SCADA- Supervisory Control and Data Acquisition System

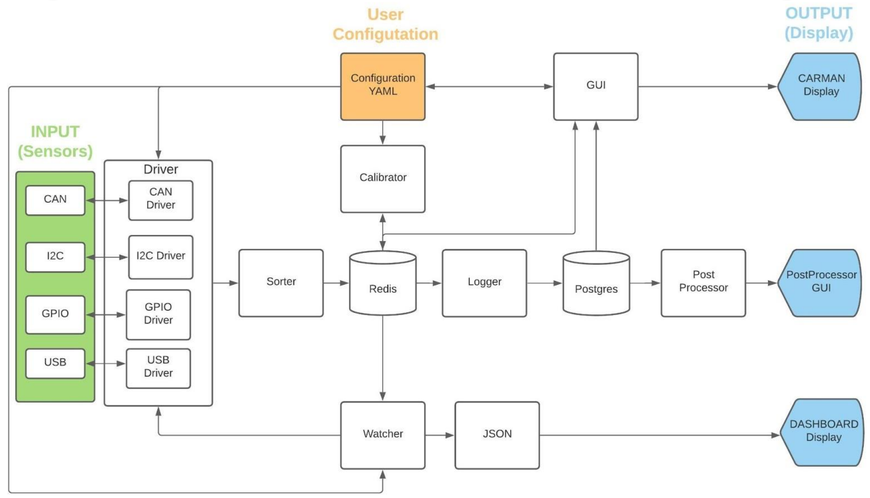
Irwin Frimpong, Harrison Walker, Lia Chrysanthopoulous, Adam Tunnell, Mithil Shah

A joint project of the Lafayette College ECE and ME Departments

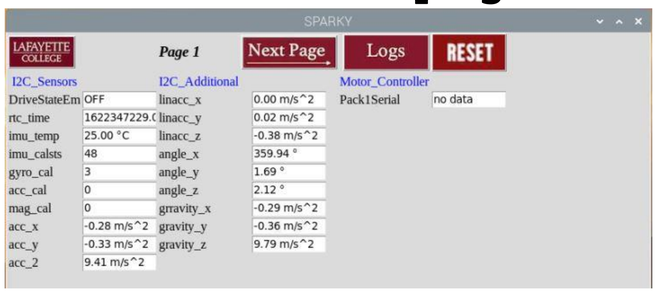
Overview

The SCADA (Supervisory Control and Data Acquisition) system is a maintainable, configurable system that reads and writes to a network of sensors on the vehicle. There is currently support for reading I2C, CAN, Parallel IO, and USB sensors. SCADA includes active system control which logs errors, sends warnings, or writes to sensors based on conditions defined in the configuration file. A post-processor allows for data collected during a drive session of the car to be analyzed after the fact.

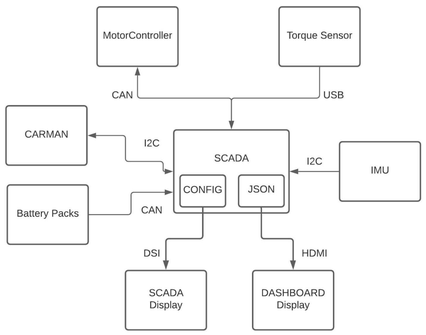
High-Level Software Architectural Diagram



Live Data Display



Hardware Diagram



Passive Data Acquisition

Driver consists of read and write methods for I2C, CAN, USB, and GPIO sensors
Sorter polls raw data from sensors
Calibrator uses config to calibrate raw data
Logger stores final data into **Postgres** database for post processing

Active Control

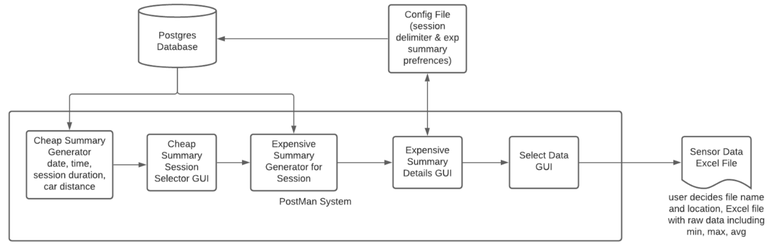
The Watcher module handles the active control aspect of the SCADA system. It checks for changes in sensor values and triggers various actions. One of the major roles of the Watcher is to trigger the safety relay whenever cooling temperature exceeds a critical value.

Sensor Configuration

Sensors and actions can easily be added and modified to specify how the sensor data is displayed, how often that sensor is polled, and how that data is read/calibrated using the configuration file. Below is an example of how a sensor is configured.

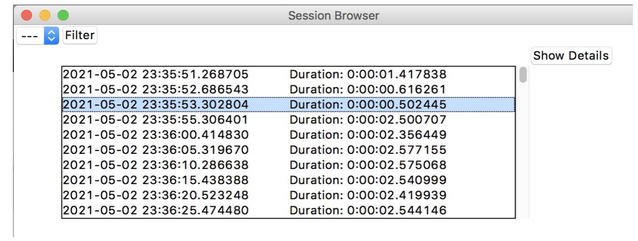
```
gravity_x:
  unit: 'm/s^2'
  inputs:
    In: gravity_x
  cal_function:
    'In>1000': '(-1)*(65536-In)*(1/100)'
    'In<=1000': 'In*(1/100)'
  bus_type: I2C
  primary_address: 0x28
  secondary_address: [0x2E,0x2F]
  precision: 2
  display_variable: number
  description: "IMU Gravity X Component"
  bit_length: 8
  sample_period: 0.2
  var_name: gravity_x
```

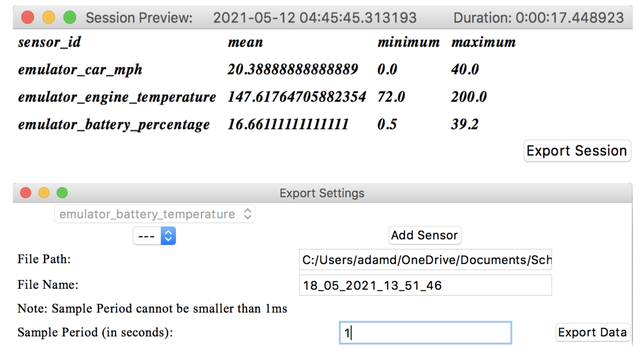
Post-Processing Architectural Diagram



Postman is the post-processing component of SCADA. It uses past data stored in the Postgres database to organize “drive sessions” that a user can select to export specific sensor data to an Excel spreadsheet for further analysis.

Post Processing Session Browser





Website QR

Scan this code to view the car on our website!