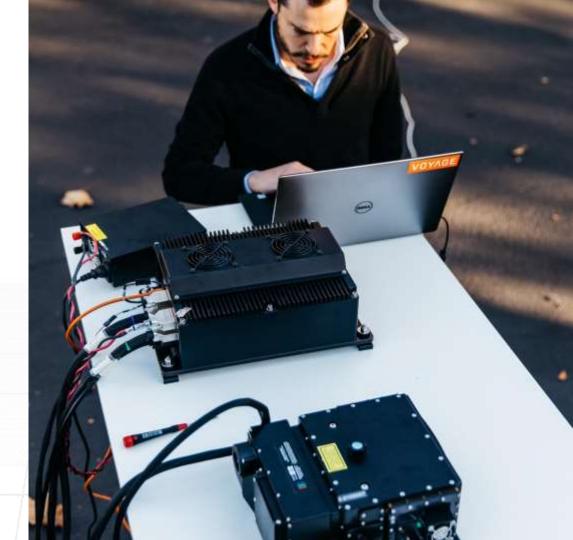




#### **A Little** About Me







### Self-Driving **Taxis**

Working to create safer, more comfortable and more affordable automotive options for communities all across North America.

Currently deployed in California and Florida.

We integrate existing components into a vehicle for rapid development time.

















### The GEN1 Voyage Taxi

The generation 1 Voyage Taxi was started in June of 2017 and was driving autonomously

in 3 months.

#### **Components of GEN1**

2017 Ford Fusion Hybrid SE

Dataspeed Kit

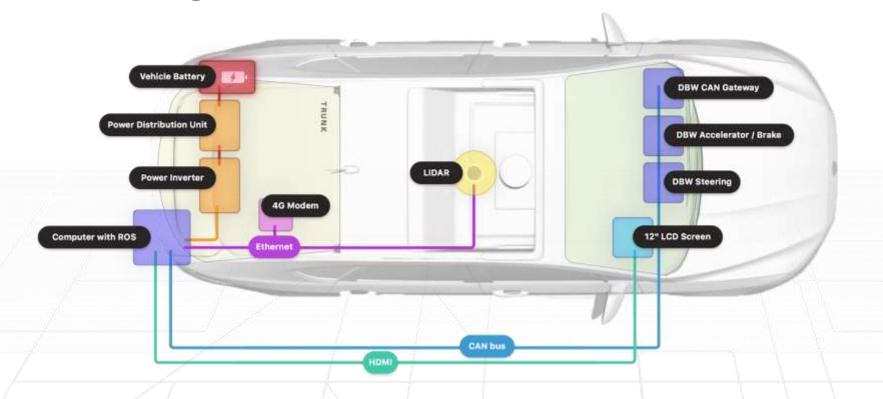
Velodyne HDL-64

Compute with ROS





# System Overview of Gen1





# Bounding the Complexity of the Self-Driving Car

Below, The Villages San Jose. Deployment 0001





### Attempted 1st Solution

Existing controller from Dataspeed Kit - too rough

Open source modules were not working well for our application. Car was too jerky for human passengers.





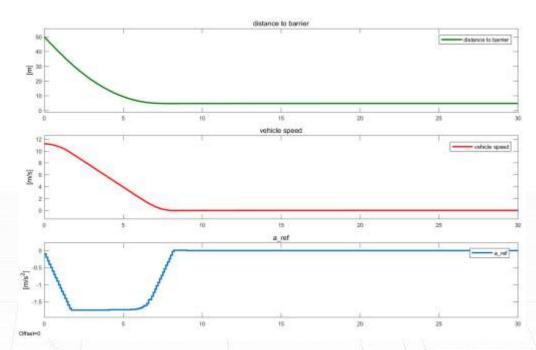
## Jumpstarting **Development**

We decided to begin with the MATLAB adaptive cruise control (ACC) system Host Car example. Driver-set velocity Set velocity Sensed Data Lead Car Host velocity Acceleration Acceleration Actaul position Acceleration a0\_lead Actual position Actual distance x0\_host Initial position x0\_lead Initial position Actual velocity v0\_host Initial velocity Actual velocity Lead velocity v0\_lead Initial velocity Host Car Lead Car Adaptive Cruise Control System



# Tuning Our Own Model Predictive Controller From the Ground Up

Vehicle was too jerky when starting and stopping, and we found that riders are especially sensitive to this type of motion.





## Integrating Into Our Vehicle





Matlab running on Linux Computer



Robot Operating
System inside Docker!



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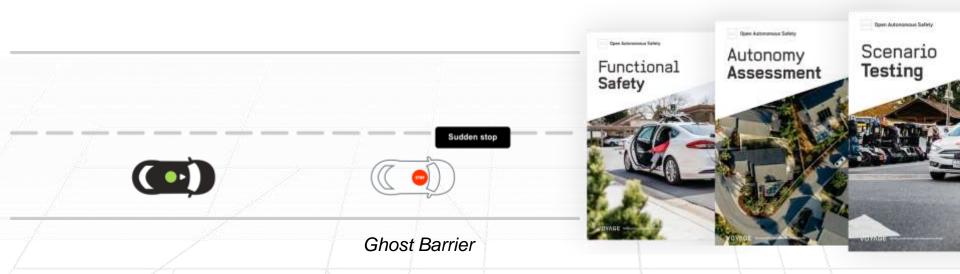


# Always Optimize For Safety

We created a new type of ROS node to simulate a ghost barrier—essentially, a virtual vehicle that we could position at various distances from the taxi.

#### Open Autonomous Safety

oas.voyage.auto





#### Conclusion: We Saved Time

Ship a real product using existing modules and hardware components

Try existing modules before developing your own

Linux, Docker and ROS, allows for super fast development.

Simulink + ROS allowed us to deploy a Level 3 Autonomous vehicle in less than 3 months





