

# GPS Tracker Nerves

# Yann Very

@yannvery



# Topics

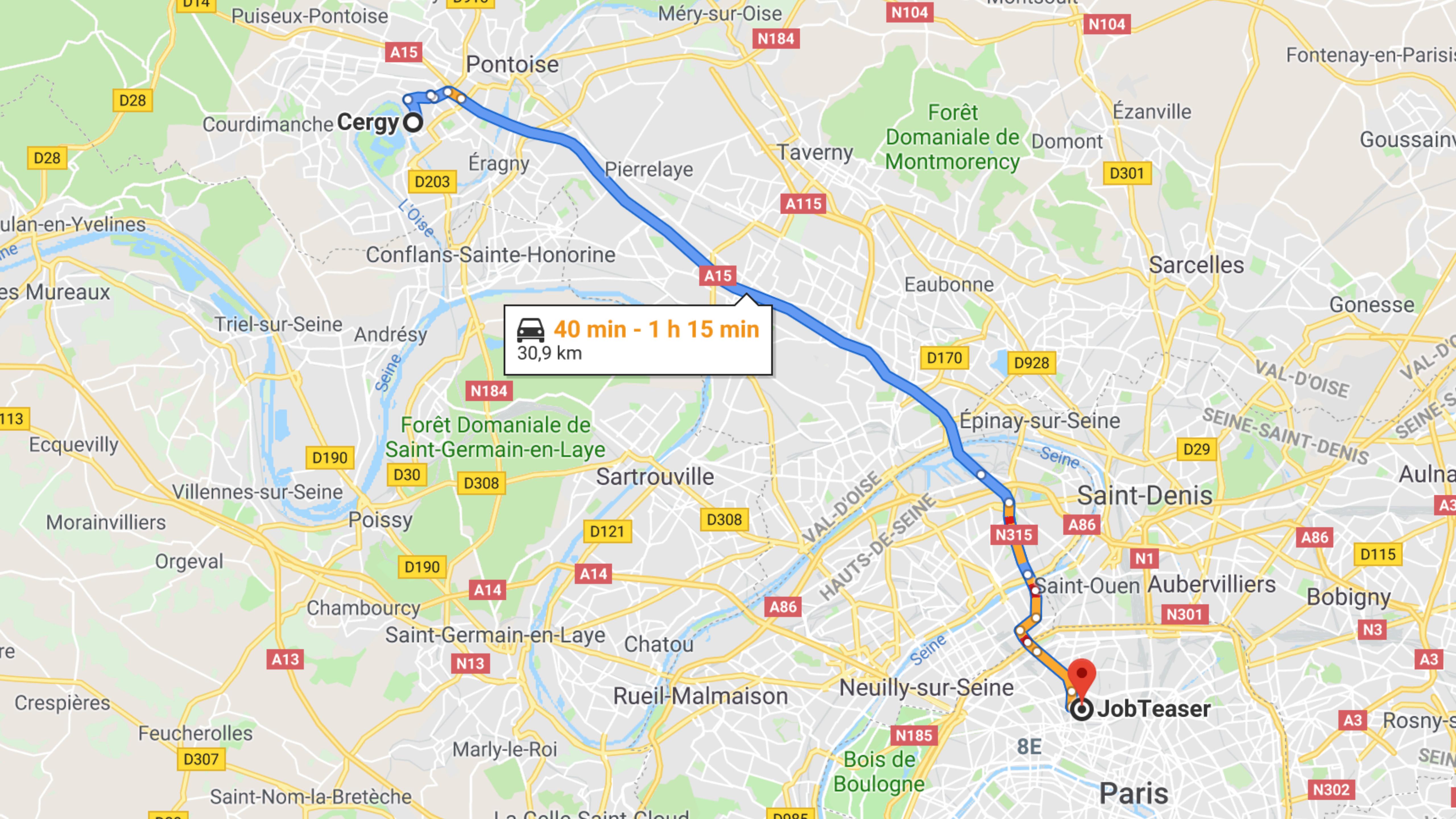
Context

Nerves

GPS / Hardware

Implementation

# Why?

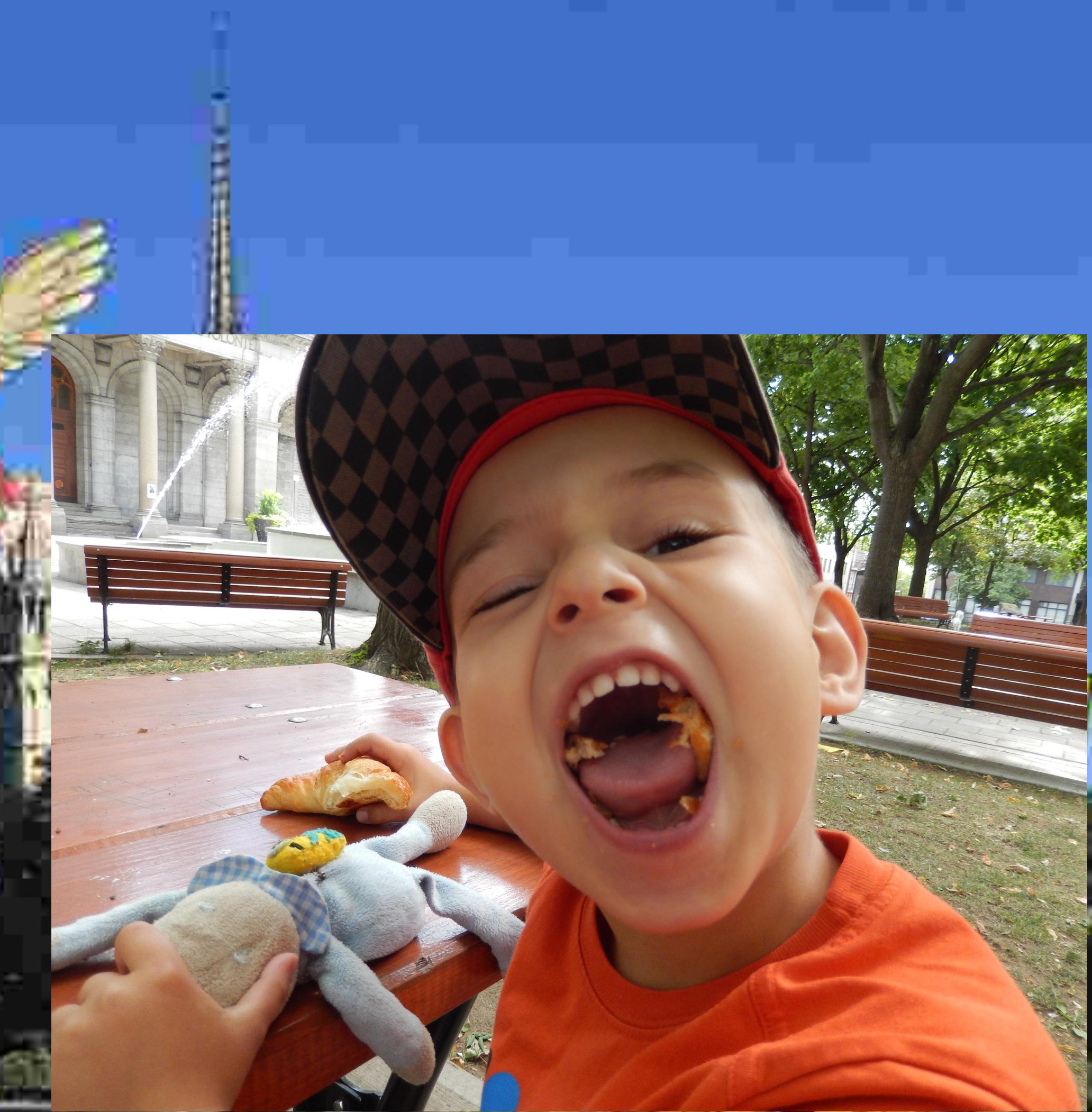
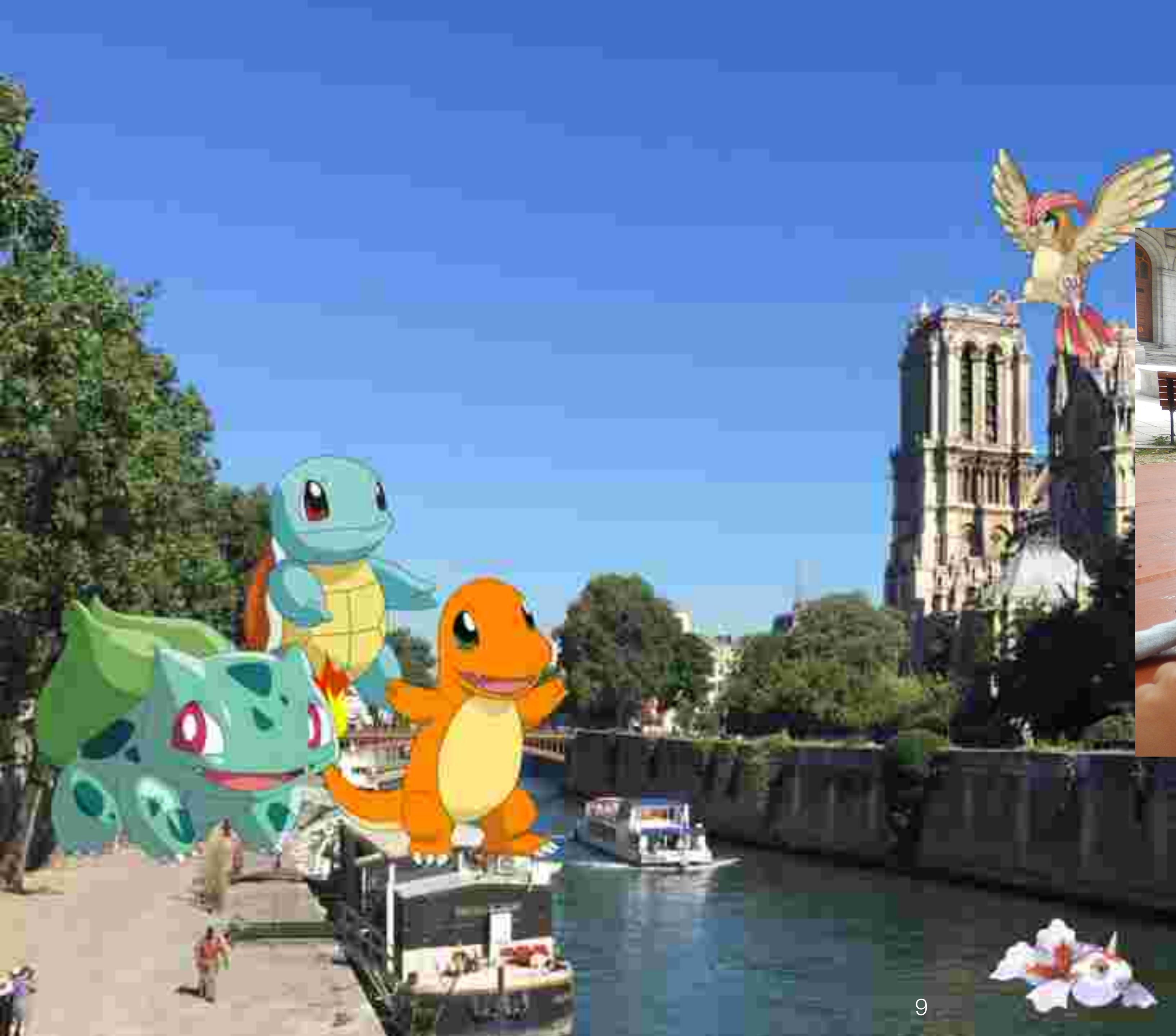




