Freight and V2X

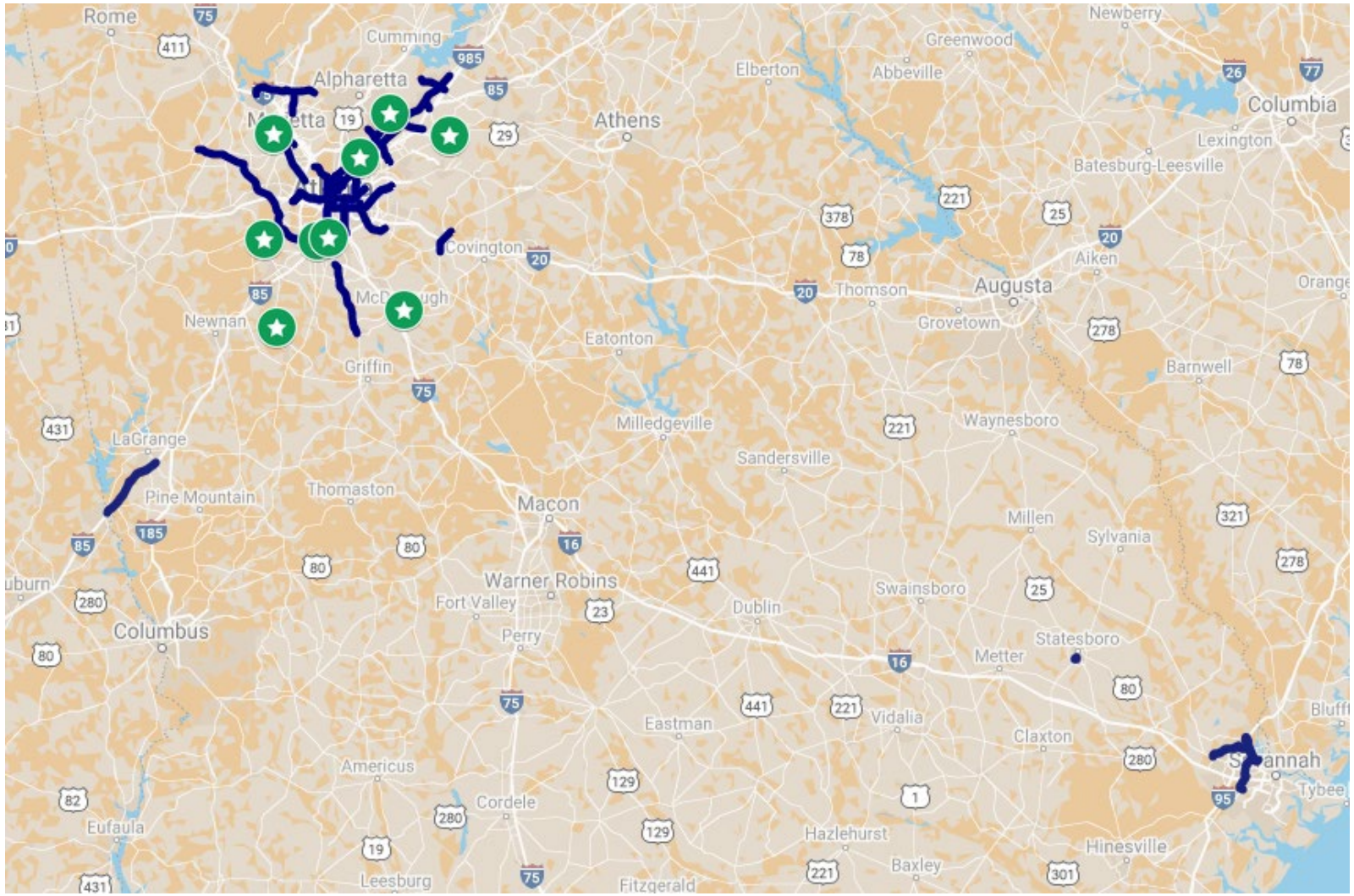
SigOps | Office of Traffic Operations

September 2021

Statewide RSUs

- GDOT Deployments
- The Ray on I-85
- Atlanta Regional Commission Sites

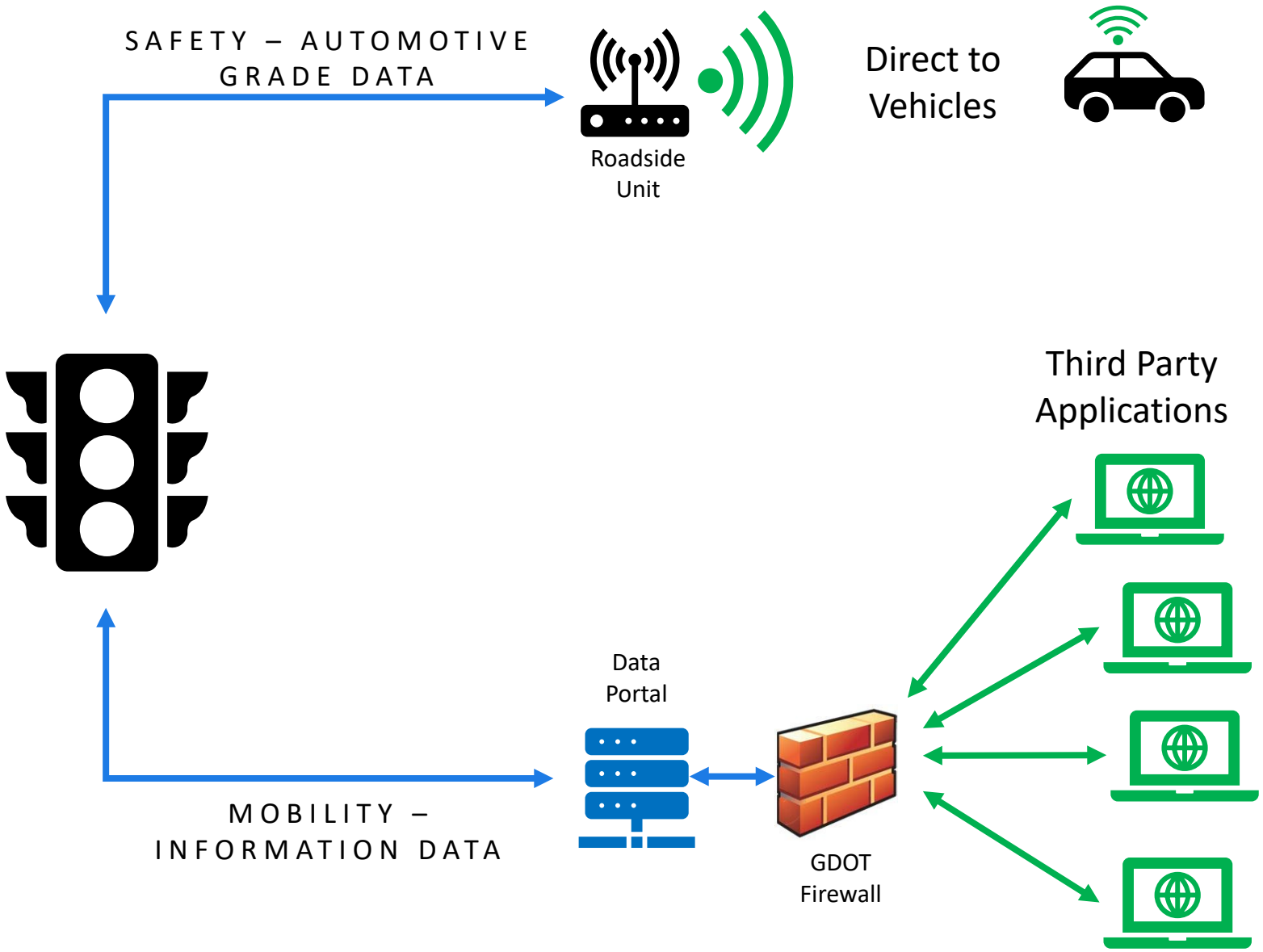
Any traffic signal running GDOT software is CV ready.



V2X Framework

Safety and mobility applications achieved through multiple means. The application drives the method the data arrives to a user.

Close attention needs to be made to data quality, security, and accuracy - especially for data used for safety applications.



Applications Enabled

Emergency Vehicle Preemption

Demonstration in Gwinnett County of the use of V2X for emergency vehicle Preemption on a fire truck.

Transit Signal Priority

Pilot of Transit Signal Priority on Xpress buses in Midtown Atlanta using V2X.

Freight Priority and Information

Equipping freight vehicles in Savannah to request signal priority and receive information regarding blocked at-grade rail crossings.

Signal Phasing and Timing

Demonstration of red-light running and optimal green speed applications to inform drivers for improved safety and mobility.

