Project Plan Presentation
Hardware in the Loop (HIL) Vehicle Simulator

The Capstone Experience
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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

Windows 10 → PCAN Basic API → Python

PEAK Driver → PCAN-USB Pro FD

Bosch Radar

wxPython → DBC Files
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?