ISIM 2021

International Symposium on
IoT and ML for
Ecosystem Restoration &
Multihazard Resilience
05th to 09th of June 2021

Introduction to Git & GitHub

Sai Shibu

Note: Contents are from publicly available data

About Me

Research Assistant III at Center for Wireless Networks and Applications, Amrita Vishwa Vidyapeetham

Research TAG: Intelligent Infrastructure & Pervasive Mobile Computing

Area of Interest: Future Mobility, Blockchain Technology, IoT & ML

Social Profiles

Git & Github

Git is an example of version control

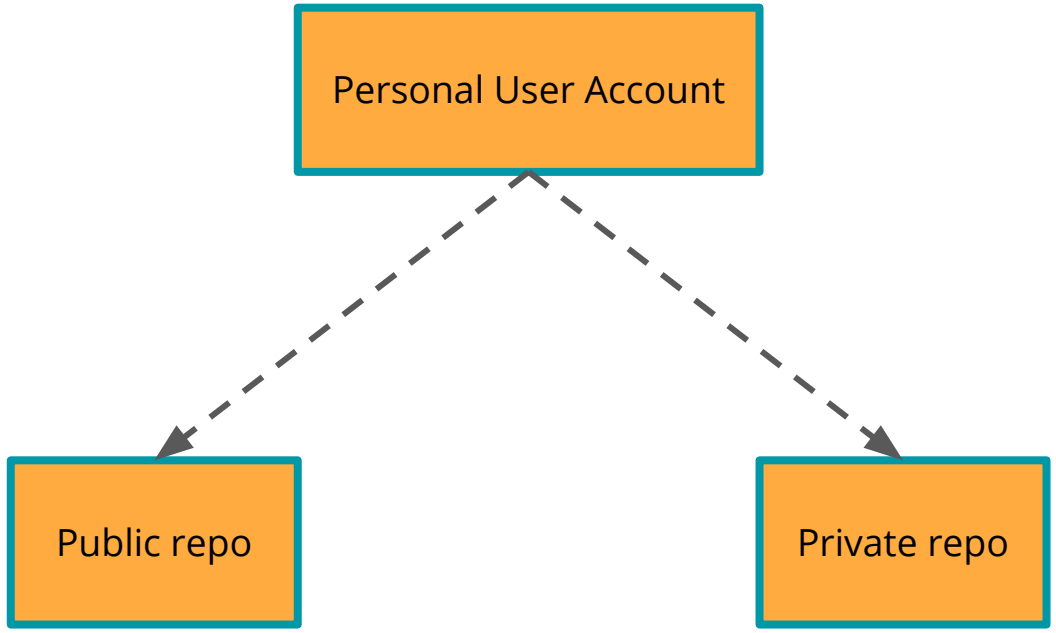
Version control is a system that records changes to a file or set of files and helps us recall specific versions later if needed. E.g. Subversion (SVN), CVS etc It allows you to :

- Revert files or the whole project to an earlier state
- Compare changes over time
- See who modified what?
- Control modifications by collaborators with the permission of admin/owners

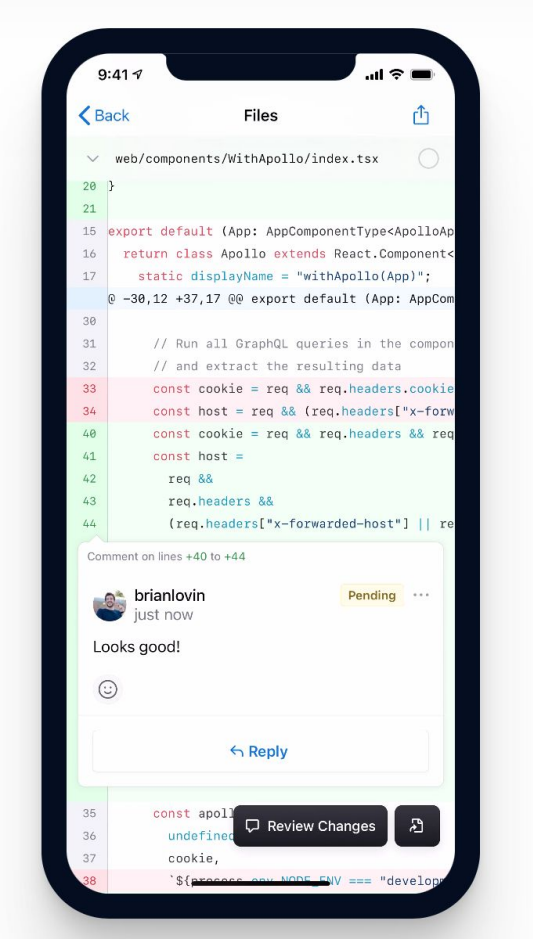
Github is a repository hosting service for Git

