

MICHIGAN STATE

U N I V E R S I T Y

Beta Presentation

Hardware in the Loop (HIL) Vehicle Simulator

The Capstone Experience

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Fall 2021



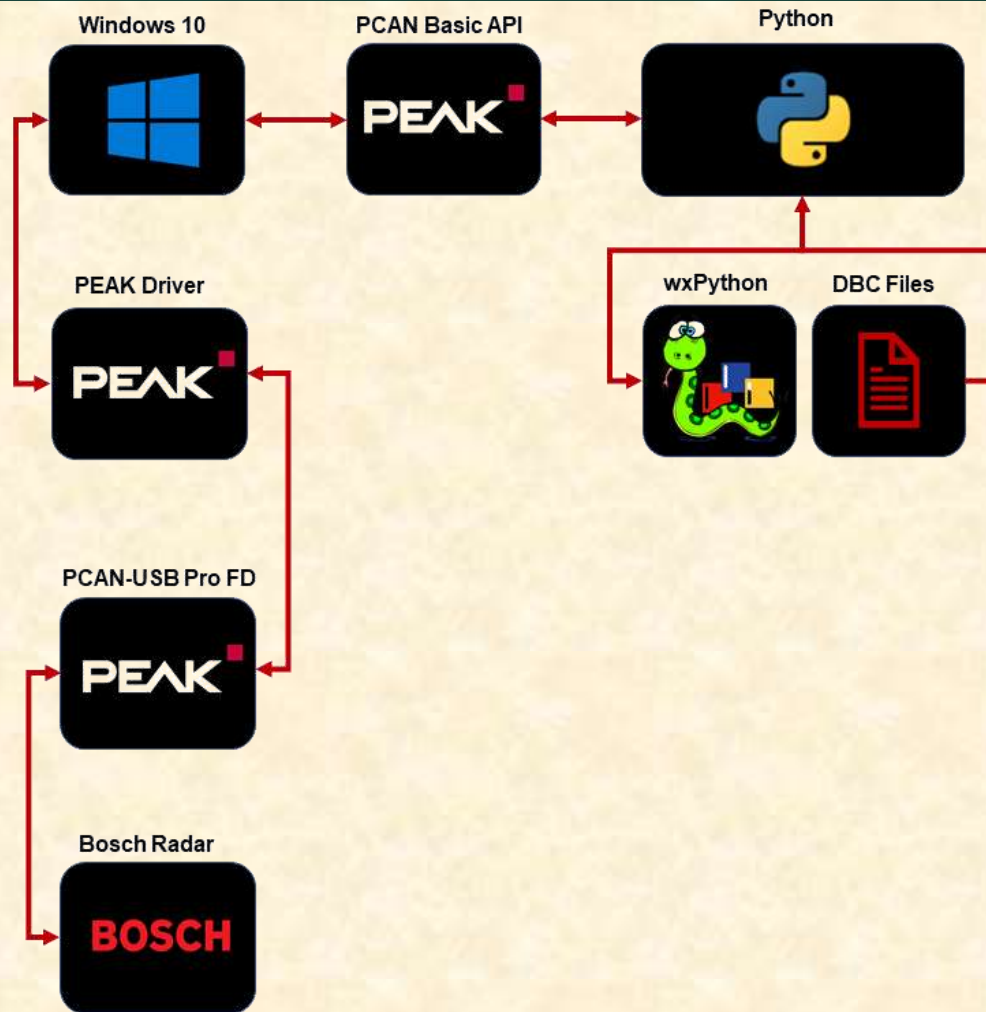
*From Students...
...to Professionals*

Project Overview

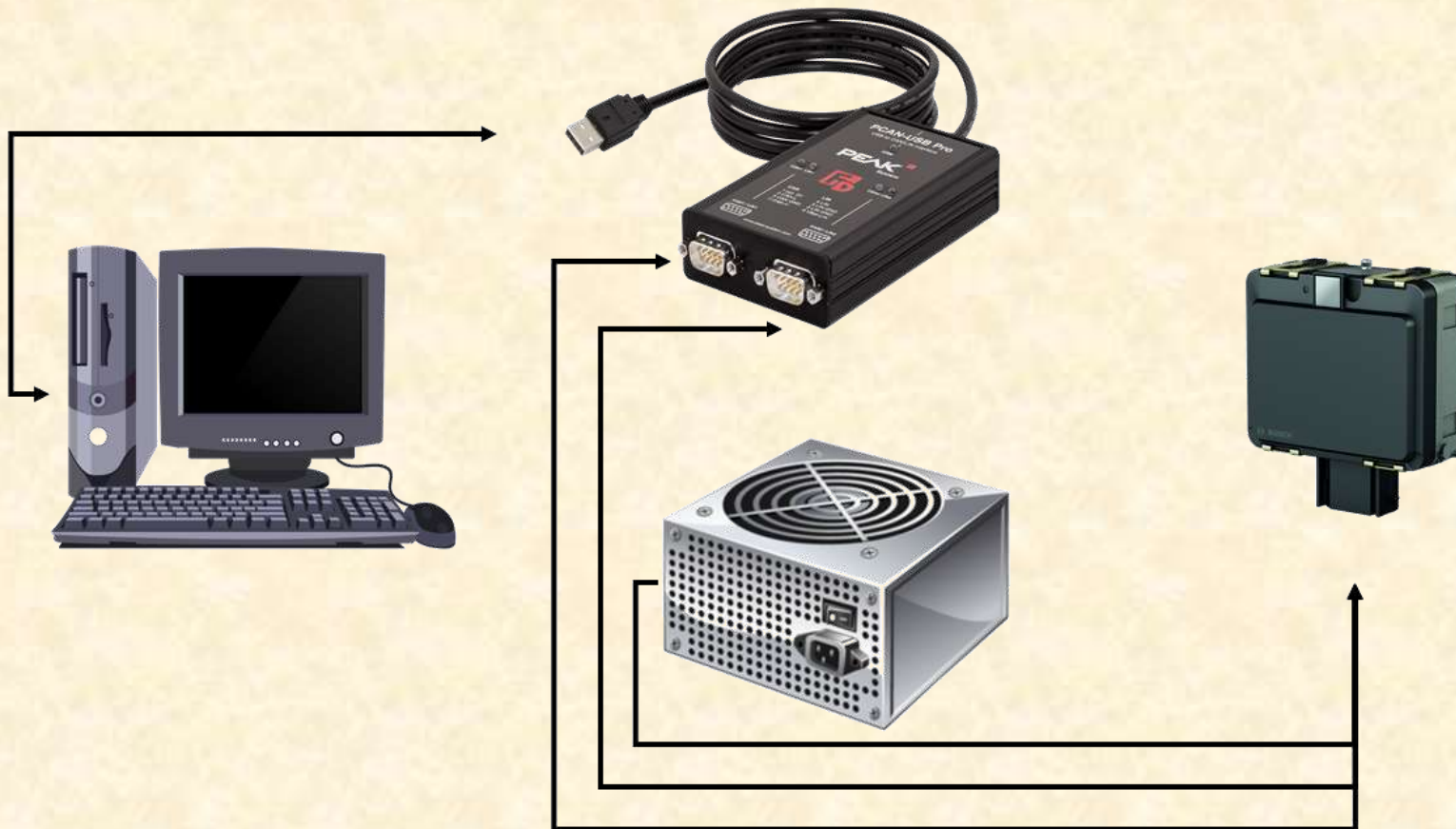
- Windows 10 application that will simulate a vehicle's CAN Bus by using a HIL system.
- Current hardware is too expensive and not available to all of Bosch's engineers at once.
- Simulates vehicle functions such as acceleration, steering, braking, gear changing, cruise control, and more.
- Ability to simulate different variations of vehicles that is configurable by the user.