OHMAGIF.COM







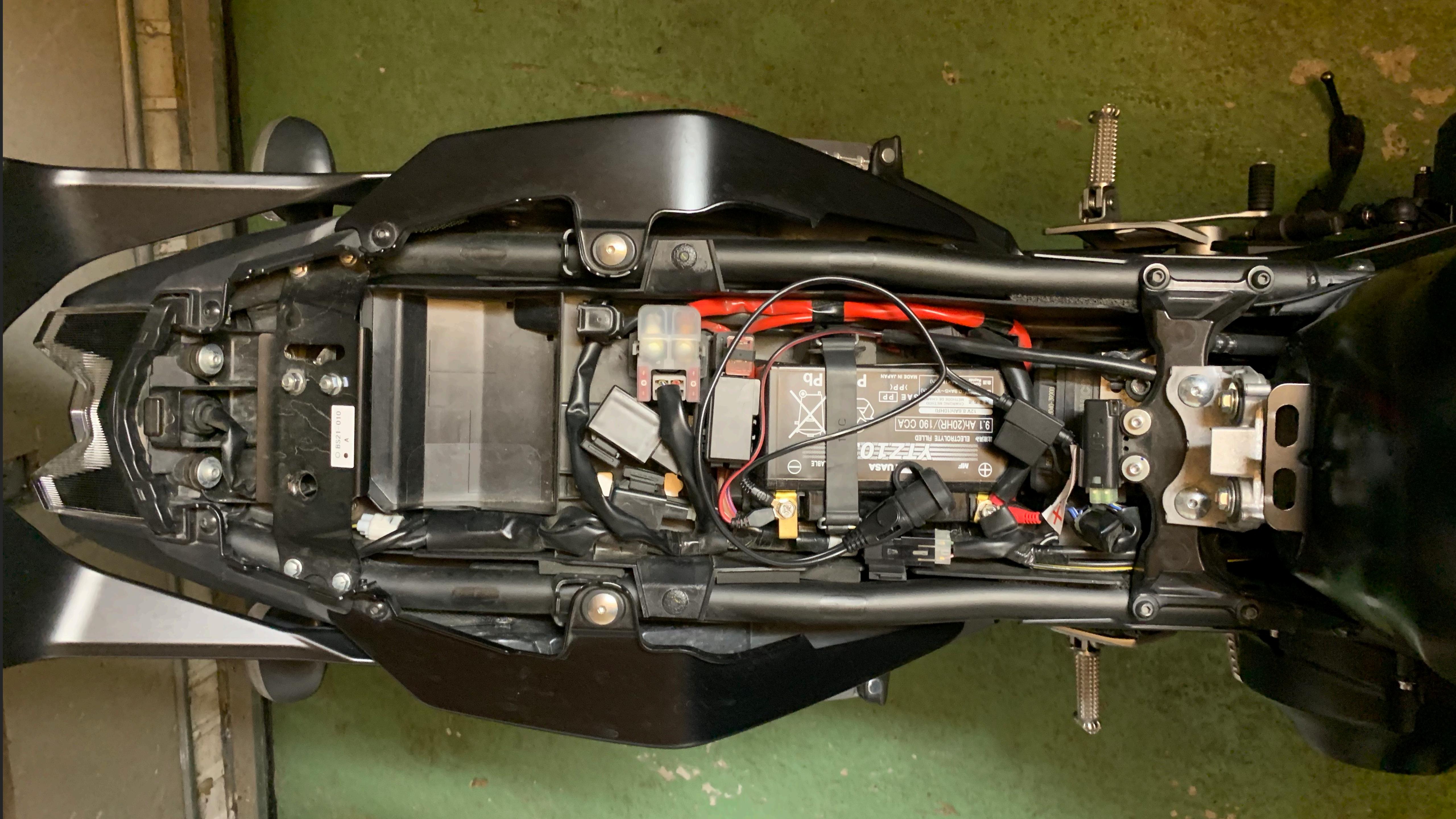




# Core Feature

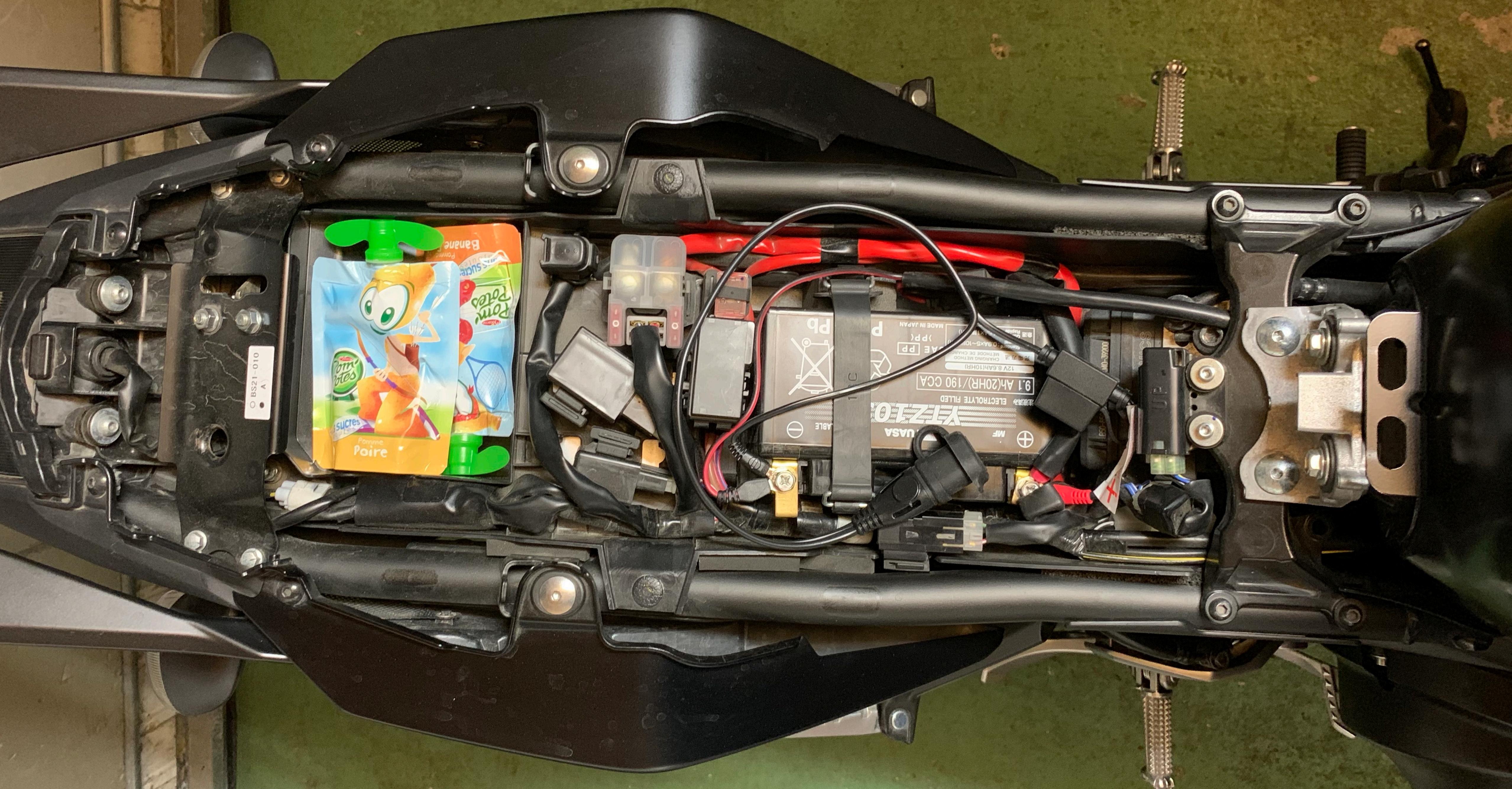
- Make a GPS tracker
- Emit my position
- Provide an html page with my current position

# Where to begin?



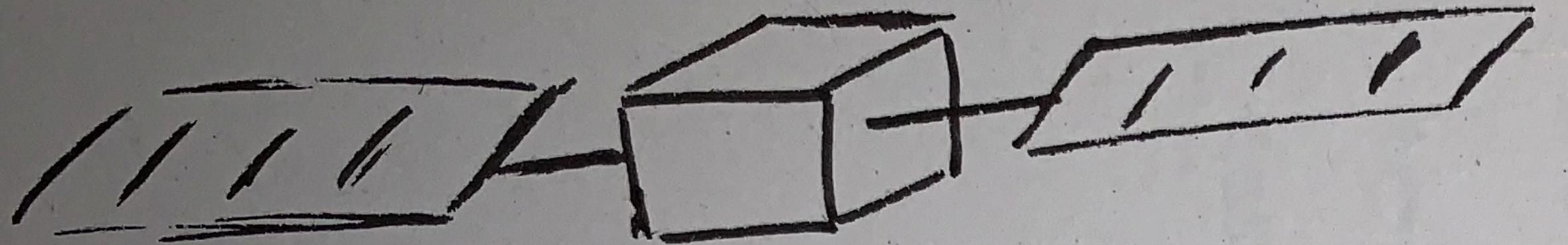
9.1 AH(20HR)/190 CCA  
MADE IN JAPAN  
30A-60A  
SAE PP  
Pb  
YUASA  
AGM  
ELECTROLYTE FILLED  
TEC AUTOMOTIVE

BS21 010  
A

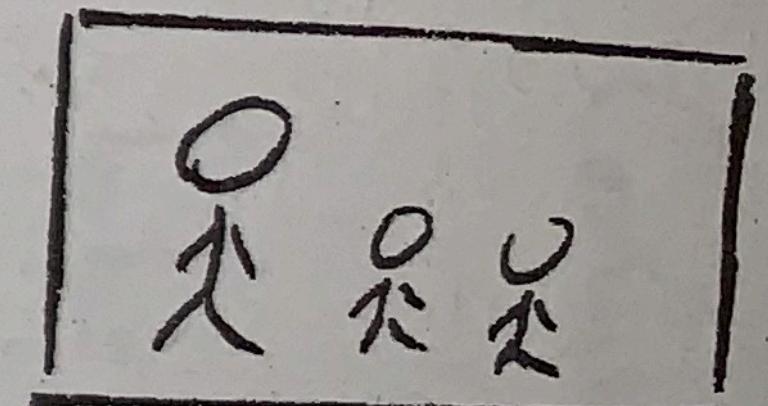
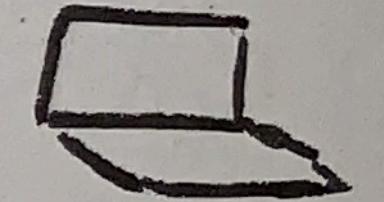
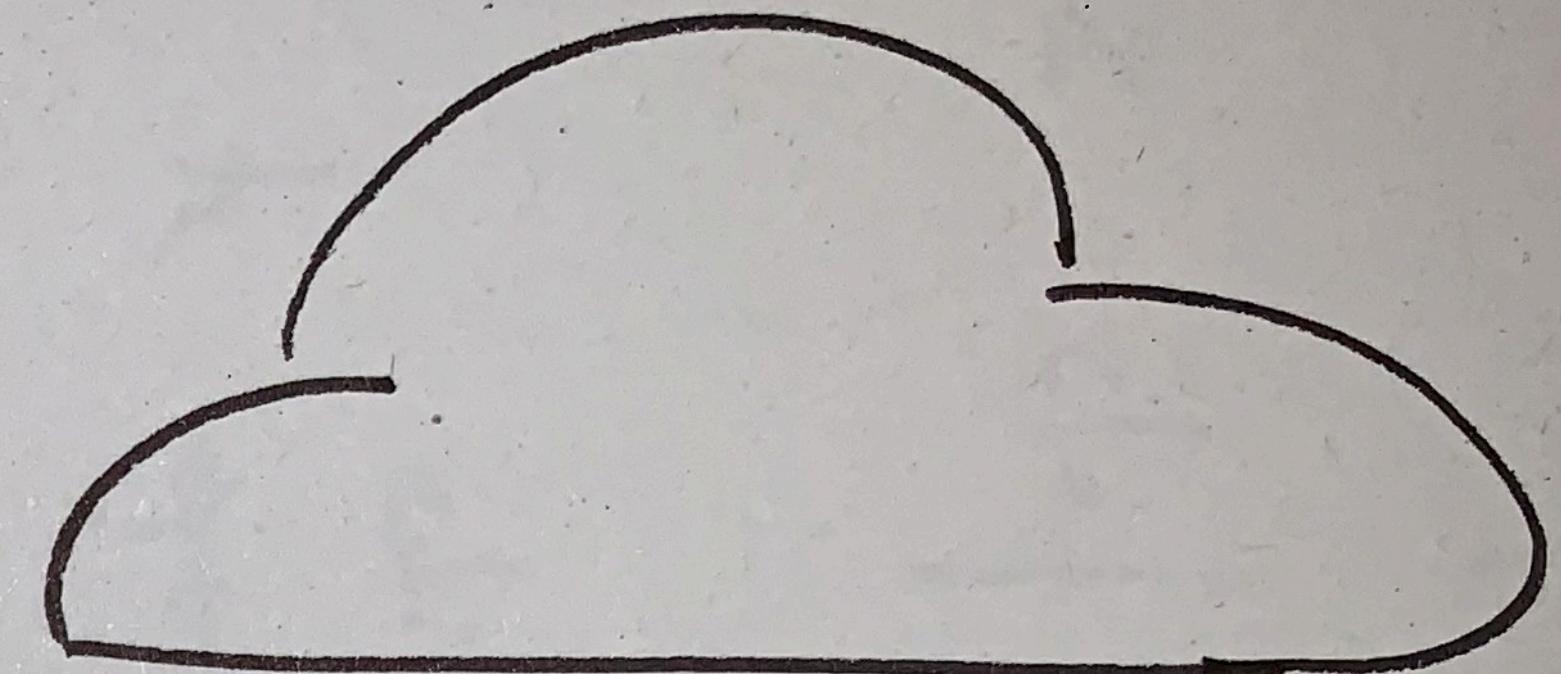


