Center for Accelerating Innovation

U.S. Department of Transportation
Federal Highway Administration

On-Ramp to Innovation
every day counts

Use of Crowdsourcing to Advance Operations

Source: Idea SV, El Salvador Milonario

How often is the “ask the audience” life line correct in the game show “Who Wants to be a Millionaire”?

A: 95% of the time

B: 50% of the time

C: 30% of the time

D: 75% of the time

Today's Webinar Topics & Presenters

EDC-5, Operations & Crowdsourcing: *An Overview*
James Colyar, Transportation Specialist
FHWA Office of Operations

Crowdsourcing for Operations: *Opportunities & Considerations*
Greg Jones, Transportation Specialist
FHWA Office of Operations & Resource Center

UDOT Citizen Reporter Program
Lisa Miller, Traveler Information Manager
Utah Department of Transportation

Managing Traffic with Probe Data
Edward Cox, Engineering Director of Traffic Management
Indiana Department of Transportation

Incident Detection and After-Action Reviews
Chris Lambert, Systems Consultant for ITS
Kentucky Transportation Cabinet

Source: Unsplash

EDC-5, Operations & Crowdsourcing

An Overview

What is *"Every Day Counts"*(EDC)?

State-based model to identify and rapidly deploy proven but underutilized innovations to:

- ✓ shorten the project delivery process
- ✓ enhance roadway safety
- ✓ reduce congestion
- ✓ improve environmental sustainability

- EDC Rounds: two year cycles
- Initiating 5th Round (2019-2020) - 10 innovations
- To date: 4 Rounds, over 40 innovations

For more information: https://www.fhwa.dot.gov/innovation/

FAST Act, Sec.1444

Transportation Systems Management and Operations (TSMO)

- Optimizing use of existing facilities.
- Maximizing performance of the system.
- Buying the most mobility for the least cost.
- Treating capacity as an asset to manage.
- Getting you there – people and goods.
- Targeted solutions to congestion causes.
- Complement to capacity projects.
- Approaches to match demand to supply.

Effective operations is built on a foundation of monitoring current conditions.

Real-Time Monitoring: A Weakness in the Foundation of Operations

There are 4 primary limitations in our typical approach to real-time monitoring:

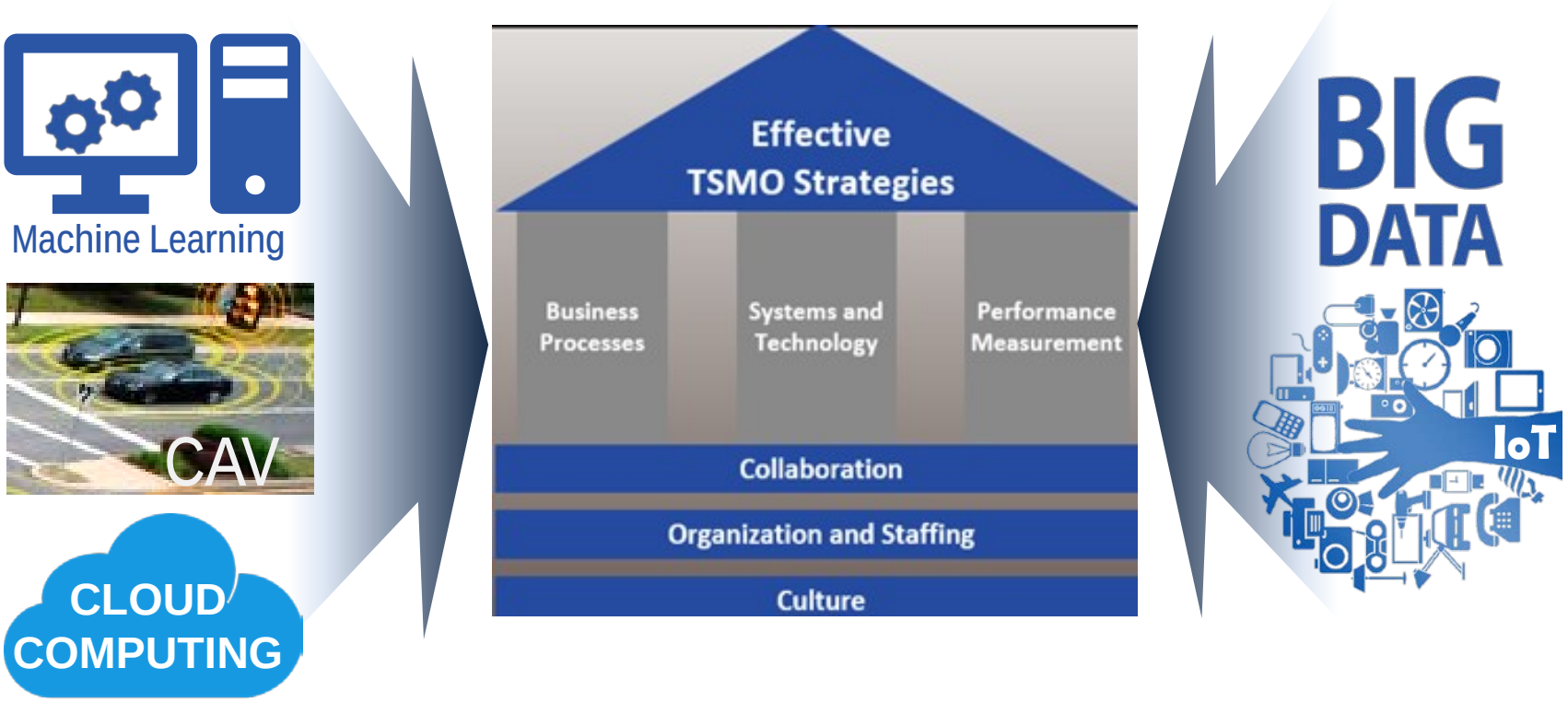
1. Big gaps in geographic coverage.
2. Lags in timeliness of information.
3. Cost to build-out and maintain field equipment.
4. Jurisdictional stovepipes.

Source: FHWA

These limitations reduce the ability to efficiently and (cost) effectively operate the system.

What's New for Operations?

Cheaper, accessible, monitoring, processing, and use of real-time data.



Source: Adapted from FHWA

Crowdsourcing: A Potential Solution

When integrated with an agency's existing efforts, crowdsourcing helps agencies:

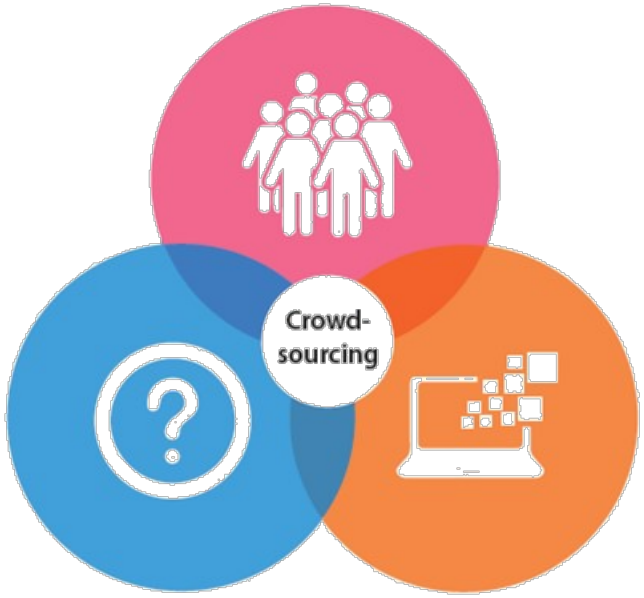
- Expand geographic coverage and resolution.
- Reduce information time lags for improved real-time situational awareness.
- Reduce dependence on and cost associated with roadside sensors and systems.
- Overcome jurisdictional stovepipes.
- Implement proactive operations strategies.

Crowdsourcing is a proven lower-cost solution to improving safety and operations.

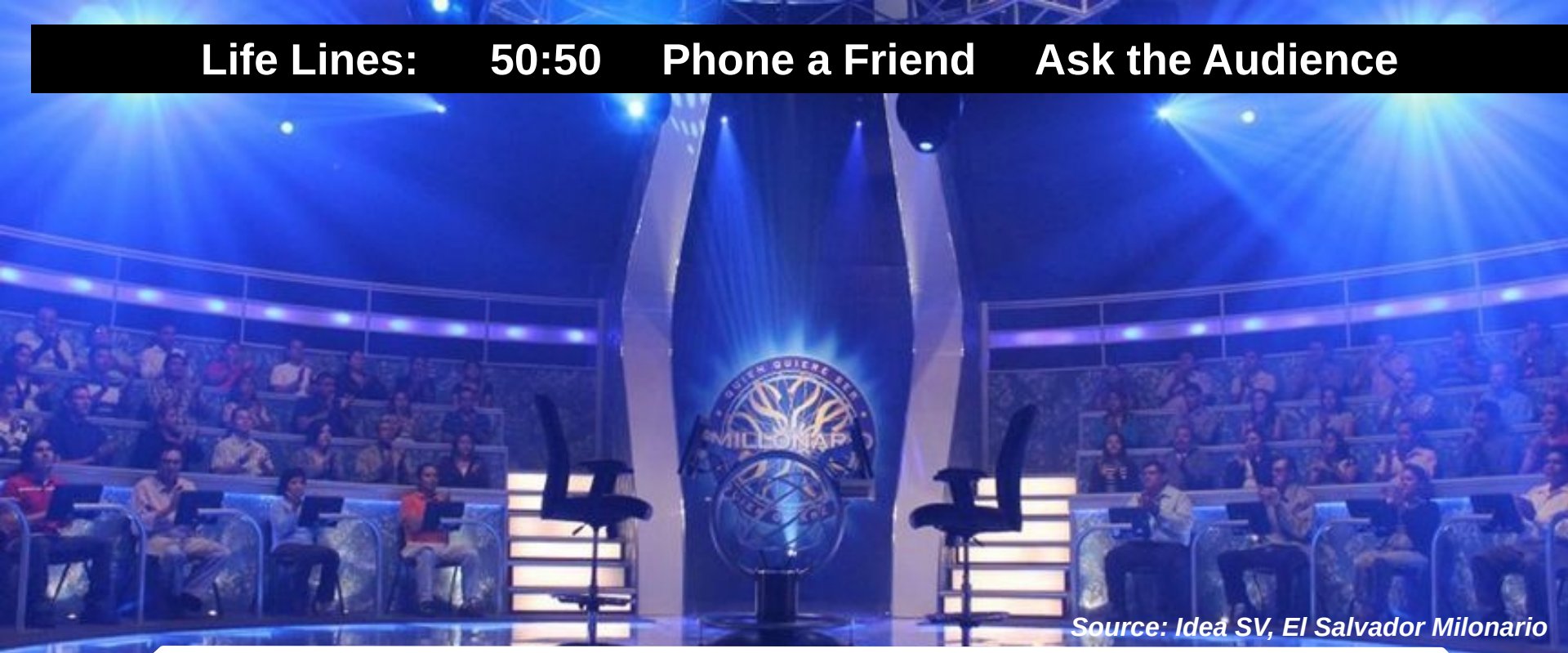
What Exactly is Crowdsourcing?

