



The LiDAR Enabled Safe System: Leverage Physical AI and 3D Data for Proactive Vision Zero Interventions

Donald R. Shupp
ITS West Account Executive

OUSTER

ITE Western District Meeting
June 30, 2026

Industry challenges



NATIONAL

U.S. pedestrian deaths reach a 40-year high

JUNE 26, 2023 · **npr**

Juliana Kim



How is this video
detection camera
going to see
underpass zones?

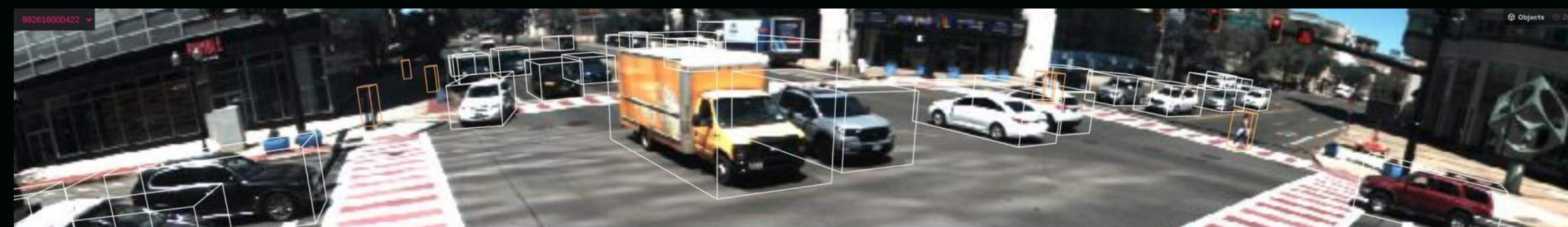


What is LiDAR & differences to Video & Radar

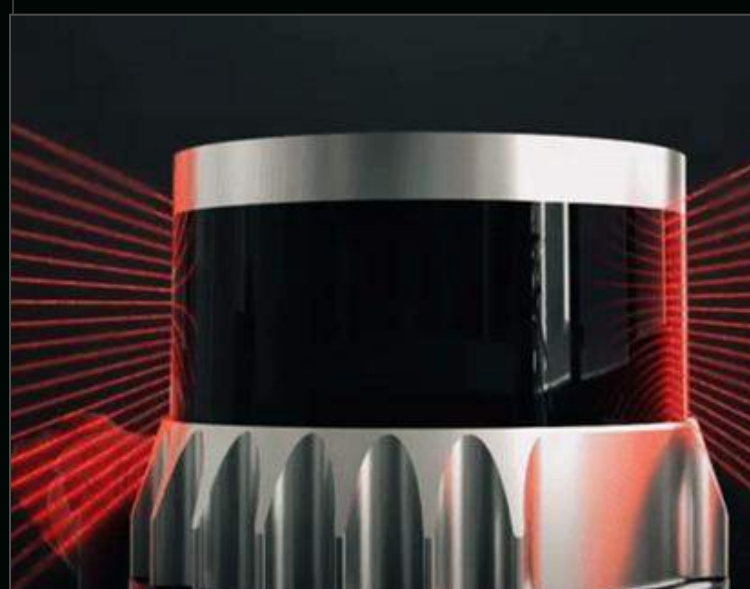
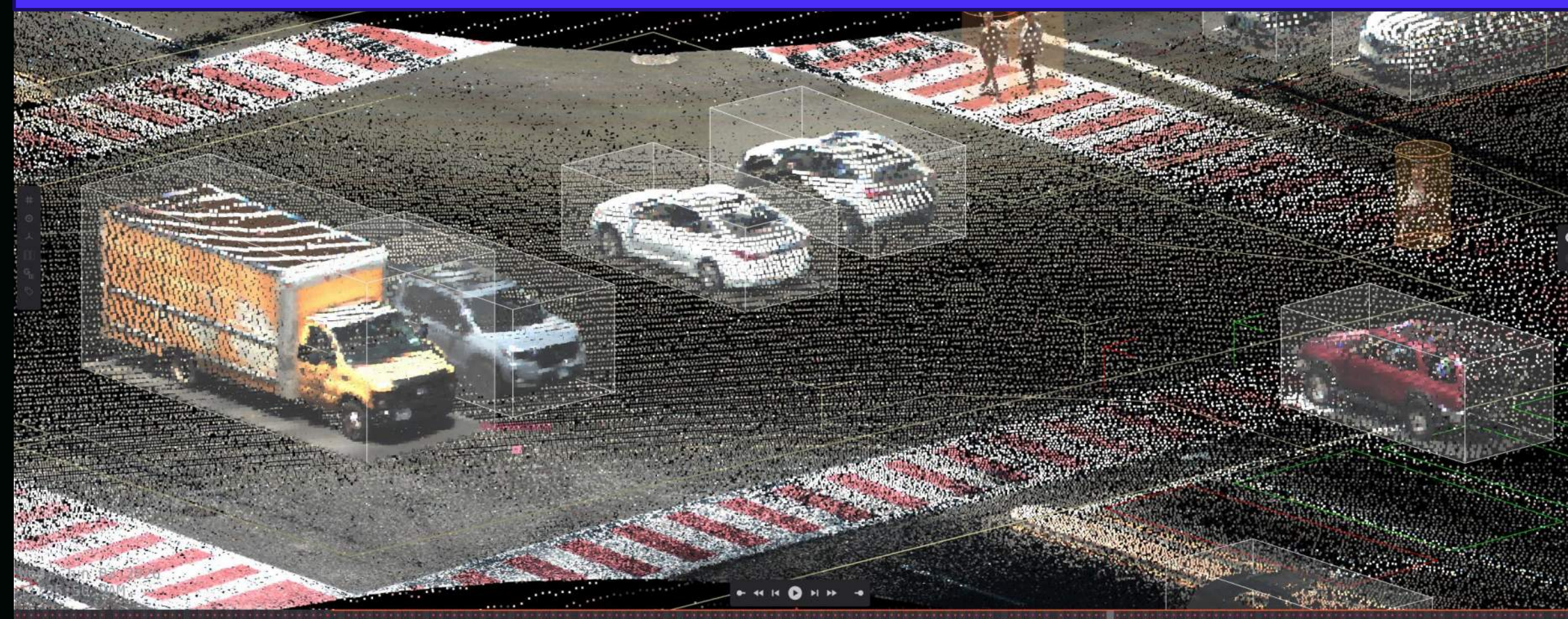
"Light Detection and Ranging" uses near-infrared light pulses (lasers) to measure reflection time & distances, to detect intersection objects.

Ouster Rev8 rotating LiDAR sensors collect up to 10.4 million points per second.

Fast scan rate creates a **3D Point Cloud** or digital traffic twin of an intersection or roadway, with accurate 3D bounding boxes of multimodal road users.



Above: 2D data directly from lidar (not a camera!)
Below: 3D point cloud in native color



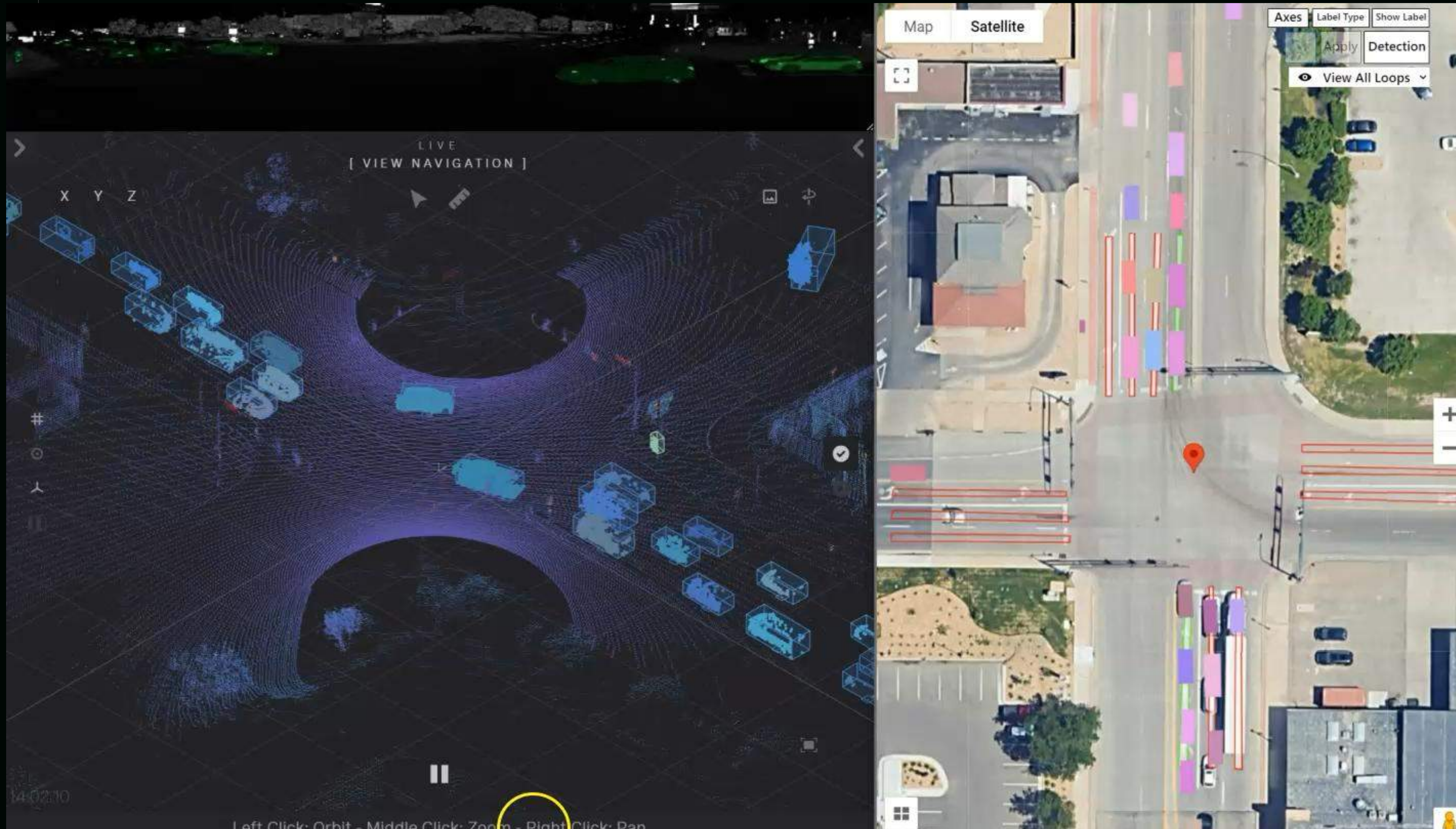
Intersection LiDAR Sensor Types on the market

