

Orlando, FL

November 7-8, 2024



2024 TRANSPORTATION SYMPOSIUM

Truck Parking and Rail Detection Design Using Machine Learning Concepts



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FDOT District Two – TSM&O Program Manager



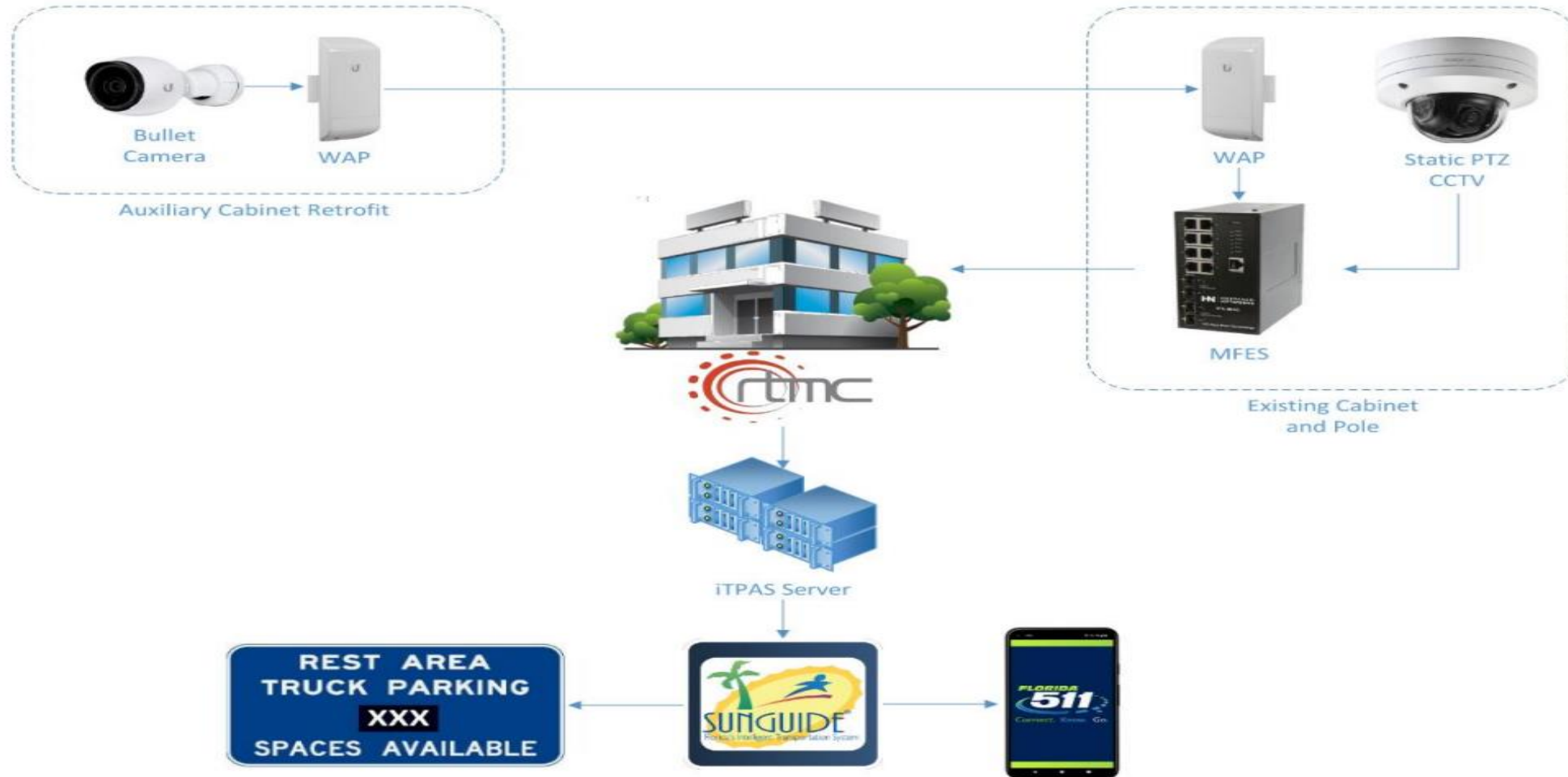
Innovative Truck Parking Availability System

Design Guide for Camera-Based iTPAS

Overview

- Origin of Truck Parking
 - Jason's Law (Jason Rivenburg)
 - South Carolina gas station
 - Signed into law July 6th, 2012
 - Funding to States for designated truck parking areas
- Florida
 - FIU research paper December 27th, 2012
 - Truck Parking trends
 - Magnetometers (Pilot test – Leon and Alachua County) in 2012
 - Central Office initiative began in 2014 with pilot test of truck parking at I-95/CR 210 Rest Area (MVDS)
 - Statewide effort in late 2015 (TPAS)
 - Deployment began in 2019
- District Two
 - Magnetometer issues
 - SASHTO
 - Video Analytics or iTPAS

Overview (Continued)



iTPAS Pilot

- Baker County Rest Area
 - Worked with vendor
 - Tested capabilities
 - Proved capabilities
 - Forecast possibilities
- Adam Storm, P.E.
 - Camera placement
 - Camera type (CCTV, bullet, fisheye)
 - Mounting type
 - Power and communication
- Evarist Ruhazwe, P.E., PhD
 - Machine Learning expertise for transportation
 - Video analytics
 - Network requirements
 - SunGuide

Site Layout



TATION

Needed Equipment

- ITS Cabinets
 - Auxiliary cabinets on existing light/wooden poles or
 - Traditional pole-mounted cabinets for existing/new ITS poles
- Power source
 - Existing ITS infrastructure
 - Solar option
- Cameras
 - Simple IP bullet-style cameras may be used
 - District 2 has been using Ubiquiti cameras
- Communication
 - Fiber
 - Wireless
 - Cellular

Needed equipment - Cabinets

- Auxiliary cabinets on existing light/wooden poles OR
- Traditional pole-mounted cabinets for existing/new ITS poles



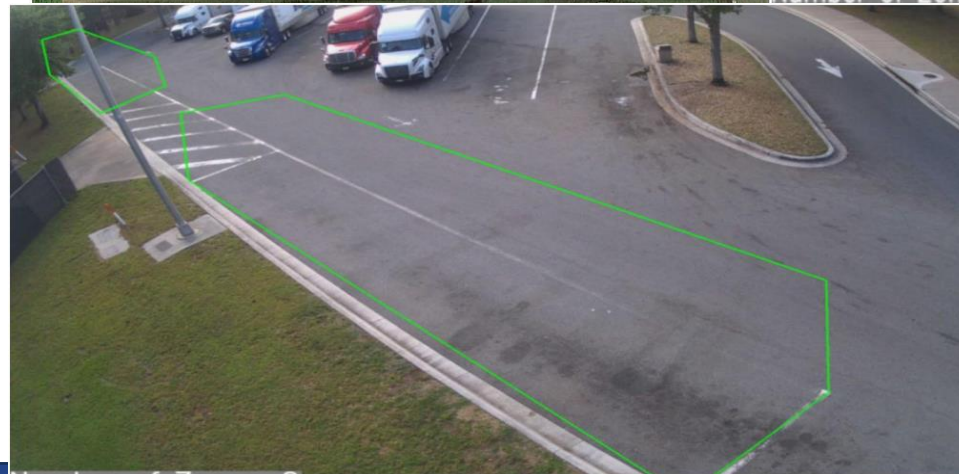
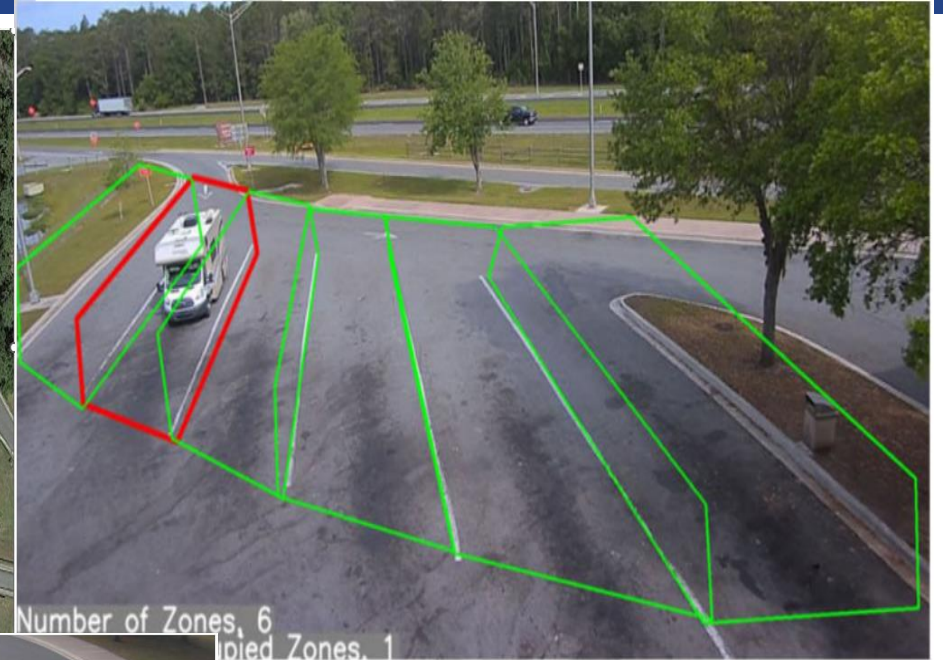
Camera

- Cameras
 - Simple IP bullet-style cameras may be used
 - District 2 has been using Ubiquiti cameras
 - Sometimes CCTV Cameras may be used



Camera placement

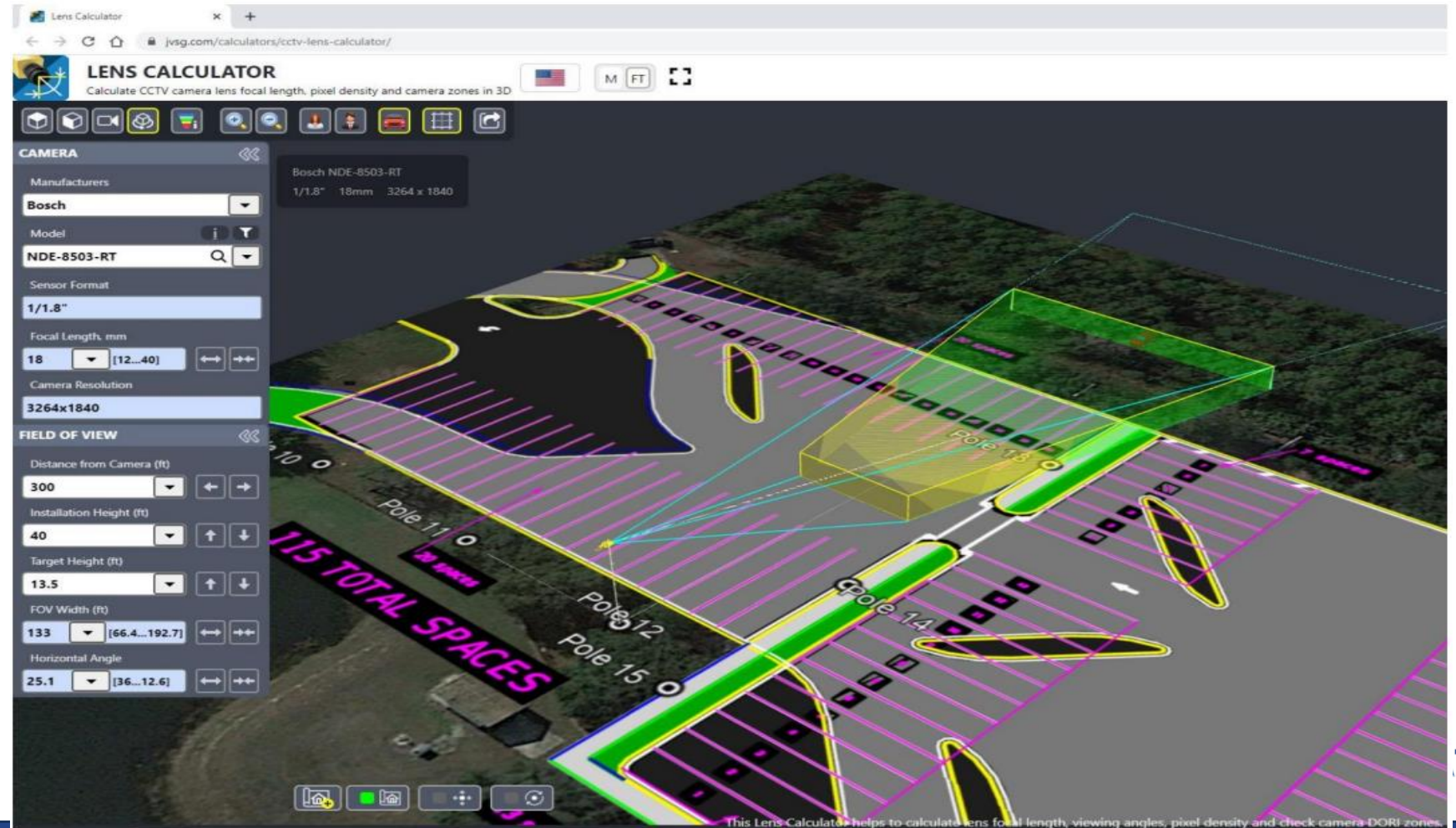
- Depends on factors like number, orientation and distribution of parking spaces
- 6 parking spaces per camera is good practice



