



:Bluecity

5G-Enabled Real-Time Multi-Modal Traffic Monitoring System

bluecity.ai



Loop



Radar



Camera

Current traffic solutions require multiple technologies to address the cities data needs

- Extremely expensive to install and maintain
- Requires road closure
- Limited data about presence of cars
- No other type of road users
- Requires underground wiring

- Requires 4 sensors per intersection
- Requires road closure
- Limited data about presence of cars
- No other type of road users

- Unreliable under adverse weather and lighting conditions.
- Privacy concerns.
- Mainly used for planning/surveillance

OVERVIEW



Reliable

Collect data in any lighting or weather conditions.



Multi-modal

On-board AI classifies your data between vehicles, pedestrians and bikes.



Non-Intrusive

Single-sensor solution to cover whole intersection.



Connected

Powered by LTE/5G, Explorer delivers real-time access to your data.



Privacy-Protected

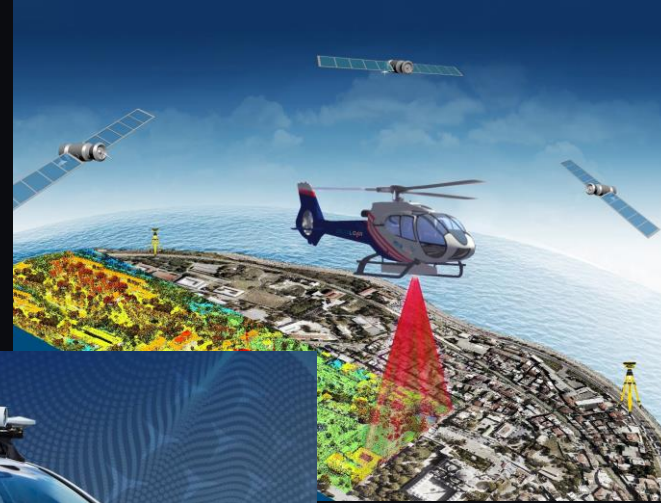
No privacy concerns



Lidar History: From Military to Commercial



Military



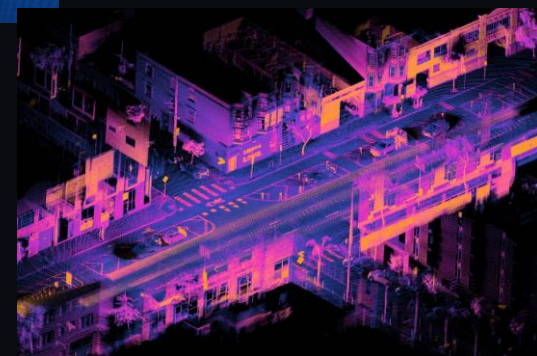
airborne



Drone



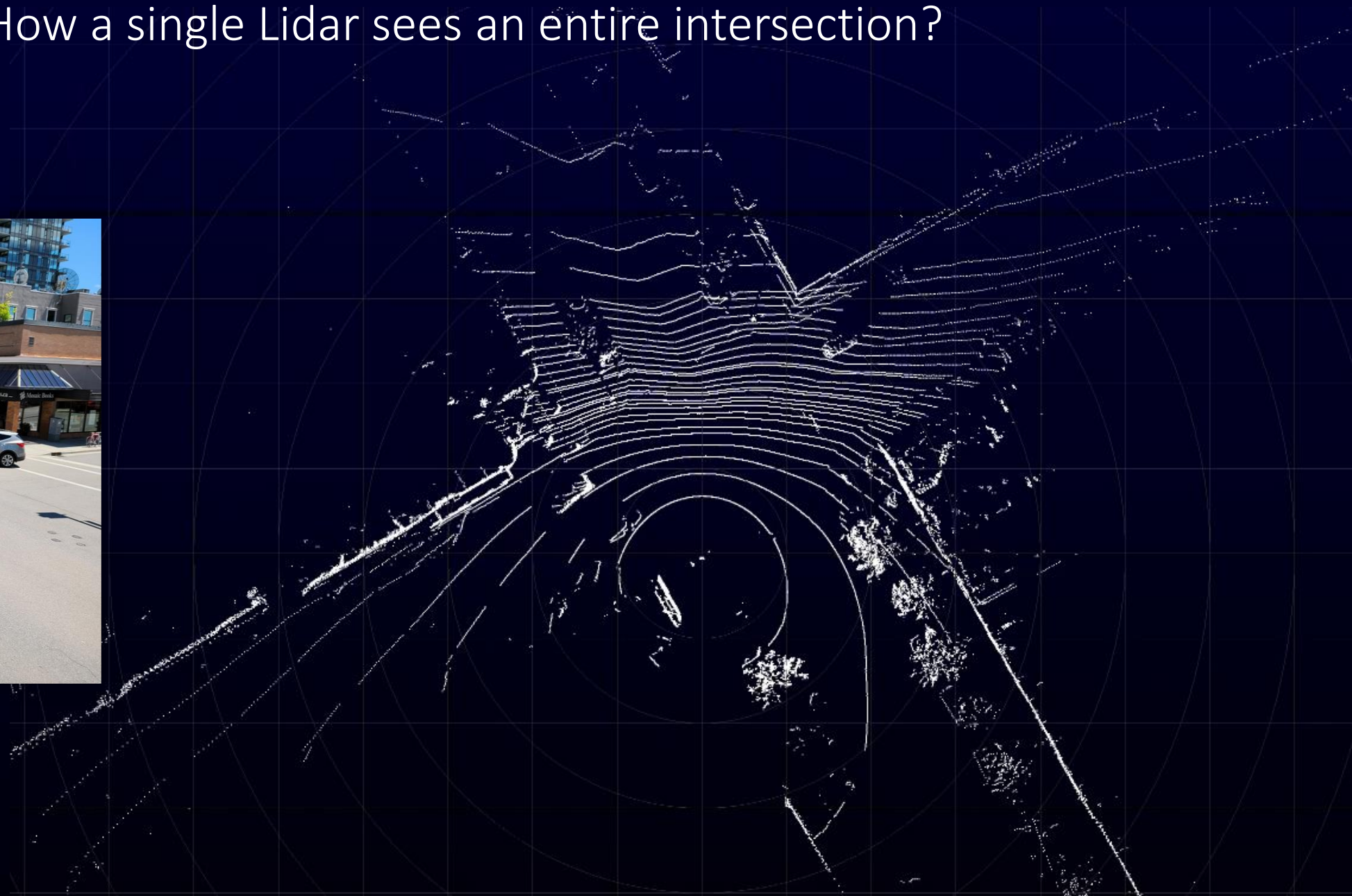
Mapping



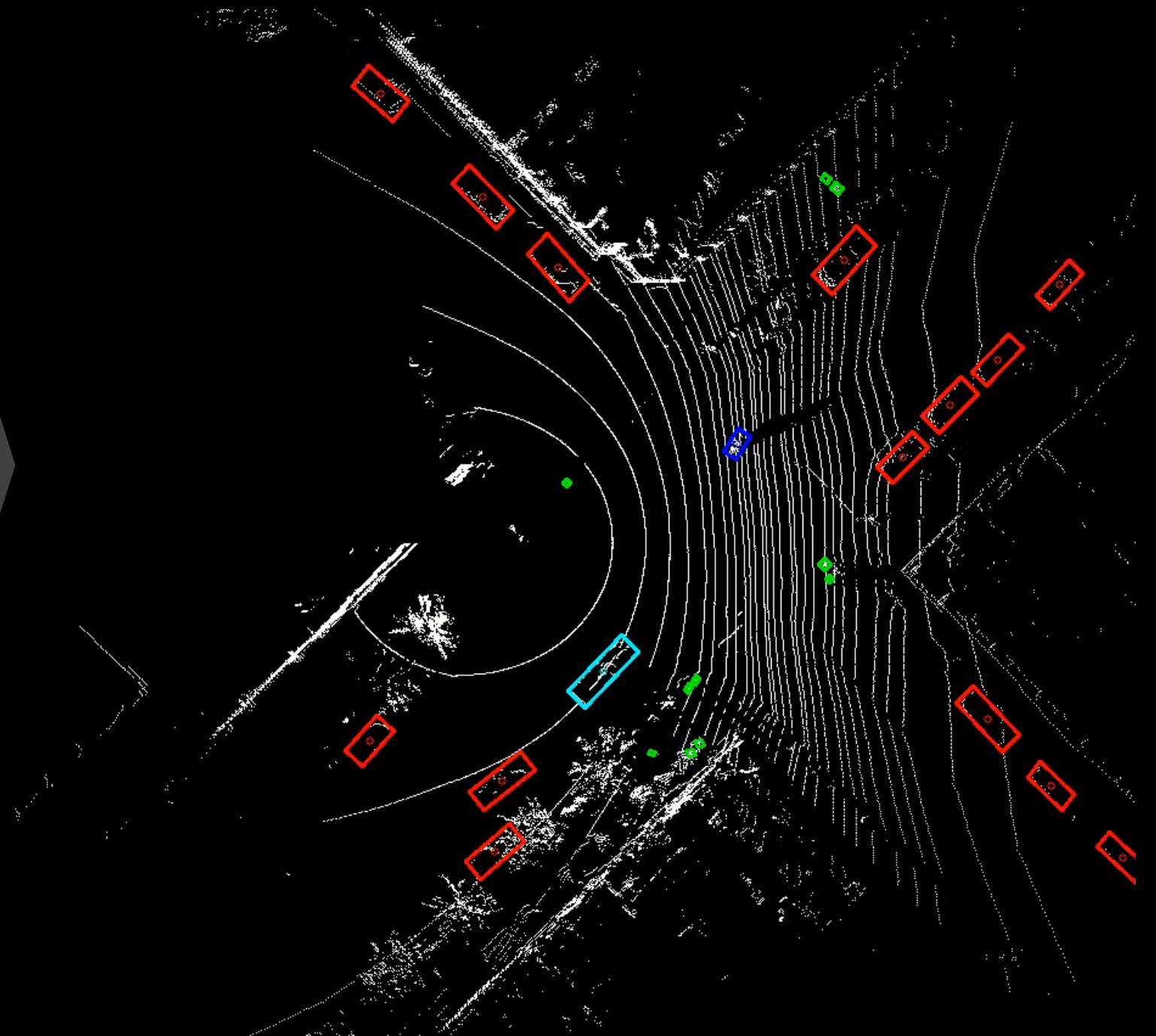
ITS

Very Expensive
Limited Availability

How a single Lidar sees an entire intersection?

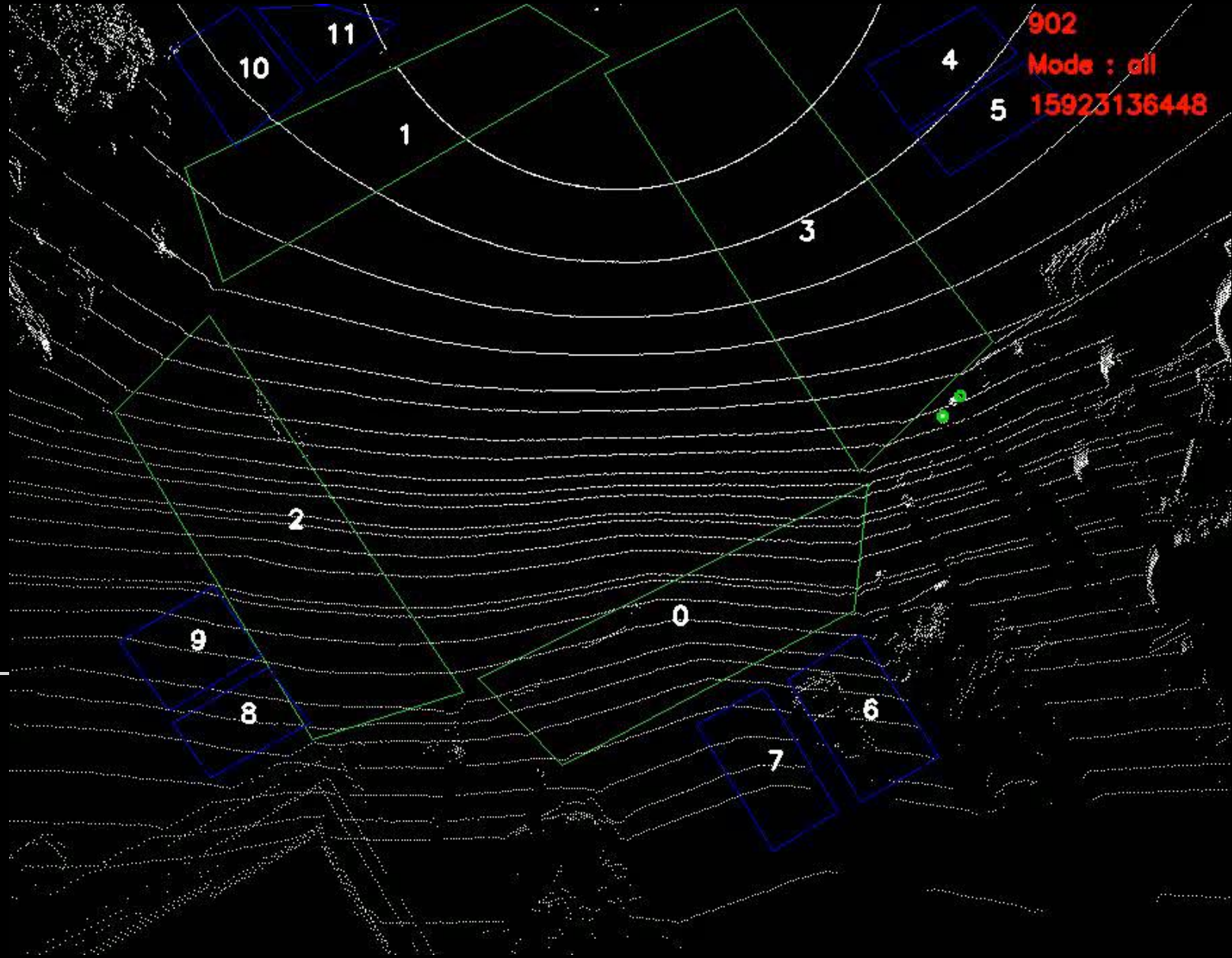


Real-time object detection, classification and tracking



