Project Portunus

Universal Car Module

Development Team

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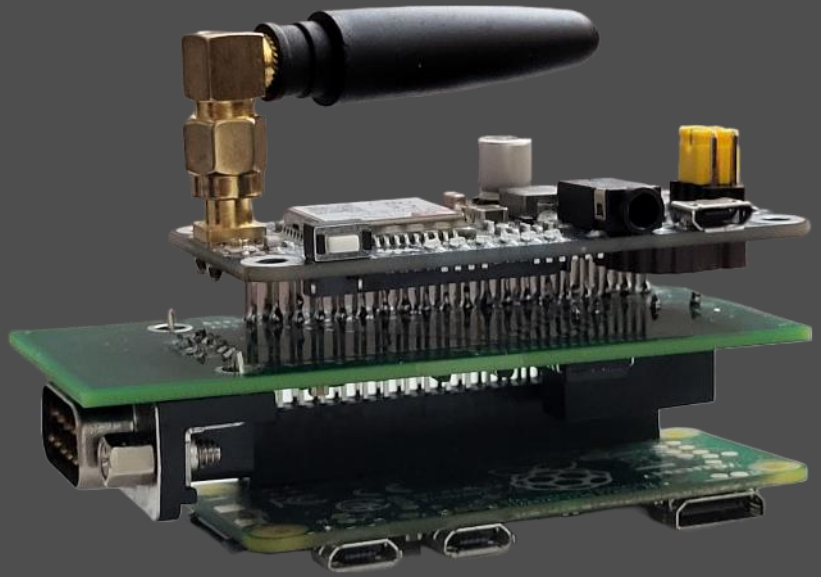
Problem

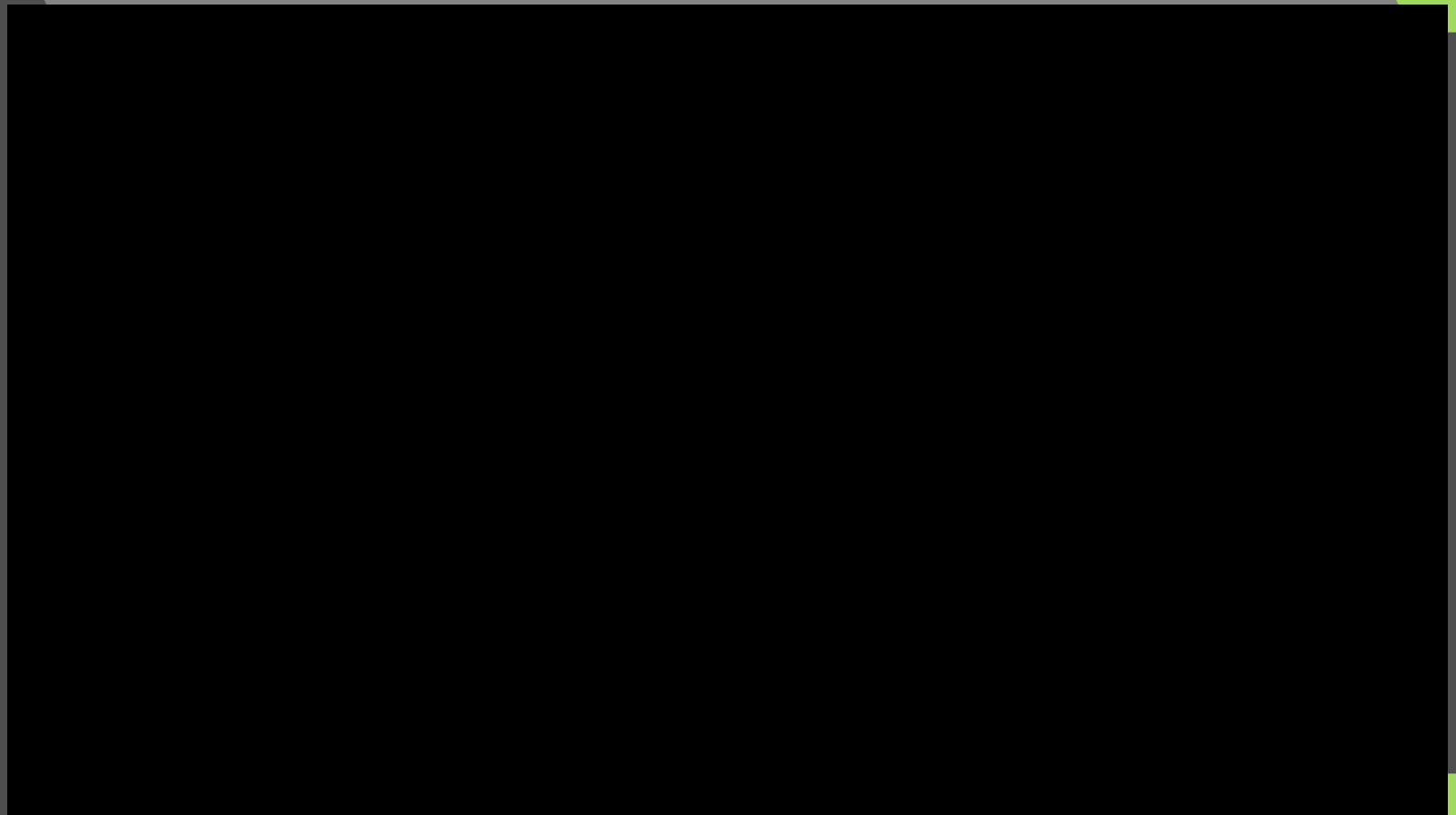
- New cars have partner apps to control the vehicle
- Apps specific to manufacturer
- No universal mainstream solution

