Connected and Automated Vehicles Summit

October 16-18, 2019

Nicole Kolb Hood
MoDOT

Missouri's Current CAV Initiatives

Autonomous TMA

TTS

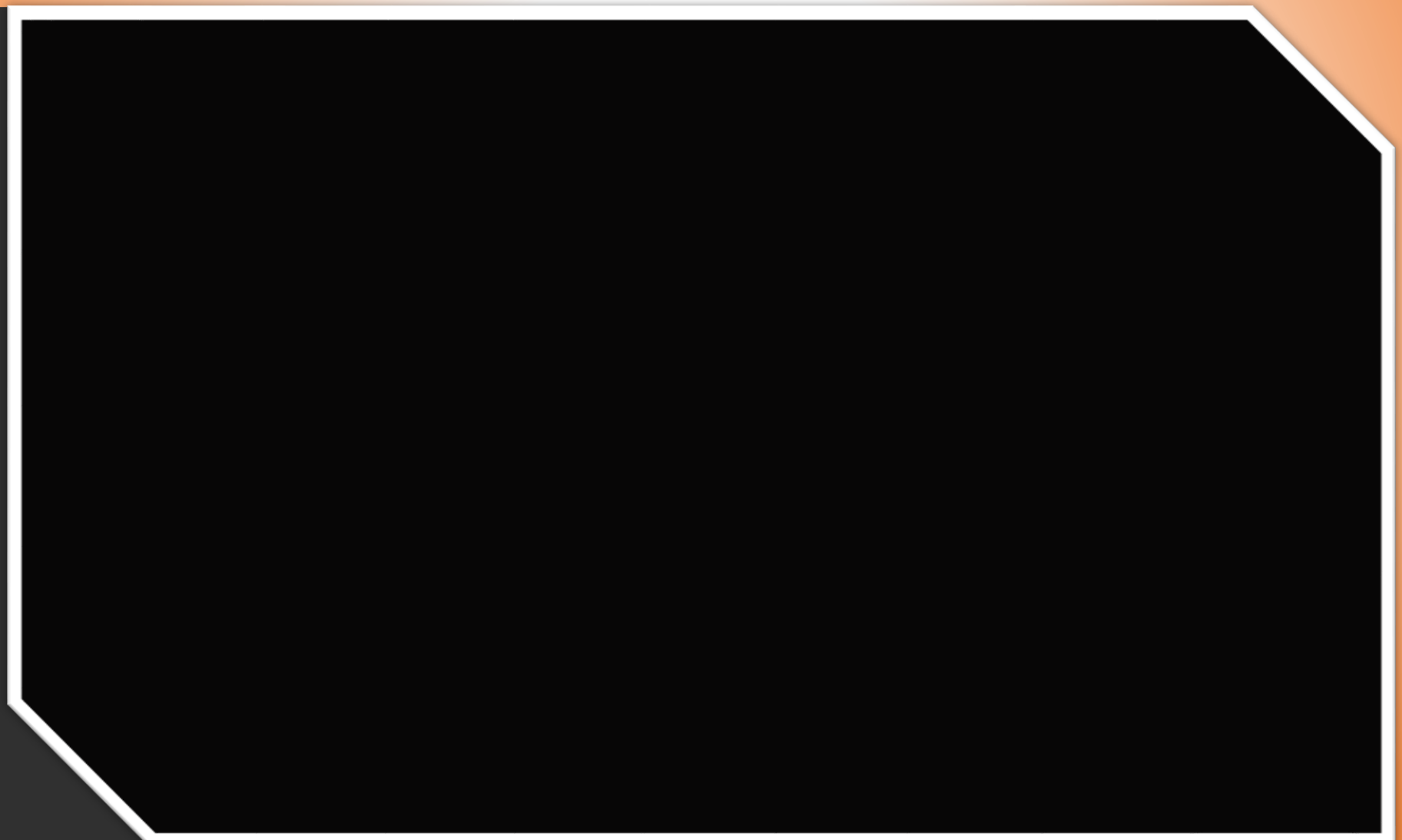
HAAS/Makeway

Predictive Analytics

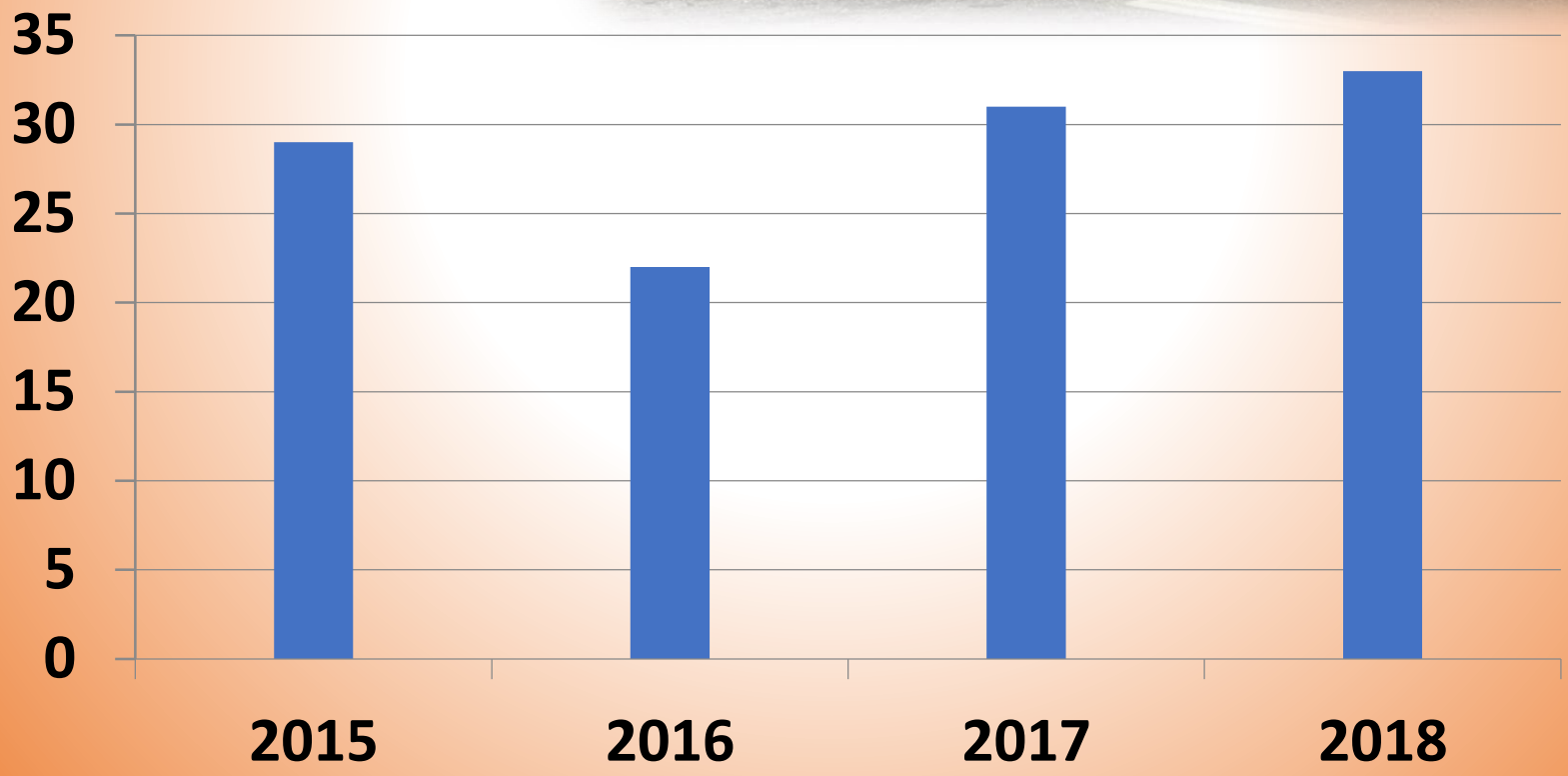
Policy

MoDOT's Driverless TMA Initiative

Higher Education Channel



MoDOT TMA Crashes



What is the Goal?

