MICHIGAN STATE
UNIVERSITY

Project Plan Presentation

Hardware in the Loop (HIL) Vehicle Simulator

The Capstone Experience

Team Bosch

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From Students…
…to Professionals

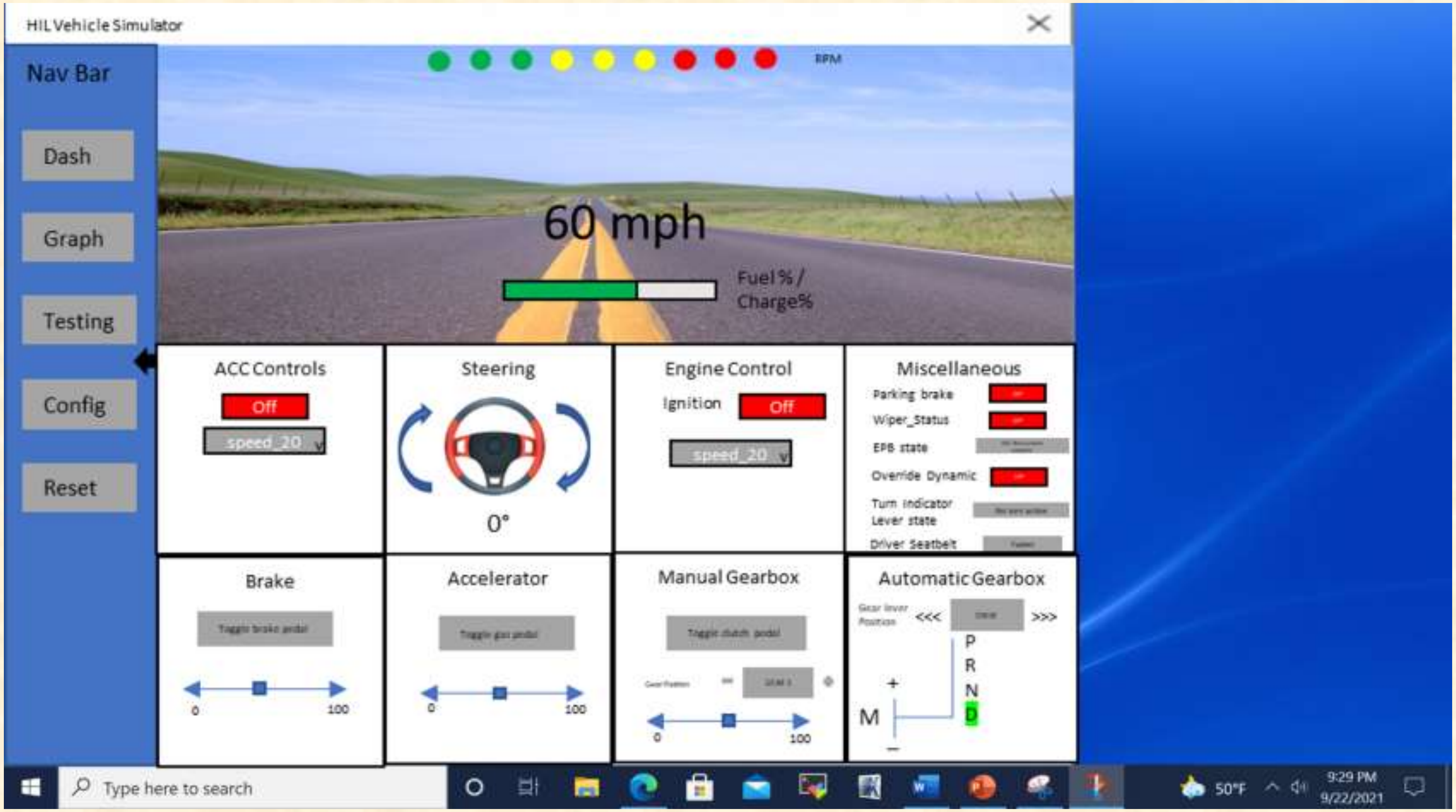
Functional Specifications

- Windows 10 application that will simulate a vehicles CAN Bus using cost-effective hardware
- Current hardware is too expensive and not available to all of Bosch's engineers at once
- Allows vehicle function such as acceleration, steering, braking, ACC and more to be simulated on cheaper hardware
- Ability to simulate different variations of vehicles configurable by the user

