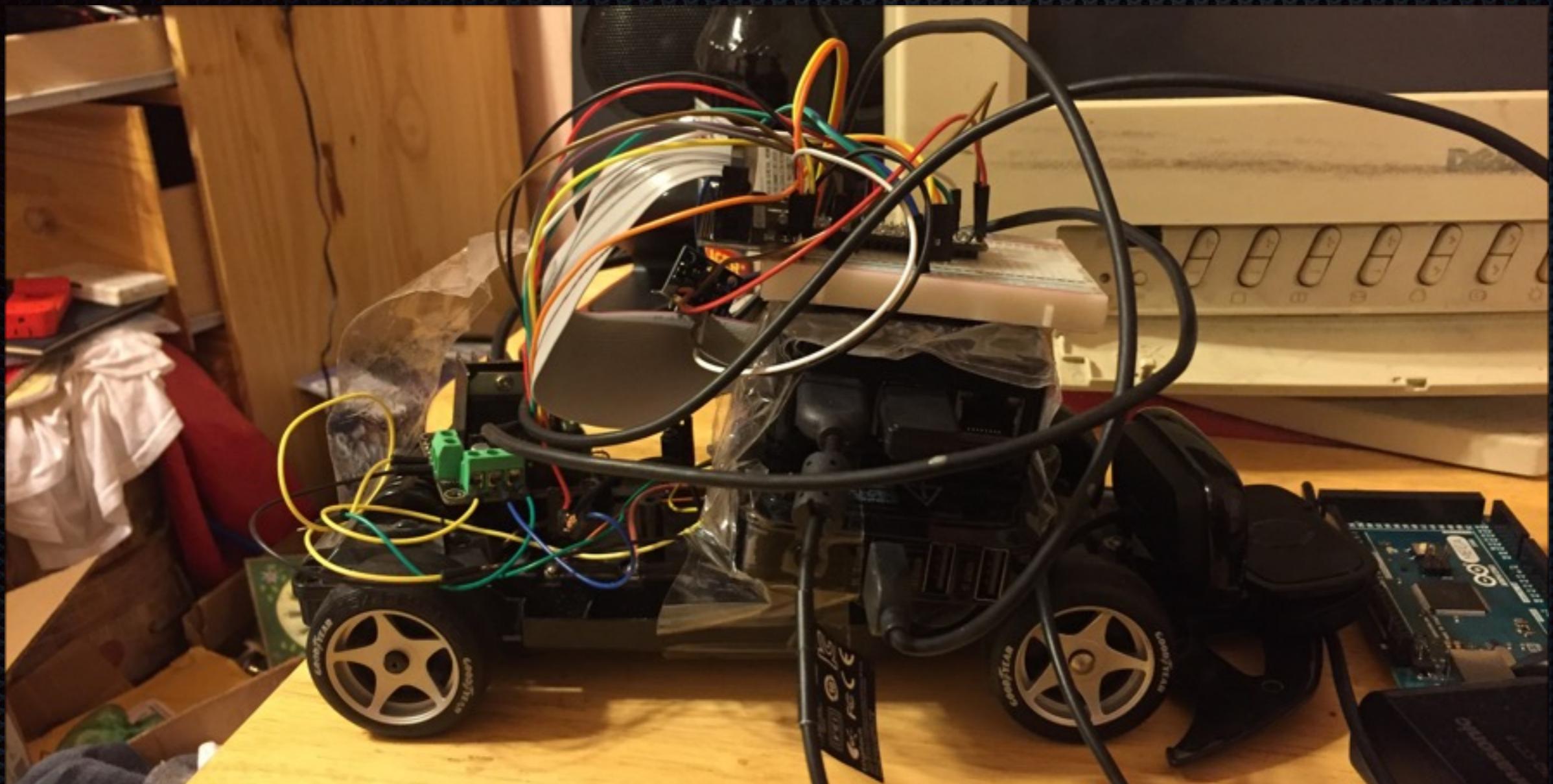


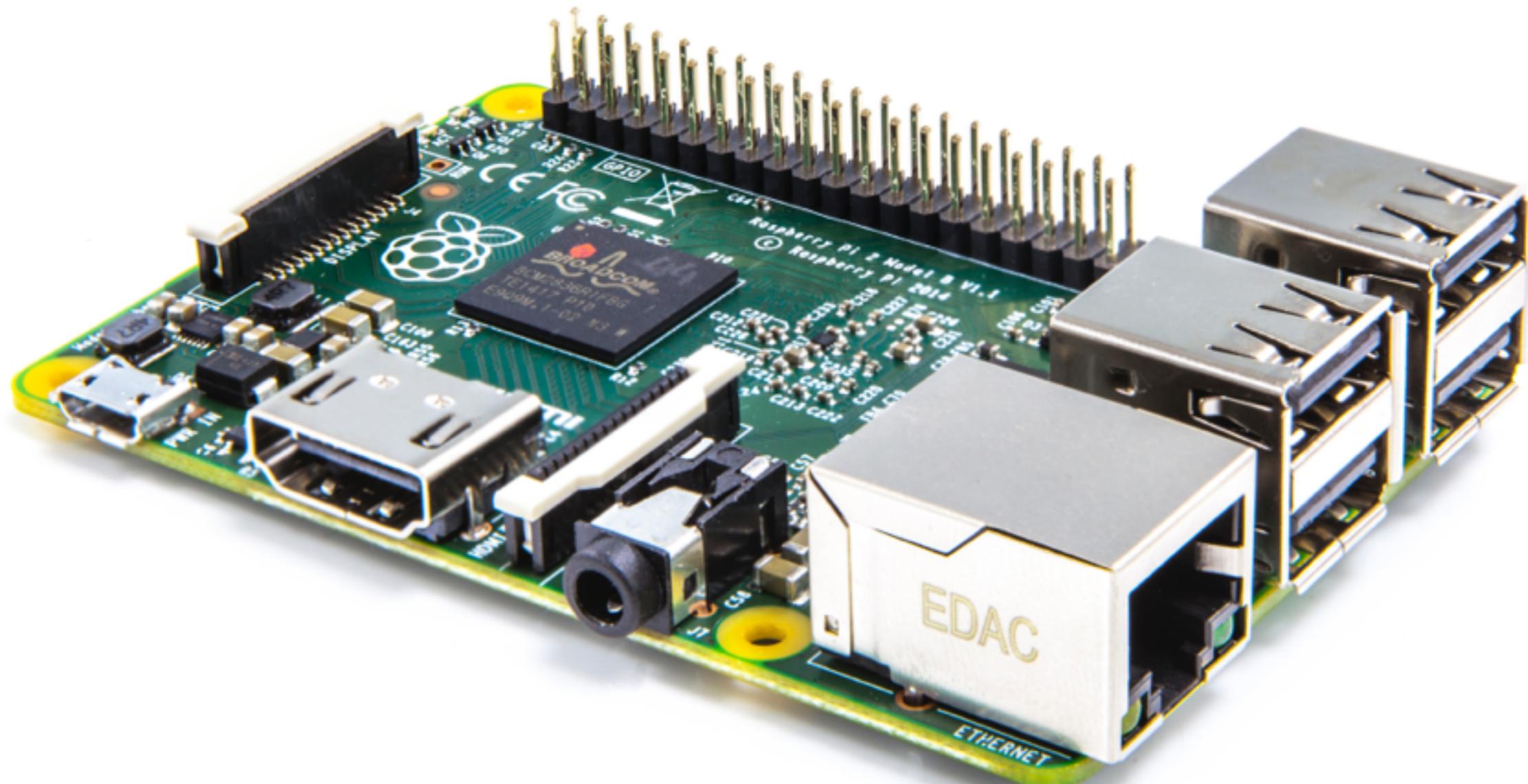
# Building a Drone

## The Hardware and Software



# The Drone

No, it's not a bomb. Wait'll I add lithium batteries though. ;)



# Raspberry Pi 2

The Brain

# Tech Specs

- Broadcom ARMv7 Quad-Core CPU
- 1GB RAM
- HDMI Port
- 40 pin extended GPIO pins
- 100/10 Ethernet
- 4xUSB2.0 ports
- Camera port
- Display port (not DisplayPort)
- Micro SD Card slot
- Micro USB Power source



