

ITS Heartland

Leveraging High-Resolution Data and Cloud-Based Arterial Performance Analysis for the Smart Mobility Future

David Spinney

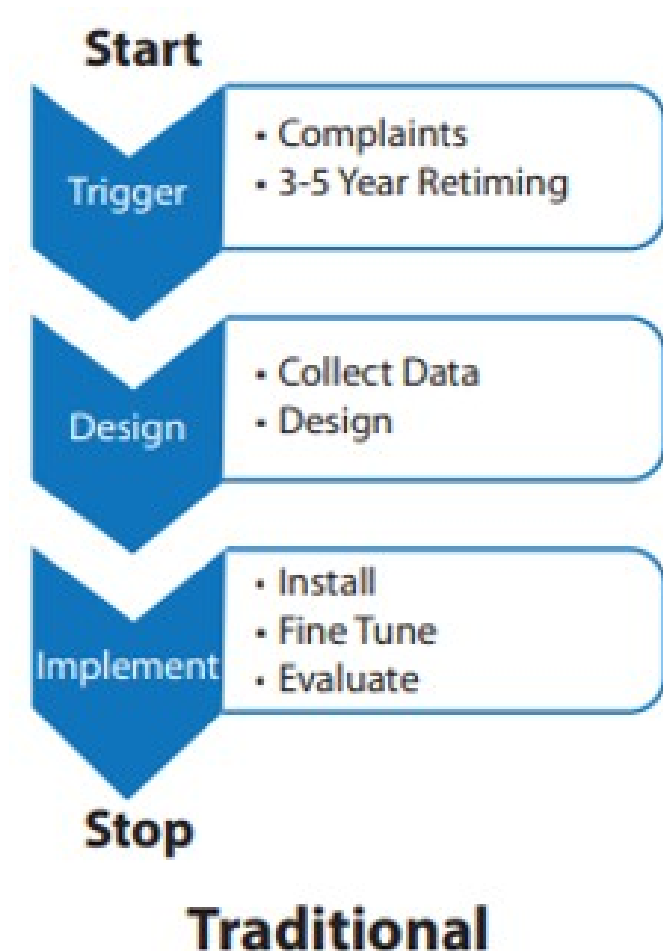
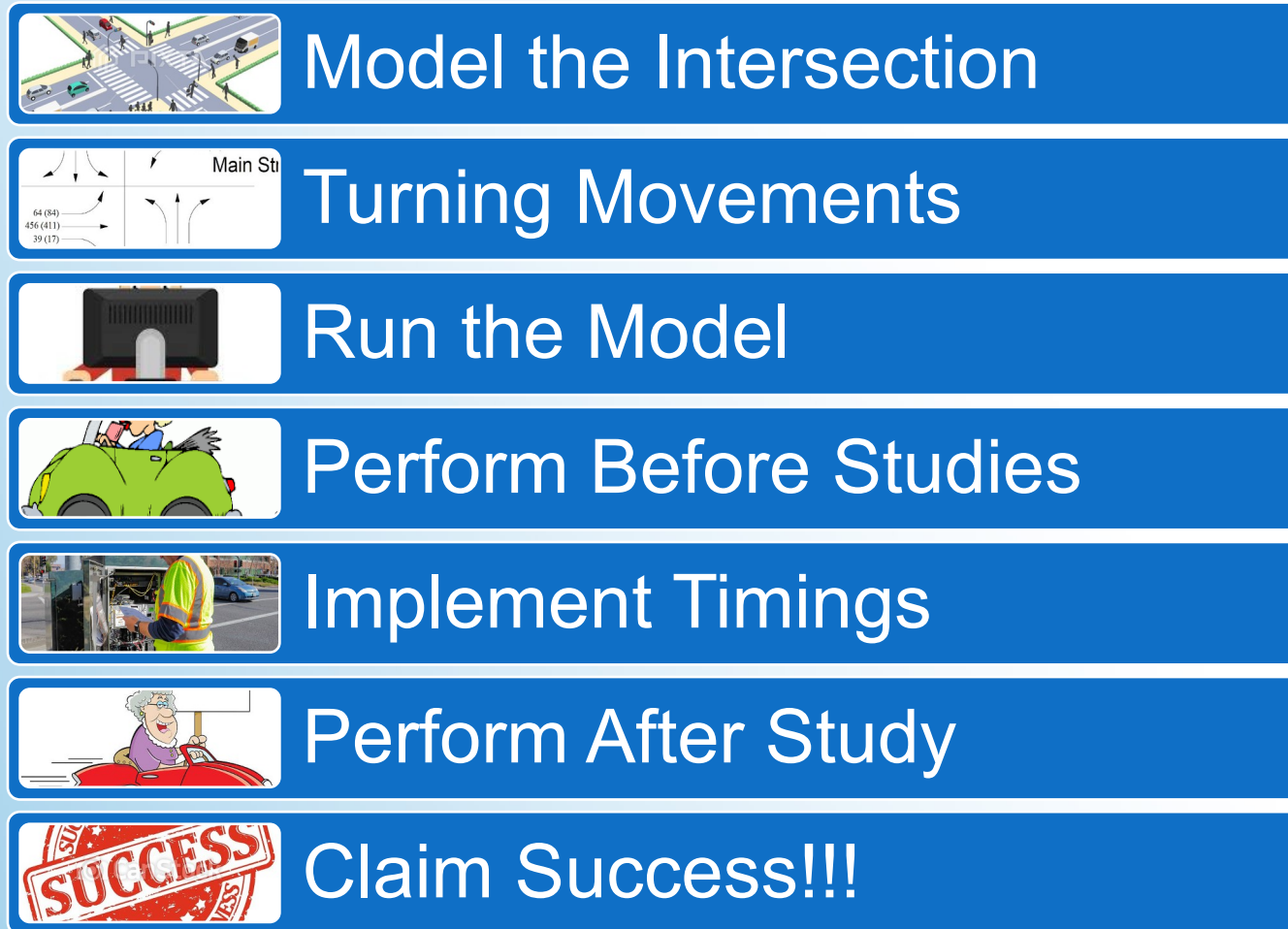
Vice President, Econolite Systems Inc.

