Practical Python - Internet of Things

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Outline

Introducing MicroPython

- Python for microcontroller boards
- Started as a Kickstarter
- All Open Source

Introducing the ESP8266

- 80MHZ processor
- lots of GPIO pins
- Digital interfaces
- One Analogue
- Wifi
- Cheap
- reasonably well documented (now)

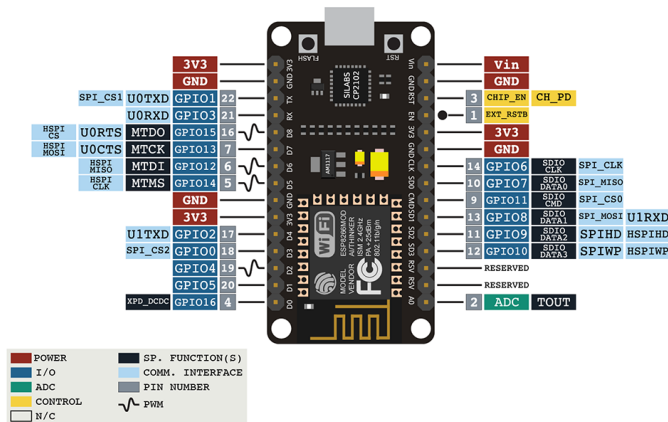## ESP8266 Development Board

Pin Mapping

Micropython	Board
0	D3
2	D4 (also Led1 but inverse)*
4	D2
5	D1
9	SD2
10	SD3
12	D6
13	D7
14	D5
15	D8
16	D0 (also Led2 but inverse)*

Introduction to Electricity

► The water analogy

http://www.electricalonline4u.com/2015/10/
ohm-law-explanation-guide.html
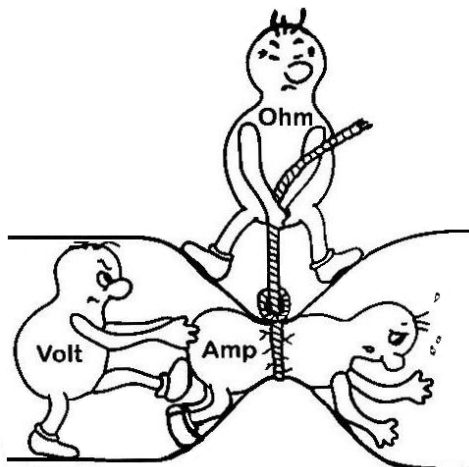
Installation

► Install Python, e.g. http://anaconda.org
► Install esptool

```
> pip install esptool
```

► Clear flash memory

```
> esptool.py --port /dev/ttyUSB0 erase_flash
```

► Download MicroPython
  http://github.com/micropython/micropython/releases
► Flash board

```
> esptool.py --port /dev/ttyUSB0 --baud 460800 write_flash
    --flash_size=detect 0 ~/Downloads/esp8266-$version.bin
```

Setup

- ▶ Connect to the board

```
> screen /dev/ttyUSB0 115200
```

- ▶ Hit enter!
- ▶ Work out WIFI name

```
> import network
> ap = network.WLAN(network.AP_IF)
> ap.config("essid")
```

- ▶ Write this down!
- ▶ Turn on the Web Server

```
> import webrepl_setup
```

- ▶ Follow the prompts. Pick a simple password.
- ▶ Turn on Web Server
- ▶ Reboot...
- ▶ Connect to Board, password is micropythoN

Look Around

- ▶ Micropython implements a filesystem, just like a computer.

```
> import os
> os.listdir()
```
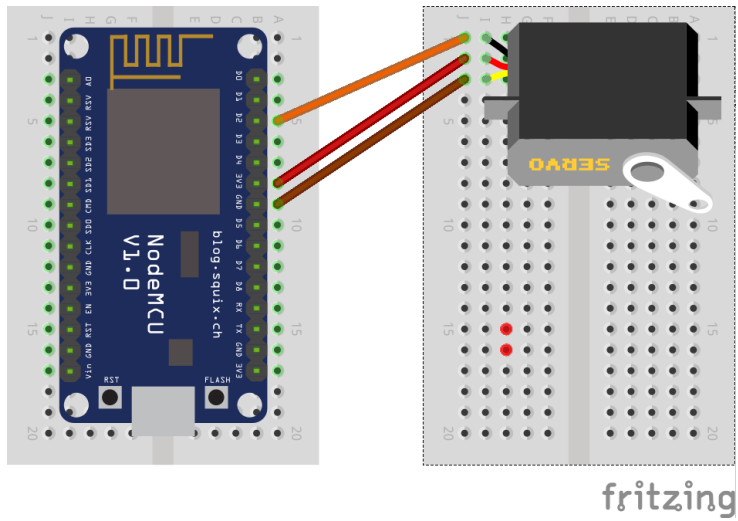
RGB LED Layout