# ARMv7 Quad-Core CPU

- Four execution cores
- ARMv7 instruction set
- 900MHz clock speed



# 1GB RAM Chip

- ELPIDA RAM
- 8132B means 8132Mb or 1GB of RAM





- High-Definition interface
- Capable of 1080p video
- Supports audio over HDMI

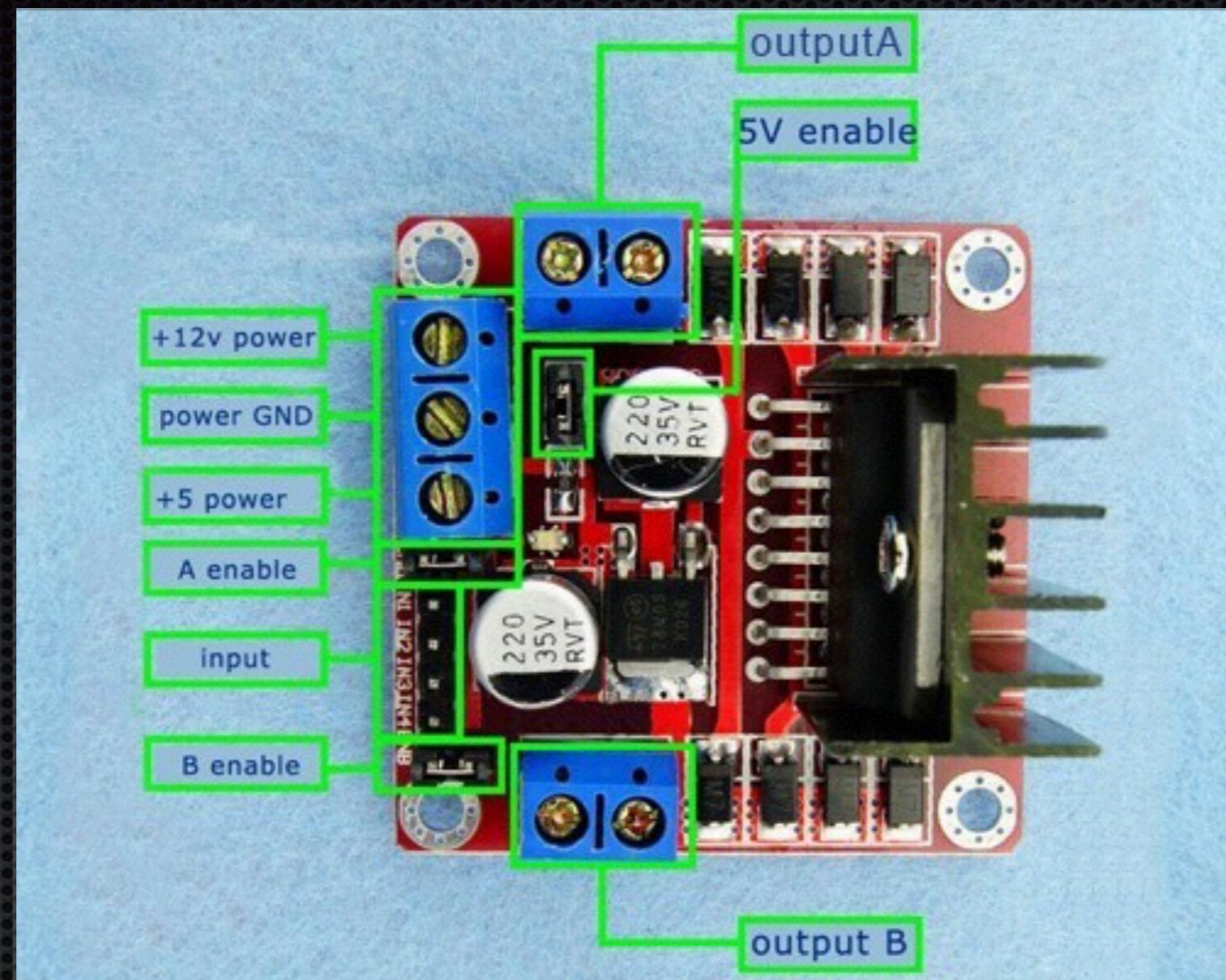
# GPIO (General-Purpose Input/Output)

- I<sup>2</sup>C - Hardware communication protocol
- SPI - Another protocol
- GPIO pins support PWM (Pulse-width modulation)