Freight Applications

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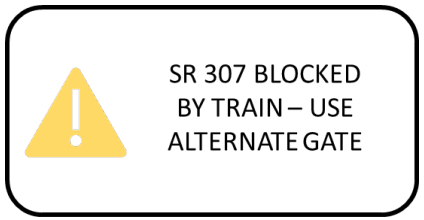
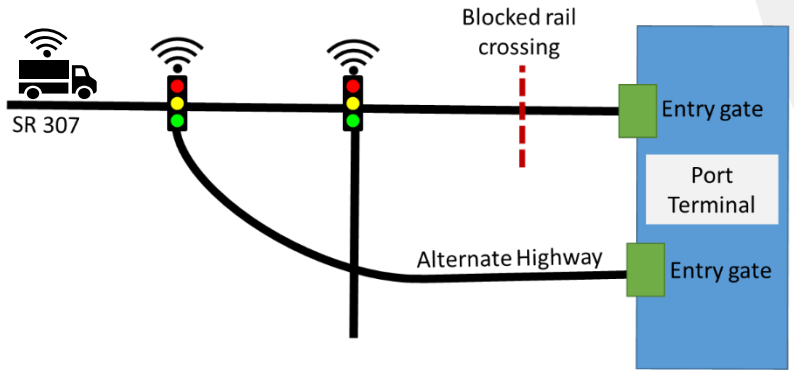
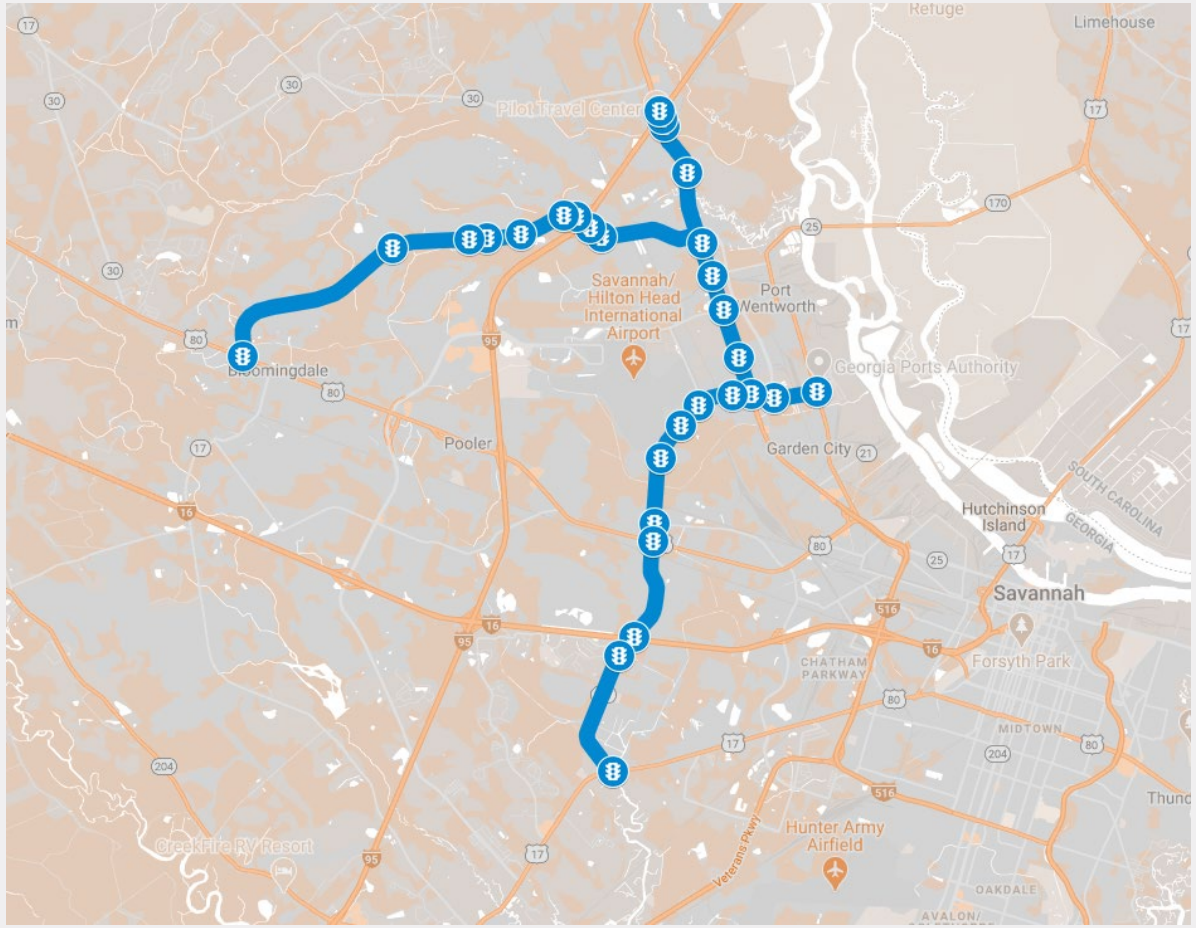
GPA Freight Signal Priority Pilot

- Installation of RSUs at signalized intersections around port ingress/egress routes
- Broadcasting SPaT and MAP, traveler information messages for road conditions
- Demonstration of freight signal priority
- Outfitting fleet vehicles