fritzing
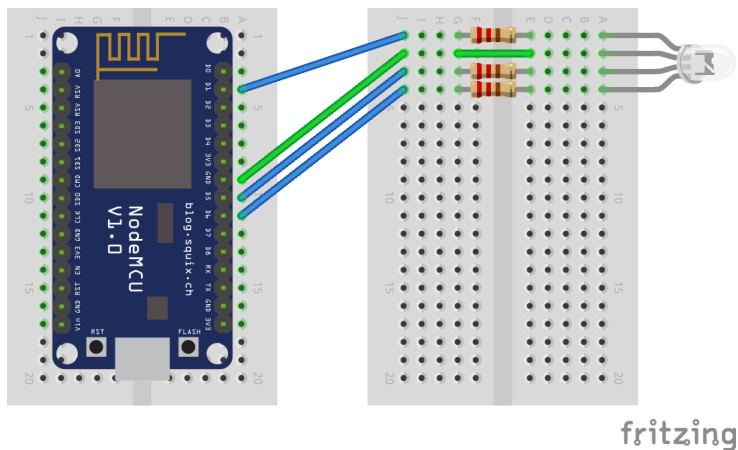
RGB LED Code

```
> from machine import Pin, PWM
> r = PWM(Pin(4), freq=500, duty=0)
> g = PWM(Pin(12), freq=500, duty=0)
> b = PWM(Pin(14), freq=500, duty=0)
>
```
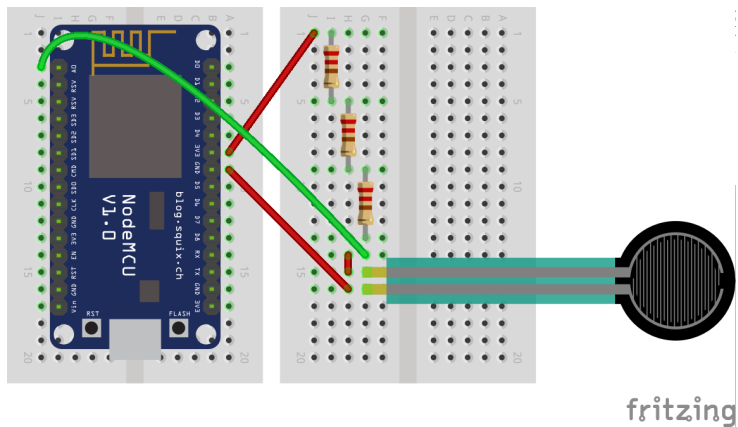
Servo Layout

- Orange - PWM
- Red - +V
- Brown - Ground

Servo Code

```
> from machine import Pin, PWM
> s = PWM(Pin(14), freq=50, duty=0)
```
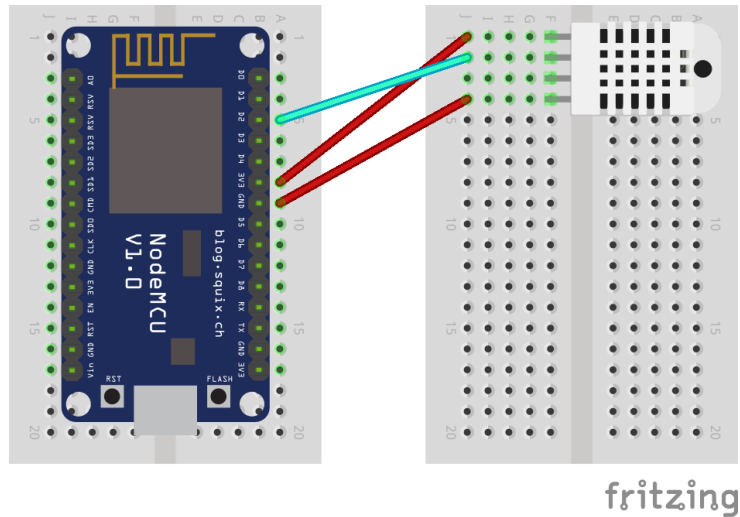
Force Sensor Layout

Force Sensor Code

```
> from machine import ADC
> adc = ADC(0)
> adc.read()
```

Temperature Sensor Layout

Temperature Sensor Code

```
> import dht
> import machine
> d = dht.DHT11(machine.Pin(4))
>
> # Only once a second.
> d.measure()
> d.temperature()
> d.humidity()
```

Stand Alone Mode

- Special files:
  - boot.py, main.py
- Wifi

```
> import network
> n = network.WLAN(network.STA_IF)
> n.active(True)
> n.connect("slqwireless")
> n.isconnected()
> n.ifconfig()
```

Resources

- These notes: Copyright © 2017 Clinton Roy
  - https://github.com/clintonroy/slq2017python ©①
- https://docs.micropython.org/en/latest/esp8266/
  esp8266/tutorial/
- http://fritzing.org/