IoT with CircuitPython

Look mam, no development environment.

David Glaude

Fosdem'20
https://github.com/dglaude/Fosdem20CircuitPython

Partial disclosure

Not related to my job

   (so I will not disclose)

Not affiliated with Adafruit

   (but I have stickers for you)

What is CircuitPython

CircuitPython is a fork of MicroPython

MicroPython is a re-implementation of Python 3 language optimised for MicroProcessor

MicroPython Damien George was initially working on STM32F405RG (M4)

PyBoard, KickStarter for ESP8266, micro:bit, PyBoard-D

CircuitPython vs MicroPython

CircuitPython vs MicroPython

Be aware as of 11/2016 the master branch of Adafruit's MicroPython GitHub repository has a new API which is not directly compatible with other MicroPython libraries.

- Different hardware support with some overlap (STM32)

- MicroPython support interrupt, asynchronous / uLibrary

- CircuitPython has multilingual error

- Different Wifi offloading board and different BLE API (both low level)

CircuitPython 1.0.0

JULY 19, 2017

https://blog.adafruit.com/2017/07/19/circuitpython-1-0-0/

Based on MicroPython 1.8.7.

Support Atmel SAMD21 (aka M0) and ESP8266

CircuitPython 2.0.0

SEPTEMBER 12, 2017

https://blog.adafruit.com/2017/09/12/circuitpython-2-0-0/

Based on MicroPython 1.9.2.

CircuitPython 3.0.0

JULY 9, 2018

https://blog.adafruit.com/2018/07/09/circuitpython-3-0-0-released-adafruit-circuitpython/

Support for the SAMD51 (aka M4)

Based on MicroPython 1.9.3.

CircuitPython 4.0.0

MAY 20, 2019

https://blog.adafruit.com/2019/05/20/circuitpython-4-0-0-released/

Remove ESP8266 support

Support Nordic nRF52840

Add bleio and Displayio replace framebuffer

Based on MicroPython 1.9.4 @25ae98f.

CircuitPython 5.0.0

SOON

https://blog.adafruit.com/2020/01/21/circuitpython-5-0-0-beta-4-release-adafruit-circuitpython/

Support for STM32F4, iMX RT10xx and Sony Spresense microcontrollers

Better BLE

Adafruit

Maker company from NYC

Women-owned company founded by Limor engineer from mit

open hardware and open source

A company with values: Gender Inclusive, voting day, STEM education, Support for …

https://www.adafruit.com/

Ressources

https://circuitpython.org/

100+ boards: Adafruit and other

Learn guide

https://learn.adafruit.com/category/circuitpython

sensor => library => example => learn guide

Community

Discord:

https://adafru.it/discord

Forum:

https://forums.adafruit.com/

CircuitPython library

200+ Libraries

- py: Python library
- mpy: Bytecode compiled
- frozen = build into core

Blinka

Circuit Python Library for

- Microcontroller https://learn.adafruit.com/assets/81365
- Single Board
- Personal Computer: Linux Windows Mac
  https://learn.adafruit.com/assets/81369

https://learn.adafruit.com/circuitpython-on-any-computer-with-ft232h

User Friendly experience

- Appear as a USB storage
- Just edit code.py or main.py
- Add library by copying files
- Serial over USB available for REPL
- Drag and drop new firmware (UF2)

https://learn.adafruit.com/welcome-to-circuitpython

Hello World Demo

REPL

print("Hello World!")

Mu, the recommended Editor

- Auto-detect CircuitPython board
- Python highlight and checking
- Immediately save the complete file
- Serial support for REPL
- Draw graphic from output

https://madewith.mu/

https://codewith.mu/

Blinkt Demo

The microcontroller Hello World

https://learn.adafruit.com/welcome-to-circuitpython/creating-and-editing-code

IoT

- Adafruit IO
- Airlift
- PyPortal
- BLE with nRF52840

Adafruit IO

Adafruit IO is a platform designed Adafruit to display, respond, and interact with your project's data.

https://io.adafruit.com/

We also keep your data private (data feeds are private by default)

and secure (we will never sell or give this data away to another company) for you.

It's the internet of things - for everyone!

https://learn.adafruit.com/mqtt-in-circuitpython

AirLift

- ESP32 used as a Wifi coprocessor
- Based on Nina Fw
- Use SPI rather than UART
- On board, add-on, DIY
- Require M4, nRF52840 or above

Demo Cheerlight

CheerLights is an #internetofthings project by @scharler to synchronize lights to the same color at the same time all around the world.

https://cheerlights.com/

https://twitter.com/cheerlights

- PyGamer + AirLift
- PyPortal text
- PyPortal json

BLE

- recommendation: nRF54840 board
- GAP: Central or Periferical
- GATT: Server or Client

https://learn.adafruit.com/assets/86833

https://learn.adafruit.com/circuitpython-nrf52840

https://learn.adafruit.com/ble-hid-keyboard-buttons-with-circuitpython/understanding-ble

https://learn.adafruit.com/category/bluefruit-slash-ble

BLE Demo

Hide n Seek (beacon)

Central/client Color (Adafruit UART protocol)

Adafruit form factor

- Arduino
- Feather
- ItsyBitsy
- Circuit Playground (CPX & CPB)
- Micro-bit (CLUE)

Jargon (1/2)

- Circuit Python: Adafruit fork of Micro Python (see rules)
- Blinka: Software layer to use Circuit Python Library on computer
- Feather: Adafruit form factor for microcontroler board
- Feather Wing: Adafruit addon board that plug on a Feather to add feature
- Circuit Playground: Adafruit round form factor board for education
- DotStar: Adafruit name for individually-addressable RGB color based on APA102/SK98225 LED
- NeoPixel: Adafruit name for individually-addressable RGB color based on the WS2812, WS2811 or SK6812 LED/drivers

Jargon (2/2)

- Bluefruit (LE): Adafruit name for board that support Bluetooth (and BLE)
- - Airlift: Adafruit name for ESP32 based (Nina FW) Wifi/HTTPS co-processor for microprocessor
- Crickit: Robotics interface board for Circuit Playground, Microbit or Feather
- Stemma: 4 pin JST PH (2.0mm pitch) used for I2C connector
- Stemma QT: smaller 4 pin JST SH (1.0mm pitch) use for I2C connection
- Express: Board typically supporting Circuit Python that have additional storage
- Adafruit IO: Online service for IoT, dashboard, mqtt, ...

Peoples

- Limor
- Phil
- Scott
- Dan
- Kattni
- John Park
- ...

Thank you

Thank you to the Circuit Python community

Questions (if any time left)

Stickers