Raspberry Pi2 GPIO Header		
Pin#	NAME	NAME
01	3.3v DC Power	DC Power 5v
03	GPIO02 (SDA1 , I <sup>2</sup> C)	DC Power 5v
05	GPIO03 (SCL1 , I <sup>2</sup> C)	Ground
07	GPIO04 (GPIO_GCLK)	(TXD0) GPIO14
09	Ground	(RXD0) GPIO15
11	GPIO17 (GPIO_GEN0)	(GPIO_GEN1) GPIO18
13	GPIO27 (GPIO_GEN2)	Ground
15	GPIO22 (GPIO_GEN3)	(GPIO_GEN4) GPIO23
17	3.3v DC Power	(GPIO_GEN5) GPIO24
19	GPIO10 (SPI_MOSI)	Ground
21	GPIO09 (SPI_MISO)	(GPIO_GEN6) GPIO25
23	GPIO11 (SPI_CLK)	(SPI_CE0_N) GPIO08
25	Ground	(SPI_CE1_N) GPIO07
27	ID_SD (I <sup>2</sup> C ID EEPROM)	(I <sup>2</sup> C ID EEPROM) ID_SC
29	GPIO05	Ground
31	GPIO06	GPIO12
33	GPIO13	Ground
35	GPIO19	GPIO16
37	GPIO26	GPIO20
39	Ground	GPIO21