Github

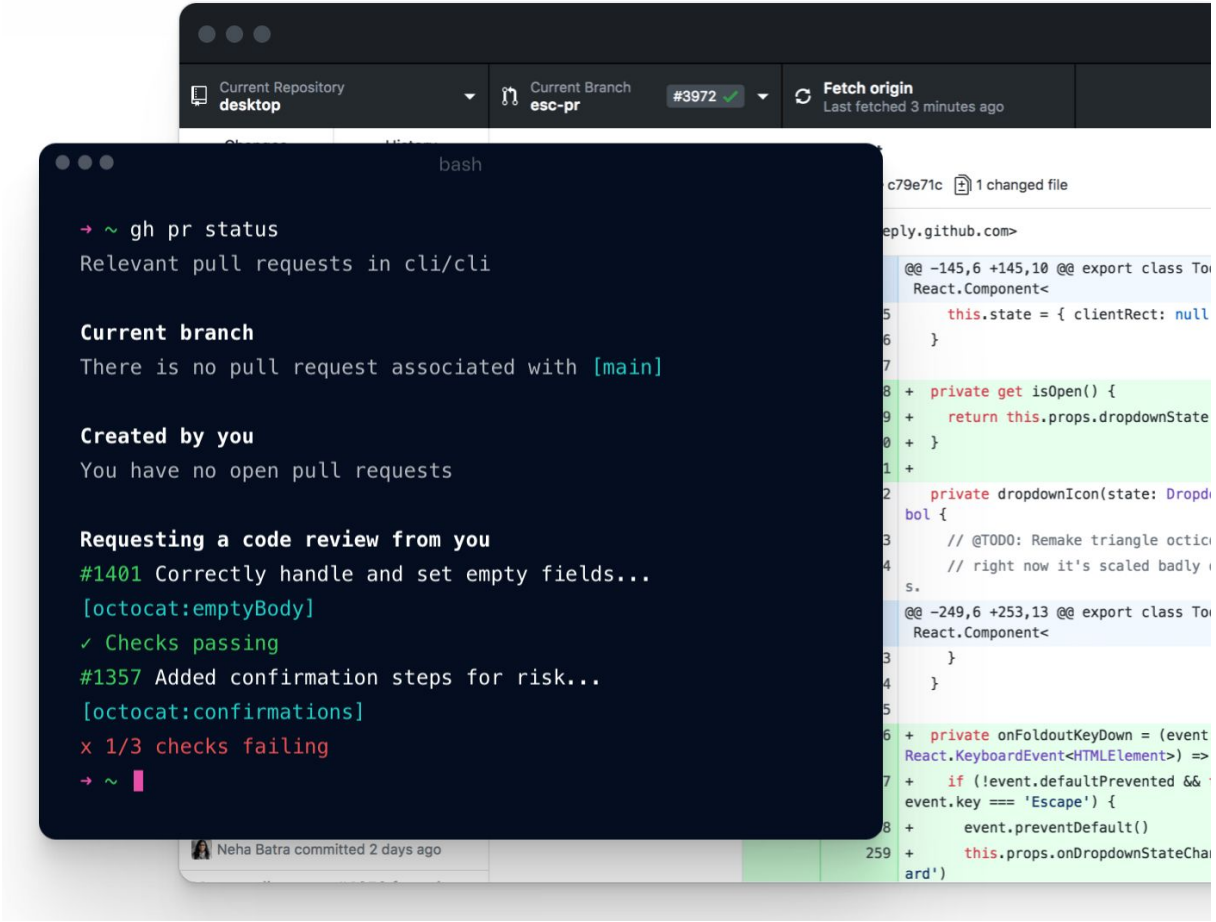
- Unlimited public repositories and collaborators on all plans
- Limited Private repositories
- Ability to add unlimited repository collaborators
- Public repositories are open to view and copy but not commit changes.



GitHub Clients



Mobile App



CLI & GUI Desktop App

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Quick Demo


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Thank You!

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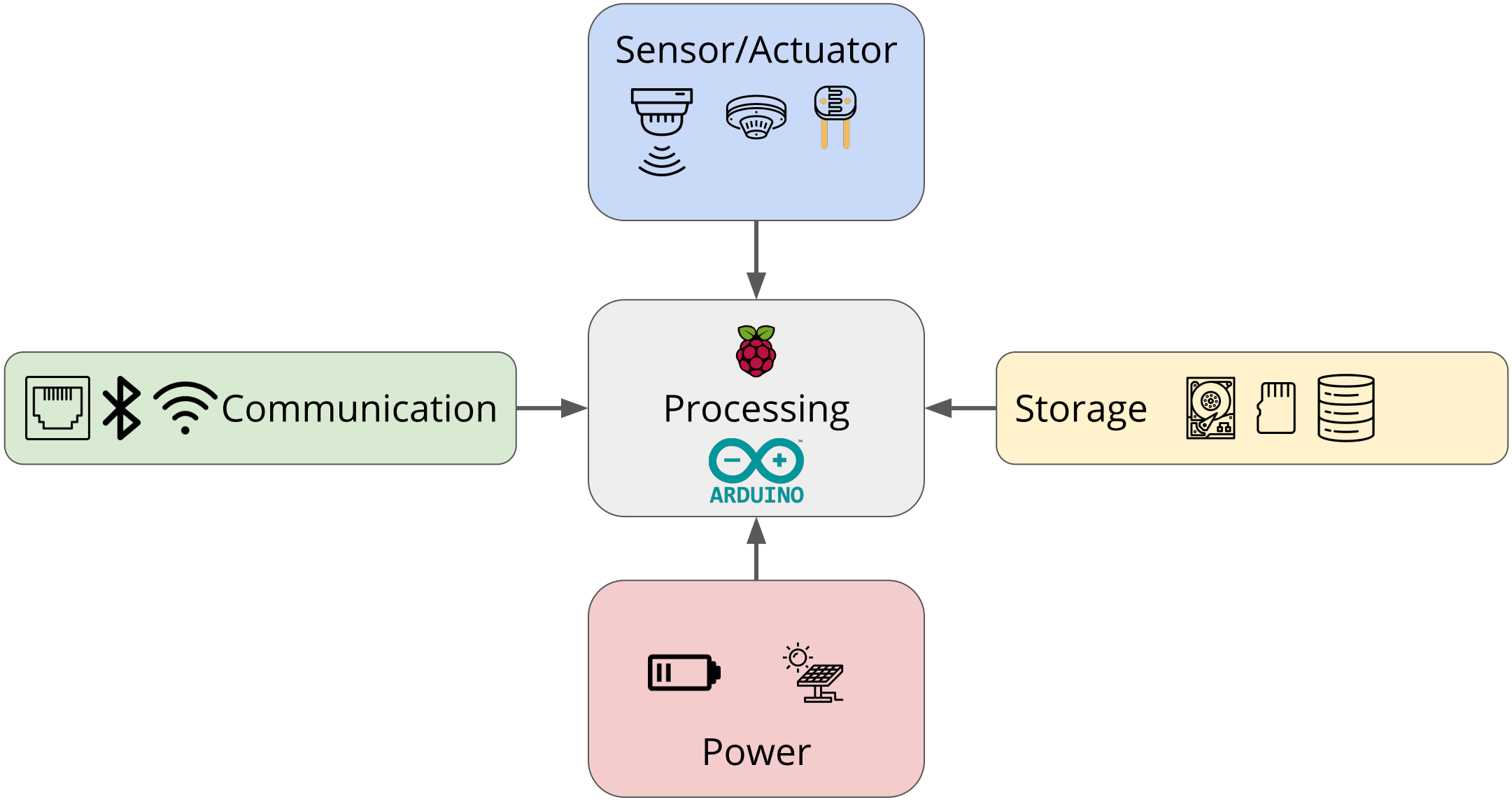
Introduction to Single Board Computers