Example in-cab message



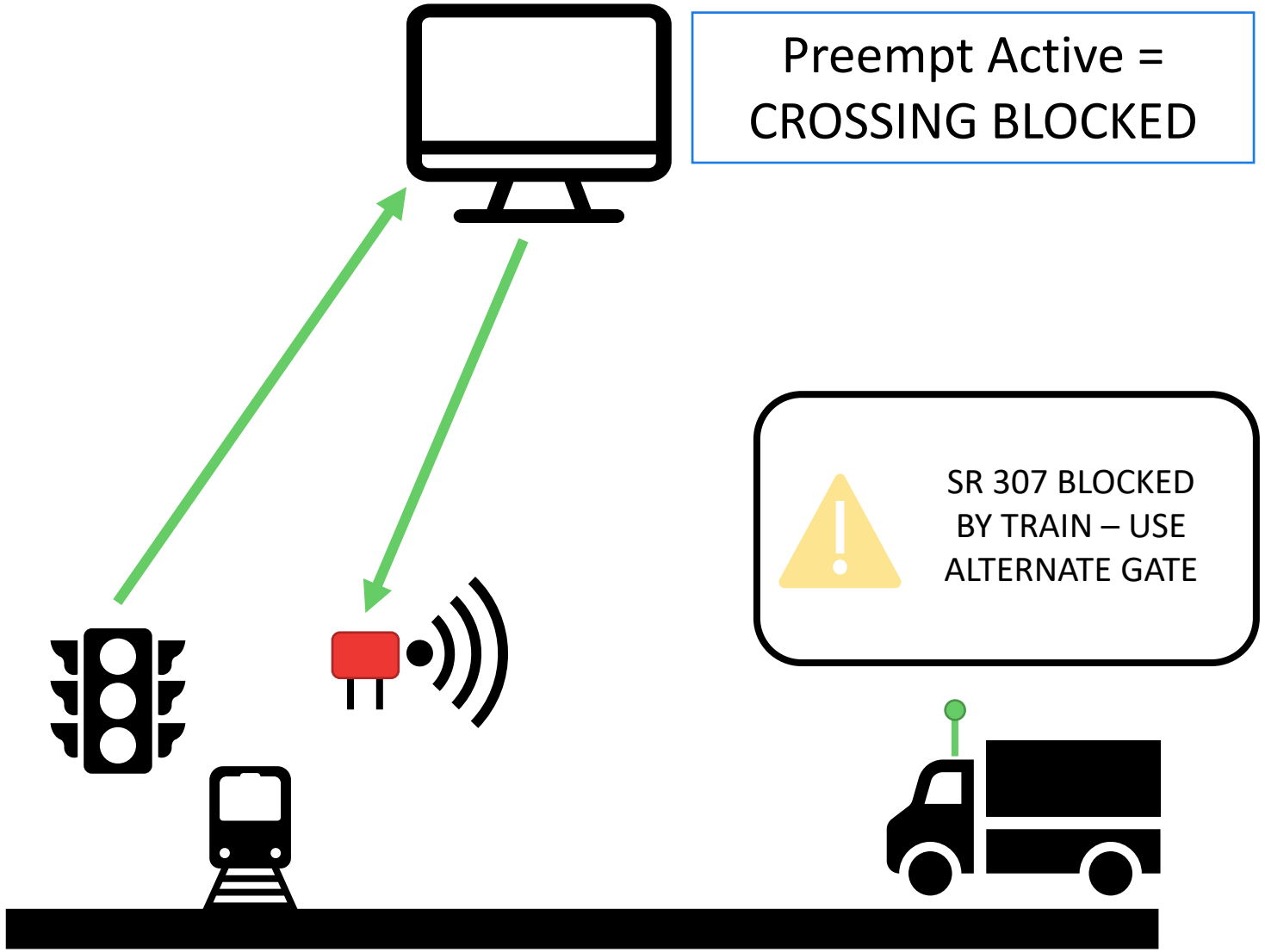


System Design

Existing signal infrastructure enters its preempt state when the railroad crossing gates are activated.

Central application listens for the preempt input at these intersections through API.

This input triggers the RSUs to broadcast a TIM message to select RSUs to provide information to drivers.



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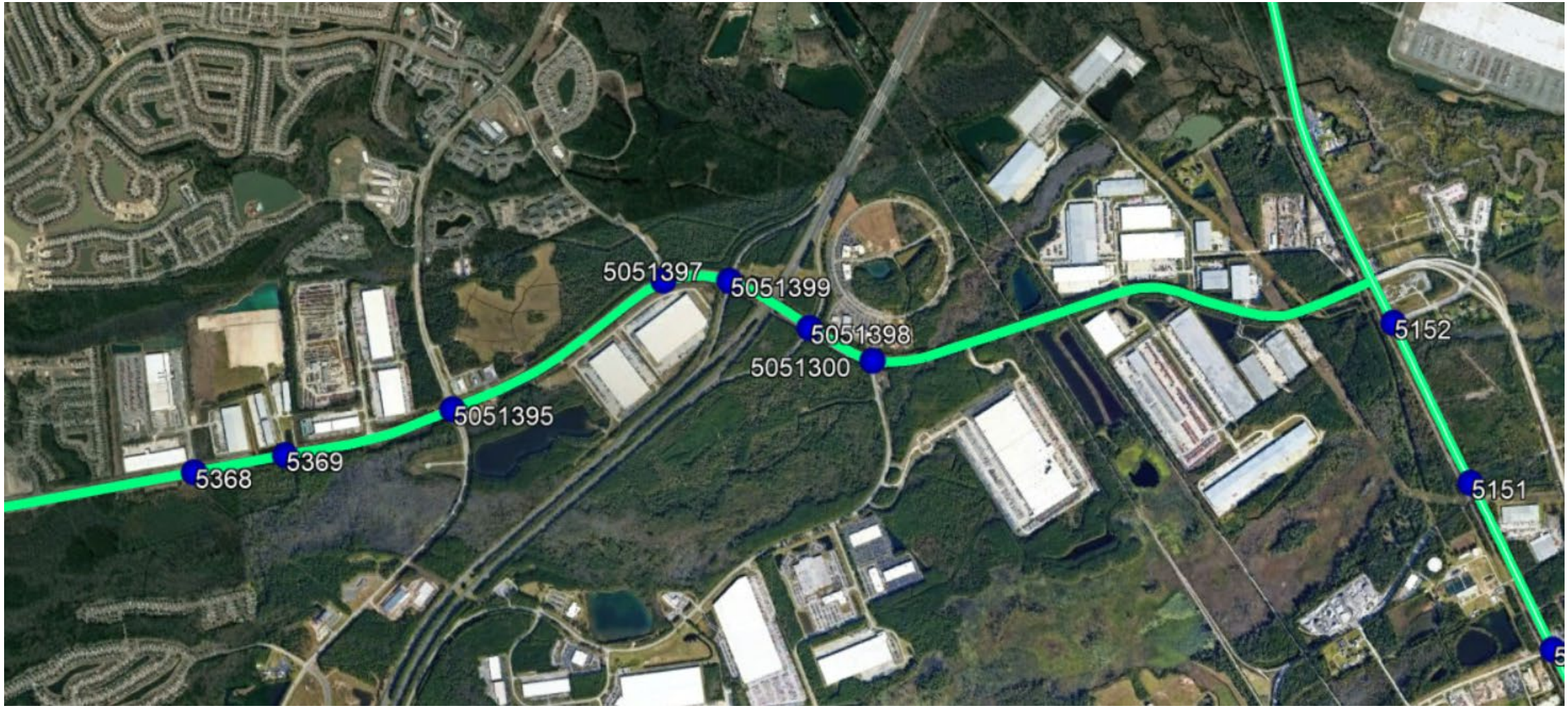
Signal Priority