Fixed Angle View Sensor

Magnetic levitated rotational Sensor



Quality of True Digital Twin vs Google Map Overlay



Left:
Blue City 3D LiDAR

Right:
Radar Detection Zone
Overlay onto Google
Aerial Street Map

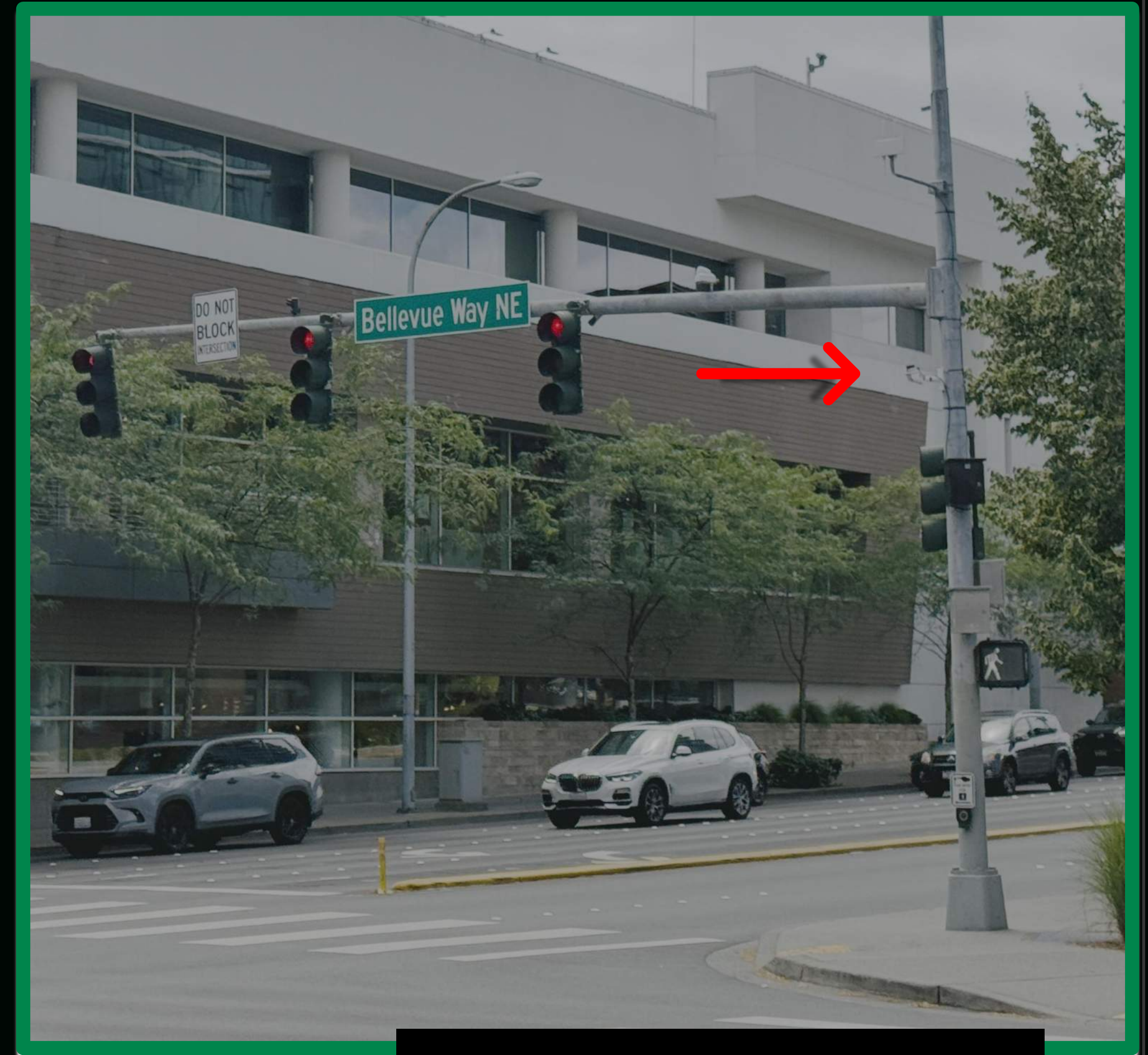
City of Bellevue Blue City LiDAR Pilot Project

Install

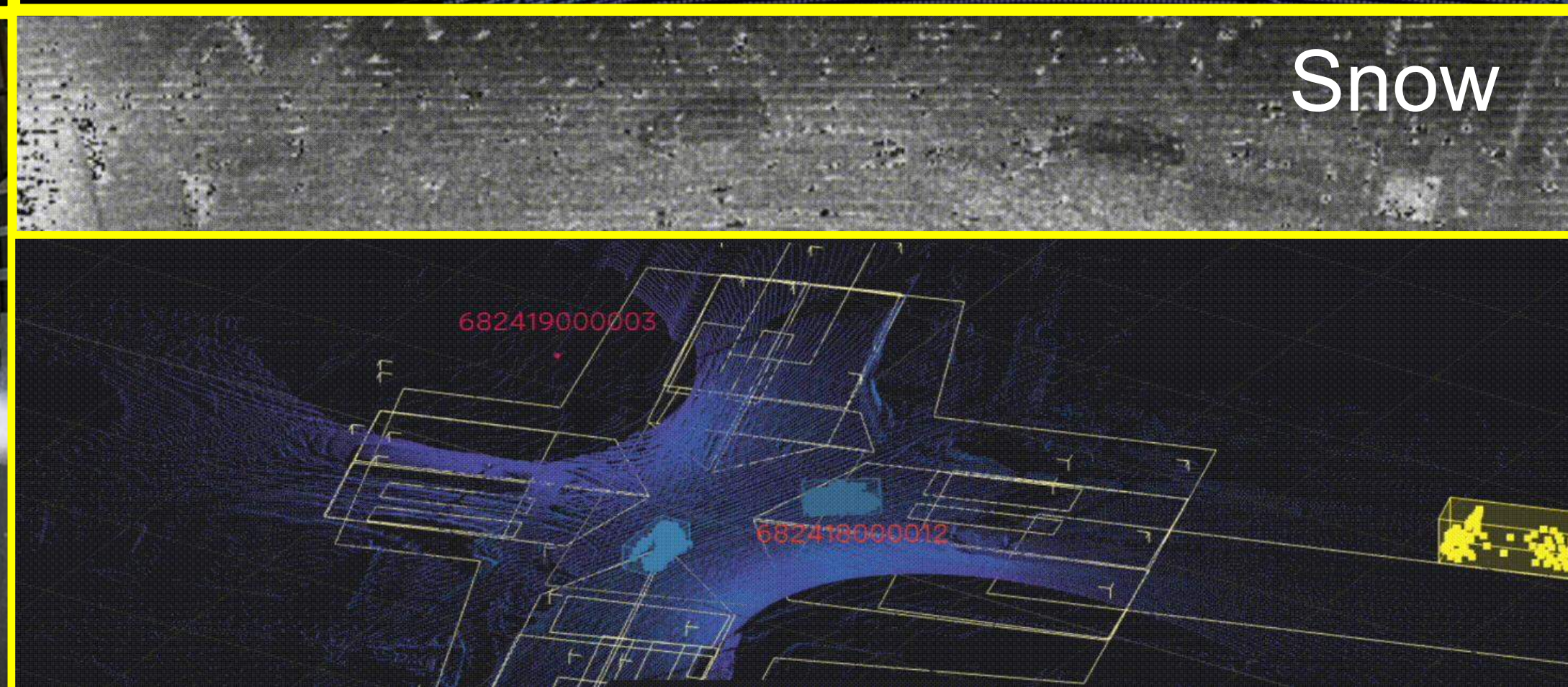
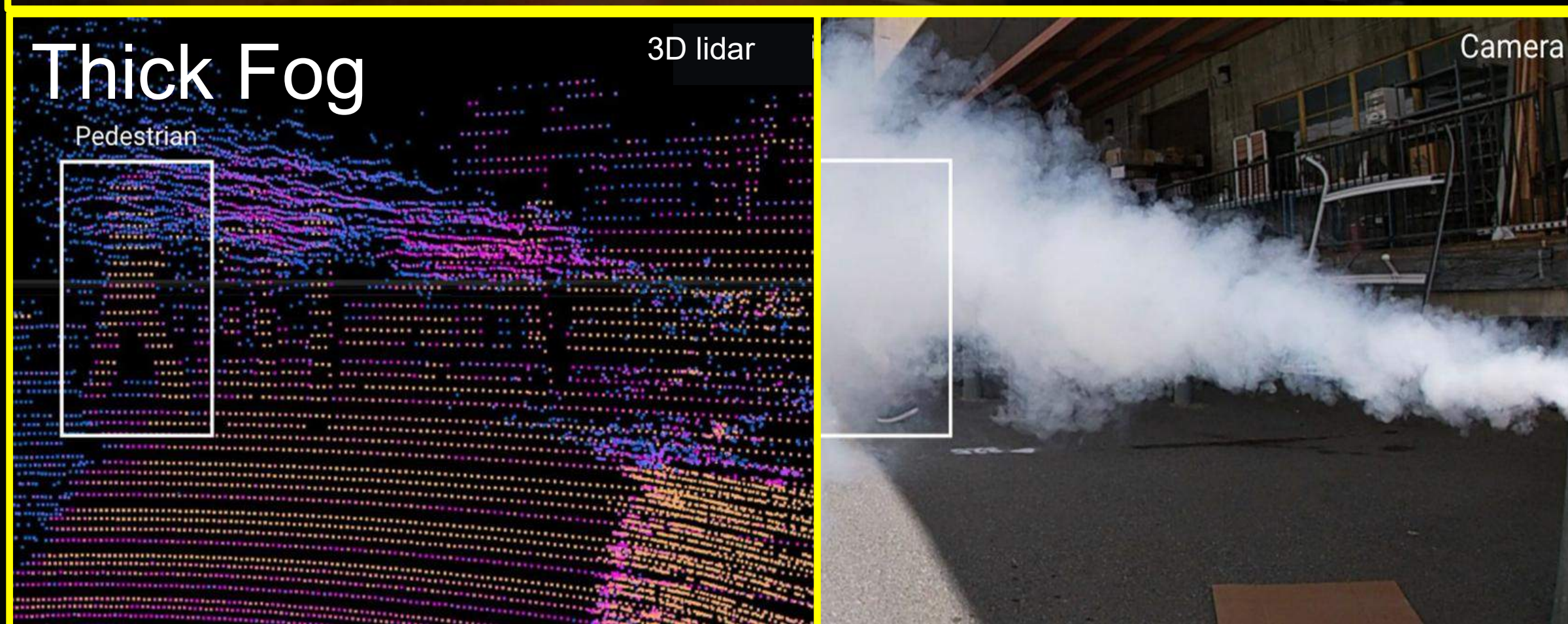
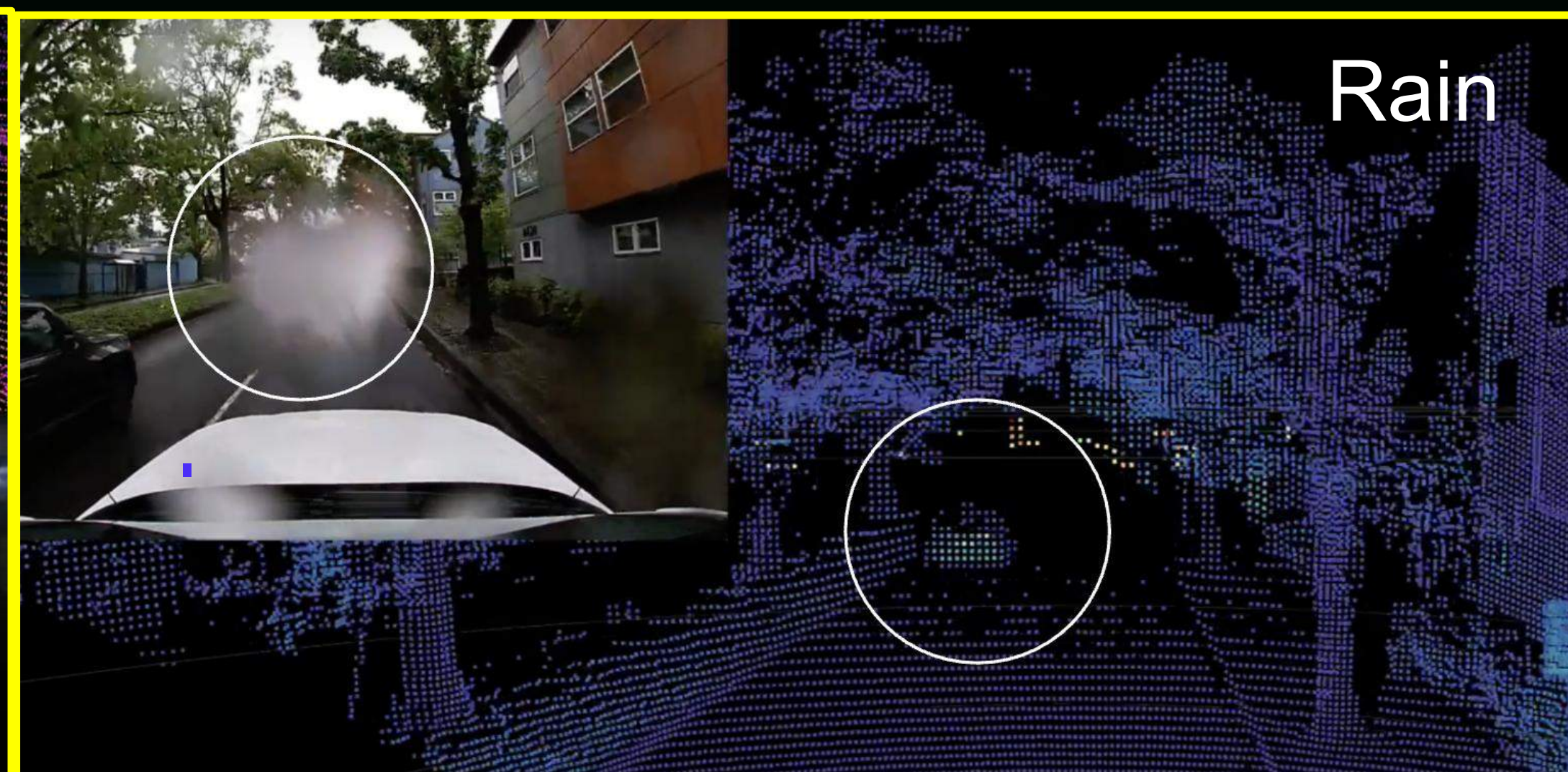
- Two OS-1 sensors cover a 4-way intersection
- 13-15 ft height on existing traffic pole
- Typical sensor tilt angle of 15° – 20°
- Average 3 hour install
- Compatibility with SCATS NEMA TS1 Cabinets

