LAB 1 - Sensors and actuators

Introduction

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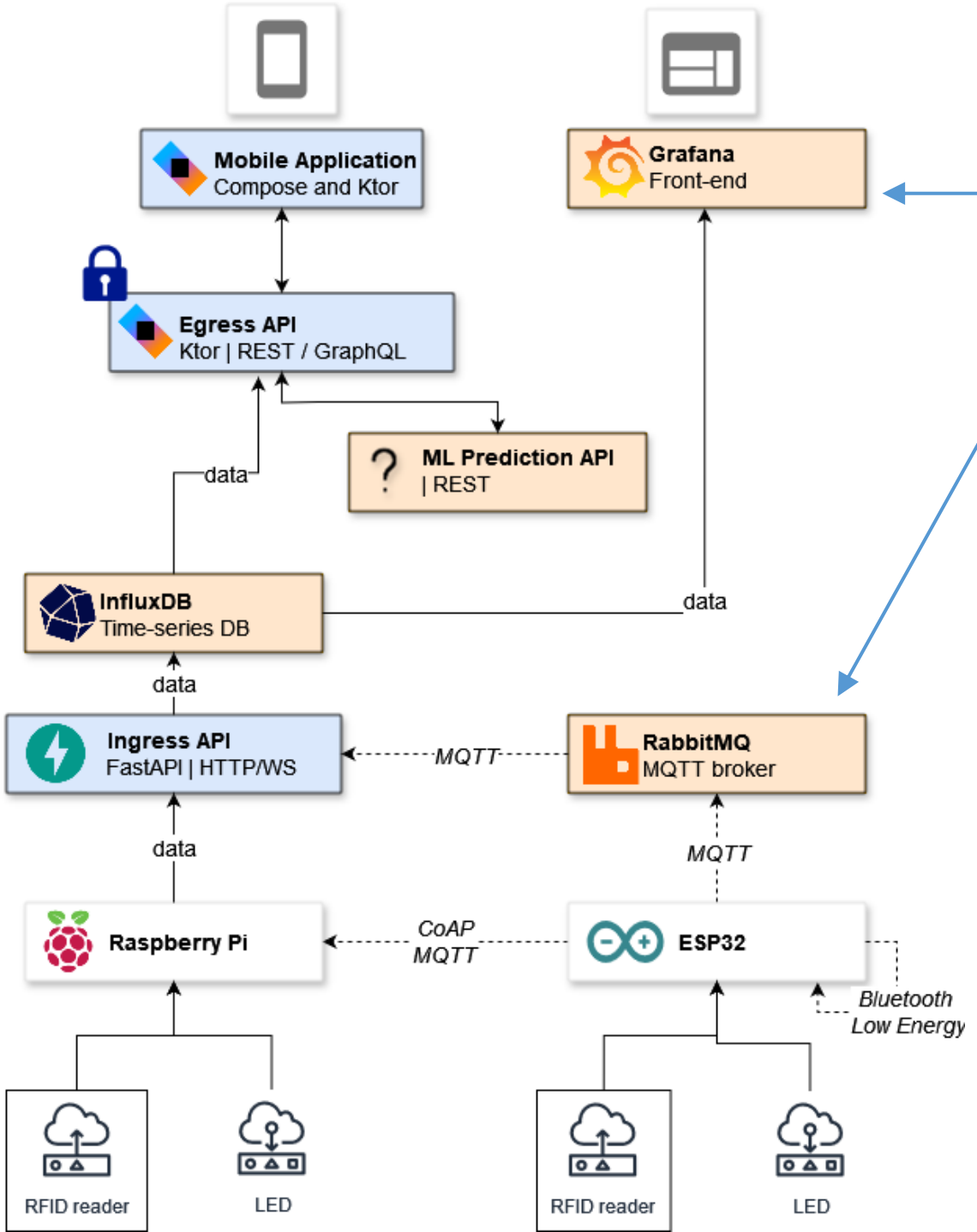
Cloud and Mobile Applications

Organization of Theory and Labs

- Week 1 Thursday
  - Lecture on theory
  - Lab 1 on Ufora
  - Do Lab 1 in practical session
  - Lab 2 on Ufora
  - **Preparation** work for Lab 2 **at home**
- Week n Thursday
  - Finish Lab n-1 at home and **turn in report by Thursday @10** before theory
  - **Turn in preparation work for Lab n by Thursday @10** before theory
  - Lecture on theory
  - Do Lab n in practical session
  - Lab n+1 on Ufora
  - **Preparation** work for Lab n+1 **at home**

-1 point per day lab turned in late!

