow fighter supervisors in the field with more information to make better decisions. Around-the-clock access to this crucial information and the supervisor's ability to stay in the field longer can improve resource allocation decisions, enhance efficiency, increase safety, minimize environmental impact, and enhance the Caltrans work environment.

## LEARN MORE

Final report can be found at:

<http://ahmct.ucdavis.edu/pdf/UCD-ARR-15-09-30-07.pdf>



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