Pilot project 2024

- Access full safety analytics & actuation in one complete system
- Informed decisions based on real-time data
- Optimized for all changing traffic conditions and weather ("Four Seasons Test")
- Seeking accuracy improvements to existing video detection system platforms



How does rotating LiDAR Accuracy improve Safety?

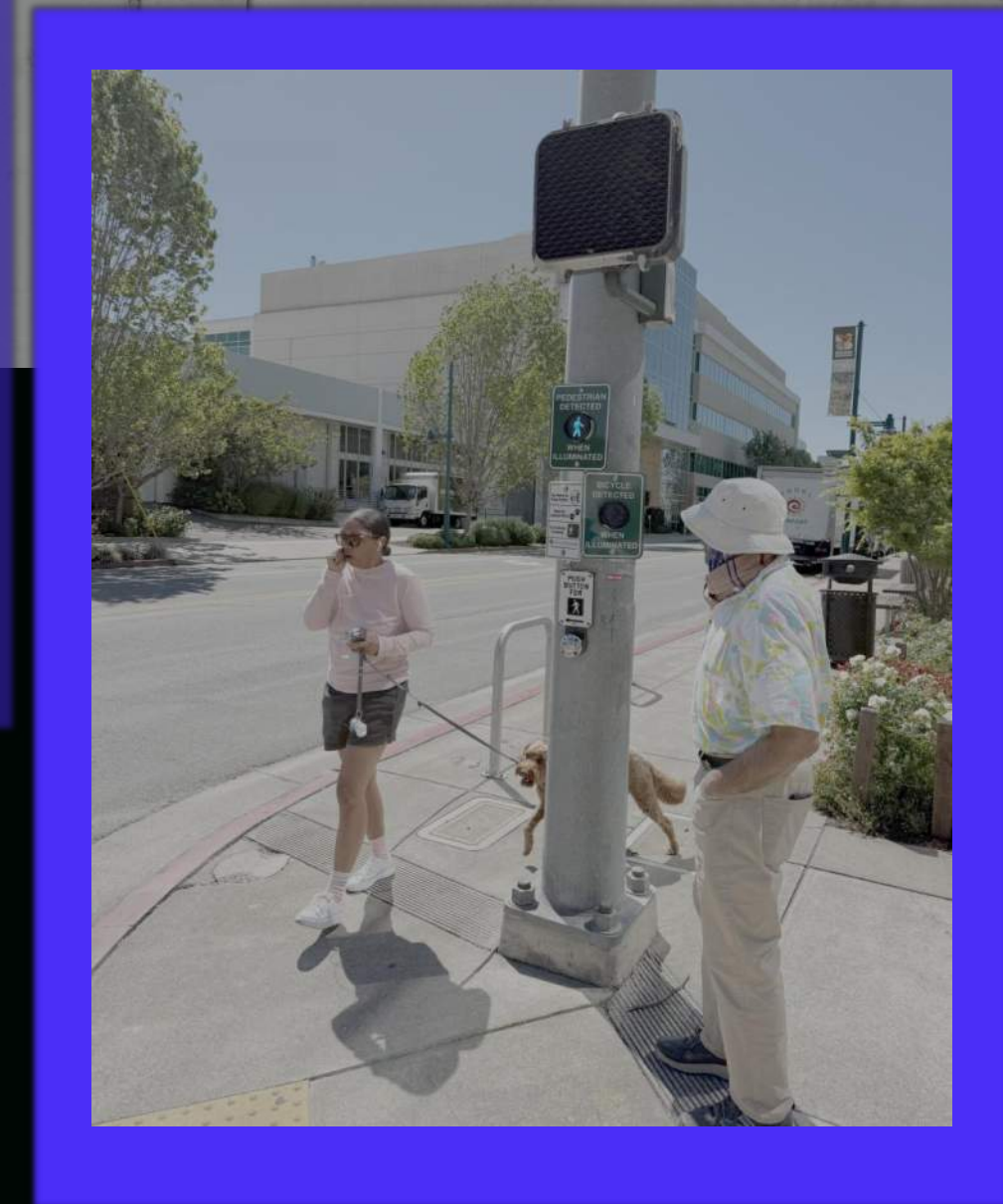
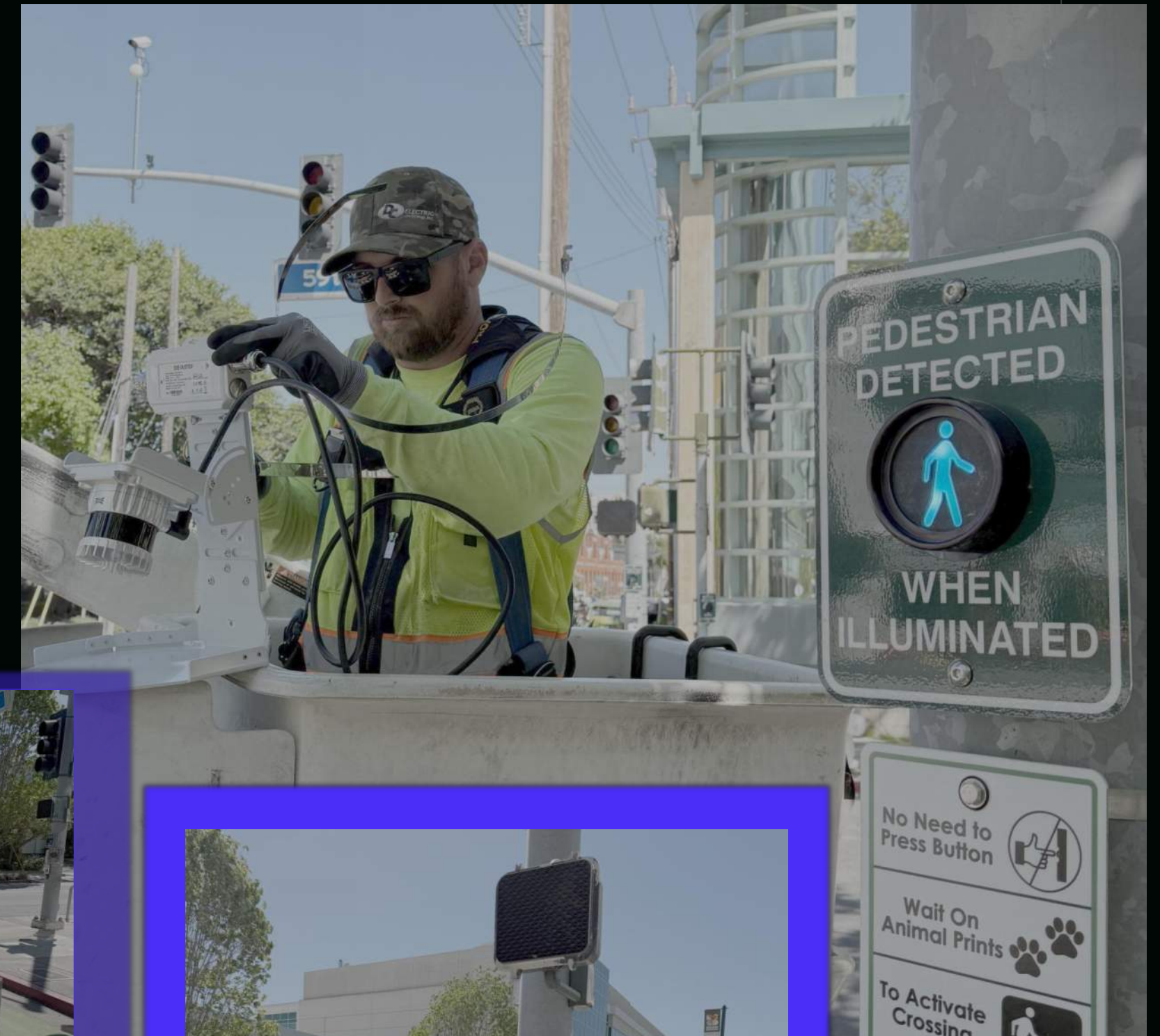