The Big Picture



- Outlined boxes are microservices
- Colored boxes are hosted on Kubernetes cluster in the cloud
- Blue boxes you implement
- Orange boxes are shared services in the cloud

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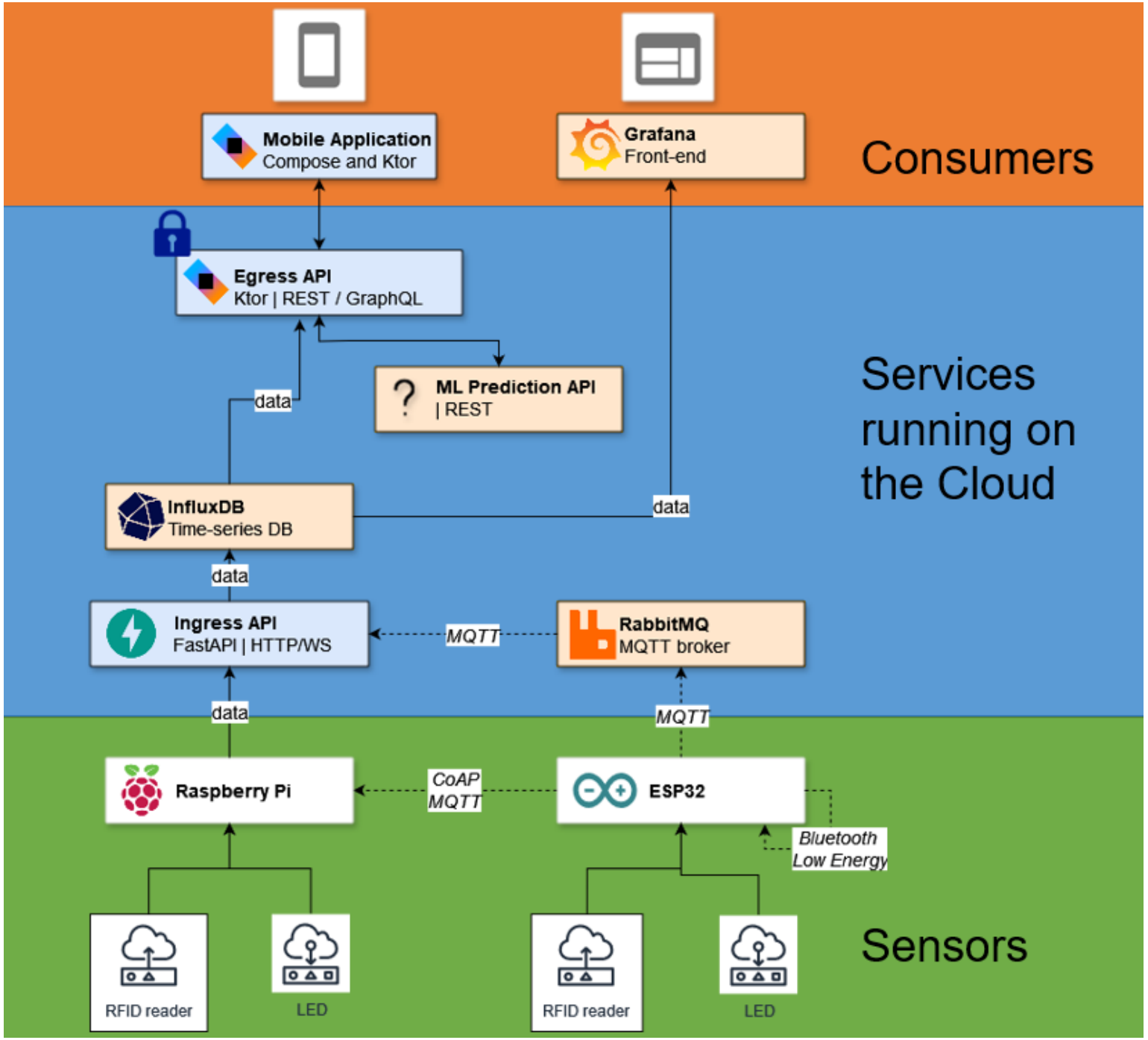
IoT Stack