Online CCTV field-of-view estimation tool

<https://www.jvsg.com/calculators/cctv-lens-calculator/>

- Single camera coverage

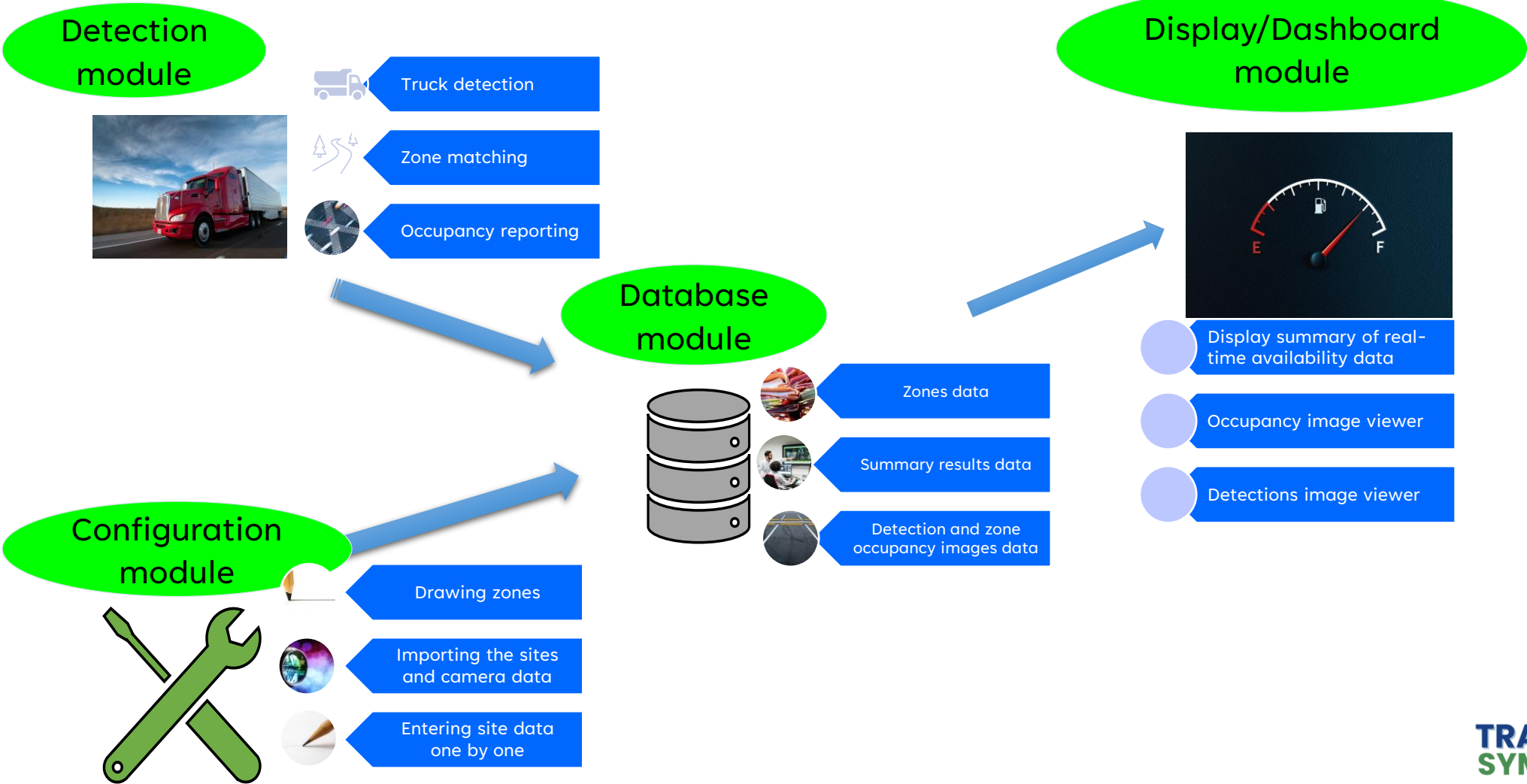


Needed equipment – Server requirements

- Central server space at TMC is ideal.
- Server that the iTPAS is running on have the following specs
 - 6 CPU cores
 - No GPU necessary
 - 100 GB storage
 - 8 GB memory

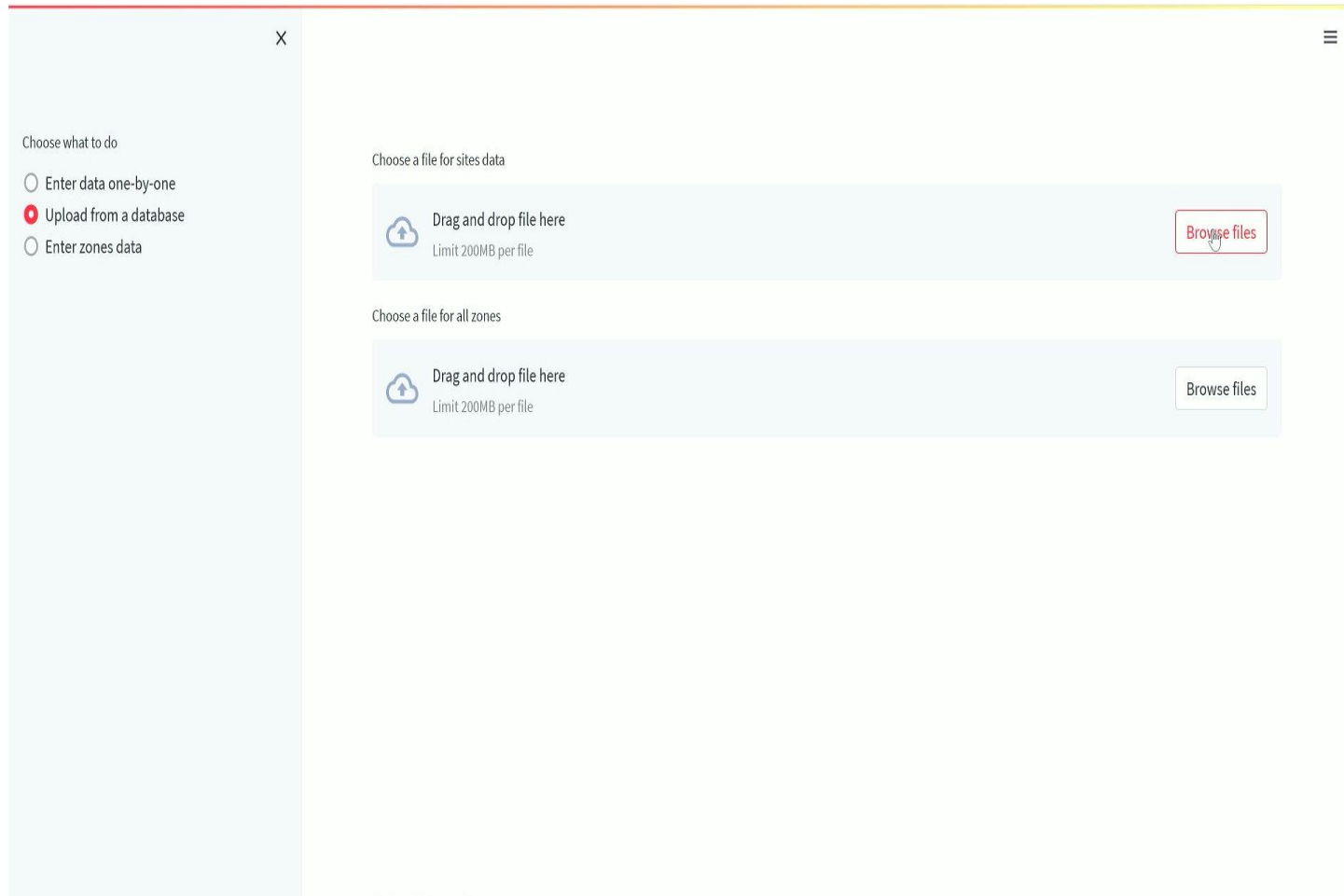


Software for iTPAS



Configuration module

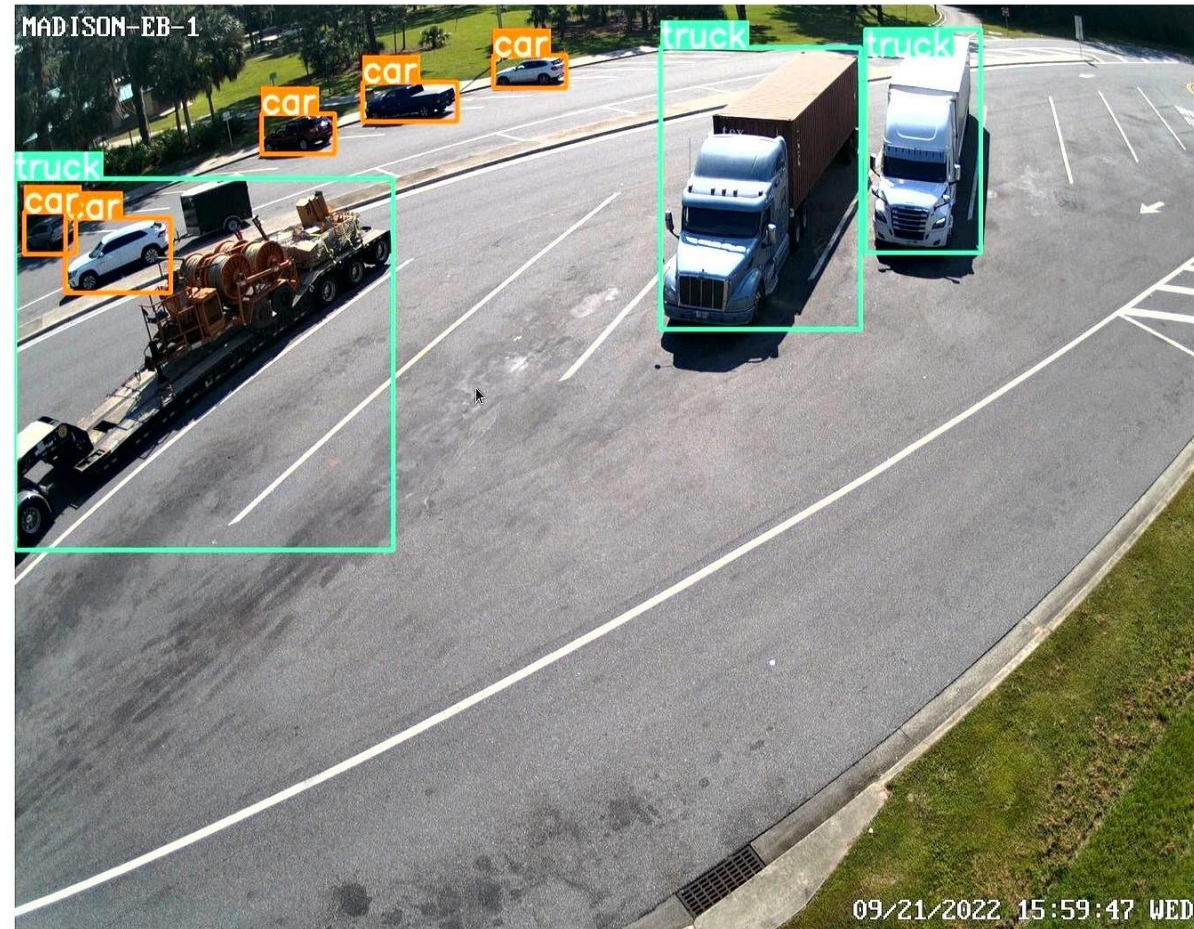
- Browser-based data entry and drawing tool
- Import data feature
- User can draw shapes of zones on camera snapshots
- Exclusion zones are added to avoid false detections



The screenshot displays a web-based configuration interface. On the left, a sidebar titled "Choose what to do" contains three radio button options: "Enter data one-by-one", "Upload from a database" (which is selected), and "Enter zones data". The main content area is divided into two sections for file uploads. The first section, "Choose a file for sites data", features a light blue box with a cloud icon, the text "Drag and drop file here" and "Limit 200MB per file", and a red "Browse files" button. The second section, "Choose a file for all zones", has a similar layout with a light blue box, the text "Drag and drop file here" and "Limit 200MB per file", and a white "Browse files" button. The interface includes a close button (X) in the top right of the sidebar and a hamburger menu icon in the top right of the main area.