Eliminate operator injuries when the rear protective vehicle is impacted by removing the operator from the vehicle.

Contract with Kratos Defense and Security Solutions

- $550K – retrofit two MoDOT trucks
  - Partially funded with SPR funds
  - International trucks with MASH TMAs
- No payment until it performs
  - Training, component testing and verification
  - 32 hr. closed road test
  - 250 hr. live work zone test

Functionality

What It Can Do:

- Leader-Follower system
- Follow at distances up to 1500’
- Pause and catch up
- Function in short duration GPS denied environments
- Provide redundant, secure communication link
- Arrow board and turn signals synced

What It Can’t Do:

- Platoon to project at highway speeds
- Follow through signals and intersections
- Laterally offset from the lead vehicle

32 Hour Testing
April/May 2019

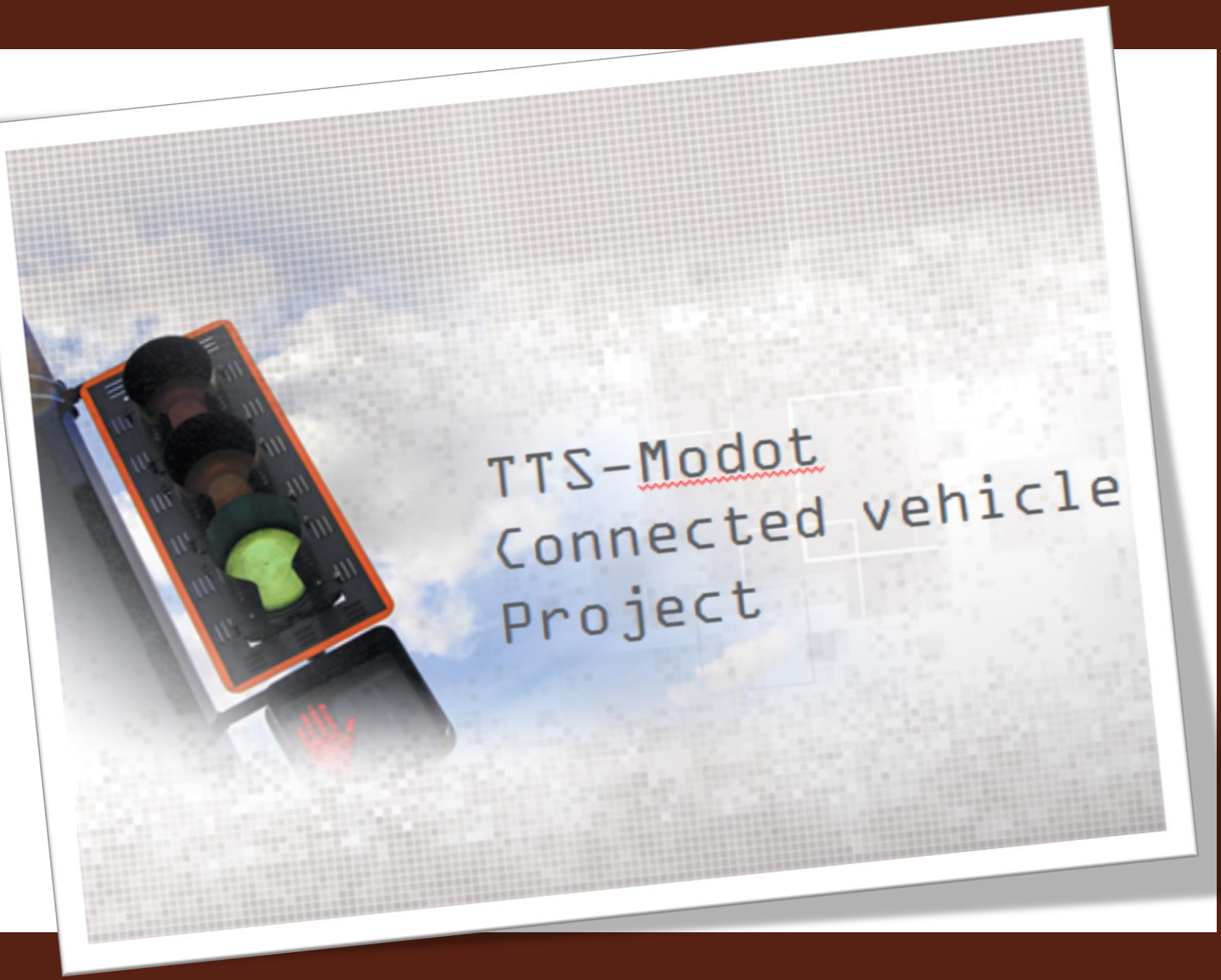
- State Fairgrounds
- V2V dropouts – *MoDOT retrofit issue*
- Radar timeout E-STOP - *sky data issue*
- Entering Dead Reckoning too often – *satellite issue*
- Veered off course - *excessive CPU usage*
- Follow distance accuracy - *hardware issue*
- Delayed E-STOP – *excessive CPU usage*
- Lateral accuracy issue – *code issue*

250 Hour Testing
June 2019

- Live work zones
- Location accuracy issues
  driving under bridges
- GPS degradation/DR/follow
  accuracy issues

Kratos Solutions:

- GPS card upgrade – 2.5 X satellites
- GPS antennae upgrade - amplification
- Roof mounted warning LIDAR


TTS-Modot
Connected vehicle
Project

Data Sharing

- TTS - information service provider for connected vehicle applications
- 2018 - agreement executed – provides no cost, data sharing platform for data innovation
- 2019 - TTS deployment