# Identifying the unknown

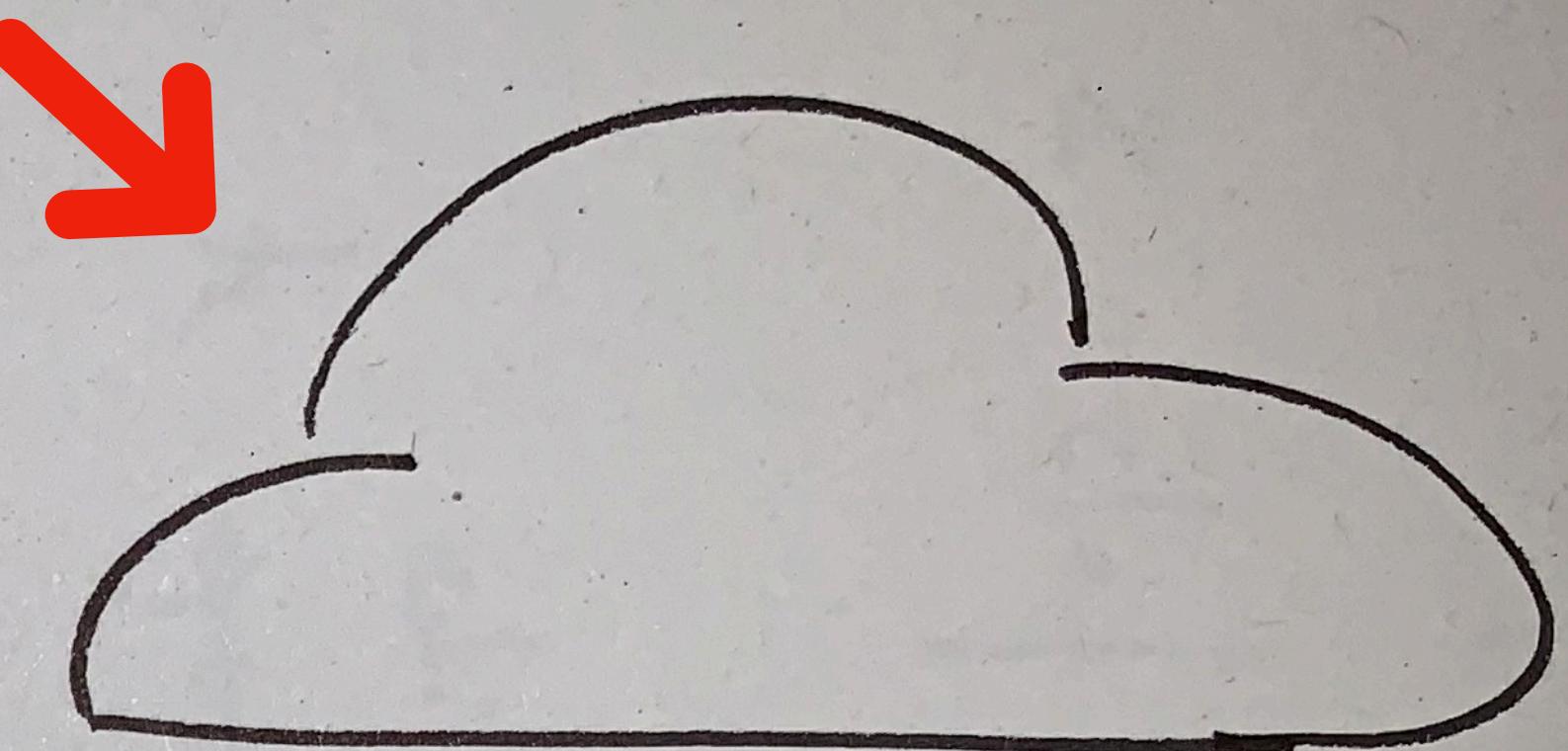
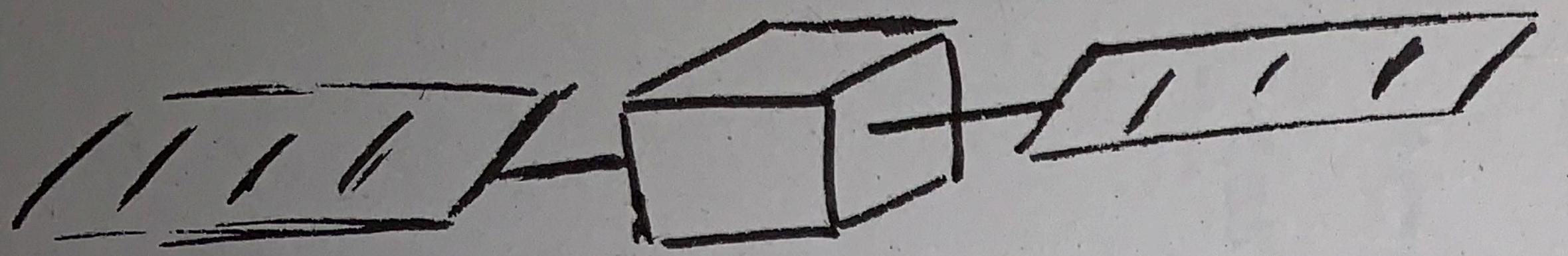
# By making a plan



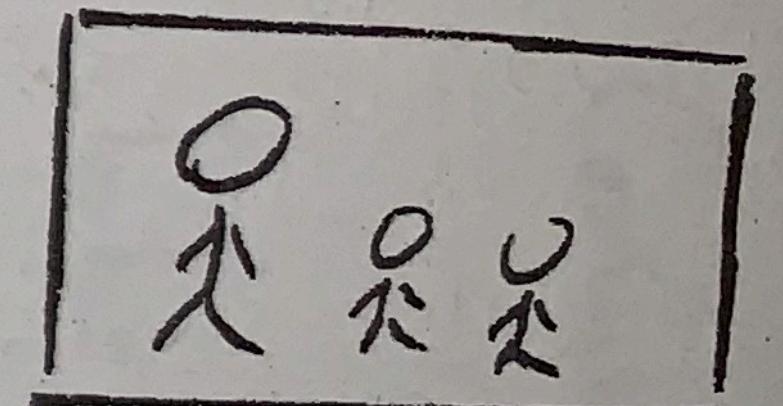
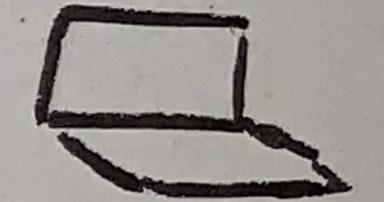
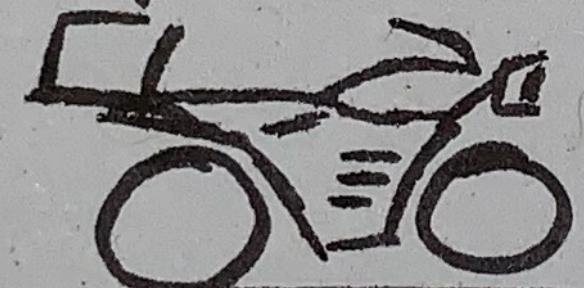
Tracker  
Gps





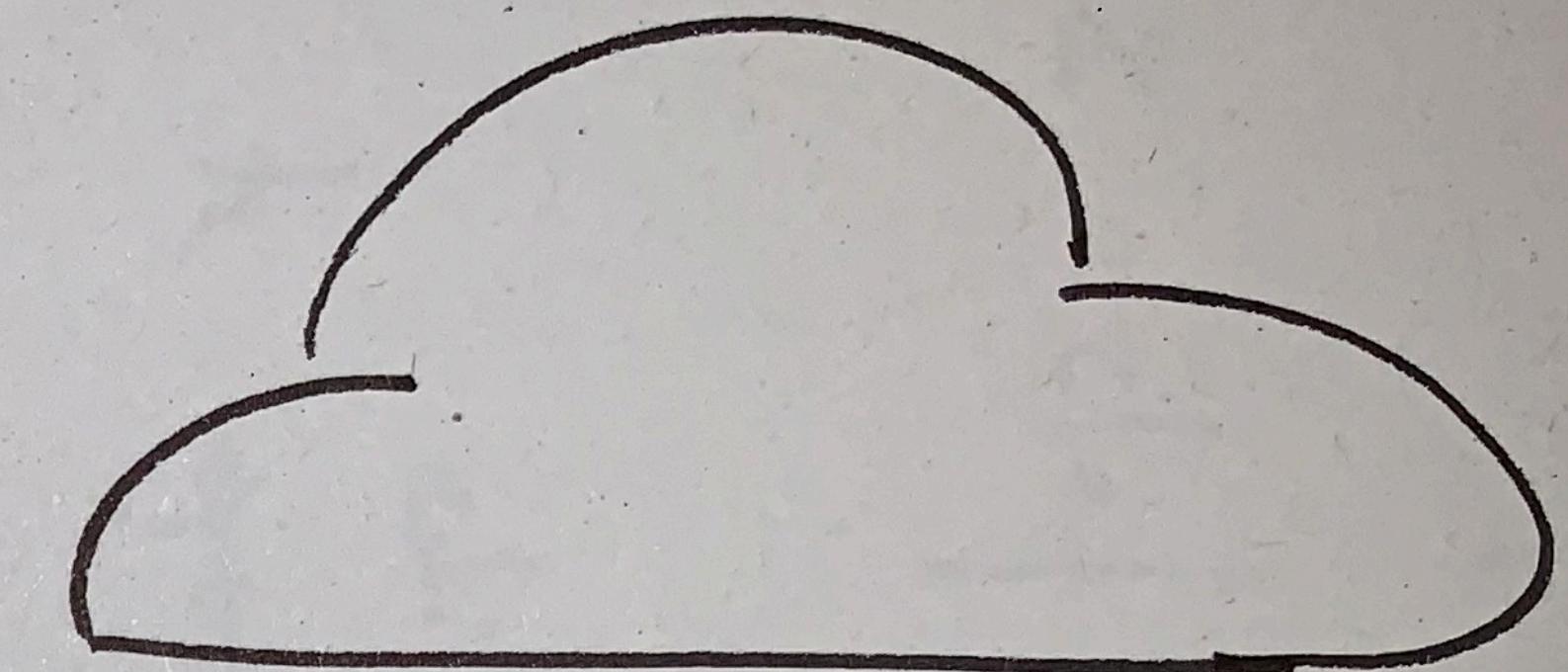
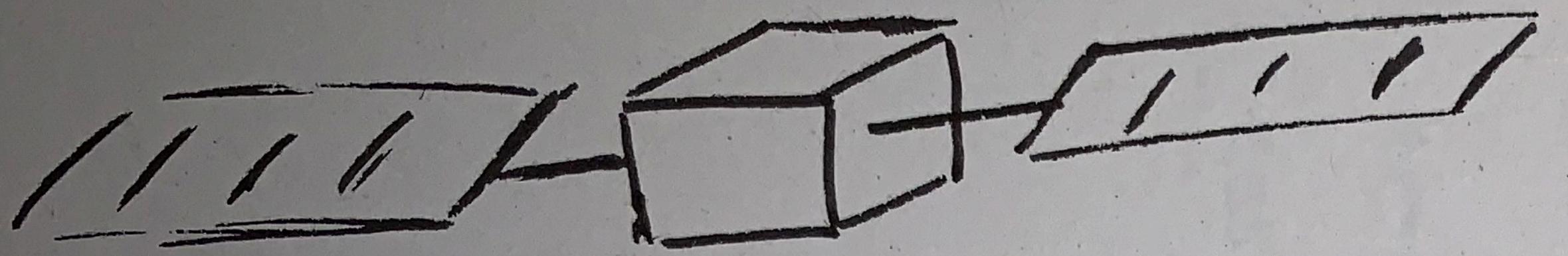


Tracker  
Gps

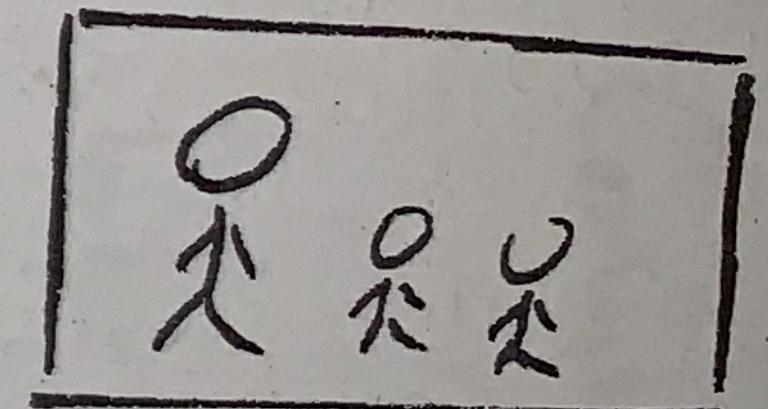
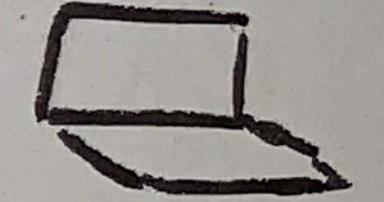
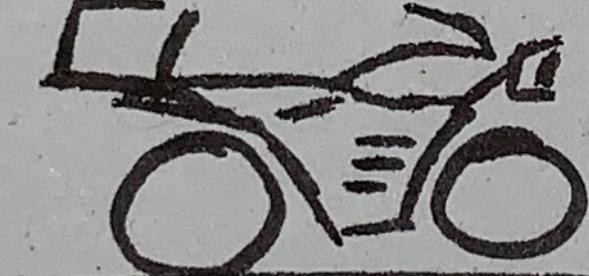


