Crowdsourcing for Operations Case Study

Indiana Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

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Indiana's Crowdsourcing Journey

The Indiana Department of Transportation (INDOT) applies vehicle probe data to better operate every freeway facility in the State and over 200 miles of arterial facilities. INDOT first purchased probe data in 2011 to actively manage a major Interstate closure.

Through a partnership with Purdue University, INDOT developed and applied a suite of Web-enabled tools and performance dashboards using INRIX® probe data. These tools help INDOT improve the management of incidents, work zones, snow and ice operations, and signal timing. They also support capital project selection and planning efforts. The tools are open source, meaning they are available to acquire, enhance, and deploy without a fee.

Probe Data Verification and Storage

INDOT and Purdue University evaluated probe data from multiple vendors. They verified the reasonableness of probe data latency and accuracy by driving empty routes at night with multiple cell phones in a vehicle, comparing vehicle global positioning system (GPS) speed against probe data to confirm data usefulness.

INDOT now collects data on 6,659 Interstate and 34,829 non-Interstate segments, totaling 59.7 million records per day. INDOT stores over 21 terabytes (TB) of historic data, and annually adds approximately 3.6 TB of data. Its one-time cost for 64 TB of data storage was approximately $110,000. INDOT manages the probe data in PostgreSQL, an open-source database.

Efficient Field Device and Probe Data Strategy

With confidence in probe data, INDOT is retiring field detector devices and expects to remove approximately 50 percent of its roadside equipment sites. INDOT will continue to maintain roadside equipment at interchanges to capture traffic volume data, which is not available in probe data sets. This blend of probe and field device use reduces overall cost while expanding operational monitoring for INDOT.

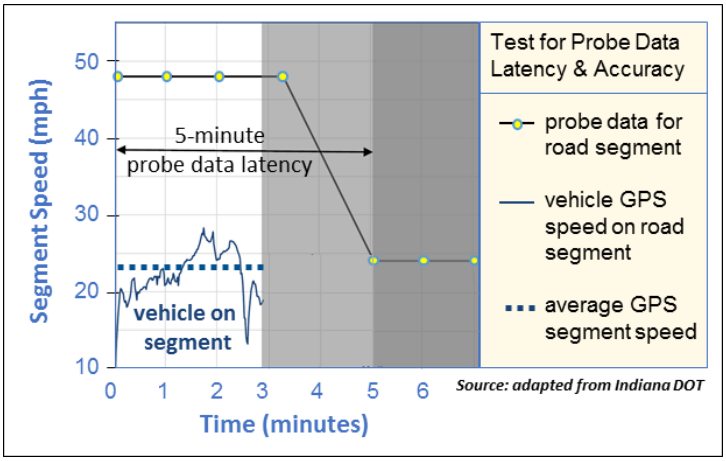

Figure 1. Chart. Data measuring probe data latency and accuracy.
(Source: Adapted from Indiana Department of Transportation.)

Delta Speed Tool for Incident Management

INDOT's Delta Speed tool provides an interactive map with an ordered list of adjoining road segments with the greatest speed difference. The map presents color dots reflecting the severity and location of speed differentials, signifying the end of a traffic queue. The tool offers filtering by route, mile marker, current work zone activities, and State patrol boundaries.

The Delta Speed tool helps INDOT Traffic Management Center (TMC) operators and law enforcement identify potential incident locations for quicker response.

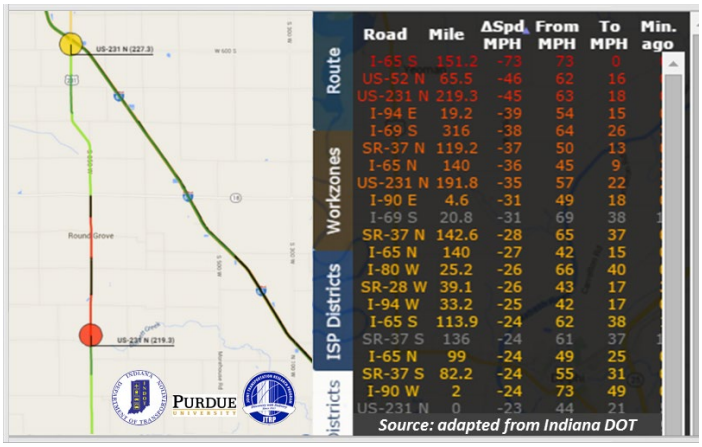

Figure 2. Screenshot. Indiana Department of Transportation's Delta Speed tool. (Source: Adapted from INDOT.)