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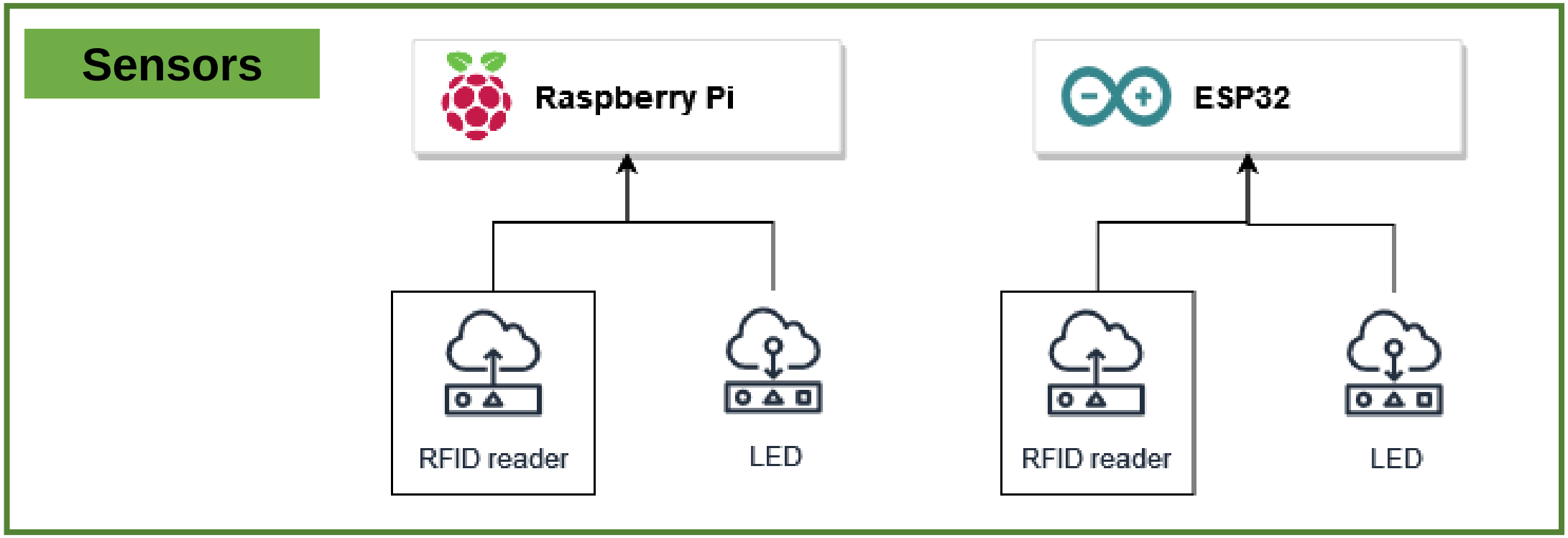
@Home: Lab0: Python refresher

- Optional
- See Ufora for link to Dodona
- Start with **Python met objecten**

Lab 1



Goals of Lab 1

- Make an **SSH connection** with a Raspberry Pi
- **Make a circuit** for a sensor and an actuator
- Control a sensor and an actuator with an **RPi**
- Control a sensor and an actuator with an **ESP32**

Material

Own material

- Laptop & charger
- **Micro-USB cable for ESP32**
- Ethernet cable (optional)
- Future
  - Smartphone and charger

Material available in classroom

- (mobile) Screen with HDMI (& power cable (USB to barrel jack))
- HDMI cable
- Keyboard
- Mouse