Problem

- Plug-n-play module
- Wireless lock/unlock
- GPS tracking
- Diagnostics



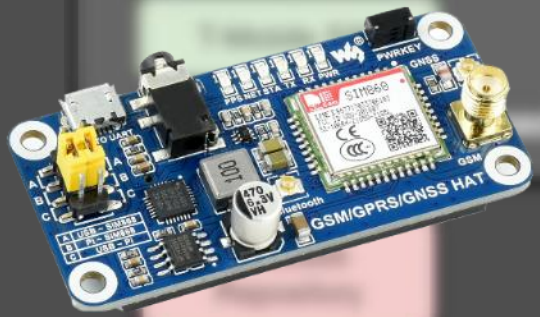
Demo

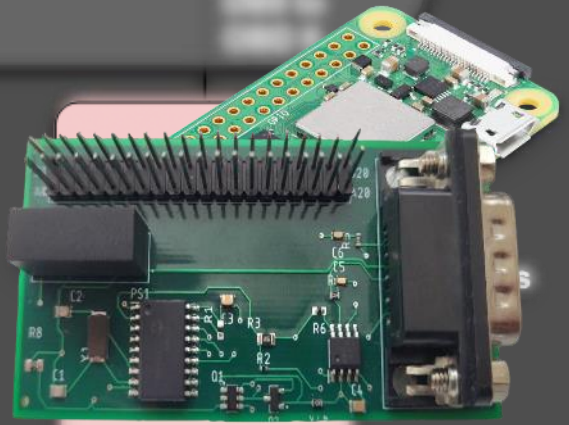


SIM 868 GPS/GSM Microcontroller

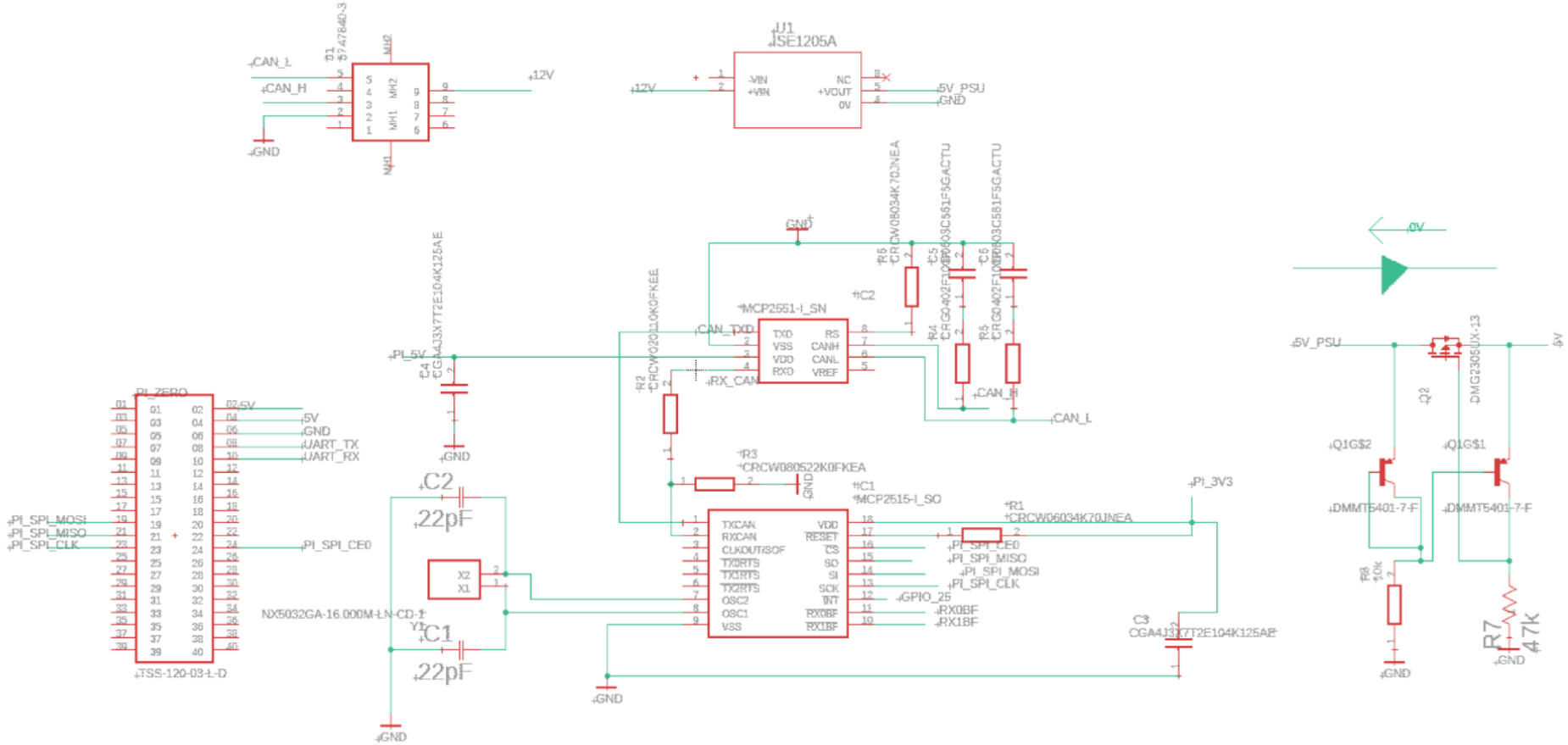
Raspberry Pi Zero

MCP2515 Controller