Relationships

Suppliers own data

Provide real time signal data, as built drawings and signal timing plans

Partners deliver the data

from ATMS, based on TTS' API

TTS delivers the product

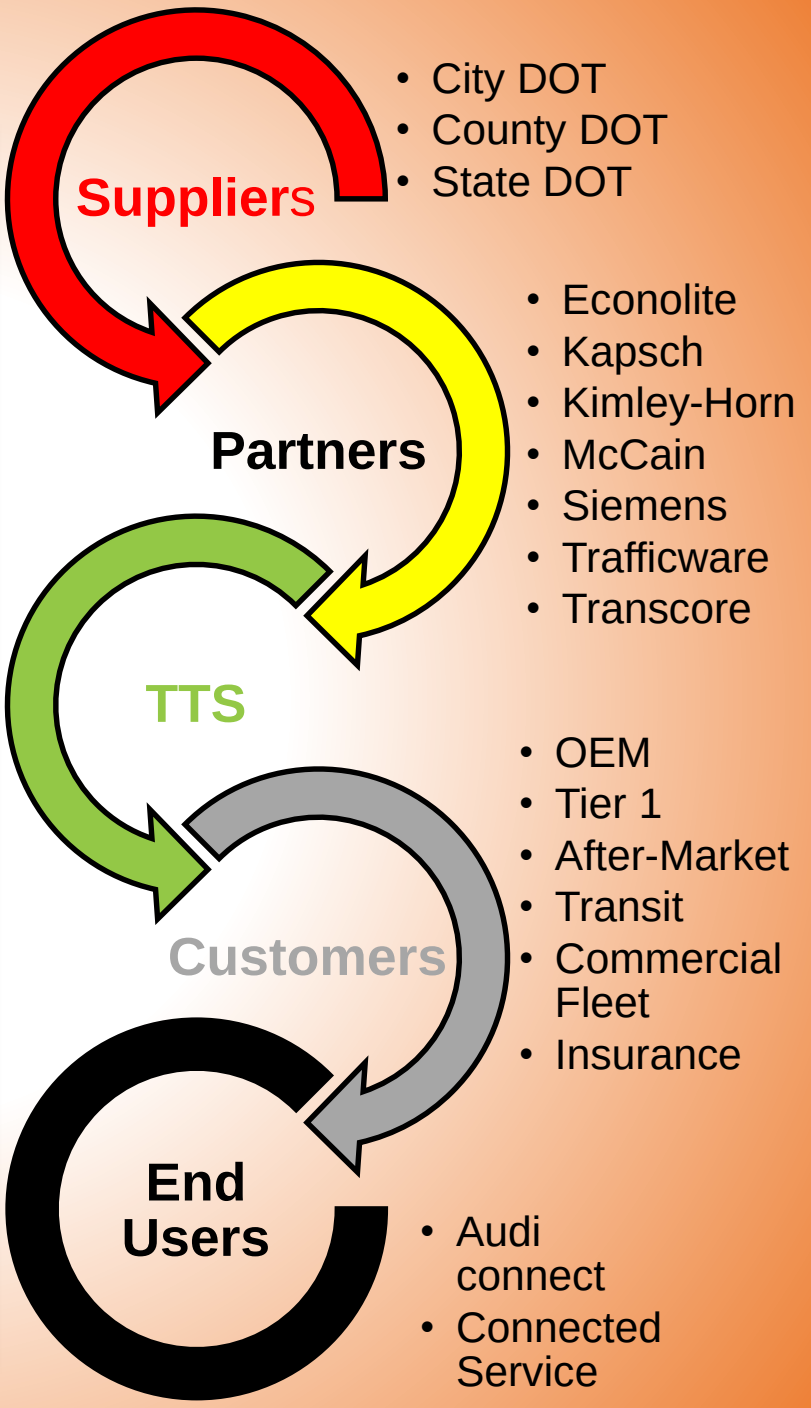
connects the systems, develops the information, maintains systems, provides support

Customers integrate the product

develop connected vehicle applications

End users value the product

Consumers of the applications



St. Louis District

Agreement → Data Feed → Product Development → Field Testing & Validation → Product Release

Signal System: TransCore TransSuite TCS **Release Date:** Q3 2019

Number of MoDOT Signals: 966

681 sending information

150 not emulating/old status

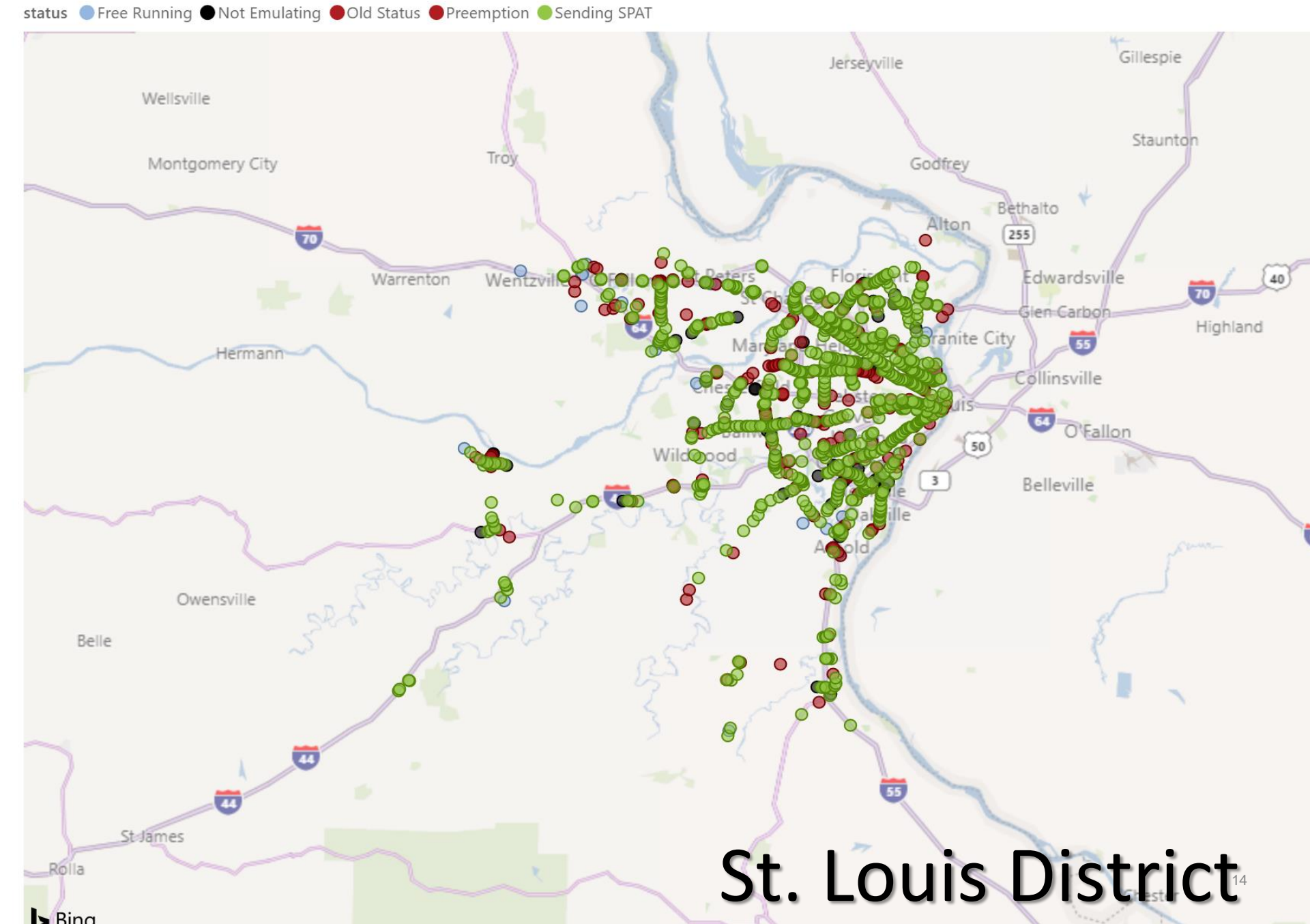
46 free-running

89 preempt

Comments:

Audi of America has released 321 intersections and is releasing signals as they meet the minimum number of crossings and error rates

TTS Product Status



St. Louis District

Kansas City District

Signal System: TransCore TransSuite TCS **Release Date:** Q4 2019

Number of MoDOT Signals: 375

264 sending information

10 not emulating/old status

23 free-running

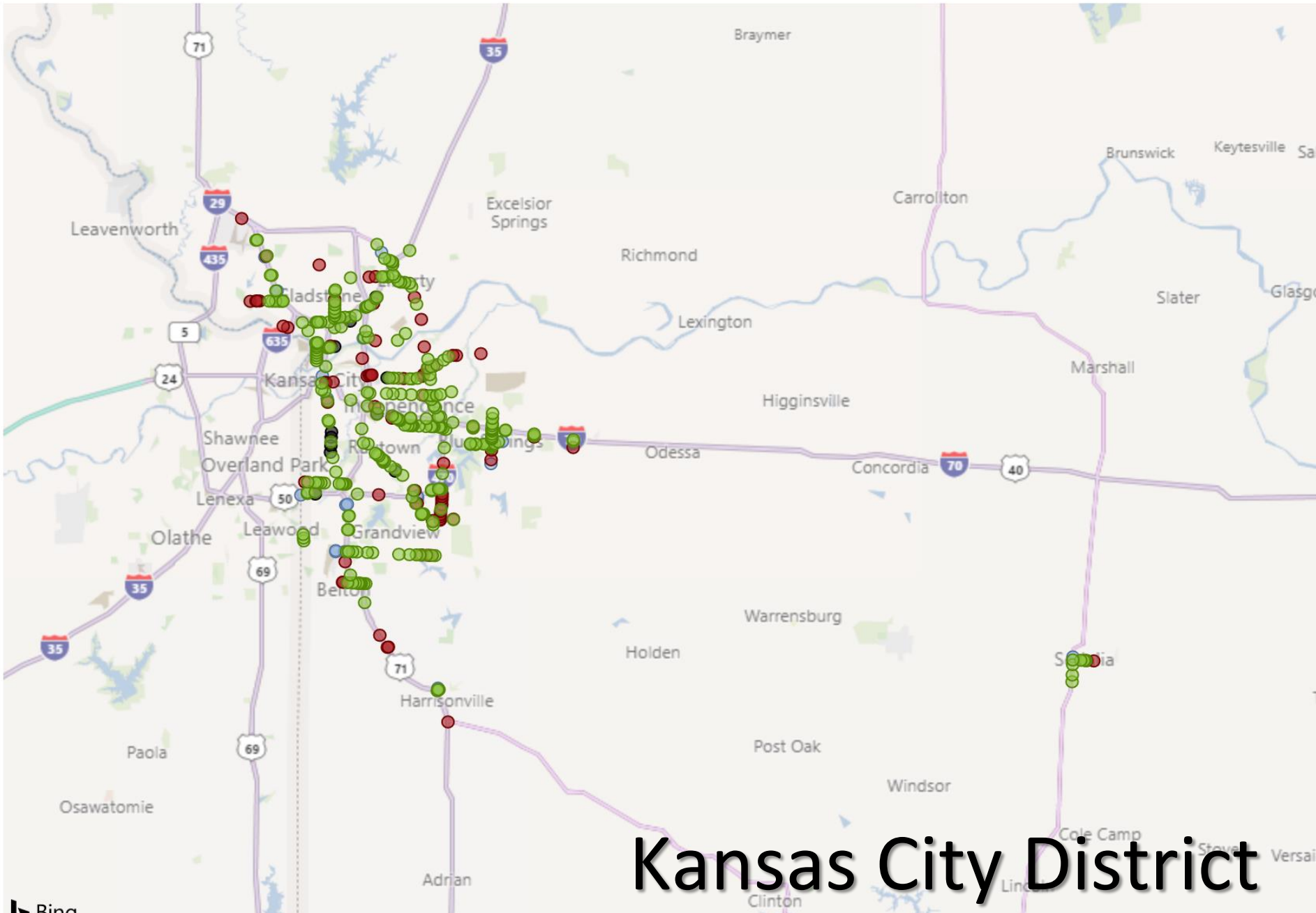
78 preempt

Comments:

TTS has been connecting with MARC and OGL signals, additional agreements with City of Merriam, KS and City of Fairway, KS

TTS Product Status

status Free Running Not Emulating Preemption Sending SPAT



Kansas City District

Southwest District

Agreement → Data Feed → Product Development → Field Testing & Validation → Product Release

Signal System: McCain Transparity

Release Date: Q2 2020

Number of MoDOT Signals: 157

Comments:

Since the City of Springfield and MoDOT share a signal system, the next step will commence once the City signs their agreement later this year.

What's next

TTS is collecting data to provide dashboards to MoDOT districts

Website access

Signal Intelligence Reports

Monthly summary by hourly aggregation

Vehicle Intelligence Reports

Same as above

- Pending system updates at OEM systems

Release

Signal Intelligence Reports

- KPI October 2019, Full Report November 2019

Vehicle Intelligence Reports

- Q1 2020

Adventures in Crowdsourcing: Incident Management Tools

HAAS Alert/Makeway Pilots

Why these technologies and What are they?

- Alert the driving public of our field crews through crowdsourcing applications (increase awareness, slow down or move over, etc.).
- Equipment installed in our fleet and use of GPS and cloud based solutions.
- When fleet lights are activated a notification gets added to the Waze app. Takes about 30 seconds.

What is the DOT doing and How are we using the technology?

- Pilot in the KC District/KDOT – HAAS Alert
  - MoDOT ER and KDOT/KHP Motorist Assist will have 31 devices.
- Pilot in the SL District – Makeway
  - 18 ER vehicles in the SL area with additional devices slated to be tested on department maintenance vehicles.

