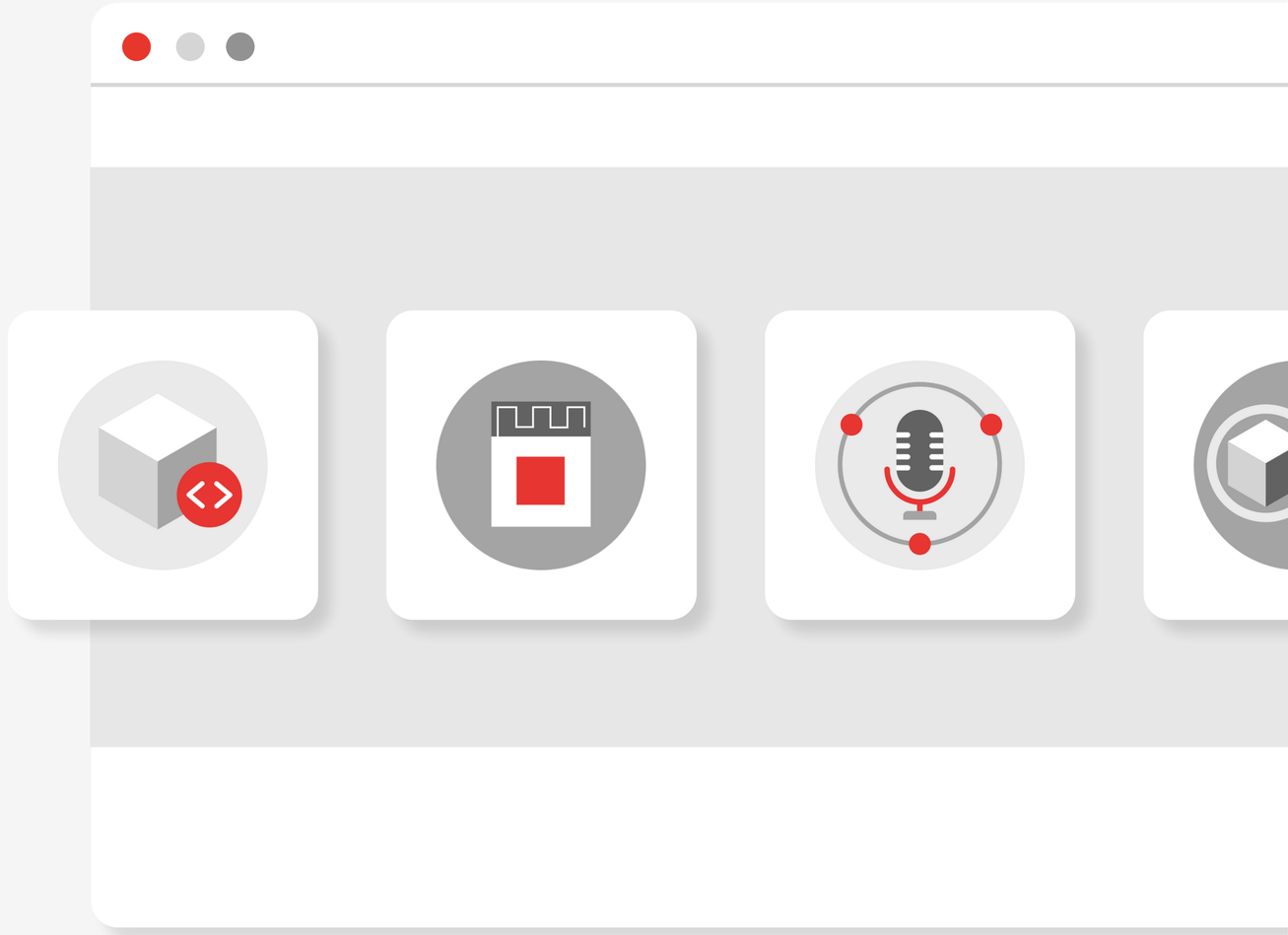
ESPRESSIF

Espressif ESP-IDF IoT Workshop



Prepared for SUTD WTH 2023

24-25 August 2023

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Senior Software & Technical Marketing Manager

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Access to Slide Deck

- Access this slide deck from your device to follow along
- Get URLs to documentation and code

https://tinyurl.com/wth-esp-idf/

Contents

Contents

01

Introduction

Our company, products, and what are we doing today?

Our Company

- Started in 2008 in China
- Offices in China, Czech Republic, India, Singapore and Brazil
- Well known for cutting-edge wireless communication, low-power, AIoT solutions
- Open-source code and documentation

Our Products

Highly integrated, low-power, wireless connectivity, cost-effective AIoT solutions

Hardware

SDKs

ESP-IDF

Cloud Connectivity

ESP Jumpstart

ESP SOLUTION AUDIO

ESP SDK HomeKit

AI/DSP

ESP32 + ARDUINO

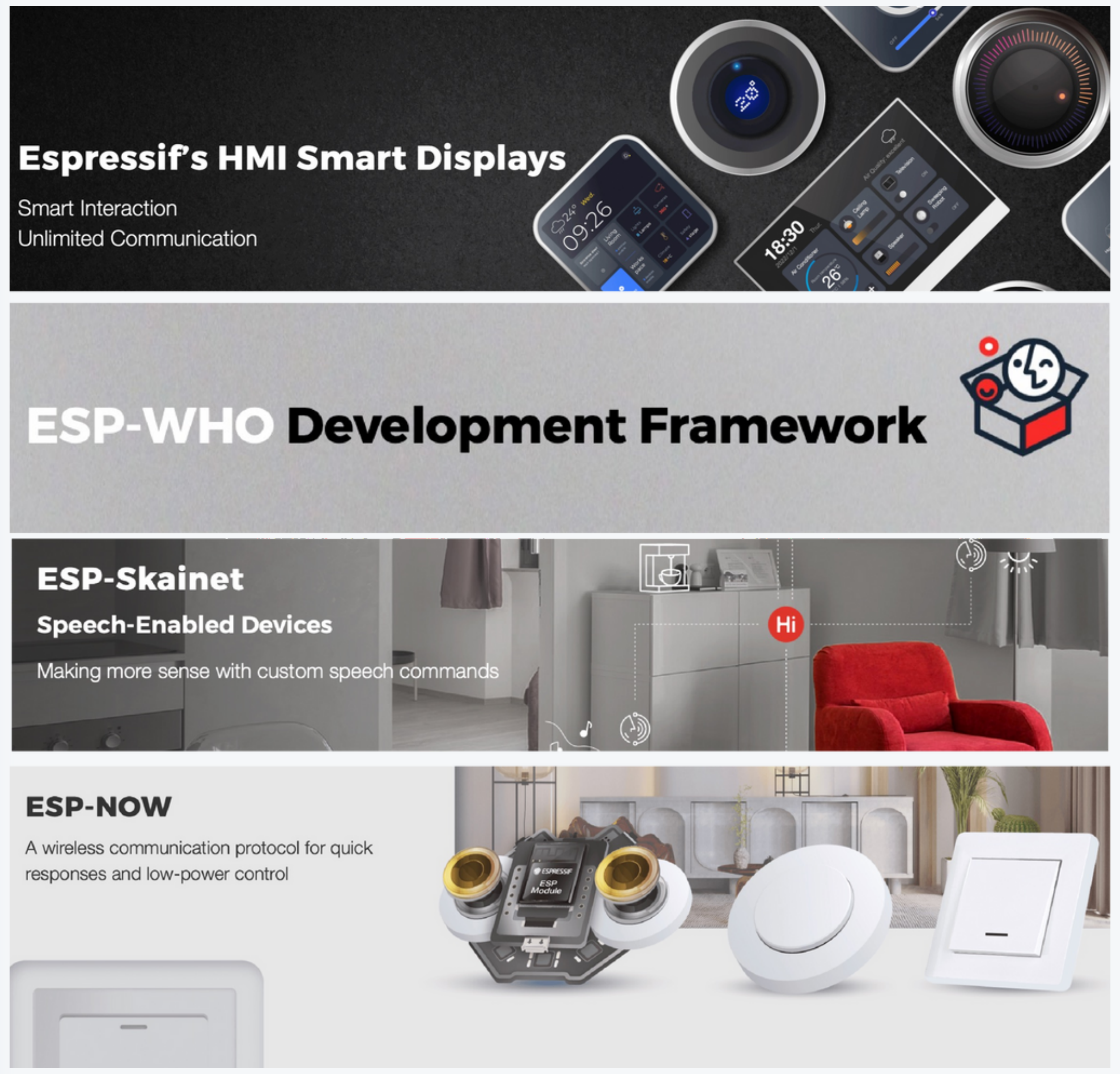
ESP Arduino

ESP SDK IoT

ESP SDK MESH

Solutions

matter



Ecosystem

aws PARTNER

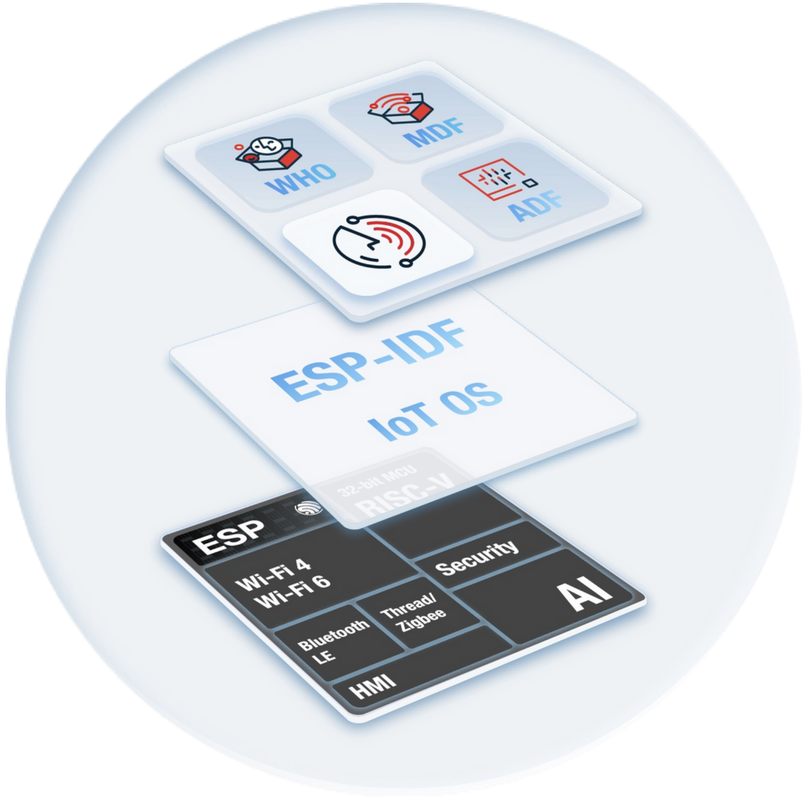
ESP RAINMAKER®

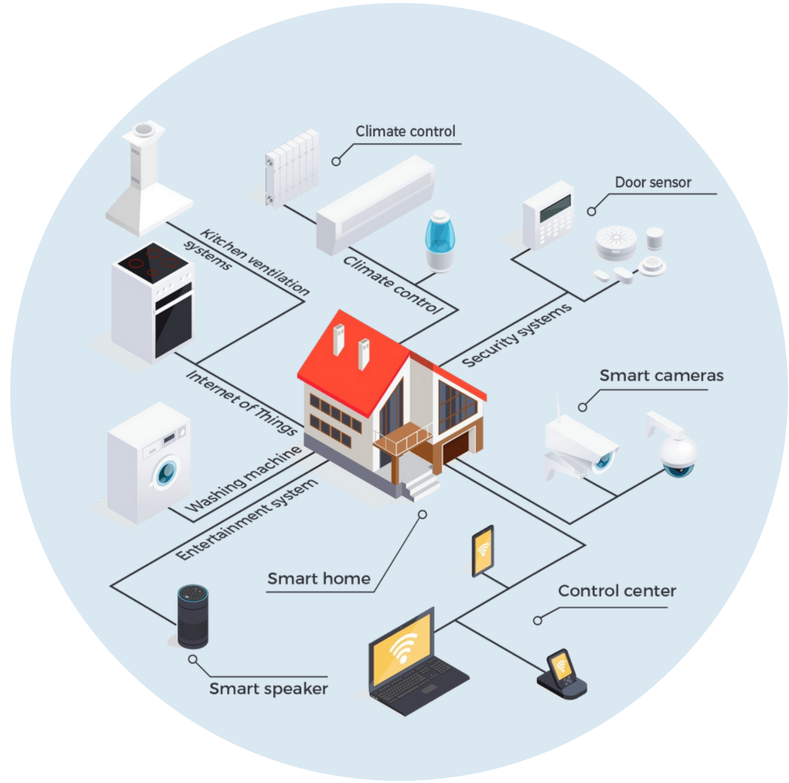
ESP INSIGHTS

aws | SmartThings | Microsoft Azure | Google Cloud Platform
阿里云 | 百度云 | 机智云 Gizwits | CoolKit
thinger.io | PLATFORMIO.ORG | Ayla Networks | TOIT
EQUES 移康智能 | COSA | dweet.io | ThingSpeak
thethings.iO | CESANTA | supla | HARDWIRE
ubidots | myDevices | DeviceHive | SLS
nano | ThingsBoard | TEMBOO | IoTify
nabto | FotaHub | ioiaqo | Golioth
IOTize | WizzDev | Enapter

Complete AIoT Solution Provider

From chip to embedded software to production-ready AIoT solutions





02

What is AIoT?