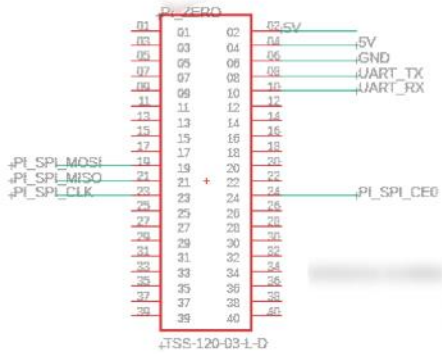


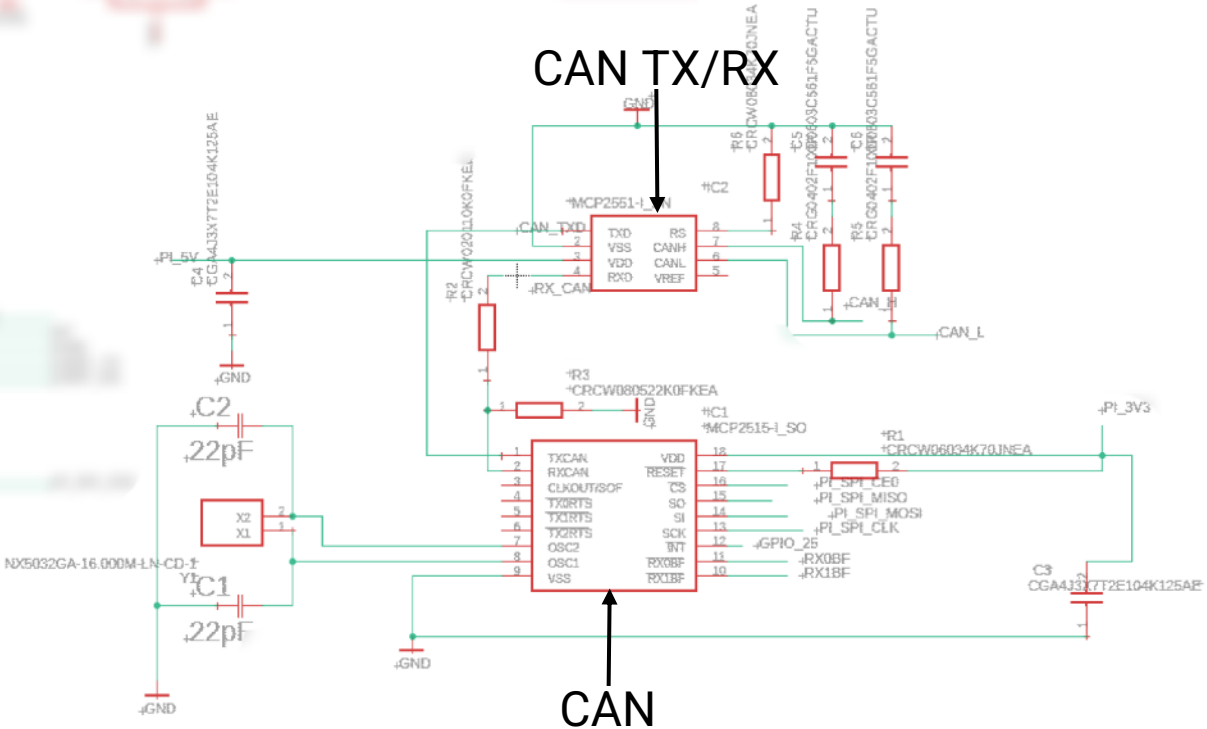


Wireless Connection

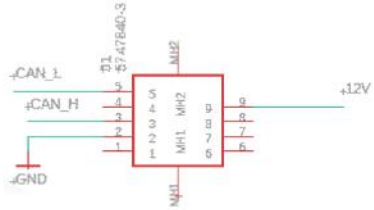

CAN_L
CAN_H
GND
12V
U1
ISE1205A
VIN
+VIN
NC
+VOUT
0V
5V_PSU
GND
MCP2551-I_SN
TXD
VSS
VDD
RXD
RS
CANH
CANL
VREF
CAN_TXD
RX_CAN
CAN_H
CAN_L
PI_5V
C2
22pF
C1
22pF
X2
X1
NX5032GA-16.000M-LN-CD-1
Y1
MCP2515-I_SO
TXCAN
RXCAN
CLKOUT/SOF
TX0RTS
TX1RTS
TX2RTS
OSC2
OSC1
VSS
VDD
RESET
CS
SO
SI
SCK
INT
RX0BF
RX1BF
GPIO_25
PI_SPI_CE0
PI_SPI_MISO
PI_SPI_MOSI
PI_SPI_CLK
PI_3V3
PI_ZERO
5V
GND
UART_TX
UART_RX
TSS-120-03-L-D
0V
5V_PSU
DMG2305UX-13
Q2
Q1G$2
Q1G$1
DMMT5401-7-F
R7
47k