April 26, 2022



Saving Lives Through Improved Mobility

Traditional Optimization Process



A Cloud-Based Integrated Platform

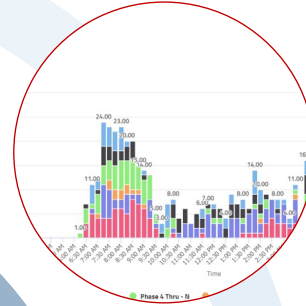
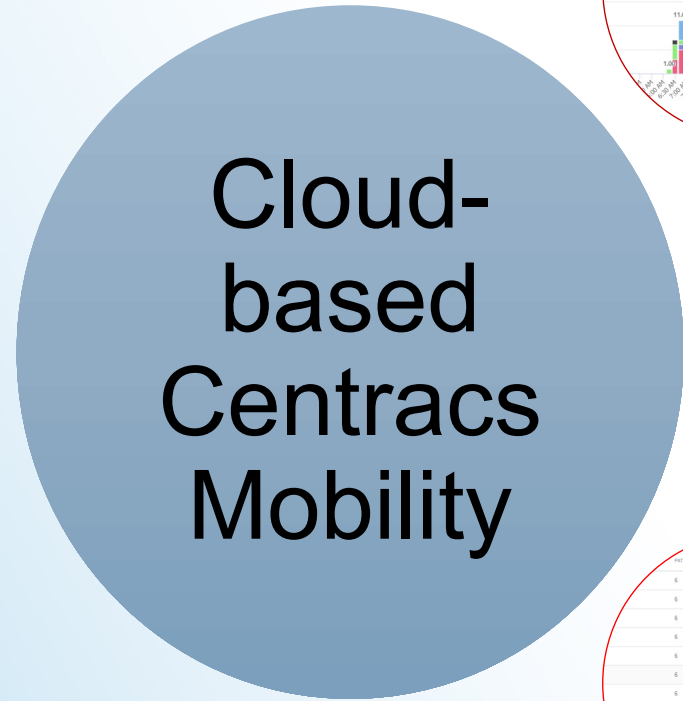
- Data Collection & Fusion from ever increasing sources
- Analytics [algorithms, Machine Learning (ML), Artificial Intelligence (AI)]
- Data driven signal timing optimization
- Download to signal controllers
- Support performance evaluation [Metrics]



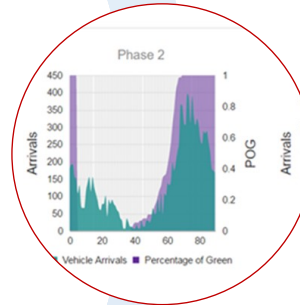
Advances in Arterial Traffic Management

- Purdue's high resolution data capture for Signal Performance Measures and new optimization methodologies
- *Priority-driven optimization* to minimize Transit Signal Priority (TSP) and Preemption impacts on coordination
- Connected/Automated Vehicle (C/AV) data
- Trajectory data via advanced detection technologies
- Crowd-sourced data
- Predictive Analytics