Sai Shibu

Note: Contents are from publicly available data

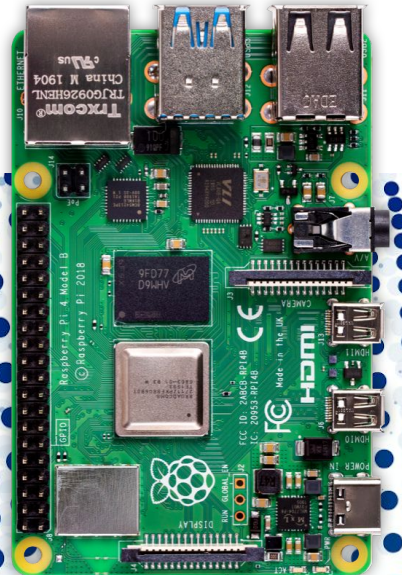
General IoT Architecture - Simplified form



Raspberry Pi

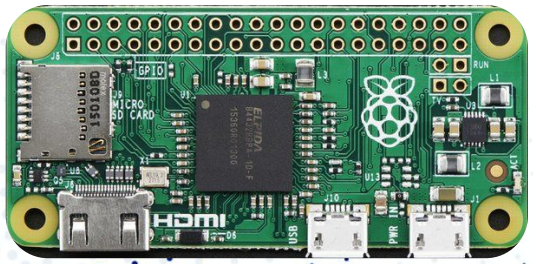
The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation for promoting the teaching of basic computer science in schools.
Makers, tinkerers and hackers adapted the R-Pi to act as a tiny computer that they can easily embed into their projects.