Vehicle detection module

- Uses YOLOv5 detection module to detect presence of trucks
- Matches the detections to the zones available
- Occupancy data saved to the database
- Images URLs with detections and occupancy saved into the database



Database module

- Saves site, cameras, zones and results information
- Uses non-sql format to save zones information because of different number of zones for each site
- Saves urls of the images with detections and occupancy information

MongoDB Compass - localhost:27017/zones_data_2

Connect View Help

localhost:27017

5 DBS 181 COLLECTIONS

FAVORITE

HOST localhost:27017

CLUSTER Standalone

EDITION MongoDB 3.6.8 Community

My Queries

Databases

Filter your data

zones_data_2

- Alachua I-75 NB Rest Area...
- Alachua I-75 NB Rest Area...
- Alachua I-75 NB Rest Area...
- Alachua I-75 NB Rest Area...
- Alachua I-75 SB Rest Area...
- Alachua I-75 SB Rest Area...
- Alachua I-75 SB Rest Area...
- Alachua I-75 SB Rest Area...
- Alachua I-75 SB Rest Area...
- Alachua I-75 SB Rest Area...
- Baker I-10 EB Rest Area.B...
- Baker I-10 EB Rest Area.B...

Collections

Create collection View

Sort by Collection Name

Storage size:	Documents:	Avg. document size:	Indexes:	Total index size:
36.86 kB	20	203.00 B	1	36.86 kB
16.38 kB	1	52.00 B	1	16.38 kB
36.86 kB	1	313.00 B	1	36.86 kB
16.38 kB	1	96.00 B	1	16.38 kB
16.38 kB	12	201.00 B	1	16.38 kB

Display module



 Dashboard

 Image View

 Verification

Select a page above.

- Present the occupancy summary for all sites
- Display real-time still images (4-minute update) showing occupancy site-by-site
- Display actual detections from Yolov5 model

Real-Time Truck Parking Data

	Available Spaces	Total Spaces	Percent Occupied	Camera Status	Last Updated
Madison I-10 EB Rest Area	19	26	26%	4/4 cameras online	Tue Jul 18 09:30:55 2023
Madison I-10 WB Rest Area	15	23	34%	5/5 cameras online	Tue Jul 18 09:31:06 2023
Baker I-10 EB Rest Area	23	25	8%	6/6 cameras online	Tue Jul 18 09:31:15 2023
Baker I-10 WB Rest Area	12	25	52%	6/6 cameras online	Tue Jul 18 09:31:26 2023
Alachua I-75 NB Rest Area	3	6	50%	1/1 cameras online	Tue Jul 18 09:31:28 2023
Alachua I-75 SB Rest Area	6	13	53%	3/3 cameras online	Tue Jul 18 09:31:35 2023
Hamilton I-75 SB Welcome Center	24	39	38%	 8/9 cameras online	Tue Jul 18 09:32:00 2023
Nassau I-95 SB Welcome Center	28	43	34%	11/11 cameras online	Tue Jul 18 09:32:20 2023
Columbia I-75 NB Rest Area	27	49	44%	 8/9 cameras online	Tue Jul 18 09:32:50 2023
Columbia I-75 SB Rest Area	36	48	25%	10/10 cameras online	Tue Jul 18 09:33:13 2023
Northend St Johns I-95 NB Rest Area	31	73	57%	12/12 cameras online	Tue Jul 18 09:33:39 2023
Northend St Johns I-95 SB Rest Area	22	61	63%	13/13 cameras online	Tue Jul 18 09:34:08 2023
Southend St Johns I-95 NB Rest Area	9	14	35%	4/4 cameras online	Tue Jul 18 09:29:40 2023
Southend St Johns I-95 SB Rest Area	9	16	43%	3/3 cameras online	Tue Jul 18 09:29:45 2023

Dashboard - Summary

Dashboard

Image Viewer

Verification

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Dashboard Image viewer- Occupancy

- Dashboard
- Image Viewer
- Verification

- Present the occupancy summary for all sites
- Display real-time still images (4-minute update) showing occupancy site-by-site
- Display actual detections from Yolov5 model

Detection Image Viewer

Choose a site

Madison I-10 EB Rest Area

MADISON-EB-1

See detections for MADISON-EB-1, click to view



Dashboard Image viewer - Detections

- Dashboard
- Image Viewer
- Verification

- Present the occupancy summary for all sites
- Display real-time still images (4-minute update) showing occupancy site-by-site
- Display actual detections from Yolov5 model

Choose a site

Baker I-10 WB Rest Area

BAKER-WB-1

See detections for BAKER-WB-1, click to view



Number of Zones, 6
Number of Occupied Zones, 5

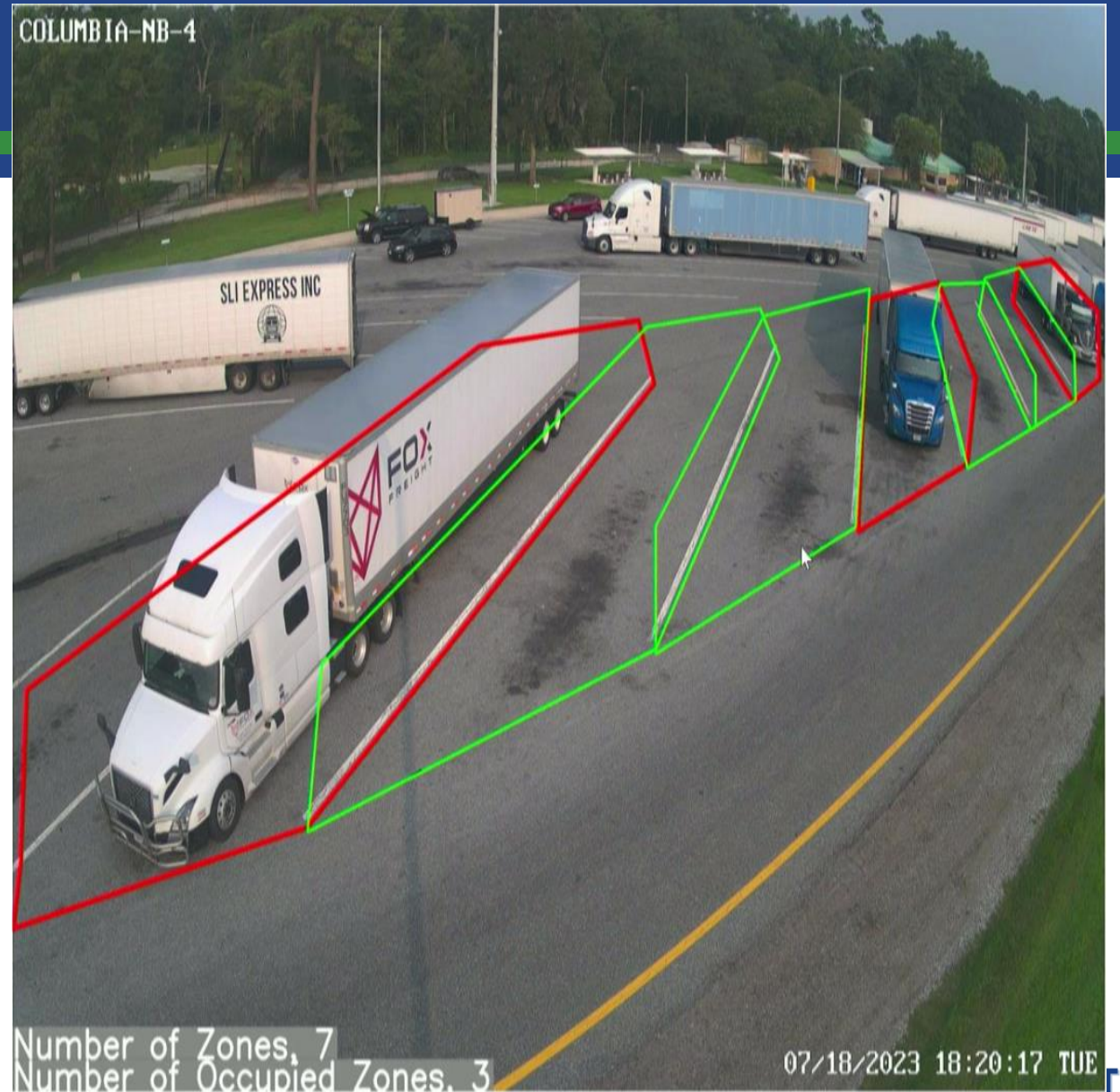
Save the original image for BAKER-WB-1

BAKER-WB-2

See detections for BAKER-WB-2, click to view

Observations

- Higher level of accuracy
- User friendly configuration module when drawing or editing or deleting zones
- Easily verifiable data
- Provides source of information for troubleshooting (issues like intermittent connectivity, camera shift, etc.)
- Vendor-agnostic such that it can be deployed and utilized by local transportation authorities



Sunguide integration

- Occupancy data pushed to sunguide
- Then pushed to the static signs with embedded DMS for display



Design Approach

- Parking layout
- Capture at most six spots per camera (more for fish-eye)
- Available staging area for poles (light poles or traditional)
- Communication capabilities (trench, directional bore, wireless)
- Power capabilities (hard wire or solar)
- Drone assessment based on layout
- Landscaping
- Network layout
- Cabinet needs

Embedded Signs

- Advanced static signs with embedded messaging
 - On main-line
 - On entrance ramps
 - At split ramps
- Connectivity
 - Hard-wire
 - Wireless
 - Cellular

Testing

- TPAS DevSpec 660 (TPDS)
 - Cameras
 - Magnetometers (revised)
 - In accordance with 995-2.13
 - PTZ IP
 - TPDS fixed **do not** have to be on APL
 - Coordination with District on TPDS software
- Testing
 - Spaces captured according to design
 - Proper height
 - No obstructions

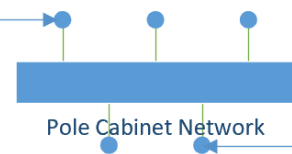
Results

- Magnetometers
 - Large amounts of downtime due to power depletion
 - Lost counts due to going into sleep mode
 - Accuracy levels of 70% or less
- iTPAS
 - Little to no downtime
 - Normally due to network issues and not system
 - Accuracy levels consistently above 95%

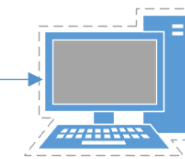
“Per Space” Systems (Wireless Detectors):



ISM Band Comms
AES 256 Encryption



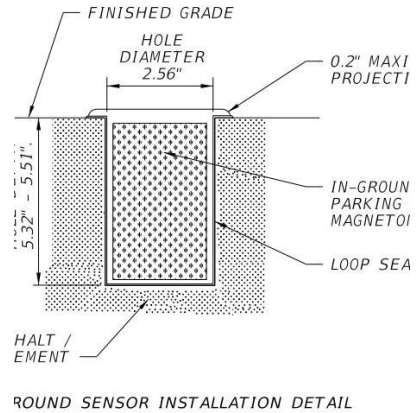
FDOT Network
UDP Port 8787/7878
Encrypted comms



Front End Device Manager and
Server components at TMC

20161 I-75 Columbus Rest Area NB	20162 I-75 Columbus Rest Area SB	20171 I-75 Alachua Rest Area NB	20172 I-75 Alachua Rest Area SB	20110 I-95 Nassau Welcome Center SB
20321 I-95 N SJ/C Rest Area NB	20322 I-95 N SJ/C Rest Area SB	20331 I-95 S SJ/C Rest Area NB	20332 I-95 S SJ/C Rest Area SB	20611 I-95 Nassau Weigh Station NB
20612 I-95 Nassau Weigh Station SB	20621 I-75 Hamilton Weigh Station NB	20622 I-75 Hamilton Weigh Station SB	20631 I-10 Madison Weigh Station EB	20632 I-10 Madison Weigh Station WB

