The E-Truck Challenge

- The goal of this 4-year capstone project is to convert a class-7 diesel fueled medium duty Peterbilt 337 truck into a battery electric truck.
- We are cross collaborating with 3 other E-Truck capstone teams: Controls Architecture, Retrofit Packaging & Optimization (Retrofit), and the System Definition & Modeling team (Systems).
- We also collaborate with the E-Truck RSO.

Objective

- Create electrical schematics for the existing low voltage (LV) systems and high voltage (HV) systems.
- Design a new HV system with new BEV (Battery Electric Vehicle) components.

Assumptions & Requirements

- 650 - 800V is our power requirement for our HV systems based on future 4-year BEV trend research.
- No modifications on current 12V LV systems.
- CCS1 charger port.
- ~400 kWh total power consumption.
- Components are not finalized and subject to change based on requirements/design decisions.

Approach and Implementation

- The first step of this project was to gain familiarity with electrical vehicles by research and dissecting wiring harnesses and components in the truck to create a detailed bill of materials consisting of LV components.
- Component research focused on powertrains, batteries, and thermal management.
- We created the first iteration of a high-level block diagram shown in Figure 1.

Verification

- Our team built a physical testbench prototype to verify our proposed CAN architecture which tests the continuity of analog and CAN signals through DB9 ports (Figure 5).

Challenges & Constraints

- 4-year project with an initial difficulty distinguishing deliverables between teams.
- Large amount of technical knowledge needed to create diagrams.
- No defined list of new components; we were not able to include pin inputs/outputs in our diagram.

Future Work

- Build physical wiring harnesses for the truck’s new EV components.
- Dive into routing methodology of selected components.
- Verification of connection between the controller and each component via testbenches.

References & Acknowledgement

- Industry Mentors: Shweta Hardas, Yudong Lin, Jeff Spaulding, and Stephen Oi
- Faculty Mentors: Professors Sep Makhsous and Per Reinhall
- Teaching Assistant (TA): Rose Johnson
- All E-Truck Teams: Controls, Retrofit, and Systems.
- Retrofit team for the 3D CAD model of the truck (Figure 4).