Abstract
The Indiana Department of Transportation (INDOT) manages over 1800 centerline miles of interstate that can be profoundly impacted by weather, crashes, and construction. Real-time performance measurement of interstate speeds is critical for successful traffic operations management. Agency managers and Traffic Management Center decision makers need situational awareness of the network and the ability to identify irregularities at a glance in order to manage resources and respond to media queries. One way to access this level of detail is crowdsourced probe vehicle data. Crowdsourced probe vehicle data can be obtained by collecting speed data from cell phones and GPS devices. In Indiana, approximately 2673 predefined interstate segments are used to generate over 3.8 million speed records per day. These data can be overwhelming without efficient procedures to reduce and aggregate both spatially and temporally. This work introduces a spatial and temporal aggregation model and an accompanying real-time dashboard to characterize the current and past congestion history of interstate roadways. The primary high level view of the aggregated data resembles a stock ticker and is called the "Traffic Ticker." The data archive allows for after-action review of major events such as ice storms, major crashes, and construction work zones.

Crowdsourced Probe Vehicle Data
The crowdsourced probe vehicle data are obtained from a third-party vendor and are calculated from GPS locations and headings of cell phones and similar devices. Speeds are reported each minute for a segment. For analysis, the median of each fifteen-minute bin is used.

Winter Weather
Winter storms disrupt travel due to low visibility and unsafe roads due to snow and ice. The graph at right shows Jan.-Mar. of 2015. Callout i shows normal congestion of around 20 miles, and callouts ii, iii, and iv show three large winter storms that all affected different parts of the state.

Over February 1 and 2, 2015, a winter storm swept across the upper half of the state, with snow depths as high as 17 inches in the northern two districts, Lagrange and Fort Wayne, on the morning of the 2nd. Storm-related congestion had largely subsided by noon on Feb. 2nd.

Traffic Ticker
http://tinyurl.com/trafficticker

Traffic Ticker for Fort Wayne (shown in black) shows magnitude but not location of congestion. The dashboard at left provides drill-down capability from Traffic Ticker to show spatial distribution.

The longitudinal speed profile for a given road is accessed by clicking on the roadway graph in Traffic Ticker. Here, the congestion on I-69 in Fort Wayne during the two days of the snowstorm was primarily on Northbound from MM 285 to 257.

I-70 Crash
On April 21st at 1750, a crash on I-70 W in the Crawfordsville district caused a queue of two miles. At 1830, a secondary crash occurred at the back of the queue, causing a truck fire and closing the interstate.

Detour Route: Signs and Signals

The route of the detour is shown at right, with traffic diverting onto US-52 at Lebanon and following SR-28 to US-231 back to I-65 N.
- Temporary signals were installed at
  - US-52 and SR-28
  - SR-28 and US-231
  - US-52 & SR 47
- The four-way stop at US-231 and SR-18 was also converted to a two-way stop
- The balloons mark the location of
  - 15 dynamic message signs (DMS)
  - 40 trailblazing signs, and
  - 19 others (traffic light warning signs, work zone warnings, etc.).

Dynamic Message Sign (DMS) Trailblazing Other

Congestion Profile on Detour Route from Aug. 7 to Sep. 7

Separating fact from fiction: Using data to tell the real story of the detour

Traffic Ticker

Five phases of Detour Route Management:
1. Identification of Diversion Route
2. Trailblazing
3. Temporary Signals and Flasher changes
4. Optimization of Signal Timing
5. Incident Management

First 9 days of closure

Severe congestion (~15 mph) eliminated

Coordination with Public Safety

ISP changes SR-18 from 4-way to 2-way stop and 90 minutes later, queue is cleared.

Stop

Stopped traffic is mitigated – fewer long queues

Detour Route segments, colored to match graph

Additional information about the application of the Traffic Ticker during the I-65 N Detour, Aug. 2015, is available in the Journal of Transportation, pp. 32-37, December 2015.