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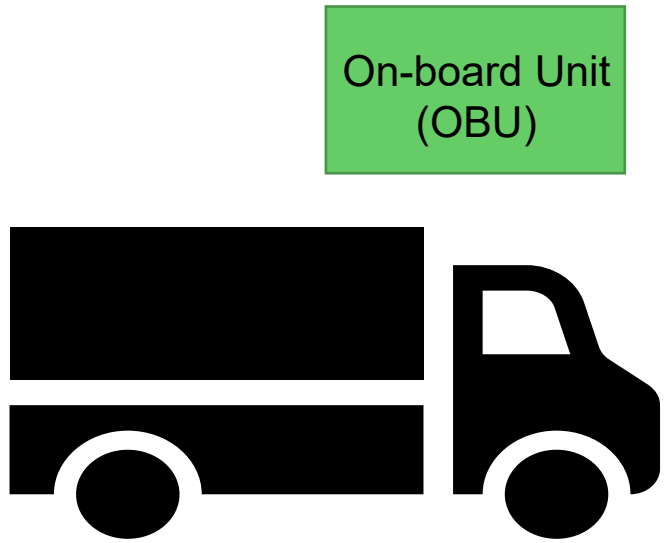
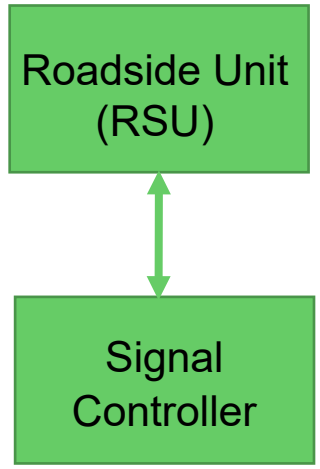
V2X Component Diagram

1. Freight vehicle sends priority request to onboard unit (OBU) without condition.
2. OBU sends signal request message to roadside unit (RSU) wirelessly to request priority.





3. RSU passes priority request to the signal controller.
4. Signal controller uses built-in logic to assign (or not assign) priority based on operator defined parameters.
5. Signal and RSU pass signal status message back to OBU on truck of priority granted or not.

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In-cab Equipment

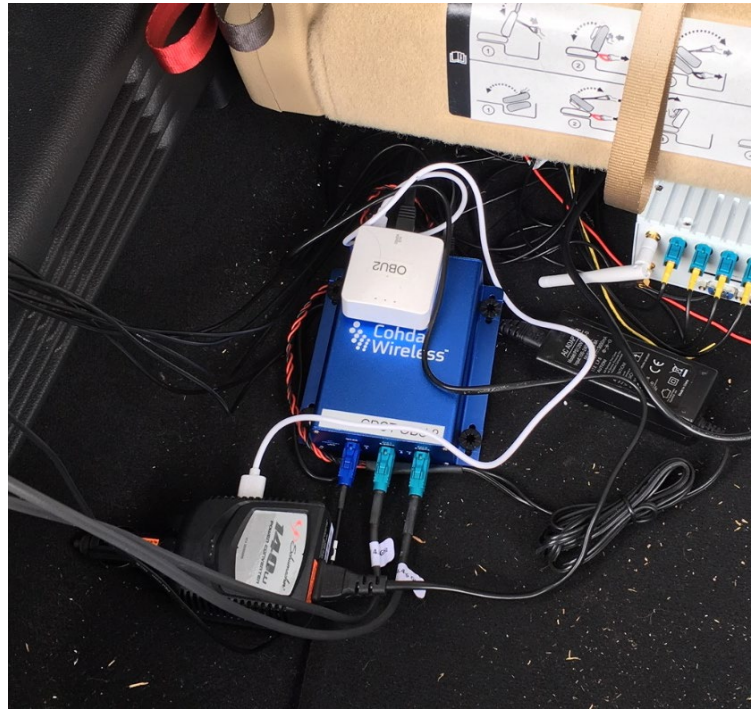
On-board Unit (OBU).