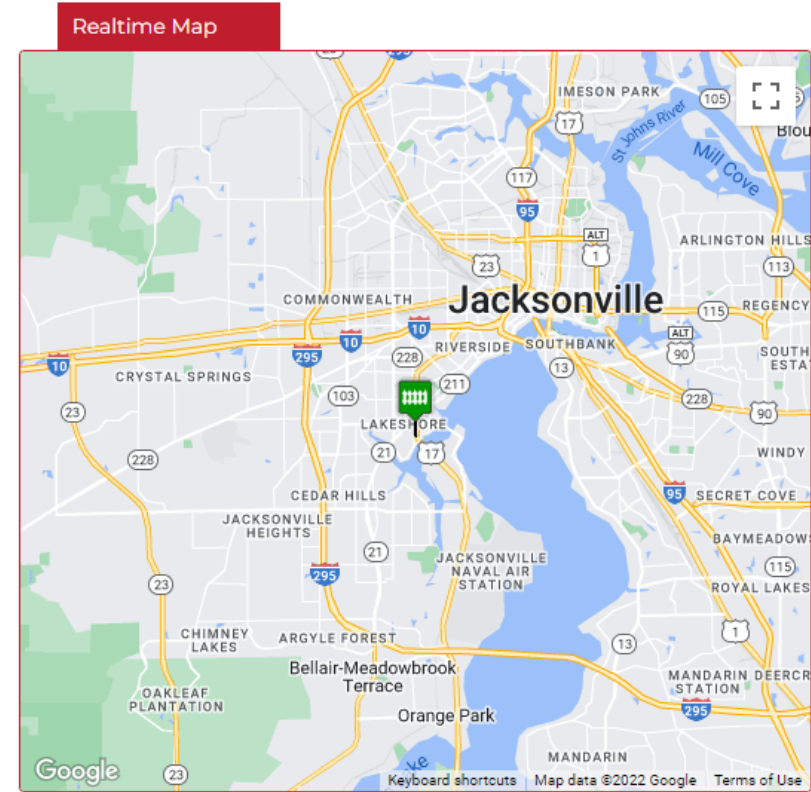
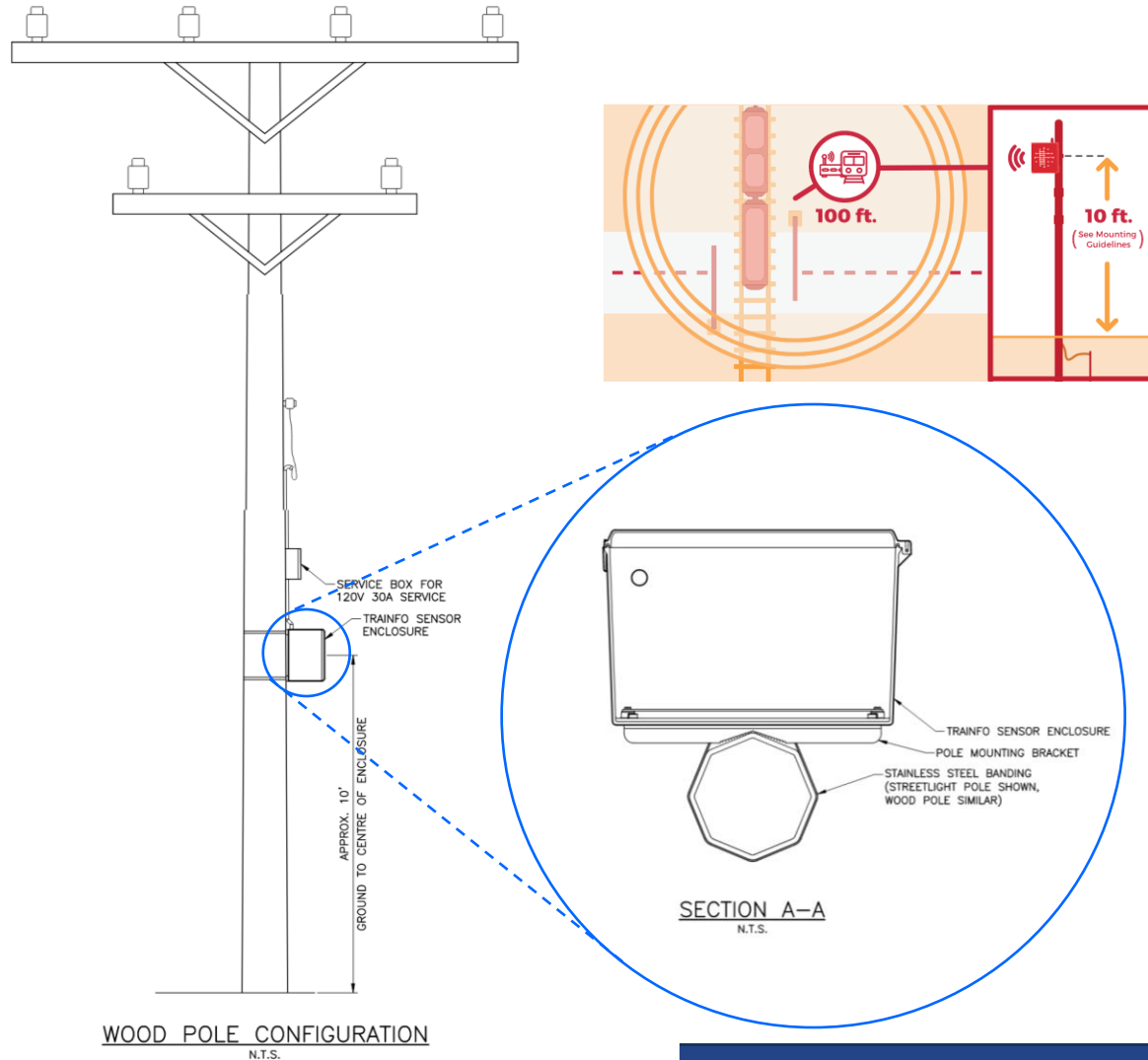
“Per Space” Systems (Wireless Detectors):



- Significant detector failures
- Frequent site visits and repairs needed to keep operational
- Supply chain issues with replacement pucks
- Cost of hardware removal/replacement
- Software licensing costs

Rail Detection Design Guidance from FDOT District Two

Acoustic Sensor Placement



Acoustic Sensor Field Assessment



Mounting Alternatives



Solar, dedicated pole

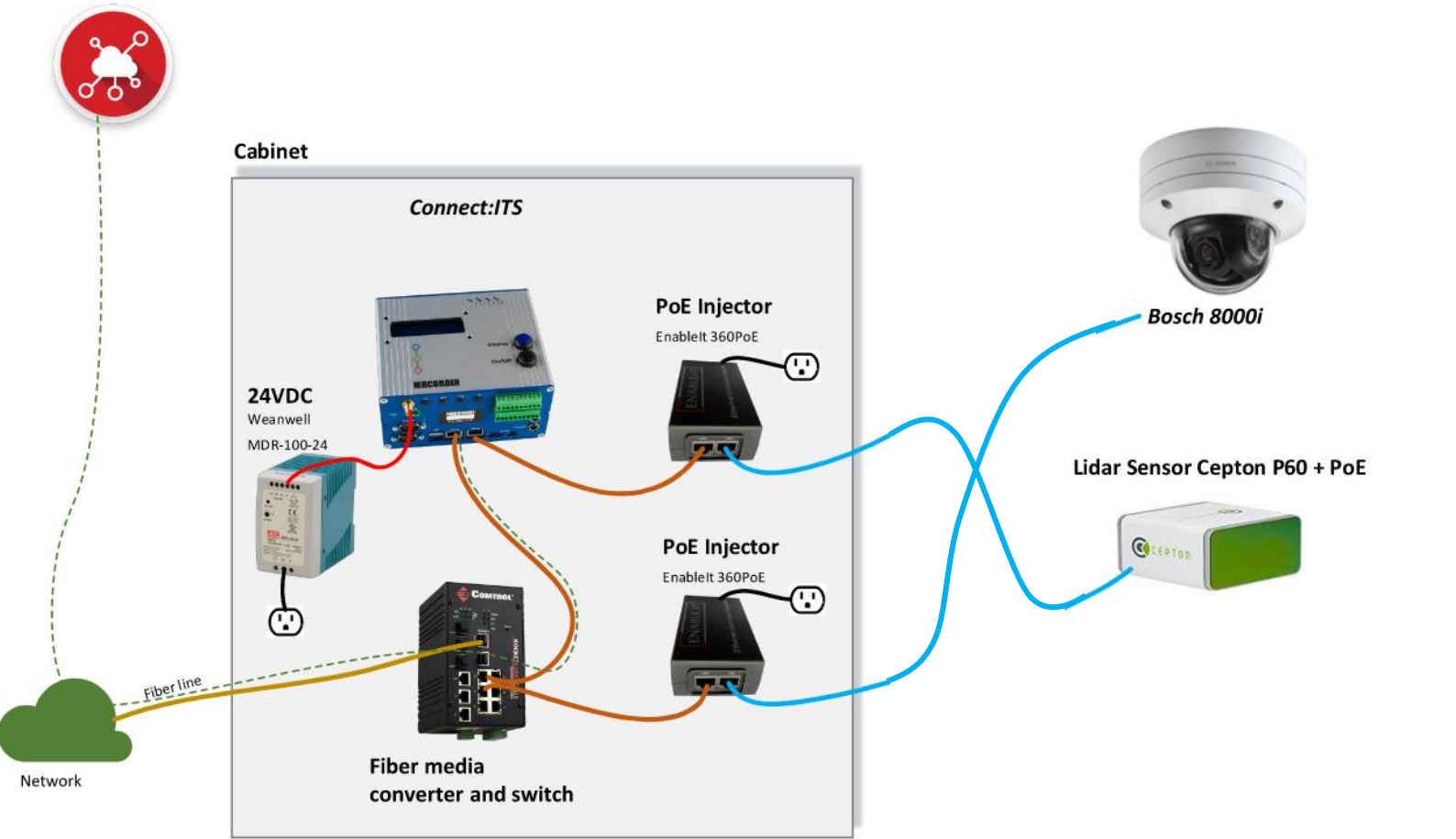


Hardwire, utility pole

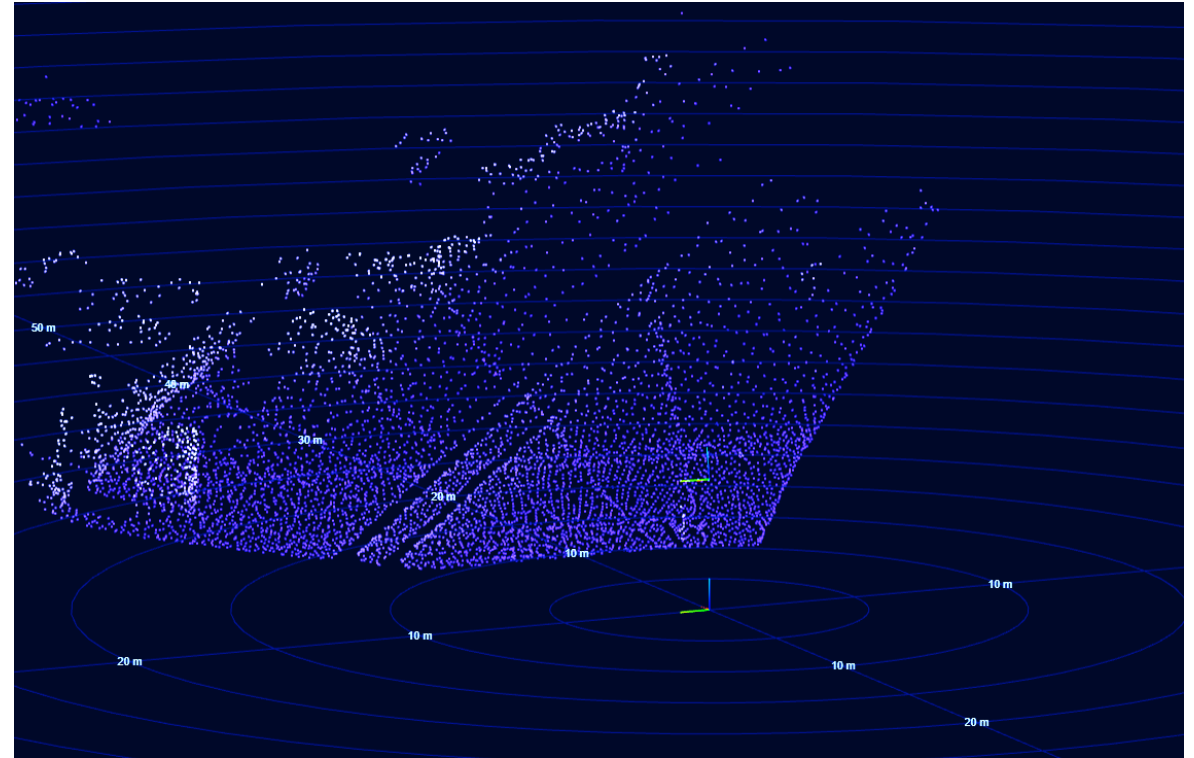


Hardwire, traffic pole

Lidar & Video Analytics Field Assessment

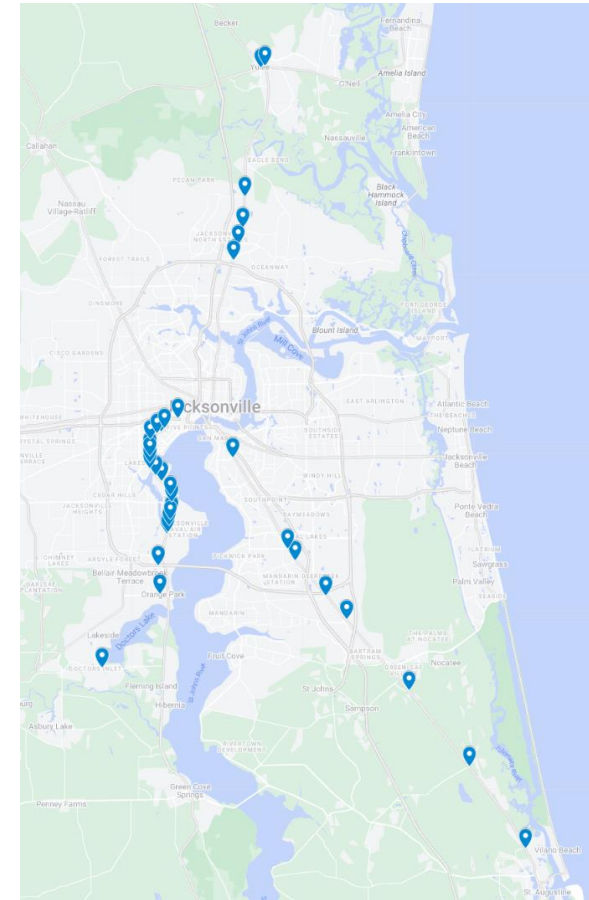


Lidar & Video Analytics Field Assessment



Expansion

- Cover more corridors
 - 20 crossings along US 17 between I-295 and I-10 for dense corridor evaluation
 - 20 more crossings to work our way out to other counties
 - Nassau (US 17), St Johns (US 1), and Clay (US 17)
 - Mix of acoustic and video for crossing detection
 - Acoustic evaluation: draw bridge horn detection
 - Video evaluation: train characteristics analysis
- Dissemination
 - EMS dispatch at high priority crossings
 - FL511 for general wayfinding
 - SunGuide®/DMS for complete system integration and automation
 - Beacons for edge cases, similar to draw bridge notification systems