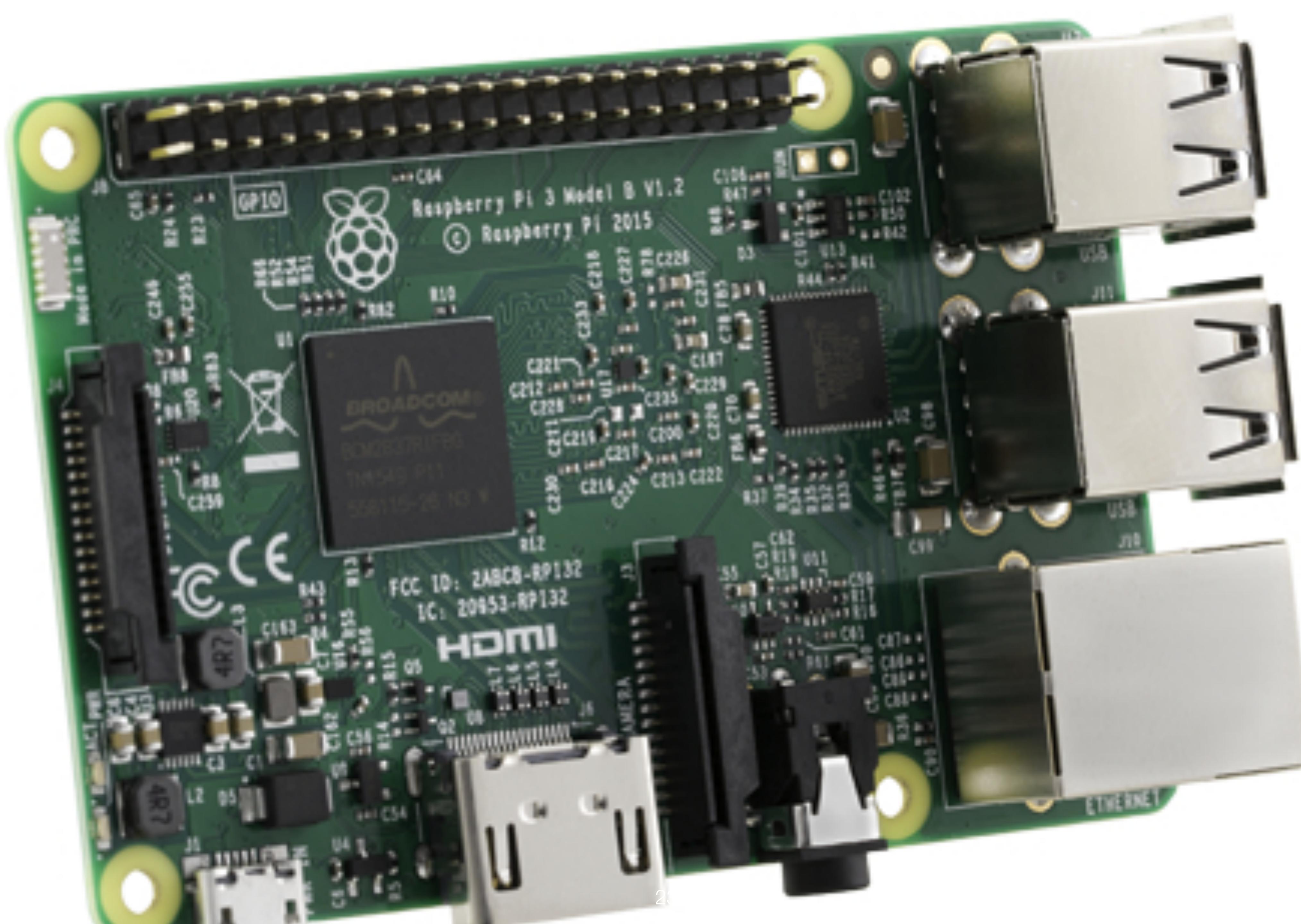
# A web app

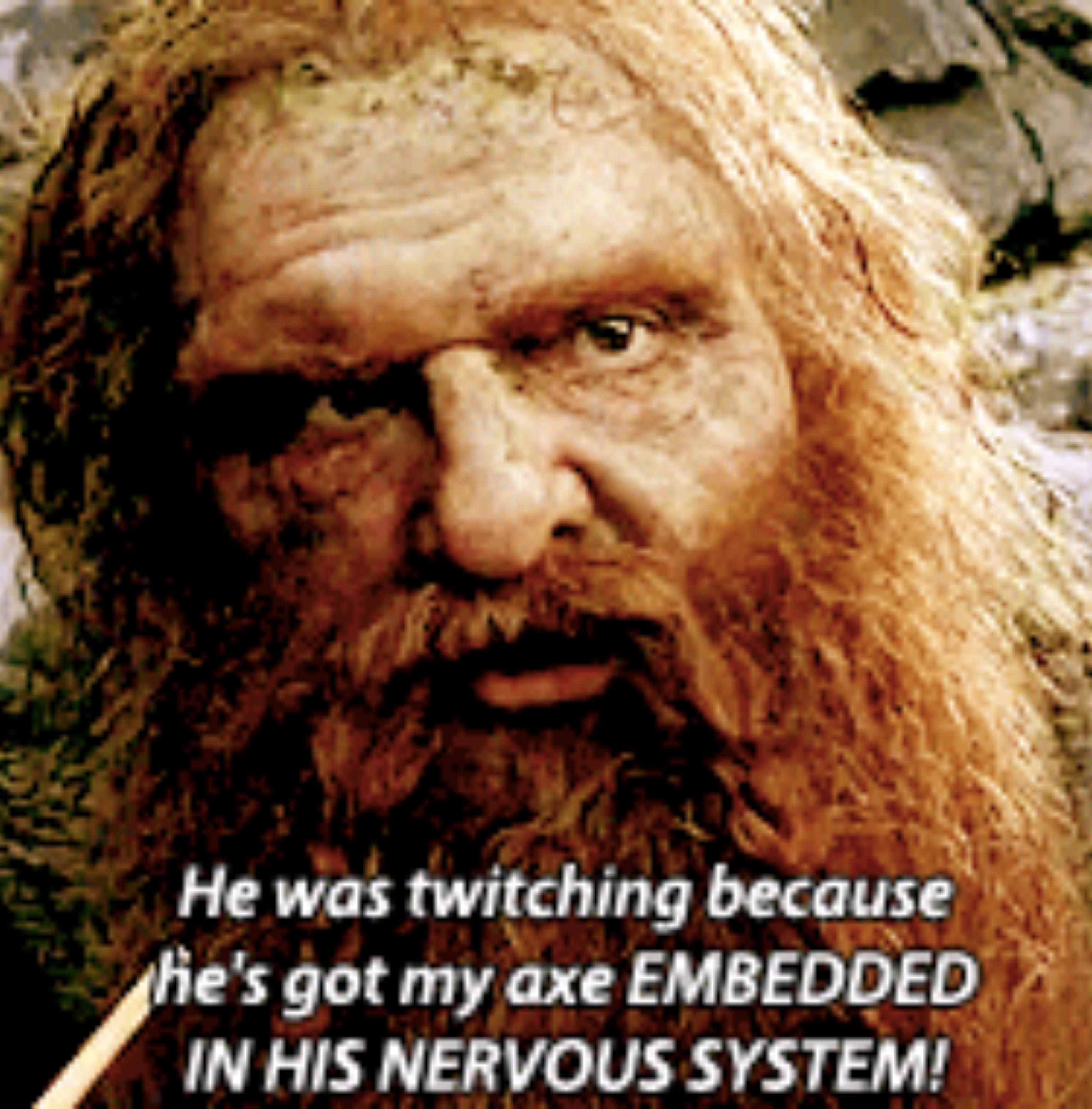




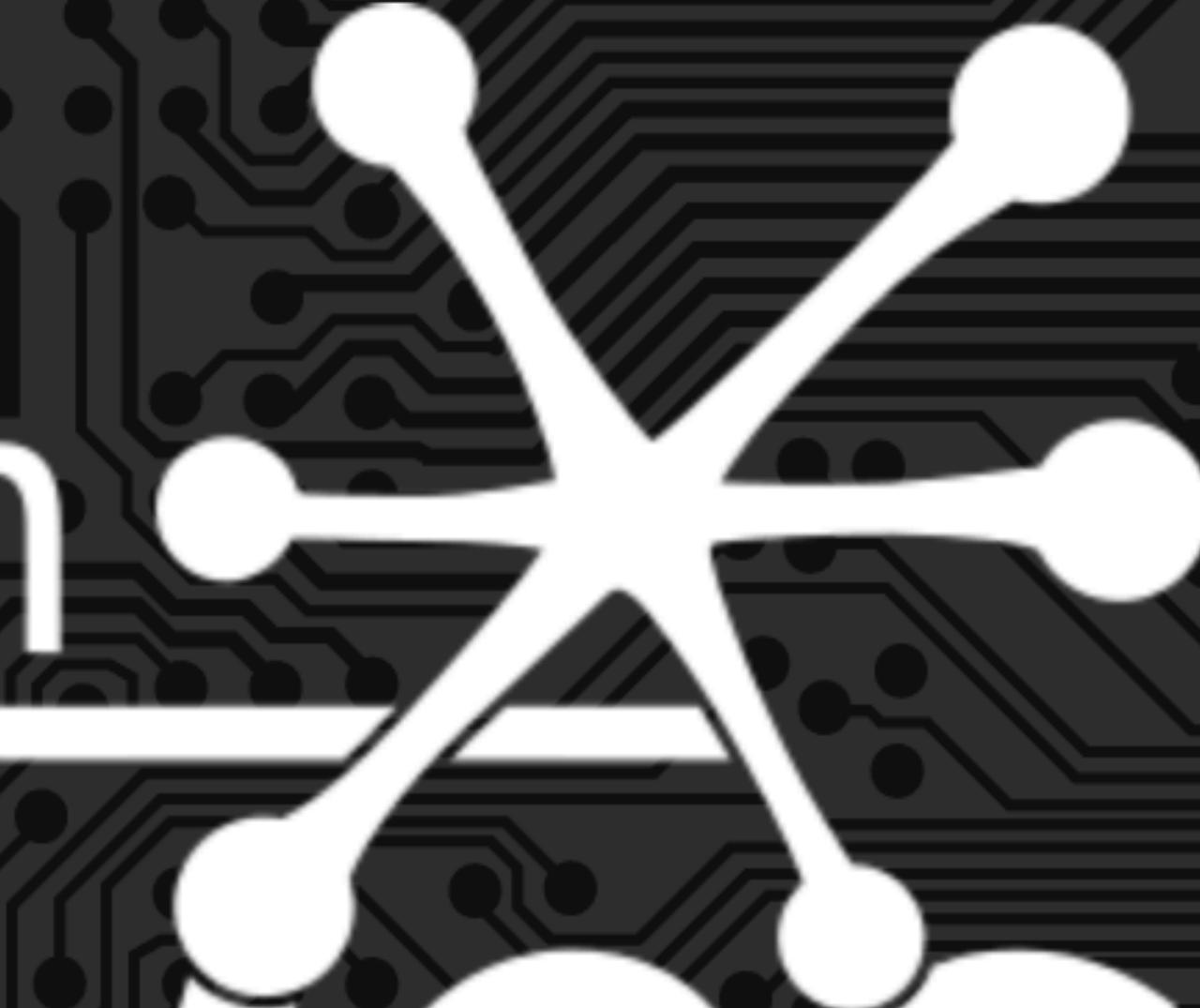
Tracker  
Gps







***He was twitching because  
he's got my axe EMBEDDED  
IN HIS NERVOUS SYSTEM!***



Built with  
nerves

 [nerves-project / nerves](#)

[Watch ▾](#) 52    [Star](#) 1,200    [Fork](#) 96

[Code](#)    [Issues 20](#)    [Pull requests 1](#)    [Projects 0](#)    [Wiki](#)    [Security](#)    [Insights](#)

Craft and deploy bulletproof embedded software in Elixir <http://nerves-project.org>

[elixir](#)    [nerves](#)    [embedded](#)

 802 commits     3 branches     54 releases     59 contributors     Apache-2.0

## Contributors

This project exists thanks to all the people who contribute.