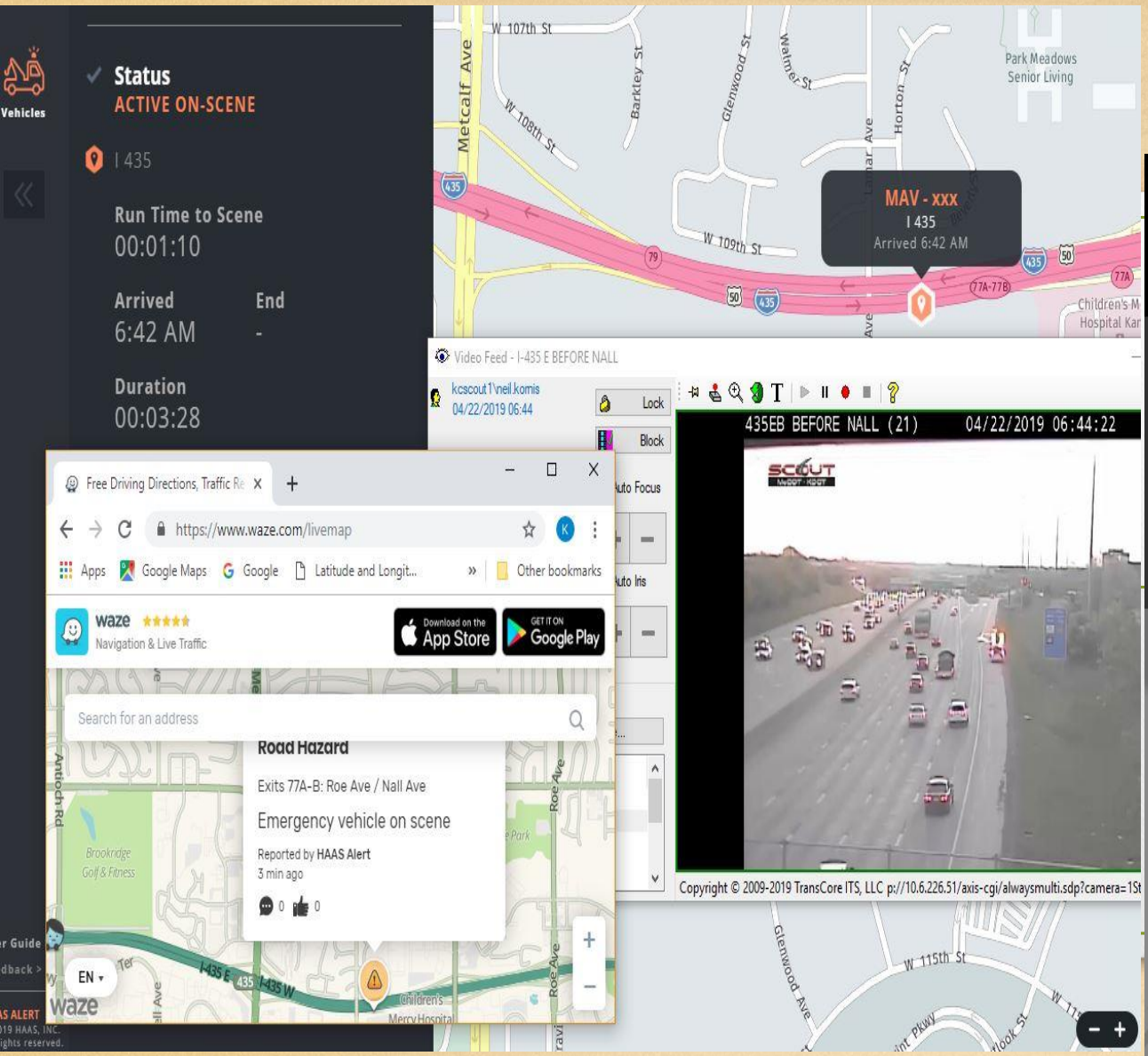
HAAS Alert Pilot

- MoDOT Emergency Response - 1 truck
  - Alerted 9,706 drivers
  - 968 Incidents
- In June, July and August (MO side)
  - 68,760 drivers were alerted via WAZE

HAAS Alert Pilot

- Monthly Reports for fleet activity.
- On Demand Reports:
  - Spreadsheet with GPS coordinates and speed
  - Number of incidents vehicle responded to
  - Will show when the lights were on or off