Crowdsourcing is the practice of addressing a need or problem by enlisting the services of a large number of people via technologies. Crowdsourcing:

- ✓ Addresses a need or problem outside of an organization's resources or means by distributing the workload across a large group of people.
- ✓ Leverages the collective wisdom and unique insights of a crowd.
- ✓ Uses technology and new forms of communication and interaction to document, share, and reflect on the world.



Life Lines: 50:50 Phone a Friend Ask the Audience



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Crowdsourcing Examples

Source: K W Reinsch

1906: UK Weight Judging Competition

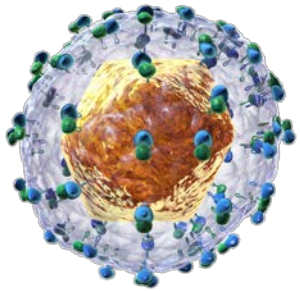
- British scientist held competition @ Fat Stock & Poultry Exhibition.
- 787 took part in steer weight-guessing contest.
- Average 2 lbs. off; best guess 10 lbs. off.


Source: Pixabay

1995: Amazon Reviews

- Customers offer reviews & comment/vote on others' reviews.
- Rating, based on machine learning, and affect product visibility.
- Reports of review tampering surfaced in 2004.

Crowdsourcing Examples



Source: Bruce Blaus

2000: Folding@home, Stanford University

- Volunteers allow use of their computers' idle processing power to simulate protein folding and drug design.
- 2M sign-ups = 5th most powerful computer in the world.
- Enables research into Alzheimer's, Cancer, & more.

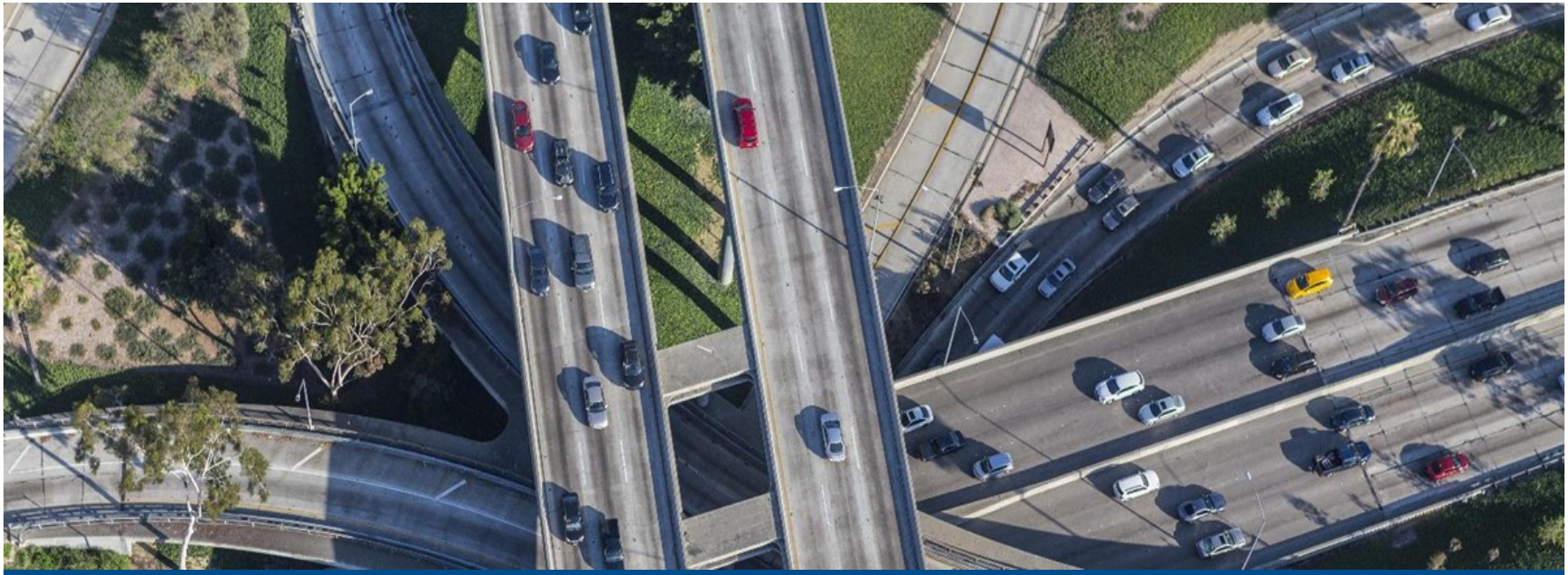
2008: Lego Ideas

- Users post their ideas for potential Lego products.
- If an idea generates 10,000 views within a year, it qualifies for review by Lego.
- A user with a successful idea launch is entitled to 1% of the product's revenues.

Source: Unsplash

Crowdsourcing is Everywhere

- Airbnb
- Best Buy
- Citizenscience.gov (GSA)
- Department of Defense
- Eucrowd (EU)
- Facebook
- Federal Bureau of Investigation
- General Electric
- Google
- Harley Davidson
- Kraft Foods
- Lego
- Mattel
- McDonalds
- Microsoft
- NASA
- Netflix
- New York City Simplicity
- Paypal
- Procter & Gamble
- Sony
- Starbucks
- Wikipedia

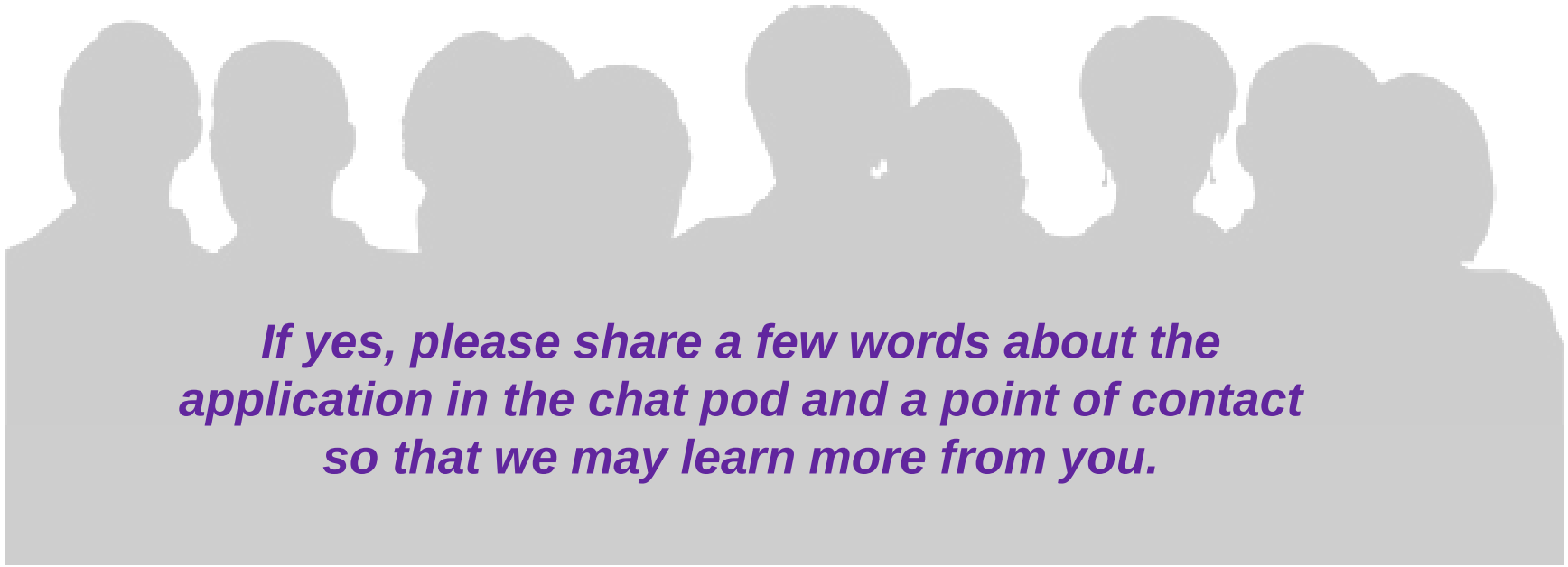


Source: Shutterstock

Crowdsourcing for Operations

POLL THE AUDIENCE

Is your region or State currently leveraging crowdsourcing for transportation operations?



If yes, please share a few words about the application in the chat pod and a point of contact so that we may learn more from you.

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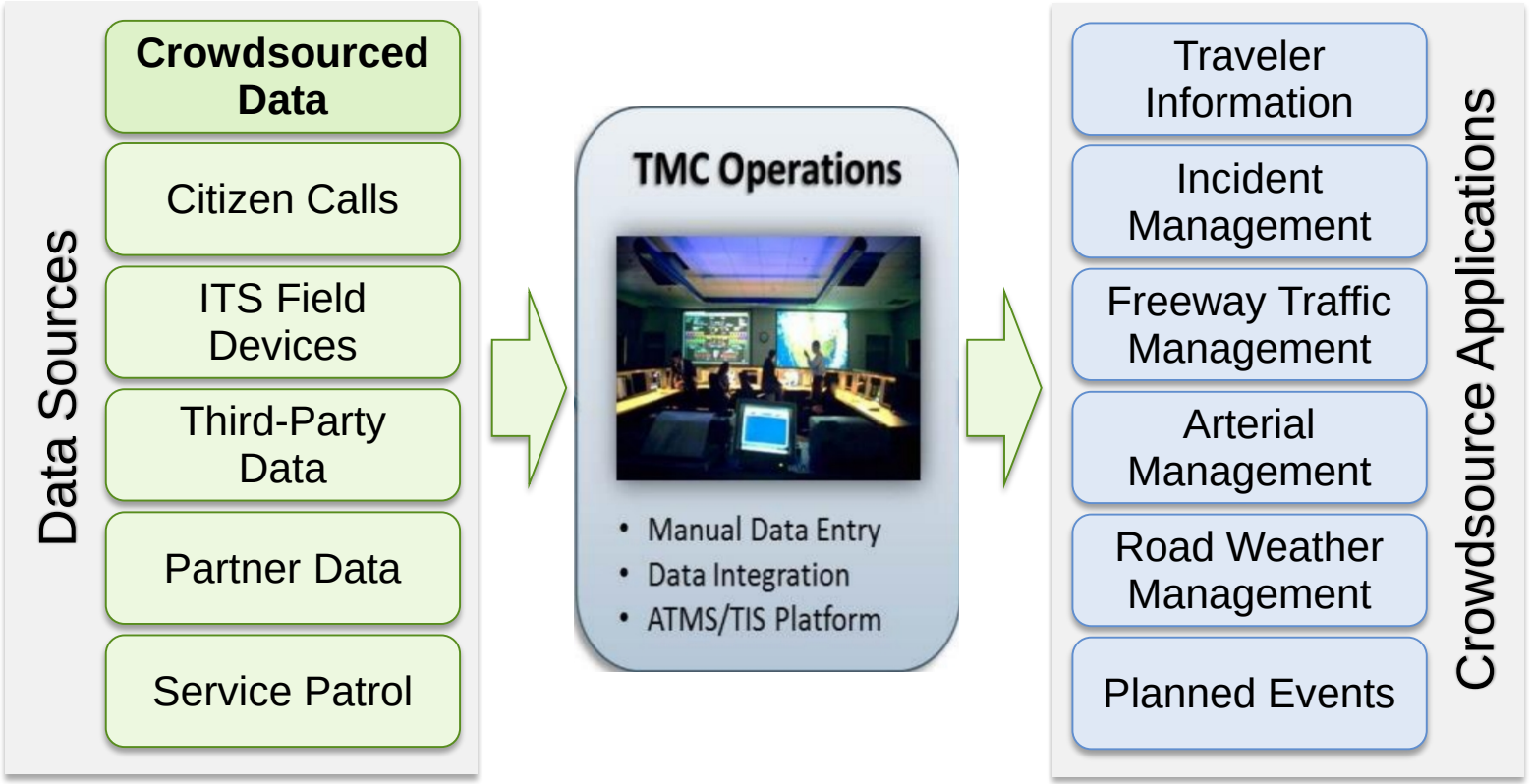
Question & Answer from Chat Box

