Off the beaten path

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TOC

Welcome
Overview
OBDII Primer
Hardware
Software
ELM chipset
Rig Setup
Live Demo

Welcome

Go around the room, introduce yourself, mention something about yourself:

- Raspberry Pi developer
- Car enthusiast
- Tech enthusiast
- Right to repair

Overview

Welcome to the second ‘Off the beaten path sponsored by TIBCO’ meeting

Who we are- Technology enthusiasts that are interested in seeing solutions to things that might just be ***off the beaten path***

Topics will range wildly….

Logistics

700-730 Snacks and light fare

730-830 Meeting discussion

830-900 Move up stairs - networking - social til close

On-board Diagnostic (OBD) II

1. What is OBD?
2. Brief history
3. Cables, devices, and connectors
4. OBDII functionality

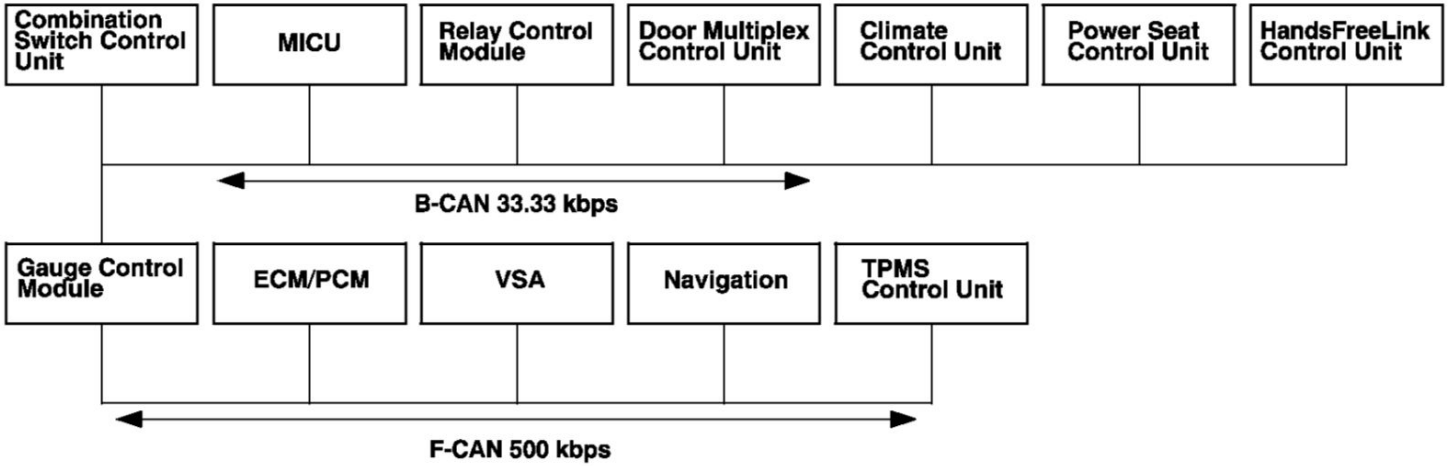
On-board diagnostics (**OBD**) is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle subsystems.[1]

2007 TSX - Multiplex Integrated Control System Description

Body controller Area Network (B-CAN) and Fast Controller Area Network (F-CAN)

Fast controller Area Network (F-CAN) and Body Controller Area Network (B-CAN) share information between multiple Electronic Control Units (ECUs). B-CAN communication moves at a slower speed for convenience related items, and for other functions. F-Can information moves at a faster speed for "real time" functions such as fuel and emissions data. To allow both systems to share information, the Gauge Control Module translates information from B-CAN to F-CAN and from F-CAN to B-CAN.

The ECUs on the B-CAN and F-CAN transmit and receive information in the form of structured messages that may be received by several different ECUs on the network at one time. These message are transmitted and received across a communication circuit that consists of a single wire that is shared by all the ECUs on the circuit. Since messages on the F-CAN network are typically of higher importance, a second wire is used for communication circuit integrity monitoring. A backup circuit is also added to the headlight and wiper circuits on the B-CAN network in the event of a network wire or ECU failure that would effect the operation of the system.