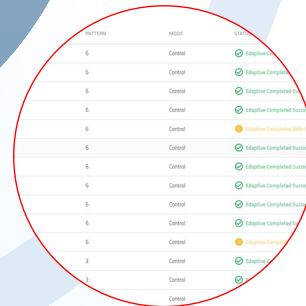
Smart Signals



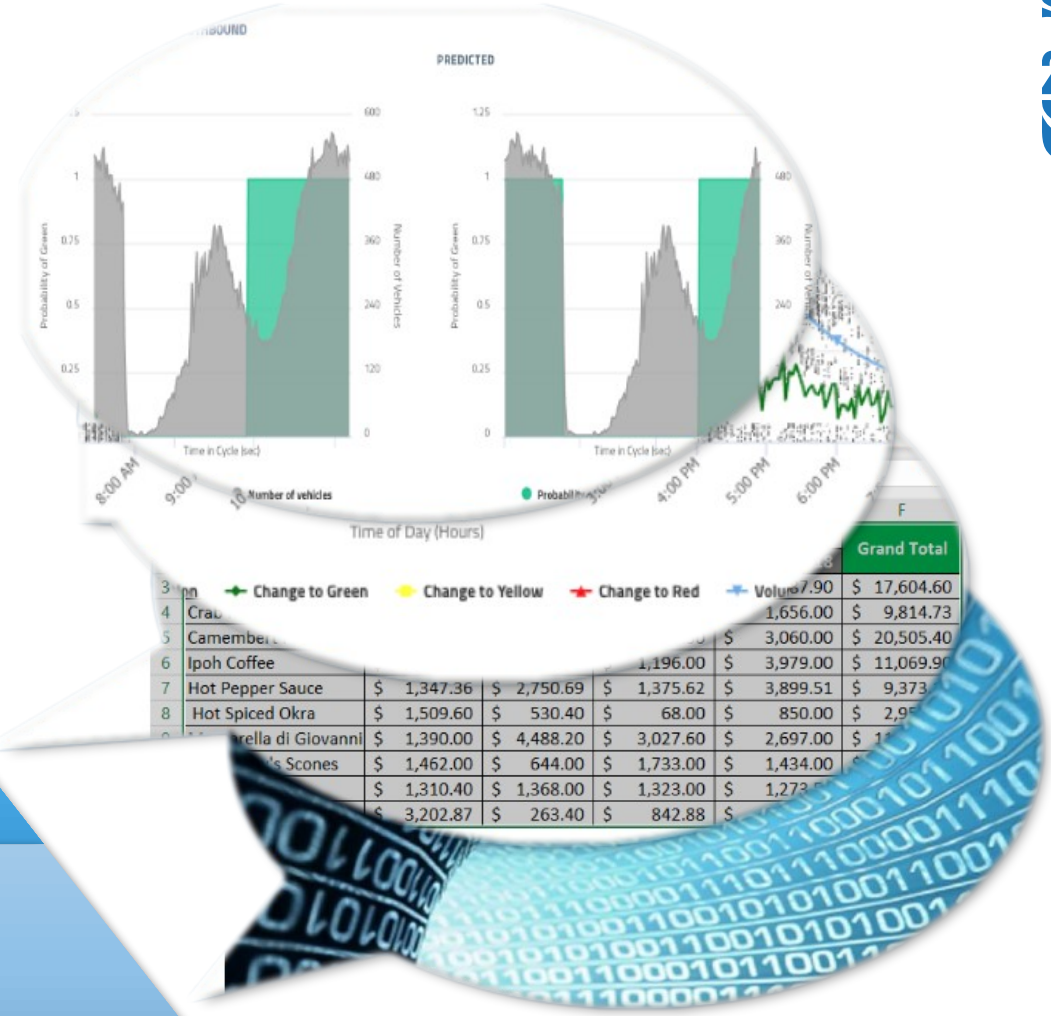
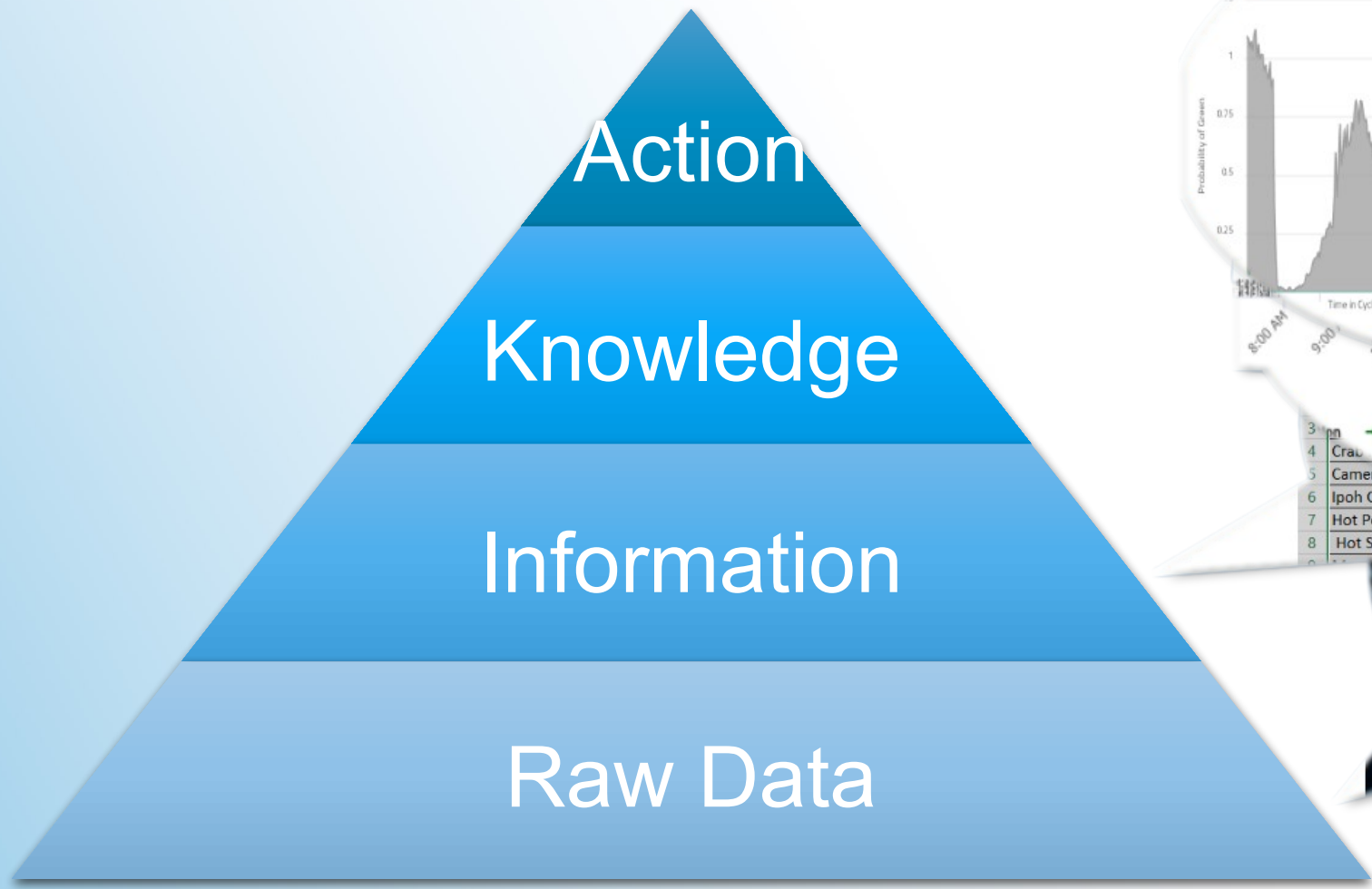
High-res data-based Analytics



Pattern Optimizer (user selectable schedule)