[Become a Backer](#)

# Nerves

Platform

Framework

Tooling

# Platform

## Supported Targets and Systems

TARGET	SYSTEM	TAG
Raspberry Pi A+, B, B+	<a href="#"><u>nerves_system_rpi</u></a>	<code>rpi</code>
Raspberry Pi Zero and Zero W	<a href="#"><u>nerves_system_rpio</u></a>	<code>rpi0</code>
Raspberry Pi 2	<a href="#"><u>nerves_system_rpi2</u></a>	<code>rpi2</code>
Raspberry Pi 3 B, B+	<a href="#"><u>nerves_system_rpi3</u></a>	<code>rpi3</code>
BeagleBone Black, BeagleBone Green, BeagleBone Green Wireless, and PocketBeagle.	<a href="#"><u>nerves_system_bbb</u></a>	<code>bbb</code>
Generic x86_64	<a href="#"><u>nerves_system_x86_64</u></a>	<code>x86_64</code>

# Framework

Ready to Go Elixir libraries:

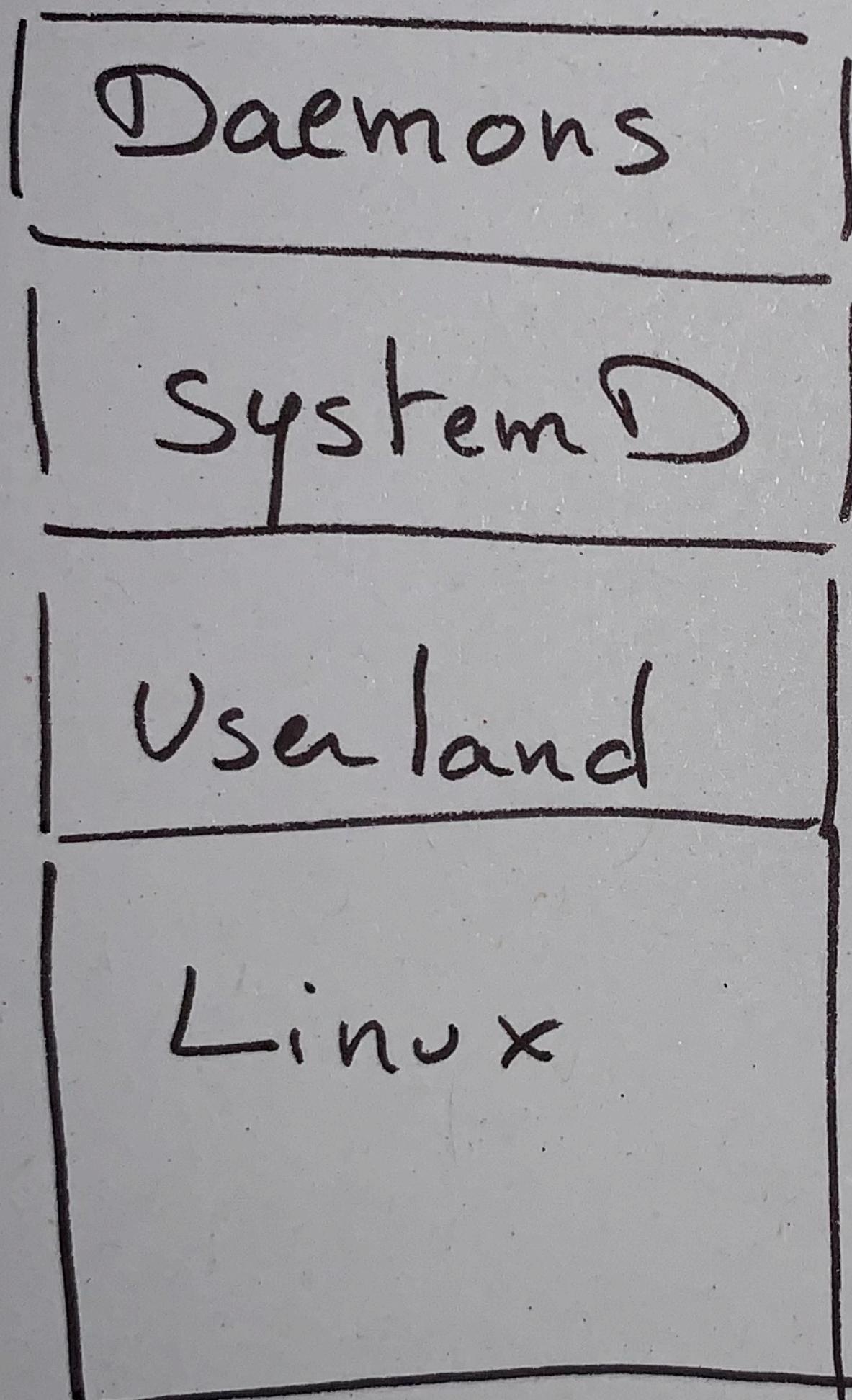
- Network
- Interacting with the hardware

# Tooling

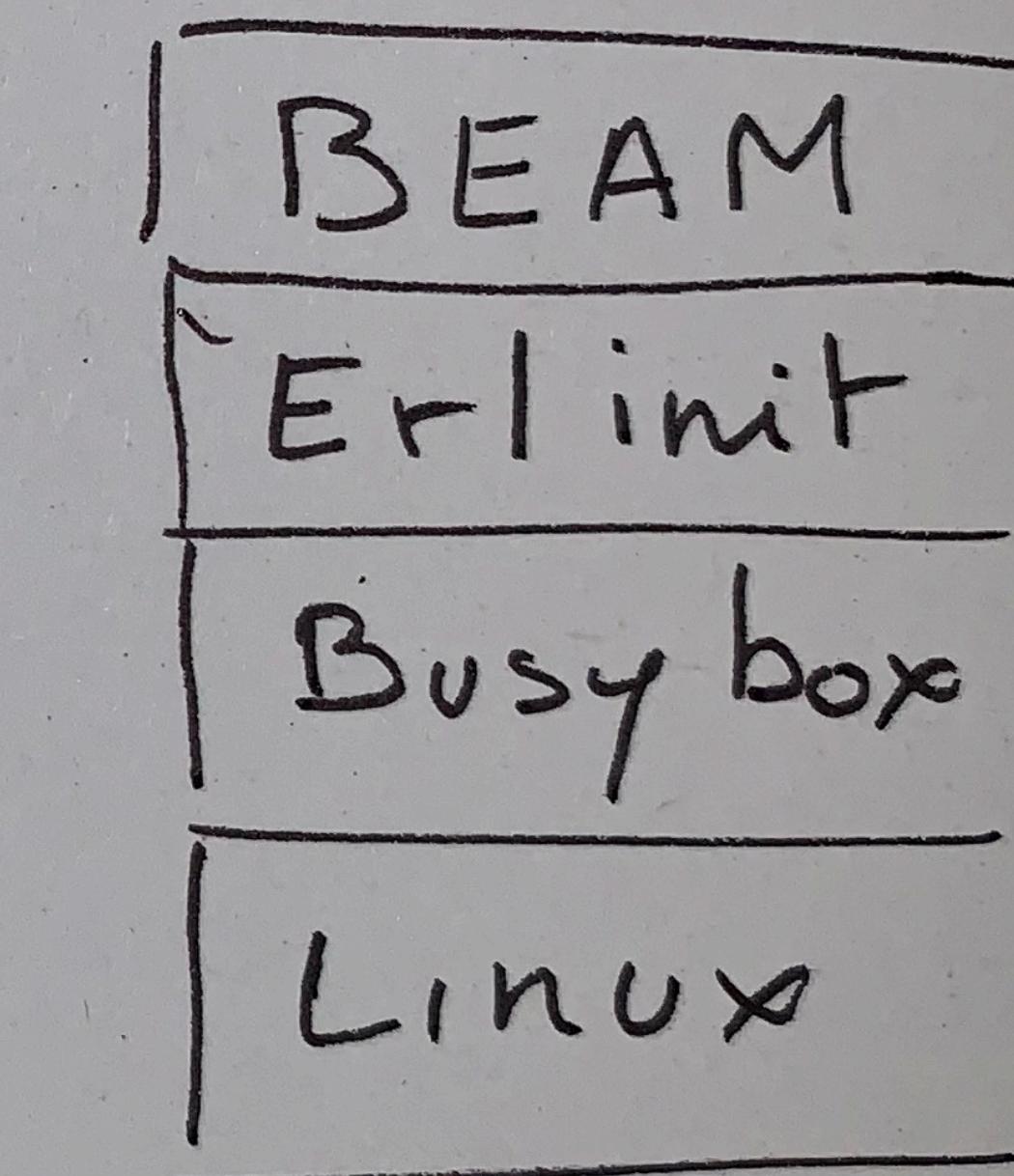
CLI which allows to:

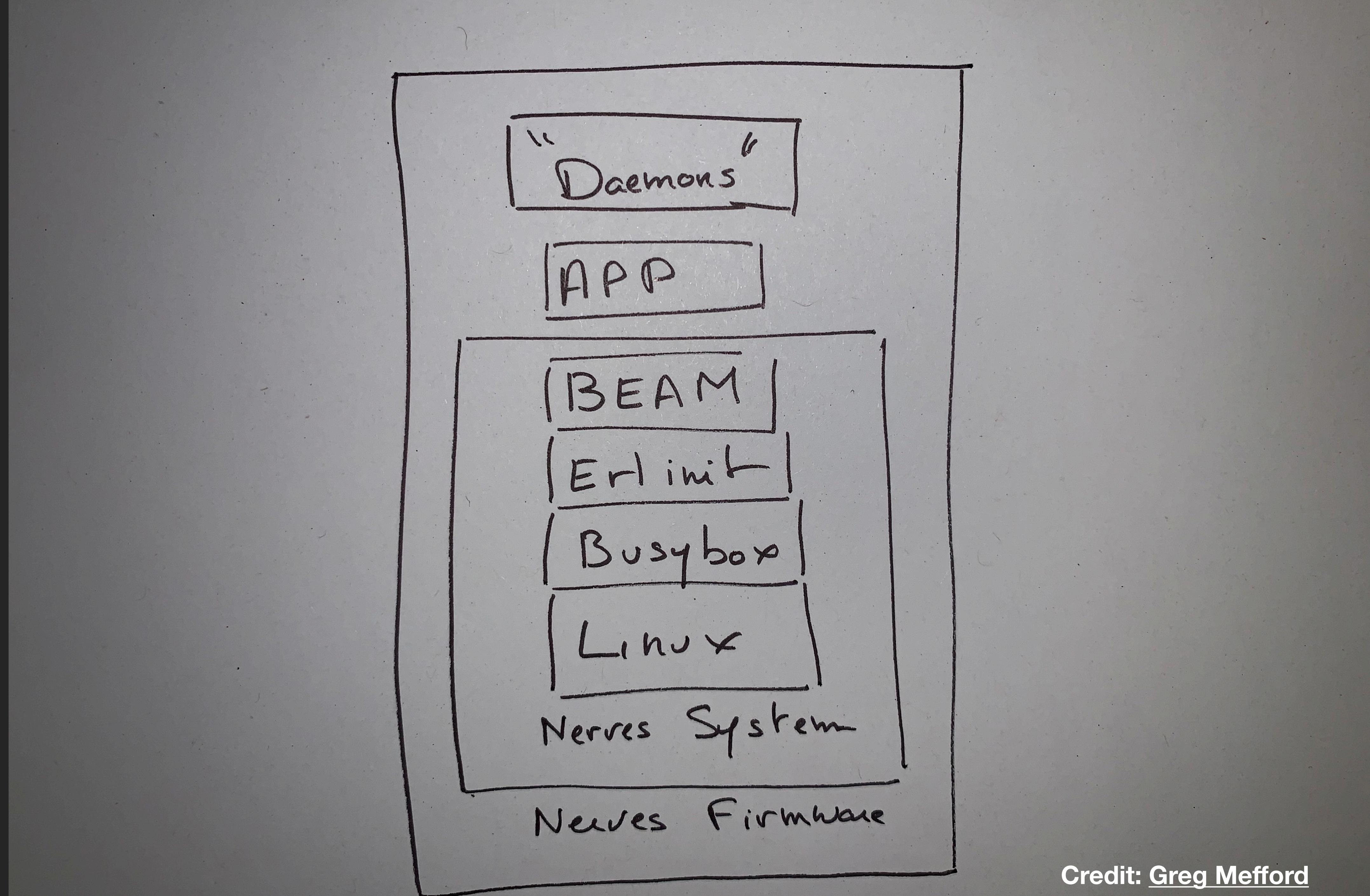
- Create a project
- Build firmware
- Configure a release

# Standard Distribution



# Nerves System





Credit: Greg Mefford

# Create a Nerves Project

```
# Create a Nerves project  
mix nerves.new gps_tracker
```

[Code](#)[Issues 2](#)[Pull requests 2](#)[Projects 0](#)[Wiki](#)[Insights](#)