OBD Brief History

1991
OBD-I

1996
OBD-II

2001
EOBD
aka European OBD-II

2008
CAN

SAE J1850 PWM (Ford)
SAE J1850 VPW (GM)

ISO 9141-2 (Asia & Europe)
ISO 14230-4 (2003+)

ISO 15765 (CAN)

OBD II Connectors

Hand-held Self-contained

Usually very limited functionality
Read and reset trouble codes
Trouble code definition library

PC Based

Serial RS232 implementation

Mobile WiFi/Bluetooth

Often paired with smart phone and the two must be in range of each other

OBD II Device Market

Dash Cams

GPS, Shock sensors (accelerometers)

Heads Up Display (HUD)

Display real-time data back, reflect off windshield

Insurance

Voluntary reporting of driving behavior
- Acceleration/deceleration
- Distance travelled
- Speed statistics (max/average)

Functionality exposed through OBDII port

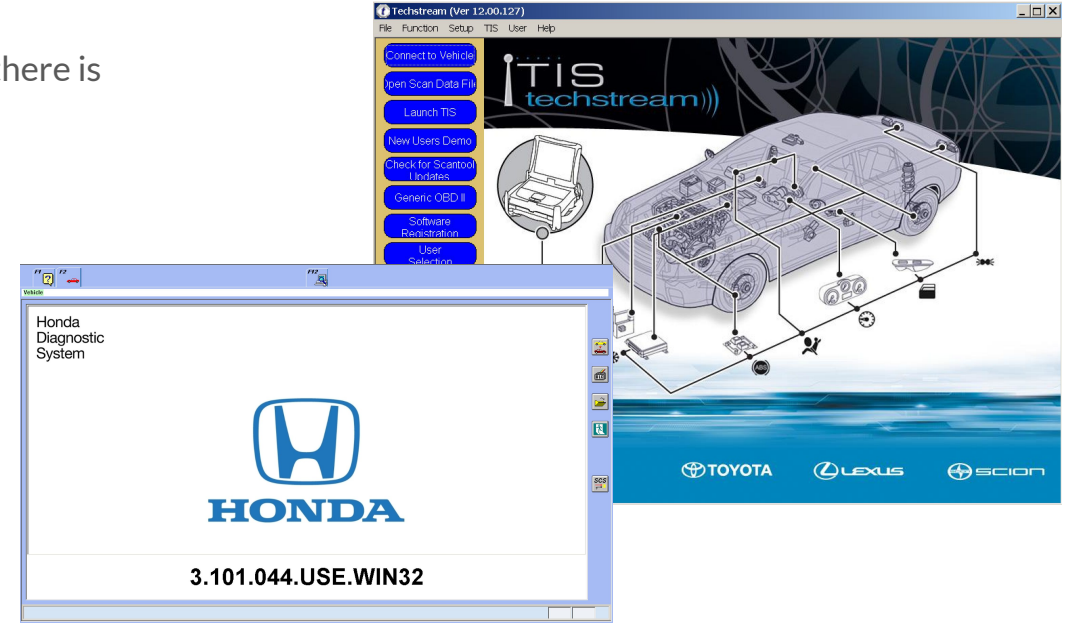
Engine/transmission diagnostics

- Velocity
- RPMs
- VIN, odometer, # of engine starts
- Intake manifold pressure
- 02 sensor
- Fuel system, fuel pressure, throttle position
- DTCs, distance with CEL activated
- And so on… https://law.resource.org/pub/us/cfr/ibr/005/sae.j1979.2002.pdf

Functionality exposed through OBDII port (2)

Beyond engine/transmission diagnostics there is also:

Program blank keys*
Body control module*
Seat control module*
TPMS*
Navigation system*
Vehicle proximity notification system*



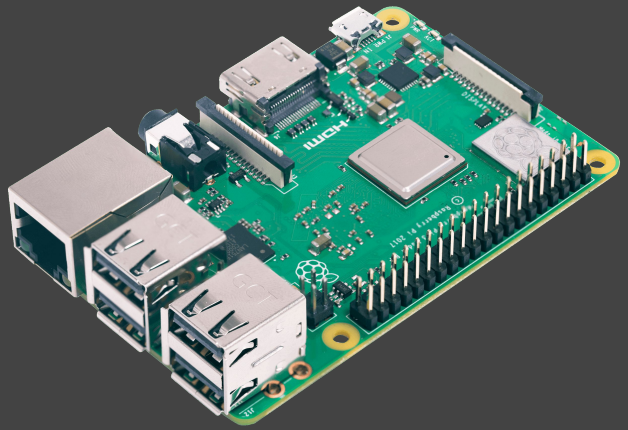
***Requires proprietary software**

Single Board Computers

Powerful and small computers. Can run familiar operating systems like Linux (CentOS).