RPi 4

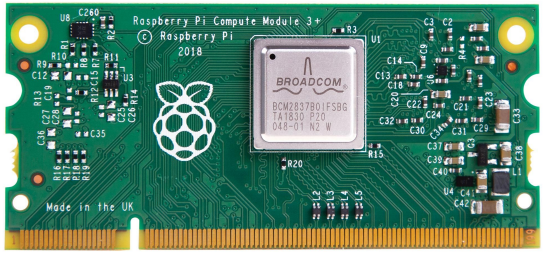


RPi 3A

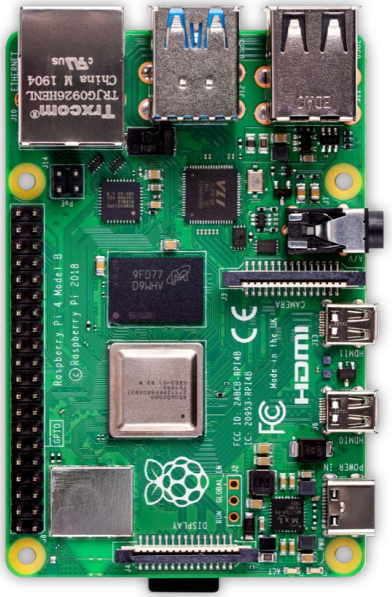
RPi ZERO W



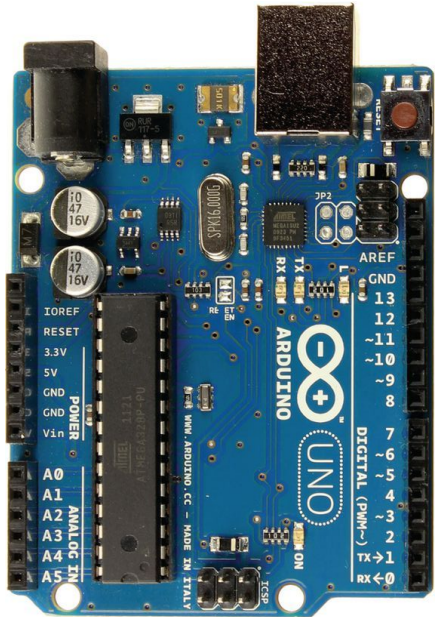
RPi COMPUTE MODULE



Raspberry Pi vs Arduino

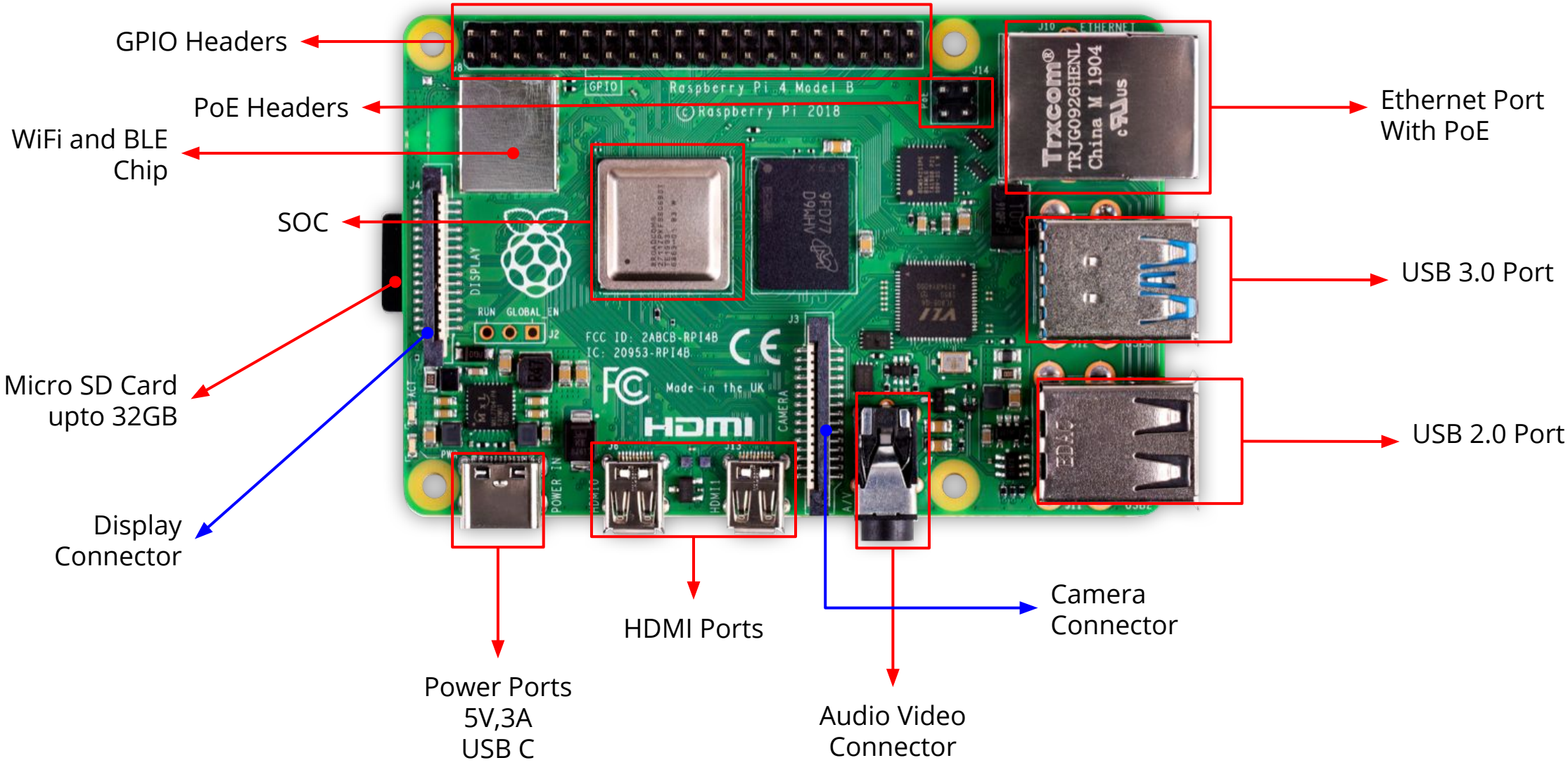


- OS Support
- Onboard WiFi & Bluetooth
- Parallel Processing
- Storage
- Multiple language support
- Sensitive to current
- No ADC
- 3.3V GPIOs



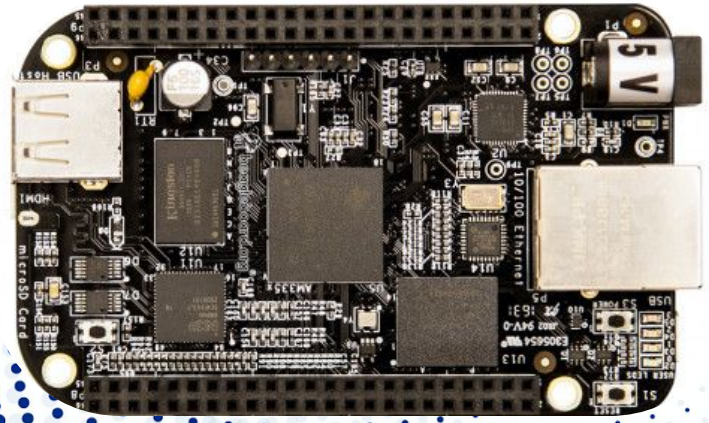
- Onboard ADC
- Low cost
- Less sensitive to current
- 5V I/O Ports
- Single programming Language
- low memory & Storage
- less number of I/Os

Raspberry Pi - Board Layout

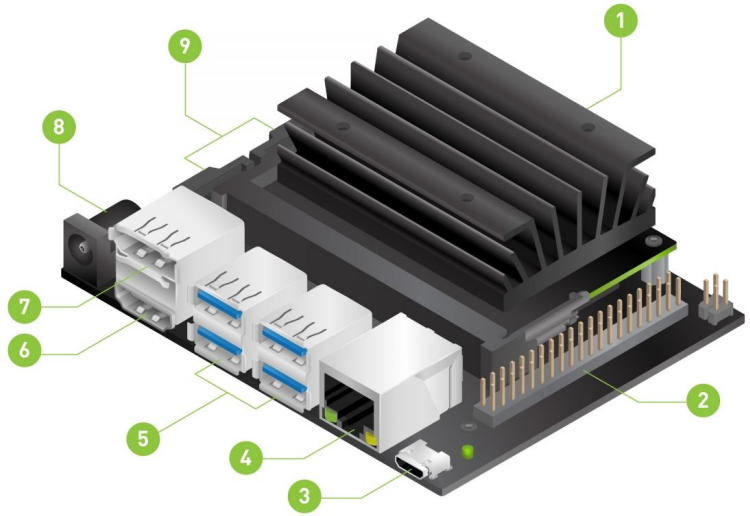


Do we have any other SBCs other than RPi?