A replacement for costly to maintain technologies

Virtual loops for all road users



Real-Time Communication with Traffic Controller

The screenshot displays the PEEK ATC (Advanced Traffic Controller) software interface, which is used for real-time communication with a traffic controller. The interface is divided into several sections:

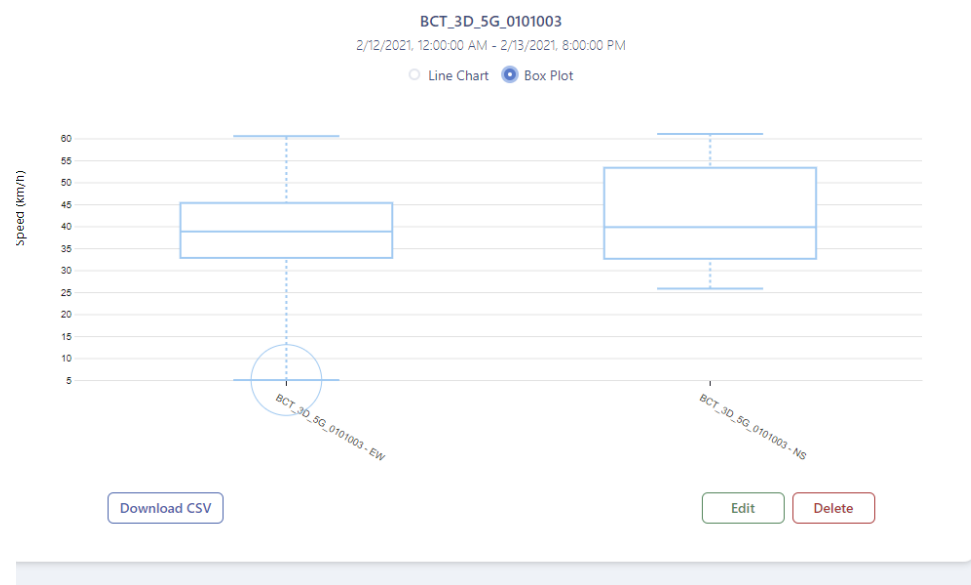
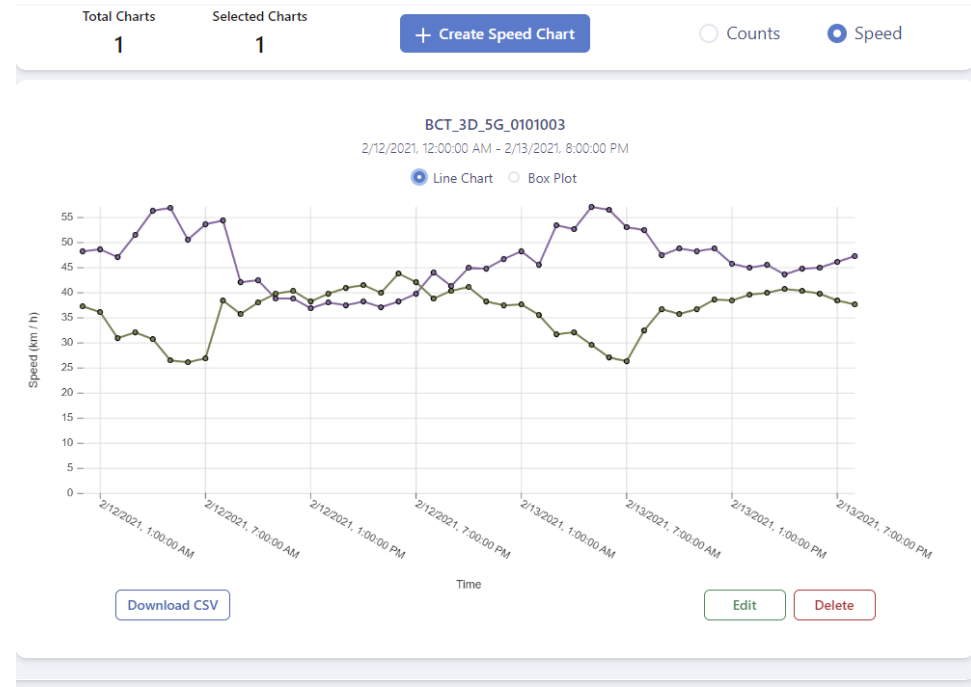
- Top Bar:** Shows the application name "PEEK" and the user "admin".
- Navigation Tabs:** Includes "FP Screen", "Utilities", "Users", "Scripter", and "Light Board".
- Left Panel (FP Screen):** Displays a text-based interface for sending commands to the traffic controller. It includes a status bar at the top showing "1.1.1 TS21 Wed 10-Mar-2021 P1:OK NC RING STATUS 16:47:45 CAB:CAFE". Below this is a table of commands and their status, followed by a numeric keypad and function keys like "HME", "ENT", "PRV", "YES", "NO", "CLR ESC", "HLP", "MNU", and "NXT".
- Right Panel (Light Board):** Contains a "Vehicle Calls" section with a grid of 48 toggle switches (12 columns by 4 rows) for controlling individual vehicle calls. The switches are labeled with numbers 1 through 48.
- Bottom Panel (Traffic Debug Tools):** Includes a "Not Recording" status indicator and a set of playback controls (play, pause, stop, previous, next, and a red record button).
- Bottom Left:** The PEEK ATC logo and the text "Advanced Traffic Controller".