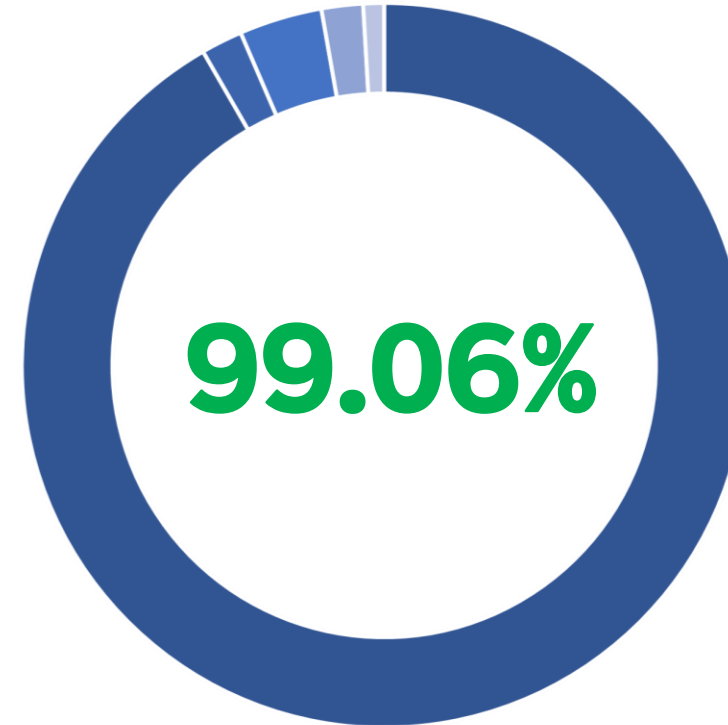


Video Analytics Results

from 8/26/21 to 9/1/21

ATMS	Preempt	Metiri	Result	Direction
		08/26/21-Thu-12:05:31	Maintenance	southbound
08/26/21-Thu-15:58:09	CYC PRMT	08/26/21-Thu-15:58:44	Match	southbound
08/26/21-Thu-15:59:06	END	08/26/21-Thu-15:58:46	Match	southbound
08/26/21-Thu-16:48:37	CYC PRMT	08/26/21-Thu-16:49:32	Match	northbound
08/26/21-Thu-16:49:41	END	08/26/21-Thu-16:49:35	Match	northbound
08/26/21-Thu-17:13:39	CYC PRMT	08/26/21-Thu-17:14:51	Match	northbound
08/26/21-Thu-17:14:56	END		Short train	
08/26/21-Thu-18:22:09	CYC PRMT	08/26/21-Thu-18:23:13	Match	northbound
08/26/21-Thu-18:24:42	END	08/26/21-Thu-18:23:33	Match	northbound
08/26/21-Thu-22:50:16	CYC PRMT	08/26/21-Thu-22:51:19	Match	northbound
08/26/21-Thu-22:51:33	END	08/26/21-Thu-22:51:28	Match	northbound
08/27/21-Fri-05:55:22	CYC PRMT	08/27/21-Fri-05:56:00	Match	southbound
08/27/21-Fri-05:57:28	END	08/27/21-Fri-05:56:27	Match	southbound
08/27/21-Fri-08:12:56	CYC PRMT	08/27/21-Fri-08:13:32	Match	southbound
08/27/21-Fri-08:13:55	END	08/27/21-Fri-08:13:40	Match	southbound
08/27/21-Fri-10:08:01	CYC PRMT	08/27/21-Fri-10:08:33	Match	southbound
08/27/21-Fri-10:08:51	END	08/27/21-Fri-10:08:35	Match	southbound
		08/27/21-Fri-16:08:01	Maintenance	northbound
08/27/21-Fri-17:02:30	CYC PRMT	08/27/21-Fri-17:03:44	Match	northbound
08/27/21-Fri-17:03:47	END		Short train	
08/27/21-Fri-18:29:15	CYC PRMT	08/27/21-Fri-18:31:38	Match	northbound
08/27/21-Fri-18:31:44	END	08/27/21-Fri-18:31:41	Match	northbound
08/27/21-Fri-21:14:32	CYC PRMT	08/27/21-Fri-21:15:16	Match	southbound
08/27/21-Fri-21:18:20	END	08/27/21-Fri-21:15:31	Match	southbound
08/27/21-Fri-22:17:33	CYC PRMT	08/27/21-Fri-22:18:36	Match	northbound
08/27/21-Fri-22:18:40	END		Short train	
08/28/21-Sat-04:44:47	CYC PRMT	08/28/21-Sat-04:45:44	Match	northbound
08/28/21-Sat-04:48:20	END	08/28/21-Sat-04:46:26	Match	northbound
08/28/21-Sat-06:33:40	CYC PRMT	08/28/21-Sat-06:34:16	Match	southbound
08/28/21-Sat-06:35:46	END	08/28/21-Sat-06:34:36	Match	southbound
08/28/21-Sat-08:08:53	CYC PRMT	08/28/21-Sat-08:10:09	Match	northbound
08/28/21-Sat-08:13:47	END	08/28/21-Sat-08:11:10	Match	northbound
08/28/21-Sat-08:16:36	CYC PRMT	08/28/21-Sat-08:17:11	Match	southbound
08/28/21-Sat-08:17:35	END	08/28/21-Sat-08:17:23	Match	southbound
08/28/21-Sat-09:54:25	CYC PRMT	08/28/21-Sat-09:54:58	Match	southbound
08/28/21-Sat-09:55:24	END		Short train	
08/28/21-Sat-16:32:25	CYC PRMT	08/28/21-Sat-16:33:25	Match	northbound
08/28/21-Sat-16:33:36	END	08/28/21-Sat-16:33:30	Match	northbound
08/28/21-Sat-18:27:49	CYC PRMT		Only caught end	northbound
08/28/21-Sat-18:30:22	END	08/28/21-Sat-18:30:21	Match	northbound
08/28/21-Sat-22:02:01	CYC PRMT			
		08/28/21-Sat-23:02:55	Match	southbound
		08/28/21-Sat-23:03:01	Match	southbound

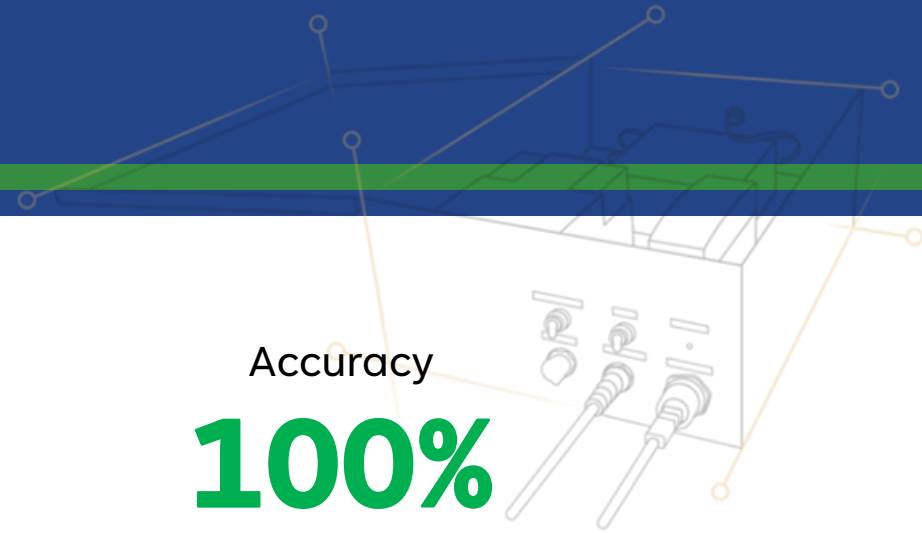
Presence Detection Accuracy



- True Positive
- Only Detected End
- Maintenance Vehicle
- Wrong Direction
- False Positive

Acoustic Sensor Results

from 6/27/22 to 7/4/22



ATMS ("Ground Truth")			TRAINFO			Result	Start Time Difference (sec)	Duration Difference (sec)
Date	Time	Duration (min)	Date	Time	Duration (min)			
6/27/2022	5:01:50 PM	1.90	6/27/2022	5:01:53 PM	2.05	Match	3	9.0
6/27/2022	6:26:55 PM	4.13	6/27/2022	6:26:57 PM	4.27	Match	2	8.2
6/27/2022	8:10:02 PM	1.92	6/27/2022	8:10:03 PM	2.08	Match	1	9.8
6/27/2022	10:30:49 PM	1.45	6/27/2022	10:30:49 PM	1.60	Match	0	9.0
6/28/2022	1:04:43 AM	4.17	6/28/2022	1:04:43 AM	4.35	Match	0	11.0
6/28/2022	7:44:25 AM	1.15	6/28/2022	7:44:29 AM	1.25	Match	4	6.0
6/28/2022	8:59:22 AM	1.03	6/28/2022	8:59:32 AM	0.98	Match	10	-3.2
6/28/2022	1:59:36 PM	1.83	6/28/2022	1:59:40 PM	1.92	Match	4	5.2
6/28/2022	4:03:10 PM	1.63	6/28/2022	4:03:12 PM	1.75	Match	2	7.0
6/28/2022	5:45:47 PM	4.27	6/28/2022	5:45:48 PM	4.40	Match	1	8.0
6/28/2022	10:37:27 PM	1.53	6/28/2022	10:37:29 PM	1.55	Match	2	1.0
6/28/2022	11:23:03 PM	4.15	6/28/2022	11:23:04 PM	4.10	Match	1	-3.0
6/29/2022	12:50:42 AM	2.27	6/29/2022	12:50:42 AM	2.15	Match	0	-7.0
6/29/2022	6:48:04 AM	1.60	6/29/2022	6:48:06 AM	1.72	Match	2	7.2
6/29/2022	8:07:25 AM	0.93	6/29/2022	8:07:29 AM	1.05	Match	4	7.0
6/29/2022	8:11:20 AM	1.02	6/29/2022	8:11:42 AM	0.68	Match *	22	-20.2
6/29/2022	12:45:46 PM	1.28	6/29/2022	12:45:50 PM	1.38	Match	4	5.8
6/29/2022	1:51:30 PM	1.10	6/29/2022	1:51:34 PM	1.23	Match	4	7.8
6/29/2022	7:35:44 PM	2.85	6/29/2022	7:35:48 PM	2.97	Match	4	7.2
6/29/2022	11:51:26 PM	1.58	6/29/2022	11:51:29 PM	1.42	Match	3	-9.8
6/30/2022	4:52:20 AM	4.52	6/30/2022	4:52:23 AM	4.43	Match	3	-5.2
6/30/2022	8:40:21 AM	0.93	6/30/2022	8:40:46 AM	0.48	Match	25	-27.2
6/30/2022	8:56:16 AM	1.10	6/30/2022	8:56:41 AM	0.63	Match	25	-28.2
6/30/2022	11:01:36 AM	4.32	6/30/2022	11:01:41 AM	4.42	Match	5	6.2
6/30/2022	1:35:57 PM	2.35	6/30/2022	1:36:00 PM	2.40	Match	3	3.0
6/30/2022	3:59:39 PM	1.05	6/30/2022	3:59:42 PM	1.17	Match	3	7.2
6/30/2022	11:52:40 PM	1.50	6/30/2022	11:52:43 PM	1.50	Match	3	0.0
7/1/2022	12:10:14 AM	2.80	7/1/2022	12:10:14 AM	2.95	Match	0	9.0
7/1/2022	8:05:37 AM	1.65	7/1/2022	8:05:39 AM	1.78	Match	2	7.8
7/1/2022	9:39:00 AM	0.88	7/1/2022	9:39:04 AM	1.00	Match	4	7.0
7/1/2022	7:38:32 PM	2.52	7/1/2022	7:38:36 PM	2.62	Match	4	6.2
7/1/2022	11:25:26 PM	2.07	7/1/2022	11:25:30 PM	1.95	Match	4	-7.0
7/2/2022	9:21:26 AM	0.92	7/2/2022	9:21:29 AM	1.07	Match	3	9.2
7/2/2022	10:33:03 AM	1.72	7/2/2022	10:33:06 AM	1.85	Match	3	8.0
7/2/2022	9:17:28 PM	2.45	7/2/2022	9:17:31 PM	2.57	Match	3	7.2
7/2/2022	11:17:38 PM	1.63	7/2/2022	11:17:42 PM	1.67	Match	4	2.2
7/3/2022	7:05:50 AM	1.48	7/3/2022	7:05:51 AM	1.62	Match	1	8.2
7/3/2022	7:42:46 AM	1.62	7/3/2022	7:42:48 AM	1.77	Match	2	9.2
7/3/2022	10:06:51 AM	0.92	7/3/2022	10:06:55 AM	0.98	Match	4	3.8
7/3/2022	2:27:25 PM	4.48	7/3/2022	2:27:27 PM	4.62	Match	2	8.2
7/3/2022	3:31:13 PM	2.93	7/3/2022	3:31:17 PM	3.05	Match	3	7.0
7/3/2022	7:06:50 PM	2.22	7/3/2022	7:07:00 PM	2.45	Match	2	7.0
					1.68			
					1.67			
					1.67			
					1.67			