Existing and Potential Crowdsourcing Applications in Transportation



Other possible applications include freight management, work zone management, and performance assessment and reporting.

Sources of Crowdsourced Data

- Data extracted from social media platforms.
- Data acquired from third-party crowdsourced data.
- Data collected from specially-developed mobile apps.

Source: Pixabay

Crowdsourcing – Opportunities for Advancing Operations

Crowdsourcing benefits Transportation Operations:

- Expands & improves real-time monitoring
- Enables more targeted and timely response
- Enables strategic / programmatic operational improvements

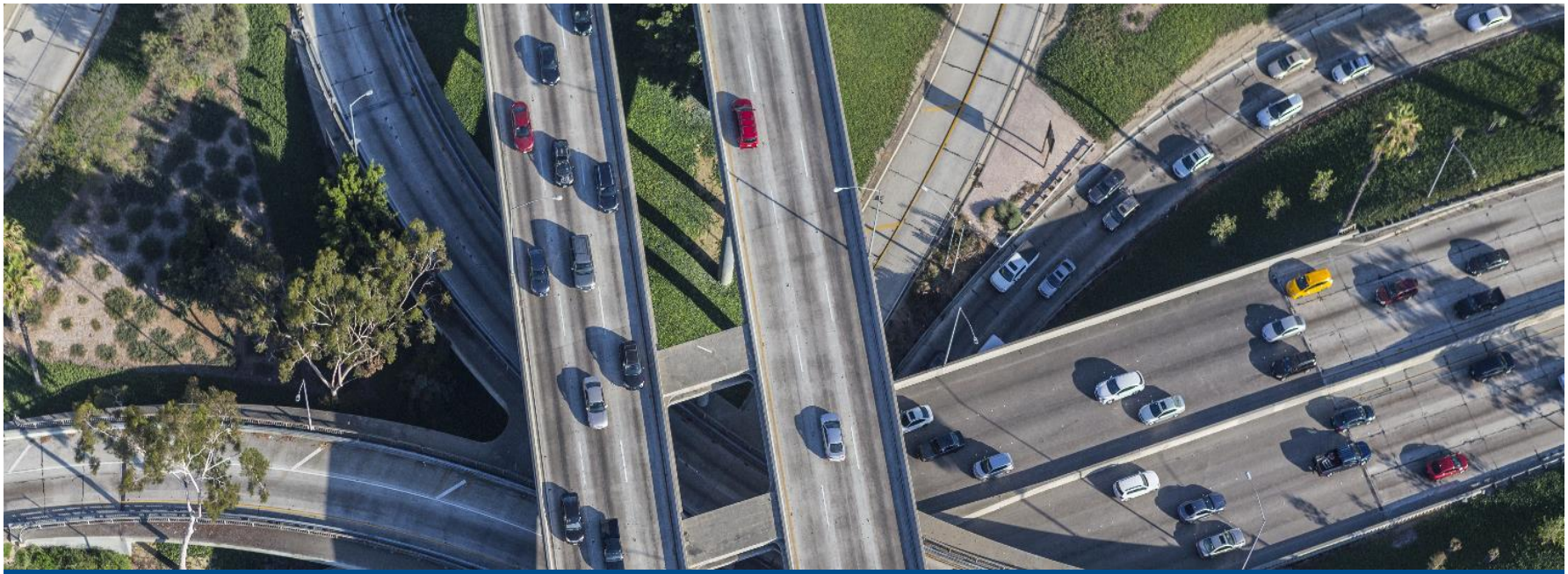
Benefits beyond Transportation Systems…

- Promotes legitimization & acceptance of public decisions.
- Improves transparency & efficiency of public expenditures.
- Promotes a sense of community & greater citizen satisfaction.

Crowdsourcing Considerations

Source: Adapted from Unsplash

- Understanding your current operational gaps or needs.
- Understand nature of data - it may be different in focus, quality, processing, and management.
- Address policy, legal, or data ownership hurdles.
- Funding / procurement for non-traditional tools and services.
- Grow technical skills and architecture approaches.



Source: Shutterstock

Crowdsourcing for Operations Case Studies

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UDOT Citizen Reporter Program

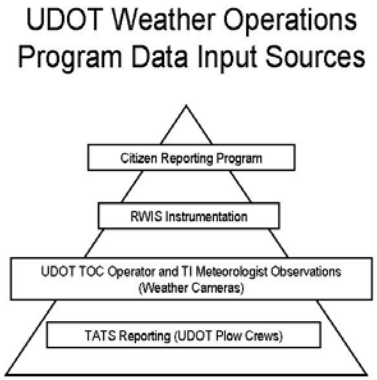
Lisa Miller
Traveler Information Manager

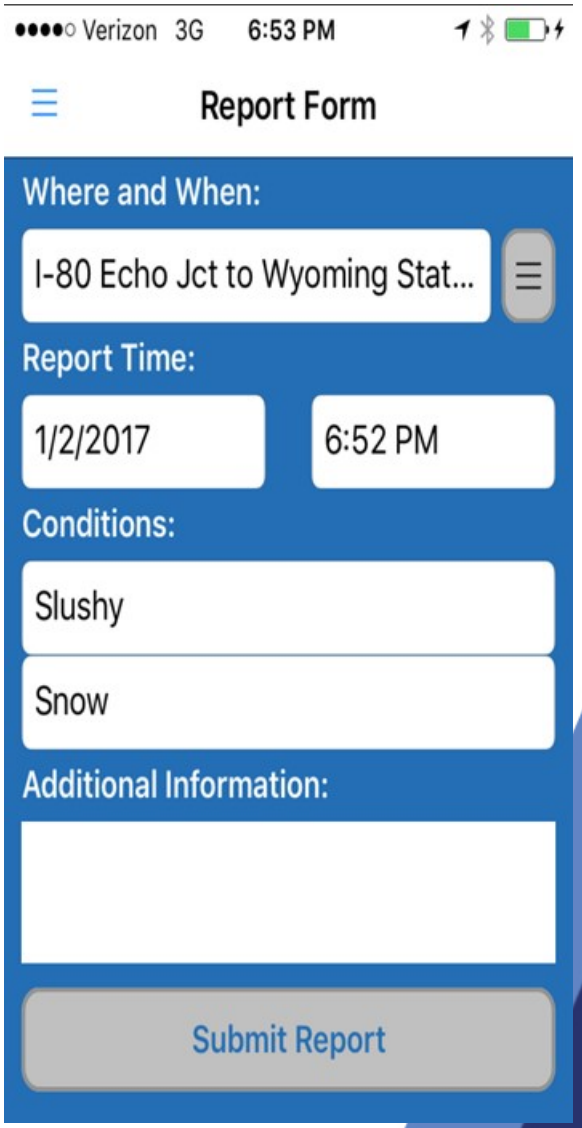
UDOT Keeping Utah Moving

EDC

History

- Launched winter 2012-2013
- Provided a consistent way for the public to report
- Short training program
- Special thanks to Wyoming DOT! (ECAR)





Keeping Utah Moving

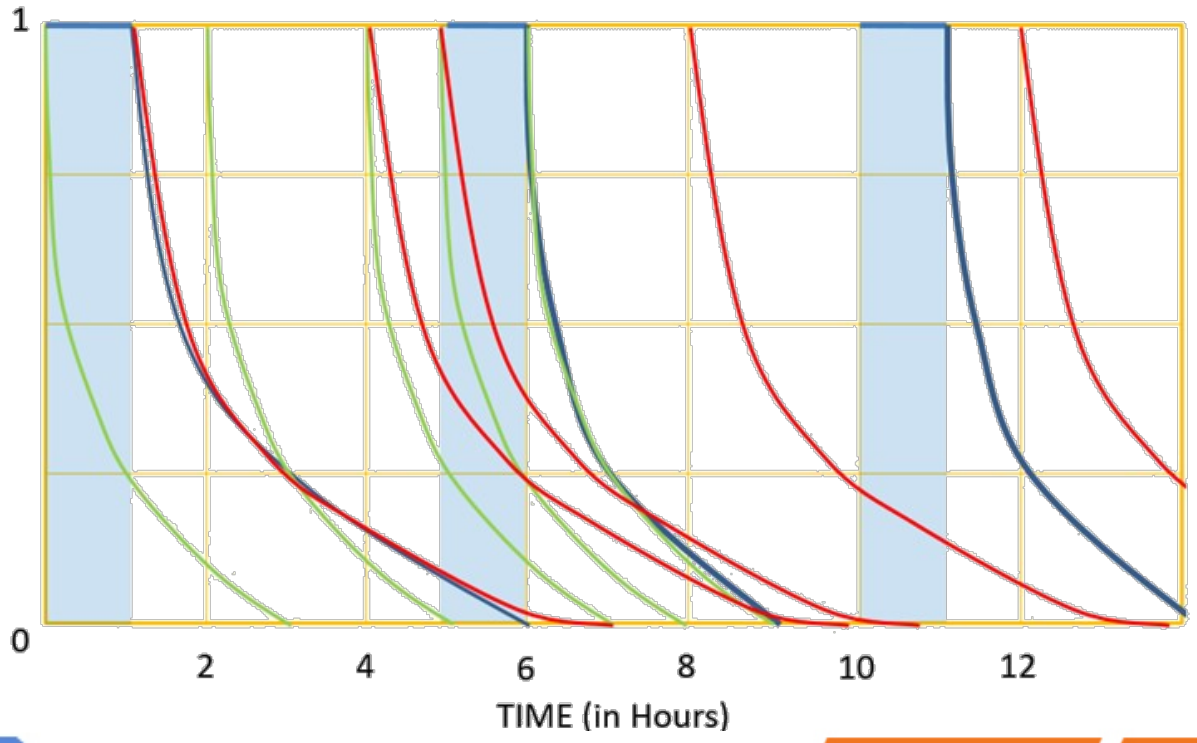
Logic:

TI Mets (Reports valid for 6 hours have an exponential decrease to 0% and report expires. TI Met reports are never more valuable than a TATS report if they are reported at the same time.)