AI + IoT = AIoT

Face recognition

Camera at your house door with live video feed

Informs user's phone when a family member or a guest is at the door

'Edge-based vs cloud-based'

'Smart cities'

'Autonomous vehicles'

'Smart homes'

03

Intro to ESP-IDF

Espressif’sofficial IoT Development Framework

What is ESP-IDF?

- ESP-IDF is Espressif’sofficial IoT Development Framework
- Provides self-sufficient SDK for any generic application
- Based on C

Do you know?

ESP-IDF currently powers millions of devices in the field and enables building a variety of network-connected products, ranging from simple light bulbs and toys to big appliances and industrial devices.

ESPRESSIF

Open-source

Faster time to market without sacrificing customization.
Drastically simplify code complexity using smart-home products SDKs.

Production-Ready

Maintains stable release, well-defined release process and a support policy

Rigorous QA process to ensure production readiness

ESP-IDF

Supports large number of software components and SDKs

Support for VScodeand Eclipse IDEs

Feature-Rich Software Components

Extension documentation on software, usage and design level

Over 100 examples to learn and start with

Documentation and Examples

04

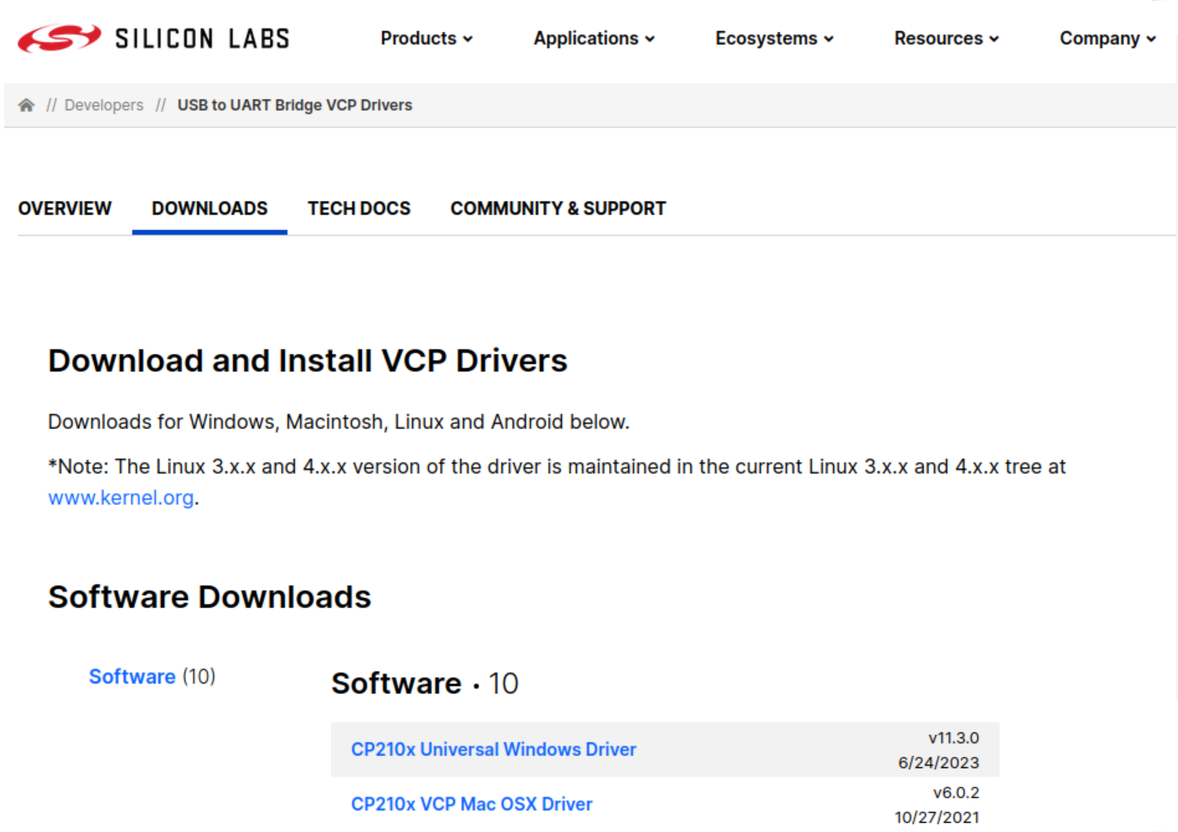
ESP-IDF: Hello world (hands-on)

ESP-IDF Installation, connect ESP32-S3 Dev Kit, flash ‘hello world’ example

Installing Driver

Google: Silicon Labs CP210x Driver

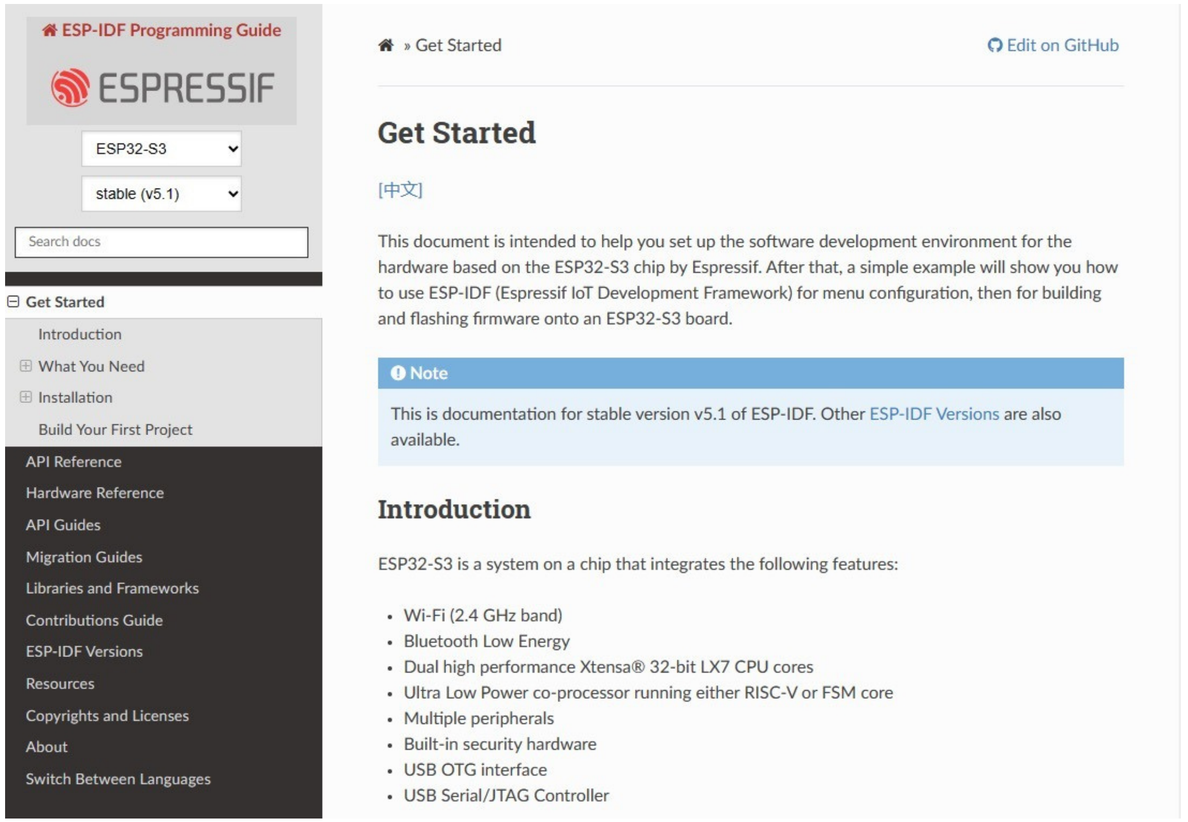
- Download driver
- Unzip folder
- Plug in your board (left port)
- Goes to device manager
- Right click
- Update driver
- Browse to the unzipped folder earlier



ESP-IDF: Hello world(hands-on)

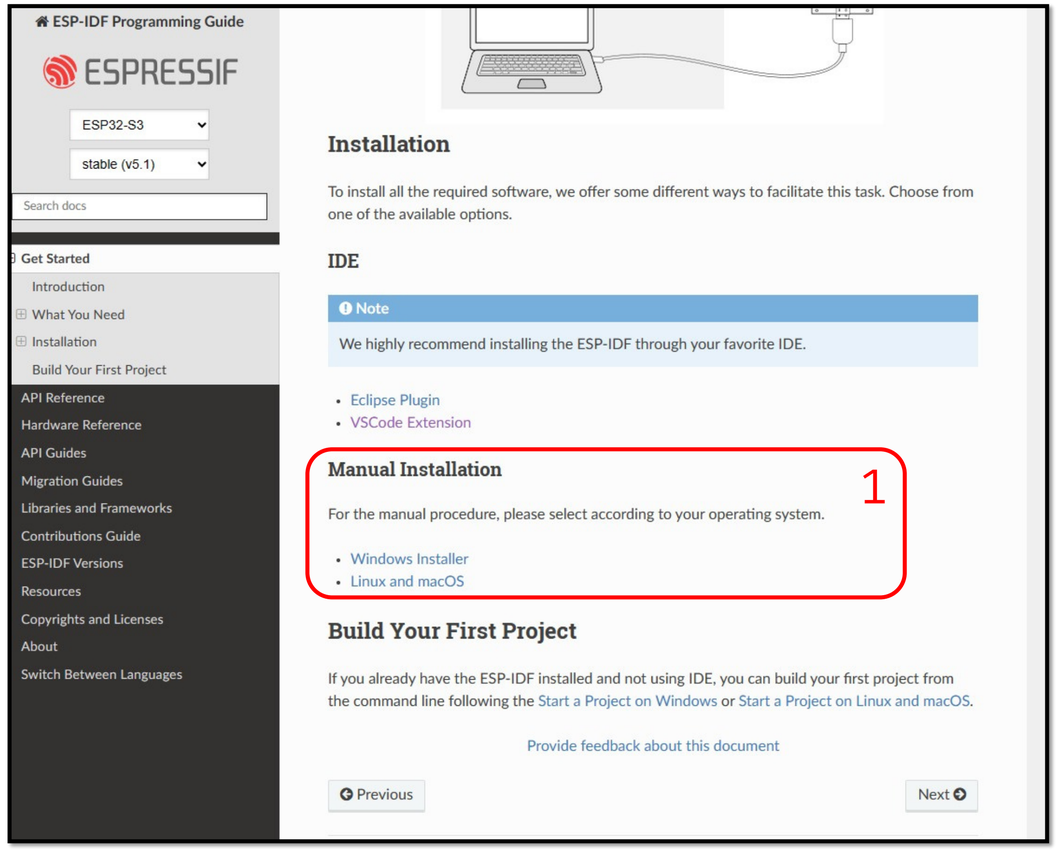
1. Go to website

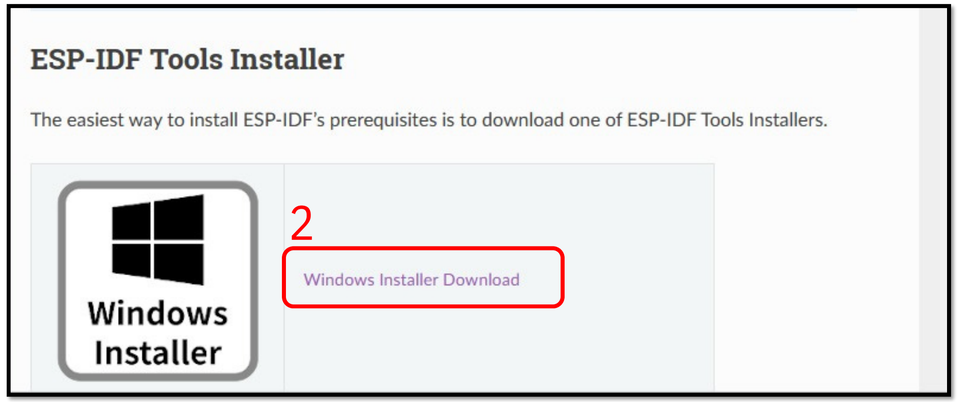
https://docs.espressif.com/projects/esp-idf/en/v5.1/esp32s3/get-started/index.html