For example - Raspberry Pi 3B+

- 1.4 GHz ARM processor
- 1 GB RAM
- 16 GB SD Card
- 4 USB 2.0
- 1 HDMI
- WiFi and Bluetooth



RPi Setup - Software Checklist

Download and install GO on RPi (documented in many places on the web)

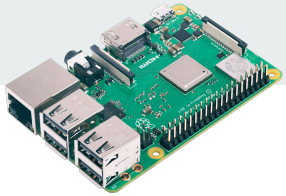
- GO bootstrap
- GO 1.12.1
- Install dep

Download and install GO libraries for OBDII

- go get -u github.com/tarm/serial
- go get -u github.com/wkarasz/elmobd

(Optional but recommended) Download and install Flogo

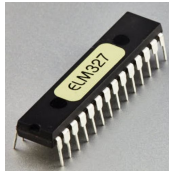
- go get -u github.com/TIBCOSoftware/flogo-cli/…
- go get -u golang.org/x/lint/golint



RPi Setup - Benchtop Hardware Shopping List

RPi 3B+ Enclosure for RPi 3B+ 5V 2.5A Switching Power Supply with 20AWG MicroUSB Cable Aluminum Heat Sink for Raspberry Pi 3 - 15 x 15 x 15mm SanDisk Ultra 16GB Ultra Micro SDHC UHS-I/Class 10 Card	35.00 12.50 7.50 .95 6.78
16 Pin J1962 OBD2 OBDII OBD Female Connector Diagnostic Cable Plug Pigtail	6.98
Mini 5W USB to 12V DC DC Step Up Converter 5V to 12V Power Supply Boost Module	1.65
ELM327 USB Scanner (Chinese clone)	14.99
	86.35

ELM327 chipset



The ELM327 is designed to act as a bridge between On-Board Diagnostics (OBD) ports and a standard serial interface.

Supports 9 different OBD protocols

Human readable command set

AT Command Summary

General Commands

<CR>	repeat the last command
BRD hh	try Baud Rate Divisor hh
BRT hh	set Baud Rate Timeout
D	set all to Defaults
E0, E1	Echo off, or on*
FE	Forget Events
I	print the version ID
L0, L1	Linefeeds off, or on
LP	go to Low Power mode
M0, M1	Memory off, or on
RD	Read the stored Data byte
SD hh	Save Data byte hh
WS	Warm Start (quick software reset)
Z	reset all
@1	display the device description
@2	display the device identifier
@3 cccccccccccc	store the @2 identifier

Programmable Parameter Commands

PP xx OFF	disable Prog Parameter xx
PP FF OFF	all Prog Parameters disabled
PP xx ON	enable Prog Parameter xx
PP FF ON	all Prog Parameters enabled
PP xx SV yy	for PP xx, Set the Value to yy
PPS	print a PP Summary