TATS (Reports valid for 1 hour then an exponential decrease to 6 hours when the report expires. TATS report have priority for 1 hour after reporting and are not overwritten by any other type of reporter)

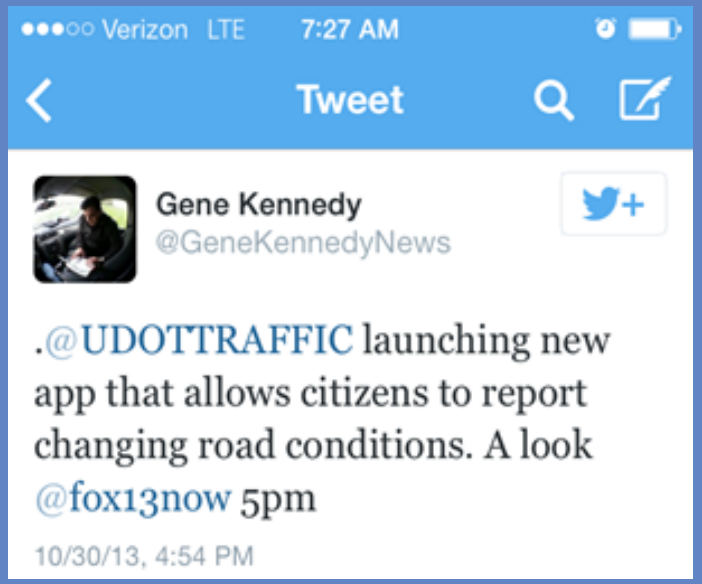
Citizen Reporters (Reports valid for 3 hours and have an exponential decrease to 0% and report expires.)

Color that appears "on top" is the report that is used for the RYG (not including priority TATS report for 1 hour)



UDOT Keeping Utah Moving

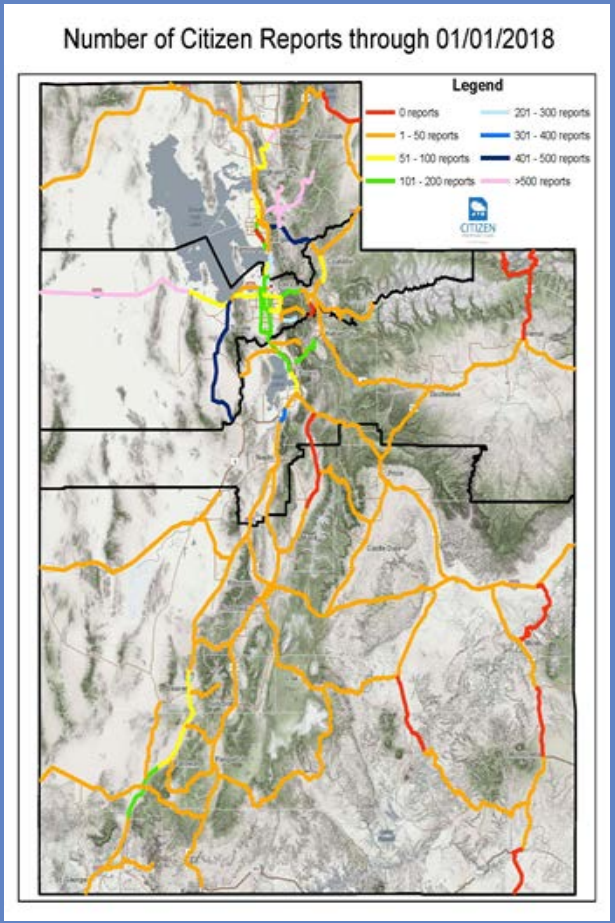
Results

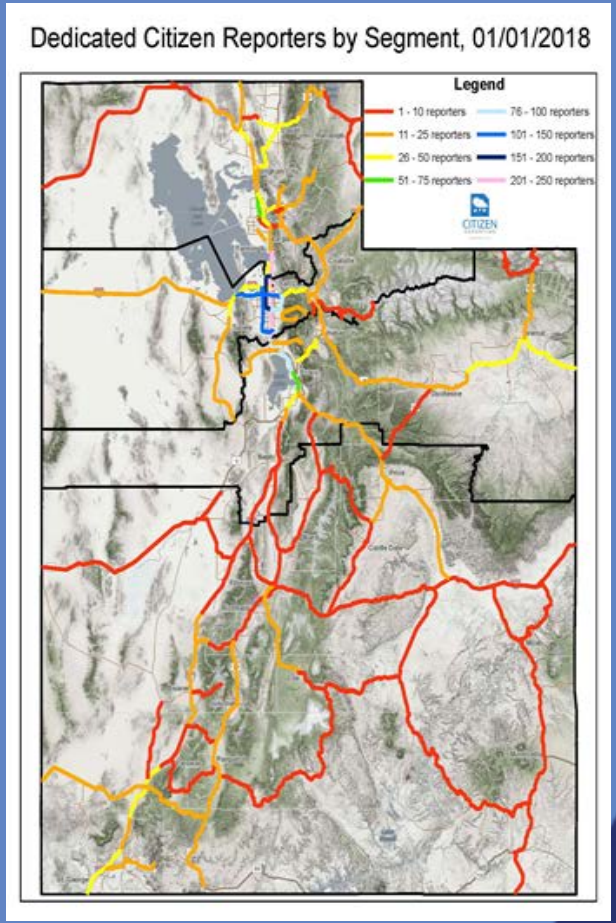

Verizon LTE 7:27 AM
Tweet
Gene Kennedy
@GeneKennedyNews
.@UDOTTRAFFIC launching new app that allows citizens to report changing road conditions. A look @fox13now 5pm
10/30/13, 4:54 PM

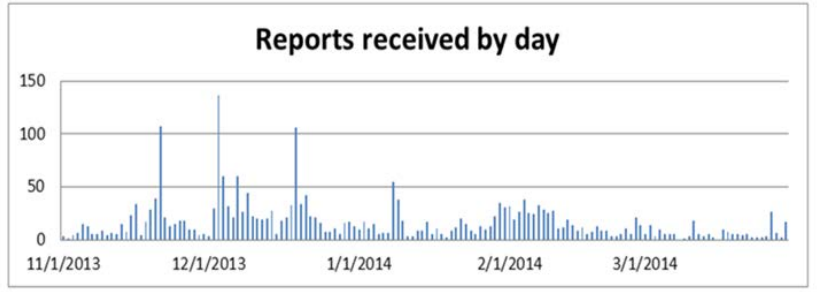

Verizon 4:22 PM
Tweet
Kylie Bearse
@KylieBearseTV
Meeting of wx/traffic minds talking winter wx and roads @UDOTTRAFFIC #utwx
10/30/13, 1:16 PM


Verizon LTE 7:27 AM
Tweet
Alex Cabrero
@KSL_AlexCabrero
Want to be part of @UDOTTRAFFIC new Citizen Reporter Program for road conditions? Starts Nov. 1st. Here is the info.
UDOT
udot.utah.gov
State of Utah
DEPARTMENT OF TRANSPORTATION
CITIZEN REPORTER PROGRAM

Results


Number of Citizen Reports through 01/01/2018
Legend
0 reports
1 - 50 reports
51 - 100 reports
101 - 200 reports
201 - 300 reports
301 - 400 reports
401 - 500 reports
>500 reports
CITIZEN


Dedicated Citizen Reporters by Segment, 01/01/2018
Legend
1 - 10 reporters
11 - 25 reporters
26 - 50 reporters
51 - 75 reporters
76 - 100 reporters
101 - 150 reporters
151 - 200 reporters
201 - 250 reporters
CITIZEN


Reports received by day
150
100
50
0
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014

Lisa Miller
Traveler Information Manager
lisamiller@utah.gov

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Question & Answer from Chat Box

Managing Traffic with Probe Data

Edward D Cox, INDOT

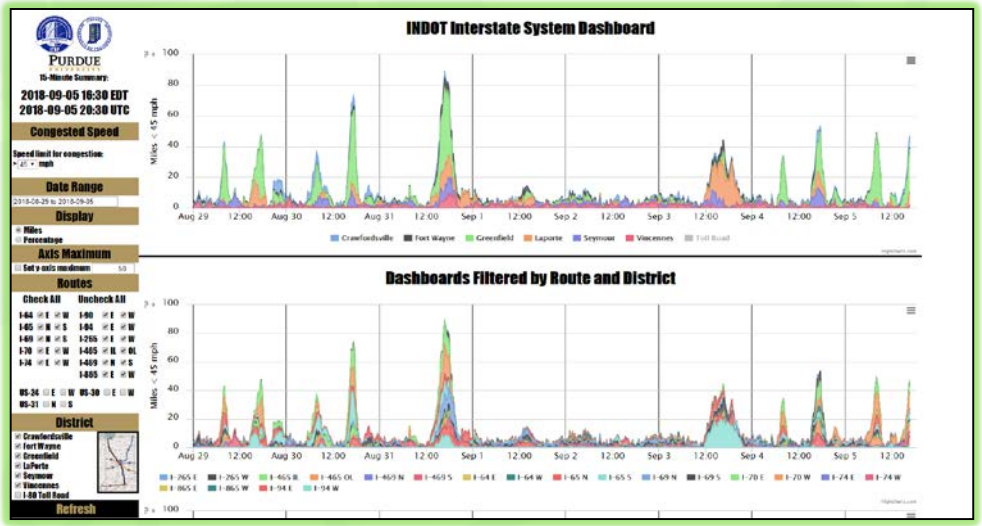
September 2018

INDOT TRAFFICWISE
Your link to smart travel

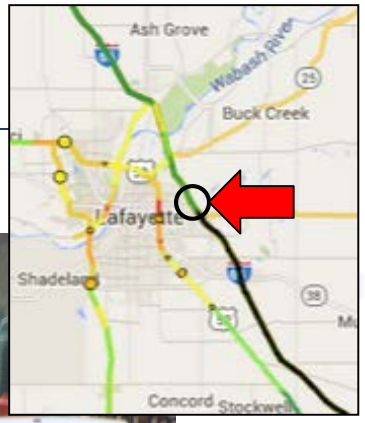
NextLevel INDIANA

Crowdsourced Probe Data

- INDOT purchases real-time probe data
- Interstates partitioned into 2000+ segments
- Download speed data every 60 seconds
- “Traffic Ticker” developed by INDOT & Purdue University to process, visualize and use data