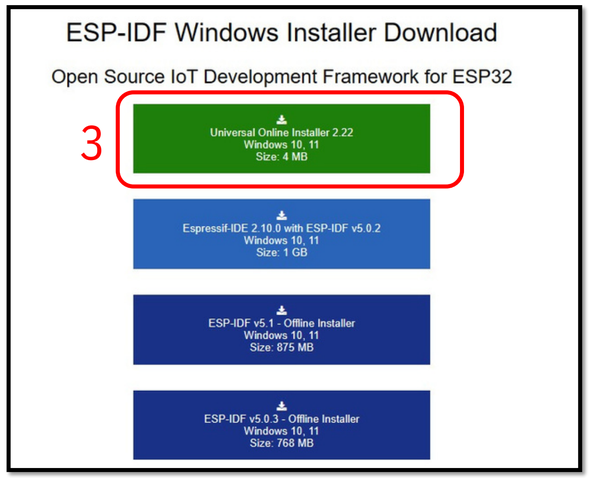


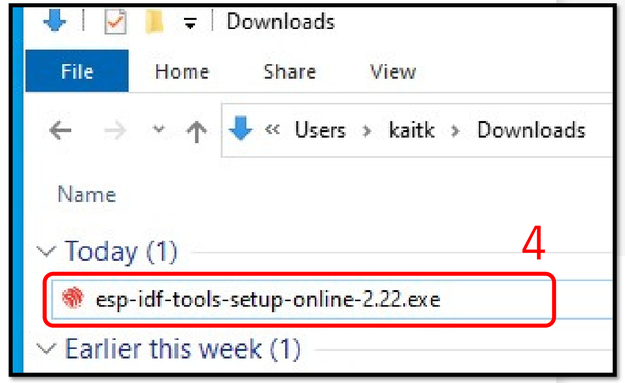
ESP-IDF: Hello world (hands-on)

2. Manual Installation



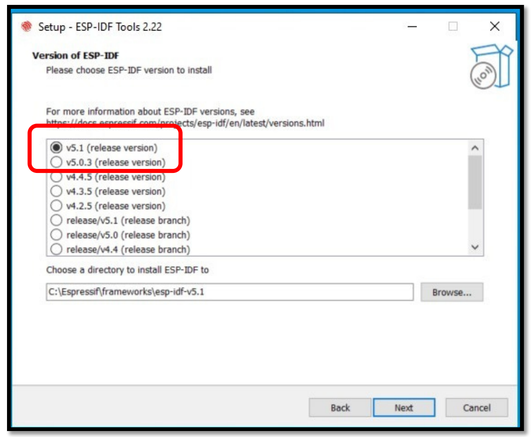






ESP-IDF: Hello world (hands-on)

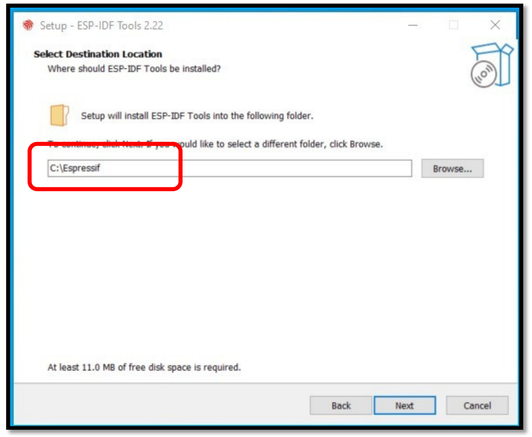
3. Install on desktop



Select ‘v5.1 (release version)’

Note

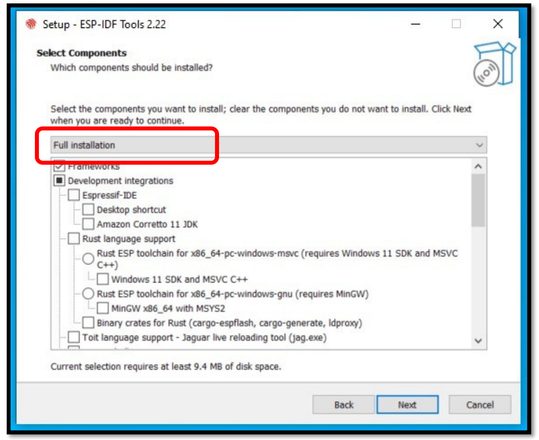
Do not choose the release branch.



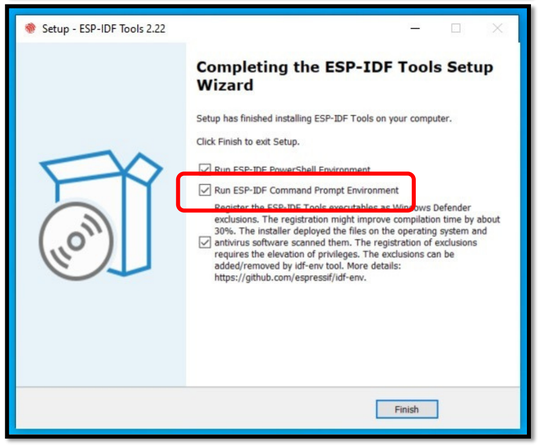
Select destination

Note

The path CANNOT have any spaces!



Select Full installation



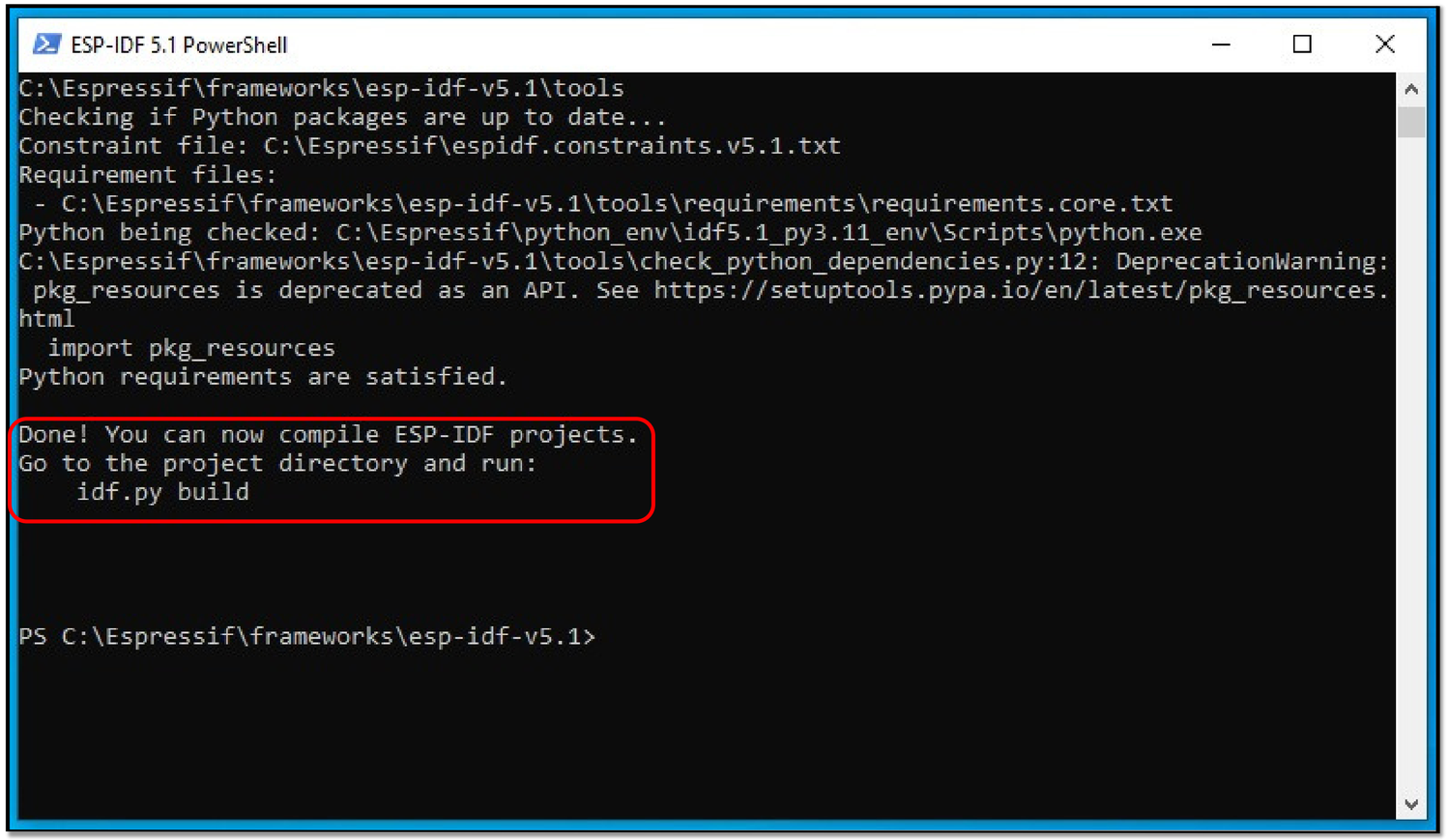
Uncheck command prompt

(you only need to open either one of the terminal)

ESP-IDF: Hello world (hands-on)

4. Launch ESP-IDF on PowerShell (terminal)

From the previous step, ESP-IDF PowerShell should run automatically



Tips

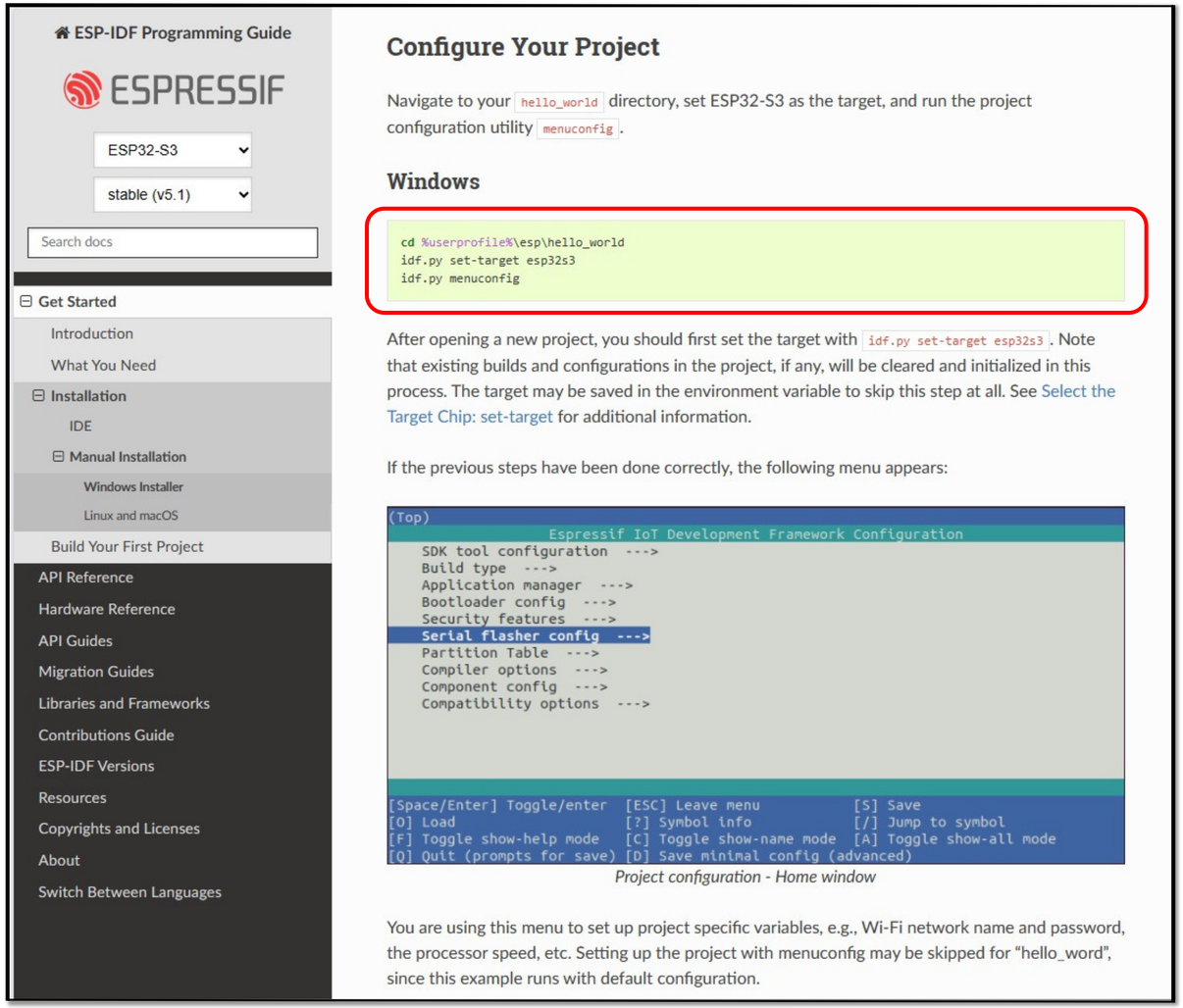
From here, you can run various ESP-IDF commands. Check out the documentation here!