Traffic Ticker Tool Guides Operational Changes

The Traffic Ticker tool graphs the miles between selected Interstate facilities within varied speed ranges. Users can specify speed thresholds, date ranges, directional routes, and districts to generate graphs.

The tool helps target and fine tune operational changes. For example, when an unplanned bridge closure diverted 35,000 daily vehicles from I-65N near Lafayette to capacity-constrained, single-lane rural roads, operators quickly identified and mitigated severe delays through quick signals installation at four-way stops, mobile message signs placement, and more. The Traffic Ticker tool helped operators reduce the detour route travel time from four hours to a single hour within five days.

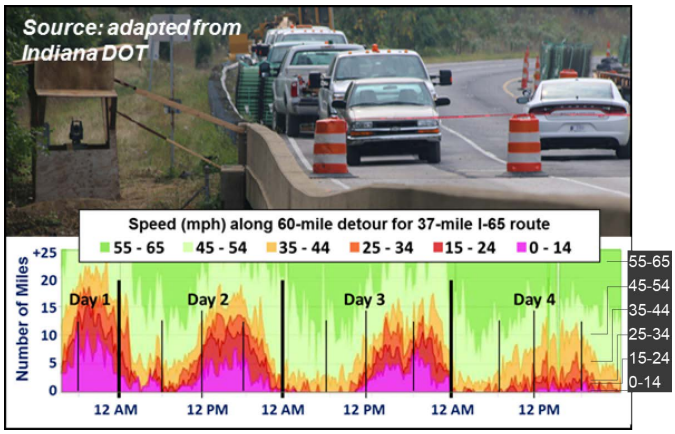

Figure 3. Chart. I-65 bridge closure and detour route speed visualization from Indiana Department of Transportation's Traffic Ticker tool. (Source: Adapted from INDOT.)

More Tools Deliver Greater Probe Data Value

One significant INDOT tool integrates probe and traffic flow data to estimate freeway delay and rank the slowest interchanges. This data helps INDOT make informed investments in capital projects. Another tool computes arterial travel times to help INDOT conduct quick before-and-after studies of signal timing changes to confirm improvements by quantifying and monetizing travel time and emissions savings.

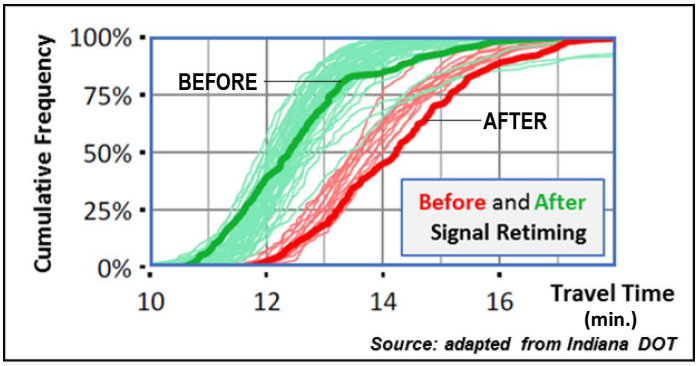

Figure 4. Chart. Probe data before and after signal retiming. (Source: Adapted from INDOT.)

Moving forward, INDOT will use probe data to expand the use of dynamic message signs to provide travel times to drivers. It also plans to use this data to introduce variable speed limit and ramp metering strategies along the southeastern section of I-465.

References

McNamara, M.; Li, H.; Remias, S.; Horton, D.; Cox, E.; and D. Bullock. "Real-Time Probe Data Dashboards for Interstate Performance Monitoring During Winter Weather and Incidents" (2016). Lyles School of Civil Engineering Faculty Publications. http://docs.lib.purdue.edu/civeng/20.

Indiana DOT presentation at the FHWA EDC-5 Vehicle Probe Peer Exchange. March 2020.

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