On-Board Unit Specifications

- 130 x 120 x 35 mm
- Max power draw 8 W
- Typical power draw 5-6 W

- External antenna mounted through magnet or permanently (screwed in)

External antenna.



Portable OBU in the back of a GDOT vehicle.

Vendor (BrandMotion) examples of in-cab displays.

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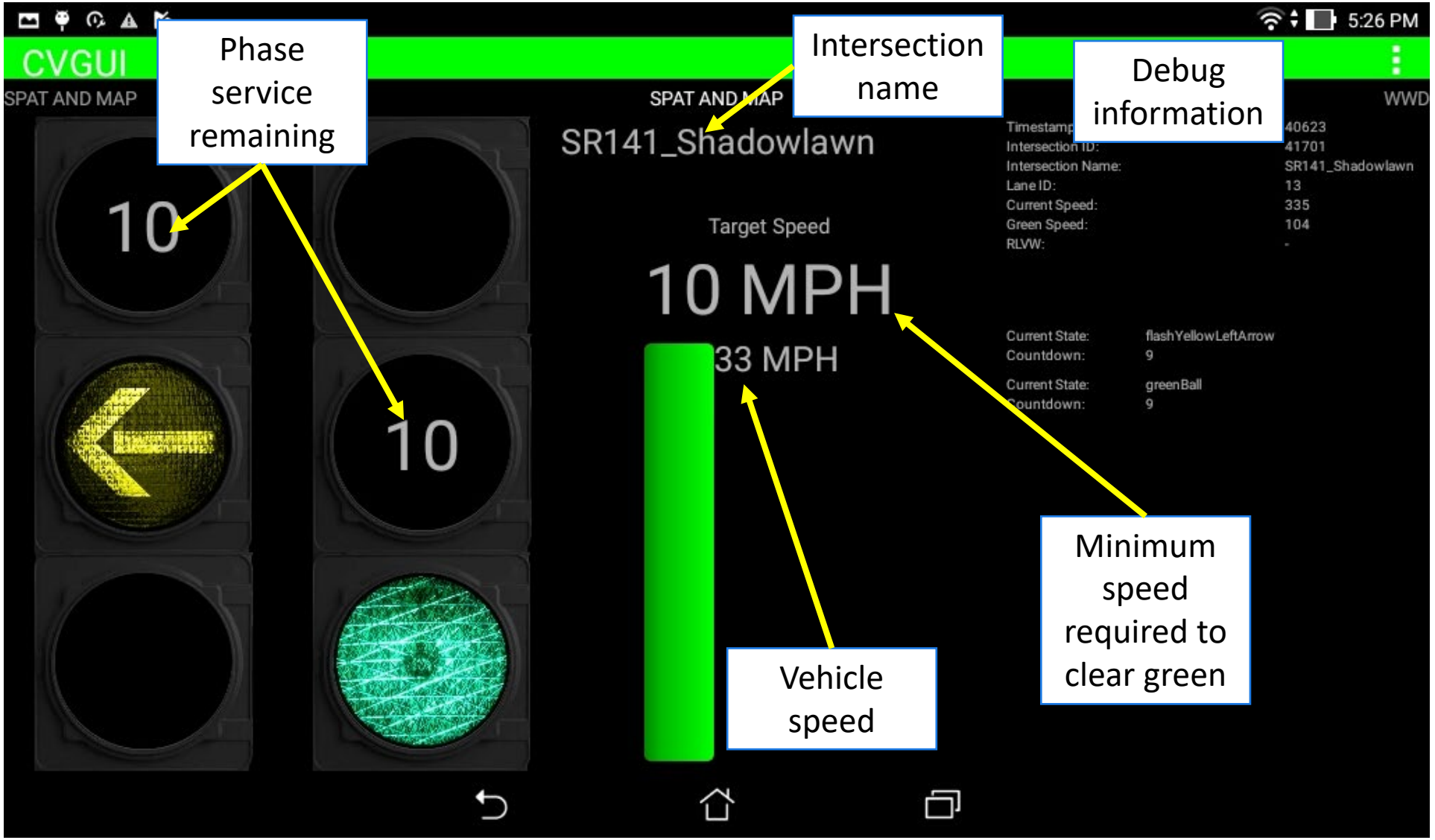
Example Traffic Signal Application Display



Outcomes and Performance Measurement

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System Performance

Through the use of high-resolution traffic signal event data, the system is monitored for performance on a continual basis.

This data can measure the performance of both the priority system as well as its impact to intersection and corridor operations.