LiDAR Detection is the most effective platform to achieve Vision Zero Safe System Objectives >>> Passive Ped Detection



Chandler installs LiDAR pedestrian detection system at busy intersection

The system was installed after a Jewish resident raised concerns about pressing the crosswalk button on the Sabbath





Physical AI: 3D native LiDAR color breakthrough



[VIEW NAVIGATION]



256 lasers provide 500' of multimodal advance detection & classification

Detection, Counts, SPM, and Analytics on Edge processing or Cloud platform

System-level privacy (PII) features at the edge

Same Detection performance in All-weather & lighting. Same accuracy at 2PM or 2AM

Rotating Lidar has a Maintenance-Free Sensor design



Examples of LiDAR sensor placement at the intersection



• San Francisco, CA, USA



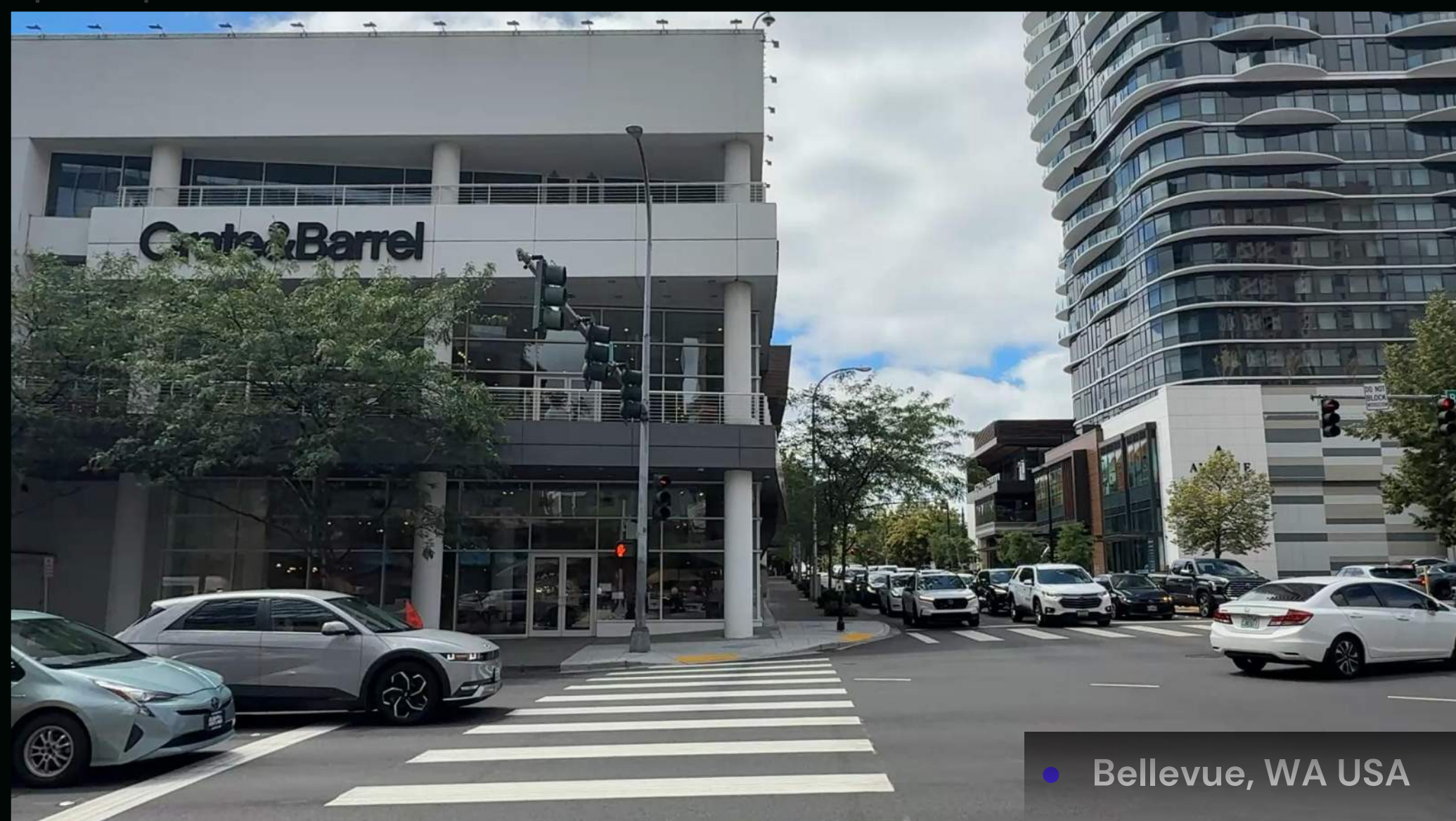
• San Jose, CA, USA



• Atlanta, GA, USA



• Portland, OR, USA



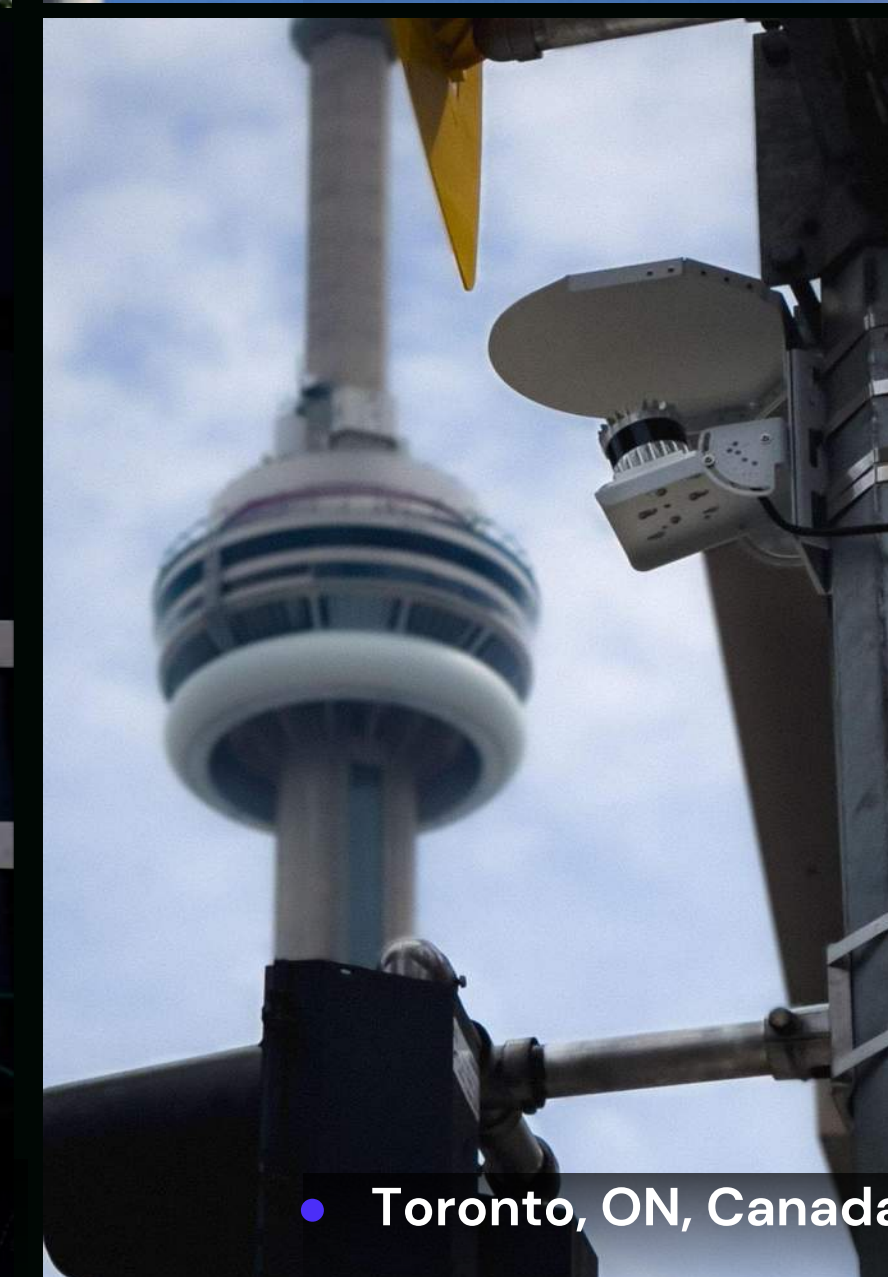
• Bellevue, WA USA



• Banff, AB, Canada

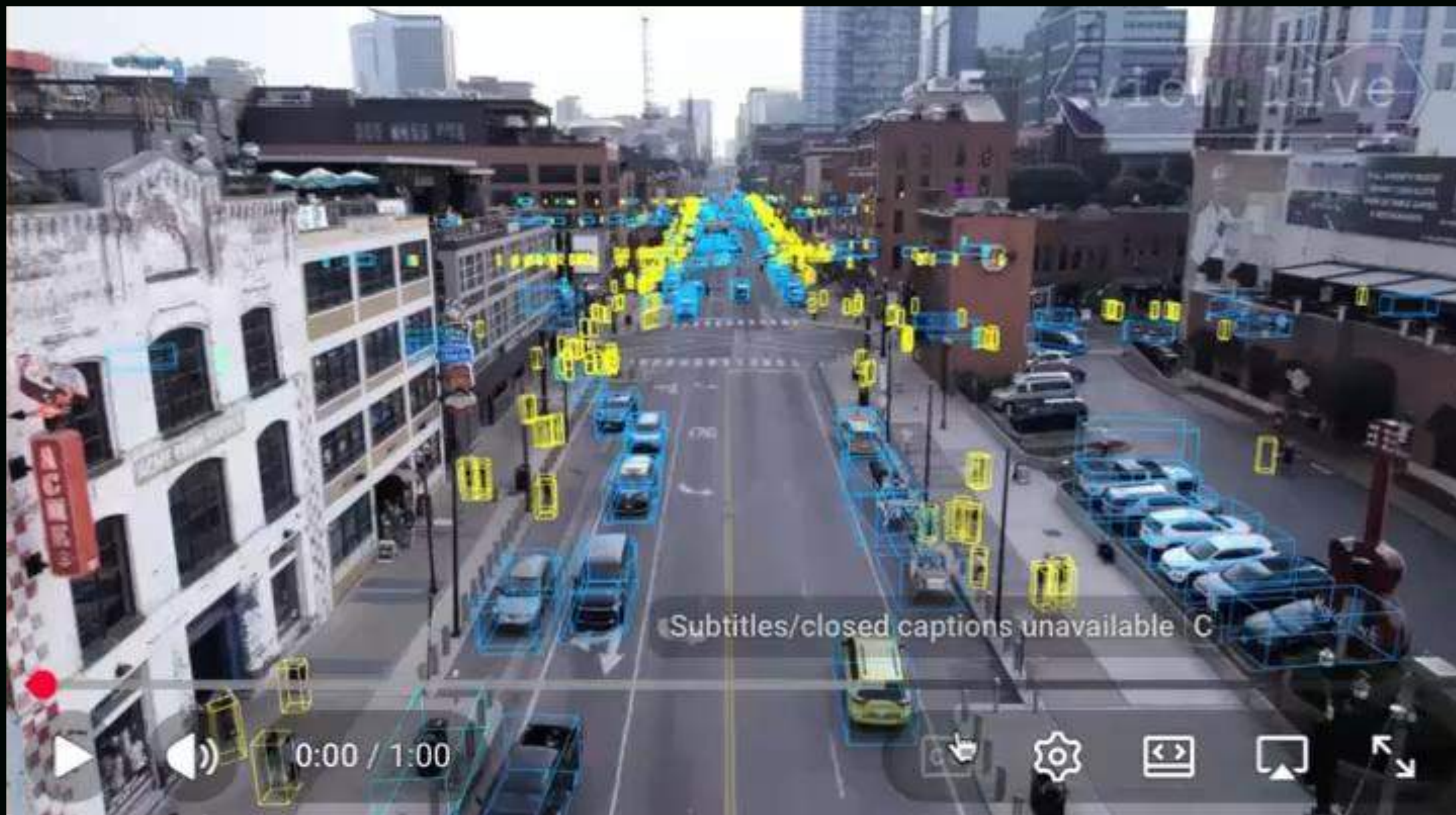


• Salt Lake City, UT, USA

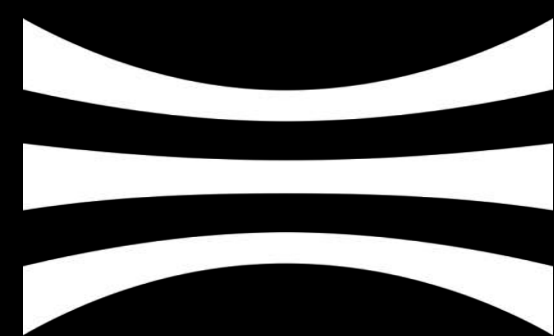


• Toronto, ON, Canada

Open API ecosystem demonstration of LiDAR data collection by Drone



Source and video owner @Vanderbilt Vector Lab – Downtown Nashville, TN



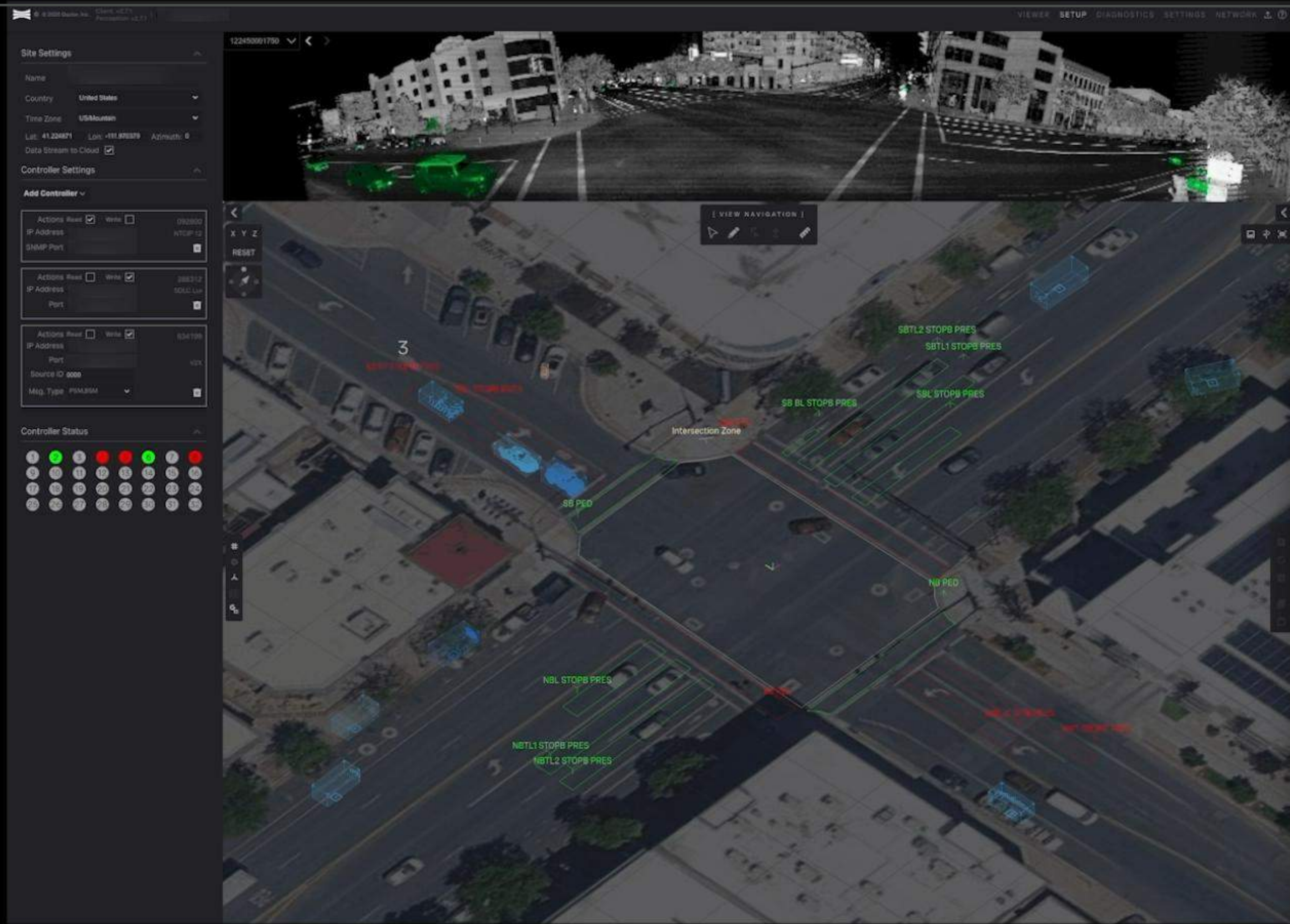
LiDAR Tool Set for Vision Zero Interventions

OUSTER



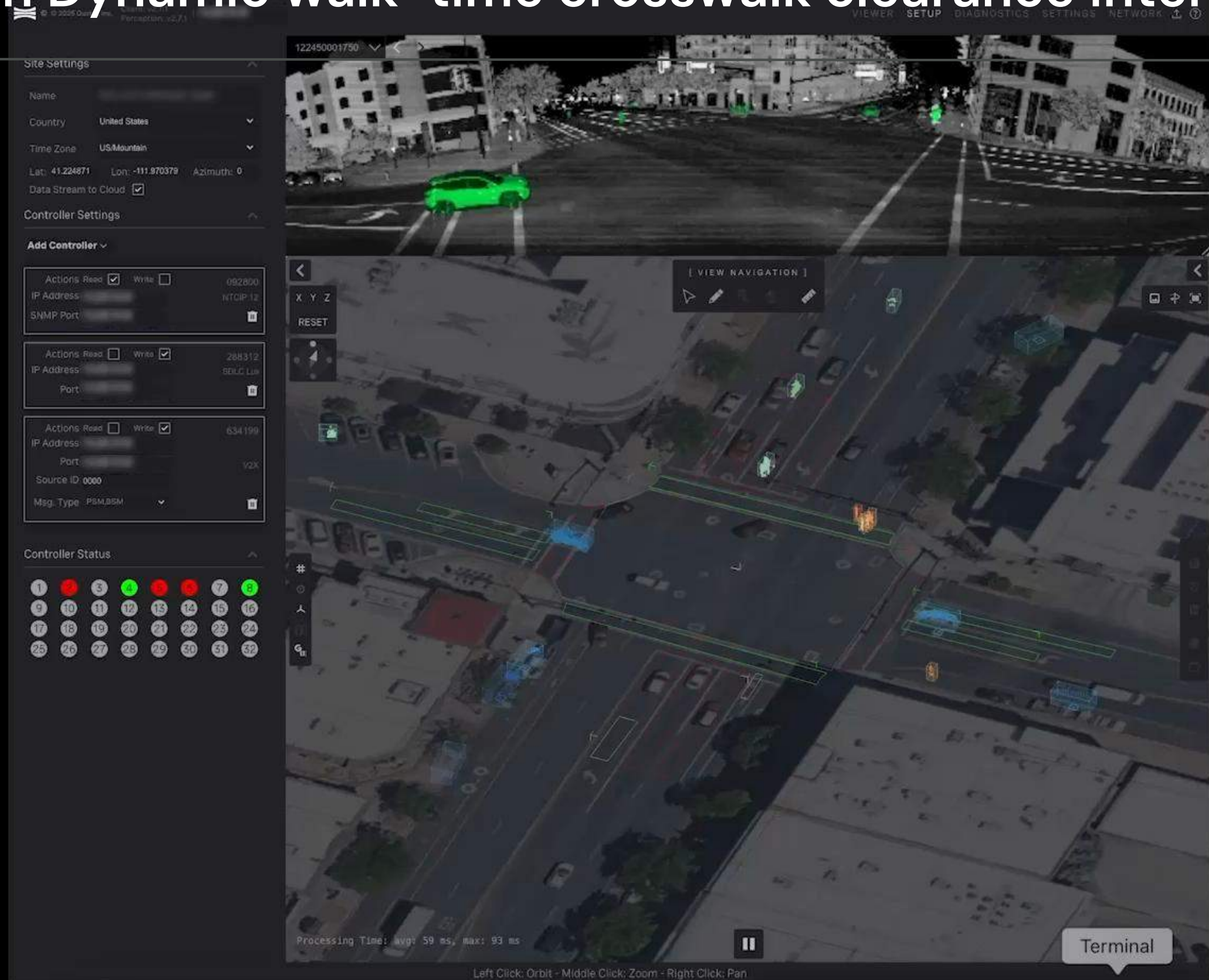
Traffic Actuation

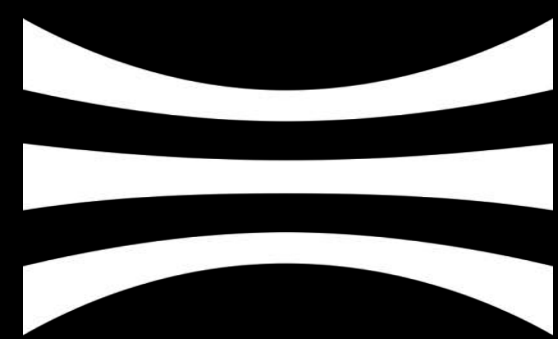
Stop-bar detection & Classification of Cars, Trucks, Bikes, and Peds