On the right side of the image, there is a separate window titled "Define Loops" showing a top-down view of a road layout with several colored rectangular loops defined on it. A timestamp "2020-11-20 21:00:51" is visible at the bottom of this window.

Fully customizable virtual loops

Speed Analysis

- Use Cases:
 - Driver Behavior Analysis
 - Traffic Light Timing Efficiency
 - Effect of weather/lighting conditions on speed distribution
 - Monitor over speeding

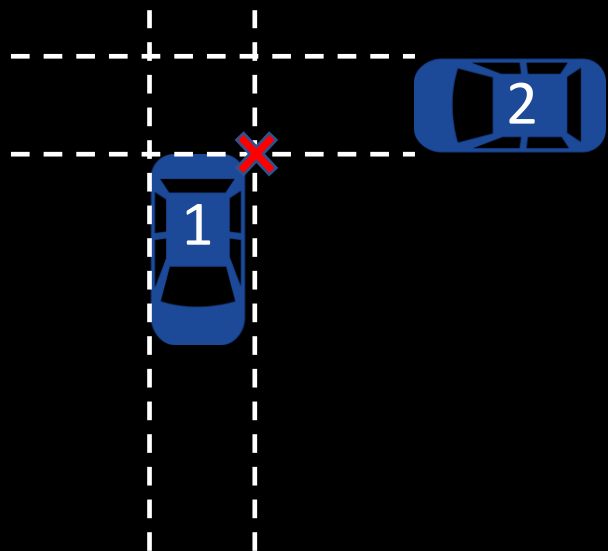


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<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0101002	Bernard_Water, Kelowna, BC, Ca...
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	BCT_3D_5G_0101003	Gordon Dr_Springfield Rd (north...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0101004	Gordon Dr_Springfield Rd (south...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0101005	Queensway_Pandoso St, Kelown...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0100001	Notre-Dame_Peel, Montreal, QC,...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0102003	Saint-Catherine_Guy, Montreal, ...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0103001	University Blvd_Acadia Rd, Vanc...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0103002	(EastSouth) University Blvd_Wes...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0103003	(NorthWest) University Blvd_Wes...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_4G_0104001	104 Ave NW - 109 St NW, Edmo...

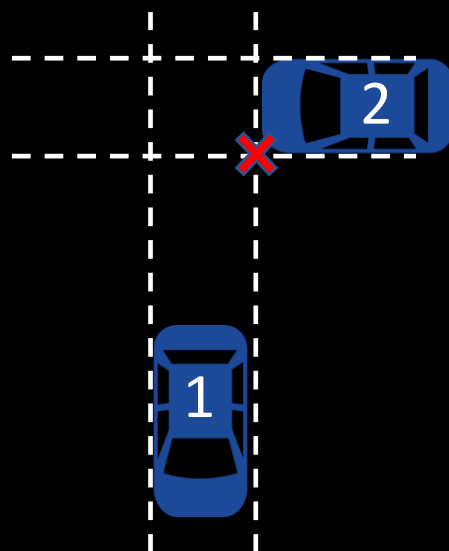
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<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0101004	Gordon Dr_Springfield Rd (south...
<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0101005	Queensway_Pandoso St, Kelown...
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<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_5G_0102003	Saint-Catherine_Guy, Montreal, ...
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<input type="checkbox"/>	<input type="checkbox"/>	0	BCT_3D_4G_0104001	104 Ave NW - 109 St NW, Edmo...