HAAS Pilot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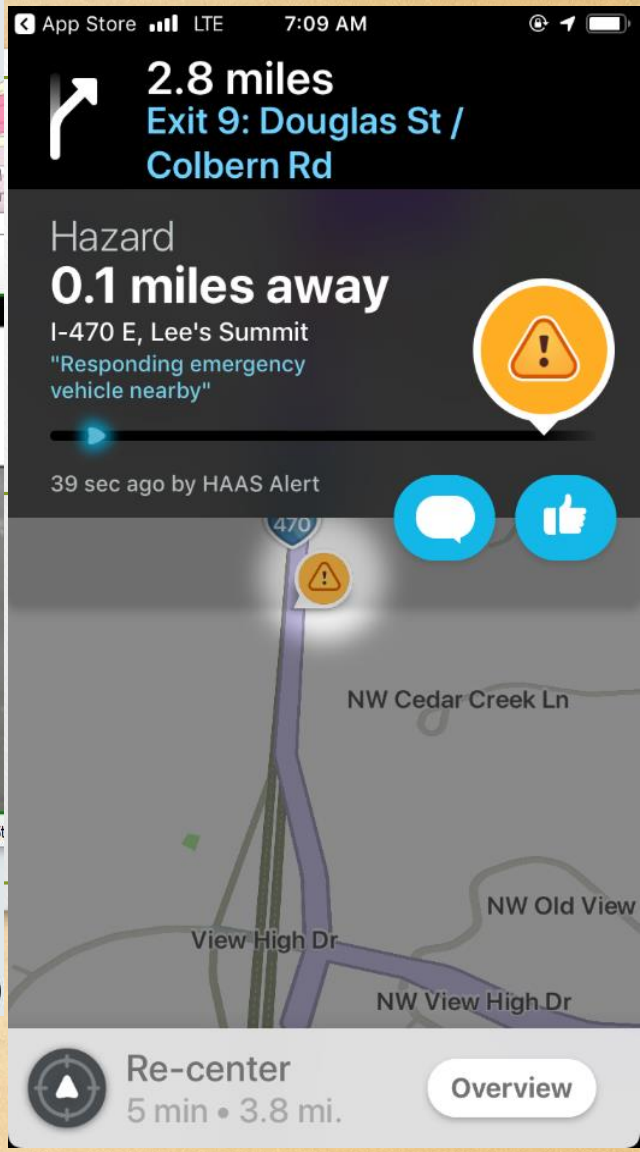
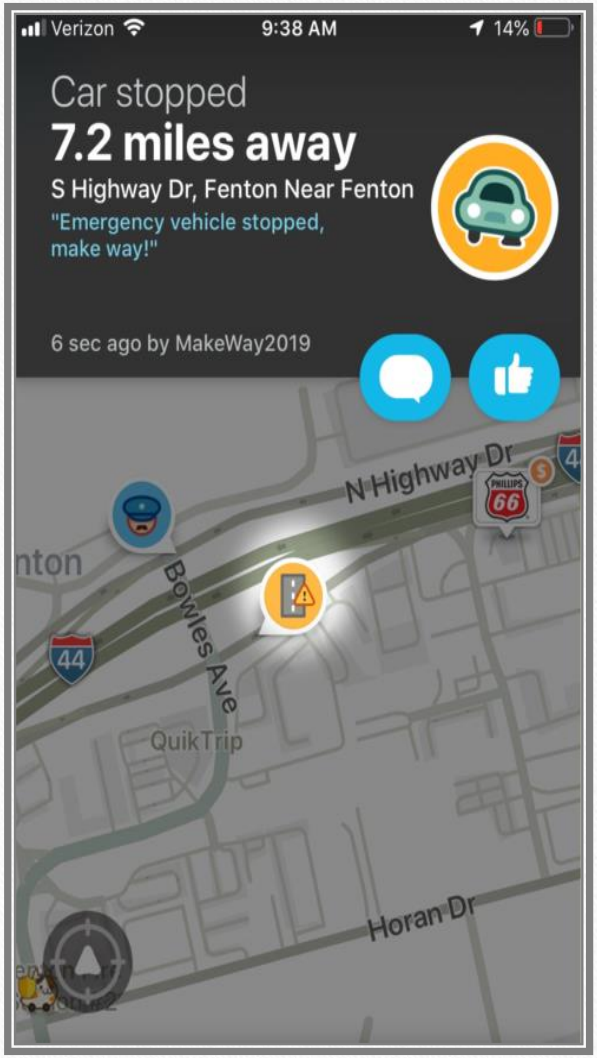
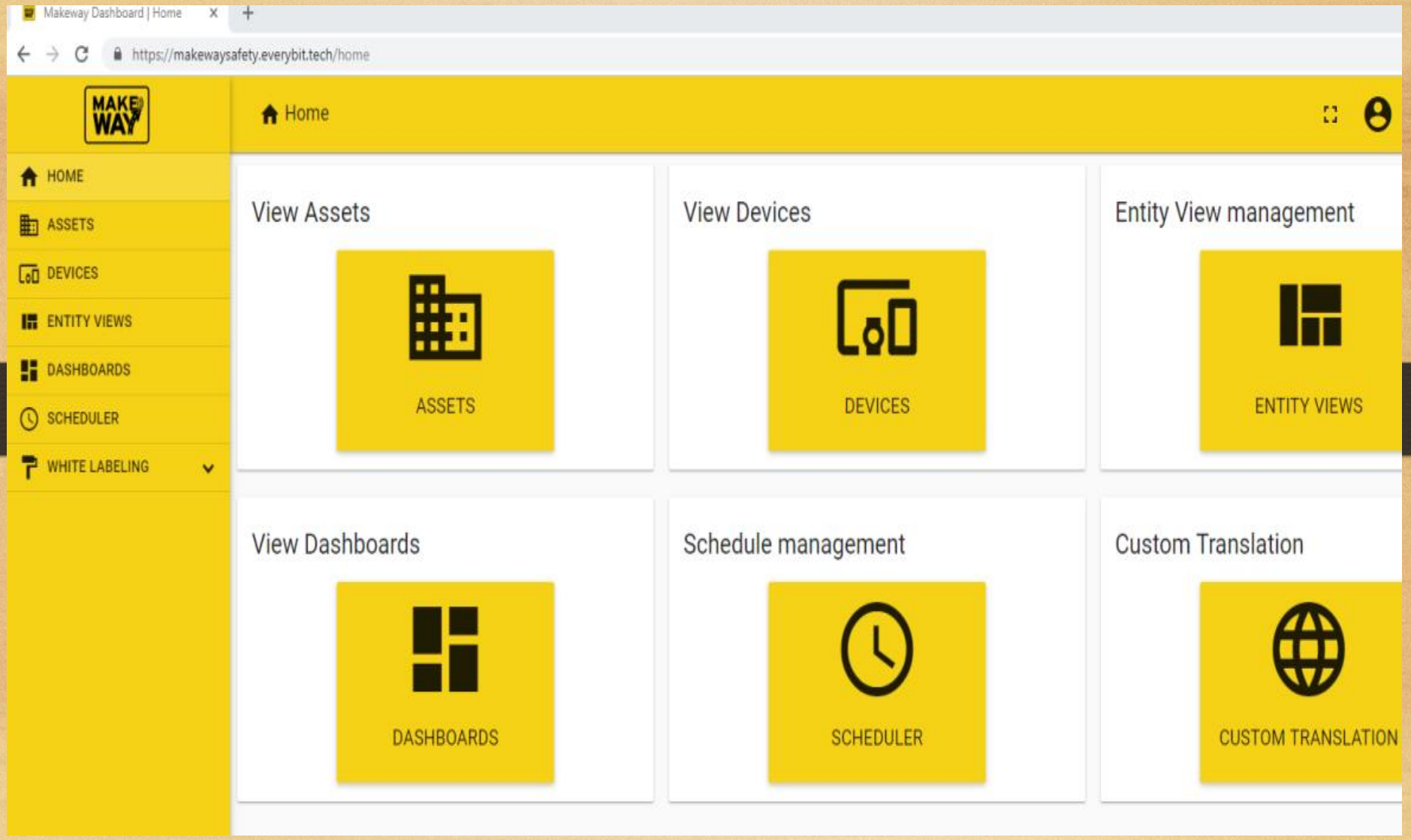
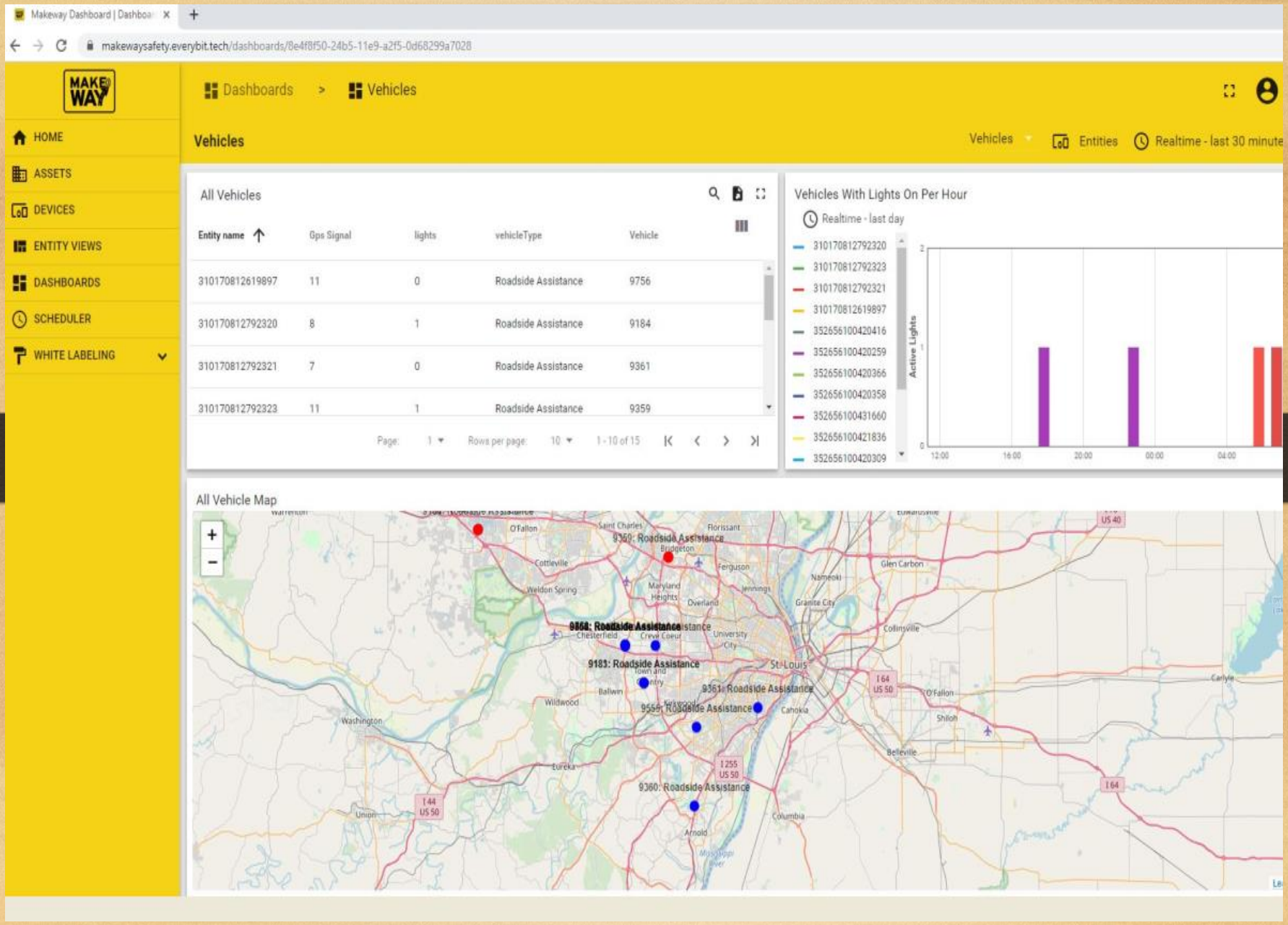
Status
ACTIVE ON-SCENE
I 435
Run Time to Scene
00:01:10
Arrived
6:42 AM
End
-
Duration
00:03:28
W 107th St
Metcalf Ave
W 108th St
Barkley St
Glenwood St
Walmer St
Horton St
Park Meadows
Senior Living
MAV - xxx
I 435
Arrived 6:42 AM
W 109th St
Video Feed - I-435 E BEFORE NALL
kcscout1\neil.komis
04/22/2019 06:44
Lock
Block
435EB BEFORE NALL (21)
04/22/2019 06:44:22
SCOUT
Free Driving Directions, Traffic Re
https://www.waze.com/livemap
Apps
Google Maps
Google
Latitude and Longit...
Other bookmarks
waze
Navigation & Live Traffic
Download on the App Store
GET IT ON Google Play
Search for an address
Road Hazard
Exits 77A-B: Roe Ave / Nall Ave
Emergency vehicle on scene
Reported by HAAS Alert
3 min ago
Antioch Rd
Roe Ave
Brookridge Golf & Fitness
I-435 E
I-435 W
Children's Mercy Hospital
EN
Copyright © 2009-2019 TransCore ITS, LLC p://10.6.226.51/axis-cgi/alwaysmulti.sdp?camera=1St
Glenwood Ave
W 115th St