Rev. 1  
06/01/2014

<http://www.element14.com>

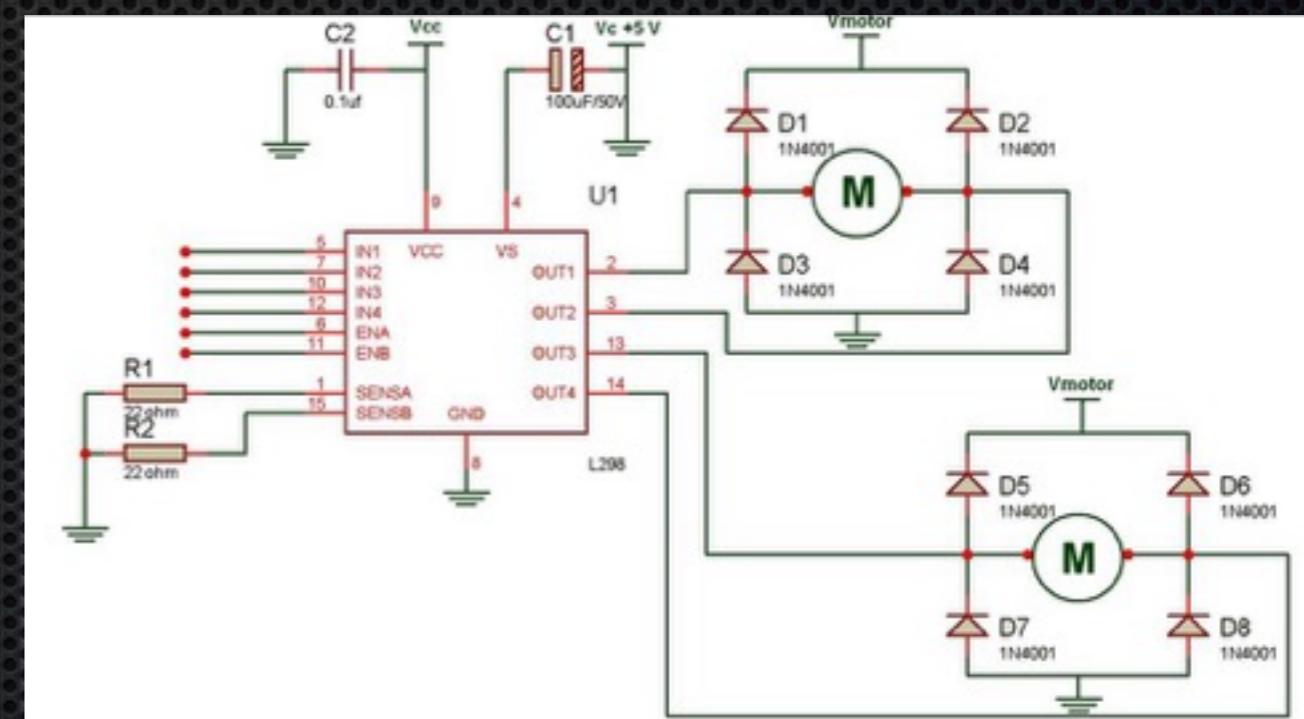


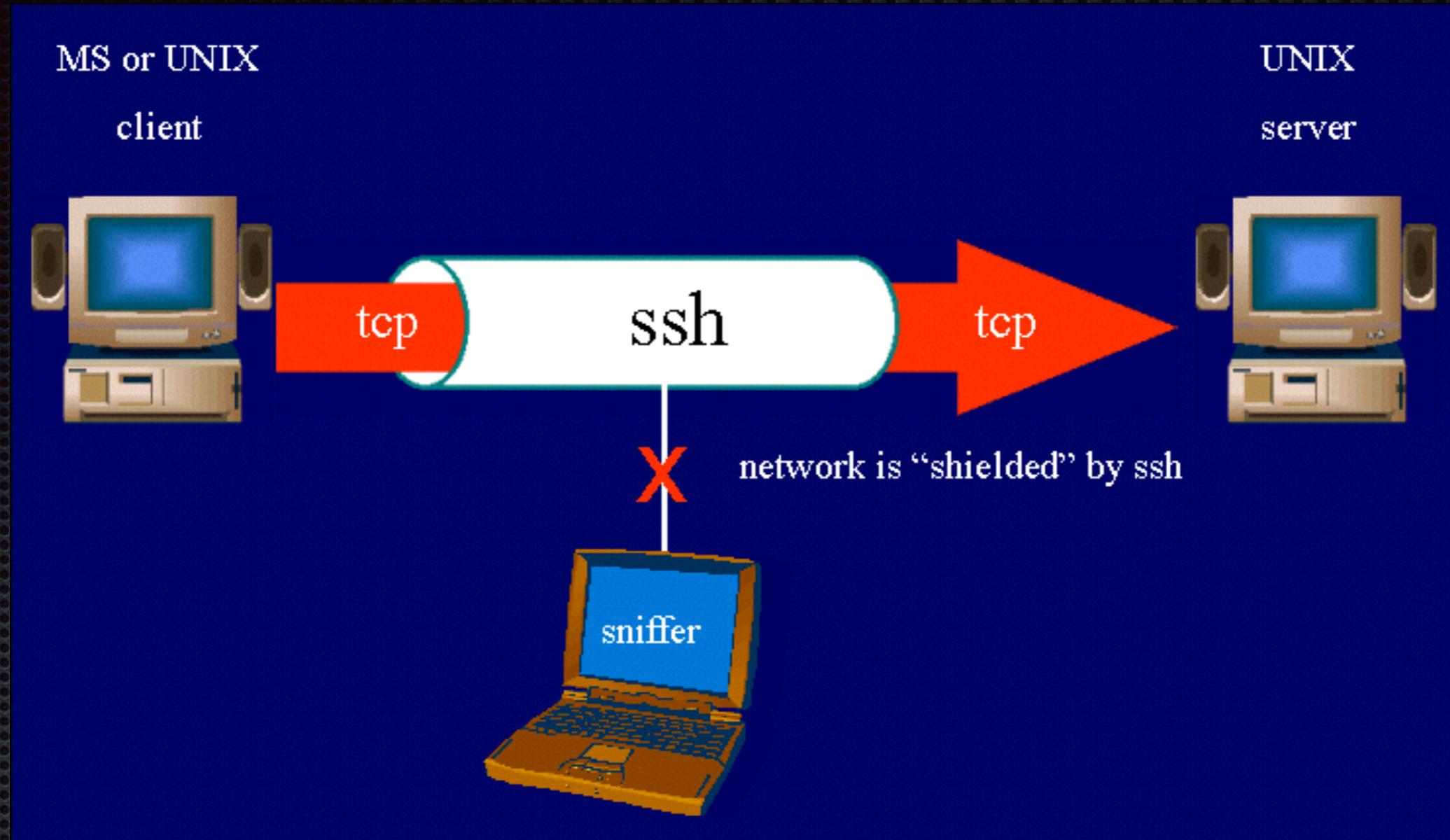
# Motor Controller

## L298N

# Controller Specs

- Support for two motors  
(Motor A and motor B)