Conflict Analysis

Near miss detection
PET estimation

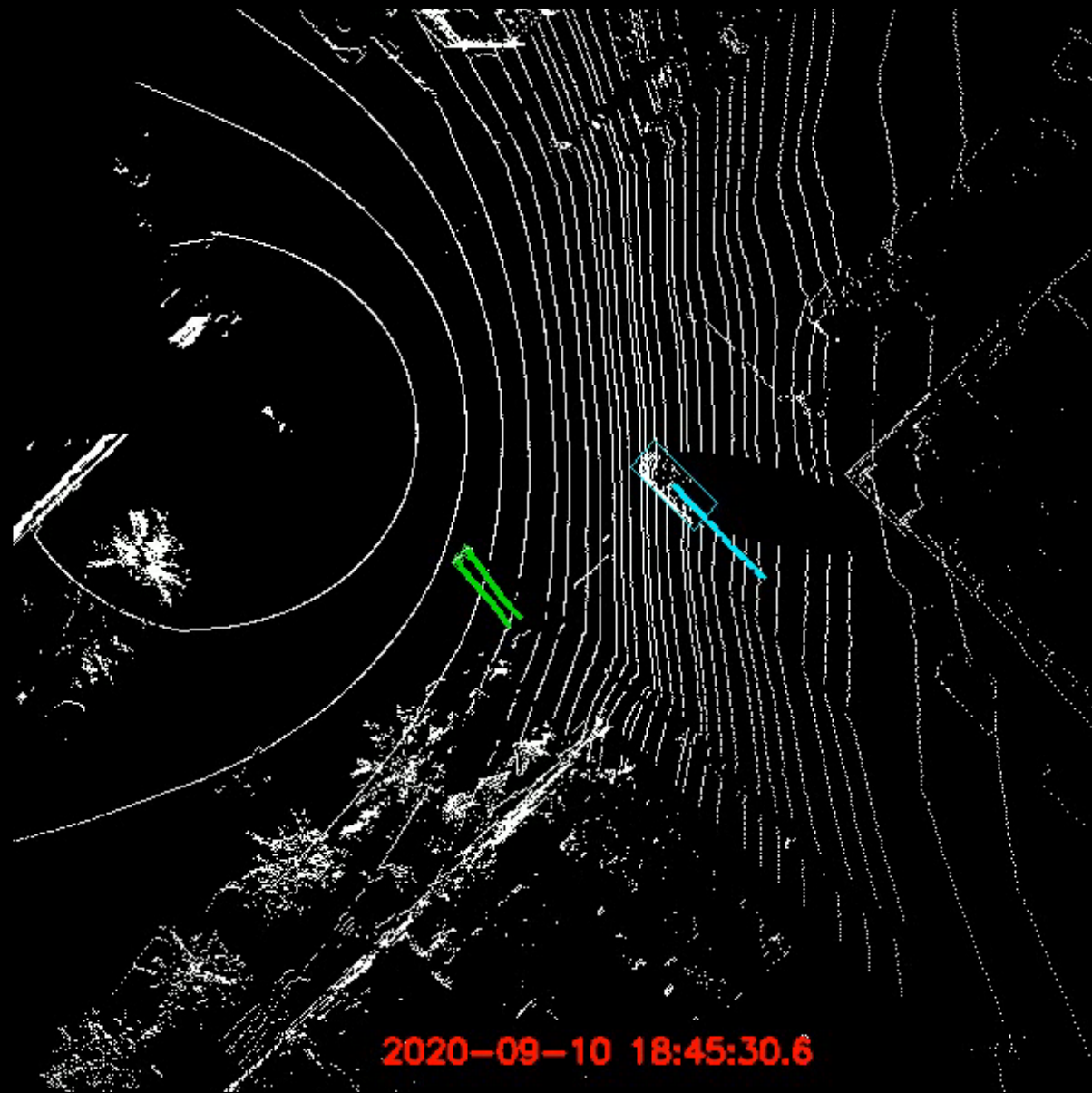


Situation at t_1



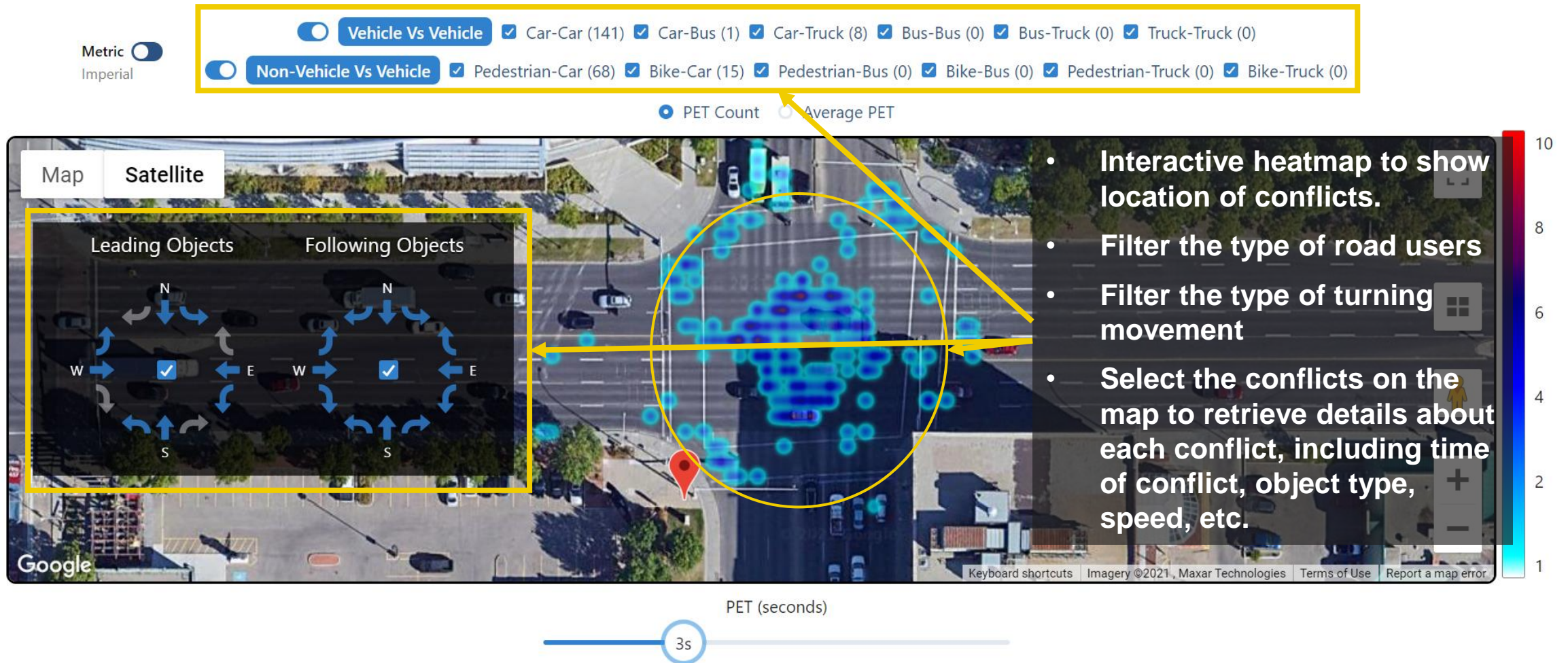
Situation at t_2

$$PET = t_2 - t_1$$



PETs less than 4 seconds are considered as **unsafe** conflict
PETs less than 2 seconds are considered as **critical** conflict

Surrogate Safety Analysis – Proactive Approach on Safety



Monitor Critical Conflicts

Validate it with watching a 10-second video clip

Recording of selected conflict



PET value in seconds

Speed of leading object

PET VALUE (s)	SPEED (km/h)	VIDEO CLIP	FOLLOWING OBJECT	LEADING OBJECT	FOLLOWING MOVEMENT	LEADING MOVEMENT	TIMESTAMP
2.3	20.2	Play MP4	Car	Car	WN	EW	4/27/2021, 11:12:31 AM
3.5	22.1	Play MP4	Car	Car	WN	EW	4/27/2021, 1:44:20 PM
1.9	23.6	Play MP4	Car	Car	WN	EW	4/27/2021, 4:25:52 PM
2.9	18.6	Play MP4	Car	Car	WN	EW	4/27/2021, 4:36:43 PM
1.8	22.8	Play MP4	Car	Car	WN	EW	4/27/2021, 6:02:50 PM
3.4	22.5	Play MP4	Car	Car	WN	EW	4/27/2021, 9:07:34 PM
1.9	17.7	Play MP4	Car	Car	WN	EW	4/28/2021, 8:16:26 AM
1.6	19.8	Play MP4	Car	Car	WN	EW	4/28/2021, 9:42:37 AM
2.4	19.5	Play MP4	Car	Car	WN	EW	4/28/2021, 12:19:16 PM
1.9	22.3	Play MP4	Car	Car	WN	EW	4/28/2021, 5:08:05 PM

Close





425 ft x 425 ft Area



Case Study 1 : Comparison of lidar and camera data



Sample
screenshot

	Bluecity	Competitor
Sample screenshot	 2020-11-23 04:45:47	 2020-11-23 04:45:47
Install footprint	1 Lidar	2 cameras
Data accuracy	98.7%	96.1%
Consistency	All weather/lighting	Proper weather/lighting

City: Repentigny, QC.

Consulting partner: CIMA+

Case Study 2 : Comparison of lidar and loop



City: Edmonton, Canada.

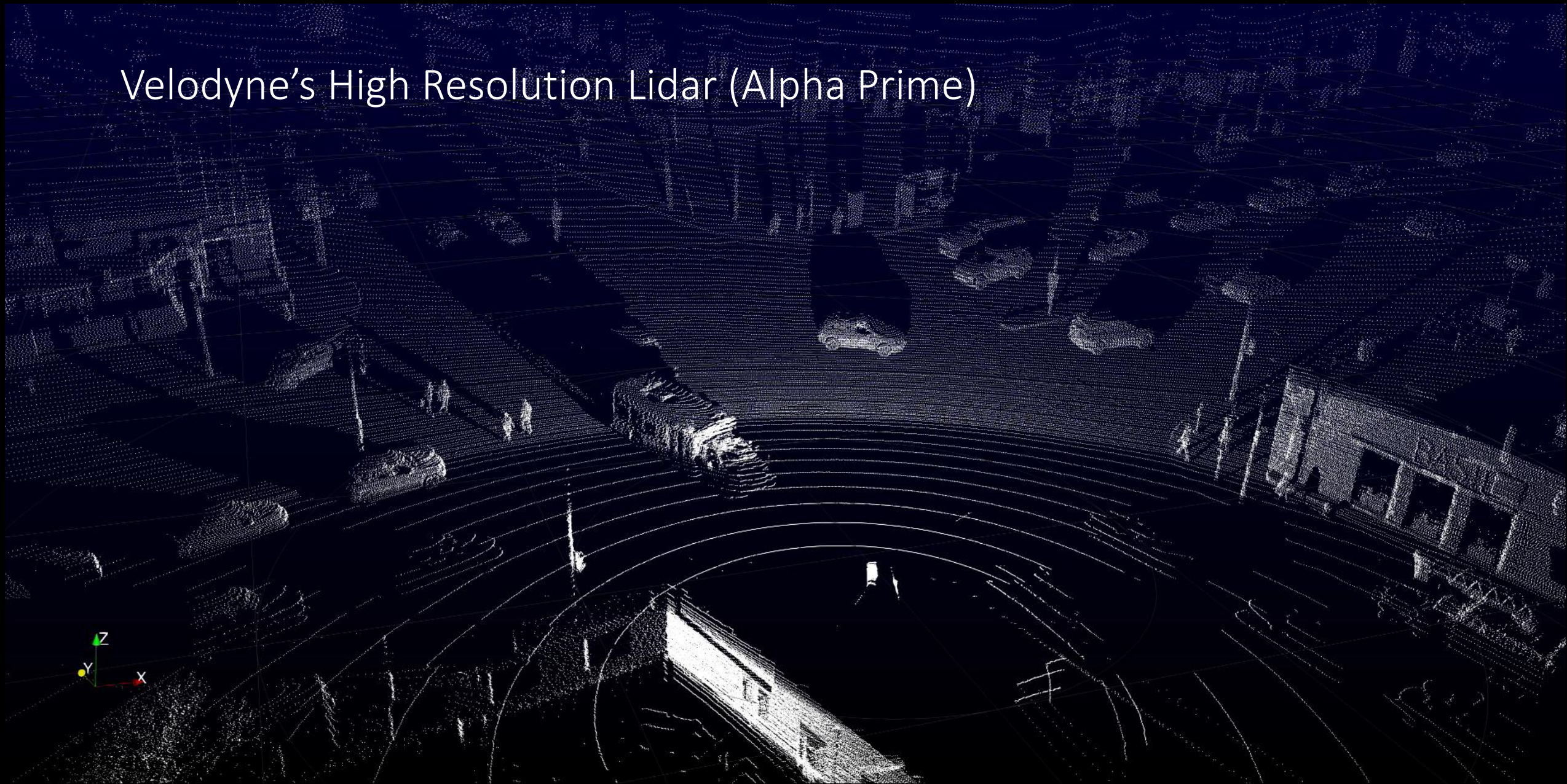
Count Comparison

Date	ISD	Blue City	Difference	Difference (%)
2021-05-03	11,734	12,161	427	4%
2021-05-04	11,936	12,326	390	3%
2021-05-05	12,314	12,740	426	3%
2021-05-06	12,463	12,889	426	3%
2021-05-07	12,199	12,526	327	3%
2021-05-08	9,476	9,623	147	2%
2021-05-09	8,281	8,418	137	2%
Grand Total	78,403	80,683	2,280	3%