A couple small examples to demonstrate using Nerves

262 commits

5 branches

0 releases

36 contributors

Branch: master ▾

New pull request

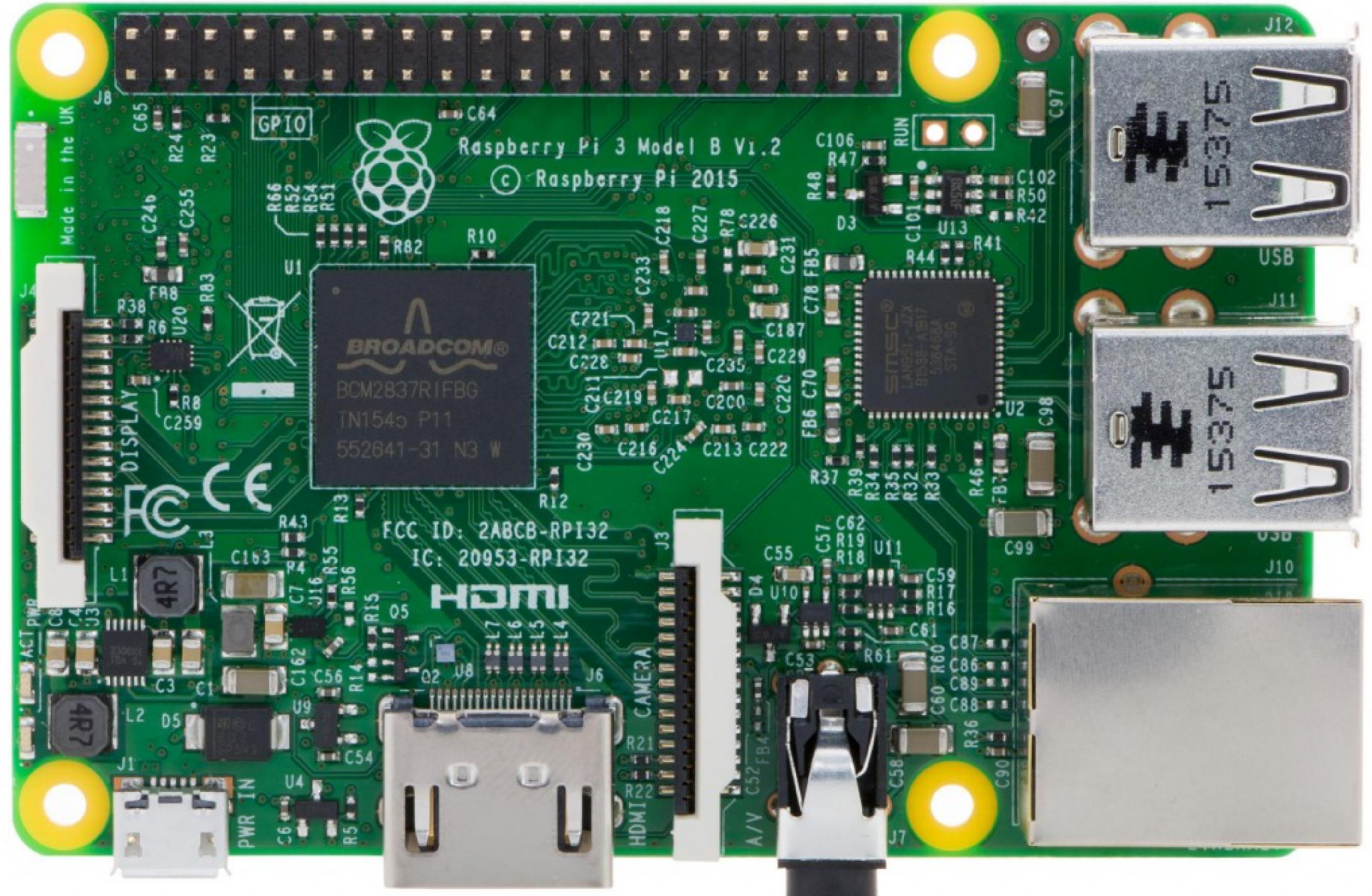
Create new file

Upload files

Find File

Clone or download ▾

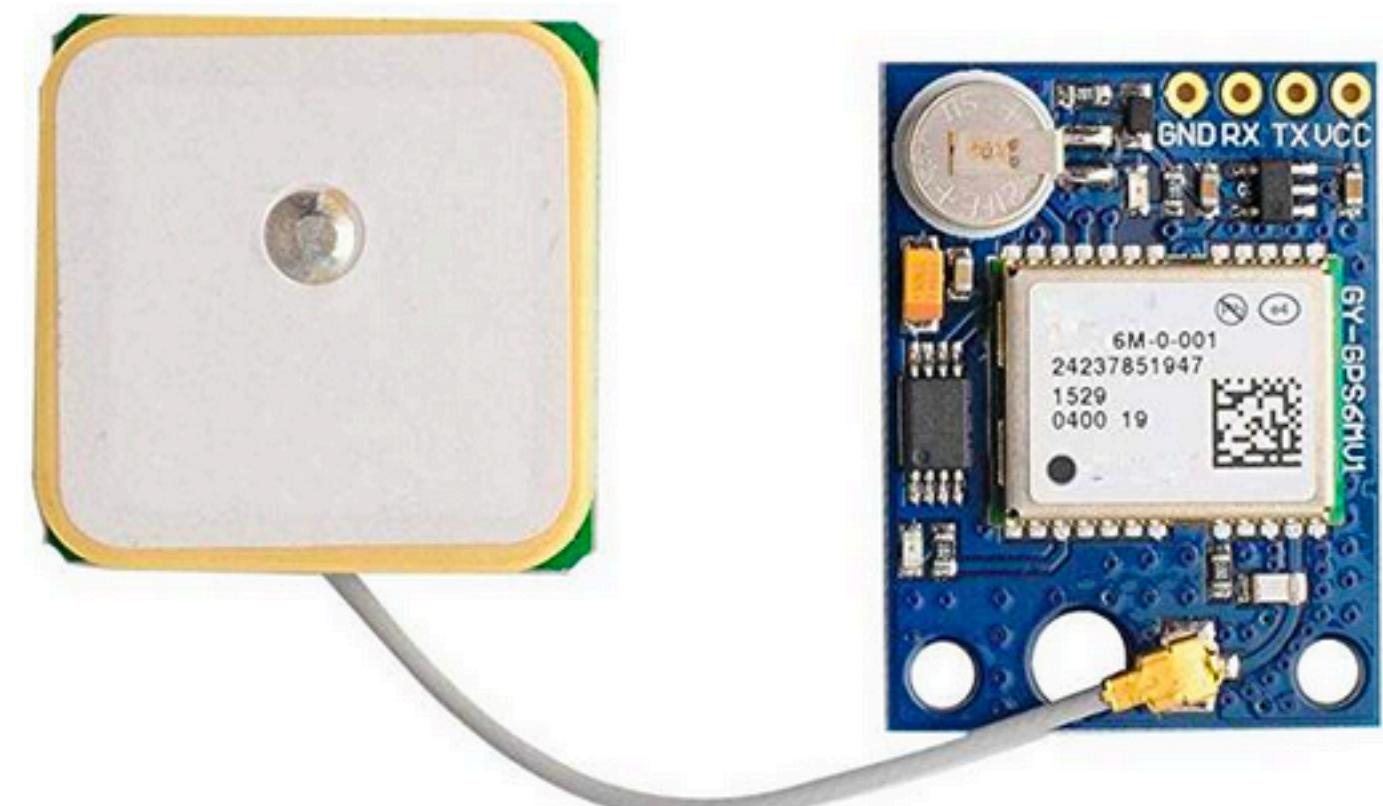
 GregMefford and f hunleth	Consistently assume rpi0 target by default	Latest commit d9a21ca on Feb 21
<a href="#">.circleci</a>	Upgrade to Elixir 1.8 in CI	3 months ago
<a href="#">blinky</a>	Consistently assume rpi0 target by default	3 months ago
<a href="#">hello_gpio</a>	Consistently assume rpi0 target by default	3 months ago
<a href="#">hello_leds</a>	Consistently assume rpi0 target by default	3 months ago
<a href="#">hello_network</a>	Consistently assume rpi0 target by default	3 months ago
<a href="#">hello_phoenix</a>	Update for Elixir 1.8 and Nerves 1.4	3 months ago
<a href="#">.gitignore</a>	Synchronize various files with latest template	7 months ago
<a href="#">CODE_OF_CONDUCT.md</a>	Add links to contribution guides	9 months ago
<a href="#">CONTRIBUTING.md</a>	Add links to contribution guides	9 months ago
<a href="#">ISSUE_TEMPLATE.md</a>	Add links to contribution guides	9 months ago
<a href="#">README.md</a>	Update for Elixir 1.8 and Nerves 1.4	3 months ago



# GPS



# Neo 6m GPS



DIYmall 6M GPS Module with EEPROM for MWC/AeroQuad with Antenna for Arduino Flight Control Aircraft

★★★★★ 25

\$16<sup>50</sup>

Ca marche  
pas !!

RTFM !!



[https://www.terraelectronica.ru/pdf/show?pdf\\_file=%2Fz%2FDatasheet%2FU%2FUART+GPS+NEO-6M+User+Manual.pdf](https://www.terraelectronica.ru/pdf/show?pdf_file=%2Fz%2FDatasheet%2FU%2FUART+GPS+NEO-6M+User+Manual.pdf)