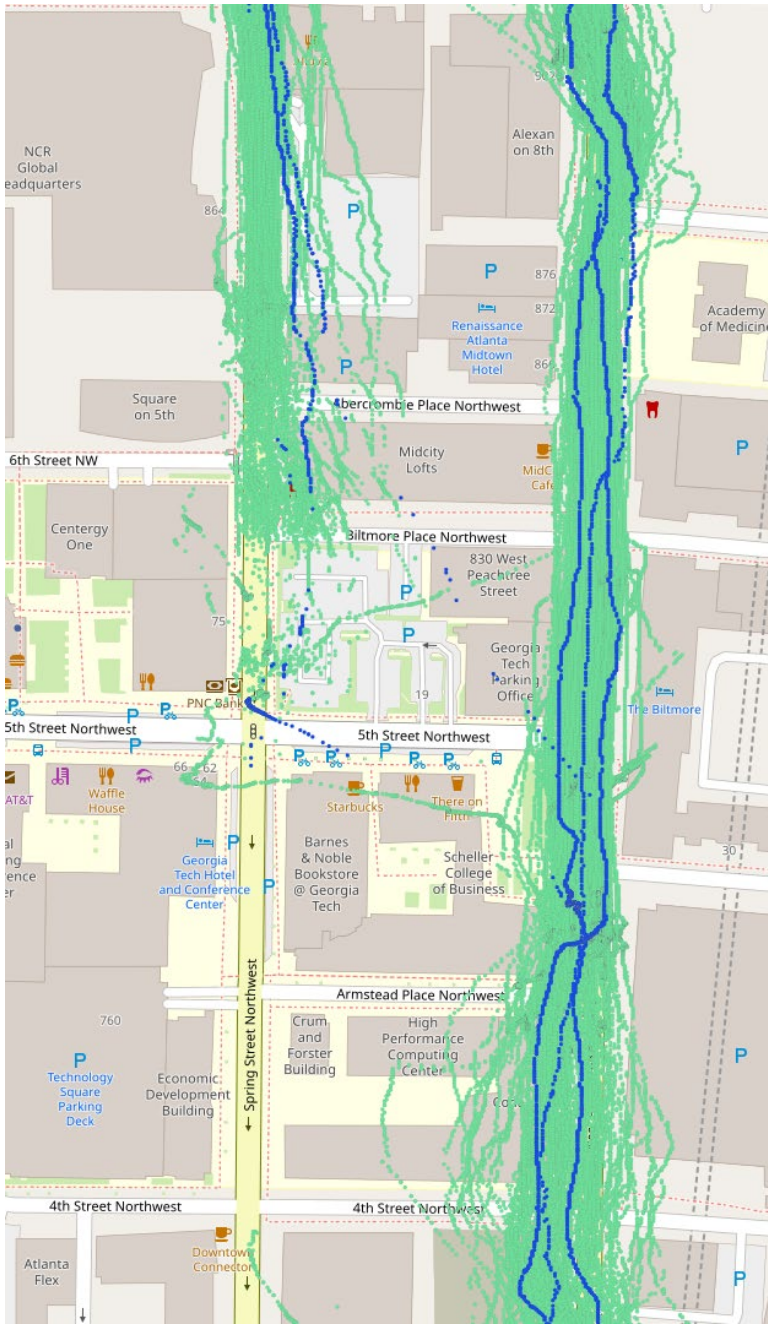
TimeStamp	DeviceId	SignalID	EventId	Event Descriptor
2021-04-13 07:46:55.7	2919	177	112	TSP Check In
2021-04-13 07:46:55.8	2919	177	113	TSP Adjustment to Early Green
2021-04-13 07:47:36.5	2919	177	114	TSP Adjustment to Extend Green
2021-04-13 07:48:14.8	2919	177	113	TSP Adjustment to Early Green
2021-04-13 07:48:20.0	2919	177	115	TSP Check Out
2021-04-13 07:50:34.6	2924	182	112	TSP Check In
2021-04-13 07:50:34.7	2924	182	113	TSP Adjustment to Early Green
2021-04-13 07:50:42.6	2924	182	114	TSP Adjustment to Extend Green
2021-04-13 07:50:56.6	2954	206	112	TSP Check In
2021-04-13 07:50:56.7	2954	206	113	TSP Adjustment to Early Green
2021-04-13 07:51:08.6	2924	182	115	TSP Check Out
2021-04-13 07:51:11.2	2954	206	114	TSP Adjustment to Extend Green
2021-04-13 07:51:11.5	2948	242	112	TSP Check In
2021-04-13 07:51:11.6	2948	242	113	TSP Adjustment to Early Green
2021-04-13 07:51:21.7	2948	242	112	TSP Check In
2021-04-13 07:51:33.2	2948	242	114	TSP Adjustment to Extend Green
2021-04-13 07:51:40.7	2954	206	115	TSP Check Out
2021-04-13 07:51:52.8	2956	208	112	TSP Check In
2021-04-13 07:51:52.9	2956	208	113	TSP Adjustment to Early Green
2021-04-13 07:51:53.8	2956	208	114	TSP Adjustment to Extend Green
2021-04-13 07:52:01.8	2948	242	115	TSP Check Out
2021-04-13 07:52:19.9	2936	194	112	TSP Check In
2021-04-13 07:52:20.0	2936	194	113	TSP Adjustment to Early Green
2021-04-13 07:52:30.9	2956	208	115	TSP Check Out
2021-04-13 07:52:50.0	2936	194	114	TSP Adjustment to Extend Green
2021-04-13 07:53:09.2	2935	193	112	TSP Check In
2021-04-13 07:53:09.3	2935	193	114	TSP Adjustment to Extend Green
2021-04-13 07:53:09.7	2934	192	112	TSP Check In
2021-04-13 07:53:09.8	2934	192	113	TSP Adjustment to Early Green
2021-04-13 07:53:21.1	2934	192	114	TSP Adjustment to Extend Green
2021-04-13 07:53:28.2	2936	194	115	TSP Check Out
2021-04-13 07:54:09.4	2934	192	112	TSP Check In
2021-04-13 07:54:28.4	2935	193	115	TSP Check Out
2021-04-13 07:54:40.4	2934	192	115	TSP Check Out
2021-04-15 07:48:51.4	2919	177	112	TSP Check In
2021-04-15 07:48:51.5	2919	177	113	TSP Adjustment to Early Green

Vehicle and RSU Performance

Logging of basic safety messages (BSMs) pulled from vehicles can measure the performance of V2X systems.