Traffic Actuation

Pedestrian Dynamic walk-time crosswalk clearance interval extension





Built-in V2X Connected Vehicle Platform

OUSTER

V2X Safety Messages

(BSM, PSM, SDSM, SAE J2735)



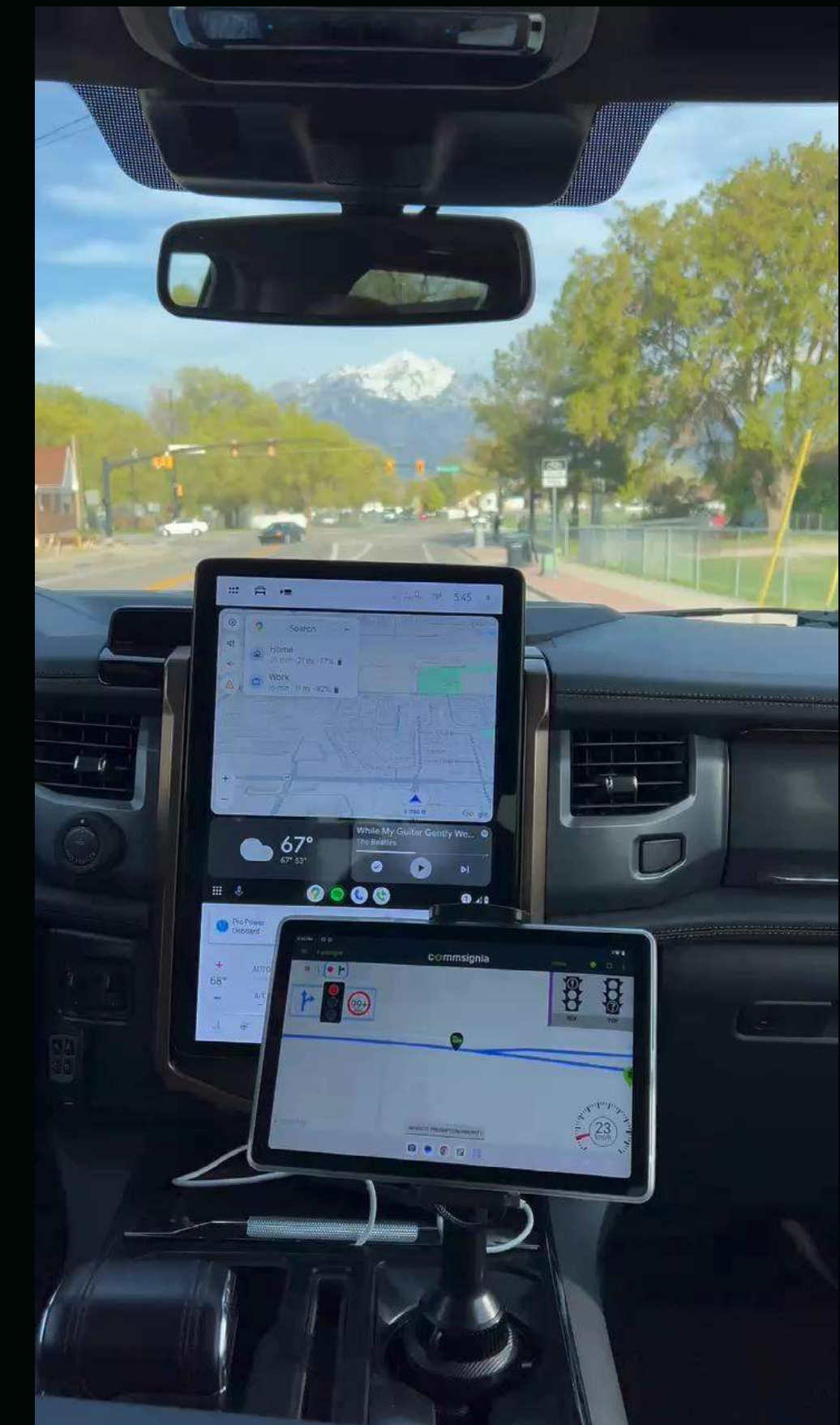
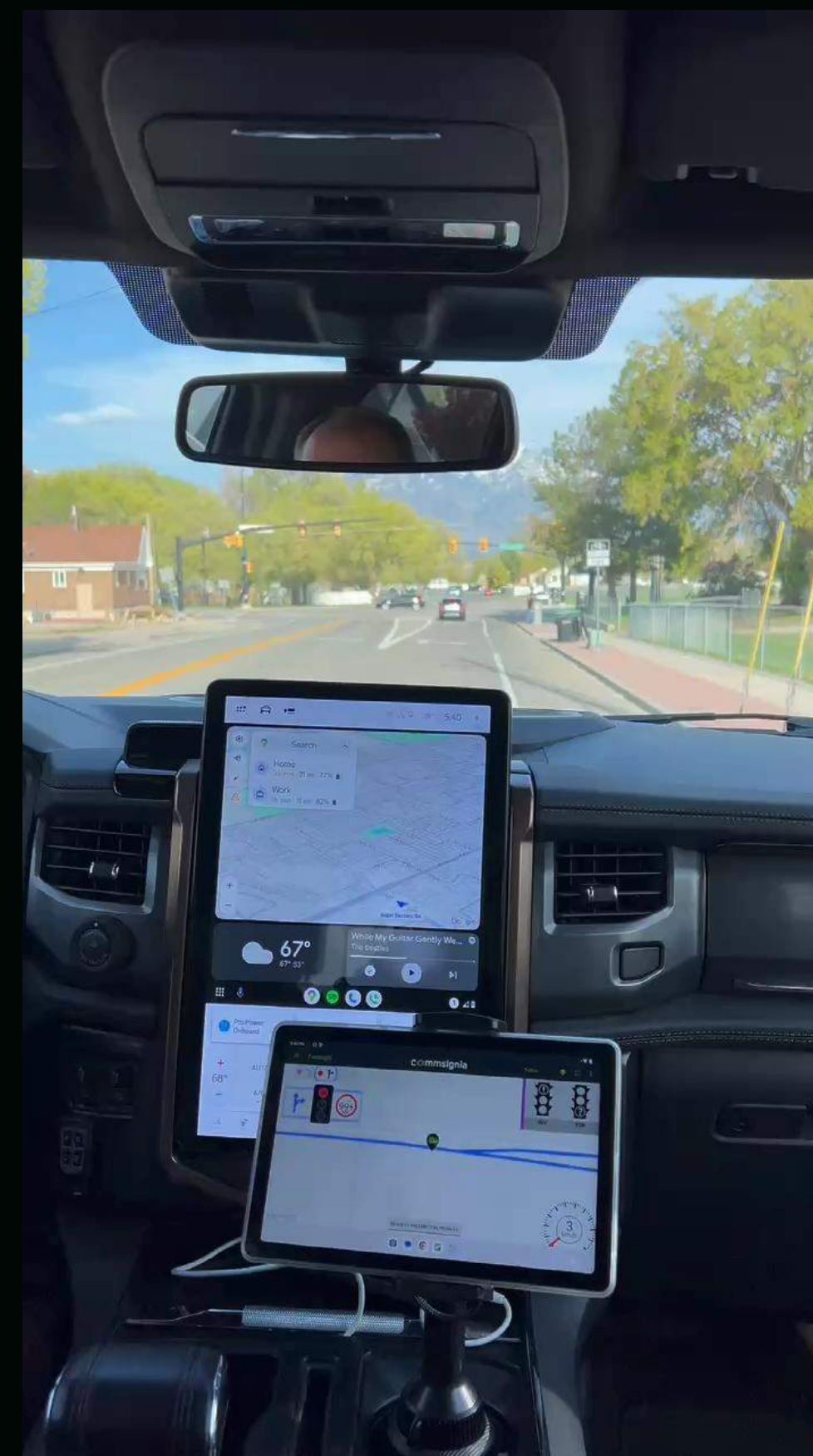
Accurate Data for V2X Safety Messages (BSM, PSM, SDSM)

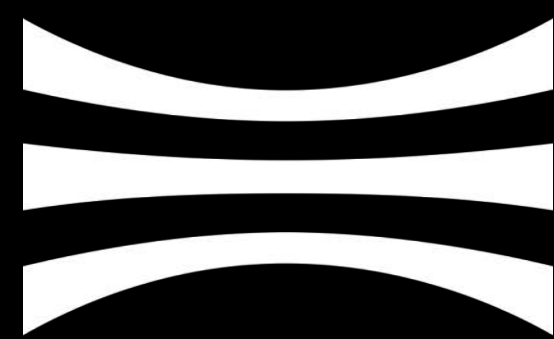


Lidar-enabled 3D detection, classification and tracking will accelerate V2X communications.

Ensure precise geolocation, speed and trajectory of different types of VRUs.