ESP-IDF: Hello world (hands-on)

Good to know!

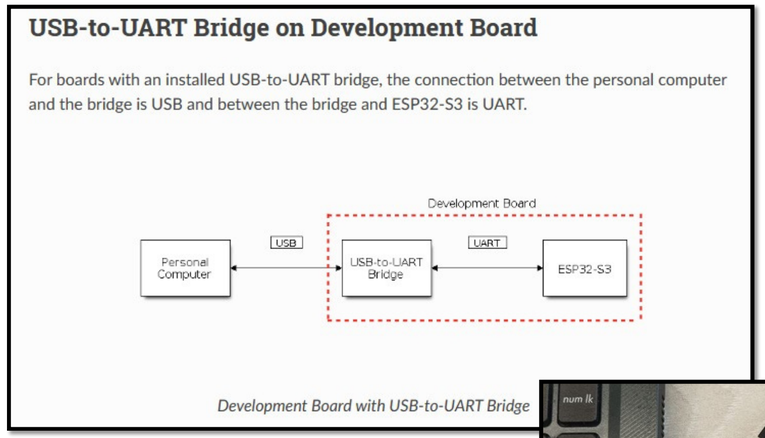
From your terminal, you can access menuconfig to configure project specific variables.

We will skip this for now, as ‘hello world’ runs on default configuration.



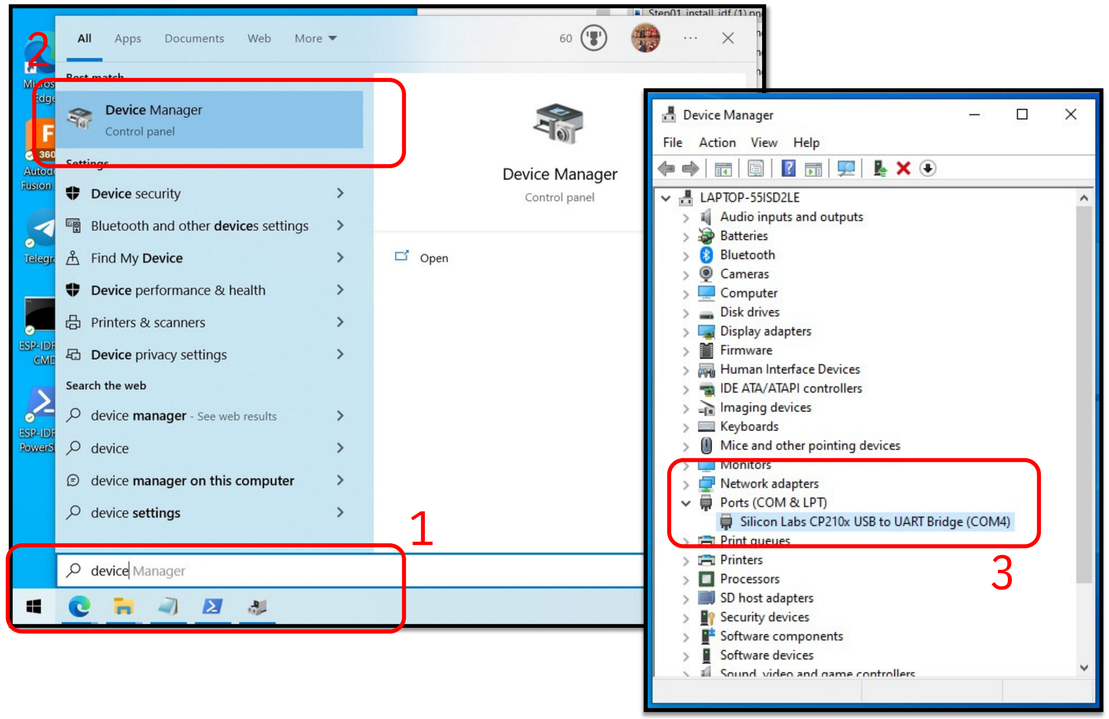
ESP-IDF: Hello world(hands-on)

5. Connect Devkit



Use the USB-UART bridge (left)

6. Identify COM Port



Plug/unplug dev board to see which COM port its connected to

ESP-IDF: Hello world (hands-on)

7a. Navigate to ‘examples\hello_world’ in PowerShell

7b. Setup builds and configuration for your chip

Use idf.py set-target esp32s3

```
PS C:\Users\kaitk\OneDrive\Desktop\myexamples> xcopy /e /i C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world hello_world
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\CMakeLists.txt
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\pytest_hello_world.py
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\README.md
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\sdkconfig.ci
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\main\CMakeLists.txt
C:\Espressif\frameworks\esp-idf-v5.1\examples\get-started\hello_world\main\hello_world_main.c
6 File(s) copied
PS C:\Users\kaitk\OneDrive\Desktop\myexamples> cd hello_world
PS C:\Users\kaitk\OneDrive\Desktop\myexamples\hello_world> idf.py set-target esp32s3
```

7c. Build, and flash

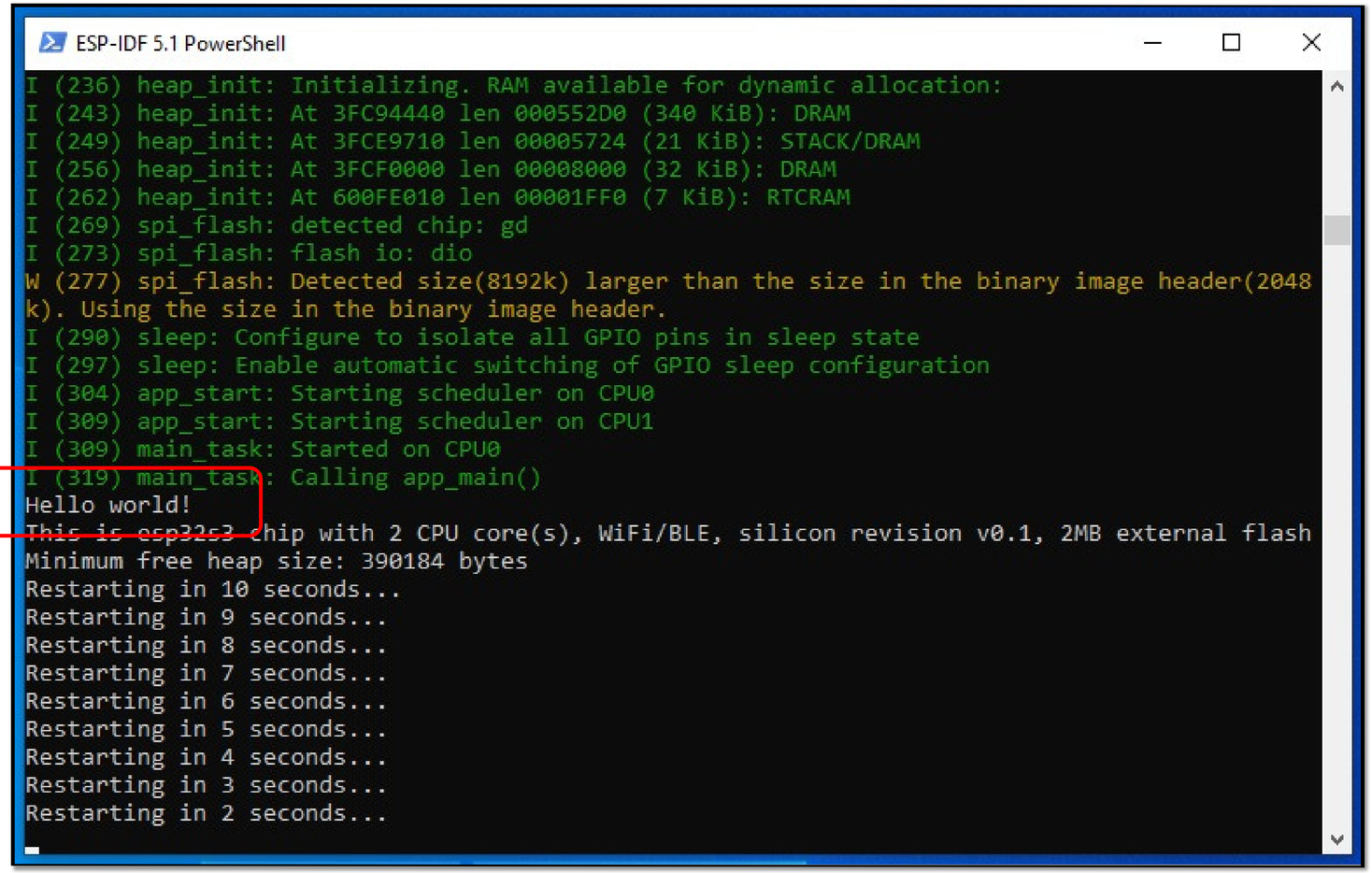
Use idf.py build

Use idf.py –p (PORT) flash monitor

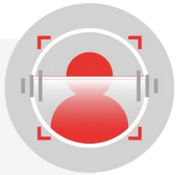
Tips
Eg, idf.py –p COM4 flash

ESP-IDF: Hello world (hands-on)

DONE!



Hands-on Time!



Download and install ESP-IDF

Navigate to ‘hello world’ example

Connect ESP32-S3-DevkitC-N8R8

Build, flash, monitor

05

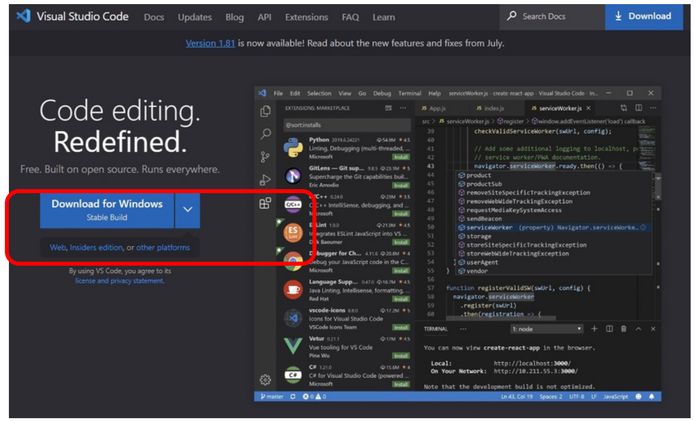
VScode: Blink (hands-on)

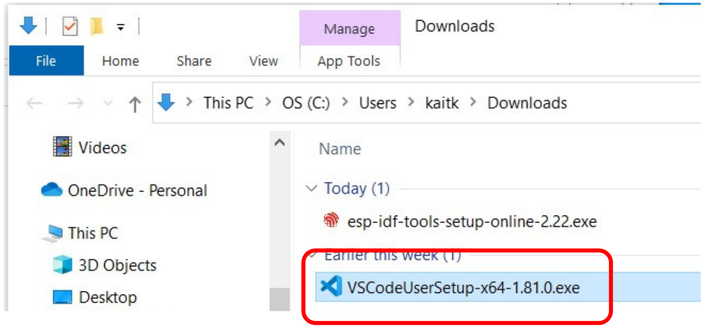
Download VScode, download Espressif IDF extension, Install, copy and flash ‘blink’ example

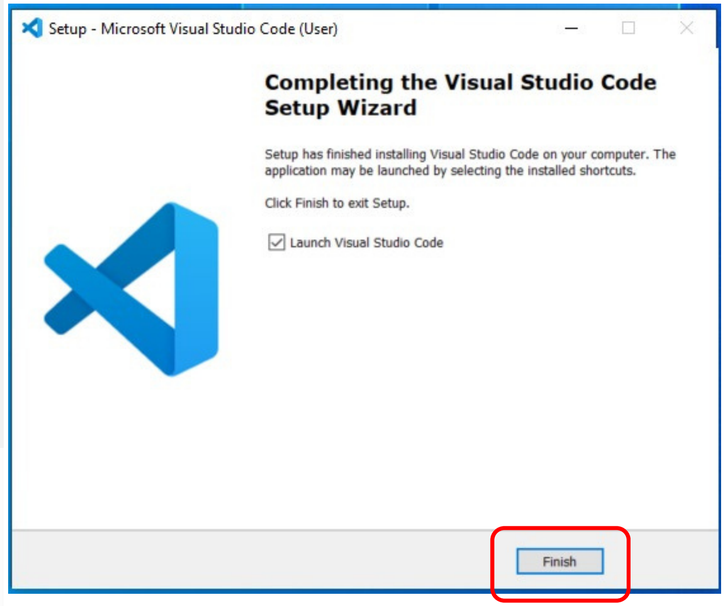
VScode: Blink (hands-on)