App Store
LTE
7:09 AM
2.8 miles
Exit 9: Douglas St / Colbern Rd
Hazard
0.1 miles away
I-470 E, Lee's Summit
"Responding emergency vehicle nearby"
39 sec ago by HAAS Alert
470
NW Cedar Creek Ln
NW Old View
View High Dr
NW View High Dr
Re-center
5 min • 3.8 mi.
Overview

Makeway Pilot




Makeway Dashboard | Home
https://makewaysafety.everybit.tech/home
MAKE WAY
Home
HOME
ASSETS
DEVICES
ENTITY VIEWS
DASHBOARDS
SCHEDULER
WHITE LABELING
View Assets
ASSETS
View Devices
DEVICES
Entity View management
ENTITY VIEWS
View Dashboards
DASHBOARDS
Schedule management
SCHEDULER
Custom Translation
CUSTOM TRANSLATION


Makeway Dashboard | Dashboa
makewaysafety.everybit.tech/dashboards/8e4f8f50-24b5-11e9-a2f5-0d68299a7028
MAKE WAY
Dashboards
Vehicles
HOME
ASSETS
DEVICES
ENTITY VIEWS
DASHBOARDS
SCHEDULER
WHITE LABELING
Vehicles
Vehicles
Entities
Realtime - last 30 minute
All Vehicles
Entity name
Gps Signal
lights
vehicleType
Vehicle
310170812619897 11 0 Roadside Assistance 9756
310170812792320 8 1 Roadside Assistance 9184
310170812792321 7 0 Roadside Assistance 9361
310170812792323 11 1 Roadside Assistance 9359
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Rows per page: 10
1 - 10 of 15
Vehicles With Lights On Per Hour
Realtime - last day
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310170812792323
310170812792321
310170812619897
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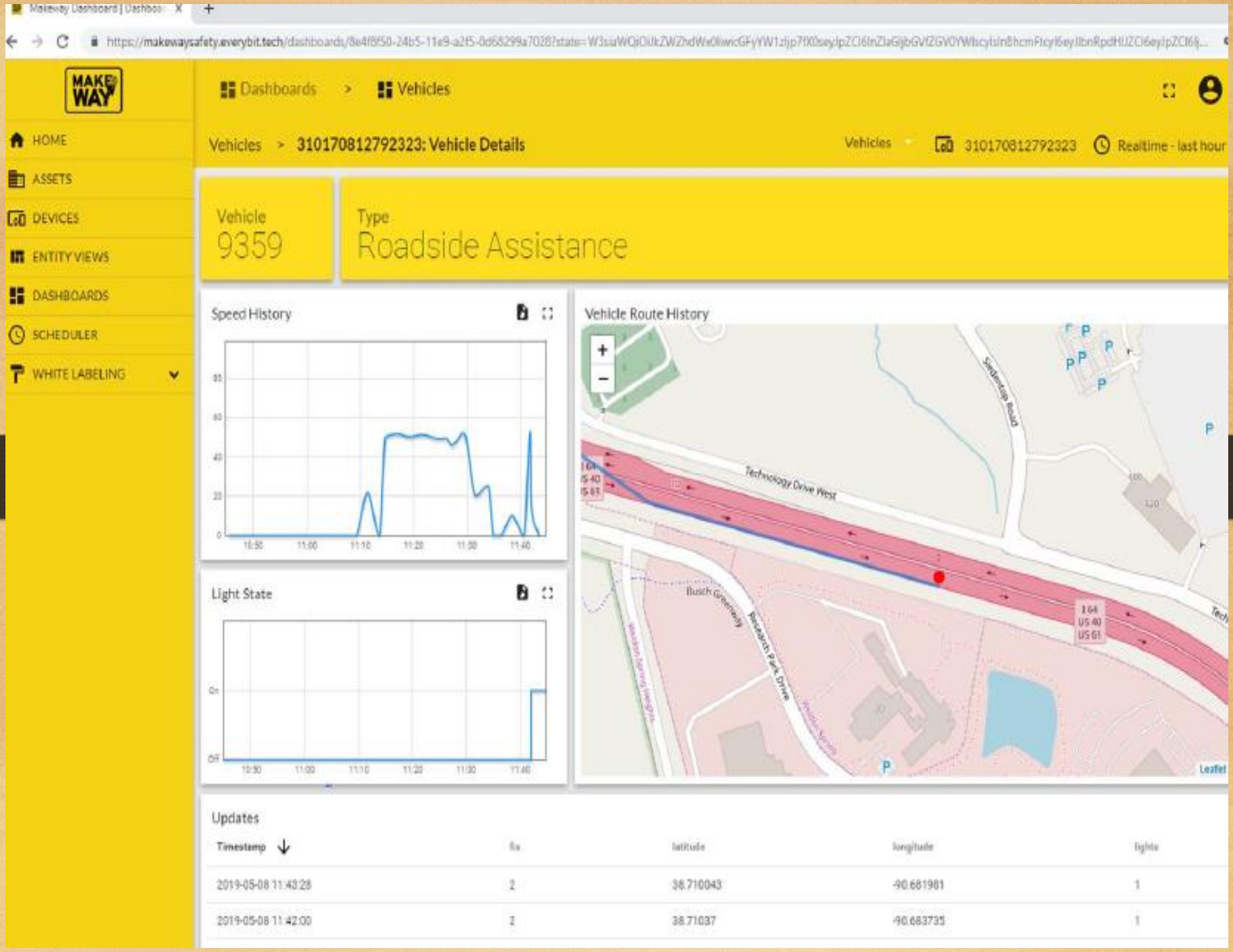
352656100420358
352656100431660
352656100421836
352656100420309
Active Lights
12:00
16:00
20:00
00:00
04:00
All Vehicle Map
9359: Roadside Assistance
9183: Roadside Assistance
9361: Roadside Assistance
9360: Roadside Assistance
St. Louis
O'Fallon
Saint Charles
Florissant
Bridgeton
Cottleville
Weldon Spring
Maryland Heights
Overland
Ferguson
Jennings
Nameoki
Glen Carbon
Granite City
Collinsville
Chesterfield
Creve Coeur
University City
Ballwin
Wildwood
Washington
Eureka
Union
Arnold
Columbia
Cahokia
Shiloh
Belleville
Carlyle
I 64
US 50
I 255
US 50
I 44
US 50
US 40