V2X in action: Video captured during Utah install





High-Fidelity AI Data Analytics using LiDAR

OUSTER

Detect near-miss events using Post Encroachment Time (PET)

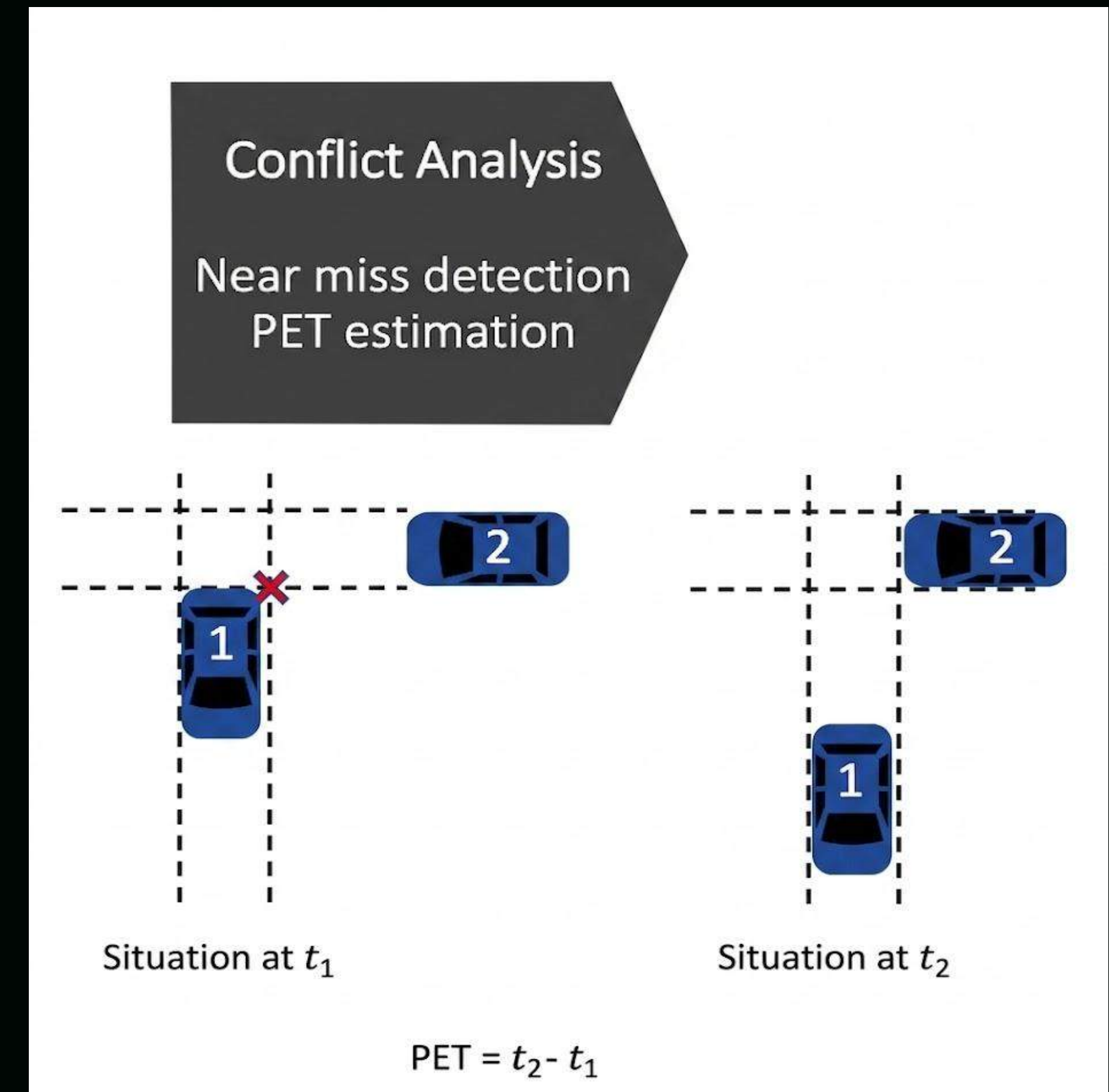
PET Definition

The time difference between:

- A leading road user passing through a conflict point
- A following road user reaching that same point

The Lower the PET:

- The higher the risk
- The closer risk of a collision



PET's <4 seconds are considered as **unsafe**
PET's <2 seconds are considered as **critical**



Near Miss Detection – Vehicle vs. Bike

For every 300 near-misses = 29 minor injuries and 1 major injury or fatality*



BlueCity



Site List

Site Details

Live View

BlueCity Analytics

Zone Analytics

Zone Analytics (BETA)

Diagnostics & Alerts

Remote Configuration

OTA

Event Review

Event Review (BETA)

Onboarding

Access Control

Architect

Help

Count

Speed

Conflicts

OBC_AG_SA_B734395

2025-09-08 00:00:00 — 2025-09-18 23:59:59



Vehicle Vs Vehicle

Car-Car (181)

Car-Bus (4)

Car-Truck (0)

Bus-Bus (0)

Bus-Truck (0)

Truck-Truck (0)

Metric (km/h)



Imperial (mph)



Non-Vehicle Vs Vehicle

Pedestrian-Car (13)

Bike-Car (11)

Pedestrian-Bus (2)

Bike-Bus (0)

Pedestrian-Truck (0)

Bike-Truck (0)



PET Count



Average PET

60

Map

Satellite

Leading

Following

N

N

W

E

W

E

S

S

Google

Keyboard shortcuts

Imagery ©2025 Airbus, CNES / Airbus, Maxar Technologies

Terms

Report a map error

10

8

6

4

2

0

PET (seconds)

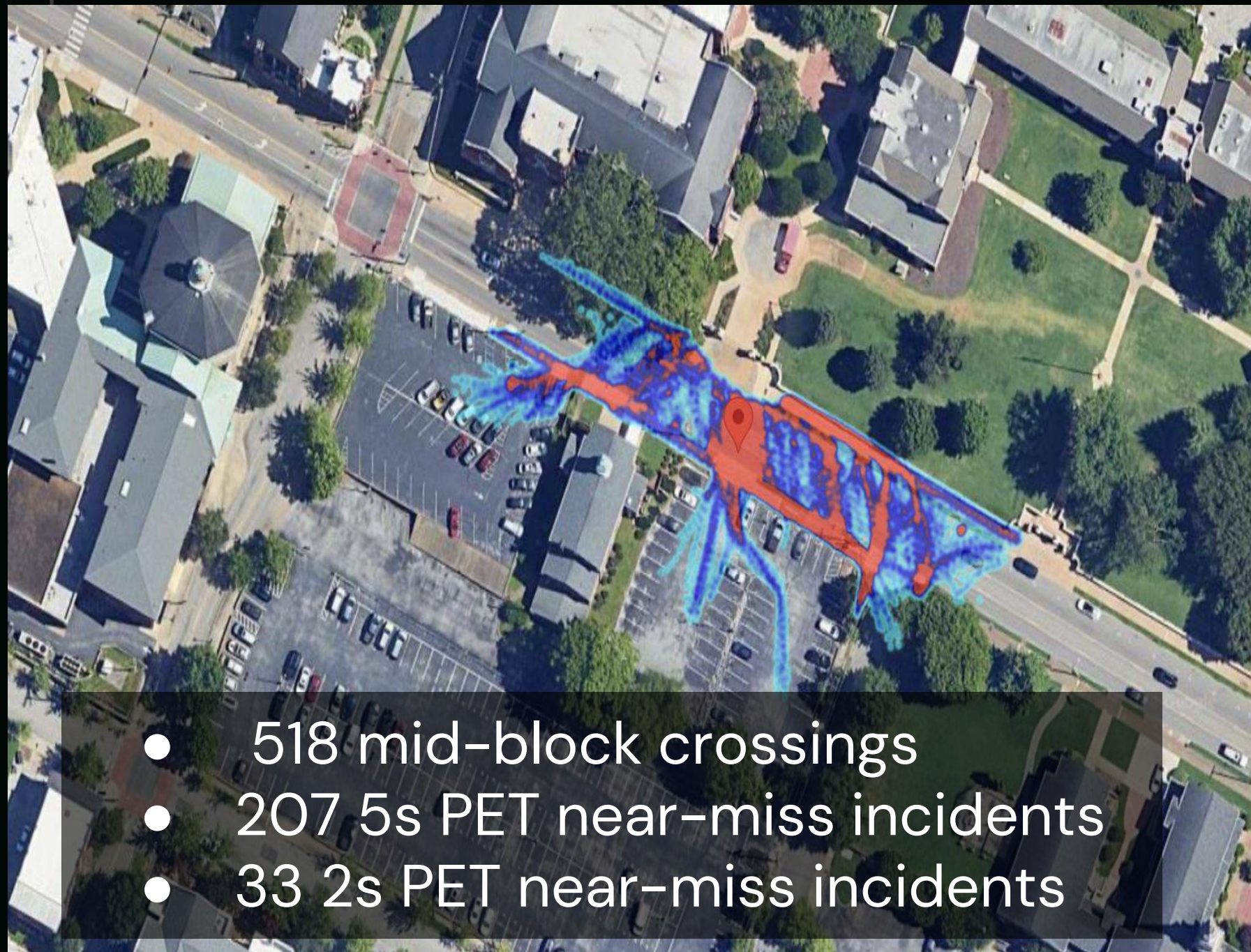
1s

PET Rate

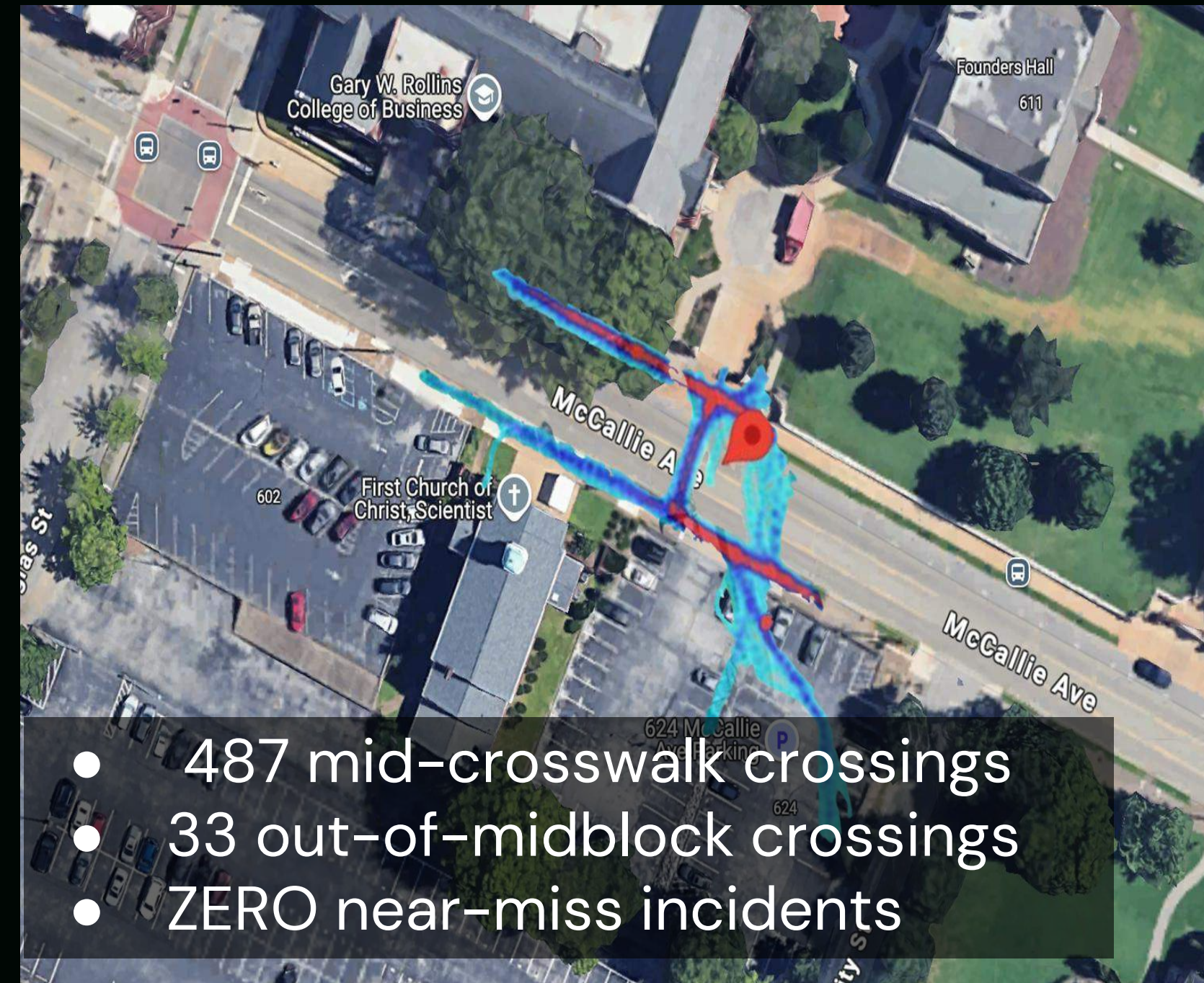
* (Heinrich's Accident Triangle)