1. Download VScode

https://code.visualstudio.com

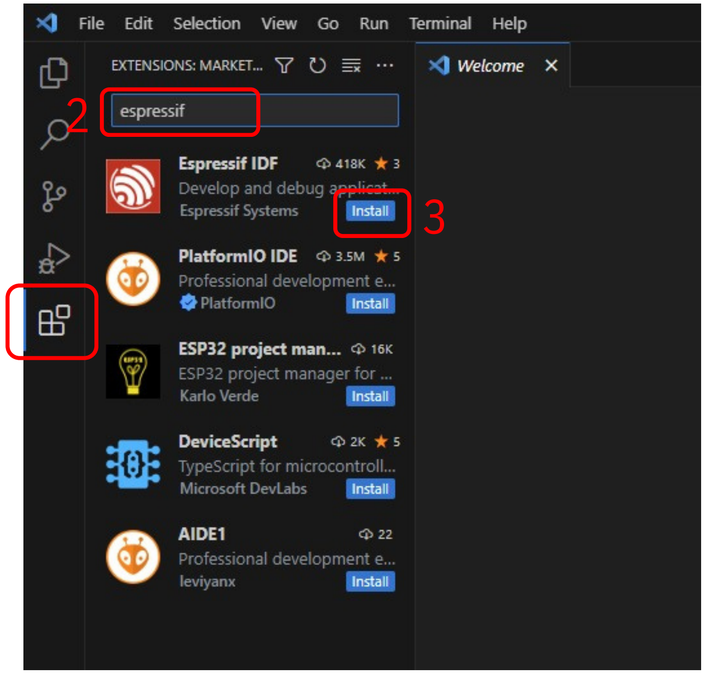




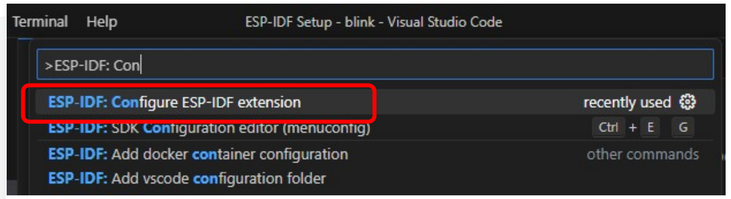


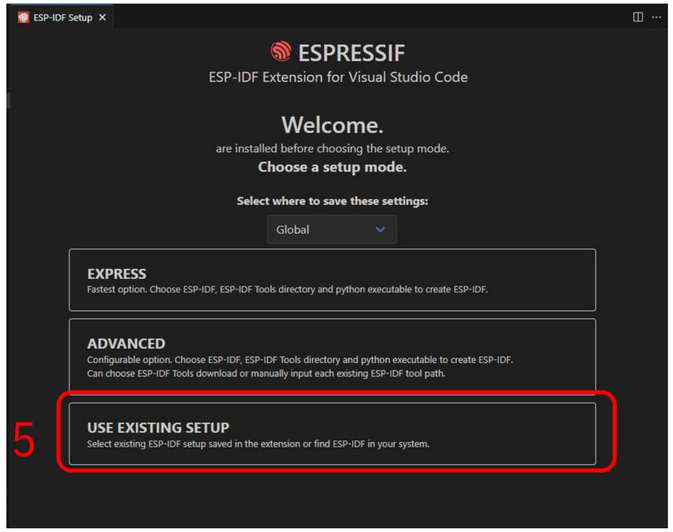
VScode: Blink (hands-on)

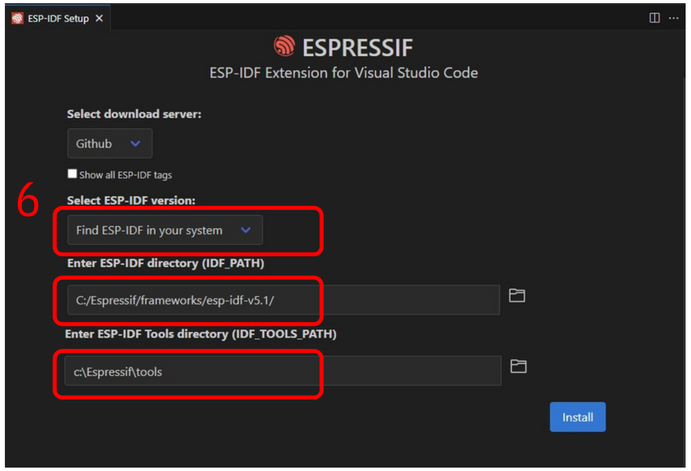
2. Download extension

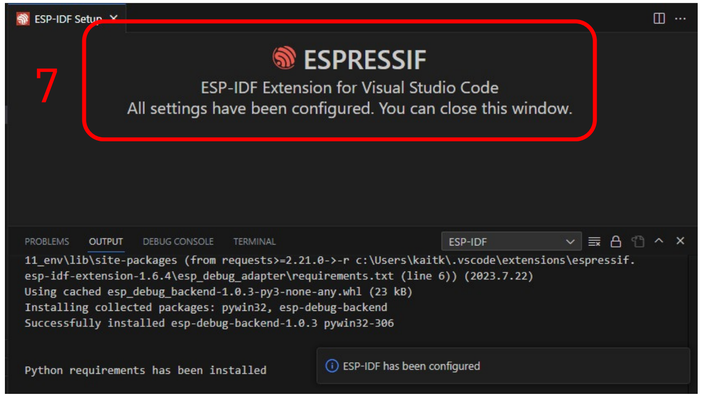


“Ctrl+Shift+P” or F1 to bring up Command Palette





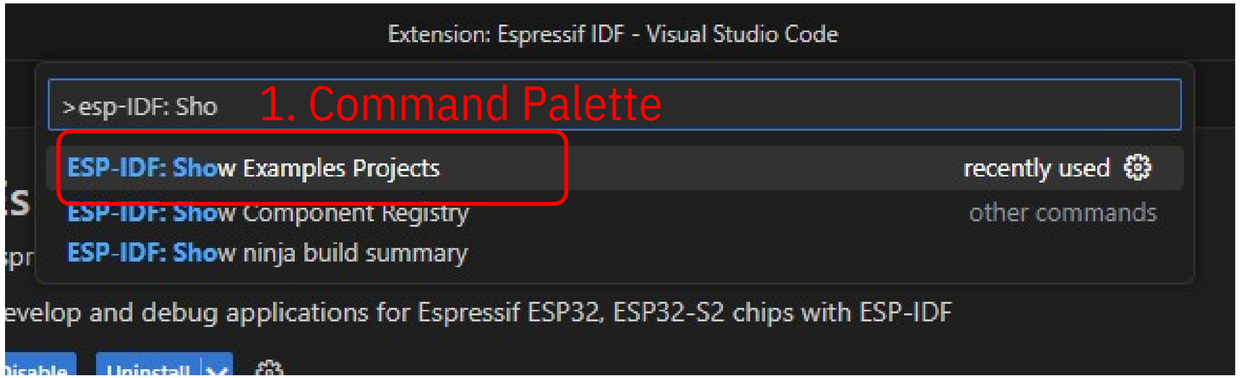


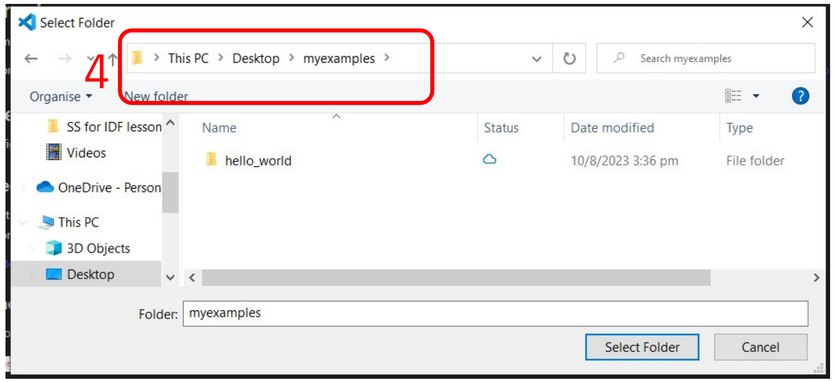


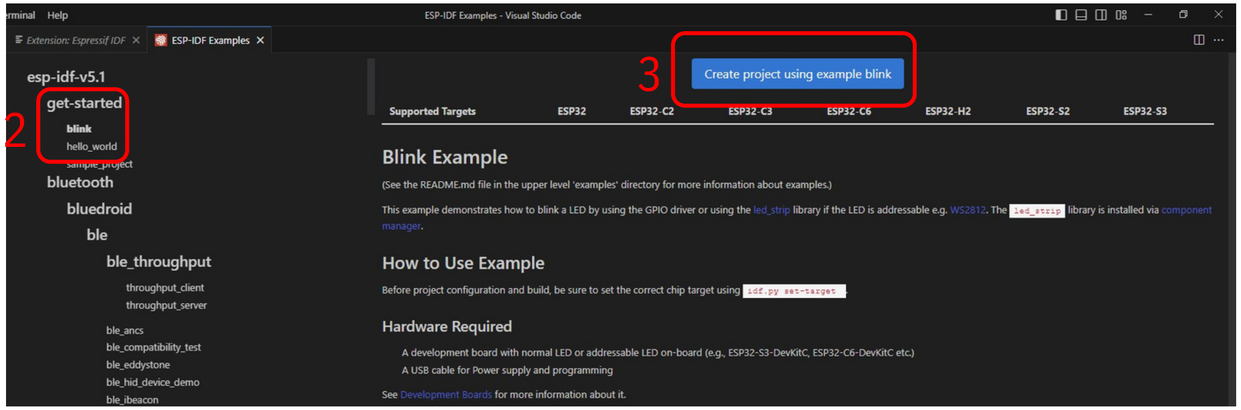
Complete!

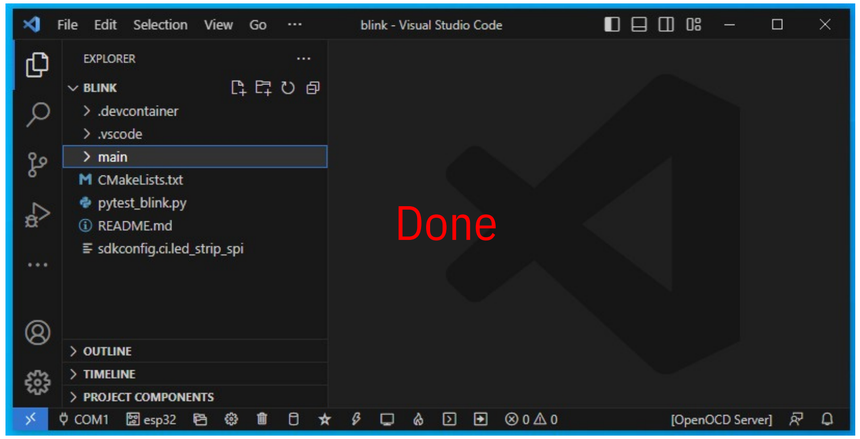
VScode: Blink (hands-on)

3. Copy ‘blink’ example





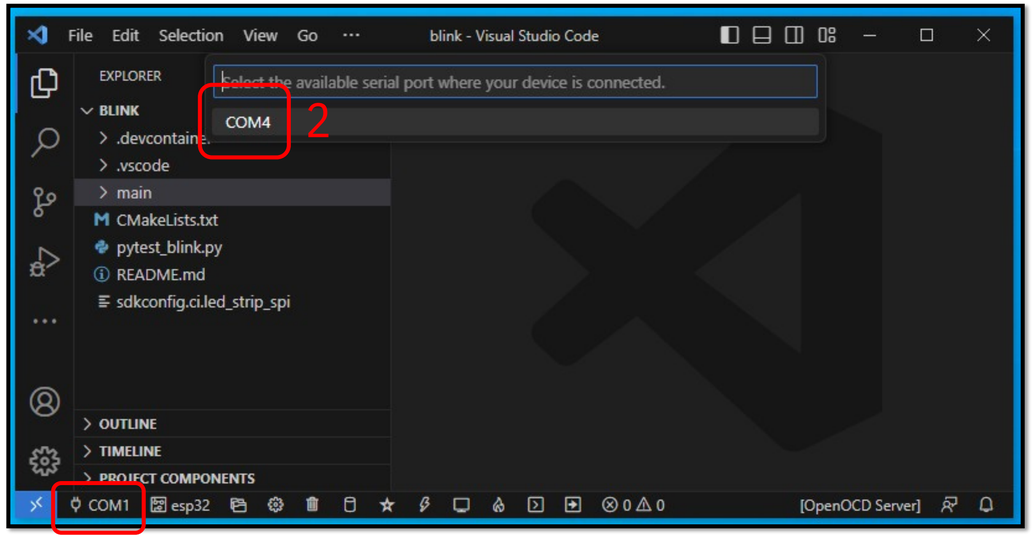




VScode: Blink (hands-on)