Pi 40 Pin Holes



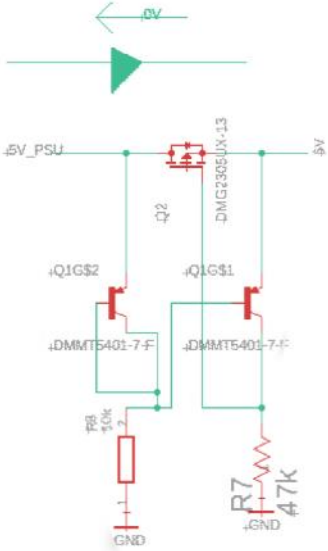

CAN TX/RX
CAN_TXD
RX_CAN
CAN_H
CAN_L
MCP2551-I_SN
MCP2515-I_SO
PI_3V3
PI_SPI_CE0
PI_SPI_MISO
PI_SPI_MOSI
PI_SPI_CLK
GPIO_25
RX0BF
RX1BF
NX5032GA-16.000M-LN-CD-1
22pF
22pF
GND
CAN Controller

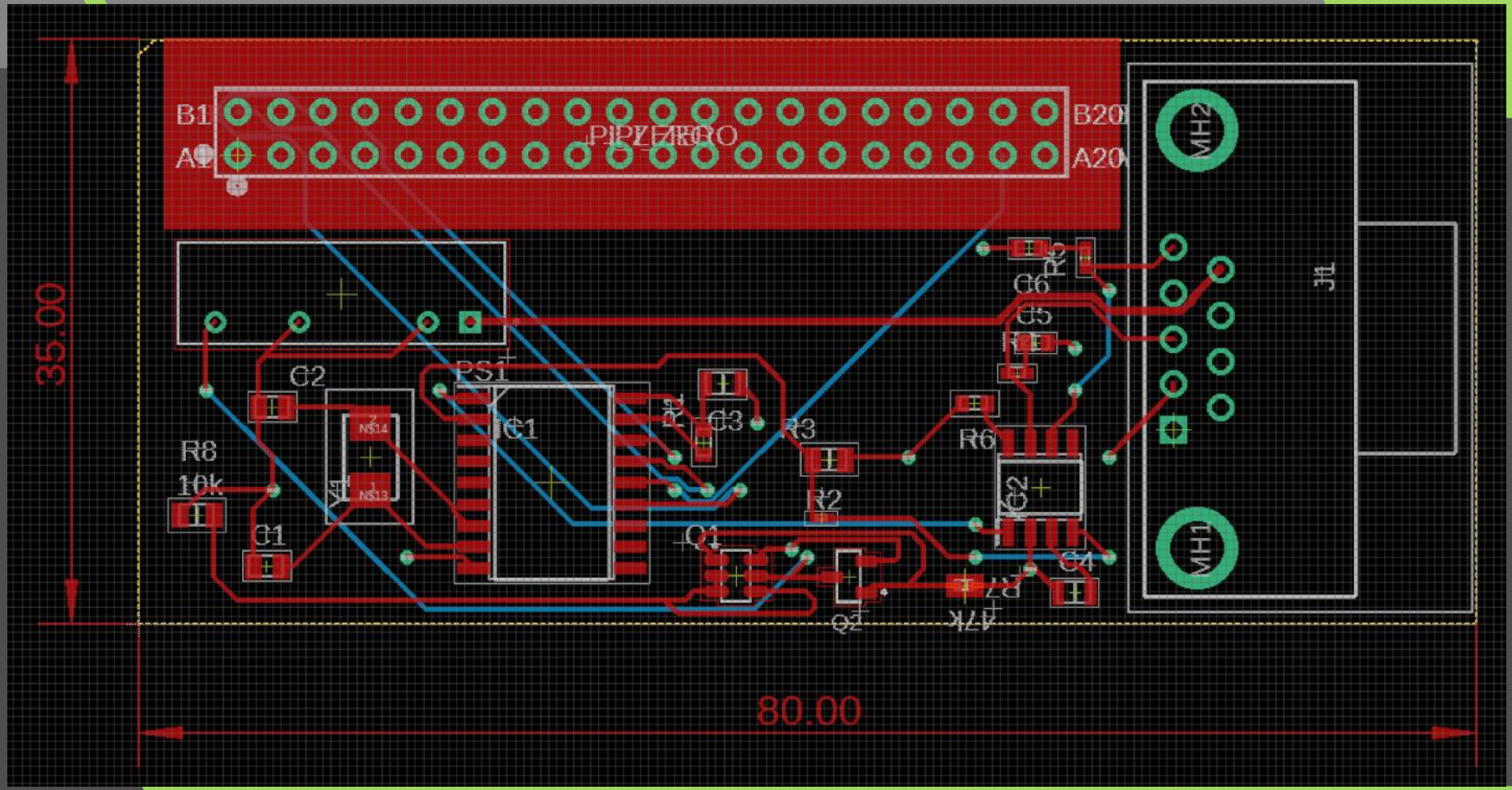
DB9 Port



Buck Converter

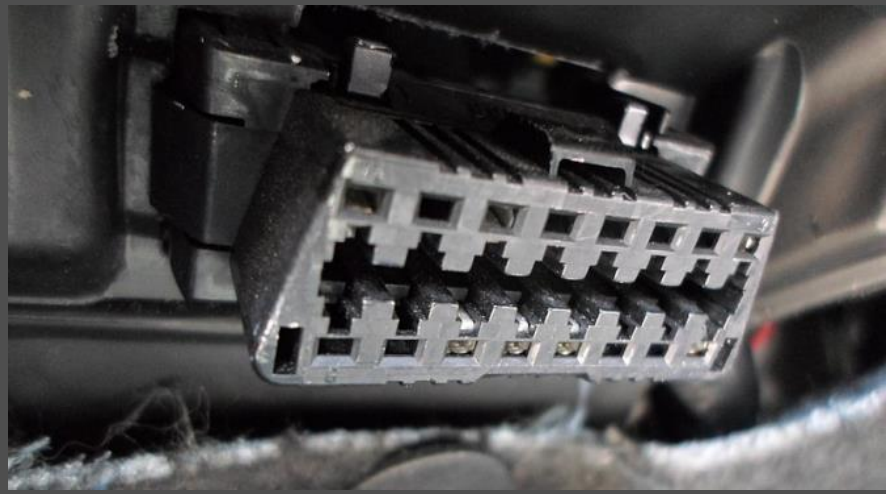
Power Diode




B1
A1
B20
A20
35.00
80.00
MH2
MH1
J1
C6
C5
C2
PS1
IC1
C3
R3
R6
R8
10k
C1
R2
Q1
Q2
C4
R7
4.7K

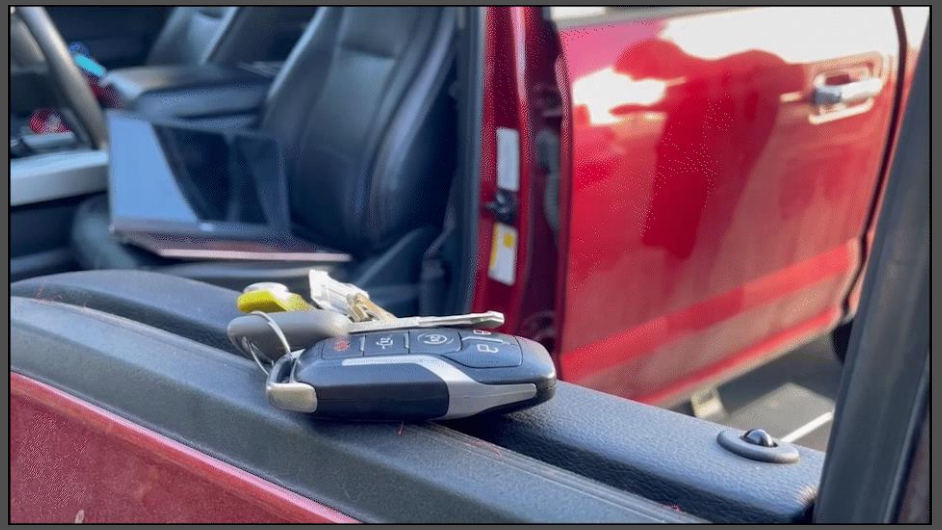
How do we talk to the car?