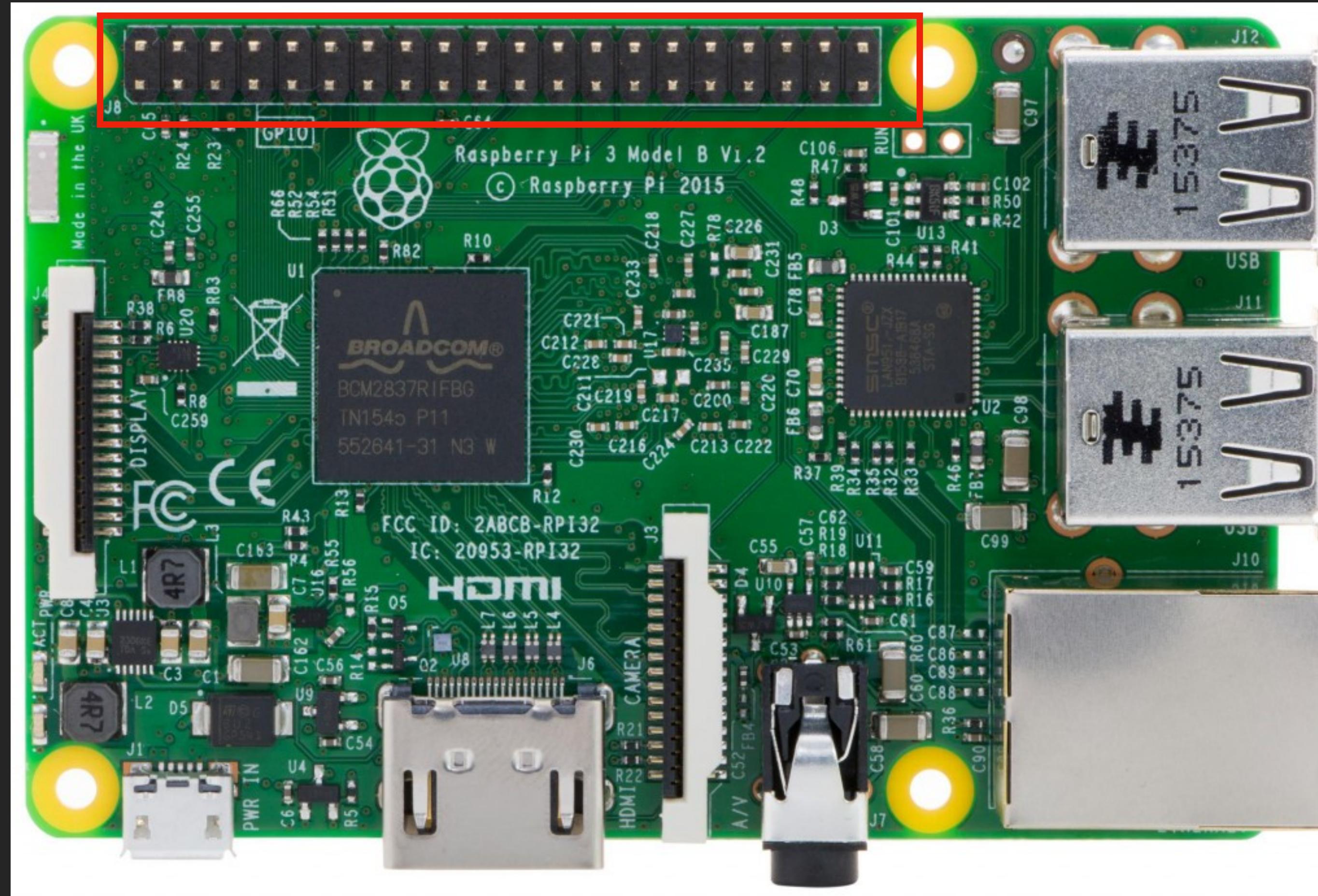
## How to use

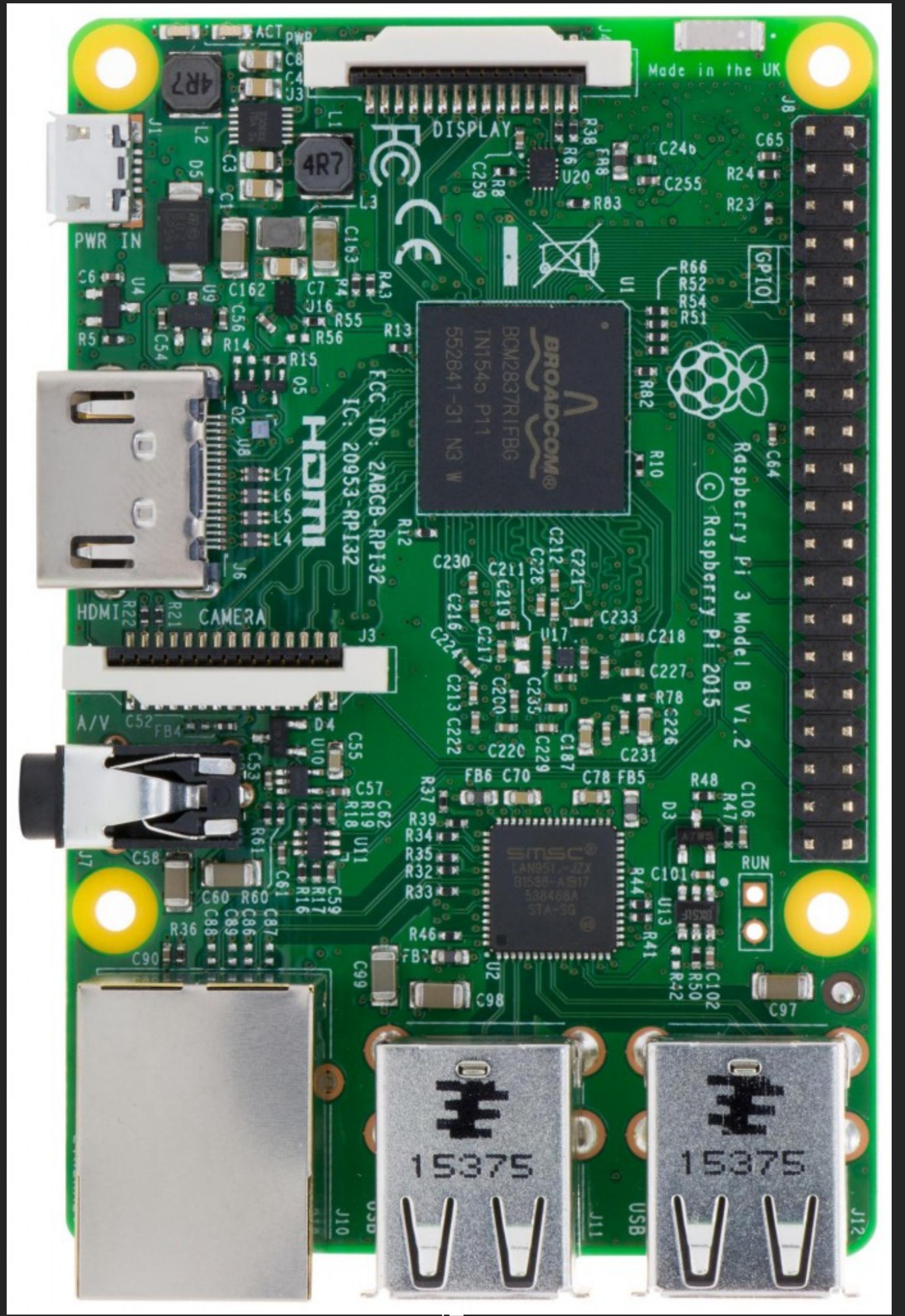
1. Connect the UART GPS NEO-6M module to a **serial module**. FT232 is applied as the serial module in this document.

The connection between the GPS module and the serial module is listed as the table below.

UART GPS NEO-6M module pins	Serial module pins
VCC	3.3V/5V
GND	GND
TXD	RX
RXD	TX
PSS*	

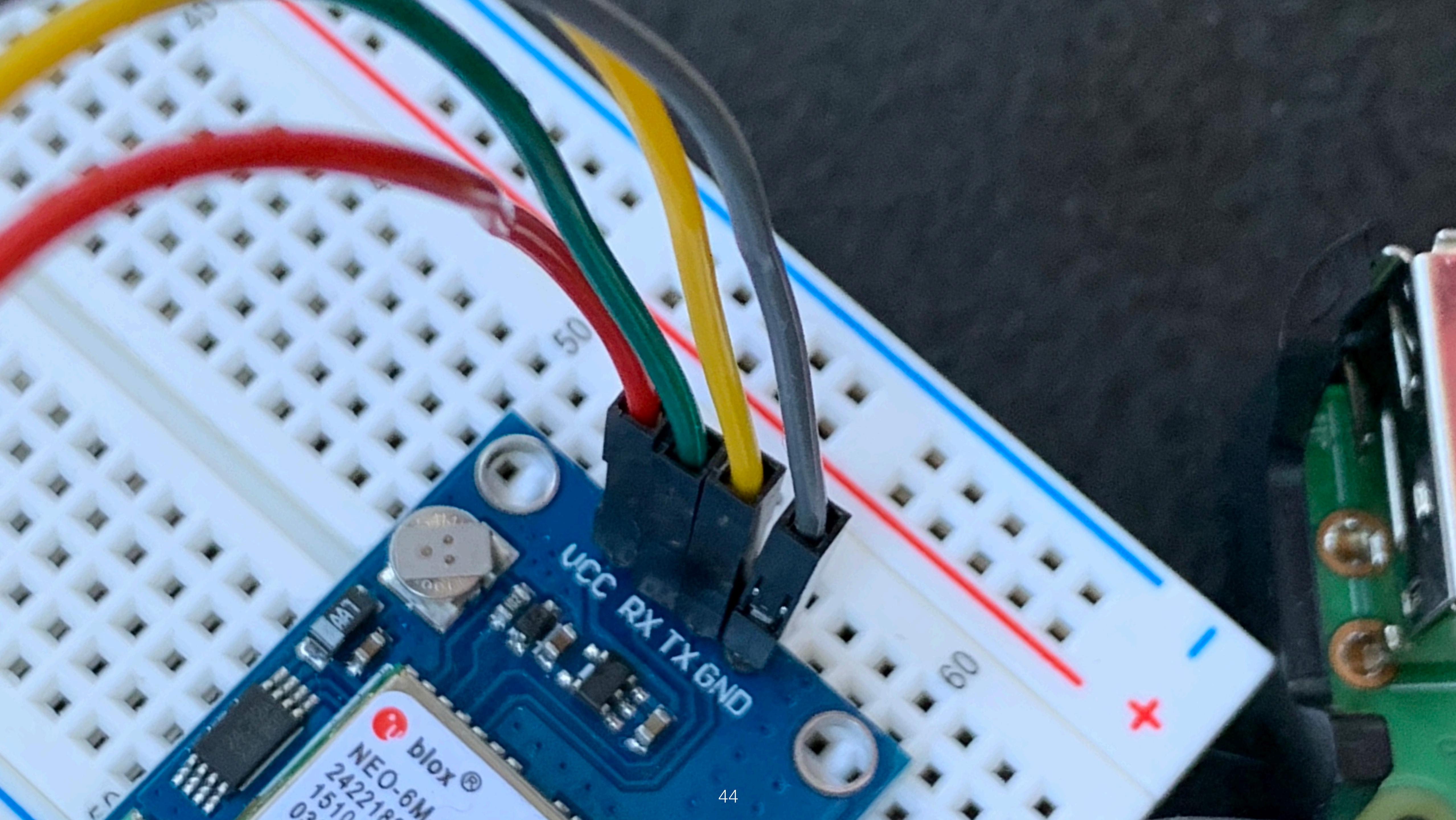
\* PPS should be connected to the clock pulse output (CPOUT) of a MCU. However, this pin is unconnected, in the case that the GPS module is connected to a computer.





# Raspberry Pi 3 GPIO Header

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I <sup>2</sup> C)		DC Power 5v	04
05	GPIO03 (SCL1 , I <sup>2</sup> C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I <sup>2</sup> C ID EEPROM)		(I <sup>2</sup> C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40





# UART MODULE

```
# mix.exs file - Update dependency

defp deps do
  [
    # ...
    # UART
    {:circuits_uart, "~> 1.3"}
  ]
end
```



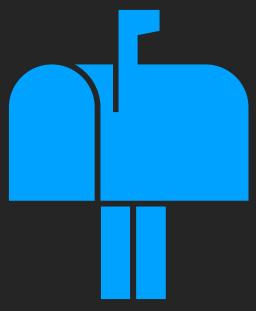
# Process Elixir



**<0.65.0>**



**Reserved Memory**



**Mailbox**

# UART MODULE

```
# Start UART GenServer (process)
{:ok, uart} = Circuits.UART.start_link()

# Ask to the UART process to open the serial port 0
Circuits.UART.open(uart, "ttyAMA0", speed: 9600, active: true)

# UART sent informations to the current process
flush()

{:circuits_uart, "ttyAMA0",
"$GPGGA,064036.289,4836.53750,N,00740.93730,E,1,04,3.2,200.2,M,,,0000*0E"}
```

# NMEA Data

"\$GPGGA,064036.289,4836.53750,N,00740.93730,E,1,04,3.2,200.2,M,,,0000\*0E"

# NMEA Data

"\$GPGGA,064036.289,4836.53750,N,00740.93730,E,1,04,3.2,200.2,M,,,0000\*0E"

\$GPGGA	<b>Global Positioning System Fix Data</b>
064036.289	<b>Time</b>
4836.53750 , N	<b>Latitude 48 deg 36.537' N</b>
00740.93730 , E	<b>Longitude 07 deg 40.937' E</b>
1	<b>Quality</b>
04	<b>Number of satellites being tracked</b>
200	<b>Altitude, Meters, above mean sea level</b>

# NMEA Module

```
defmodule GpsTracker.Nmea do
  def parse("$GPGGA," <> data) do
    data
    |> String.split(",")
    |> extract_time()
    |> extract_latitude()
    |> extract_longitude()
    |> compute_coordinates()
  end
end
```

```
iex> GpsTracker.Nmea.parse(
  "$GPGGA,064036.289,4836.53750,N,00740.93730,E,1,04,3.2,200.2,M,,,0000*0E"
)

{
  :ok,
  %{time: "064036.289", latitude: 48.608958333333, longitude: 7.682288333333}
}
```

# How to send position?

# GSM Board



# Sigfox





# Wireless Chip

# Nerves Network

# Nerves Network

```
# mix.exs file - Update dependency

defp deps do
  [
    # ...
    # Wifi
    {:nerves_network, "~> 0.5"}
  ]
end
```

# Nerves Network

```
# config/config.exs
config :shoehorn,
  init: [:nerves_runtime, :nerves_init_gadget, :nerves_network],
  app: Mix.Project.config()[:app]

# ...
config :nerves_network, :default,
  wlan0: [
    networks: [
      [
        ssid: "Iphone de Yann",
        psk: "Foobar",
        key_mgmt: "WPA-PSK"
      ]
    ]
  ]
]
```

```
defmodule GpsTracker.Transpondeur do
  use GenServer
  # Some Other Stuff here

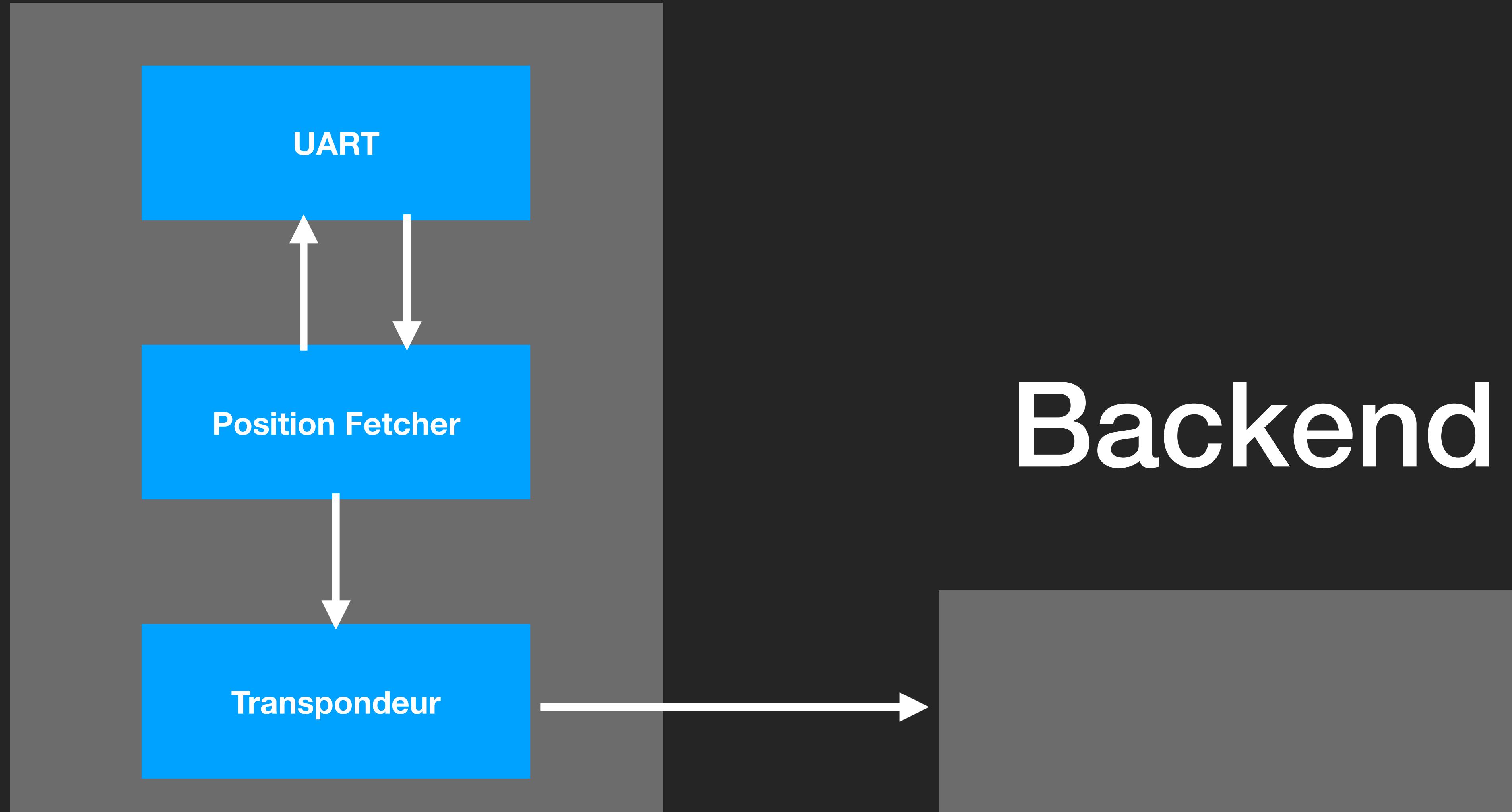
  def handle cast({:emit, position}, endpoint) do
    {:ok, json} = Poison.encode(position)

    HTTPotion.post(endpoint,
      body: json,
      headers: [ "User-Agent": "Beacon", "Content-Type": "application/json" ]
    )

    {:noreply, endpoint}
  end
end
```