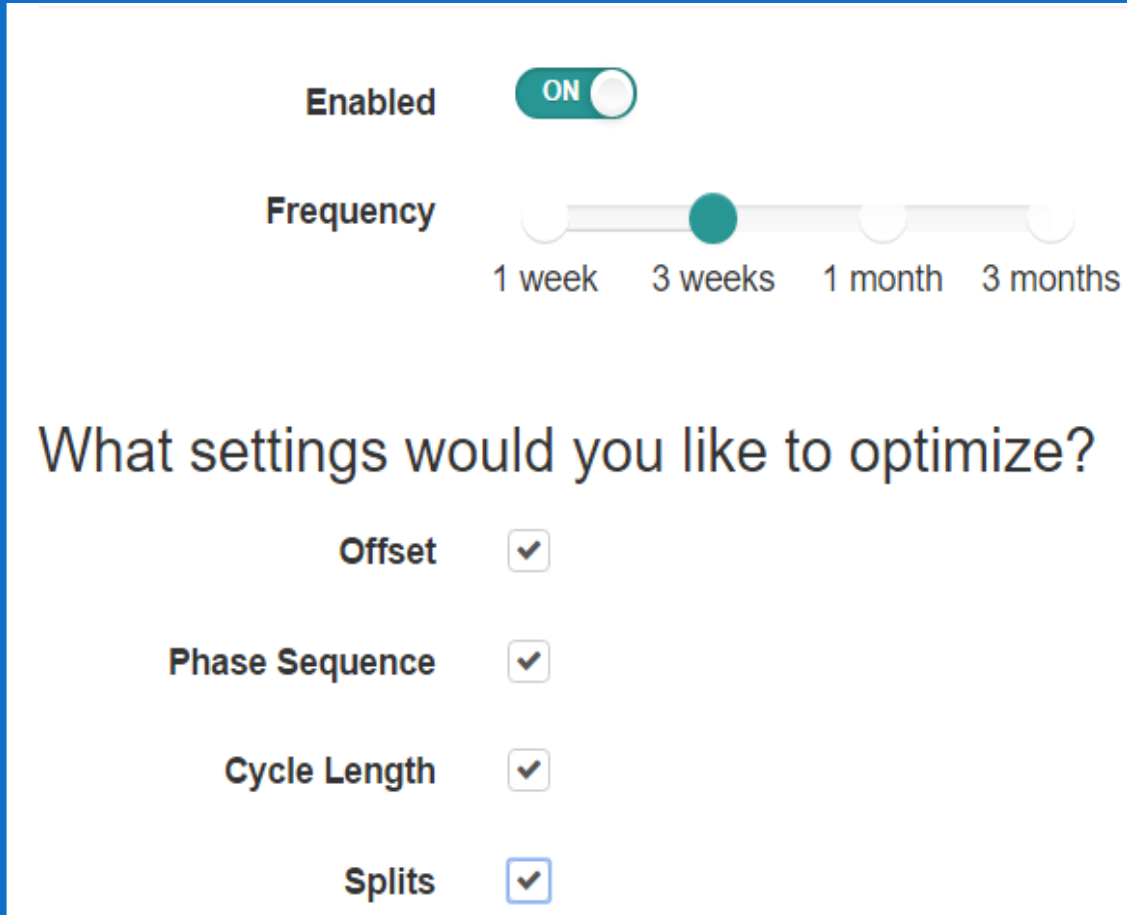


Automated updates (adaptive control)



Optimization Strategies

- Allows both automatic and “user-approval-in-the-loop”-based changes to the coordination plans
- Allows the user to set up the system to perform near-real-time and real-time optimization of the roadway network.



Enabled

Frequency 1 week 3 weeks 1 month 3 months

What settings would you like to optimize?