Yes

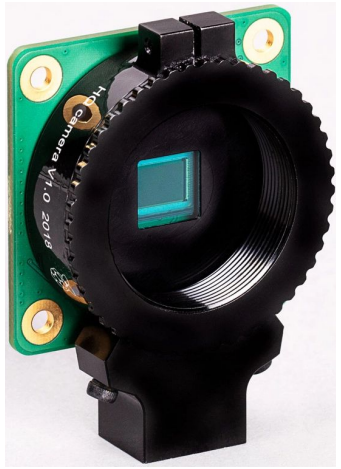


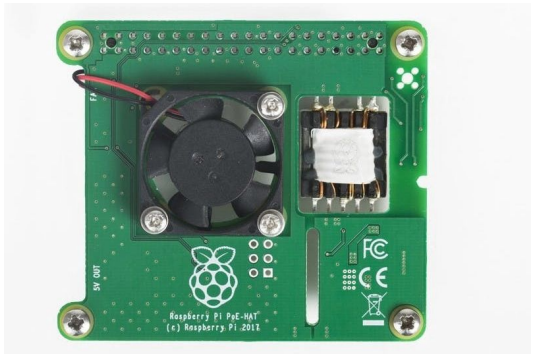
Beagle Bone

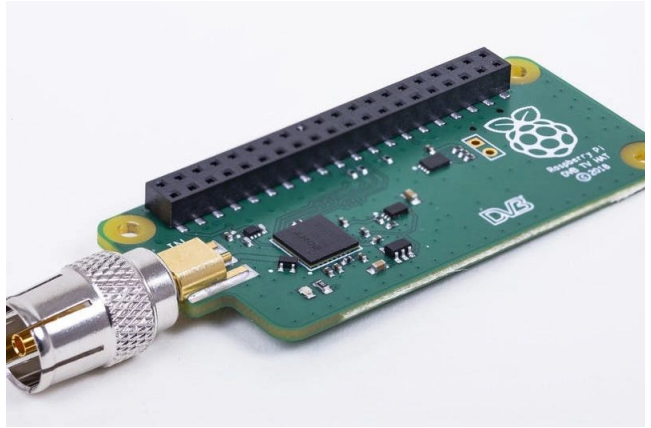


Nvidia Jetson Nano

Accessories for Raspberry Pi

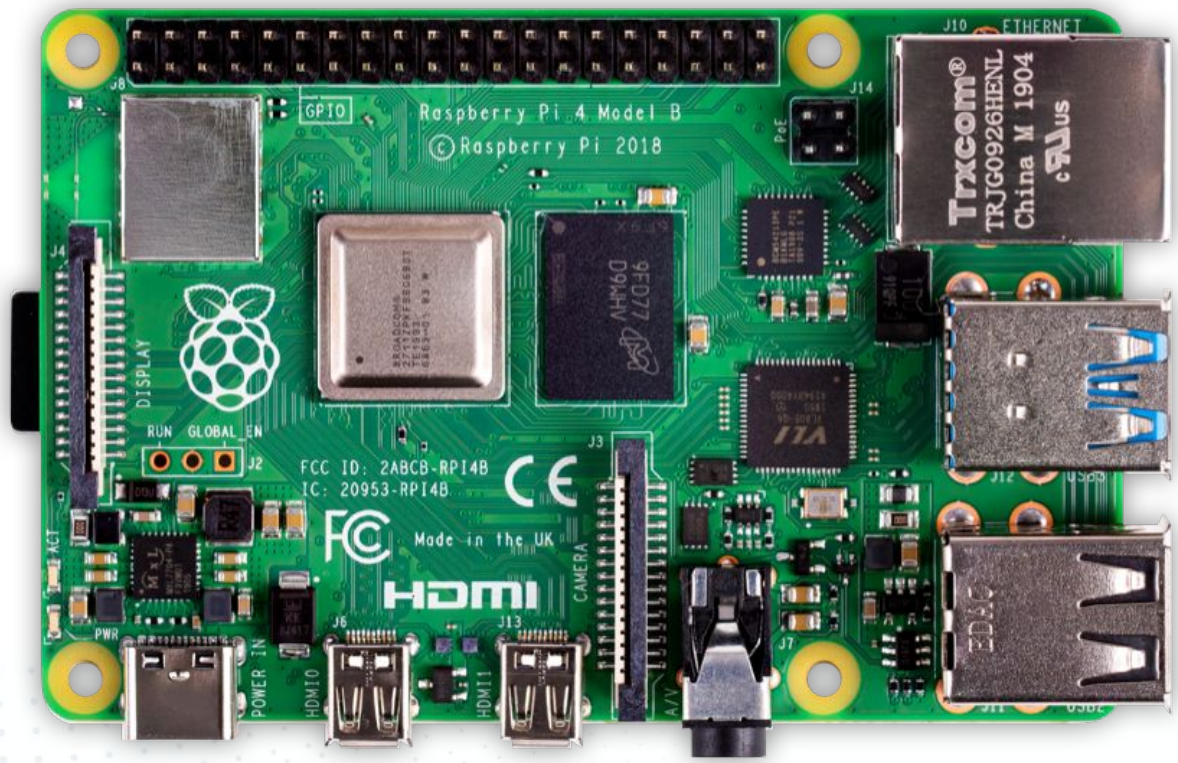






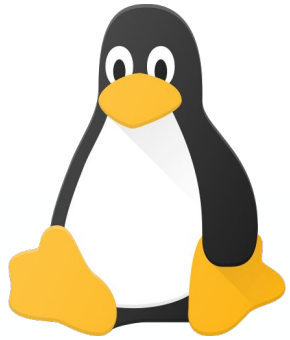
Let's get started

1. Input devices - Keyboard & Mouse
2. Display
3. SD with OS on it



What is OS? Why do we need this?