Accuracy
100%

Average Latency

4 sec

Closure Duration Error

±7.8 sec



TRAINFO Blockage Insights - Crossing Activity

Crossing

All

Date

9/11/2023 9/10/2024

Duration

0.13 363.17

Day of Week

All

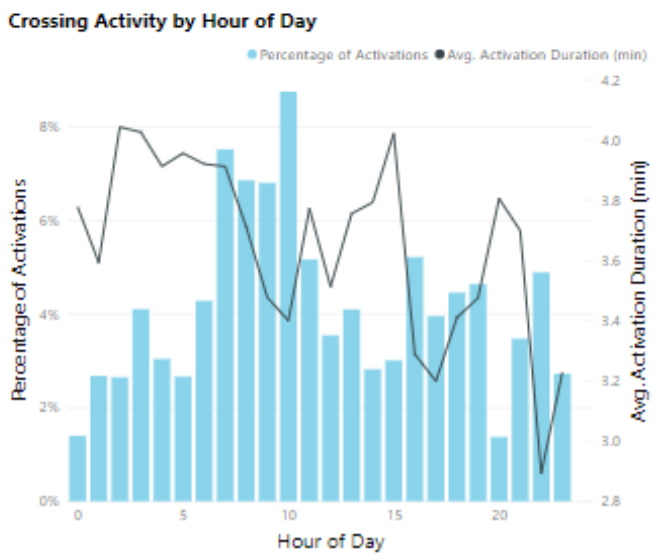
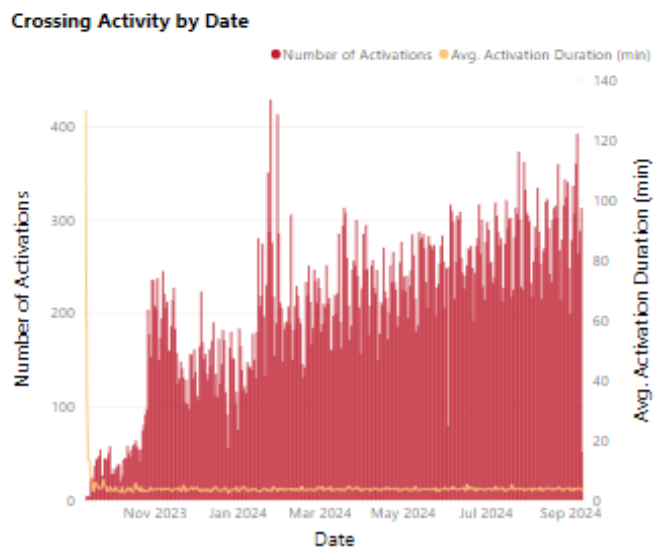
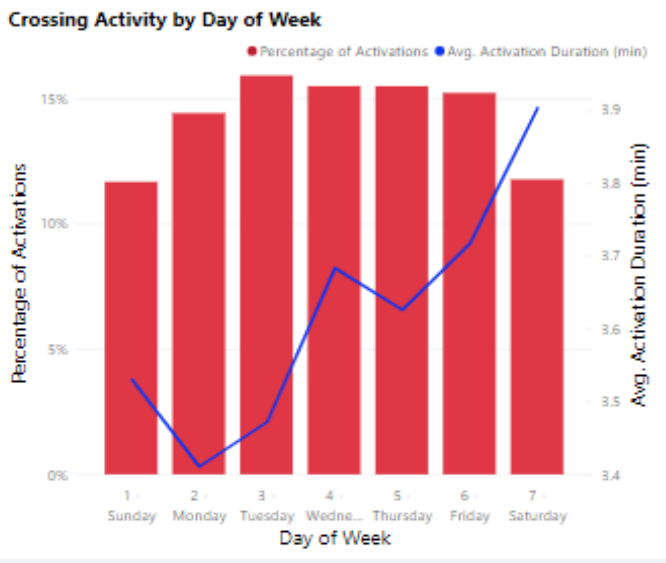
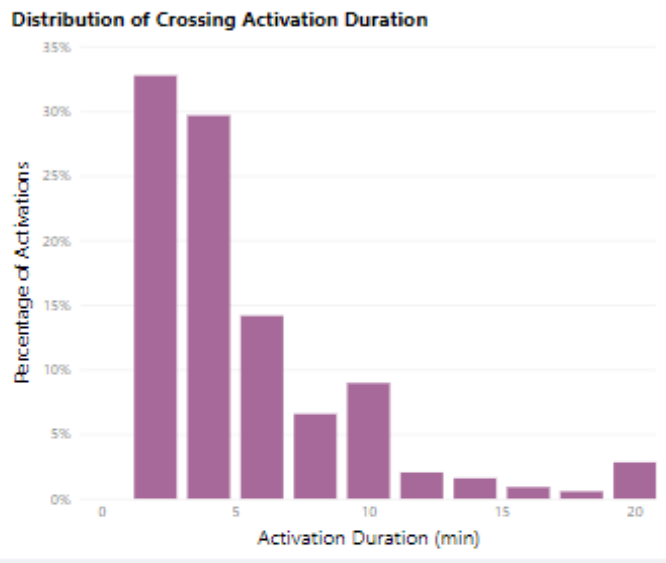
Hour of Day

All

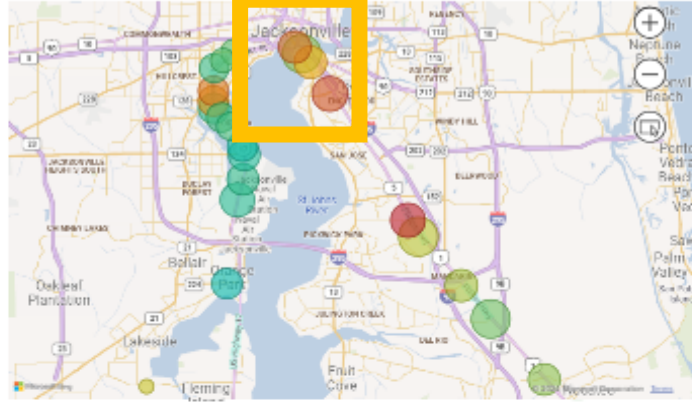
Movement Type

All

364 Longest Activation Duration (min)	11.93 Avg. Daily Activation (hr)	201 Avg. Number of Activations per Day	3.61 Avg. Activation Duration (min)
---	--	--	---



Avg. Daily Activation Frequency (size) and Avg. Activation Duration (colour) by Crossing



Crossing Activity Records

Date	Crossing	Duration (min)	Movement Type	Video File
9/10/2024 3:57:54 AM	Sunbeam Road - 271824W	7.32	Continuous	
9/10/2024 3:55:24 AM	Shad Road - 271825D	6.42	Continuous	
9/10/2024 3:44:25 AM	Greenland Road - 271829F	2.83	Continuous	
9/10/2024 3:44:14 AM	Old St Augustine Road - 271830A	0.47	Continuous	
9/10/2024 3:41:37 AM	Old St Augustine Road - 271830A	0.47	Continuous	

Crossing **CSV**

120Th Street - 620893U	https://portal.trainfo.ca/doc/us/fl/fi115/120TH_STREET.csv
Atlantic Boulevard - 271816E	https://portal.trainfo.ca/doc/us/fl/fi115/Atlantic_Boulevard.csv
Birkenhead St - 621224M	https://portal.trainfo.ca/doc/us/fl/fi115/BIRKENHEAD_ST.csv
Cr 108 - 620796K	https://portal.trainfo.ca/doc/us/fl/fi115/CR_108.csv
Cr 210 West - 271832	https://portal.trainfo.ca/doc/us/fl/fi115/CR_210



TRAINFO Blockage Insights - Crossing Activity

Crossing

All

Date

9/11/2023 9/10/2024

Duration

0.13 363.17

Day of Week

All

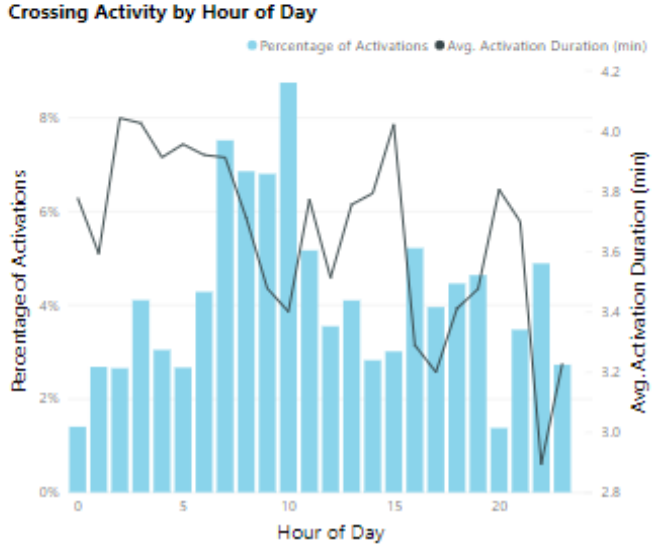
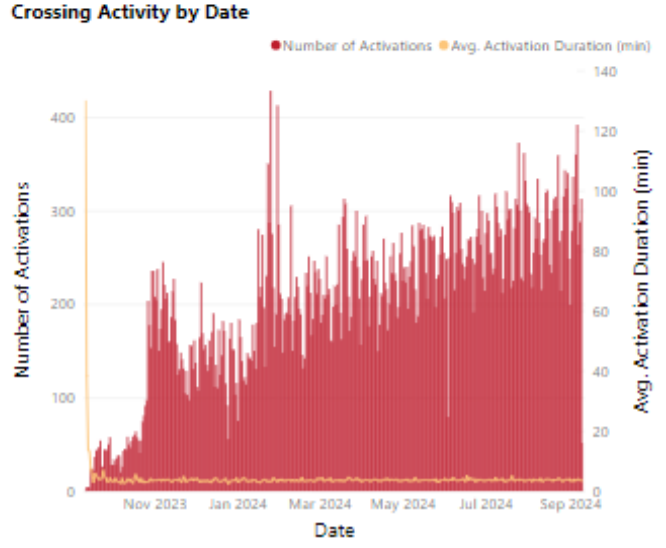
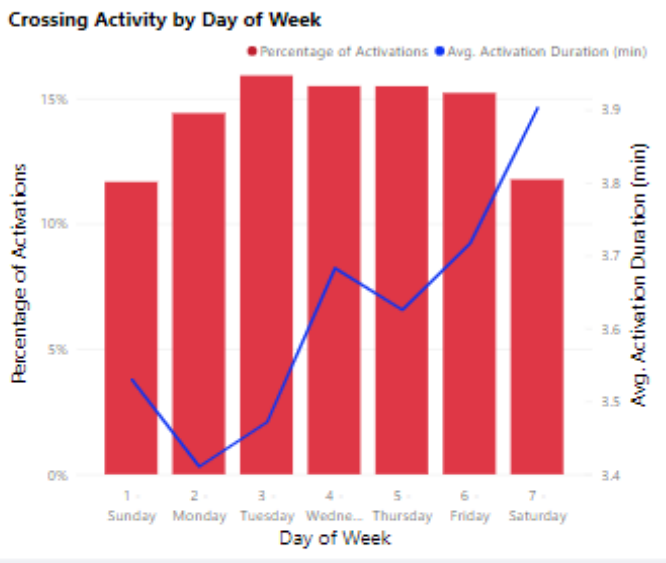
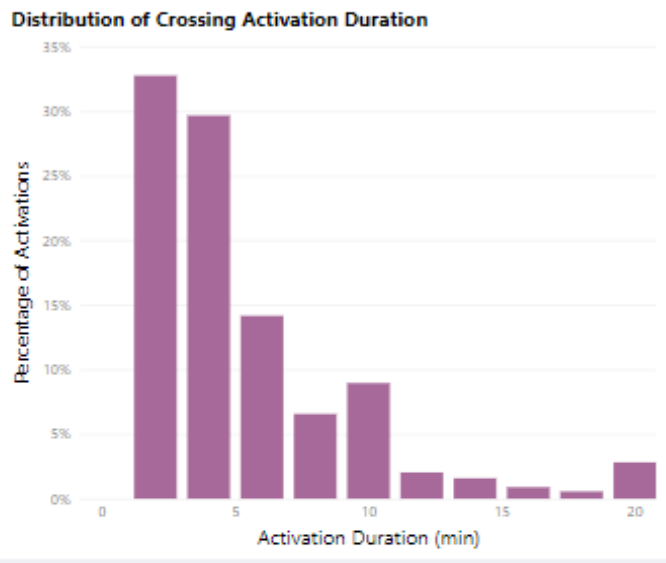
Hour of Day