4. Set COM port

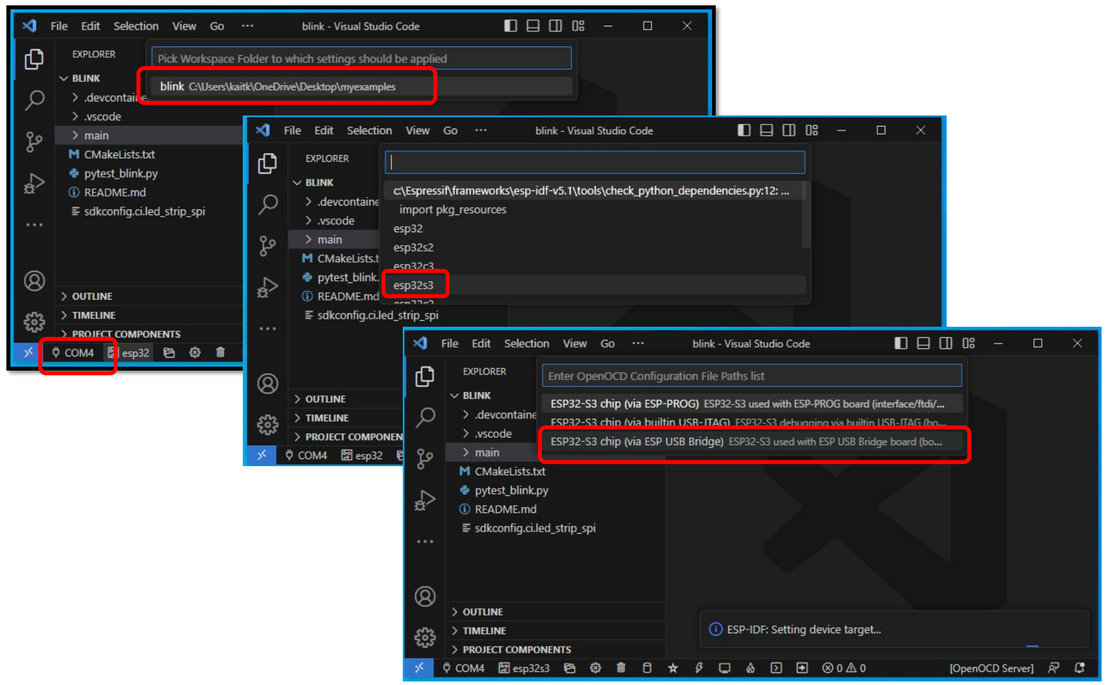
Set to your devkit's port



1

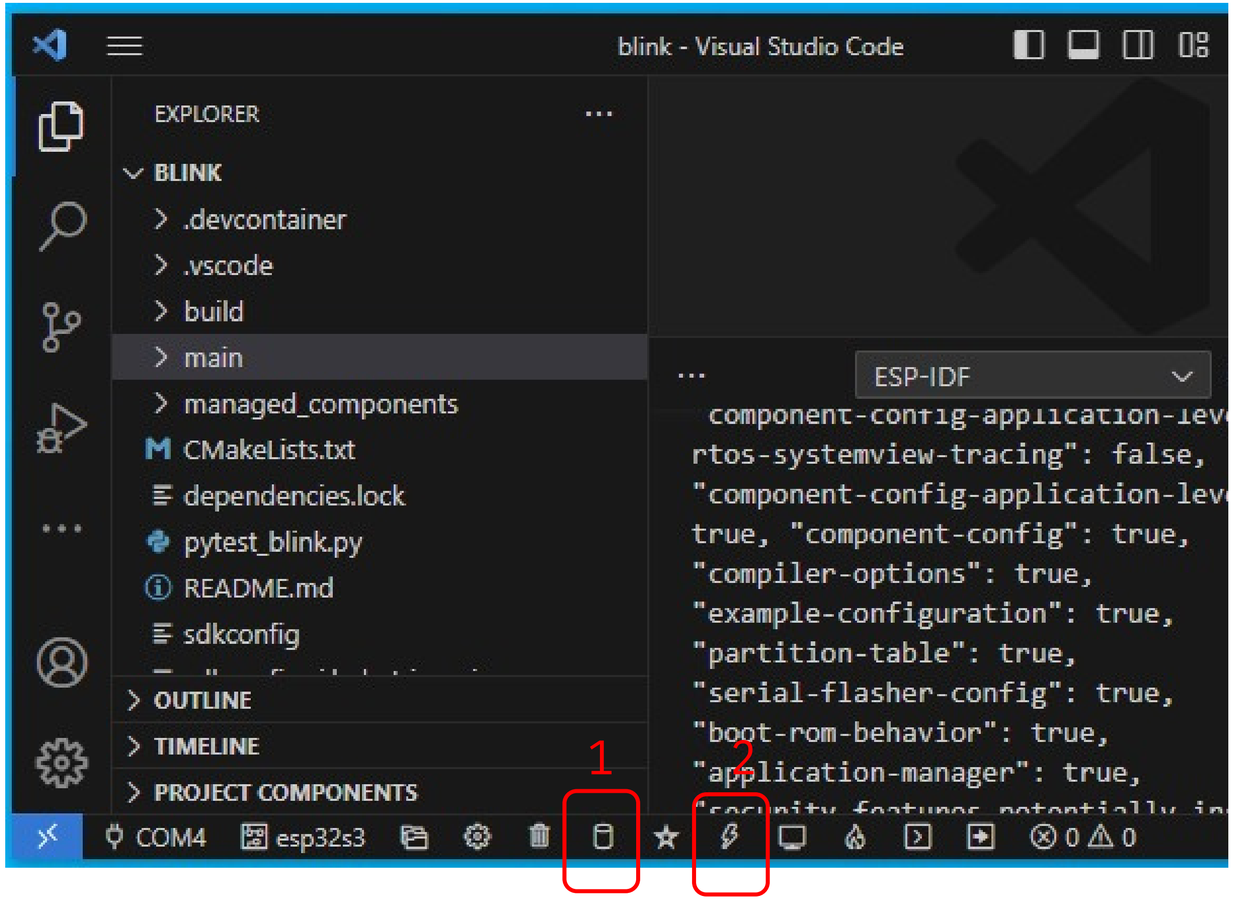
5. Set target chip

Set to esp32s3

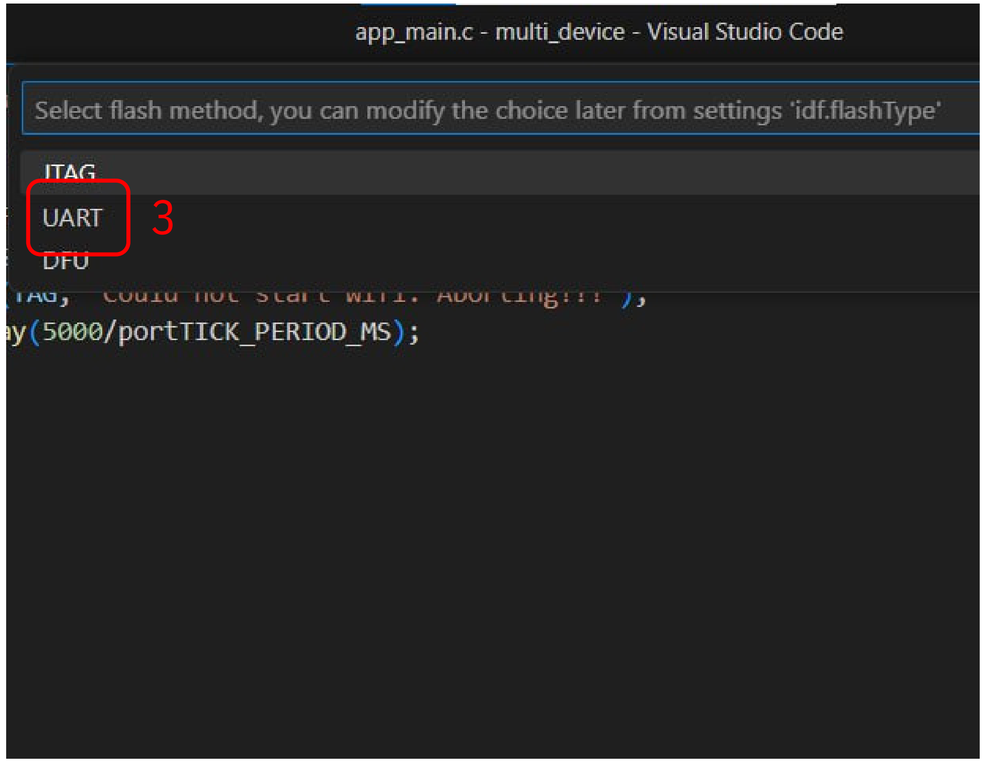


VScode: Blink (hands-on)

6. Build and flash

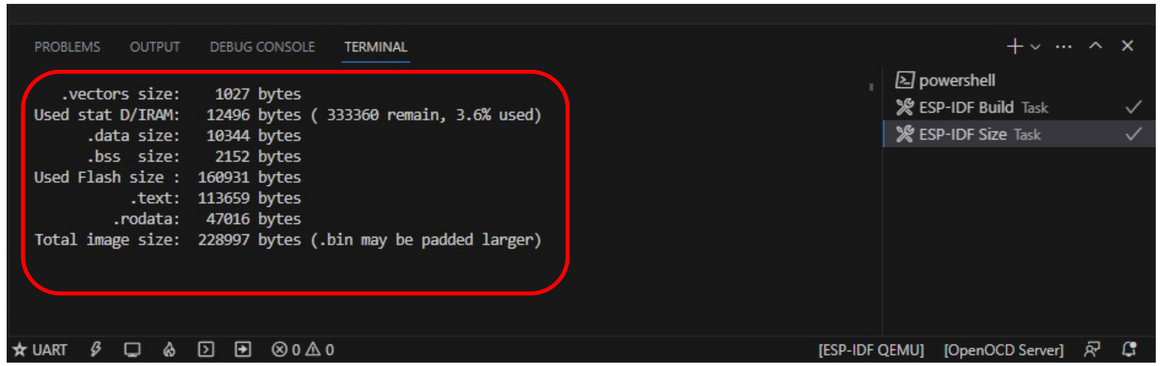


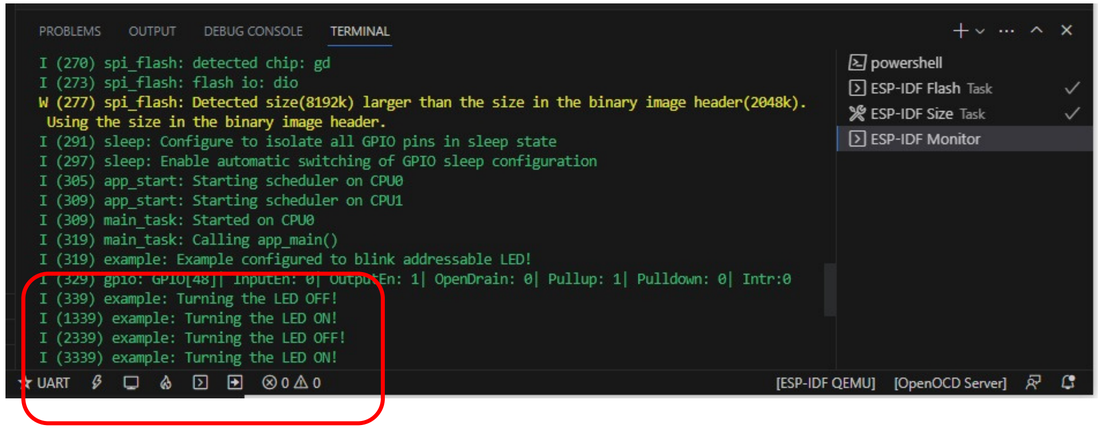
If ask for flash method, choose 'UART'

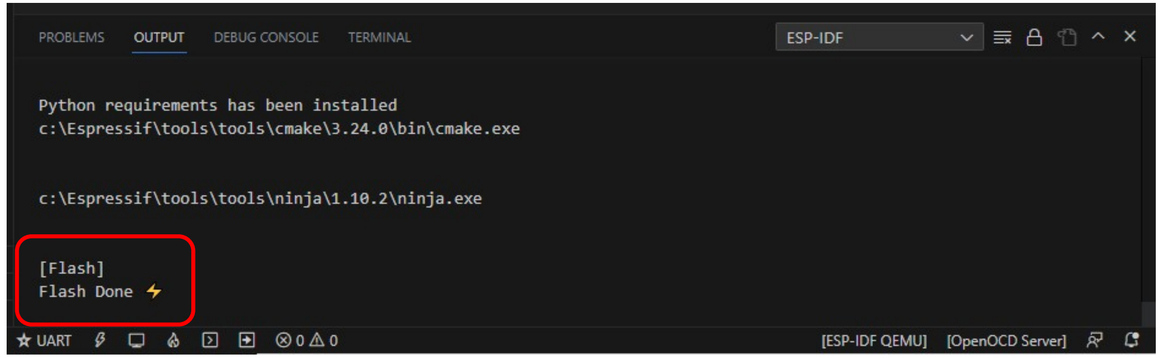


VScode: Blink (hands-on)

DONE!