The Problem: Unplanned I-65 NB Bridge Closure



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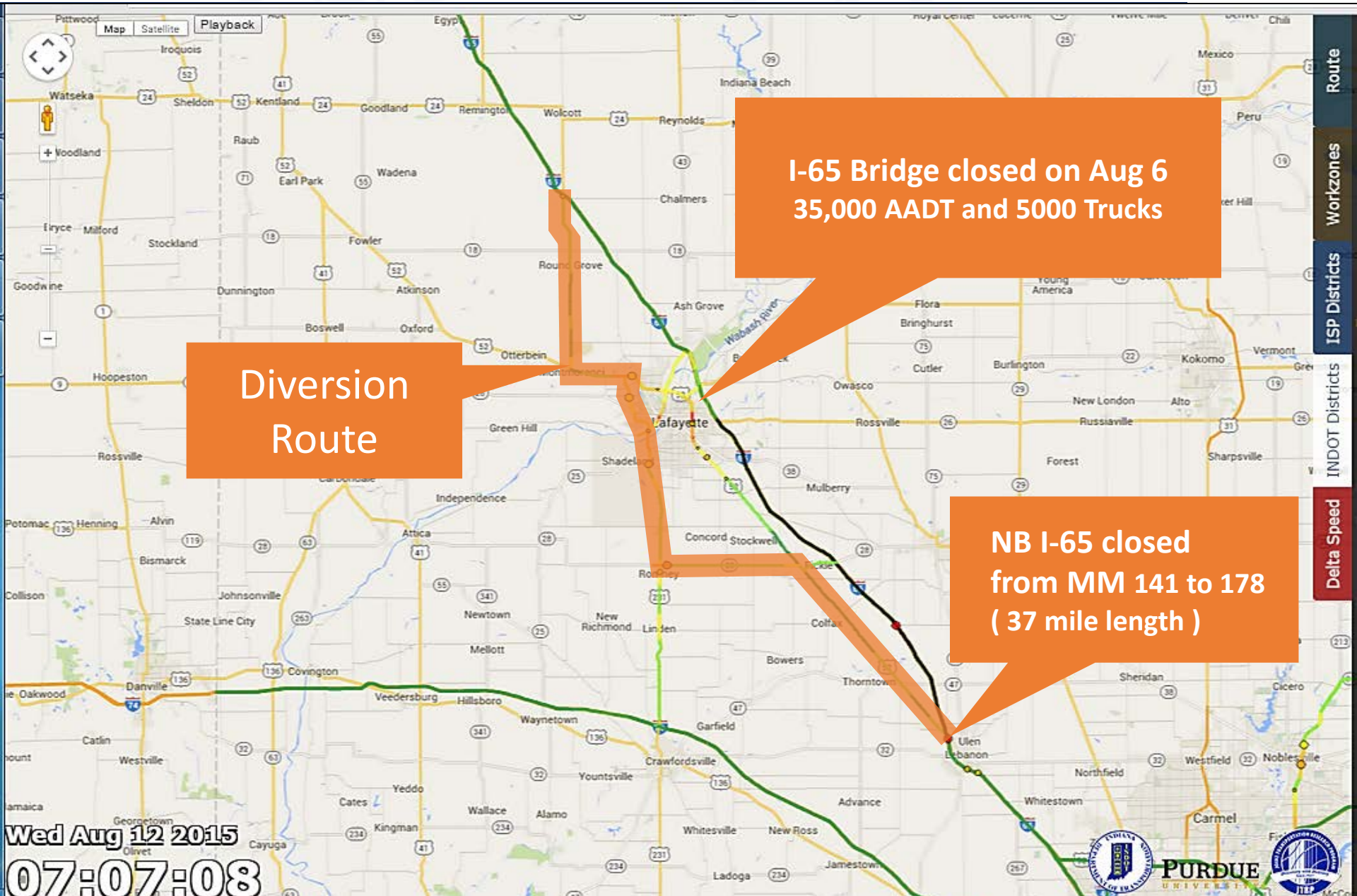
Interstate Diversion



Diversion route - capacity constrained

First Look – Perceptions of Detour

- On Day 1, a reporter drove the official detour route
- It took her 4 hours to drive 60 miles
- Press offered:

"Moral of the story is that the INDOT detour route is essentially ineffective."

Detour Diary: How bad was the detour really?

INTERSTATE 65

» 12:44 p.m. See y'all in like ten hours when I get through this detour.

» 1:53 p.m.: I'm going to kick something.

» 2:33 p.m. It would be faster to take one of these guys

So…

How do we mine the data to change operations & improve customer experience?

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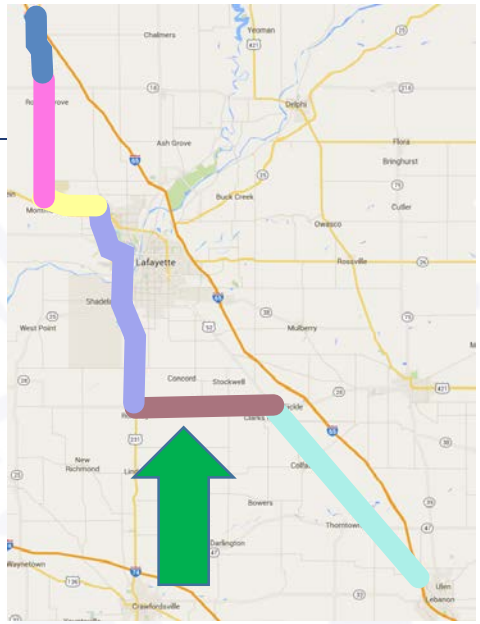
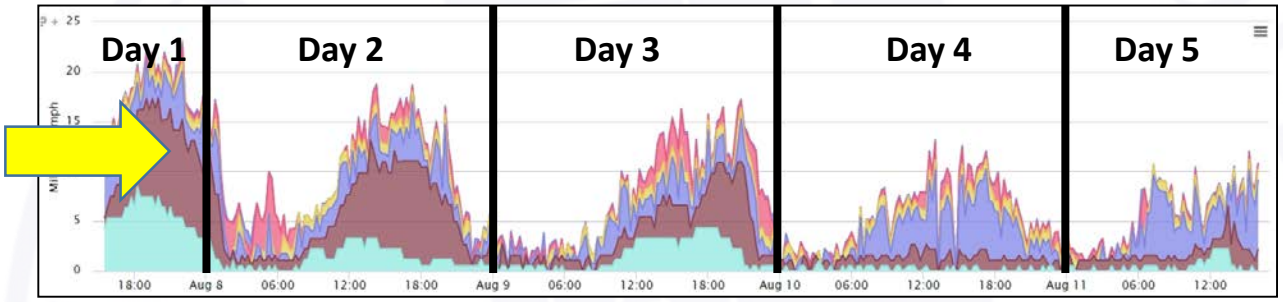
Traffic Summary along Detour Route