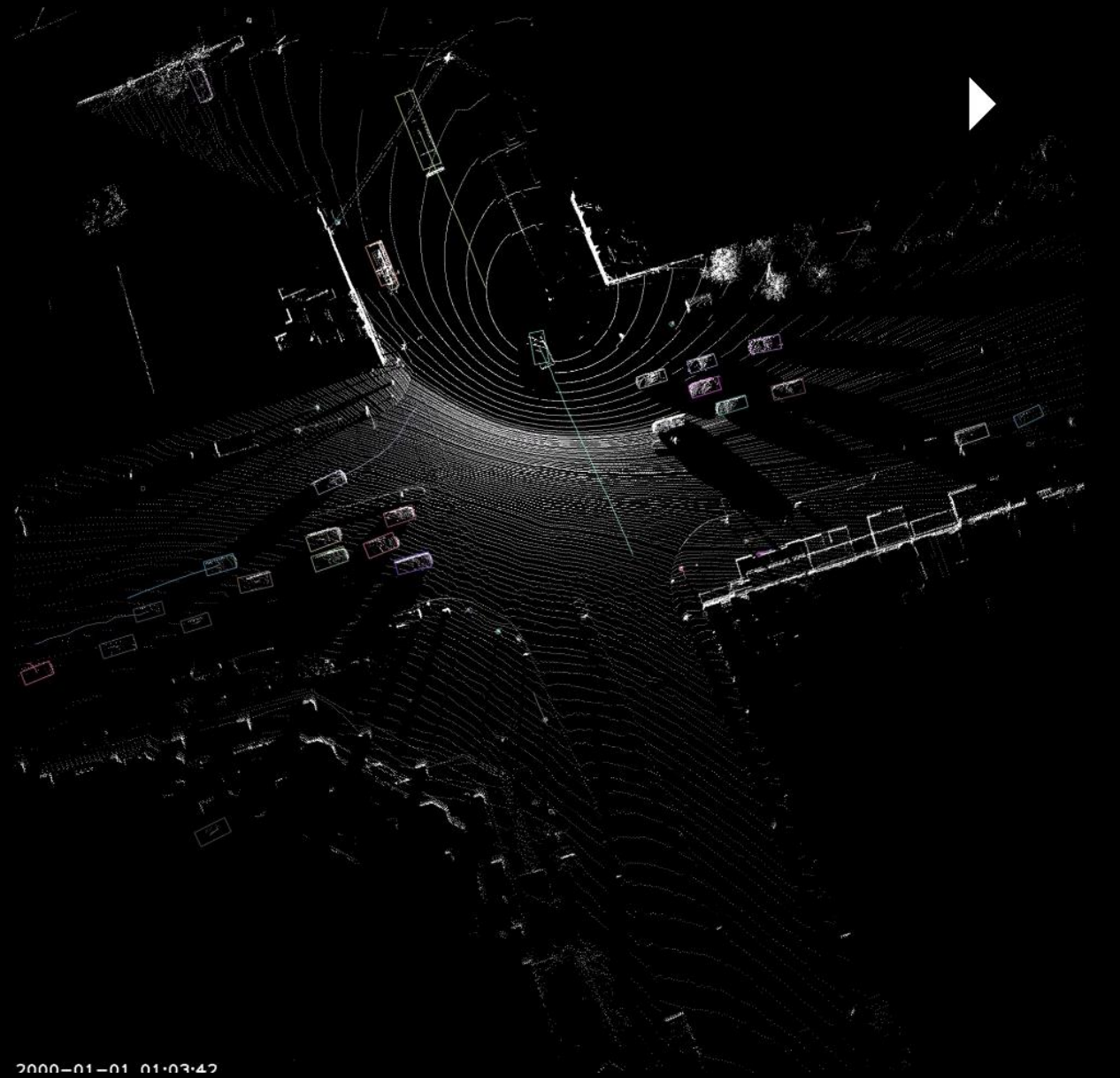
Speed Comparison

Date	ISD	Blue City	Difference (km/h)	Difference (%)
2021-05-03	39.4	40.3	0.9	2%
2021-05-04	39.2	40.1	0.9	2%
2021-05-05	39.7	40.5	0.8	2%
2021-05-06	39.0	40.3	1.3	3%
2021-05-07	38.6	39.7	1.1	3%
2021-05-08	36.2	37.8	1.6	4%
2021-05-09	38.5	39.6	1.1	3%
Average	38.7	39.8	1.1	3%

Velodyne's High Resolution Lidar (Alpha Prime)



Velodyne
High Resolution Lidar
(Alpha Prime)
Integrated with
Bluecity's Perception
Software

