



# OKLAHOMA Transportation RESEARCH

## PROJECT TITLE

IMPROVING THE EFFICIENCY  
AND ACCURACY OF ODOT  
TEMPORARY TRAFFIC  
MONITORING SYSTEM

FINAL REPORT ~  
FHWA-OK-19-02  
ODOT SP&R 2301

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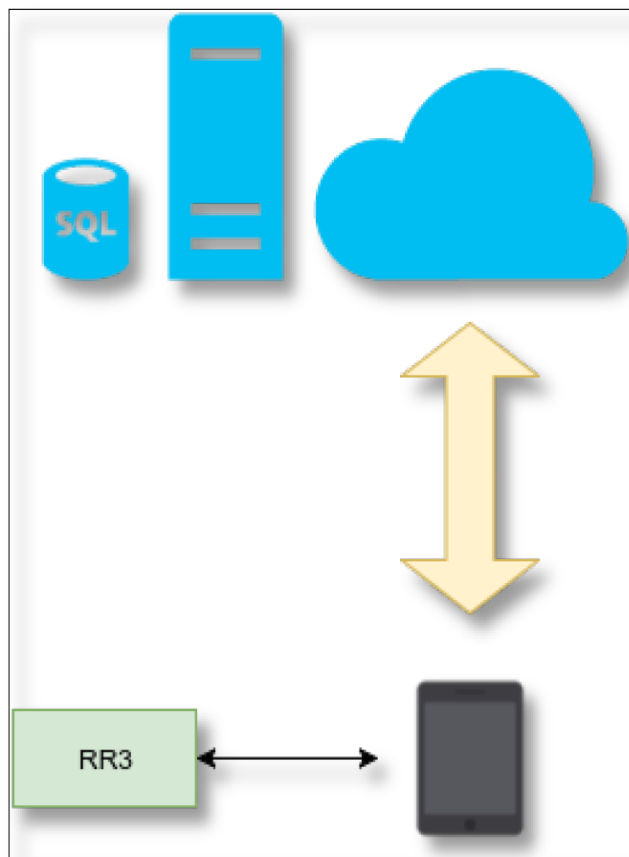
# HIGHLIGHTER

## IMPROVING THE EFFICIENCY AND ACCURACY OF ODOT TEMPORARY TRAFFIC MONITORING SYSTEM

September 2020

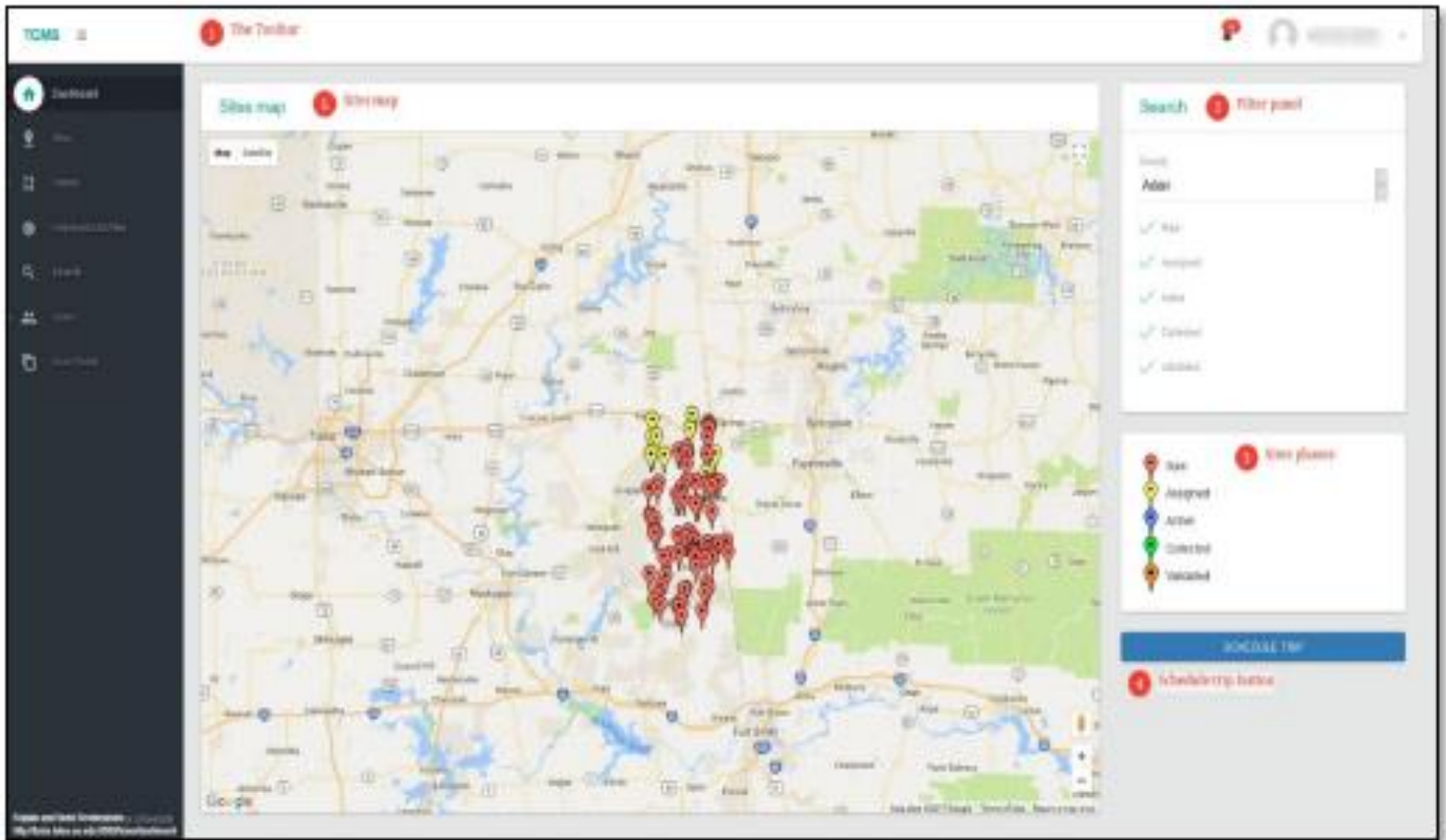
**OVERVIEW** Vehicle detection, counting, and classification are keys for not only improving road design and maintenance, but also driver safety. For many years, agencies have used manual processes to collect and log temporary vehicle data (i.e., vehicle count, site information, device used, collection date and time, ODOT operator, and other vital information) into a computer database. This process is slow and inefficient. Furthermore, mistakes in data entry are likely throughout the arduous process.