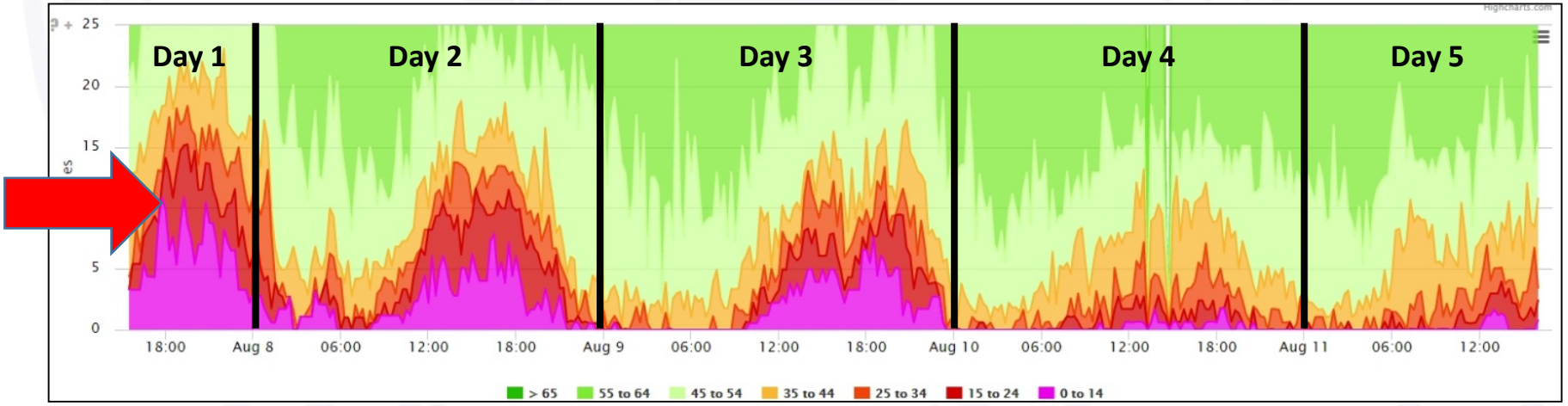


Stacked Segment Miles with Speed Below 45mph



*color reflect segment on map to the right

Miles Along Detour at Various Operating Speed



- We can effectively manage by segment and for the entire corridor -

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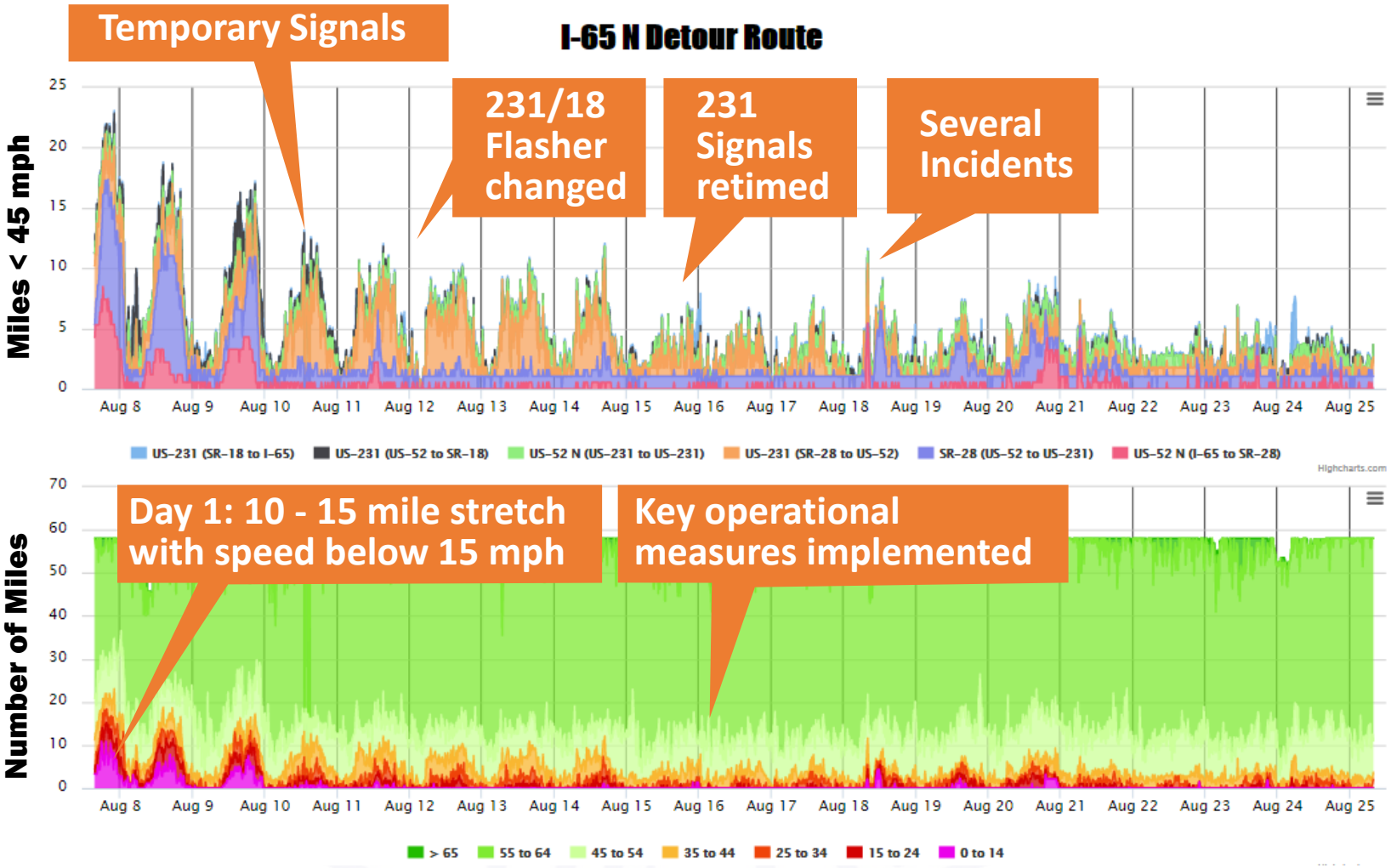
Traffic Ticker Dashboard

We can see how each operations change affects system performance



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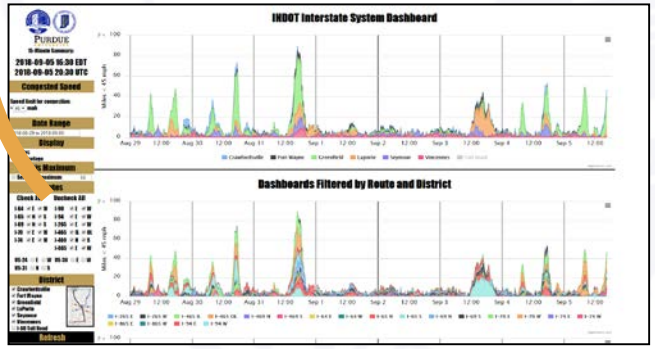
Live Traffic Ticker

Tool ingests real-time data to offer
Visual profile by segment, direction, district and other factors



PURDUE

15-Minute Summary:

2018-09-05 16:30 EDT
2018-09-05 20:30 UTC

Congested Speed

Speed limit for congestion:
> 45 mph

Date Range

2018-08-29 to 2018-09-05

Display

- Miles
- Percentage

Routes

Check All			Uncheck All		
I-64	E	W	I-90	E	W
I-65	N	S	I-94	E	W
I-69	N	S	I-265	E	W
I-70	E	W	I-465	IL	OL
I-74	E	W	I-469	N	S
			I-865	E	W

US-24 E W US-30 E W
US-31 N S

District

- Crawfordsville
- Fort Wayne
- Greenfield
- LaPorte
- Seymour
- Vincennes
- I-80 Toll Road

Refresh

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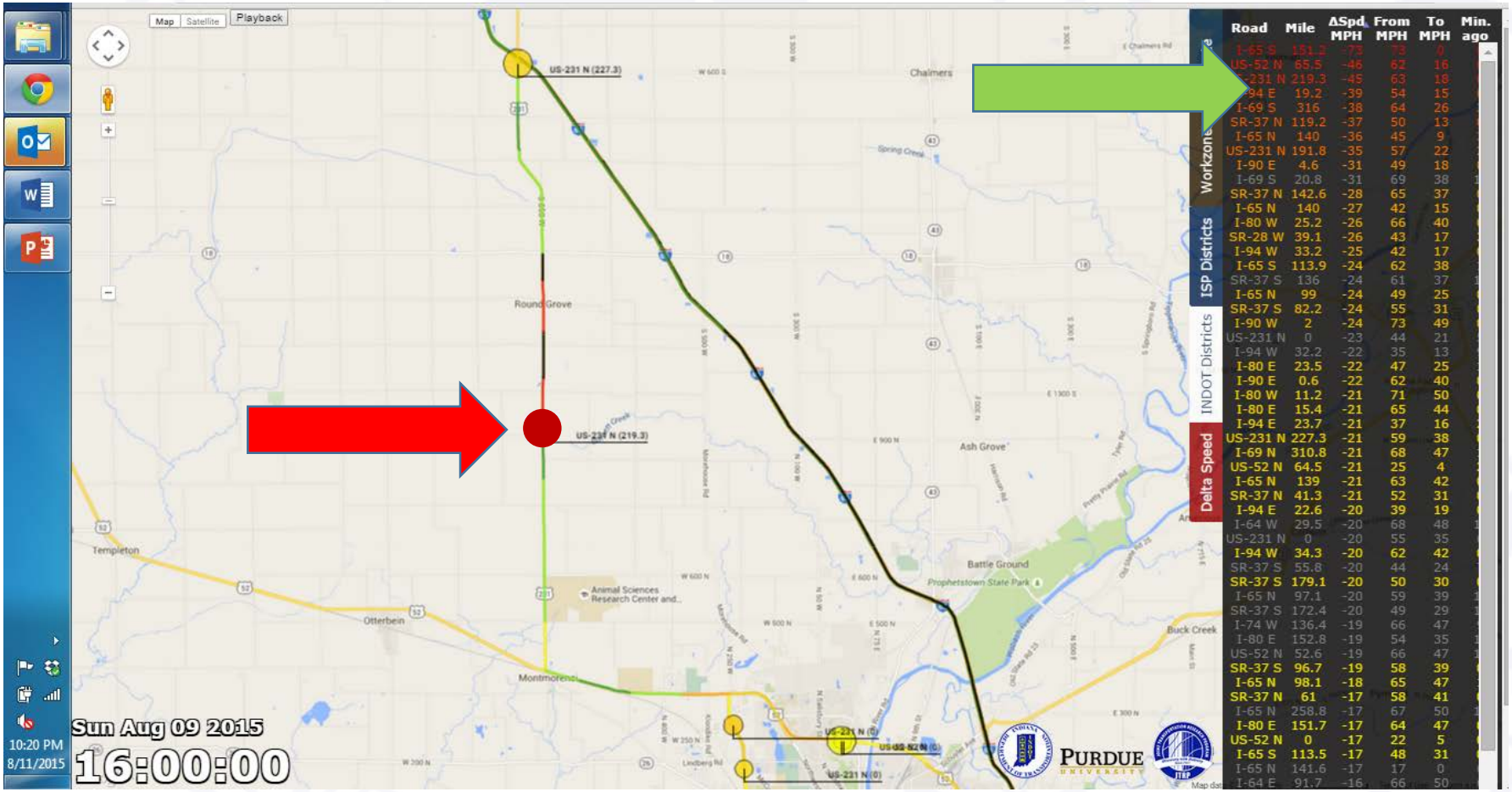
Traffic Ticker's Real-Time Delta Speed Function



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Tool helps with training and after action reviews

Public Safety Workshop

At Purdue University

NextLevel INDIANA

Using Metrics to Change Operations and Customer Experience

- Detour improvement from 4 hours to 64 minutes
- Stabilized traffic in 5 days
- No further ‘negative’ press
- Many positive reports from commuters and our staff noting zero delay stops!
- Media helped advocate use of the detour.

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Thank You

Edward D Cox
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317-899-8601

NextLevel INDIANA

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Question & Answer from Chat Box