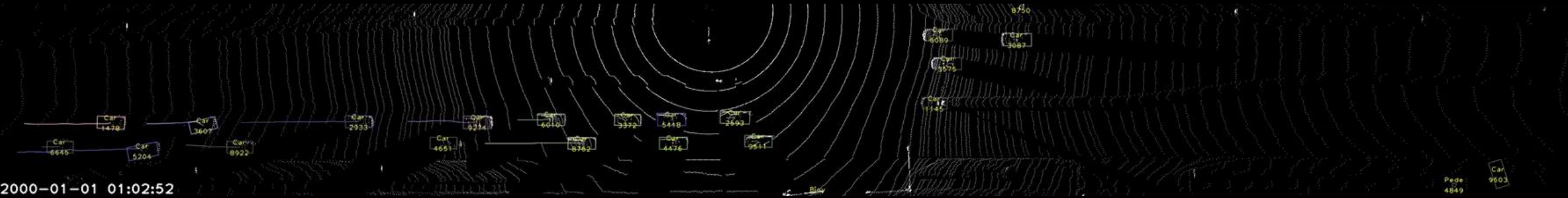


2000-01-01 01:03:42

Alpha Prime 128 Pixel Lidar

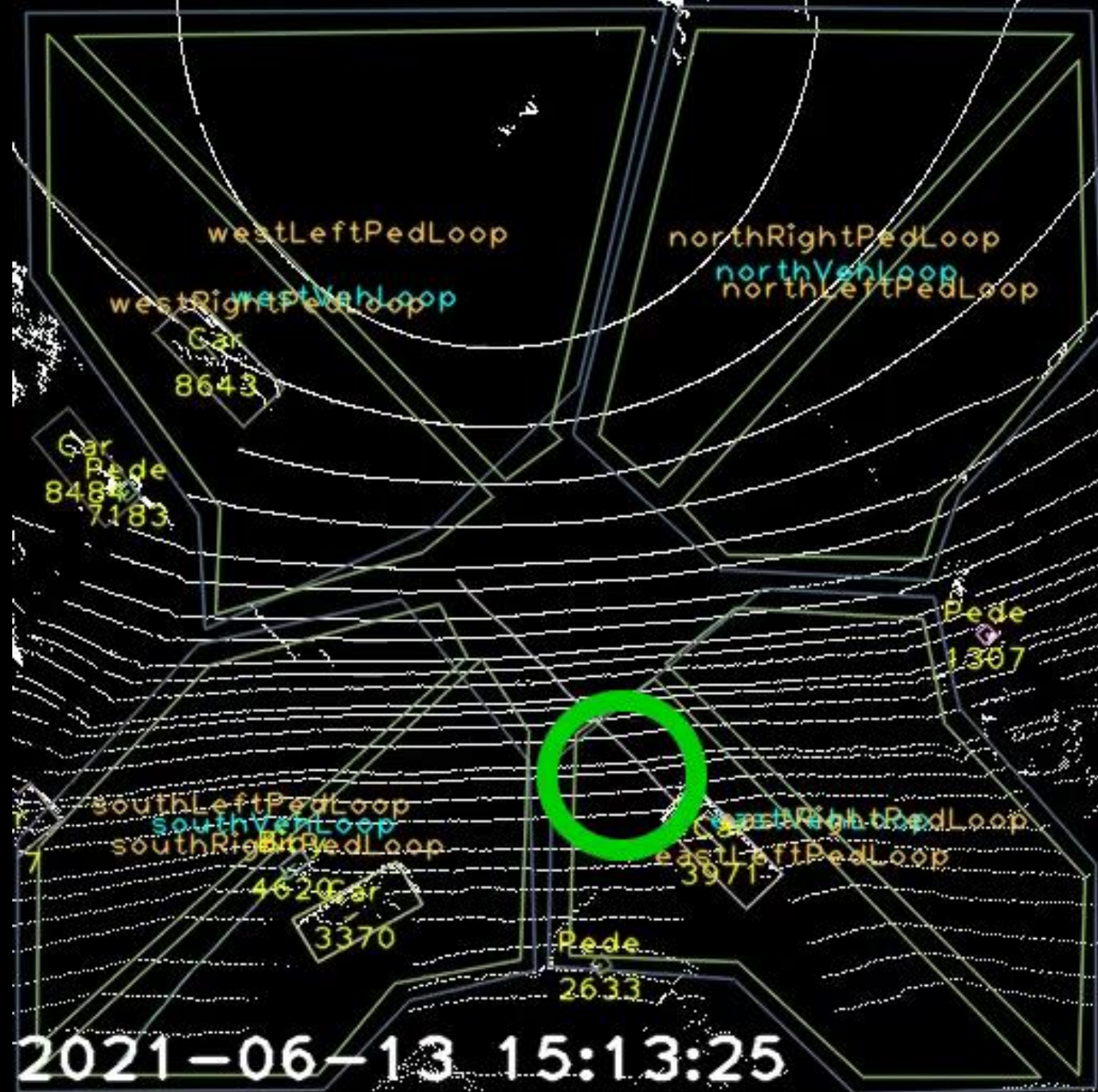
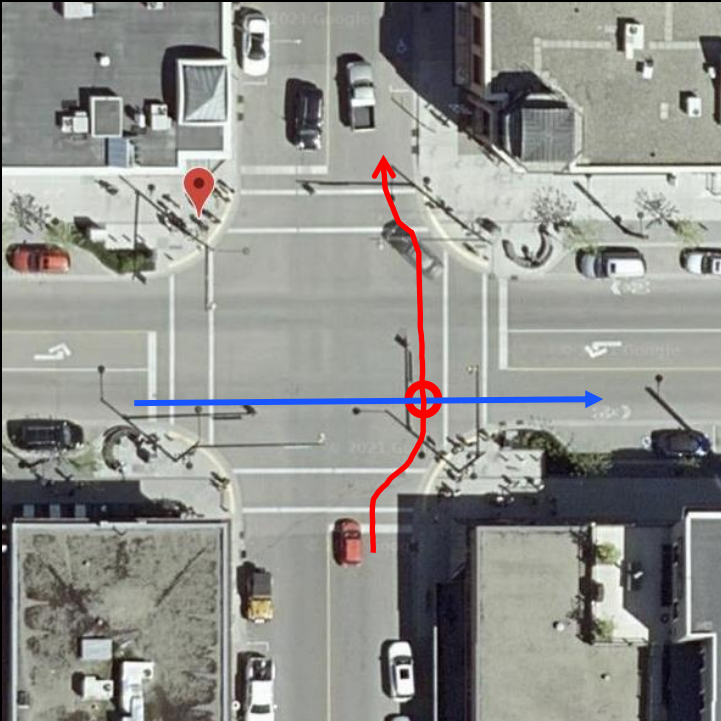
Integrated with Bluecity's Perception Software

260m (850ft) coverage with a single sensor and real-time detection



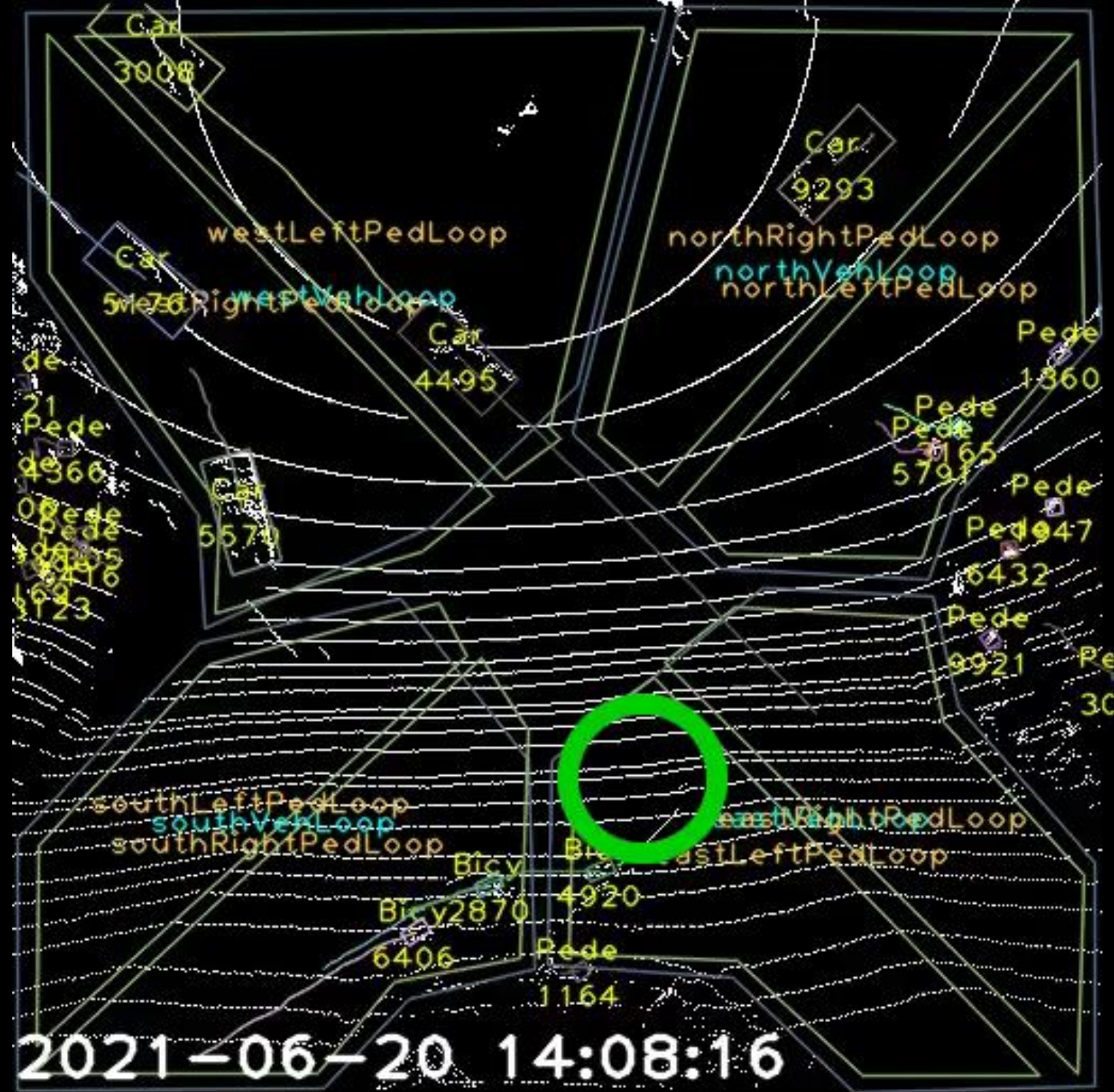
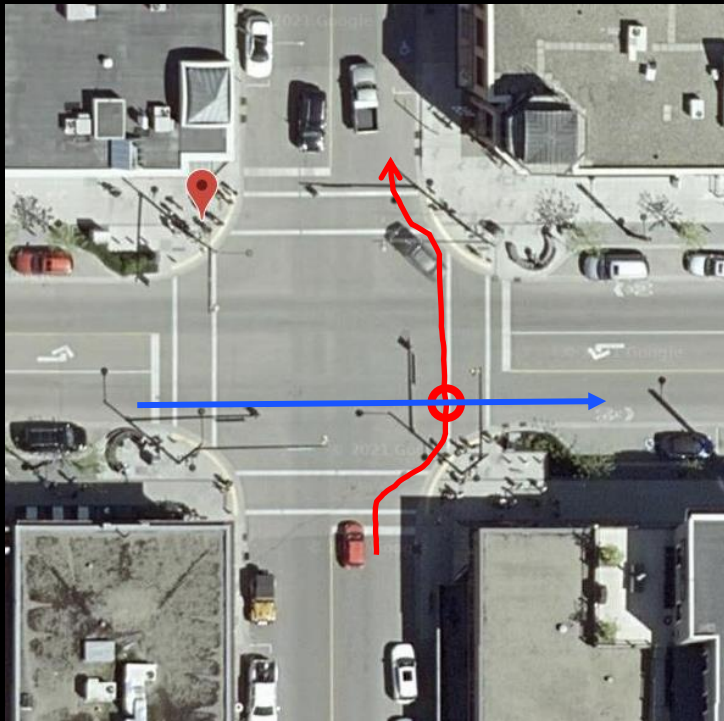
Case 1: Red Light Running / Near-Miss