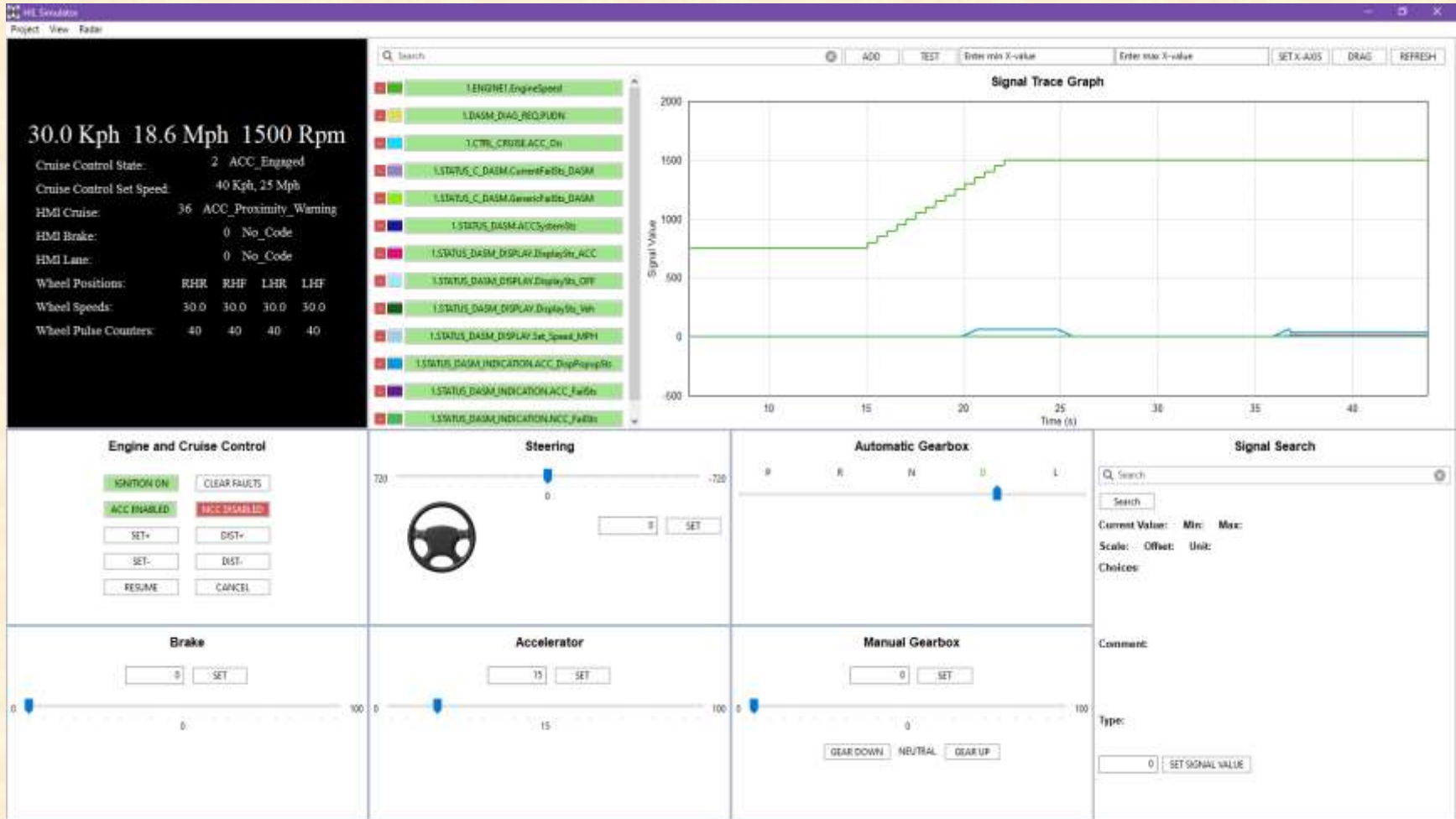
System Architecture



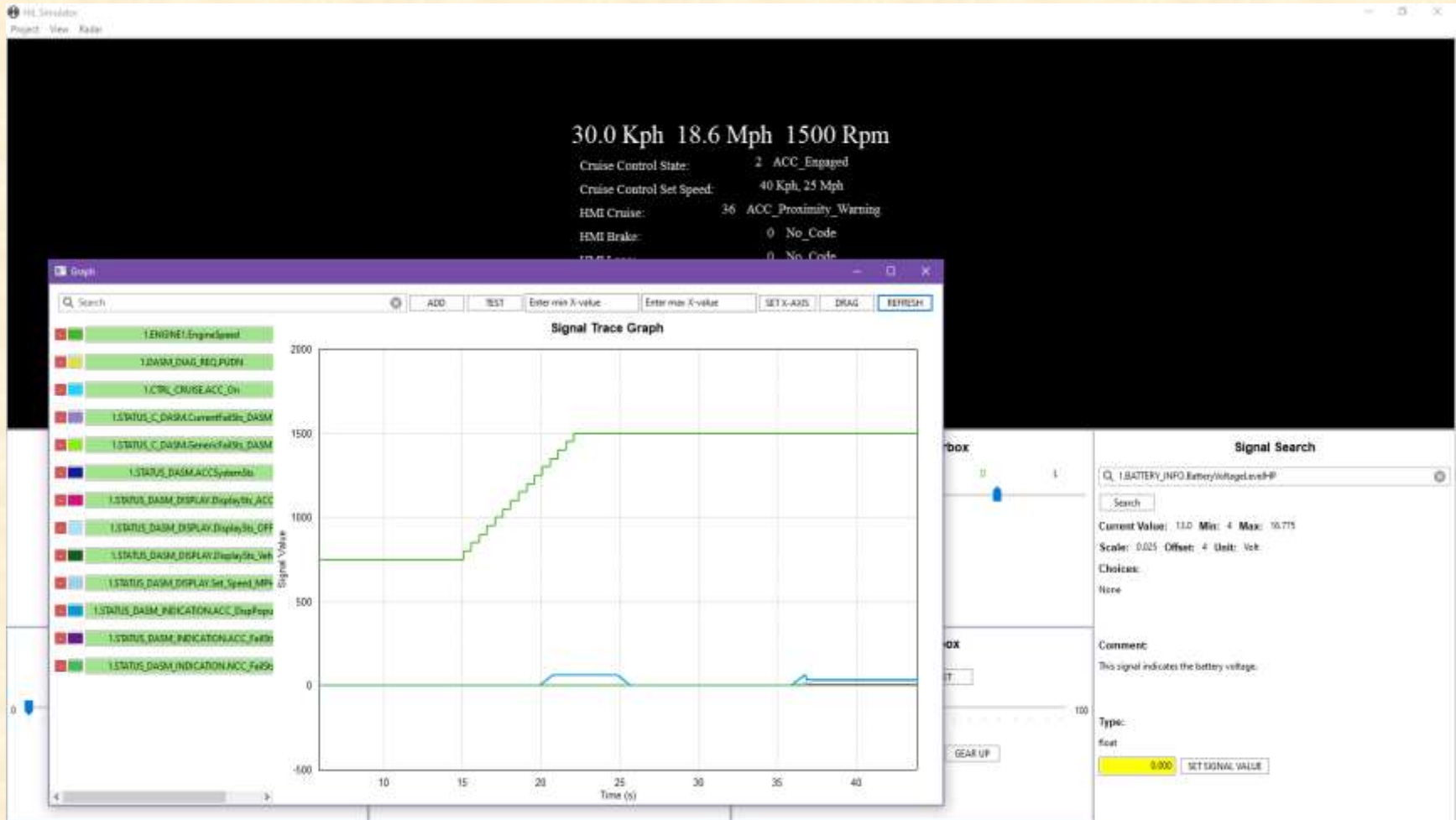
Hardware in the Loop Diagram



The Main Frame



The Main Frame/Search Frame



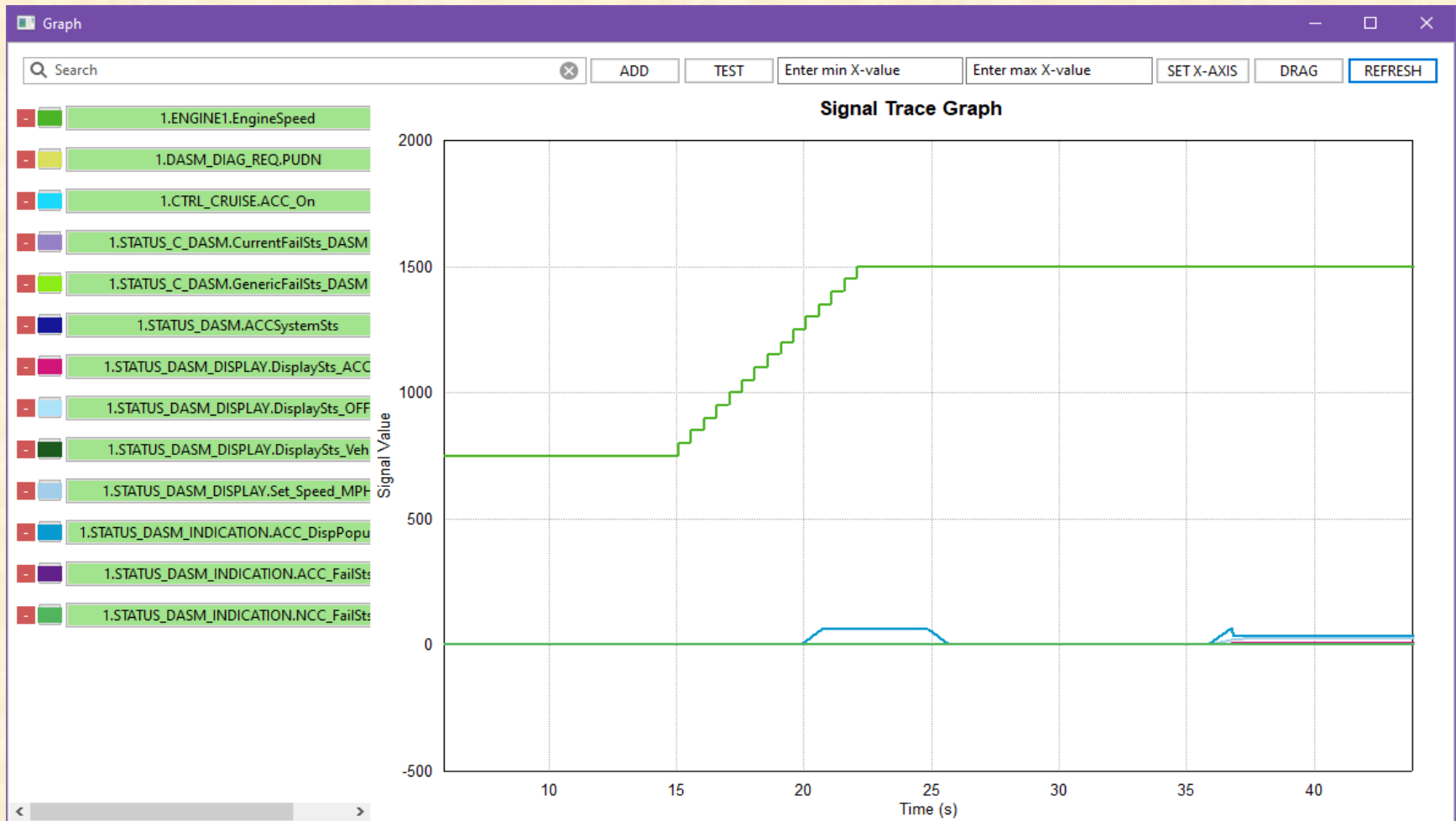
The Project Configuration Frame

The screenshot displays the HIL Simulator interface, which is divided into several functional areas:

- Top Left:** A large digital display shows "30.0 Kph". Below it, a list of vehicle parameters is visible, including "Cruise Control Set", "HMI Cruise", "HMI Brake", "HMI Lane", "Wheel Positions", "Wheel Speeds", and "Wheel Pulse Count".
- Top Center:** A "Signal Value" panel lists various engine and vehicle signals such as "1.ENGINE.EngineSpeed", "1.MAG_REQ_PLUN", "1.CRUISE_ACC_Di", "1.M.CurrentFacts_DASM", "1.M.GeneichFacts_DASM", "1.DSM.ACCTSystemSts", "1.DISPLAY_DisplaySts_ACC", and "1.DISPLAY_DisplaySts_OFF".
- Top Right:** A "Project Configuration" dialog box is open, showing the current project name "team_bosch" and options to edit it. It also lists "DBC Files" (Channel 1: car1_main.dbc, Channel 2: car2_new.dbc) and "JSON Files" (Button to Signal Maps: qm_signal_map.json, DBC-ACC to Signal Maps: cr_acc_signal_map.json).
- Bottom Left:** An "Engine and Cruise Control" control panel features buttons for "IGNITION ON", "CLEAR FAULTS", "ACC ENABLED", "ACC DISABLED", "SET+", "DST+", "SET-", "DST-", "RESUME", and "CANCEL".
- Bottom Center:** Two graphical sliders are shown: "Brake" (ranging from 0 to 300) and "Accelerator" (ranging from 0 to 15).
- Right Side:** A "GUI Mapping Editor" window titled "Dash" is open, showing a list of UI elements and their corresponding signal values. The elements include "KPH", "RPM", "CRUISE CONTROL STATE", "CRUISE CONTROL SET SPEED", "HMI", and "WHEEL SPEEDS". Each element has a search bar, a signal selection dropdown, and a "Set Value" input field.



The Graph Frame



What's left to do?

- Stretch Goals
 - The ability to log tests and load logs.
 - Add tips and pop-ups to the GUI for helpful hints.
- Other Tasks
 - Create a way to turn our project into an executable.
 - Review our code in accordance with PEP8.
 - Continue optimizing and refactoring our code.
 - Continue testing our application.



Questions?

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