All

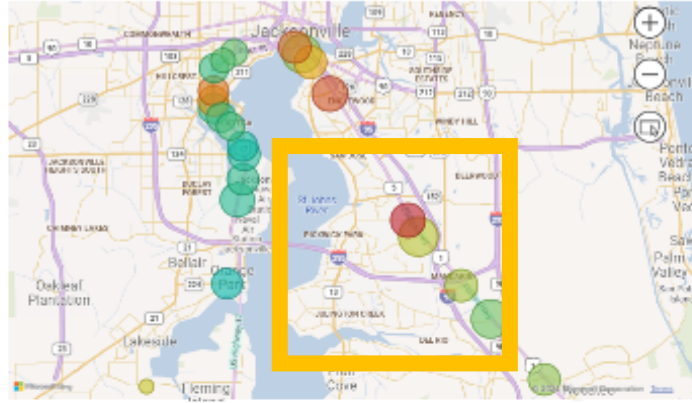
Movement Type

All

364 Longest Activation Duration (min)	11.93 Avg. Daily Activation (hr)	201 Avg. Number of Activations per Day	3.61 Avg. Activation Duration (min)
---	--	--	---



Avg. Daily Activation Frequency (size) and Avg. Activation Duration (colour) by Crossing



Crossing Activity Records

Date	Crossing	Duration (min)	Movement Type	Video File
9/10/2024 3:57:54 AM	Sunbeam Road - 271824W	7.32	Continuous	
9/10/2024 3:55:24 AM	Shad Road - 271825D	6.42	Continuous	
9/10/2024 3:44:25 AM	Greenland Road - 271829F	2.83	Continuous	
9/10/2024 3:44:14 AM	Old St Augustine Road - 271830A	0.47	Continuous	
9/10/2024 3:41:37 AM	Old St Augustine Road - 271830A	0.47	Continuous	

Crossing CSV

Crossing	CSV
120Th Street - 620893U	https://portal.trainfo.ca/doc/us/fl/fi115/120TH_STREET.csv
Atlantic Boulevard - 271816E	https://portal.trainfo.ca/doc/us/fl/fi115/Atlantic_Boulevard.csv
Birkenhead St - 621224M	https://portal.trainfo.ca/doc/us/fl/fi115/BIRKENHEAD_ST.csv
Cr 108 - 620796K	https://portal.trainfo.ca/doc/us/fl/fi115/CR_108.csv
Cr 210 West - 271832	https://portal.trainfo.ca/doc/us/fl/fi115/CR_210



TRAINFO Blockage Insights - Crossing Activity

Crossing

All

Date

9/11/2023 9/10/2024

Duration

0.13 363.17

Day of Week

All

Hour of Day

All

Movement Type

All

44

Longest Activation Duration (min)

1.35

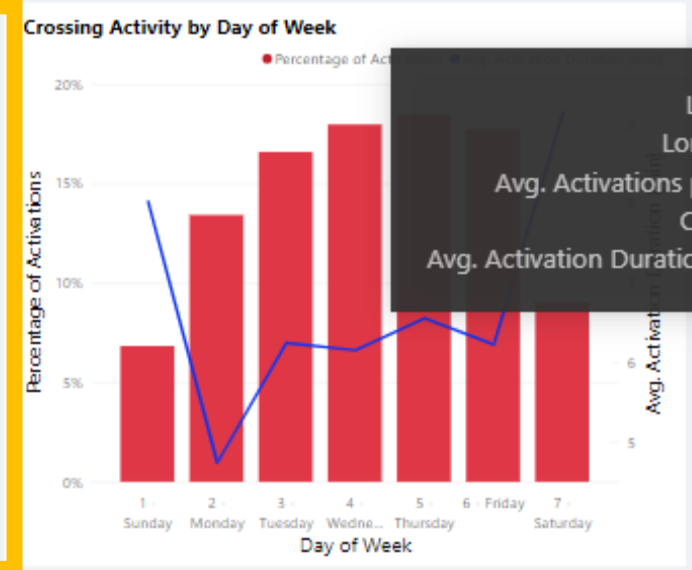
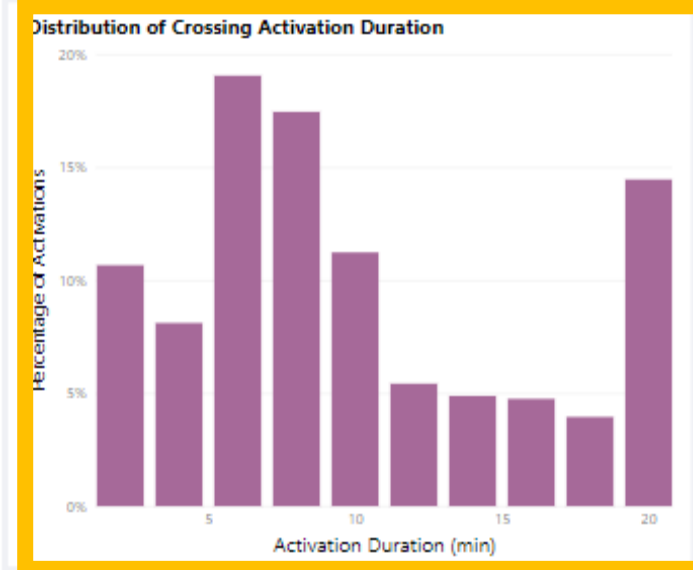
Avg. Daily Activation (hr)

13

Avg. Number of Activations per Day

6.46

Avg. Activation Duration (min)



Avg. Daily Activation Frequency (size) and Avg. Activation Duration (colour) by Crossing

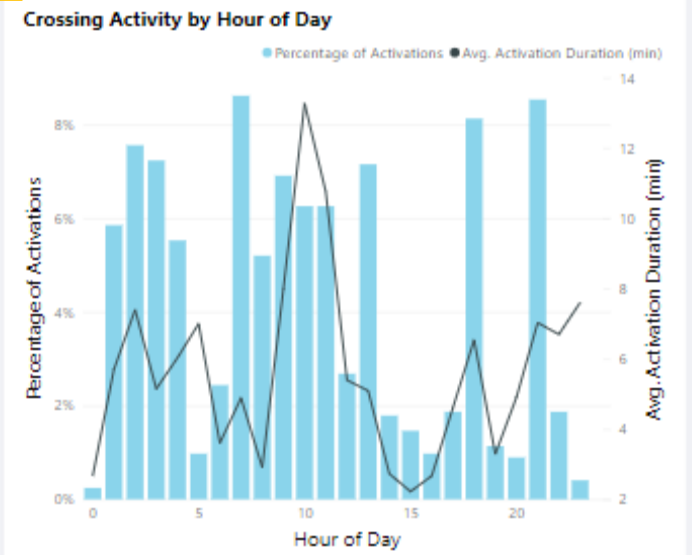
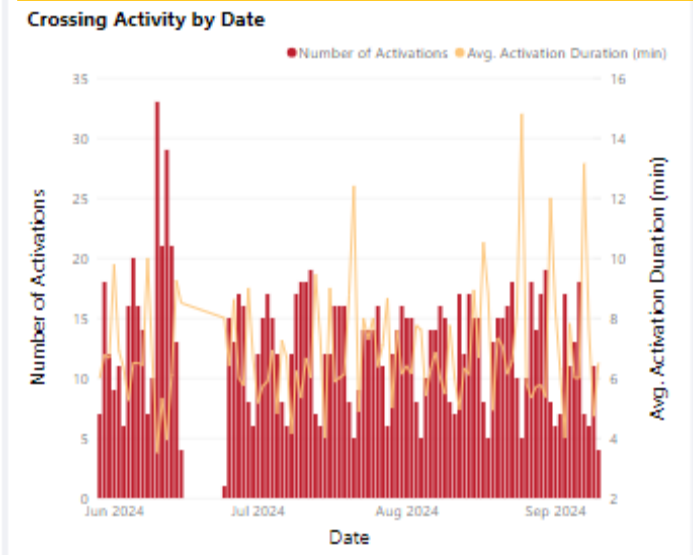
Latitude **30.206077575683594**

Longitude **-81.57877349853516**

Avg. Activations per Day **12.68**

Crossing **Sunbeam Road - 271824W**

Avg. Activation Duration (min) **6.46**



Crossing Activity Records

Date	Crossing	Duration (min)	Movement Type	Video File
6/28/2024 9:49:18 AM	Sunbeam Road - 271824W	19.62	Non-Continuous	Download
7/12/2024 11:12:21 AM	Sunbeam Road - 271824W	19.45	Non-Continuous	Download
6/4/2024 5:18:48 AM	Sunbeam Road - 271824W	19.42	Non-Continuous	
6/8/2024 10:19:01 AM	Sunbeam Road - 271824W	19.35	Non-Continuous	Download
6/14/2024 11:47:54 AM	Sunbeam Road - 271824W	19.30	Non-Continuous	Download

Crossing

Sunbeam Road - 271824W

https://portal.trainfo.ca/doc/us/fl/f1115/Sunbeam_Road.csv



TRAINFO Blockage Insights - Crossing Activity

Crossing

All

Date

9/11/2023 9/10/2024

Duration

0.13 363.17

Day of Week

All

Hour of Day

All

Movement Type

All

364

Longest Activation Duration (min)