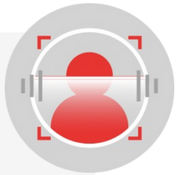




CHALLENGE YOURSELF!

Change the speed and colour of the RGB LED

Hands-on Time!



Download and install VScode & Espressif IDF

Command Palette > Configure ESP-IDF extension

Command Palette > Show Examples Project

Copy ‘Blink’ into ‘myexamples’ folder

Setup, build, flash

06

ESP RainMaker

Introduction, Features, Applications

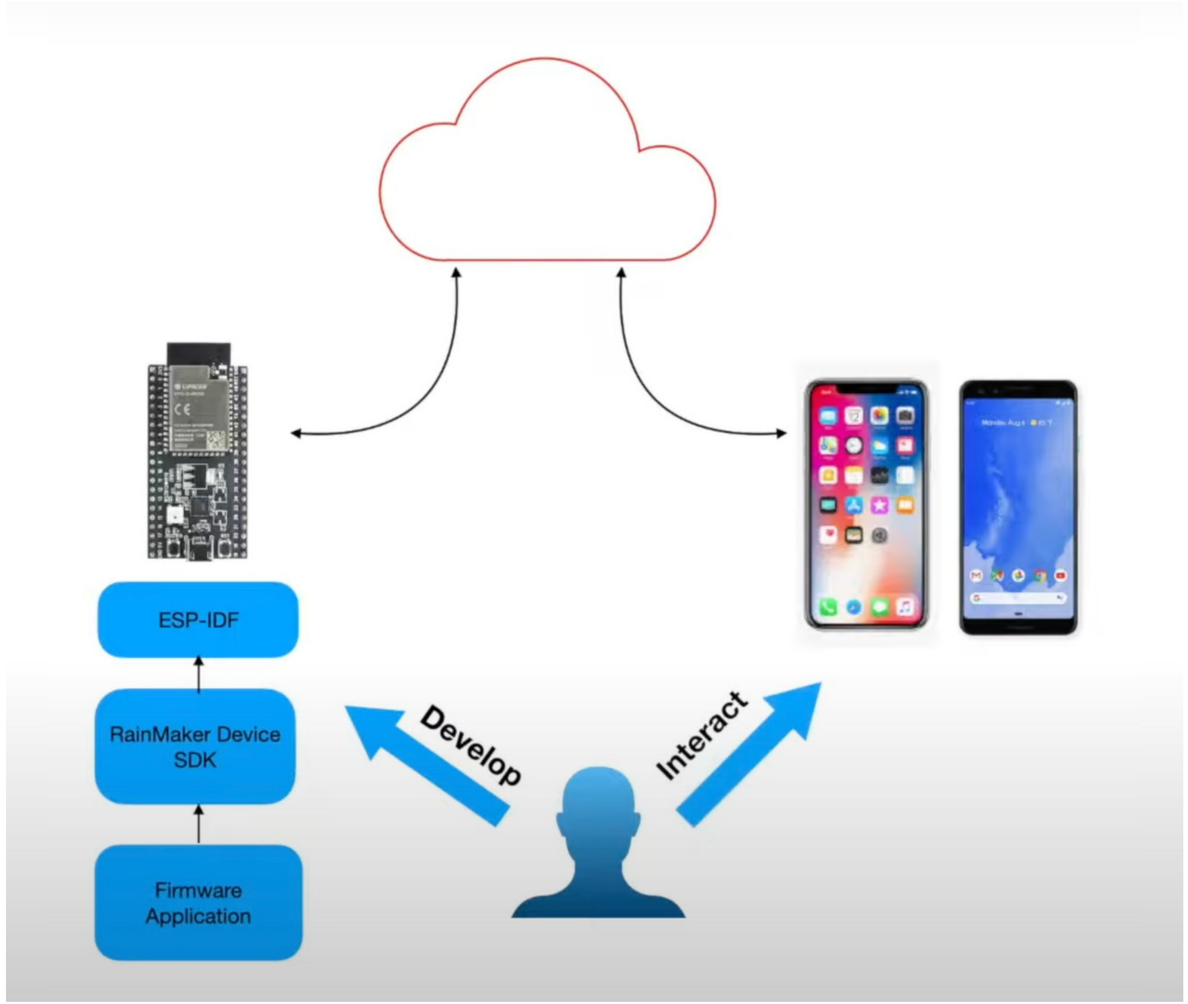
ESP RainMaker

ESP RainMaker is a complete, yet light-weight, AIoTsolution that enables private Cloud deployment for your business in a simple, cost-effective and efficient manner.

ESP RainMaker

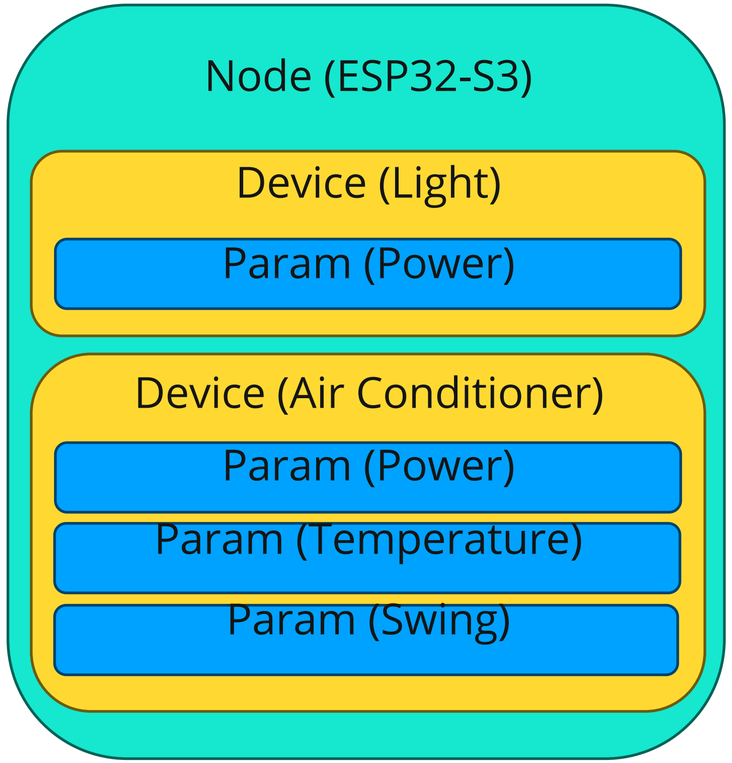
Features a self-adapting phone app and a transparent cloud middleware.

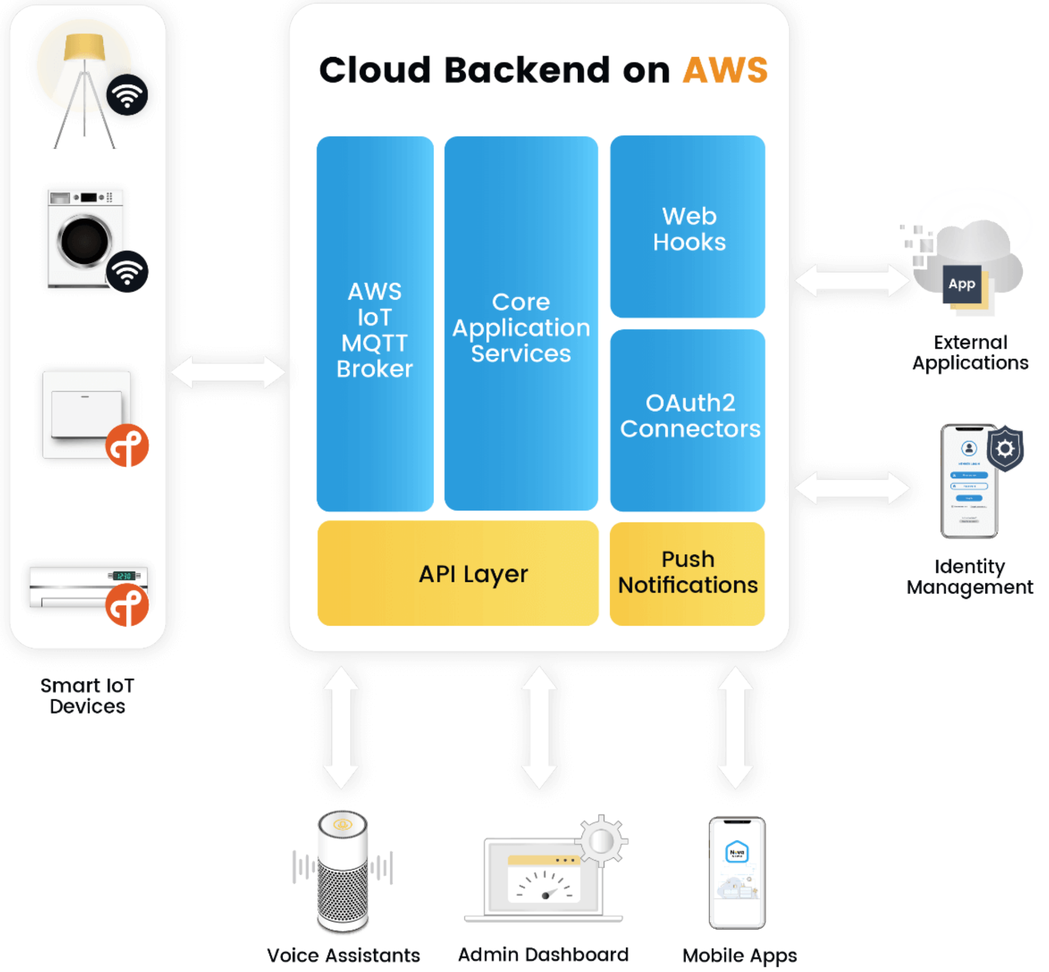
Makers can focus on developing their applications on top of RainMaker Device SDK, interact with the phone app, and forget about the rest of the infrastructure.



ESP RainMaker

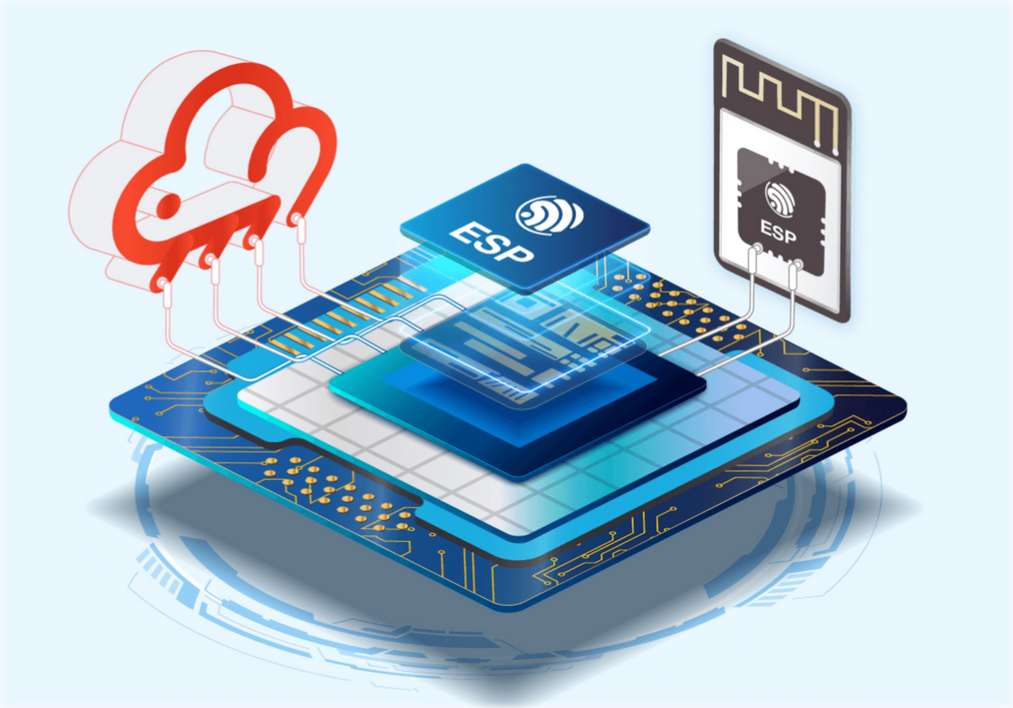
Node, Device, Parameter





ESP RainMaker

Examples



- Lightbulb
- Plug
- Lightstrip
- Socket
- Panel Light
- Dimmer
- Threadmill
- Coffee Machine
- Garage Door Controller
- Thermostat
- Remote Control Hub

ESPRESSIF

Faster development

Faster time to market without sacrificing customization.
Drastically simplify code complexity using smart-home products SDKs.