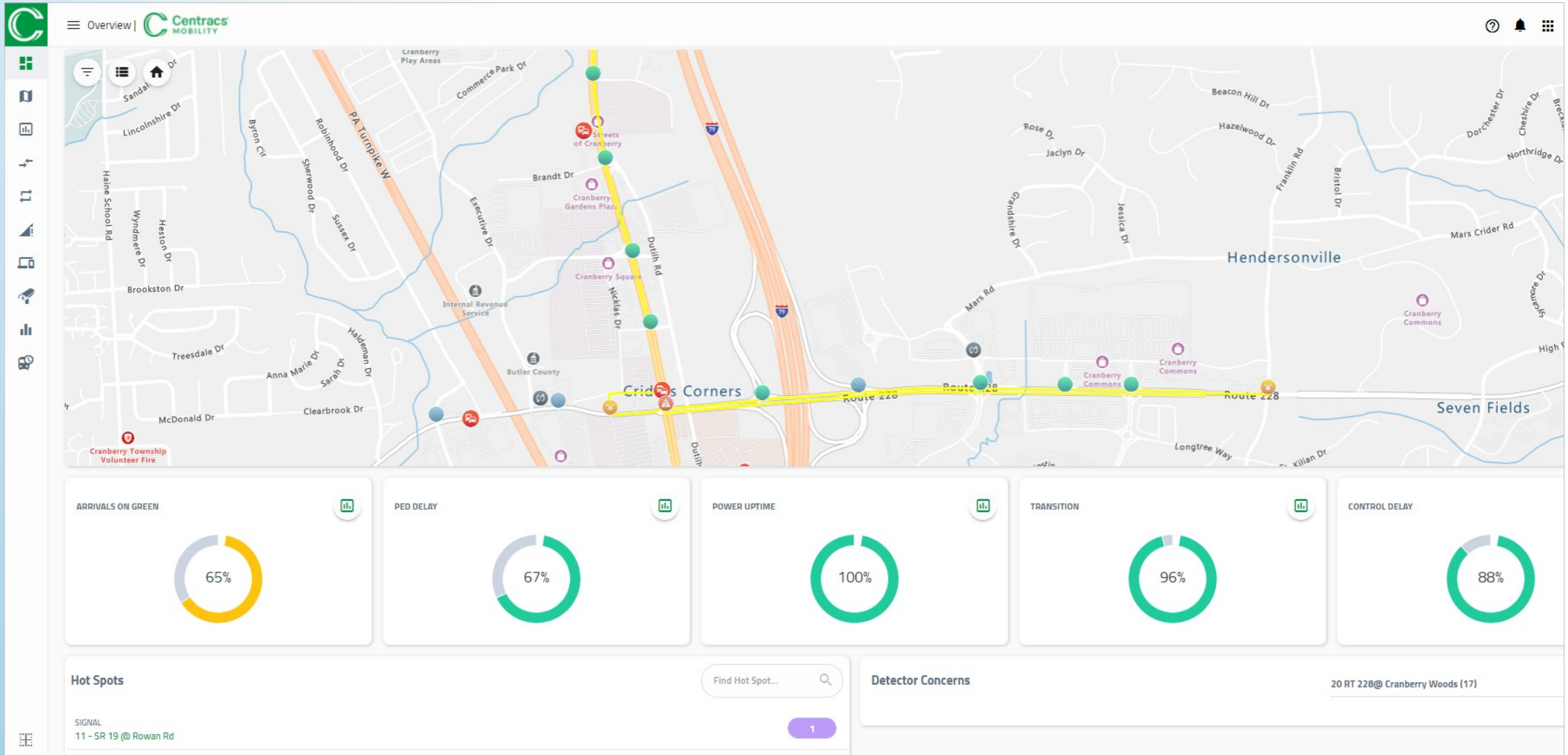
Offset

Phase Sequence

Cycle Length

Splits

Performance Dashboard

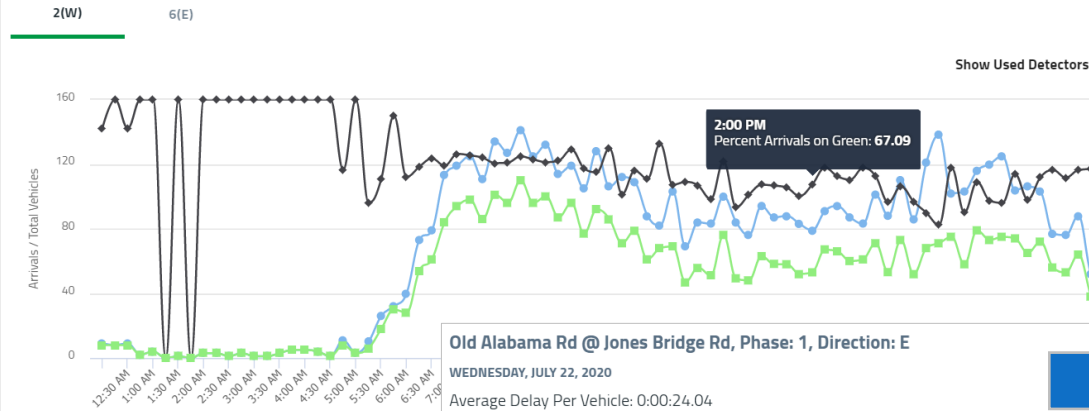


Sample Mobility Performance Metrics



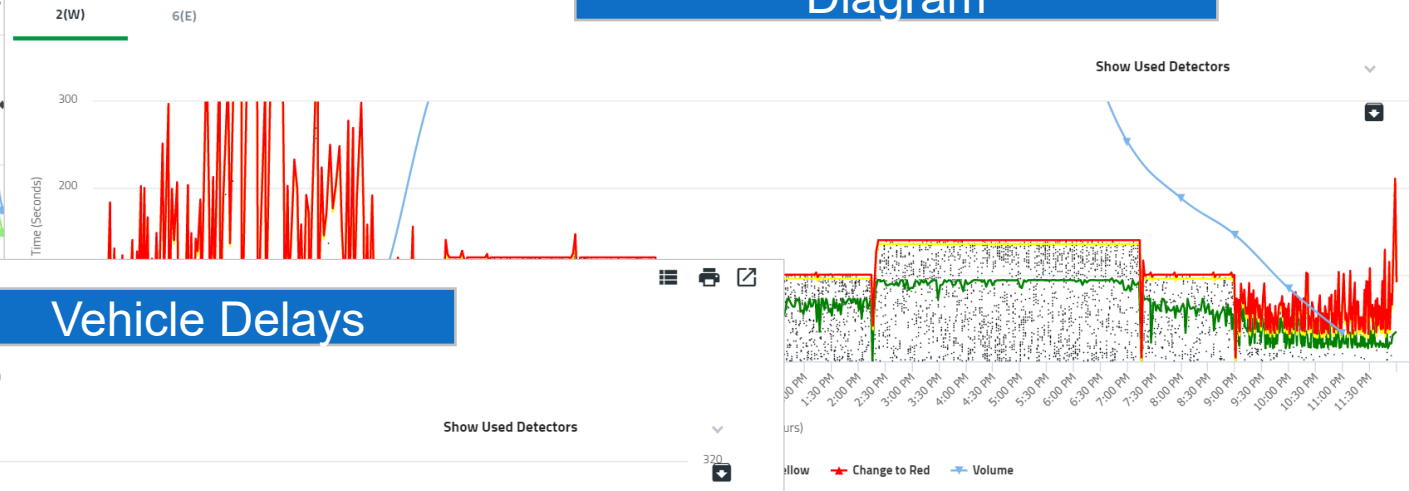
Old Alabama Rd @ Jones Bridge Rd, Phase: 2, Direction: W
 WEDNESDAY, JULY 22, 2020
 Total Detector Hits: 6127, Total AoG: 4291, AoG for the selected period: 70%

Arrivals on Green



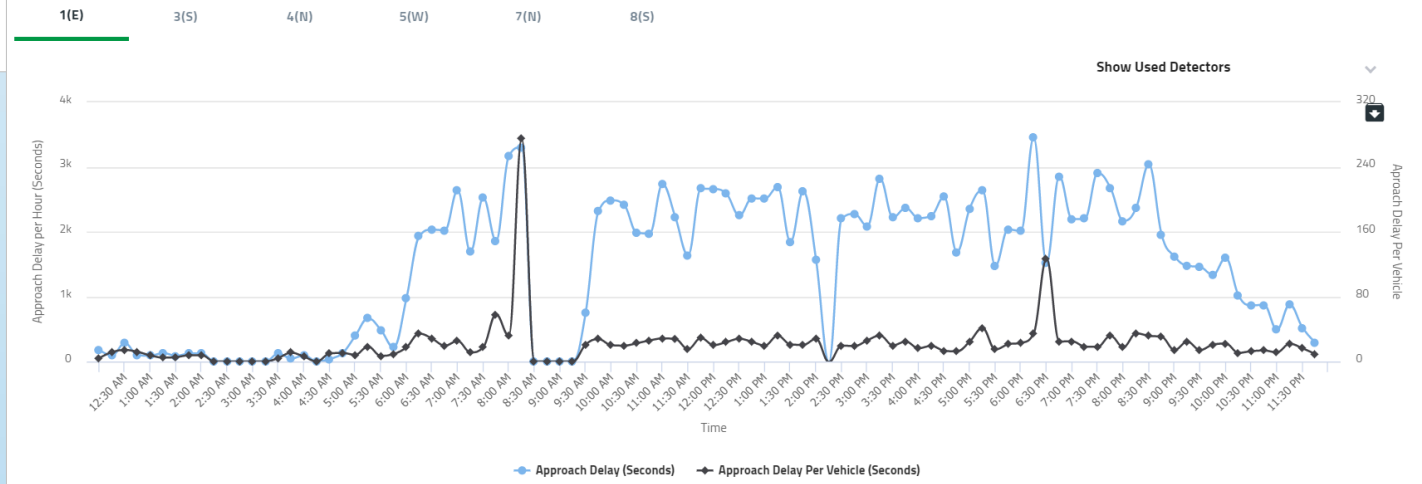
Old Alabama Rd @ Jones Bridge Rd, Phase: 2, Direction: W
 WEDNESDAY, JULY 22, 2020
 AoG: 44%