Borrowed material handed out

- Raspberry Pi 3 Model B(+)
- EU Power Supply (2.5A 5.1V)
- SD-card (16 GB) + (SD-adapter)
- ESP32 microcontroller (WROOM JOY-iT or DOIT)
- RFID reader RC522 and RFID tag(s)
- **Web of Things sensorkit**
  - Breadboard
  - LEDs
  - 10K Ohm Resistors
  - 330 Ohm Resistors
  - Resistors (3x 1K or 3x 1.2K)
  - M/M Jumper Wires
  - M/F Jumper Wires
  - (Humidity and Temperature Sensor) (DHT22)
  - (PIR Motion Sensor)

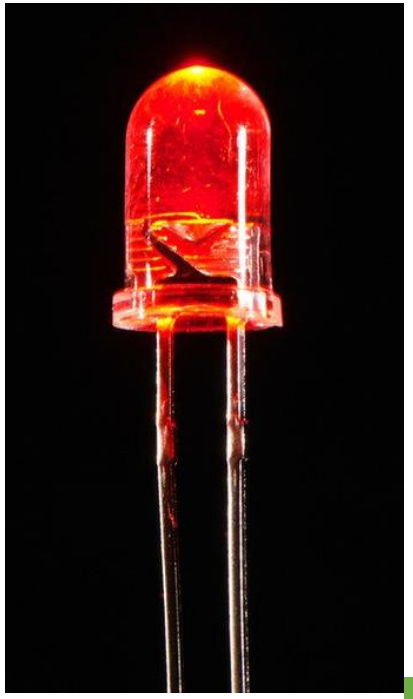
Software to install

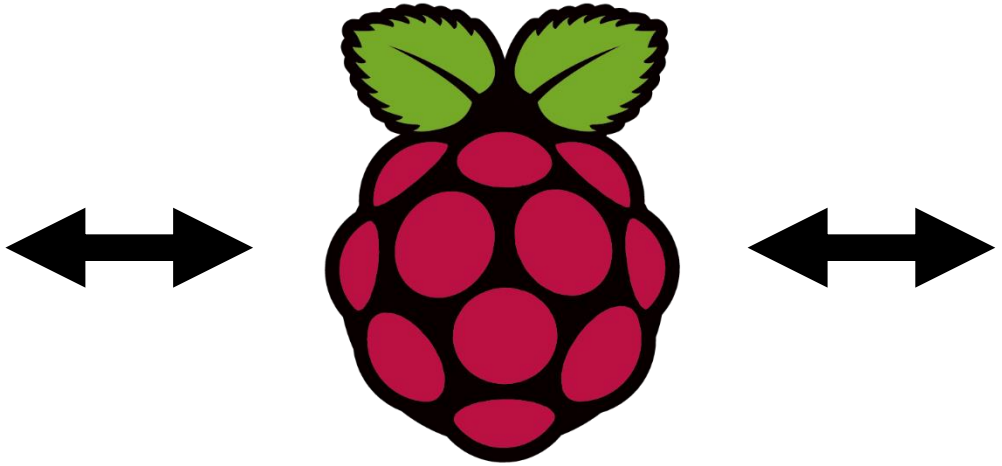
- PyCharm **Professional Edition [Free with UGent email].** Install via Jetbrains Toolbox App
- Arduino IDE