- Intermediate between user application and hardware
- Provides, file system, I/O Operation, program control, memory management



OS for Raspberry Pi

Raspberry Pi OS - 32 bit operating system

Light version and Full version

- Stripped down Linux with required packages for Raspberry Pi
- Python and other programming languages included
- Support to access GPIOs

Any other OS available for RPI?

Ubuntu MATE

Ubuntu Core

Ubuntu Server

OSMC

LibreELEC

Mozilla WebThings

PiNet

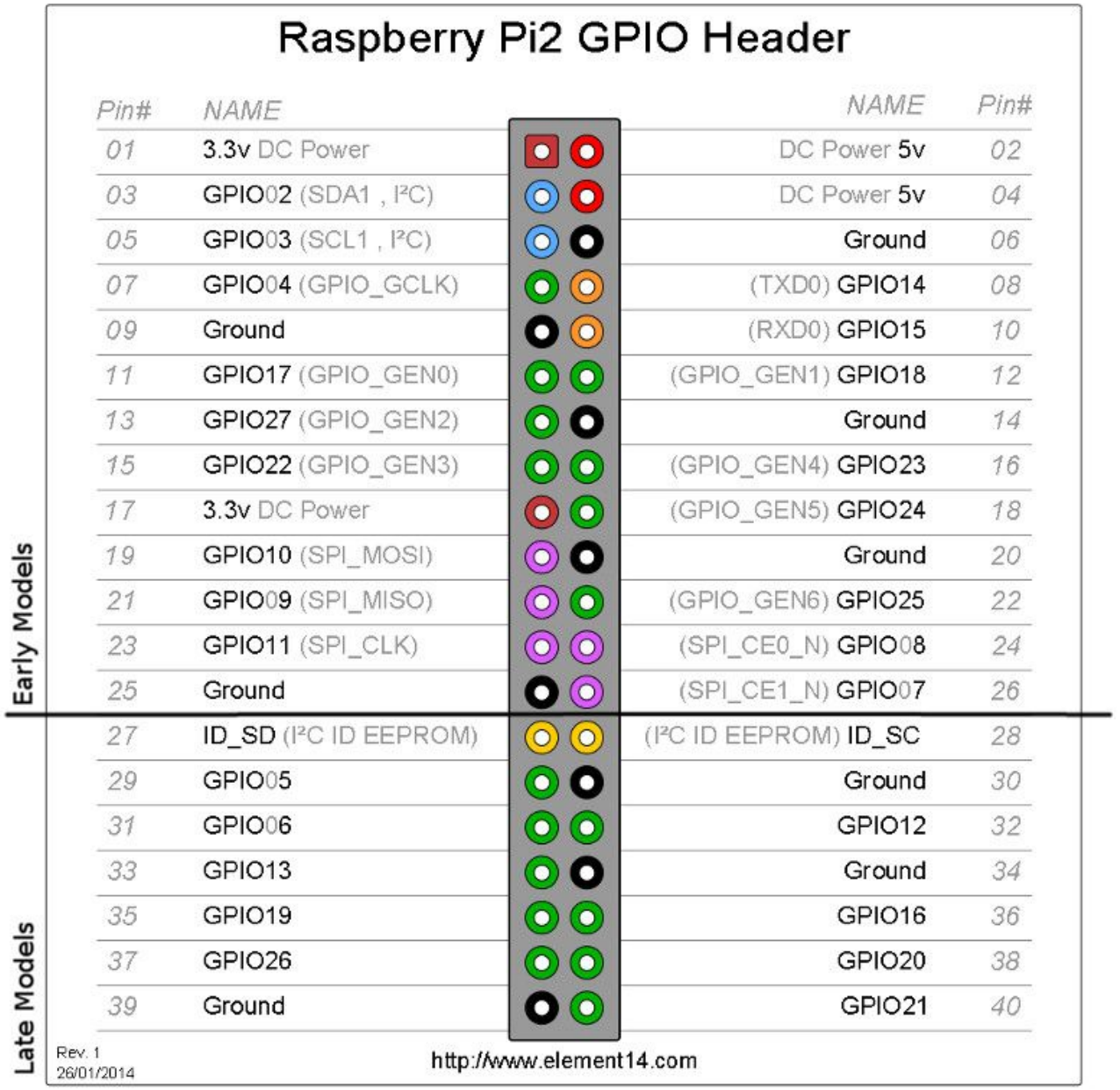
RISC OS

Weather Station

IchigoJam RPi

GPIO

- Connect Sensors and Actuators
- Digital Input and output similar to arduino. But 3.3v range & 10mA
- lack of ADC
- Possible to connect external ADCs through SPI or I2C
- PWM for motor/LED Control
- UART for communication



Using the GPIOs (Python based)

GPIO Library

Very similar to Arduino Digital Input & Output

Set GPIO to Input / Output

If input - read the specific pin to get the value

if output - set high/low to control

More reading: https://www.raspberrypi.org/documentation/usage/gpio/

UART, SPI & I2C have to enabled through raspi-config

specific libraries allow data read/write operations through these protocols.