Purdue Coordination Diagram



Old Alabama Rd @ Jones Bridge Rd, Phase: 1, Direction: E
 WEDNESDAY, JULY 22, 2020
 Average Delay Per Vehicle: 0:00:24.04

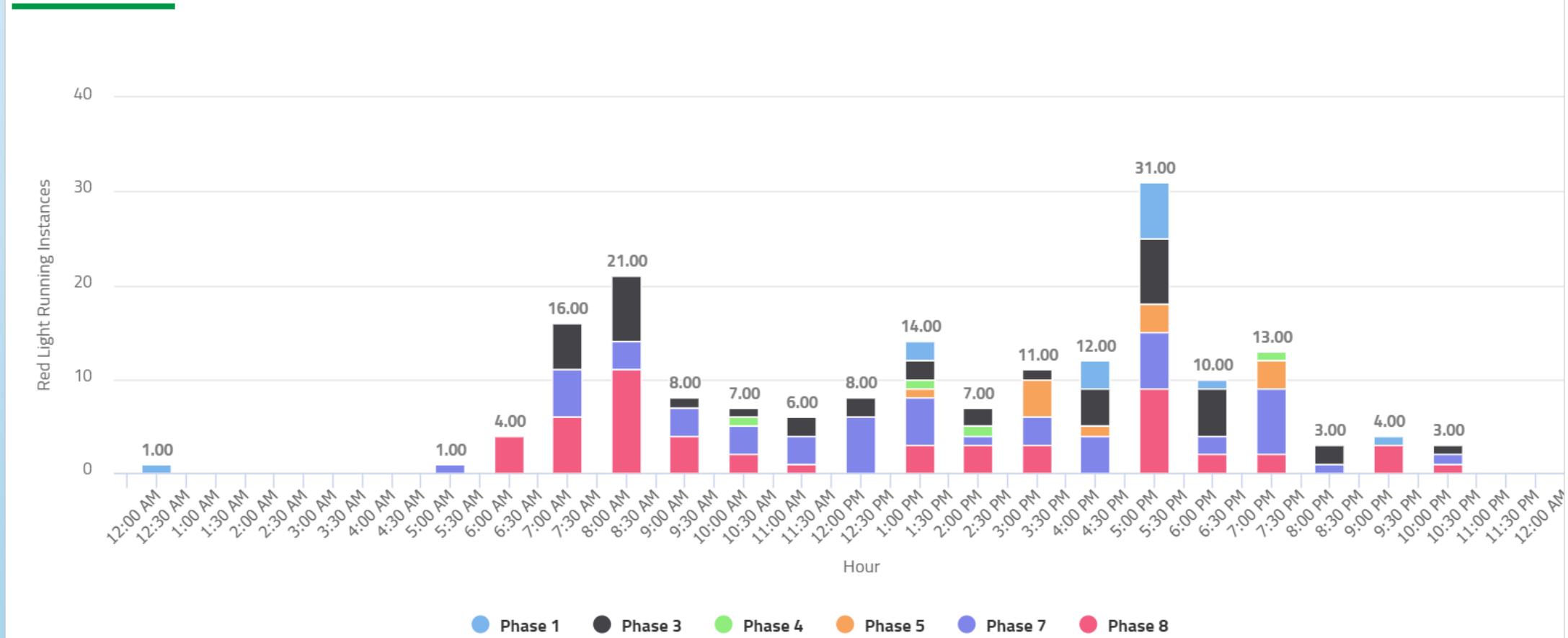
Vehicle Delays



Safety Metrics: Red Light Runner Instances

WEDNESDAY, JULY 22, 2020

ALL PHASES




Optimization Strategies



EDAPTIVE		PATTERN OPTIMIZER		NOT OPTIMIZED		Find Corridor...			
ENABLED	CORRIDOR	LATEST RUN	ANALYSIS PERIOD	LATEST ACTION	GREEN TIME / DIRECTION	INITIAL	PREDICTE		
<input checked="" type="checkbox"/>	Rt 228	6/27/21, 4:05 AM	6/20/21 - 6/26/21	6/27/21, 4:05 AM	Programmed / Westbound	Run generated from			
					Programmed / Eastbound	Edaptive data*			
<input checked="" type="checkbox"/>	U.S. 19	6/27/21, 4:05 AM	6/20/21 - 6/26/21	6/27/21, 4:05 AM	Programmed / Southbound	Run generated from			
					Programmed / Northbound	Edaptive data*			