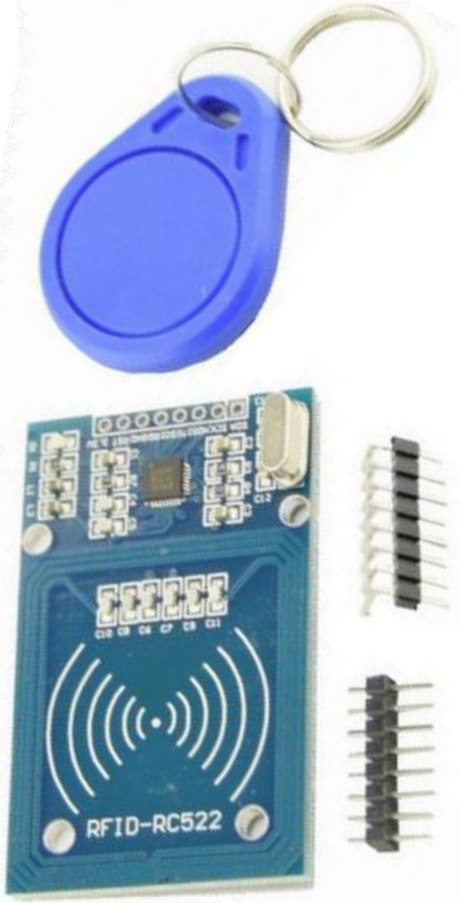
Setup process

- Setting up Raspberry Pi OS
- Connecting the Pi to a network
- Changing the hostname of your Pi
- Remotely accessing your Pi
- Connecting to your device
- Connect to Raspberry Pi via Pycharm Professional Edition
- Set date and time on RPI after setup