- PET: 0.9 seconds
- Object 1: Bike
 - Direction: South to North
- Object 2: Car
 - Direction: East to West
 - Speed: 35km/h



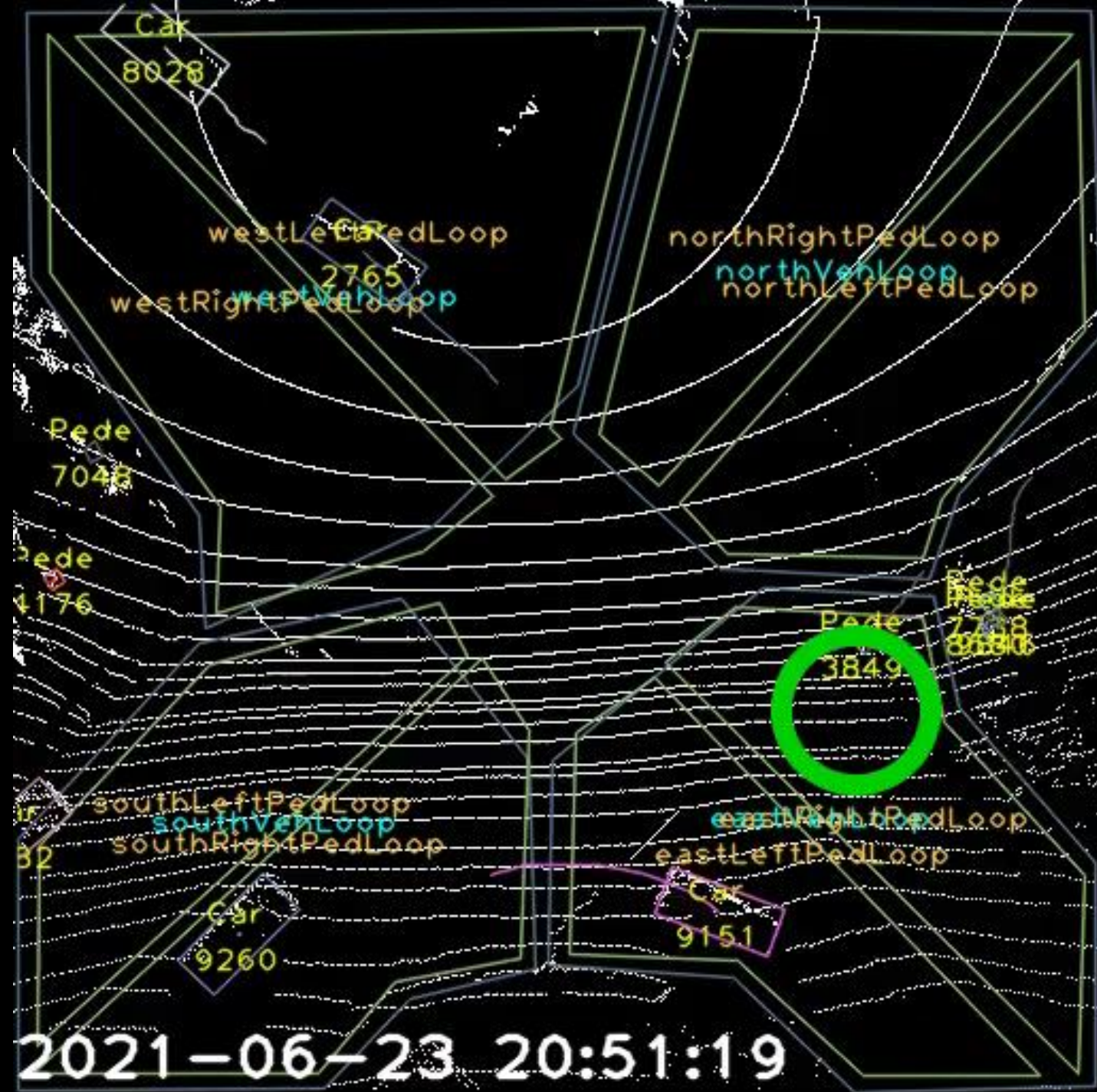
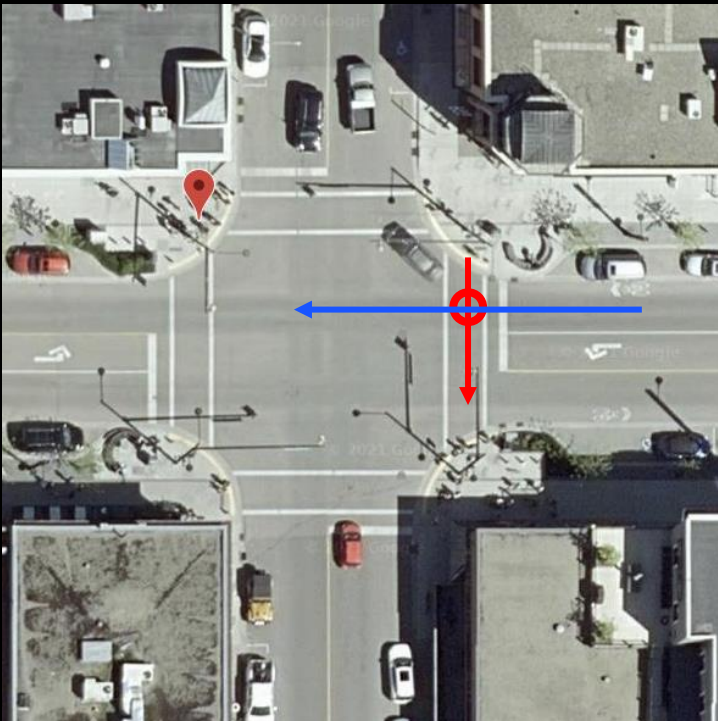
Case 2: Red Light Running / Near-Miss

- PET: 1.3 seconds
- Object 1: Bike
 - Direction: South to North
- Object 2: Car
 - Direction: East to West
 - Speed: 28km/h



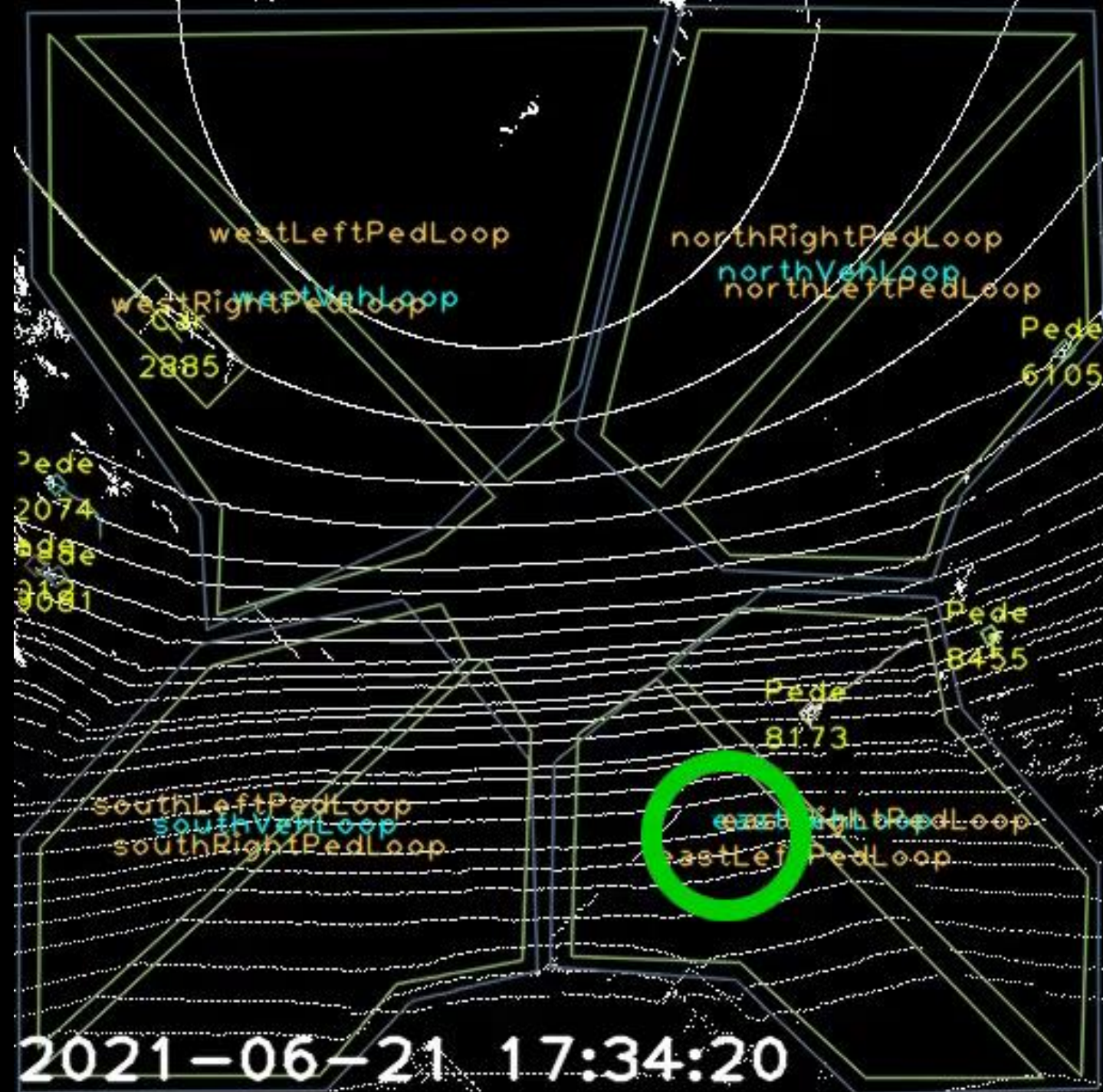
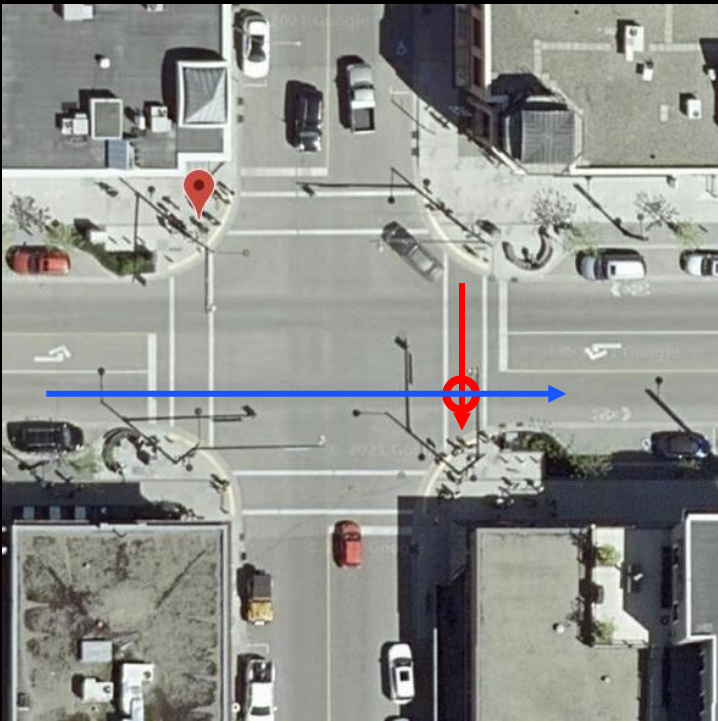
Case 3: Jaywalking / Near-Miss

