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Education

Colorado State University (CSU)
M.S. Systems Engineering ’21

The University of Tulsa (TU)
B.S. Mechanical Engineering ‘19

Engineering Projects

Student Cyber Truck Experience
2019 NASA Robotic Mining Competition
NASA Jet Propulsion Laboratory Intern

Current Project

Semi-Trailer Temperature Monitoring System

A scalable system capable of securely monitoring tire and brake temperature across trailers and dollies over heavy-duty vehicle networks as an early warning indicator for drivers.

2019 TU Senior Project Team – Credit: J. Daily

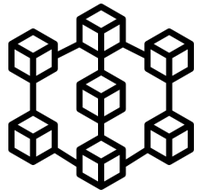
Motivation

- For large trucks involved in crashes, tire and brake failure constitutes the majority of vehicle-related factors and violations recorded by the Federal Motor Carrier Safety Administration (FMCSA).
- Heavy vehicle drivers are at a disadvantage because they may not detect the symptoms of tire and brake failure such as vibration, noise, and reduced mileage that a passenger car driver would experience.
- Trailer and converter dollies are especially difficult

Burning Brake Drums on Highway – Credit: J. Daily

Objectives

System Objectives

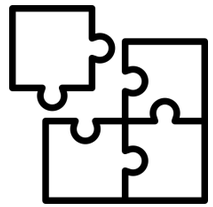


Scalable

Inexpensive

Secure

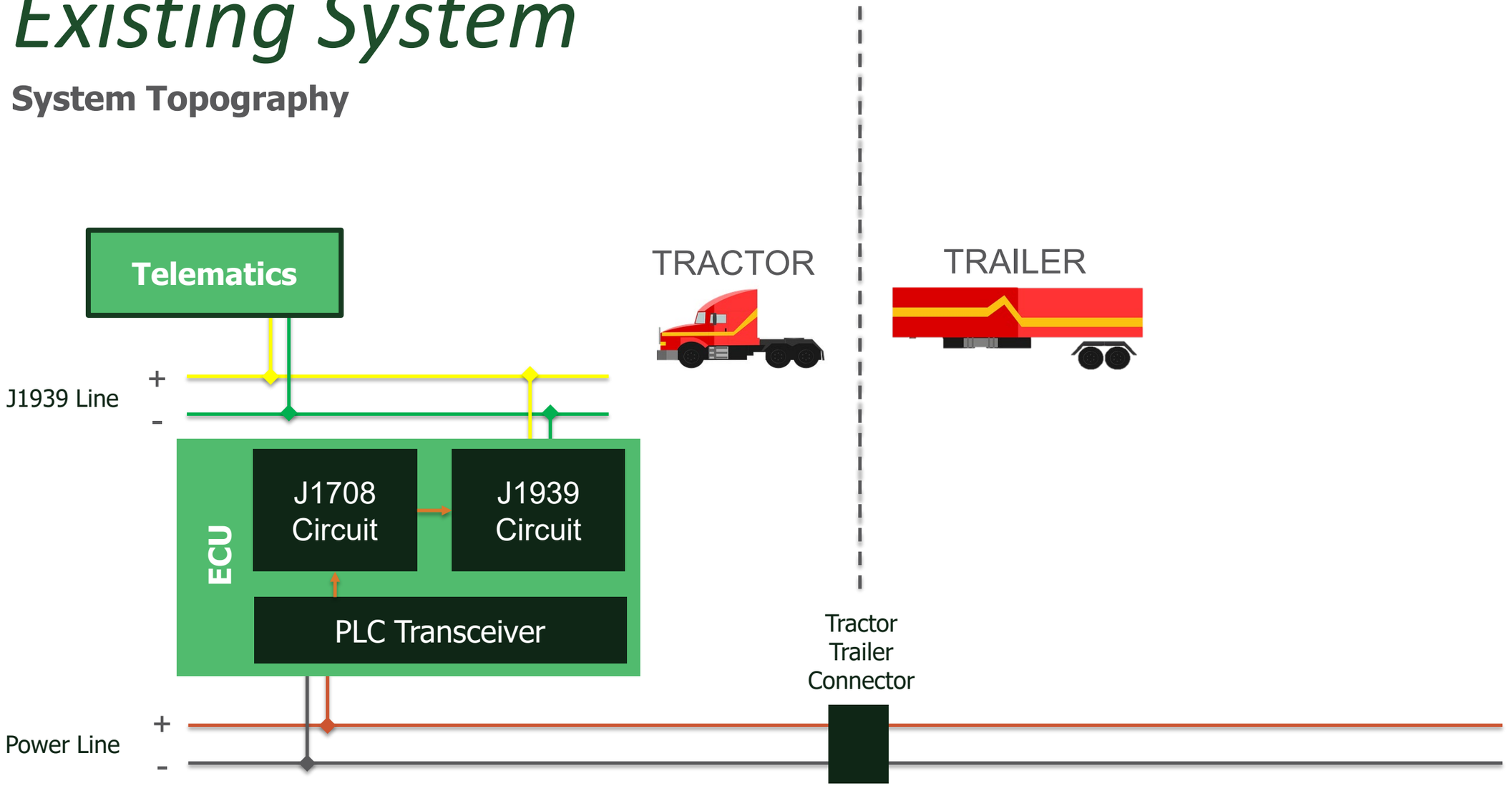
Robust



Retrofit

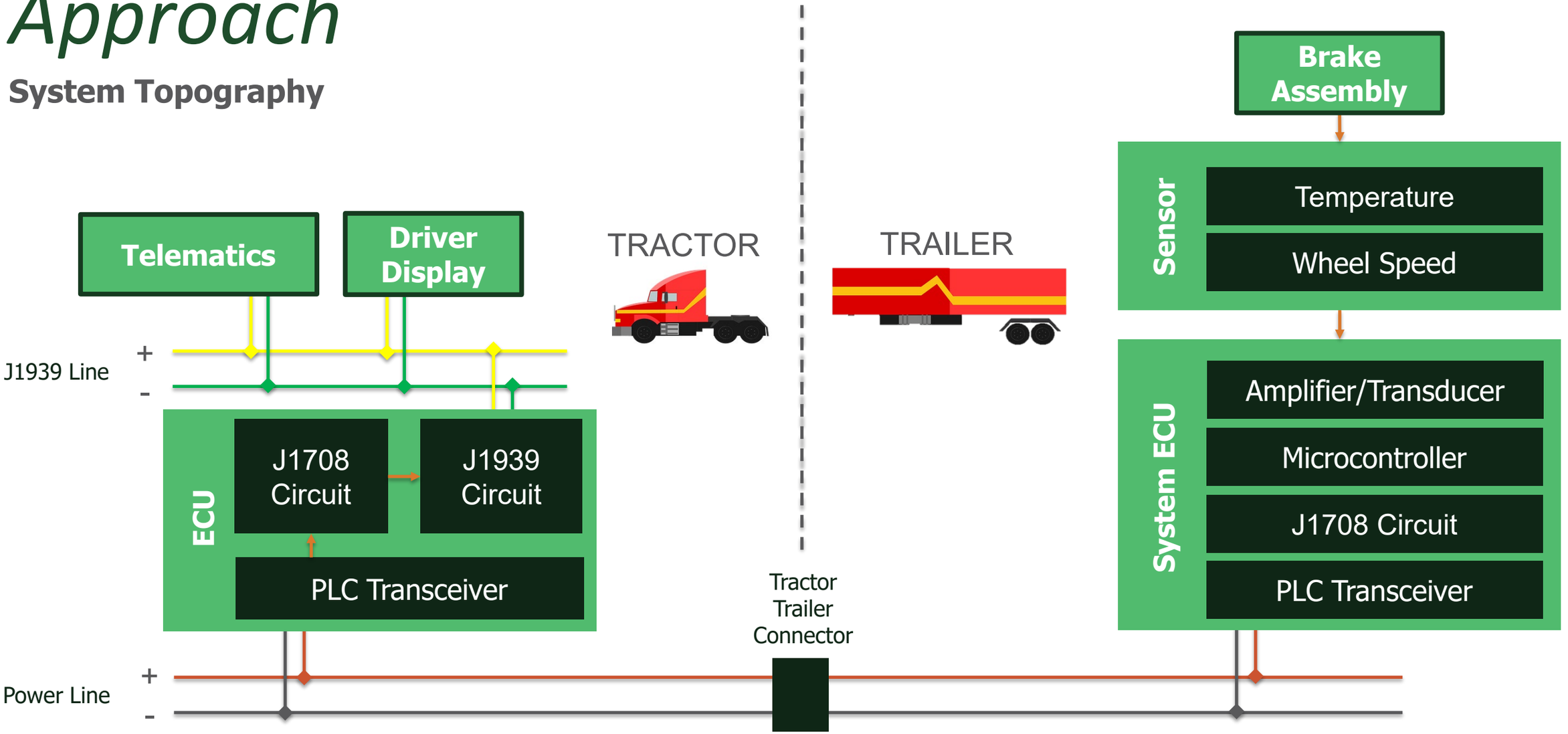
Existing System

System Topography



Approach

System Topography

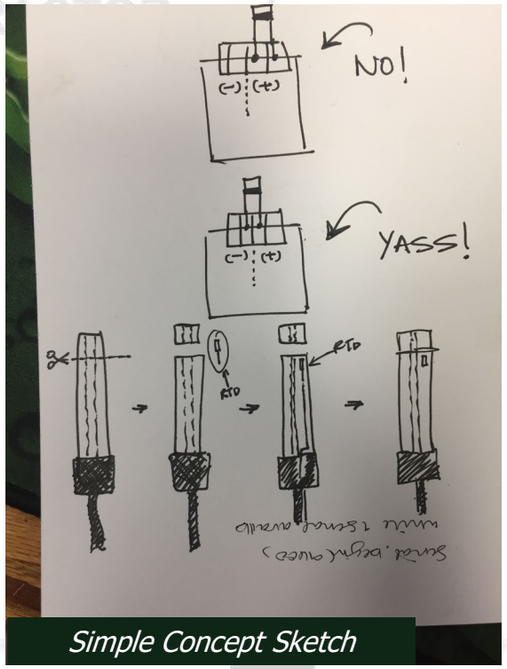


Approach

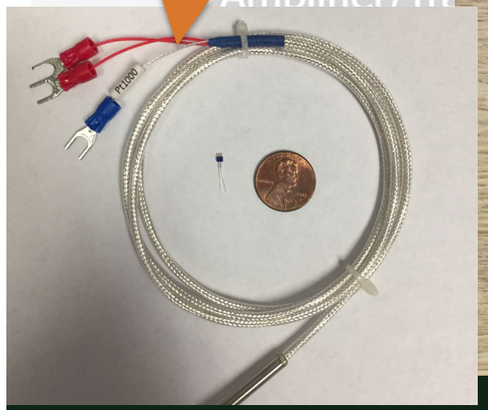
Semi-Trailer Temperature Monitoring System Topography