**RESULTS** The system detailed in this project replaces manual data handling with machine handling, eliminating possible errors in data recording and/or entry. This automated system (architecture, illustrated right) collects temporary vehicle data (e.g., count, speed, vehicle classification based on axles, collection date, time, etc.). The framework is composed of three main components: 1) an inexpensive portable sensor for counting and classifying vehicles; 2) an Android app to easily calibrate and configure the sensor on-site and obtain collected sensor data; and 3) a server that leverages wireless communication and



cloud technology for processing, storing, and presenting data. A first-phase system was deployed and tested by Oklahoma Department of Transportation in 2017. A project extension was done for further system development and debugging where its functionality was validated. The two-year extension includes server improvement, maintenance, and support for the Traffic Counting and Monitoring System web service and Android application.

Specifically, the final report introduces the use of Diamond Traffic Inc.'s vehicle classification Road Runner 3 (RR3) as a portable and inexpensive replacement for the ADR1000 vehicle counting device that ODOT used for many prior years. The extension of this project added several objectives, including web server and Android application support for Traffic Counting and Monitoring System (TCMS, illustrated below).



Furthermore, the possibility of leveraging wireless communication and replacing cabled connection for data was investigated. Various data mining techniques were developed for data validation purposes and to evaluate deployment success. An Android app was designed to provide an easy way to program and configure RR3 units on the fly. A back-end server was setup at the University of Oklahoma–Tulsa campus where data is stored, processed and monitored. A new set of algorithms operated on the back-end server for decrypting, processing, extract counting, and/or classifying data from RR3 binary output files.

The algorithms also validate data collection based on historical data and track successful/unsuccessful deployment. Finally, a TCMS web service was created to display processed data in a format requested by the ODOT administration board to aid in the decision-making process. The system was successfully tested at various Tulsa sites while debugging and system development continued. The resulting upgrades developed and tested during the extension period were also successful. This project including the development of Android application, Bluetooth wireless interface to RR3, and server website interface was accomplished in collaboration with Innovative Traffic Systems & Solutions, LLC.

**POTENTIAL BENEFITS** This project provides a framework that automates most tasks required for counting and classifying vehicles. Given that the proposed wireless interface is fully developed and integrated into the framework, operation time will be reduced, and the collection process will be simplified. ODOT administrative and managerial tasks can be positively affected by applying additional data mining and machine-learning techniques to various collected data.