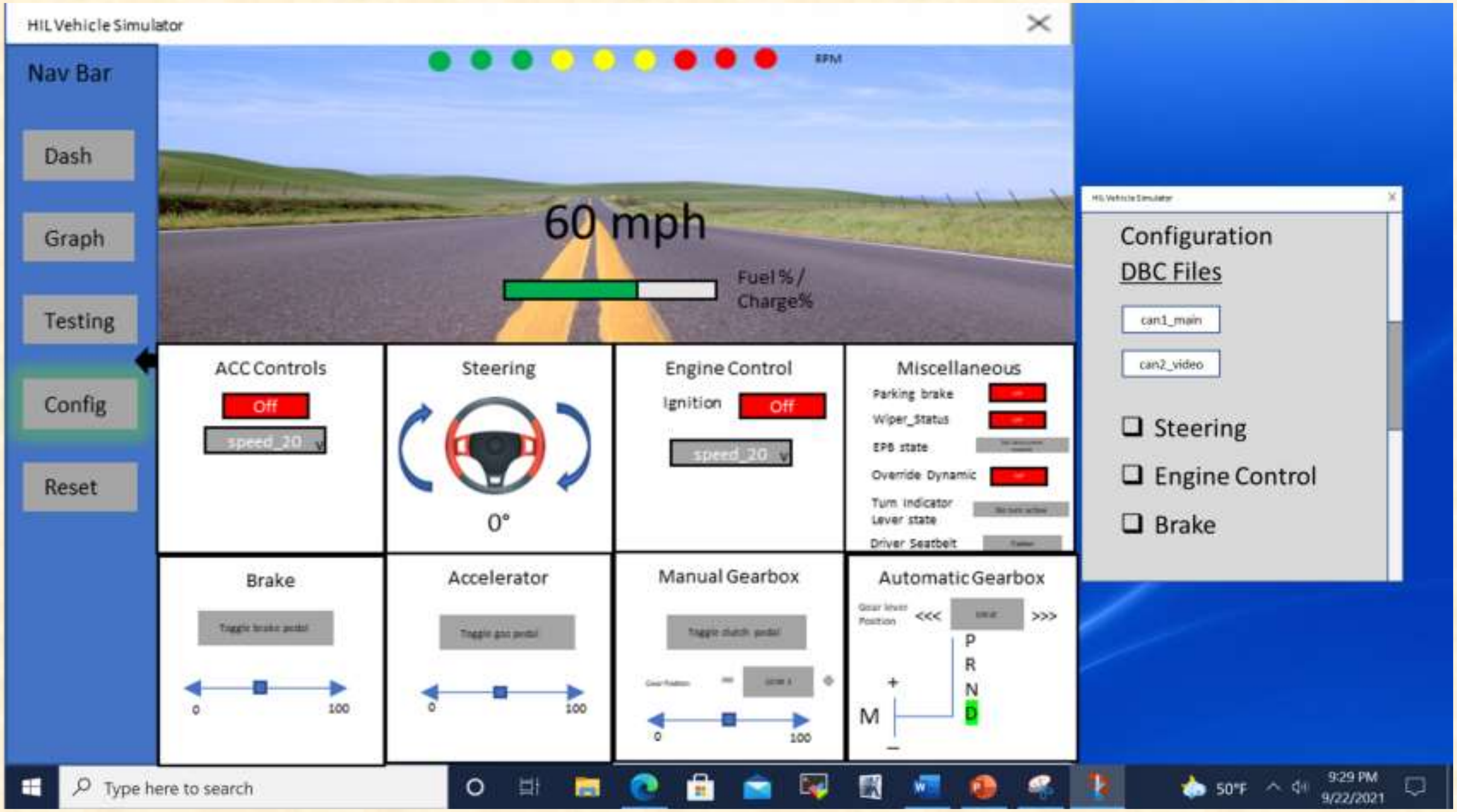
Design Specifications

- Easy to use GUI to allow user to control vehicle simulator
- GUI will allow user to configure vehicle’s base parameters to accurately simulate vehicle they wish to test
- GUI will show user a live graph of the data being sent and received to the vehicle’s CAN Bus
- User will also be able to create automated tests that will run a series of vehicle operations that the user specifies