Trailer Wheel and Brake

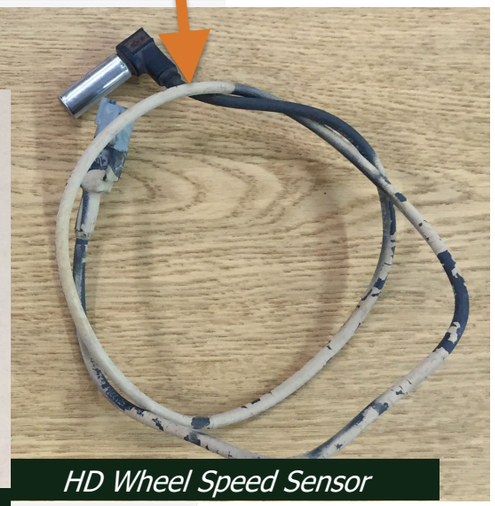

Combined Sensor



Simple Concept Sketch

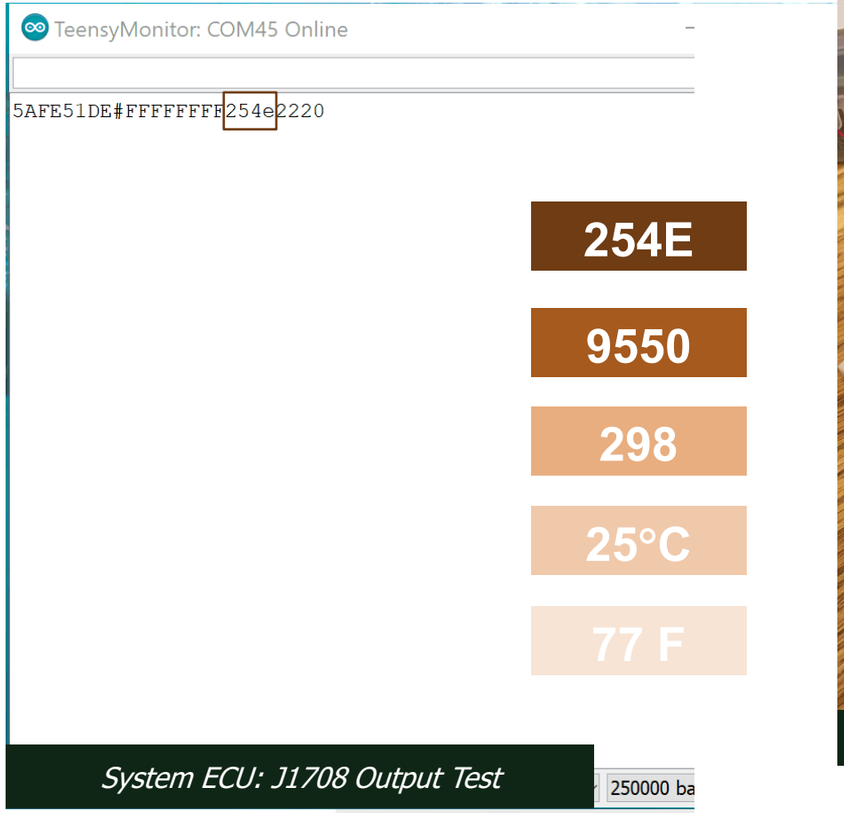


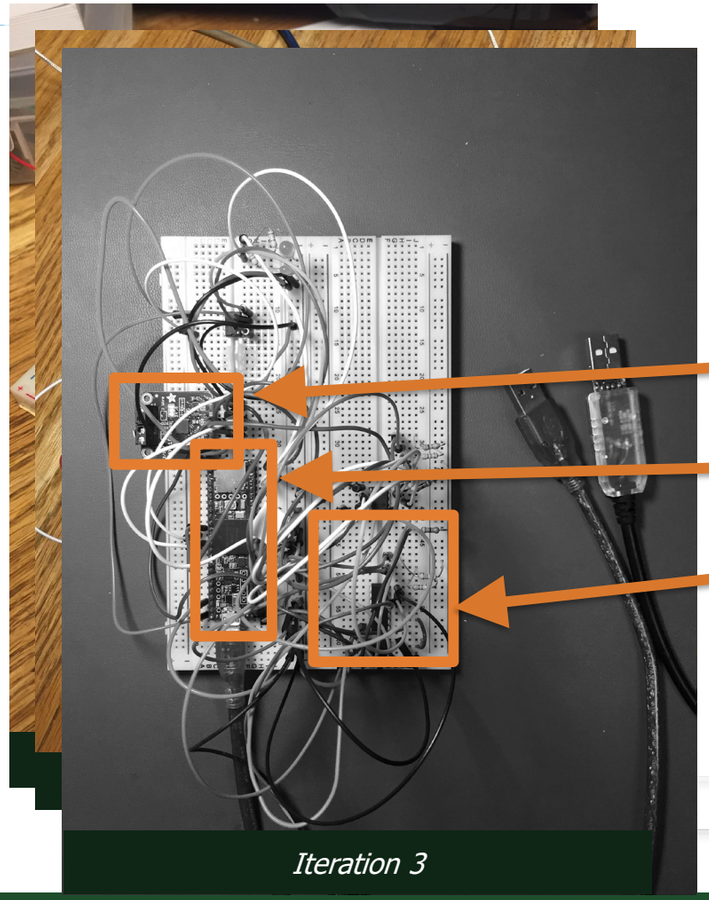
Wire and Thin Film Type PT1000 RTDs

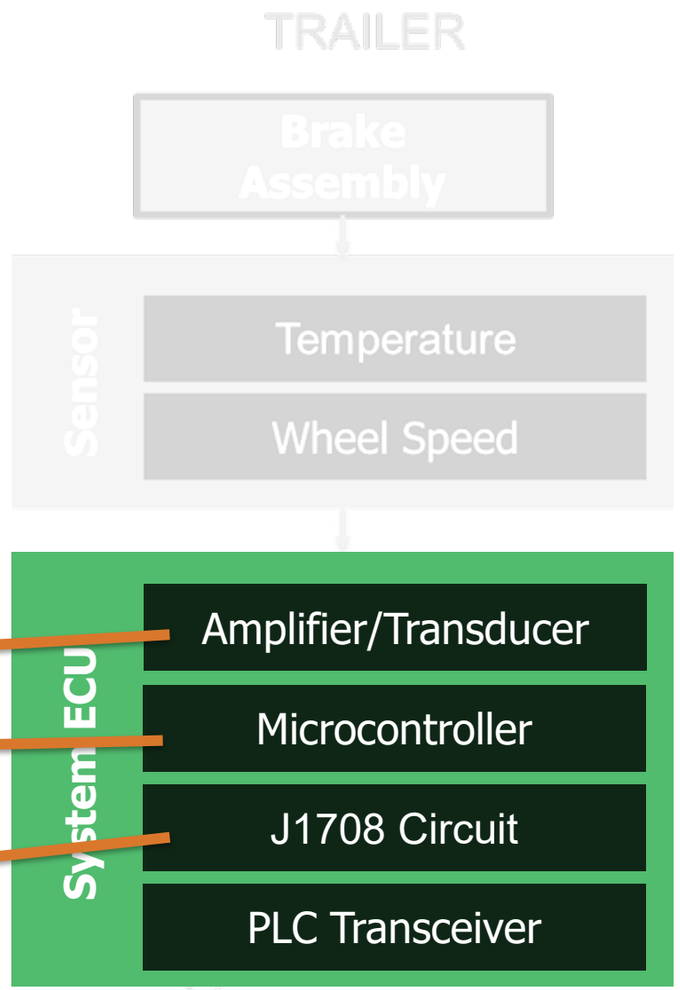

HD Wheel Speed Sensor

Approach

Semi-Trailer Temperature Monitoring System Topography