In Lab: #task1 & #task2





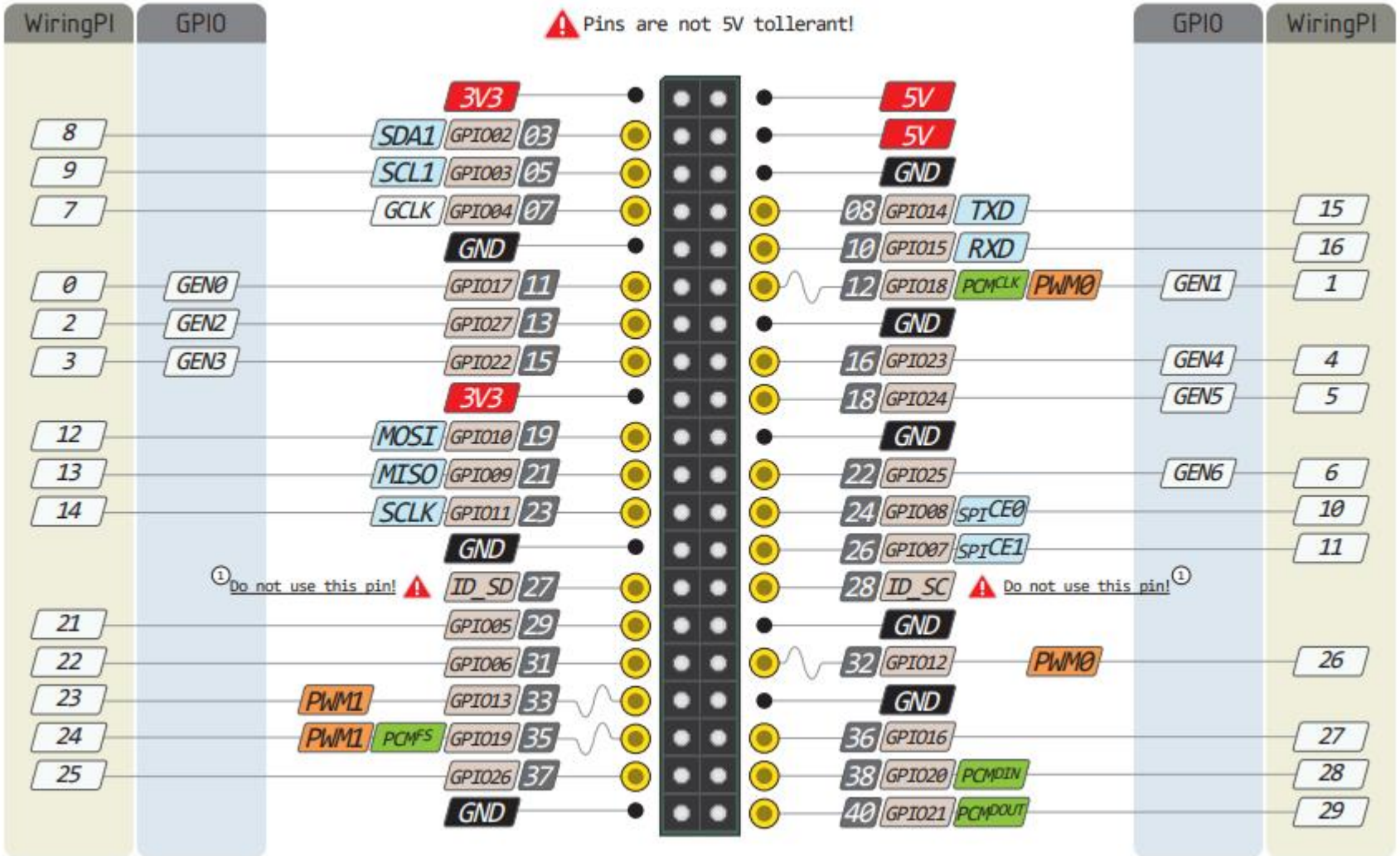


blink.py

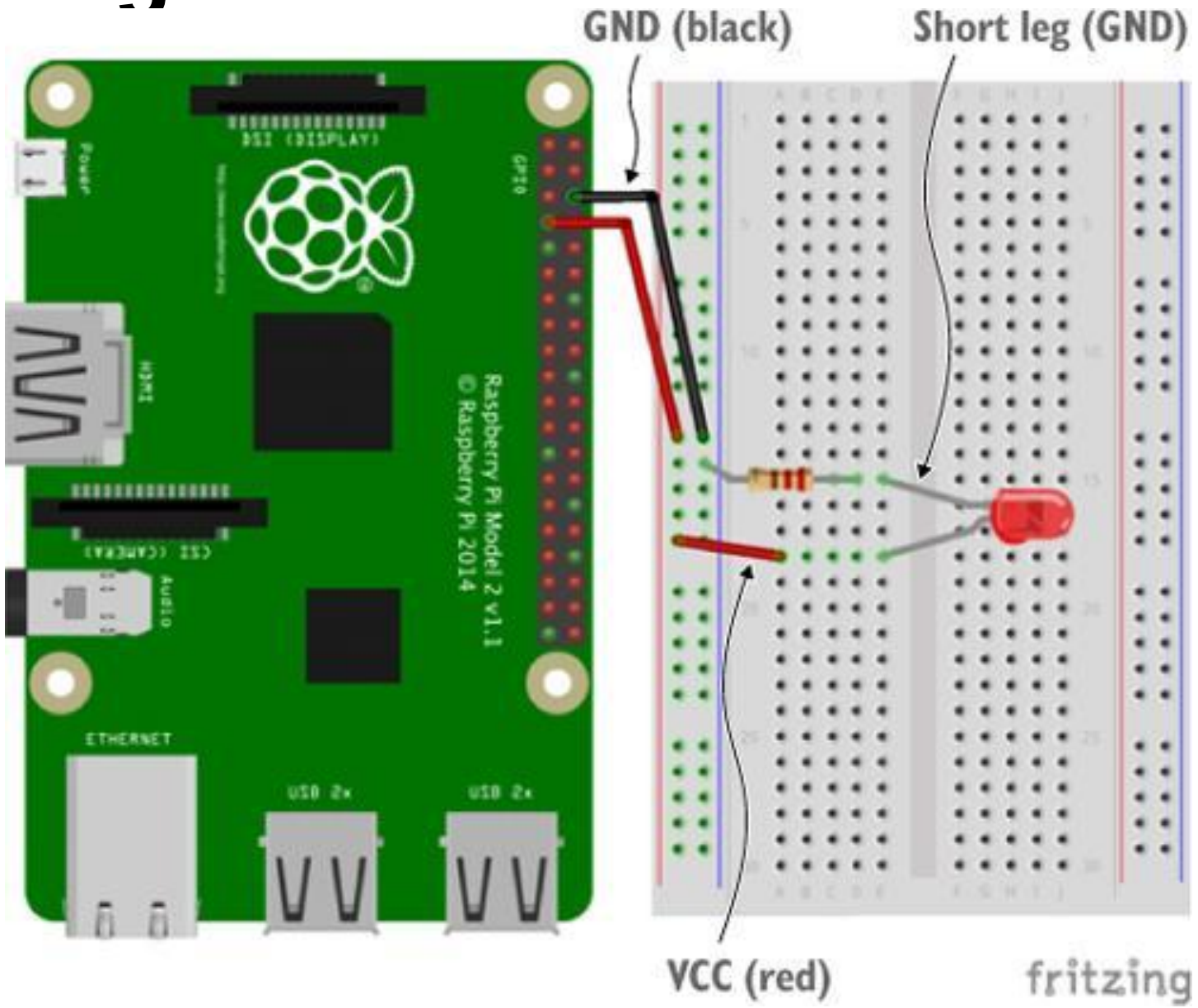
Execute these steps

readRFID.py

RPi pinout

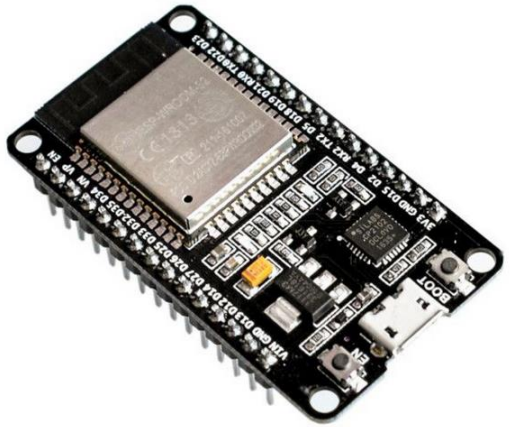

WiringPI
GPIO
Pins are not 5V tollerant!
GPIO
WiringPI
3V3
5V
SDA1 GPIO02 03
5V
SCL1 GPIO03 05
GND
GCLK GPIO04 07
08 GPIO14 TXD
15
GND
10 GPIO15 RXD
16
0 GEN0 GPIO17 11
12 GPIO18 PCMCLK PWM0 GEN1
1
2 GEN2 GPIO27 13
GND
3 GEN3 GPIO22 15
16 GPIO23 GEN4
4
3V3
18 GPIO24 GEN5
5
12 MOSI GPIO10 19
GND
13 MISO GPIO09 21
22 GPIO25 GEN6
6
14 SCLK GPIO11 23
24 GPIO08 SPICE0
10
GND
26 GPIO07 SPICE1
11
Do not use this pin!
ID_SD 27
28 ID_SC
Do not use this pin!
21
GPIO05 29
GND
22
GPIO06 31
32 GPIO12 PWM0
26
23 PWM1 GPIO13 33
GND
24 PWM1 PCMFS GPIO19 35
36 GPIO16
27
25
GPIO26 37
38 GPIO20 PCMDIN
28
GND
40 GPIO21 PCMDOUT
29