# Tracker



# Backend



an open-source JavaScript library  
for mobile-friendly interactive maps

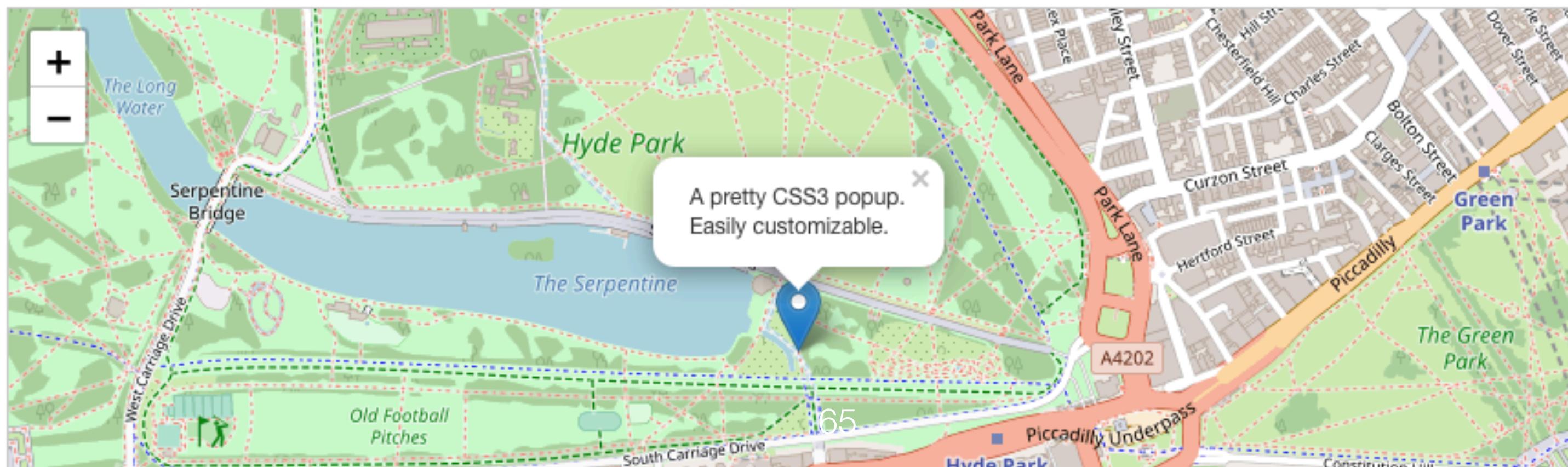


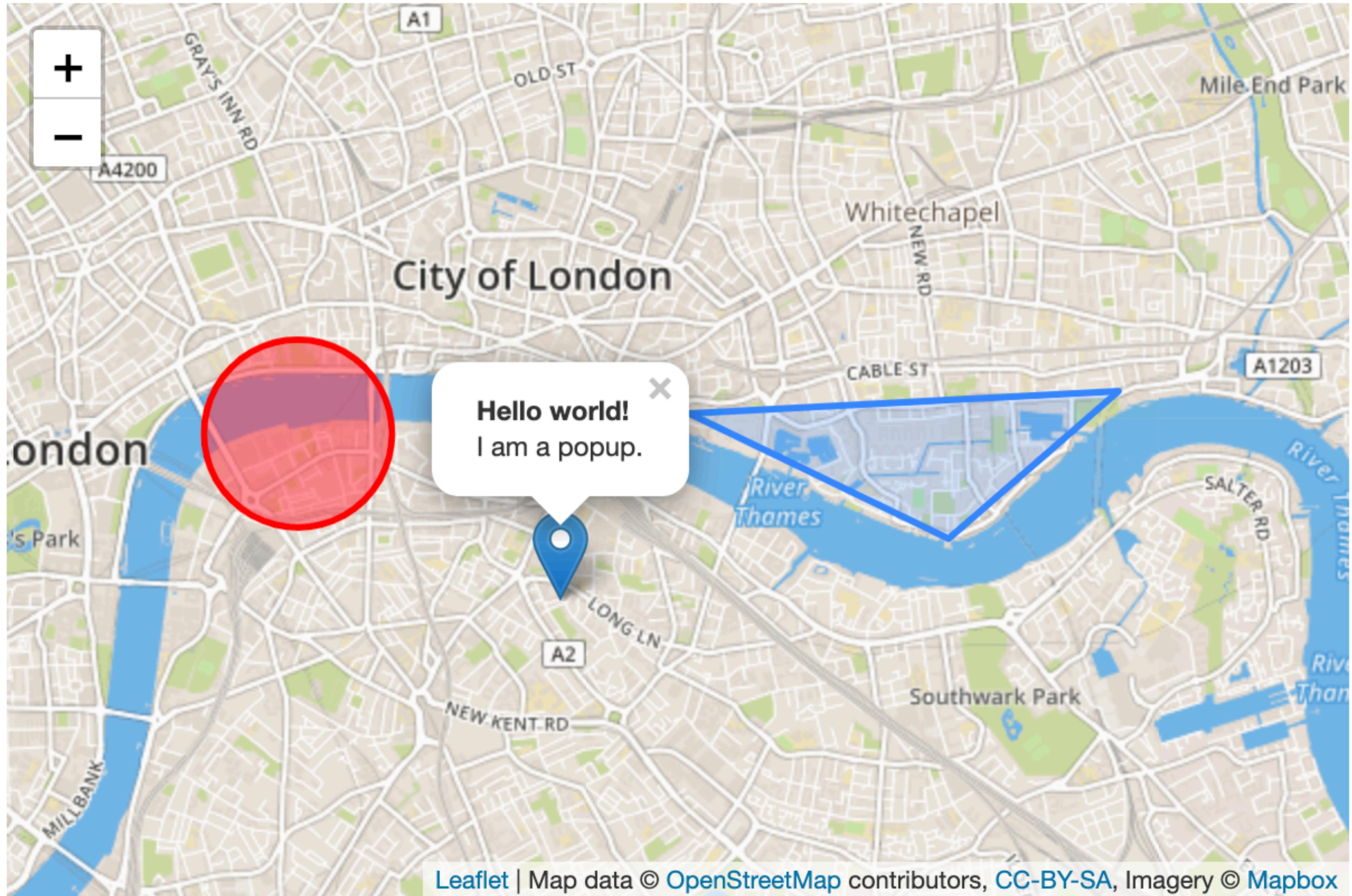
[Overview](#) [Tutorials](#) [Docs](#) [Download](#) [Plugins](#) [Blog](#)

May 8, 2019 — [Leaflet 1.5.1](#) has been released!

Leaflet is the leading open-source JavaScript library for mobile-friendly interactive maps. Weighing just about 38 KB of JS, it has all the mapping [features](#) most developers ever need.

Leaflet is designed with *simplicity, performance and usability* in mind. It works efficiently across all major desktop and mobile platforms, can be extended with lots of [plugins](#), has a beautiful, easy to use and [well-documented API](#) and a simple, readable [source code](#) that is a joy to [contribute](#) to.





# GeoJson

```
{ "type": "Feature",
  "geometry": {
    "type": "Point",
    "coordinates": [102.0, 0.0]
  }
}
```

# API EndPoint

```
defmodule GpsServerWeb.Api.PositionController do
  use GpsServerWeb, :controller

  def create(conn, params) do
    {:ok, position} = GpsServer.create_position(params)
    {:ok, geo_point} =
      position
      |> GpsServer.Position.to_geojson()
      |> Jason.encode()

    conn
    |> put_resp_content_type("application/json")
    |> Plug.Conn.resp(201, geo_point)
    |> send_resp()
  end

end
```



# Feedback

It's easy

# How Long ?

# Hard to Debug

Nerves Init Gadget

N

Software Upgrade

# Material

Raspberry pi 3

SD Card reader

GPS MODULE **X2**

Wires

Soldering Iron kit

1 battery



Now What ?

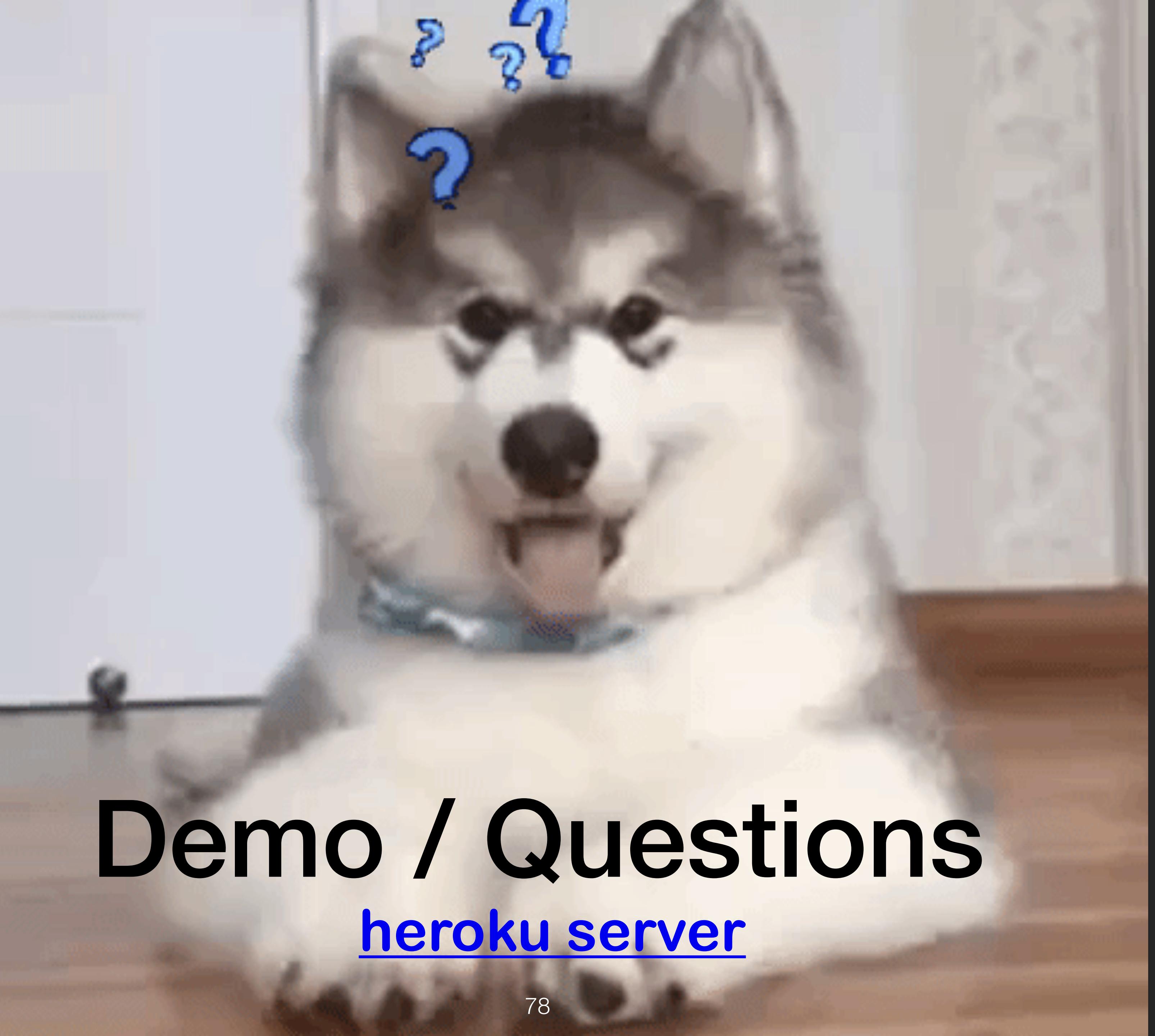
# Future - Tracker

## Optimizations

- power consumption
- Data consumption
- Space

# Future - Backend

- Login
- History
- Notification

A close-up photograph of a fluffy, light-colored dog, possibly a Golden Retriever puppy, looking slightly to the right. Three blue question marks are overlaid above the dog's head, suggesting inquiry or a question.

# Demo / Questions

[heroku server](#)

git@github.com:yannvery/gps tracker  
git@github.com:yannvery/gps server