# SSH and L2TP

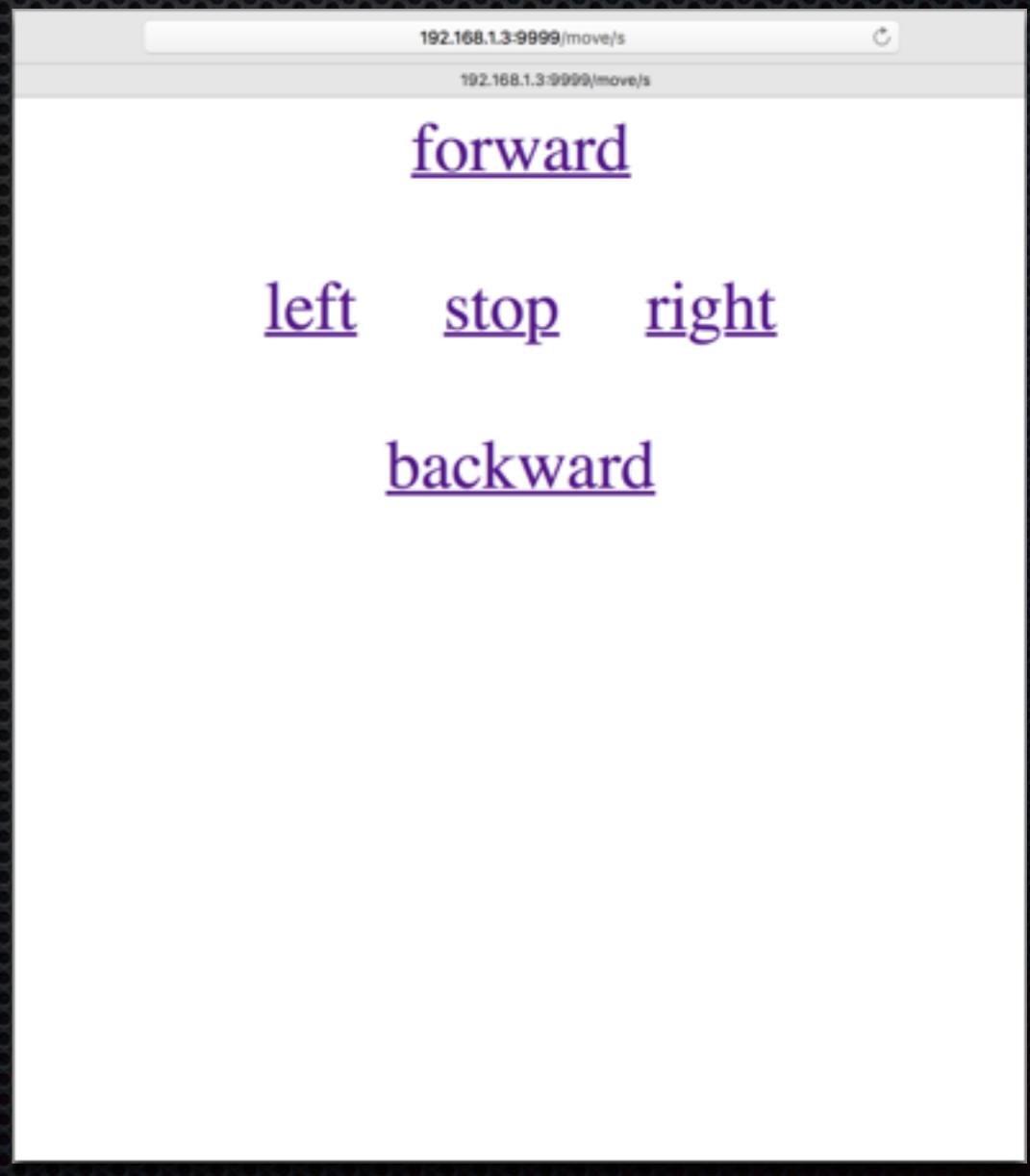
## The protocols

# Protocol Usage

- Drone connects to SSH server on boot, and activates remote port forwarding
- Forwards port 7777 on the server to port 22 on the drone
- Forwards port 9999 on the server to port 8081 on the drone (Python web-server)
- Allows access from the Internet, through an L2TP VPN connection, hosted on the same server

# Python-based HTTP Server

- Operates on port 8081 on the drone
- Provides basic control



# Final Notes

- Raspbian OS (Debian-based distribution)
- 1080p HD Camera, accessible remotely
- Supports not only forward, but backward, left, right, and stop!