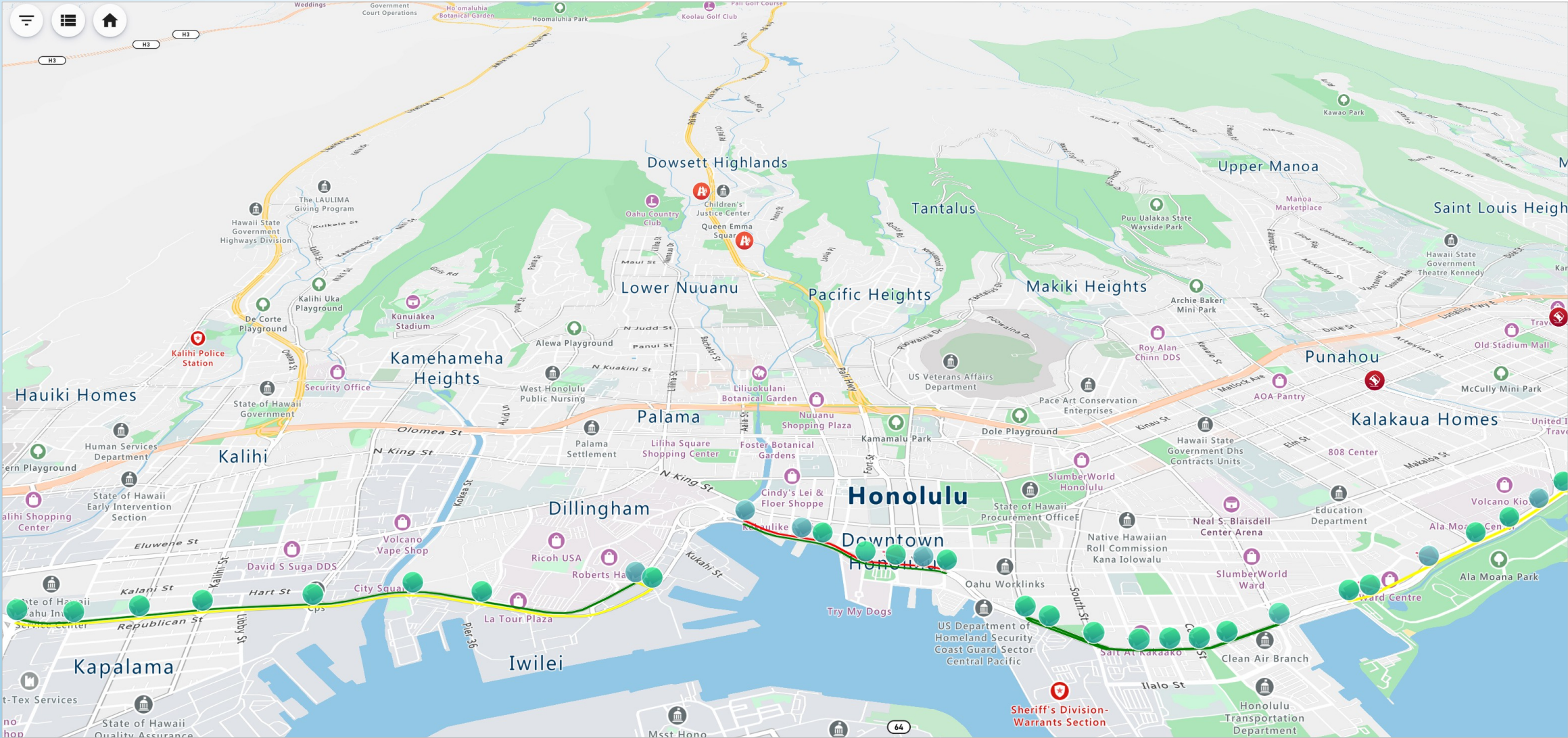
EDAPTIVE		PATTERN OPTIMIZER		NOT OPTIMIZED		Find Corridor...			
CORRIDOR	CURRENTLY RUNNING	ENABLED	SCHEDULED	ACTIONS					
Rt 228	Control								
U.S. 19	Control								

Edaptive - Operational Insight

04:25 PM	14	Control	✔ Edaptive Completed Successfully	
04:14 PM	14	Control	✔ Edaptive Completed Successfully	
04:08 PM	14	Control	✔ Edaptive Completed Successfully	
04:00 PM	14	Control	✔ Edaptive Completed Successfully	

SIGNAL	PATTERN	CYCLE LENGTH	OFFSET	SPLITS								
11 - SR 19 @ Rowan Rd	14	150 → 150	77 → 77	⊙ ₁ 21 → 25	⊙ ₂ 56 → 51	⊙ ₈ 14 → 14	⊙ ₄ 59 → 60	⊙ ₅ 22 → 26	⊙ ₆ 55 → 50			
10 - SR 19 @ Rochester Rd	14	150 → 150	4 → 4	⊙ ₂ 64 → 64	⊙ ₁ 35 → 35	⊙ ₃ 35 → 35	⊙ ₄ 16 → 16	⊙ ₅ 14 → 17	⊙ ₆ 85 → 82	⊙ ₇ 22 → 27	⊙ ₈ 29 → 24	