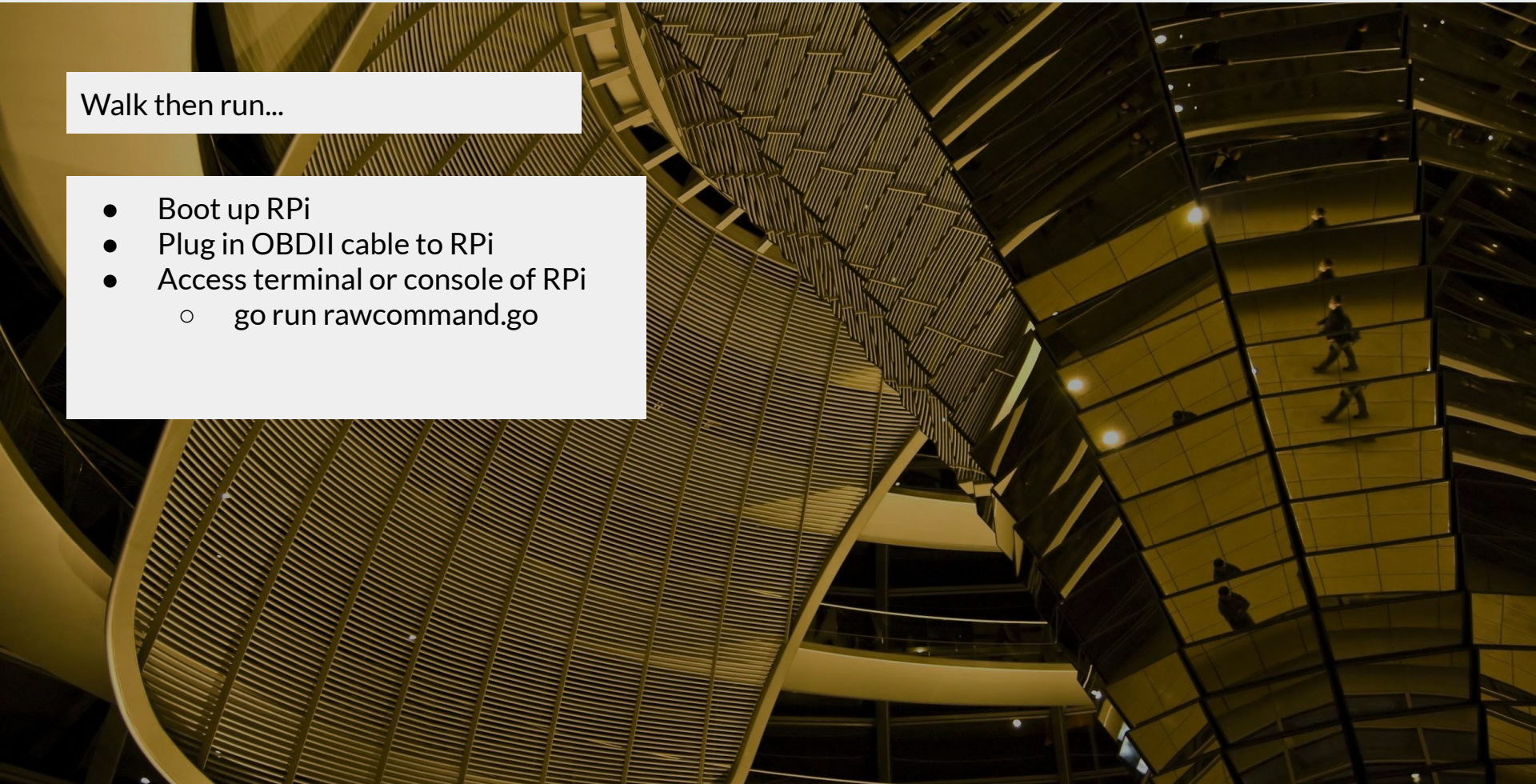
Voltage Reading Commands

CV dddd	Calibrate the Voltage to dd.dd volts
CV 0000	restore CV value to factory setting
RV	Read the input Voltage

Other

IGN	read the IgnMon input level

Demo Time!