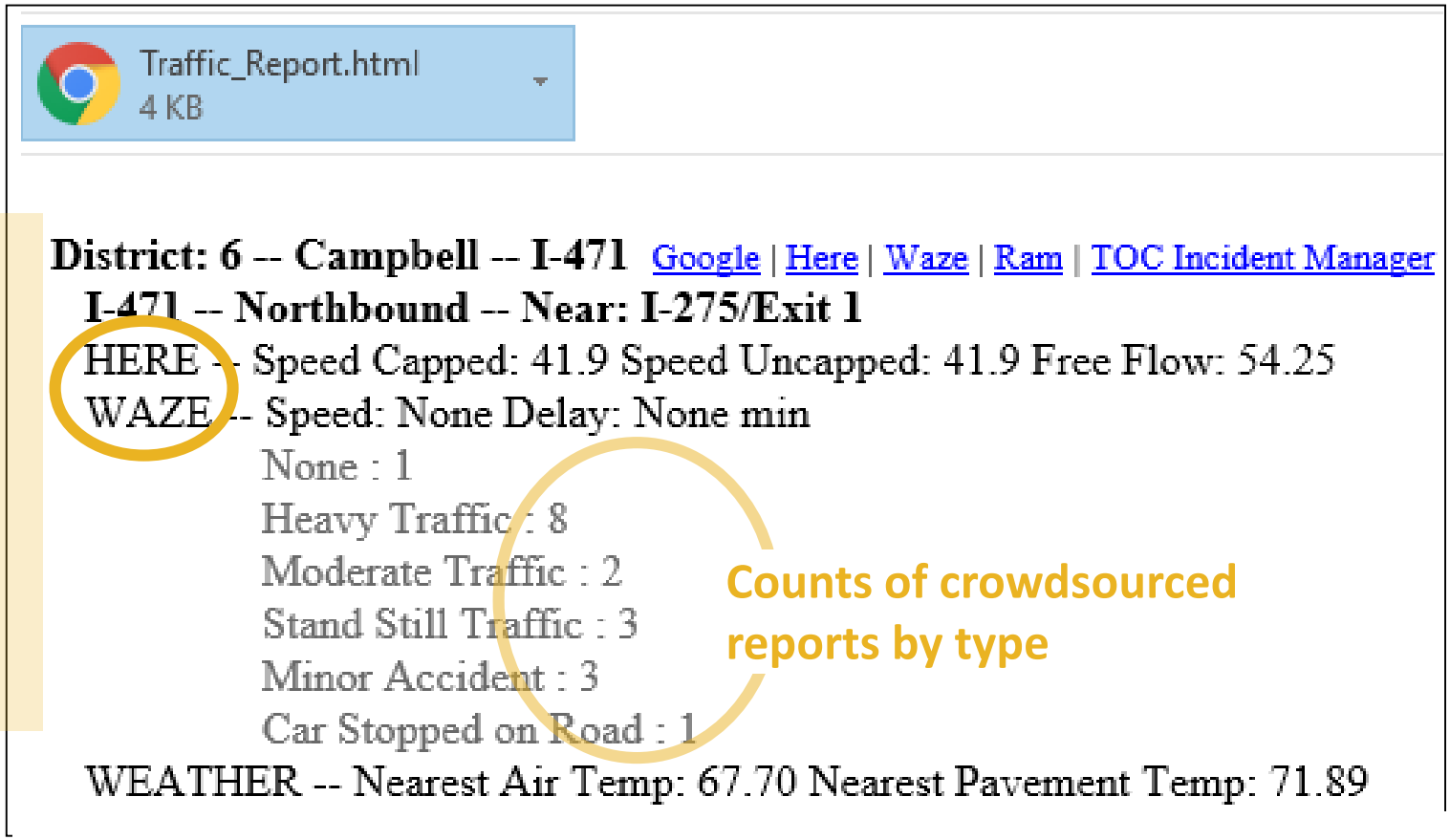
Incident Detection

Real-Time Data Verification and Filtering of Noise

Incident Detection: Email Alerts

Automated email to TMC when HERE and Waze suggest incident

Summary Section

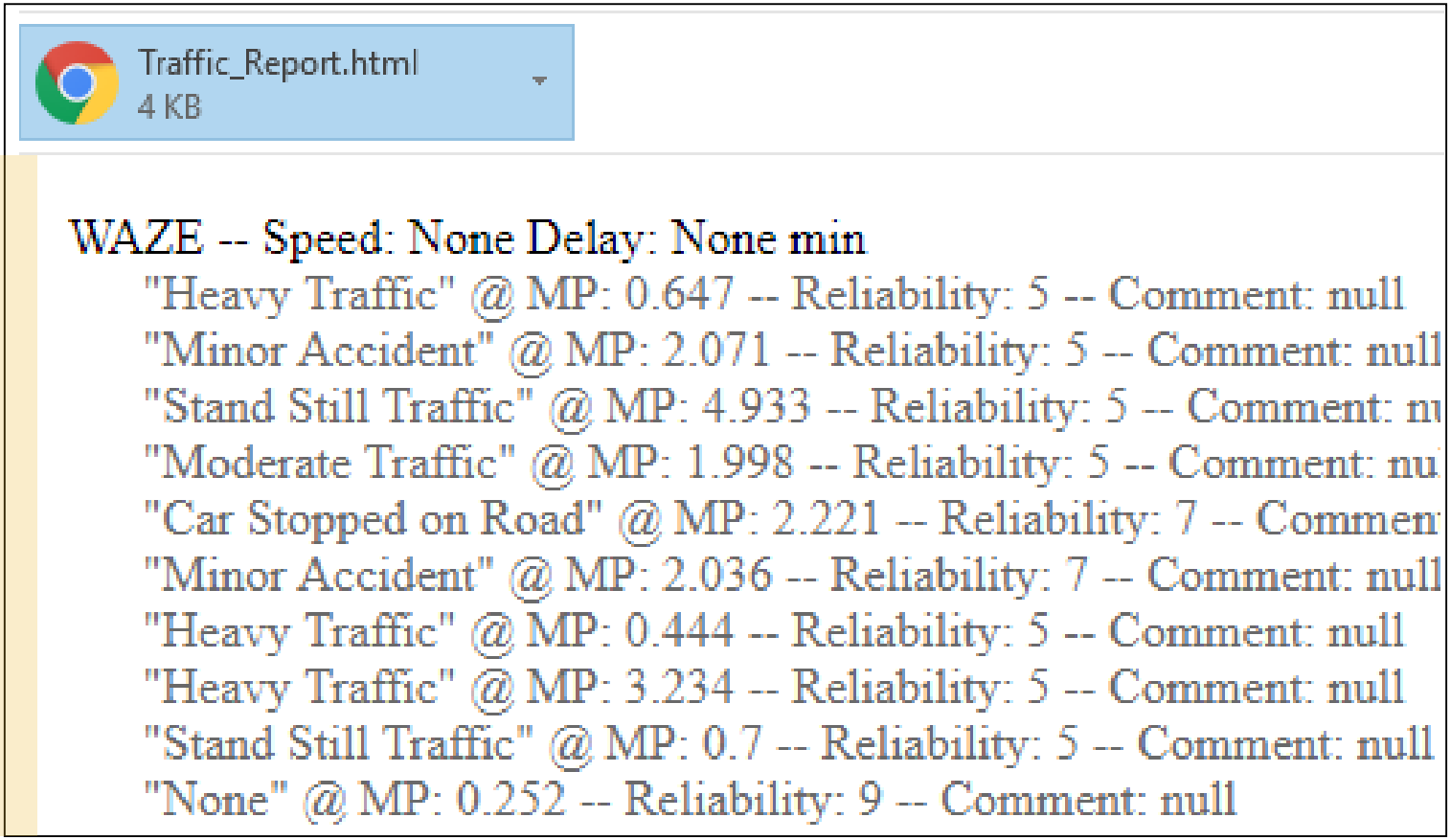


Counts of crowdsourced reports by type

Incident Detection: Email Alerts

Automated email to TMC – detailed report section

Detailed Email Content



Incident Detection: User Perception

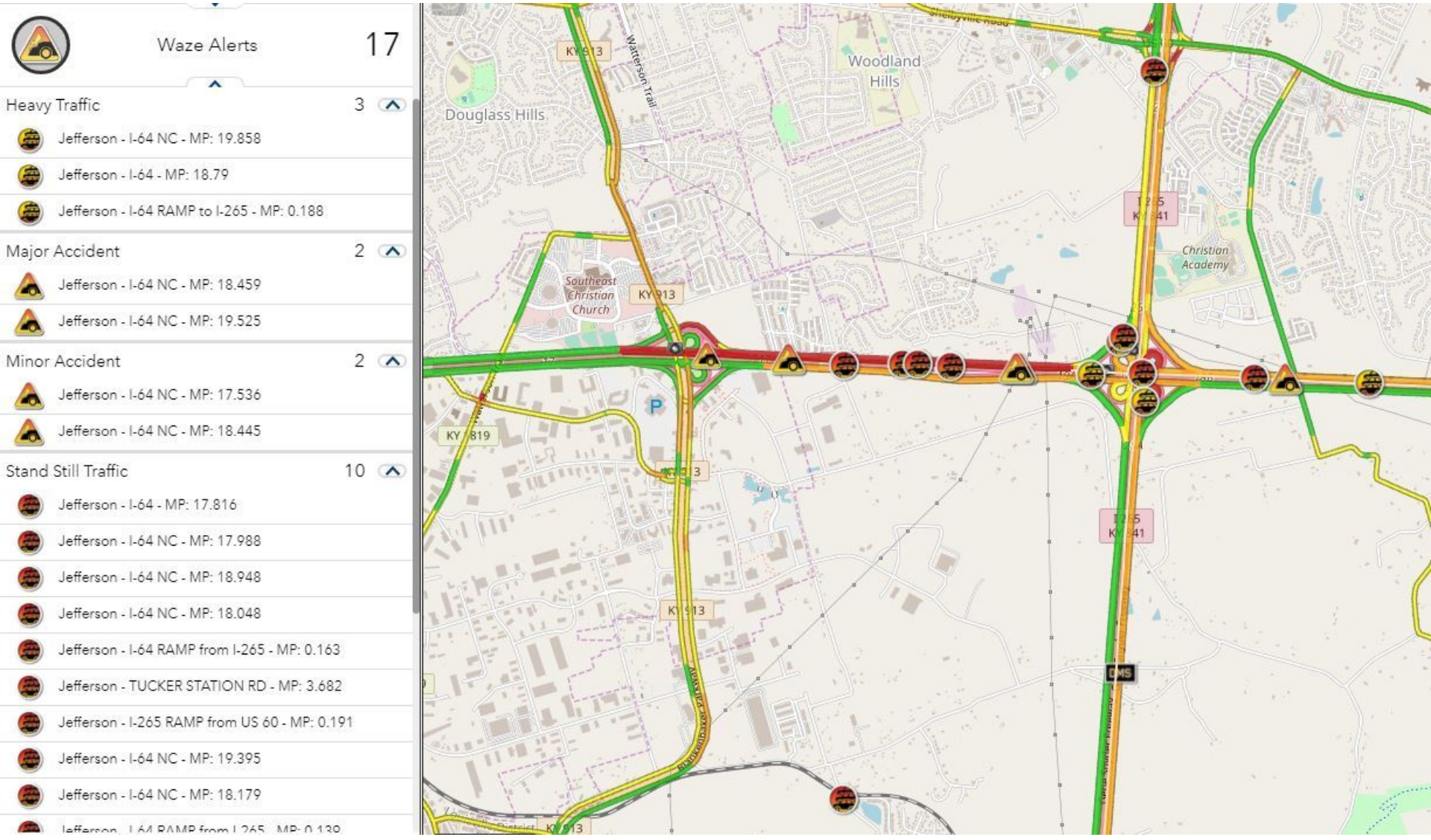
WAZE – Speed: None Delay: None

"Major Accident" @ MP 2.76 - Reliability 7
"Heavy Traffic" @ MP 4.156 - Reliability 9
"None" @ MP 2.204 - Reliability 7
"None" @ MP 2.709 - Reliability 5
"Major Accident" @ MP 2.983 - Reliability 10
:

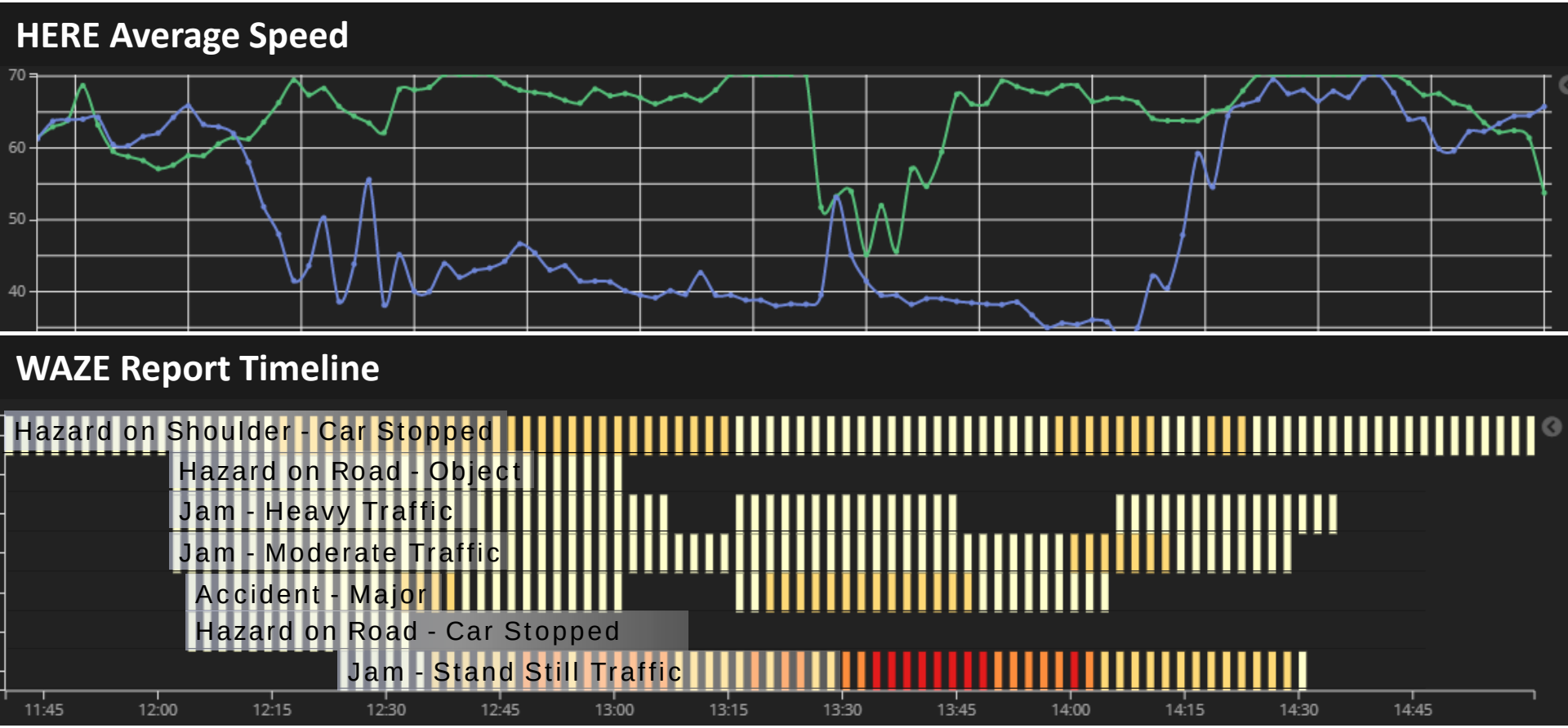
After-Action Review

Understanding the Order of Events
using Crowdsource Data

After Action Review: Incident Overview



After Action Review: Probe + Reports



One Incident, multiple WAZE Reports:

Car on Shoulder > Hazard on Road > Jam > Accident > Hazard > Jam!

After Action Review: Probe + Reports

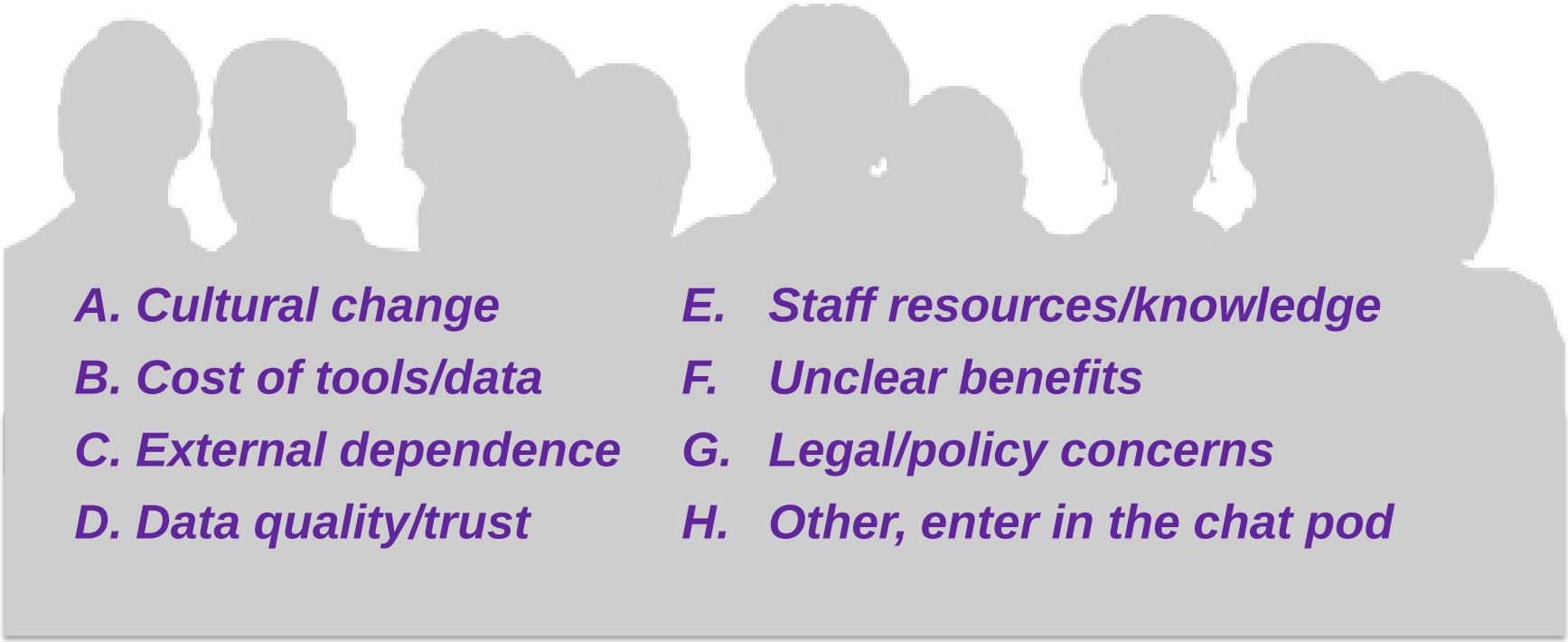
Thank You

Chris Lambert, Systems Consultant for ITS

Kentucky Transportation Cabinet

POLL THE AUDIENCE

What are the *three* most significant challenges or barriers for your agency's adoption of crowdsourcing for operations?



A. Cultural change

B. Cost of tools/data

C. External dependence

D. Data quality/trust

E. Staff resources/knowledge

F. Unclear benefits

G. Legal/policy concerns

H. Other, enter in the chat pod

Source: Shutterstock

EDC-5 Crowdsourcing Innovation

Upcoming Initiative Resources

- Workshops.
- Peer exchanges.
- On-site technical assistance.
- Training materials/training.
- Case studies.
- Fact sheets.
- Marketing materials.
- Webinars.

EDC-5 Funding Opportunities

- ***State Transportation Innovation Council (STIC) Incentive***
  - ✓ Up to $100,000 per STIC per year to standardize an innovation
  - ✓ https://www.fhwa.dot.gov/innovation/stic/

- ***Accelerated Innovation Deployment (AID) Demonstration***
  - ✓ Up to $1 million available per year to deploy an innovation not routinely used
  - ✓ https://www.fhwa.dot.gov/innovation/grants/

Innovation Deployment News

EDC News Weekly Newsletter

Weekly newsletter

INNOVATOR
Accelerating Innovation for the American Driving Experience

Bi-monthly magazine

To Subscribe:

Email: https://www.fhwa.dot.gov/innovation/

Text: Send **“FHWA Innovation”** to **468311**

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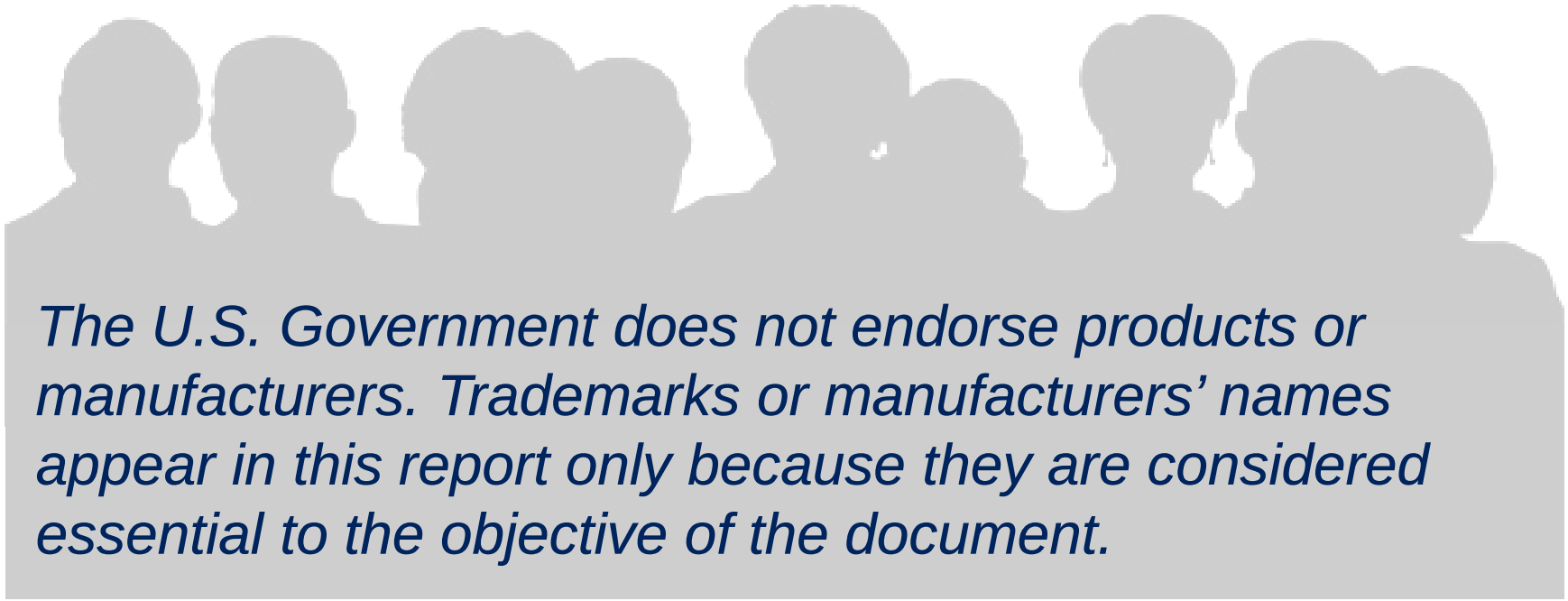
Parting crowdsourced request…

Send us a creative tagline for EDC-5, Crowdsourcing for Operations. If we use your idea, you will have “bragging rights” at the upcoming EDC-5 Summits! (Send via chat box or an email to James Colyar).

Disclaimer



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U.S. Department of Transportation
Federal Highway Administration

On-Ramp to Innovation
every day counts

Question & Answer