- CAN - Controller Area Network
- All modern car systems use CAN
- OBD II diagnostics port open to user
- Sniff CAN messages via OBD II



Car Control and Diagnostics

- Use OBD II to interface with CAN bus
- Determine CAN frame behavior
- Store Important ID’s
- Finding ID ≠ Car Control



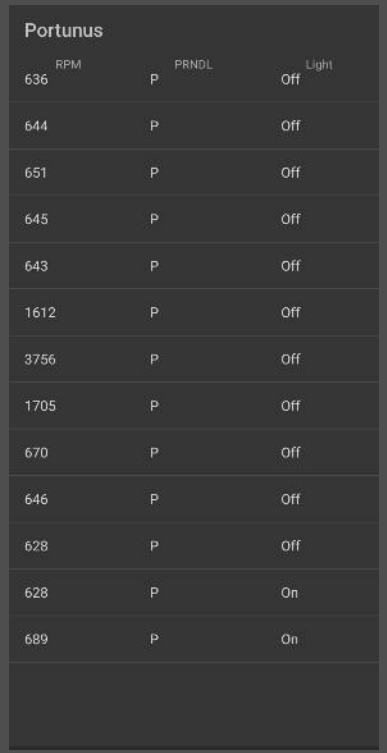
GPS Tracking

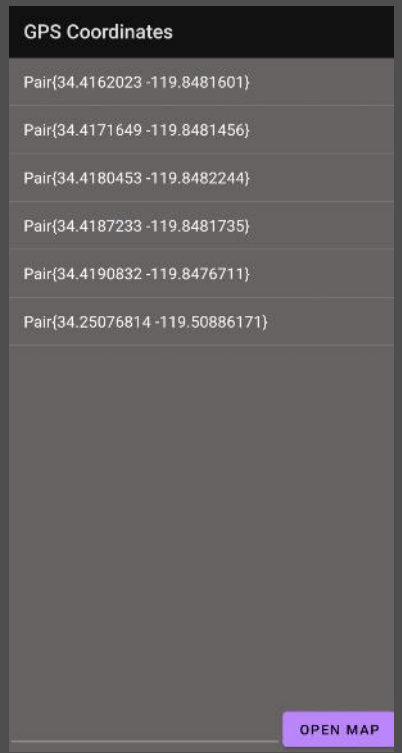
- Send the GPS data to Firebase and access it directly through the app

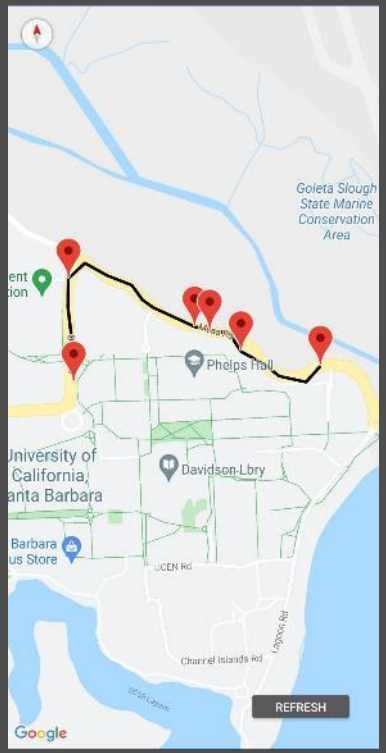
Mobile App

- Android application done using Android Studio
- Retrieves diagnostics over Firebase
- Organize GPS data and plot

Mobile App Cont.







Conclusions

- Established a connection to the car’s CAN BUS
- GPS and diagnostics data is transferred to the phone app regardless of car’s location
- Locking and unlocking the car is feasible with certain models

Thank You!

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Questions?