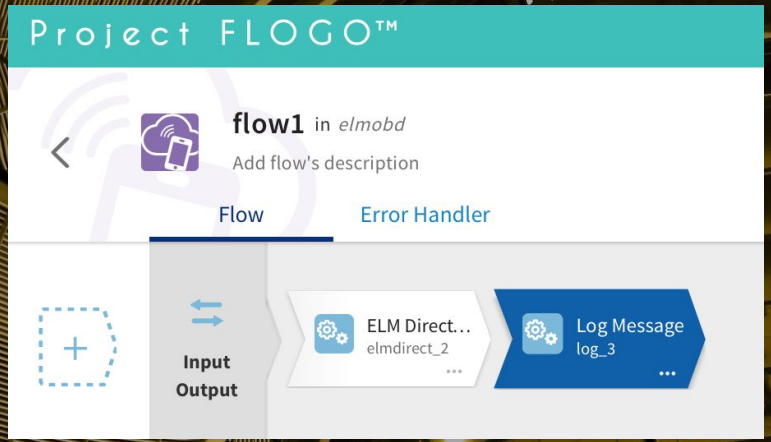


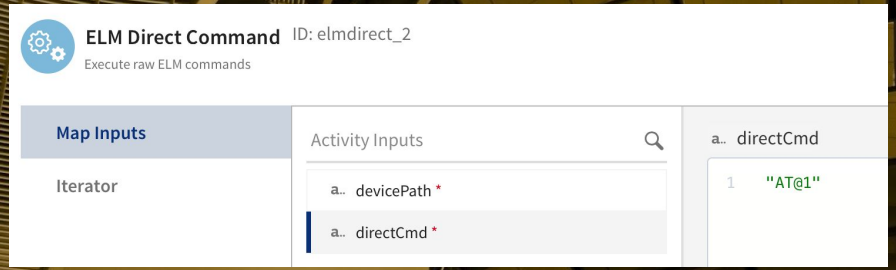
Walk then run...

- Boot up RPi
- Plug in OBDII cable to RPi
- Access terminal or console of RPi
  - go run rawcommand.go

Code free...

- Develop application in graphical tool … Flogo





flow1 in *elmobd*

Add flow's description

Flow | Error Handler

Input
Output

Add Activity

Search...

Install new Activity

Start a SubFlow

Send TCM Message

MyModel

Reply To Trigger

Return

Install Trigger or Activity

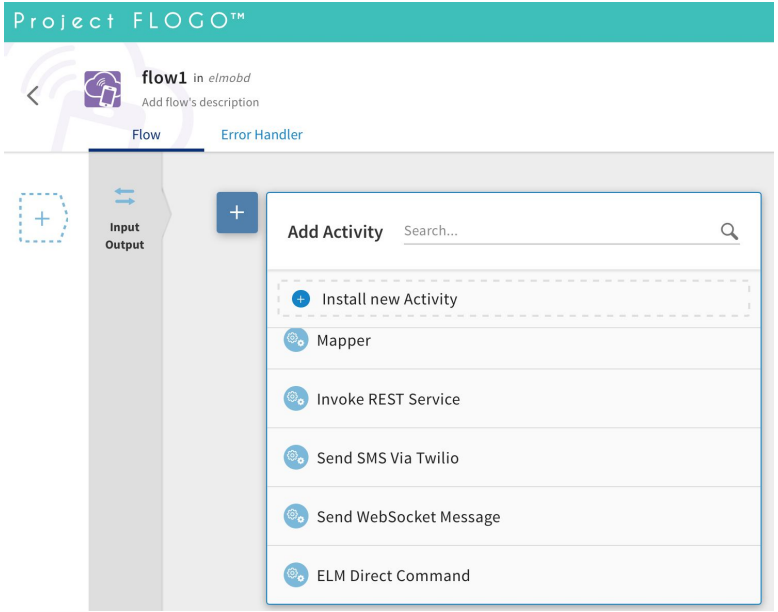
github.com/wkarasz/flogo-elmobd/activity/elmdirect

Cancel | Install

Installing Trigger or Activity

Install successful!

Okay


Project FLOGO™
flow1 in elmobd
Add flow's description
Flow
Error Handler
Input
Output
Add Activity
Search...
Install new Activity
Mapper
Invoke REST Service
Send SMS Via Twilio
Send WebSocket Message
ELM Direct Command

Resources

Project Flogo - https://flogo.io
Flogo Connector for ELMOBD - https://github.com/wkarasz/flogo-elmobd
ELM327 Command Sheets - https://www.elmelectronics.com/ic/elm327/

Further reading:
Hacker Kills Engine GPS Tracking App -
https://motherboard.vice.com/en_us/article/zmpx4x/hacker-monitor-cars-kill-engine-gps-tracking-apps
https://www.iconcox.com/products/3g-gt06e.html

https://www.postscapes.com/connected-car-devices/

Thank you.