Near-Miss & Crosswalk Safety Improvement using LiDAR

Before Study



After crosswalk installment

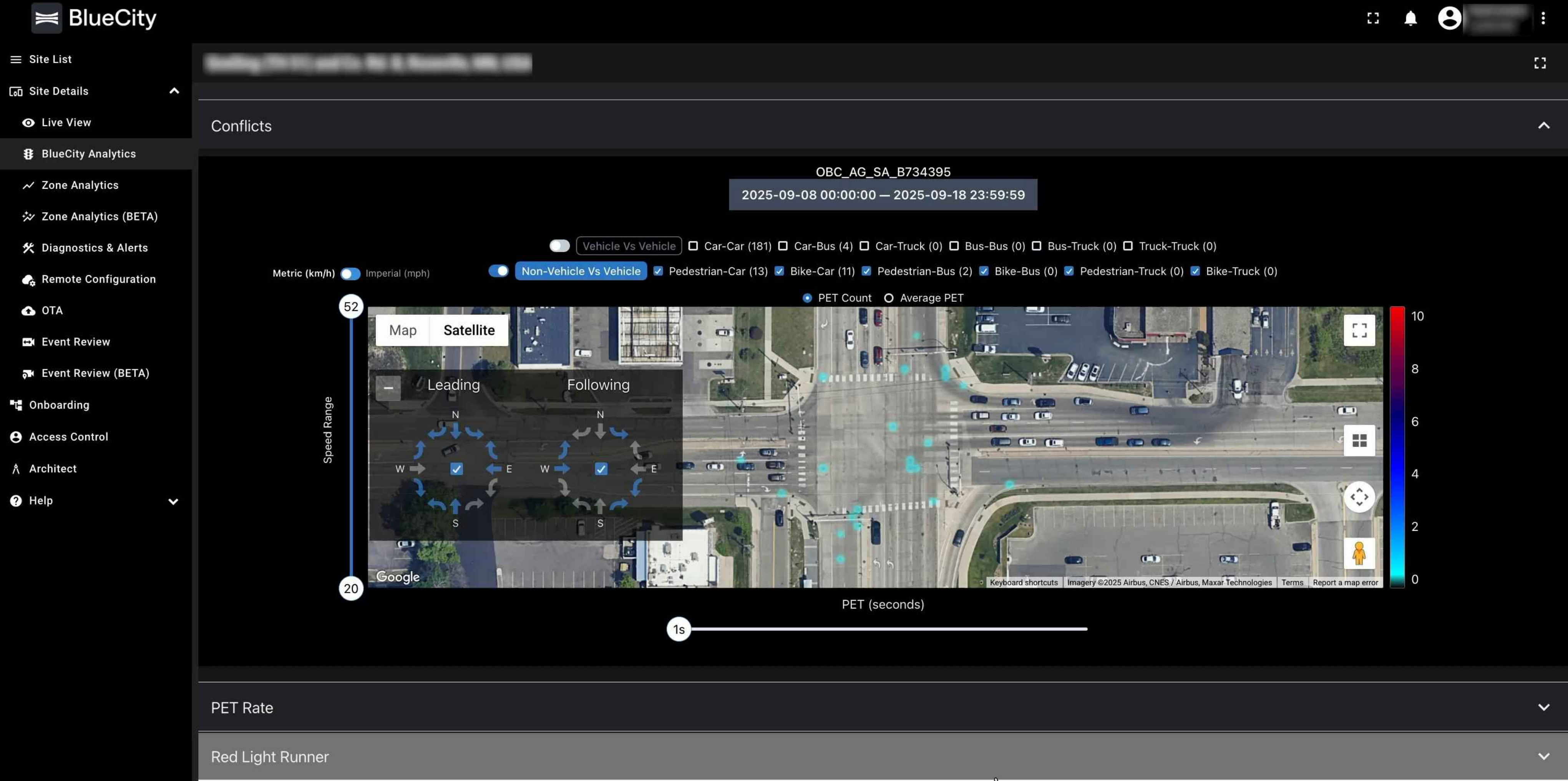


Source: University of Tennessee
Chattanooga, TN Research – Urban Infomatics



Pedestrians Outside of Crosswalks

7,500 pedestrians were killed by drivers in 2022
(The Governors Highway Safety Association)





Red Light Violations

1,000 annual U.S. fatalities due to RLR incidents
(IIHS)

100K+ injuries from RLR incidents in the U.S. in 2022
(IIHS)

BlueCity

☰ Site List

📄 Site Details ^

👁 Live View

📊 BlueCity Analytics

📈 Zone Analytics

🚧 Zone Analytics (BETA)

⚡ Diagnostics & Alerts

☁ Remote Configuration

📶 OTA

📺 Event Review

📺 Event Review (BETA)

🖥 Onboarding

🔒 Access Control

👤 Architect

🔍 Help v

📄 Site Details

Count

Speed

Conflicts

PET Rate

Red Light Runner

Outside of Crosswalk Events (OCW)

Occupancy Ratio

Green Allocation

Phase Interval

Split Trends

Split Failure

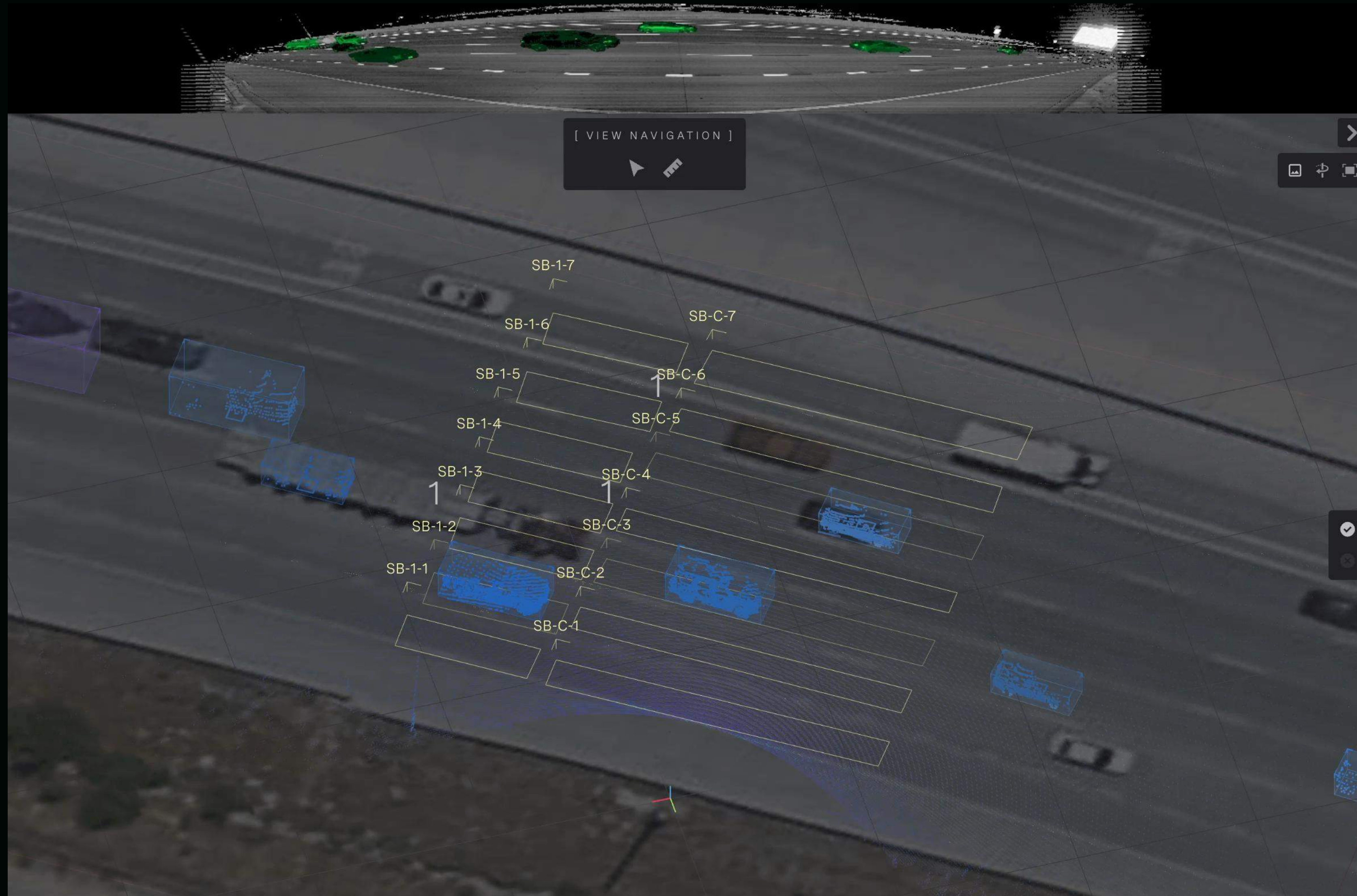
Simple Approach Delay

Arrival Patterns

Purdue Coordination



Highway Monitoring & Freeway Counts





Wrong-Way Driving Alerts



An aerial photograph of a park with a winding path, trees, and a body of water. The path is a light brown color, and the trees are green. The water is a dark blue color. The sky is a light blue color.

Thank you
Donald.shupp@ouster.io