Modbus protocol is used for industry M2M communications, eg: reading data from a smart meter. No native support available, but RS232 to Modbus converter is possible

Other SBC - Beaglebone supports CANBUS

Using GPIO

```
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BOARD)
GPIO.setup(7,GPIO.OUT)

for i in range(50):
    GPIO.output(7,True)
    time.sleep(1)
    GPIO.output(7,False)
    time.sleep(1)

GPIO.cleanup()
```

Import the GPIO Library

Choose GPIO Pinmode

Config GPIO as output

Set GPIO to high

Set GPIO to low

Clean GPIO configs

Using GPIO - Input

```
#buttonInput.py
import RPi.GPIO as GPIO
from time import sleep

GPIO.setmode(GPIO.BCM)

sleepTime = .1

#GPIO Pin of the component
lightPin = 4
buttonPin = 17

GPIO.setup(lightPin, GPIO.OUT)
GPIO.setup(buttonPin, GPIO.IN, pull_up_down=GPIO.PUD_UP)
GPIO.output(lightPin, False)

try:
    while True:
        GPIO.output(lightPin, GPIO.input(buttonPin))
        sleep(.1)
finally:
    GPIO.output(lightPin, False)
    GPIO.cleanup()
```

Import the GPIO Library

Choose GPIO Pinmode

Config GPIO as Input

Read GPIO Input

Clean GPIO configs

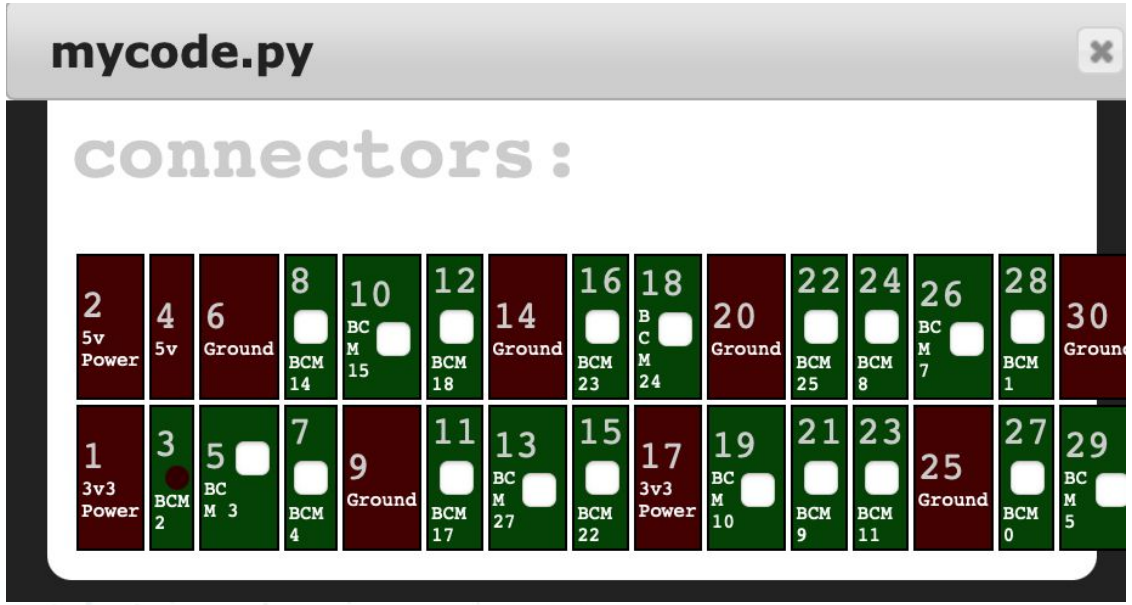
Simulators (1)

https://www.iot4smes.eu/en/demonstrator.aspx?id=4.full

UNED R-Pi Simulator

mycode.py

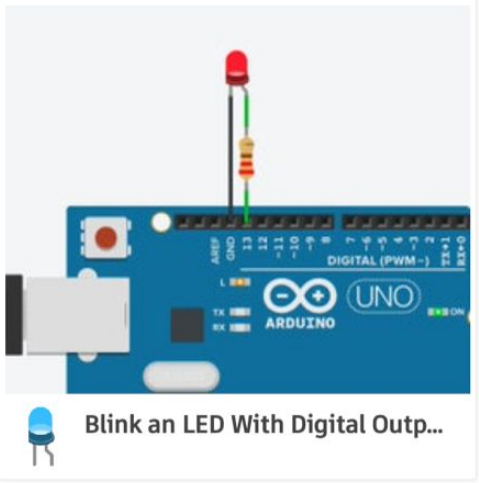
```
1  import RPi.GPIO as GPIO
2  import time
3
4  GPIO.setmode(GPIO.BOARD)
5  GPIO.setup(3, GPIO.OUT)
6  GPIO.setup(5, GPIO.IN)
7
8  # flash pin 3 five times
9  for i in range(5):
10     GPIO.output(3, GPIO.HIGH)
11     time.sleep(1)
```