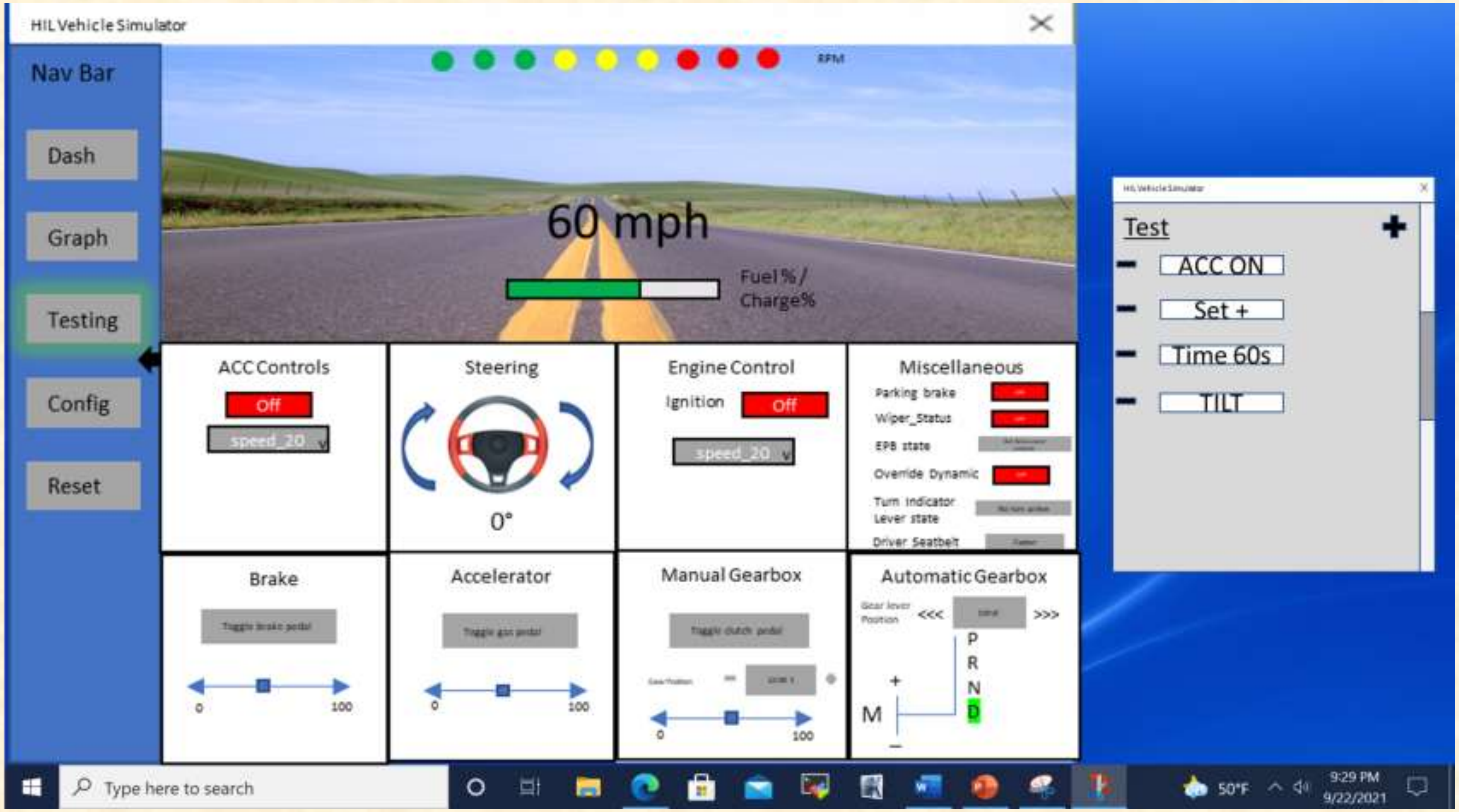
Screen Mockup: Main Dash



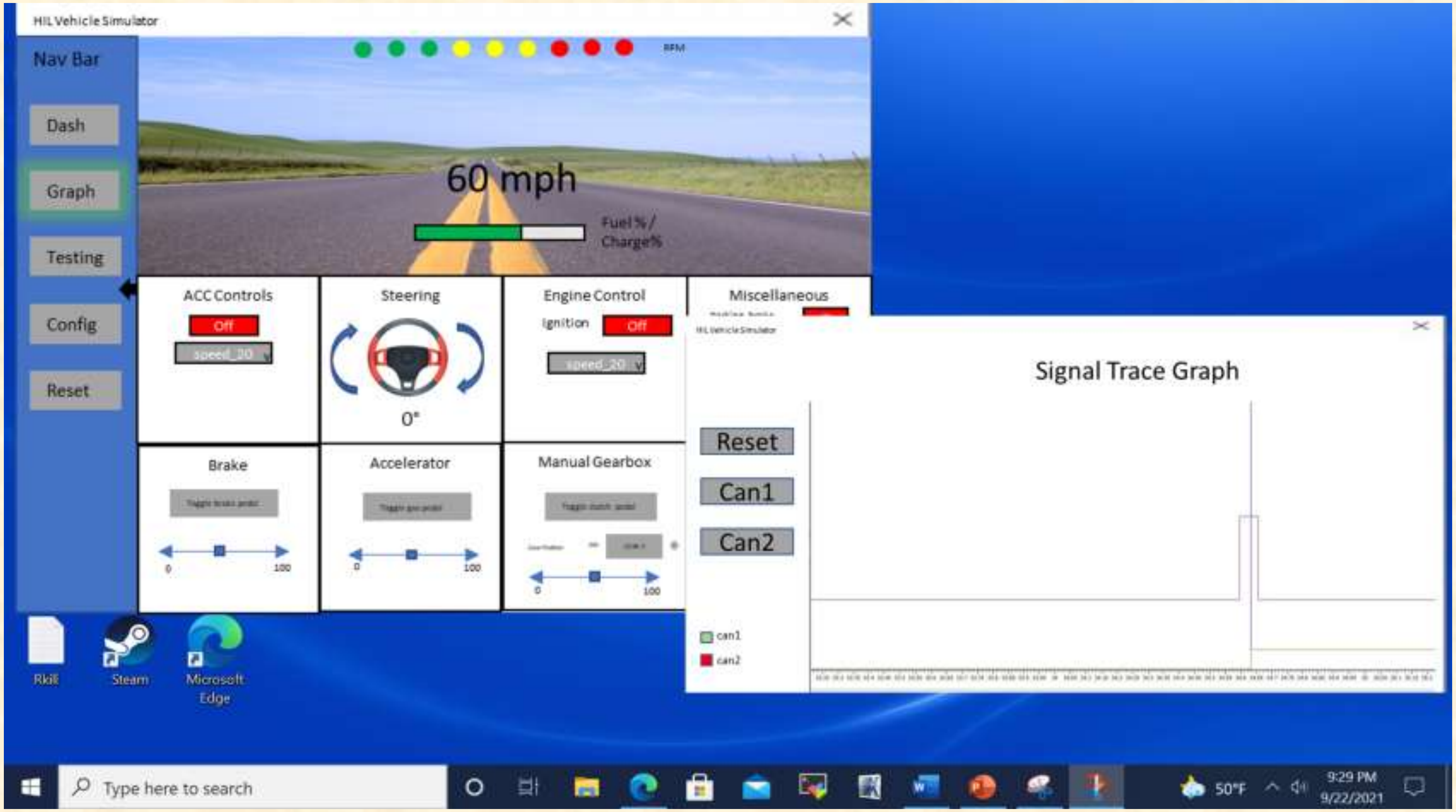
Screen Mockup: Configuration



Screen Mockup: Automatic Testing



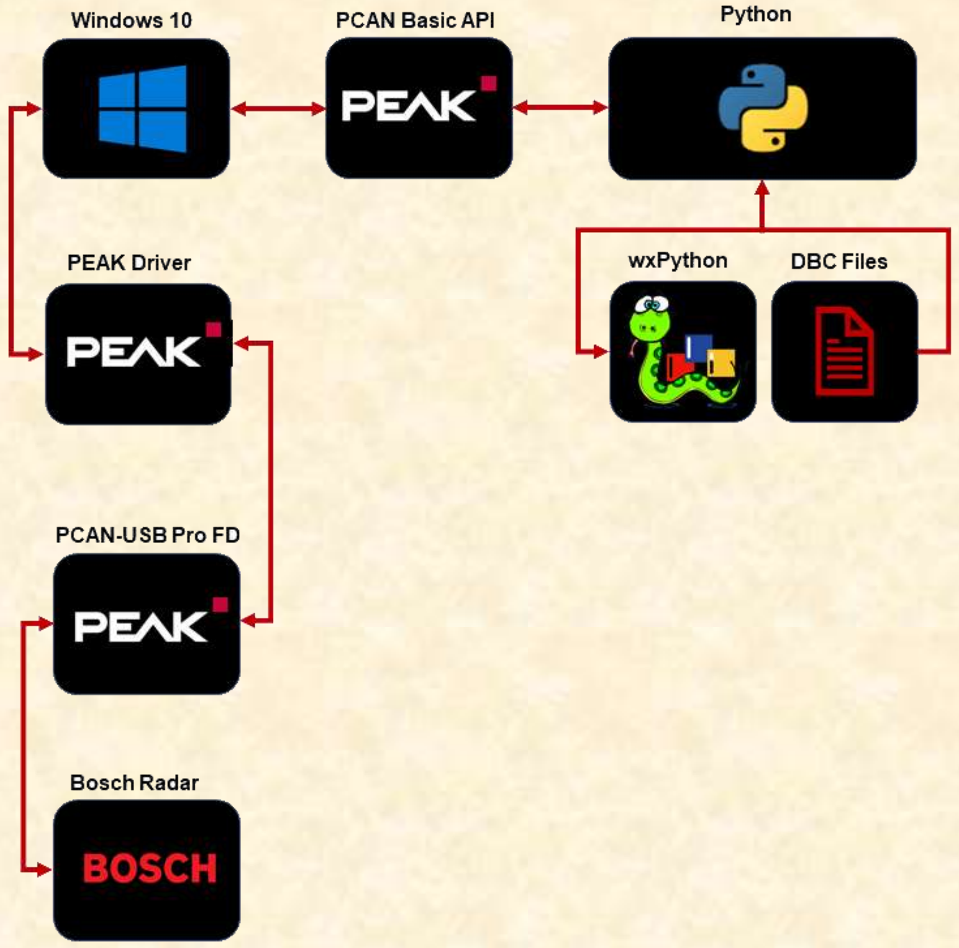
Screen Mockup: Signal Trace Graph



Technical Specifications

- Hardware Components
  - Bosch Radar: An ECU used for controlling NCC and ACC. Focal point of this simulation.
  - PCAN-USB Pro FD: Adapter that enables the connection of CAN networks to computer via USB
- Software Components
  - Python 3.9: an interpreted high-level general-purpose programming language.
  - wxPython toolkit 4.1: a python-based, cross platform GUI toolkit
  - PCAN-Basic API 3.3: a python-based API developed by Peak Systems

System Architecture



System Components

- Hardware Platforms
  - PEAK PCAN USB Pro FD
  - Bosch Radar
- Software Platforms / Technologies
  - Python
  - wxPython
  - PCAN Basic API

Risks

- Risk 1
  - Communicating with hardware through the PCAN Basic API and PEAK drivers
  - Familiarize ourselves with the hardware API and documentation to ensure smooth communication
- Risk 2
  - Creating a simple, easy to use GUI that will include all required functionality
  - Show prototypes to client as soon as possible to get feedback and find flaws through conducting real world tests that Bosch engineers would conduct
- Risk 3
  - Hardware could break physically, or we could brick the Bosch radar through software
  - Ensure all our communication with the hardware is correct and understand the signals we are sending to it. Handle the hardware with care
- Risk 4
  - Create a DBC parser that can parse any DBC file the user may submit and handle any errors
  - Ensure our parser works with the example DBC files given to use by our sponsor, test our parser against different variations of those files

Questions?

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