- PET: 1.3 second
- Object 1: Pedestrian
 - East Approach
- Object 2: Car
 - Direction: East to West
 - Speed: 25km/h



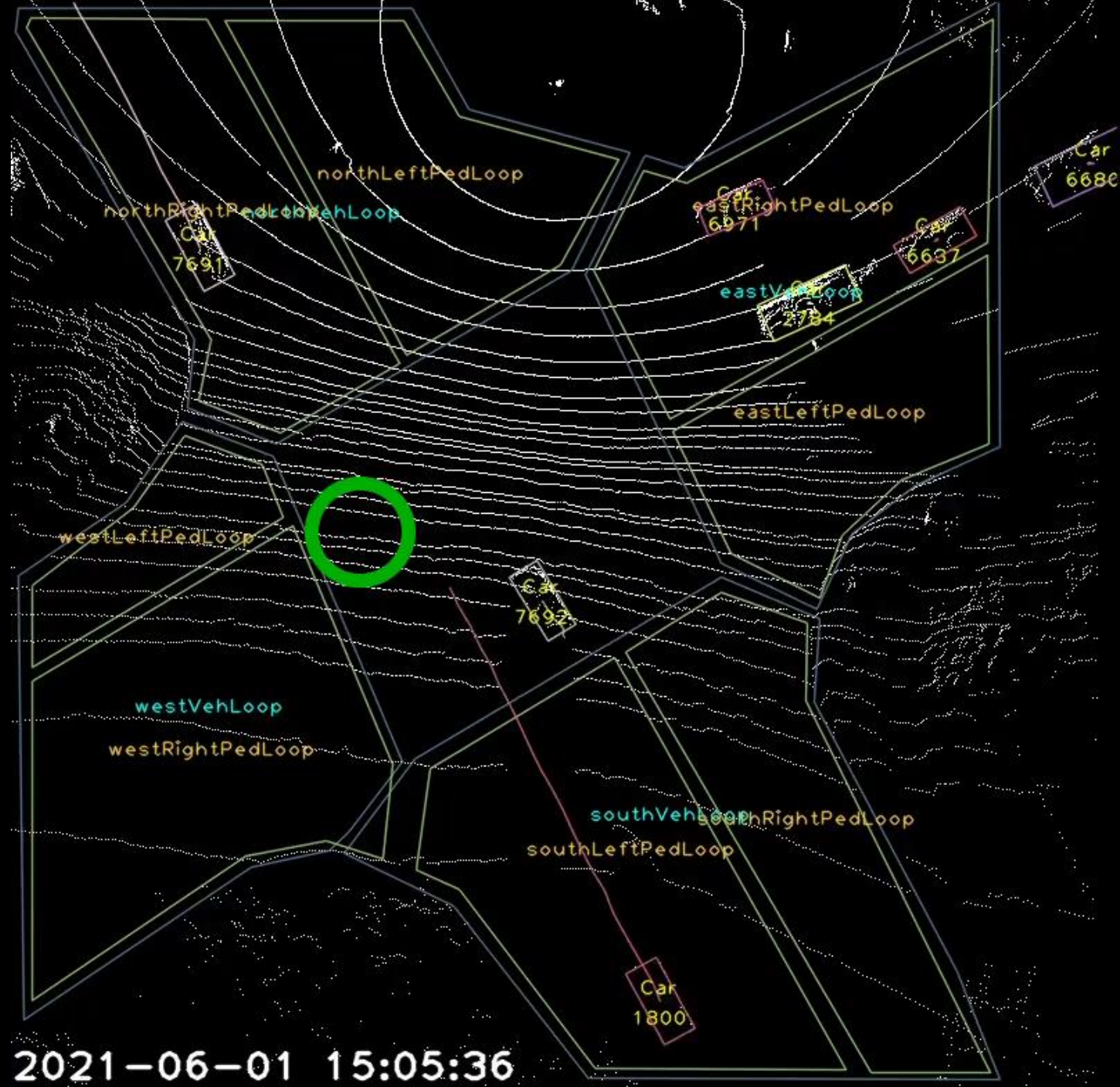
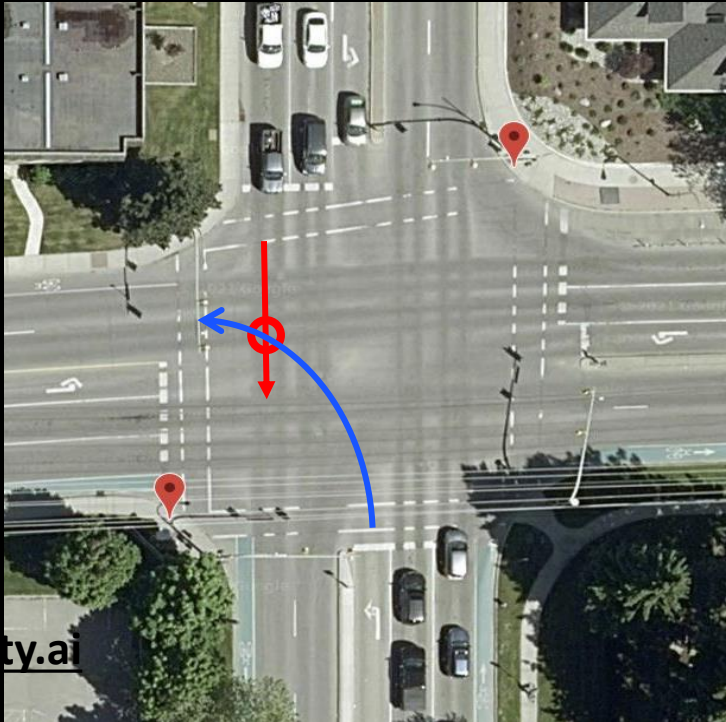
Case 4: Jaywalking / Near-Miss

- PET: 1.7 second
- Object 1: Pedestrian
 - East Approach
- Object 2: Car
 - Direction: West to East
 - Speed: 30km/h

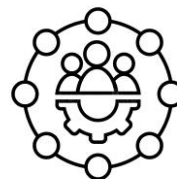


Case 5: Near-Miss

- PET: 1.2 seconds
- Object 1: car
 - Direction: North to South
 - Speed: 40 km/h
- Object 2: Car
 - Direction: South to West



AI + Lidar + 5G



Open API



Connected Vehicle



Accessibility



Emergency



Latency



Reliability



Bandwidth



:Bluecity