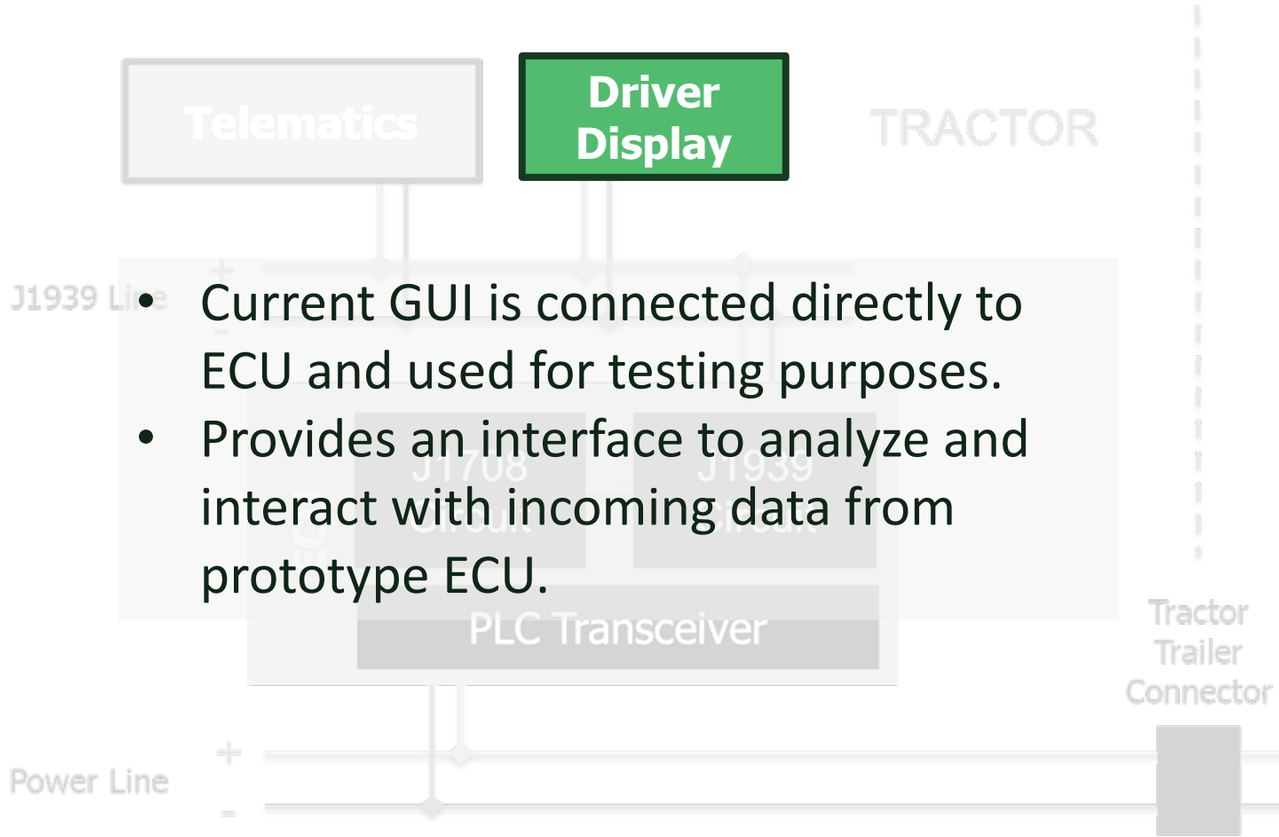




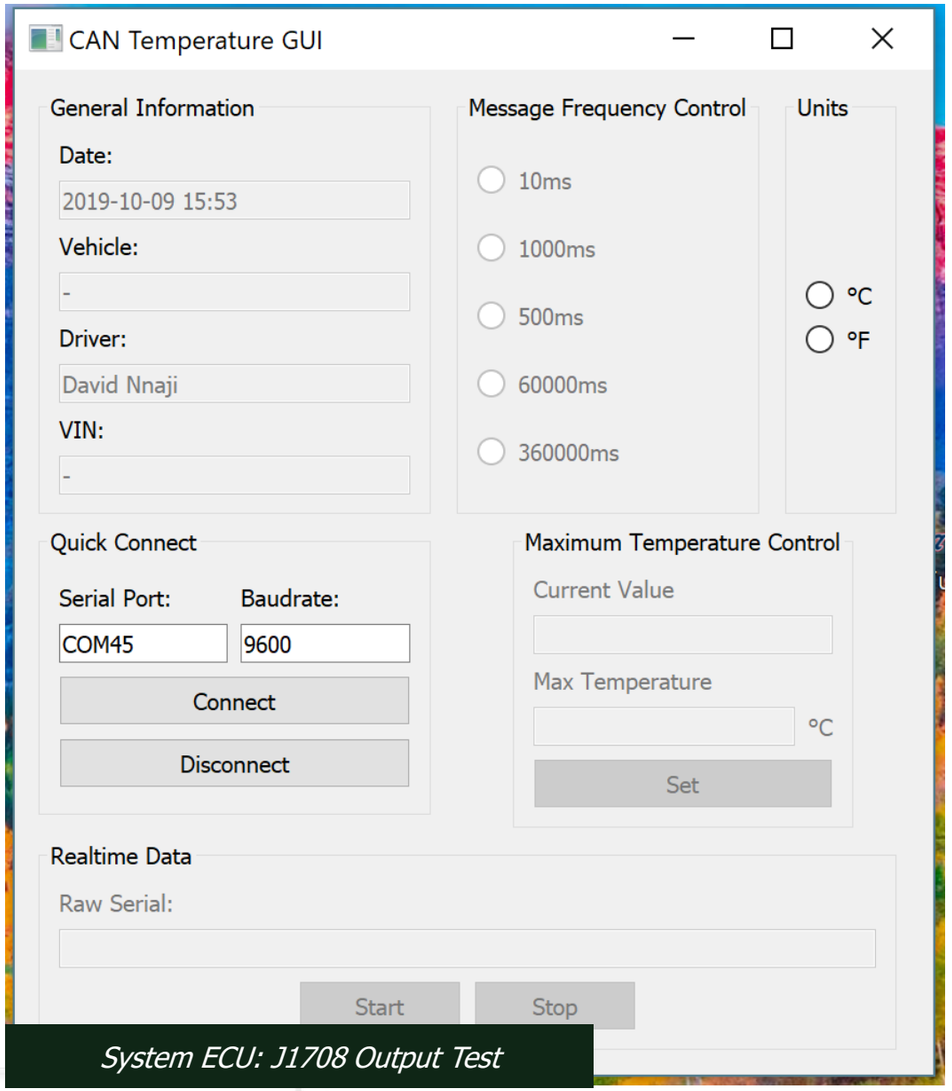


Approach

Semi-Trailer Temperature Monitoring System Topography



- Current GUI is connected directly to ECU and used for testing purposes.
- Provides an interface to analyze and interact with incoming data from prototype ECU.



System ECU: J1708 Output Test

Security

The three attributes of a secure heavy vehicle network system are authentication, integrity, and nonrepudiation [2]. The methods that are being investigated to satisfy these attributes are

- Cipher-based Message Authentication Code (CMAC)
- One-way hash of message ID and data

Thank you