Travel times can be extrapolated from data to measure travel time improvements.

Things like positional accuracy and correction can be monitored and improved as needed.



Expanded Use in Georgia

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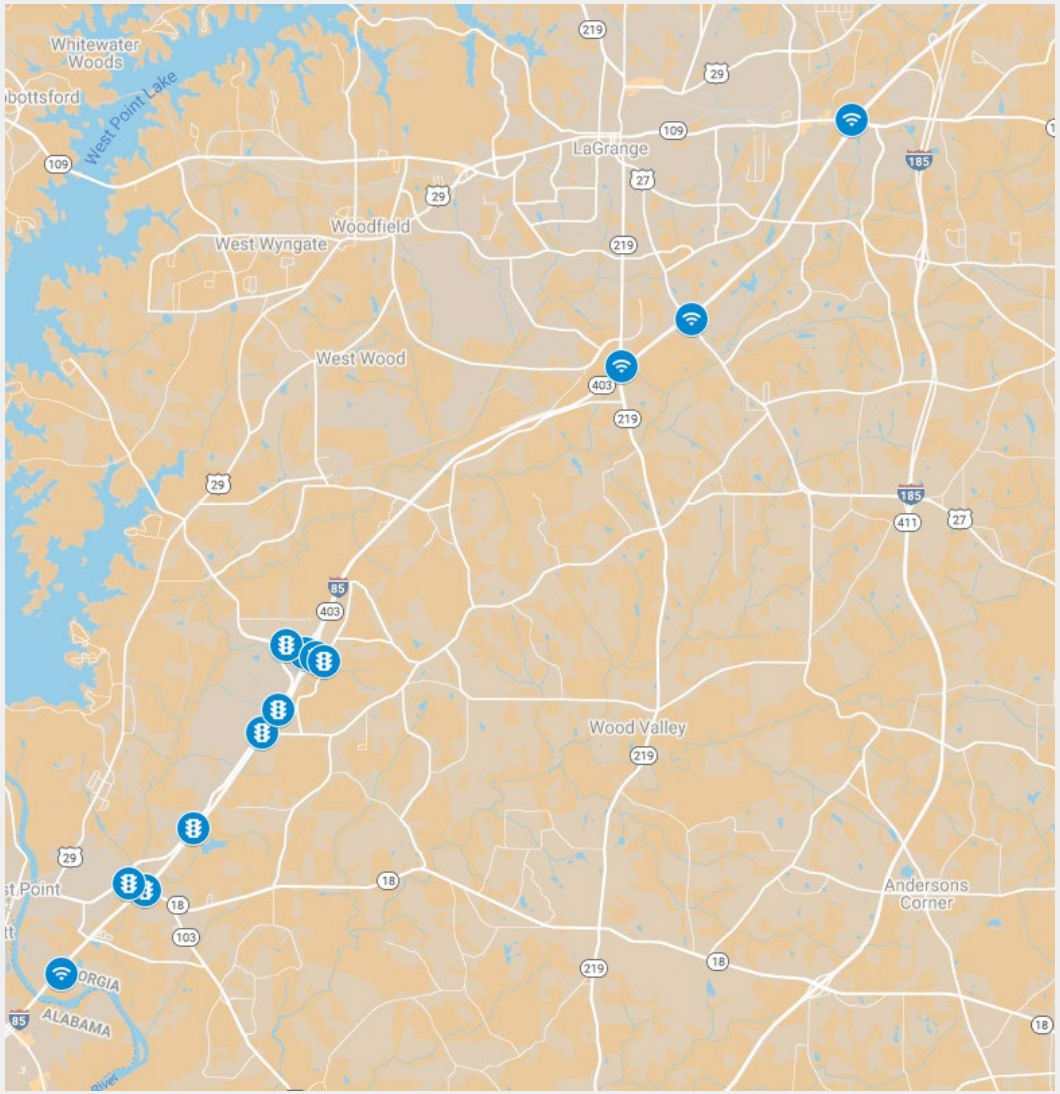
The Ray on I-85

- LTE-CV2X and DSRC RSUs deployed along 18 mile stretch of I-85
- Partnership with the Ray C. Anderson Foundation, Panasonic, and FHWA
- Demonstration of interstate safety applications
- Data platform (Cirrus) for BSM capture and analyzation
- 4 GDOT Vehicles equipped with LTE-CV2X OBUs
- Future partnerships and intersection deployments
- Kia vehicles now equipped with OBE and HID’s



Additional Considerations

Thank You!

Follow the Georgia Department of Transportation

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