Dashboards > Vehicles
HOME
ASSETS
DEVICES
ENTITY VIEWS
DASHBOARDS
SCHEDULER
WHITE LABELING
Vehicles > 310170812792323: Vehicle Details
Vehicles
310170812792323
Realtime - last hour
Vehicle
9359
Type
Roadside Assistance
Speed History
Light State
Vehicle Route History
Technology Drive West
Updates
Timestamp
fix
latitude
longitude
lights
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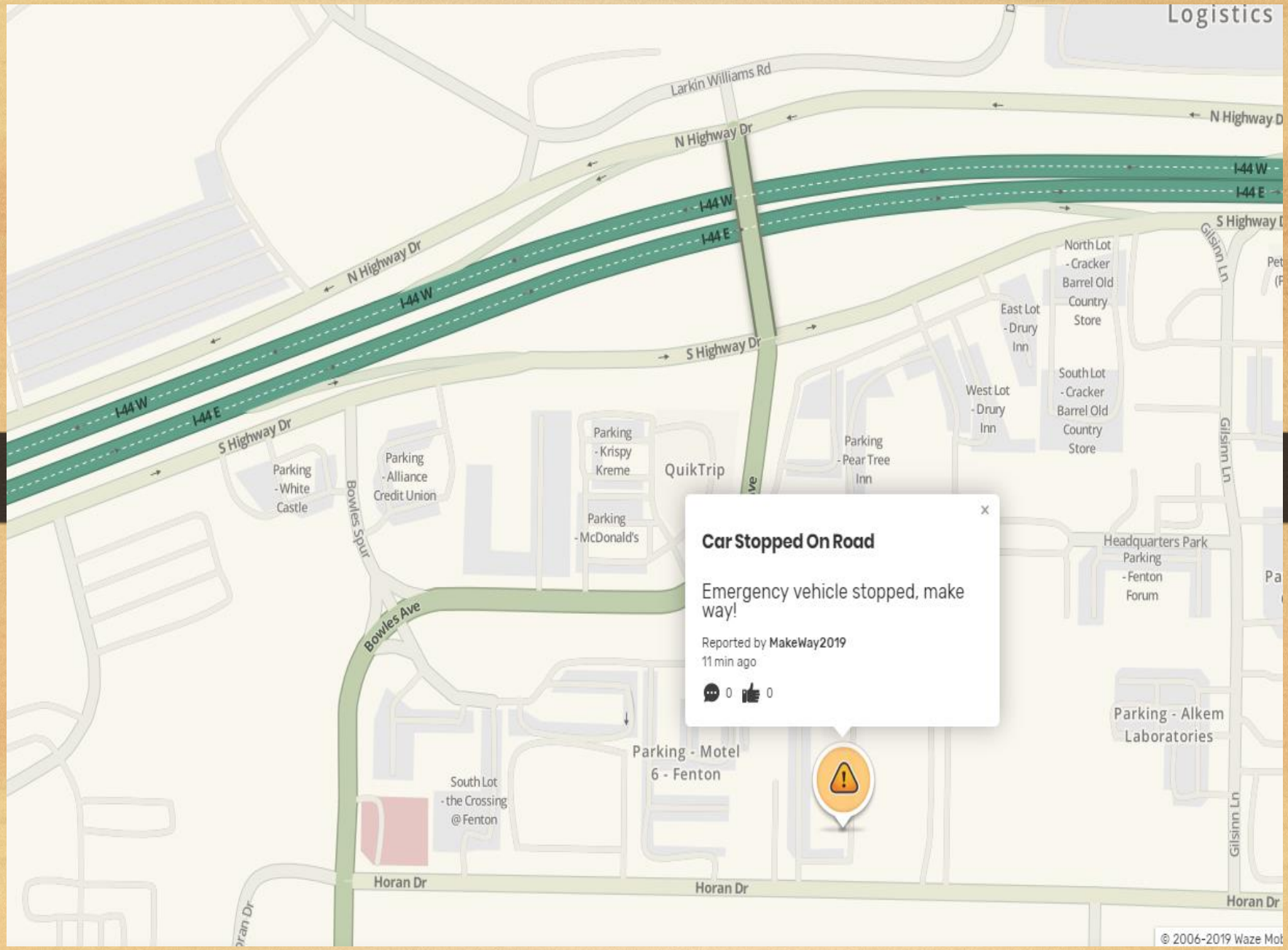
Logistics
Larkin Williams Rd
N Highway Dr
I-44 W
I-44 E
S Highway Dr
Gilsinn Ln
North Lot - Cracker Barrel Old Country Store
East Lot - Drury Inn
West Lot - Drury Inn
South Lot - Cracker Barrel Old Country Store
Parking - White Castle
Parking - Alliance Credit Union
Bowles Spur
Parking - Krispy Kreme
QuikTrip
Parking - McDonald's
Parking - Pear Tree Inn
Bowles Ave
Car Stopped On Road
Emergency vehicle stopped, make way!
Reported by MakeWay2019
11 min ago
0
0
Headquarters Park Parking - Fenton Forum
Parking - Alkem Laboratories
Parking - Motel 6 - Fenton
South Lot - the Crossing @ Fenton
Horan Dr
© 2006-2019 Waze Mob

Next Steps

- Continue pilots.
  - With possible expansions.
  - Enhancements.
- Evaluate benefits and accuracy.
- Research other technologies.
- Potential statewide deployment.

Long Range Plan

Predictive Analytics

Leveraging predictive analytics generated from CVAV, and those data items produced by cellular network providers, provide benefits to law enforcement, public safety, and other industries and services associated with transportation activity.

Policy

Missouri law does not specifically address the operation of autonomous vehicles.

Platooning

Missouri has a provision in law that prohibits vehicles, including trucks, from following another vehicle any closer than 300 feet.