11.93

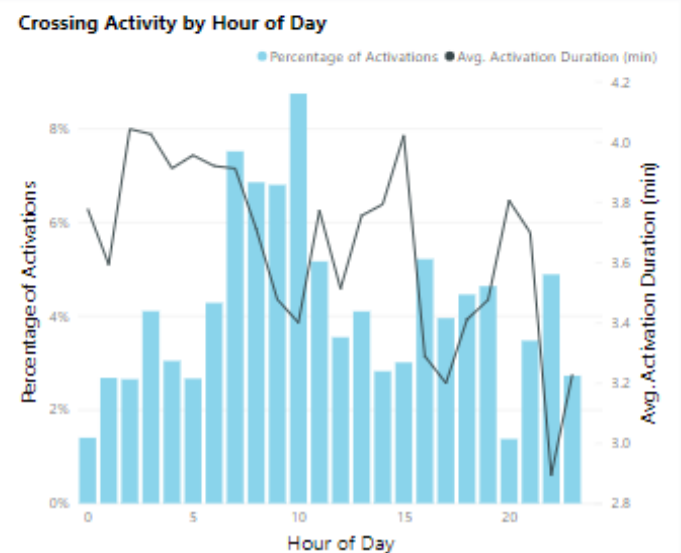
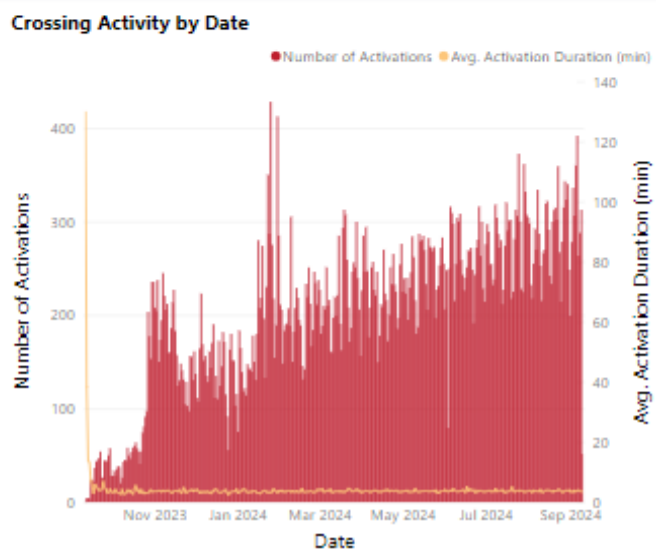
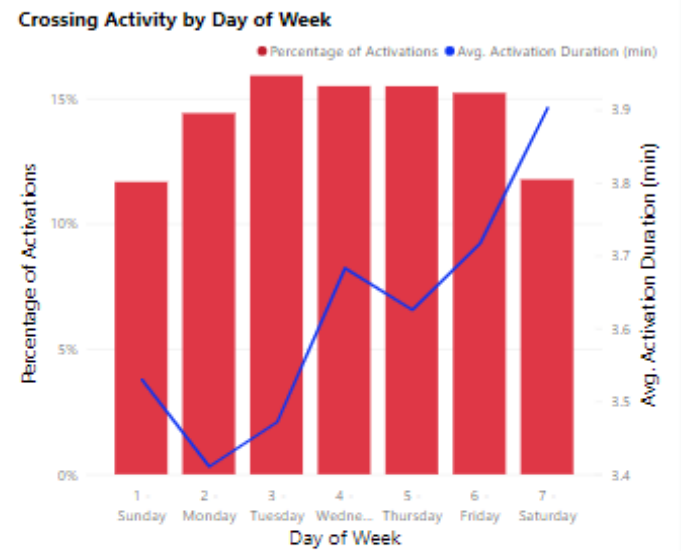
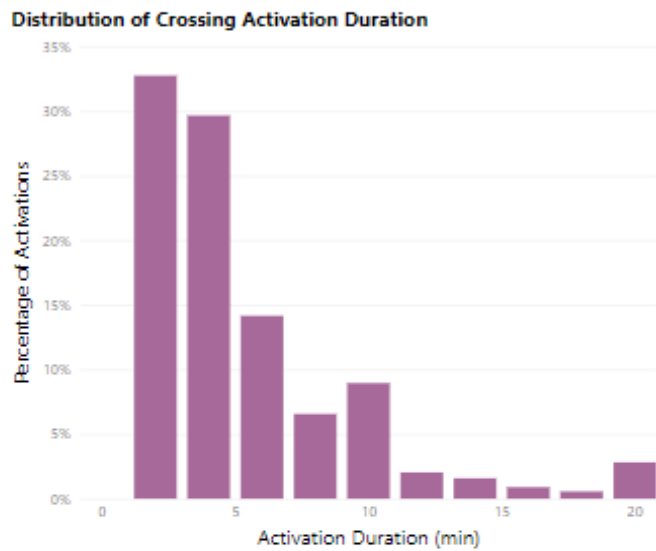
Avg. Daily Activation (hr)

201

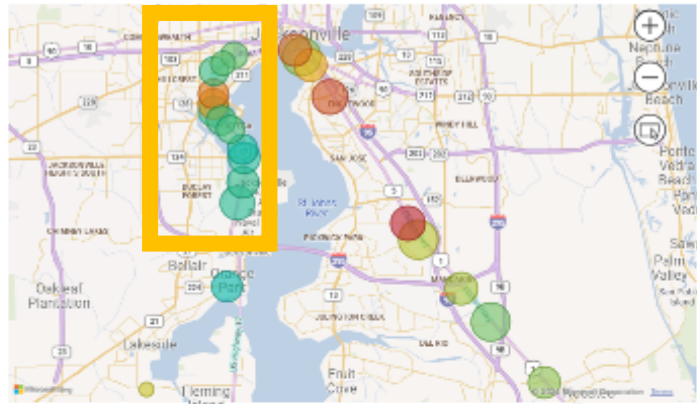
Avg. Number of Activations per Day

3.61

Avg. Activation Duration (min)



Avg. Daily Activation Frequency (size) and Avg. Activation Duration (colour) by Crossing



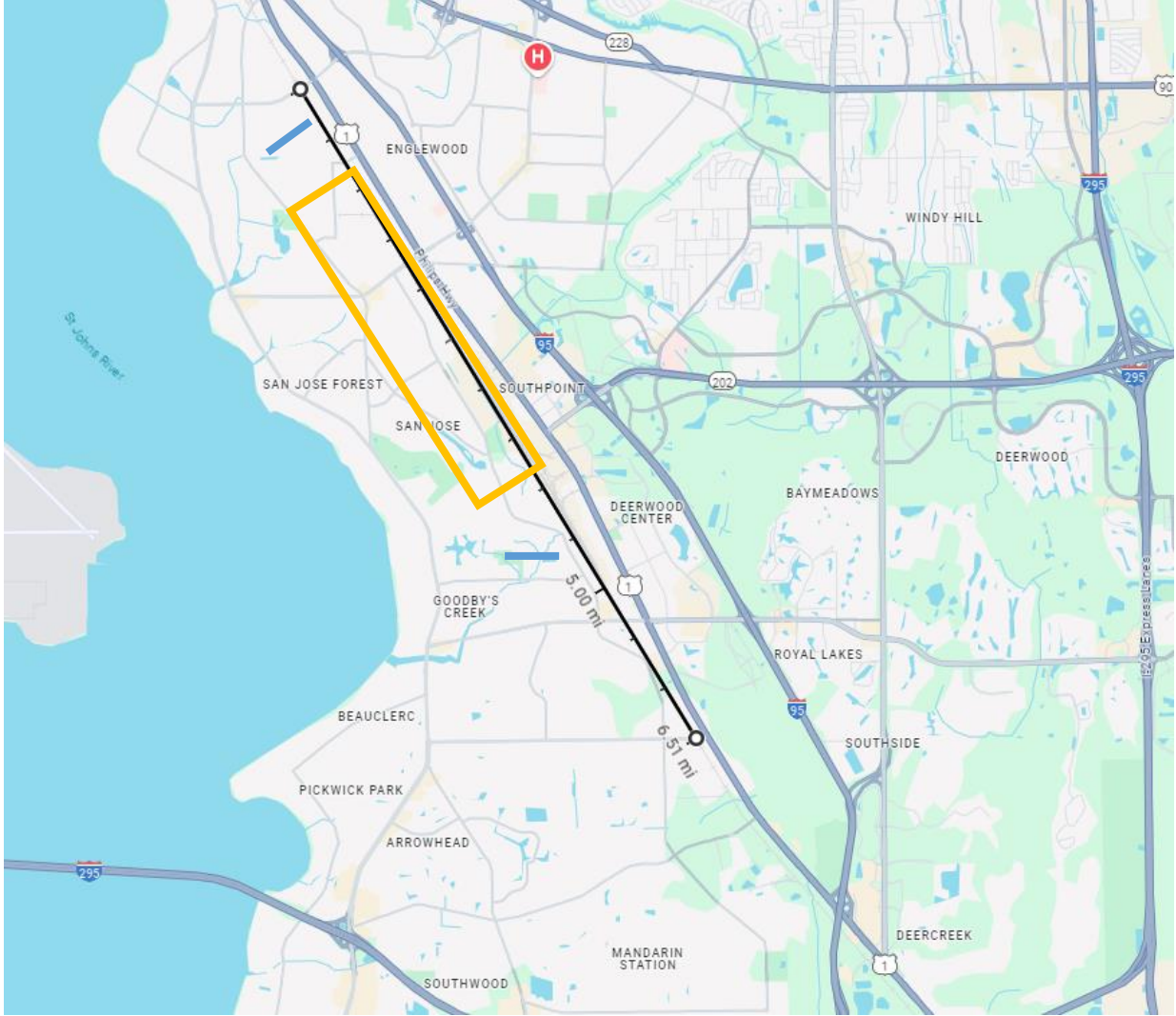
Crossing Activity Records

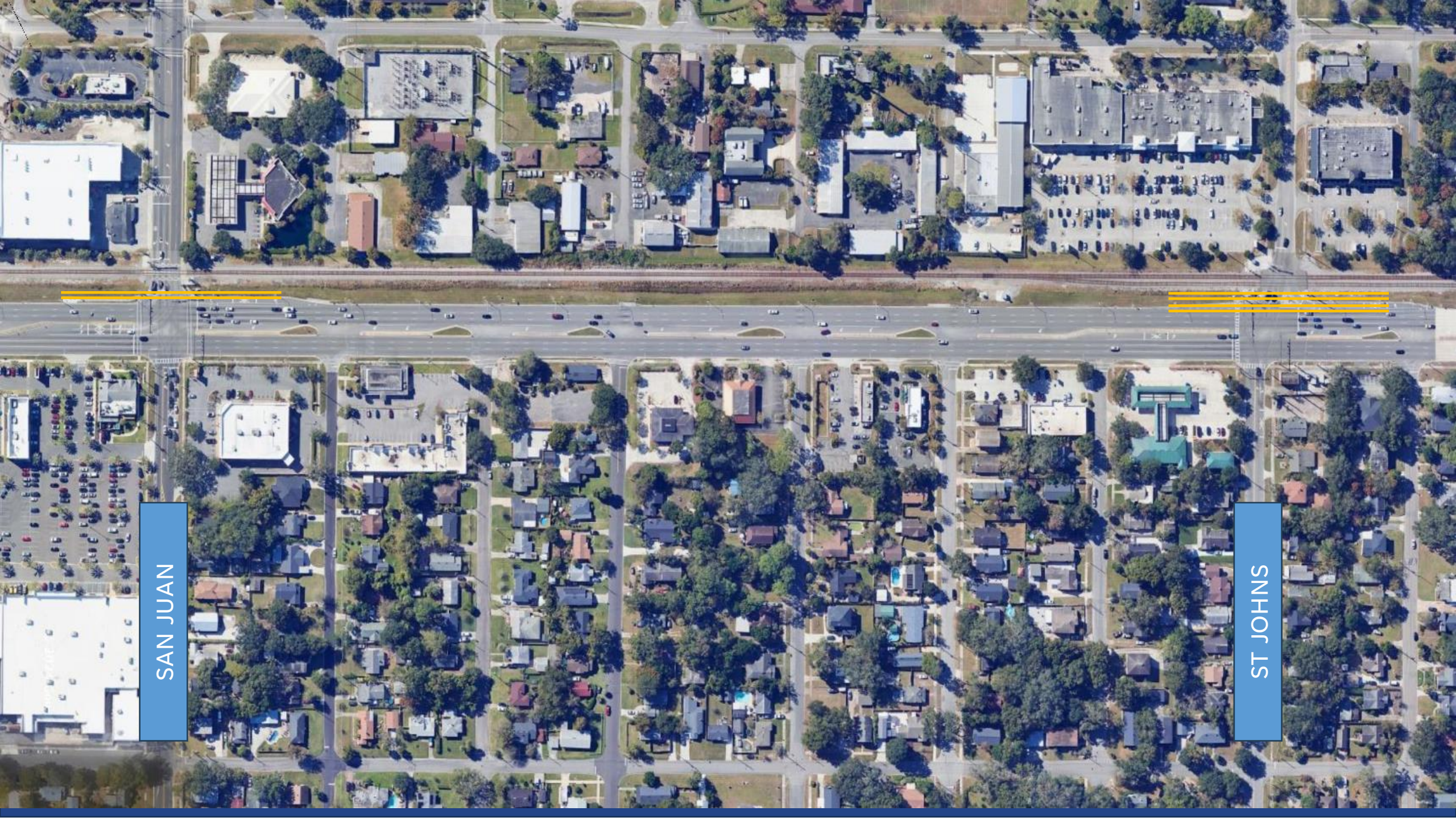
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Crossing CSV

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Atlantic Boulevard - 271816E	https://portal.trainfo.ca/doc/us/fl/fi115/Atlantic_Boulevard.csv
Birkenhead St - 621224M	https://portal.trainfo.ca/doc/us/fl/fi115/BIRKENHEAD_ST.csv
Cr 108 - 620796K	https://portal.trainfo.ca/doc/us/fl/fi115/CR_108.csv
Cr 210 West - 271832	https://portal.trainfo.ca/doc/us/fl/fi115/CR_210

Learning Curve





SAN JUAN

ST JOHNS

Lessons Learned

- Lidar
 - Still not there yet
 - Perception algorithm needs improvement
 - Price is going up due to “market forces”
- Video
 - Can be used for other “rail crossing interactions”
 - Typical video detection weaknesses
 - Improved by advanced detection algorithms vs on-board
- Acoustic
 - Train sounds are very distinct (bell, horn, rumble)
 - Must be within 100’
 - At some crossings, the warning bell stops ringing
 - Traffic signal, utility pole, or solar mounting options
 - Going through APL process



Wed, 19 Jun 2024 06:47am to 09:02am



Safety Message

**AS FAST AS YOU THINK
YOU ARE, THE TRAIN IS
ALWAYS FASTER.**



Safety Message



Contact Us



- Peter Vega, P.E. - D2 TSM&O Program Manager
- Peter.Vega@dot.state.fl.us
- 904-360-5463

- Adam Storm, P.E. – Embedded GEC
- Adam.Storm@dot.state.fl.us