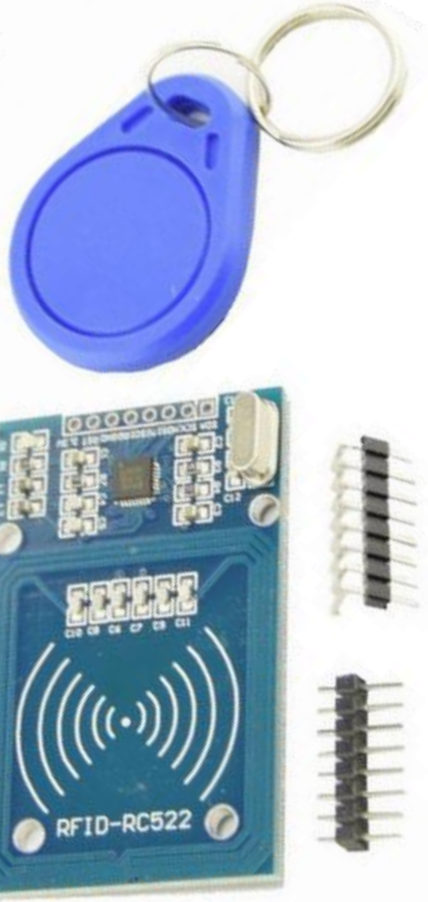
Connecting RPi to breadboard



RFID RC522 reader pinout

In Lab: #task3 & #task4



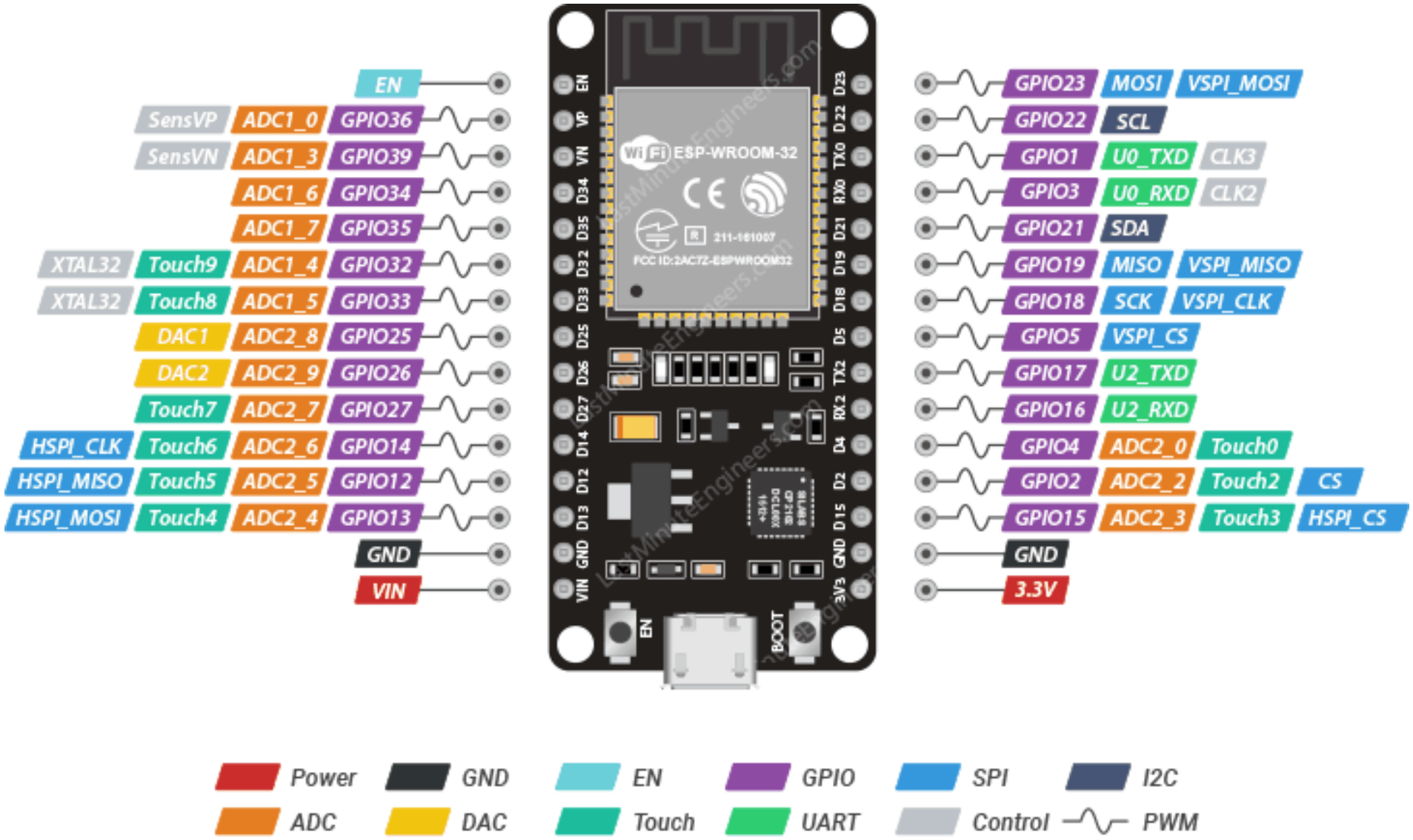


Task3: blink

Execute these steps

Task4: rfid

ESP32 pinout



Material you need to submit

- Lab report in pdf: **due Thursday 20 February at 10am**
  - Screenshots and/or pictures
  - Question
- Videos of completed tasks
- Archive and name: “Lab1_FamilyName_FirstName.zip”
- Turn in to Ufora