Honolulu Case Study



Edaptive All Day Control – Full & Half Cycle Operations



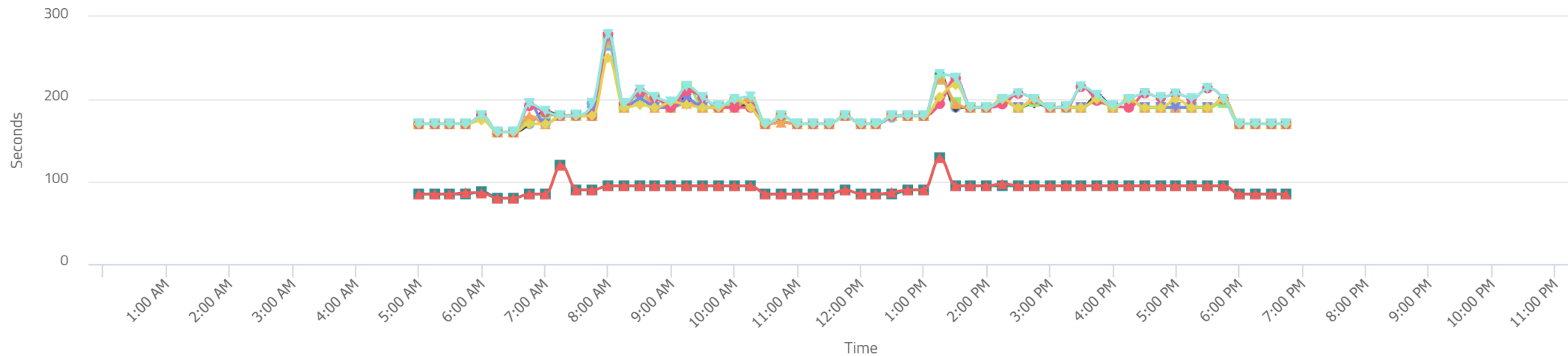
Corridor Level Cycle Length

12/30/2020

Downstream Direction SE

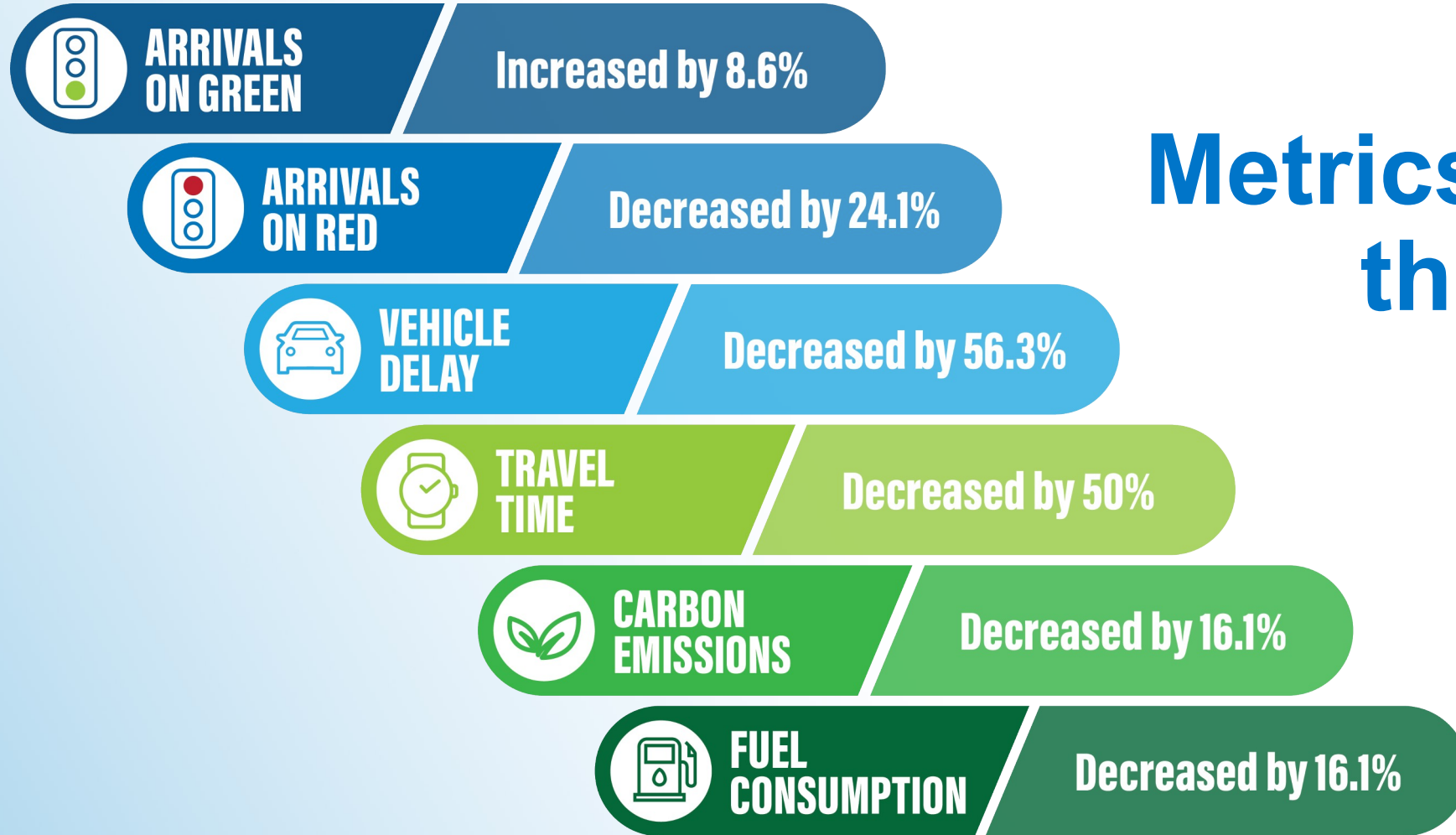


ALL PHASES - DOWNSTREAM DIRECTION SE



- 01 - N Nimitz Hwy @ Sand Island Access Rd. Main Street Cycle Length
- ◆ 02 - N Nimitz Hwy @ Puuhale Rd. Main Street Cycle Length
- 03 - N Nimitz Hwy @ Mokauea St. Main Street Cycle Length
- ▲ 04 - N Nimitz Hwy @ Kalihi St. Main Street Cycle Length
- ★ 05 - N Nimitz Hwy @ Waiakamilo Rd. Main Street Cycle Length
- 06 - N Nimitz Hwy @ Fishing Village Main Street Cycle Length
- ◆ 07 - N Nimitz Hwy @ Alakawa St. Main Street Cycle Length
- 08 - N Nimitz Hwy @ Pacific St EB Main Street Cycle Length
- ▲ 09 - N Nimitz Hwy @ Pacific St WB Main Street Cycle Length
- ★ Nimitz Hwy (Sig 1-9) Main Street Average Cycle Length

Honolulu Results



**Metrics
that
Matter**

Summary

- Leverage a cloud-based, integrated platform that supports data collection/fusion from multiple sources, analytics, signal timing optimization and performance assessment to drive arterial performance
- Address agencies' resource constraints through integrated tools and system intelligence
- Assist agencies with proactive Operations & Maintenance
- Leverage Connected/Automated Vehicles for data collection, information dissemination and onboard safety applications
- Improve safety & mobility