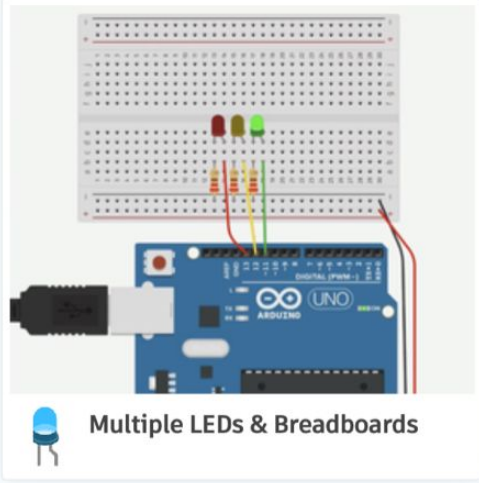


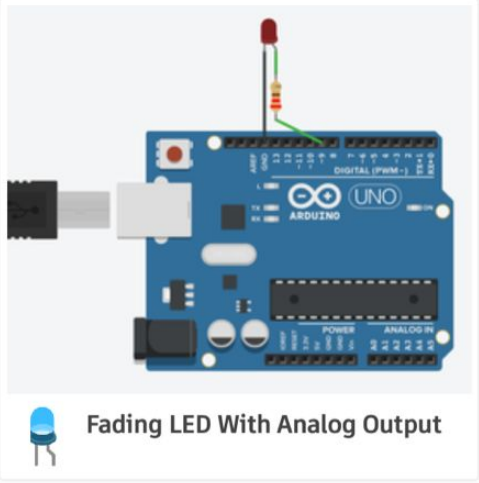
Simulators (2)

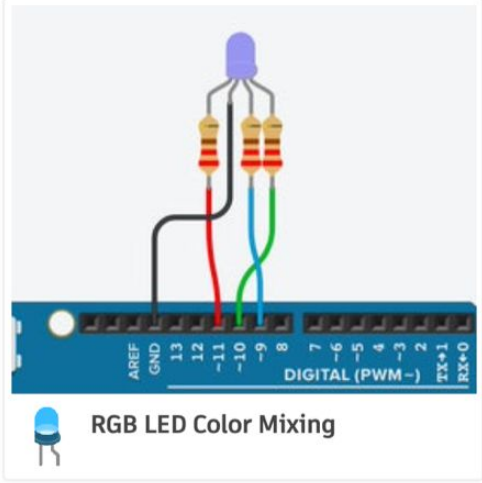
https://www.tinkercad.com

Learn Arduino

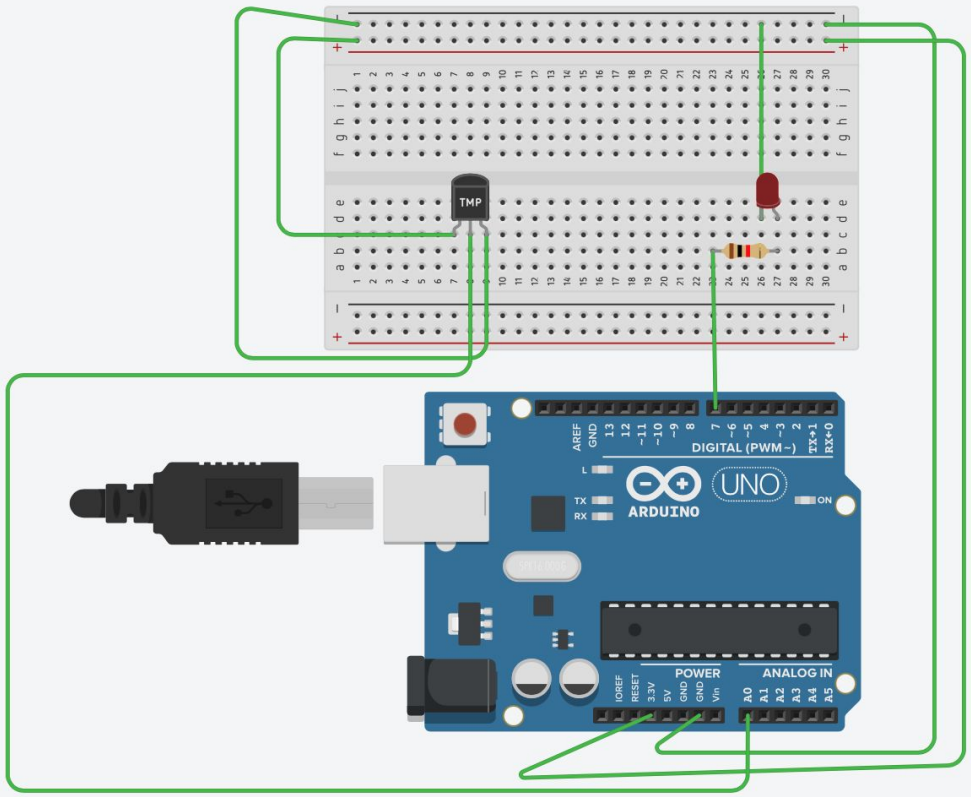








Show all Arduino



Blocks

Output
Input
Notation
Control
Math
Variables

set built-in LED to HIGH

pin 0 to HIGH

pin 3 to 0

ate servo on pin 0 to 0 degr

y speaker on pin 0 with tone 6

n off speaker on pin 0

nt to serial monitor hello world wit

RGB LED in pins 3 3

1 (Arduino Uno R3)

```
set Temp to read analog pin A0
print to serial monitor Temp with newline
set Temp to map Temp to range -40 to
print to serial monitor Temp with newline
if Temp > 25 then
    set pin 7 to HIGH
else
    set pin 7 to LOW
```

Serial Monitor

ACKNOWLEDGMENTS / REFERENCES

- http://pibeginners.com/
- https://www.youtube.com/user/RaspberryPiBeginners
- https://www.coursehero.com/file/21672571/rpi-lec/
- https://www.raspberrypi.org/
- https://www.amrita.edu/research/project/advanced-integrated-wireless-sensor-networks-real-time-monitoring-and-detection
- https://www.amrita.edu/research/project/micronet-mobile-infrastructure-coastal-region-offshore-communications-networks
- https://www.amrita.edu/research/project/amrita-wireless-smart-grid