RainMaker App

ESP RainMakerapps for iOS & Android are open-source, offering a reference design and development guidance.

ESP RAINMAKER®

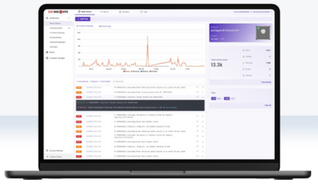
Works with online Voice Assistant, as well as offline Voice Assistant ESP-Skainet.

works with alexa
works with Hey Google
Works with Apple HomeKit

Voice Assistant Integration

Remote observability and diagnostics platform for in field-deployed devices.
Receive information about crashes, unintended reboots, error and warning logs, etc.

ESP Insights



07

VScode: Multi Device (hands-on)

Download RainMaker App, download RainMaker framework, flash ‘Multi Device’ example

VScode: Multi Device (hands-on)

1. Download ‘ESP RainMaker on smartphone

Google Play

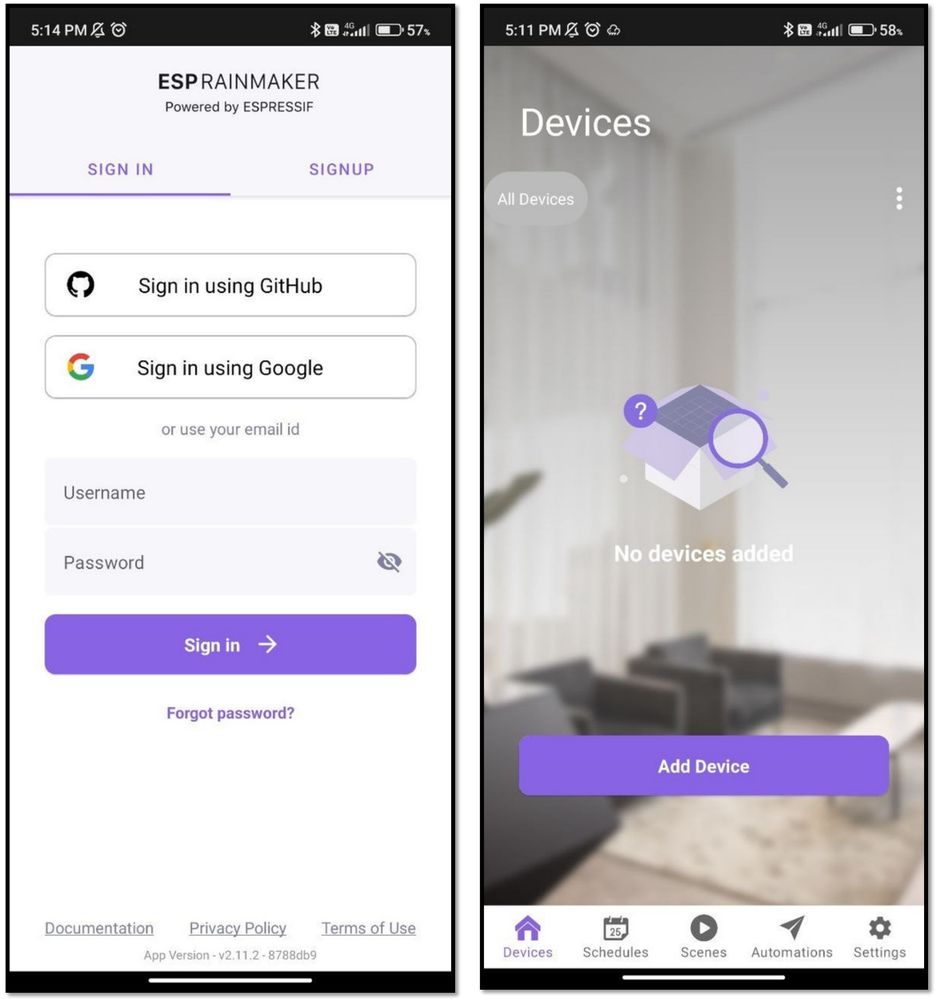
App Store

https://play.google.com/store/apps/details?id=com.espressif.rainmaker

https://apps.apple.com/app/esp-rainmaker/id1497491540

VScode: Multi Device (hands-on)

2. Make account and login



VScode: Multi Device (hands-on)

3a. Download RainMaker (2 options)

Via ESP-IDF PowerShell

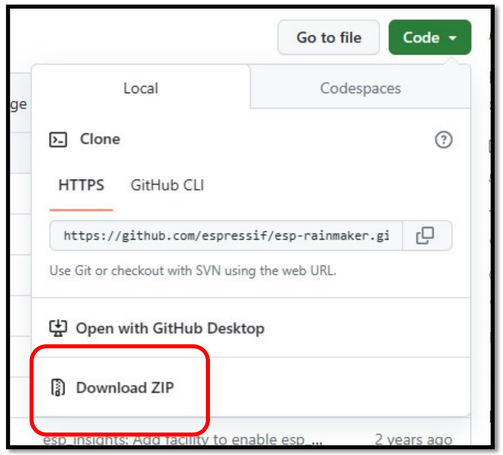
1. Navigate to C:/../espressif/frameworks
2. Run `git clone --recursive https://github.com/espressif/esp-rainmaker.git`

Via website zip download

1.Go to https://github.com/espressif/esp-rainmaker.git

2.Download as zip

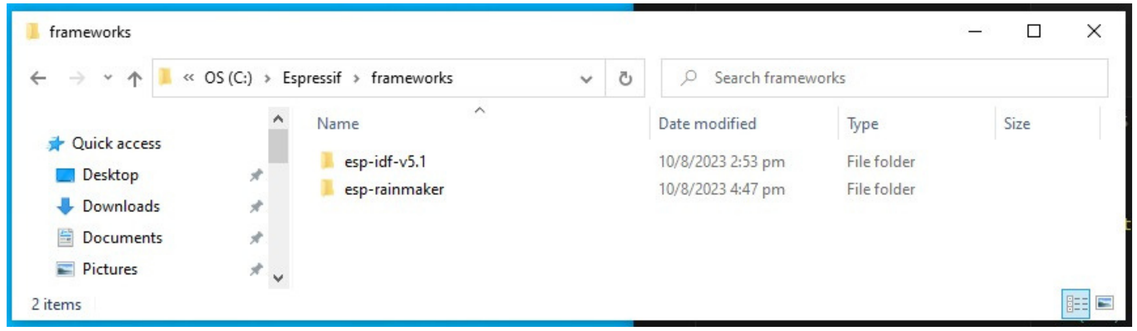
3.Extract in C:/../espressif/frameworks



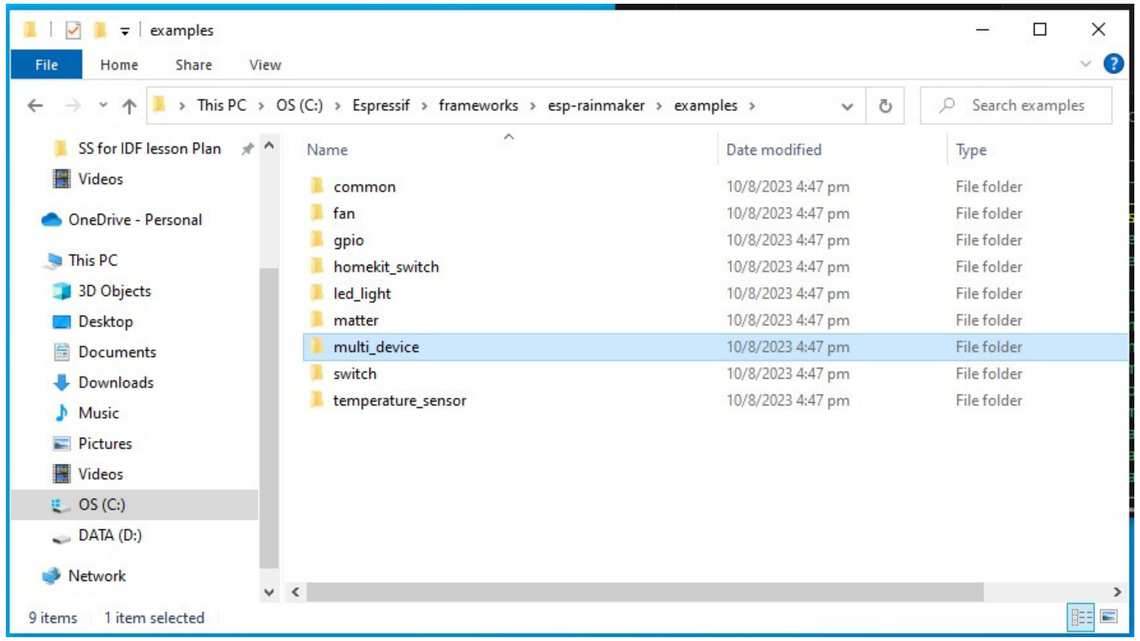
VScode: Multi Device (hands-on)

3b. Check for RainMaker

Verify that you have ‘esp-rainmaker’ in the ‘frameworks’ folder.



Check for ‘multi-device’ in esp-rainmaker > examples



VScode: Multi Device (hands-on)

4. Flash ‘multi device’ into devkit

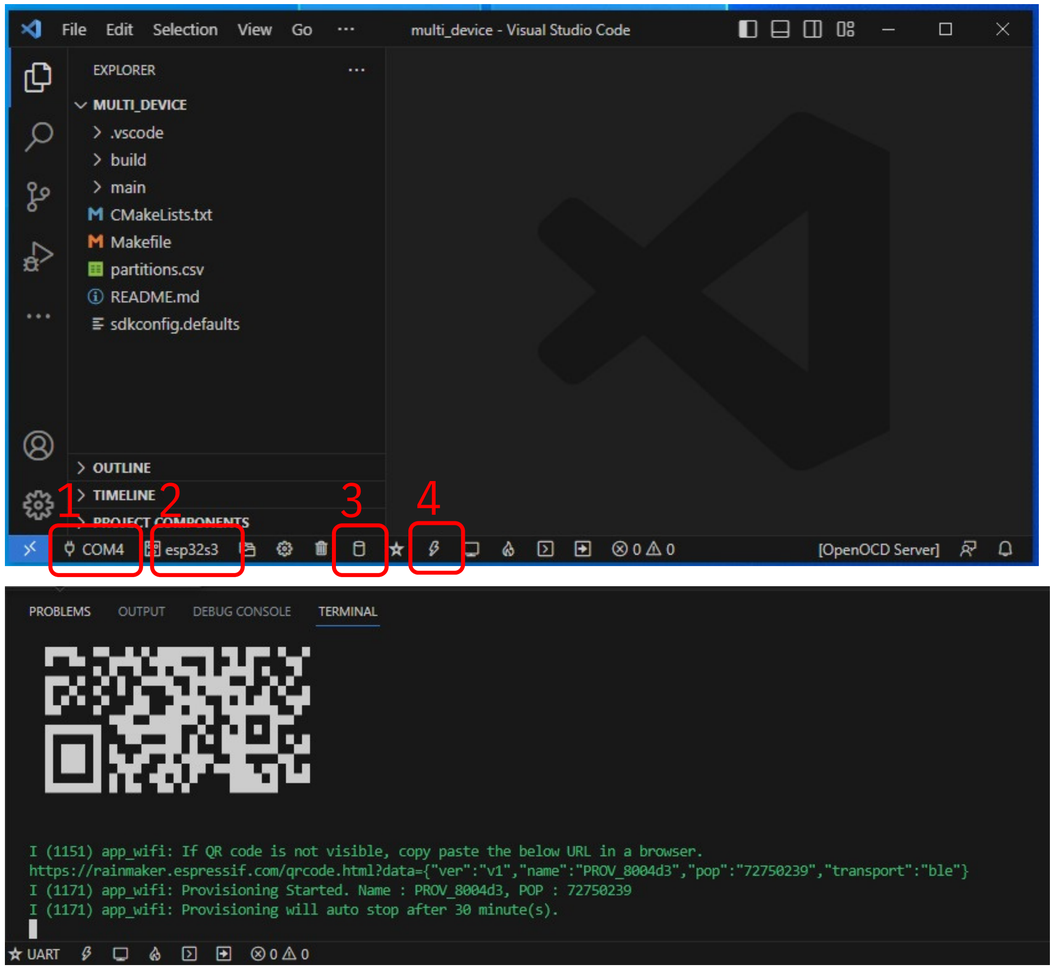
1.Open ‘multi device’ folder in VScode

2.Setup COM port and chip

3.Build project

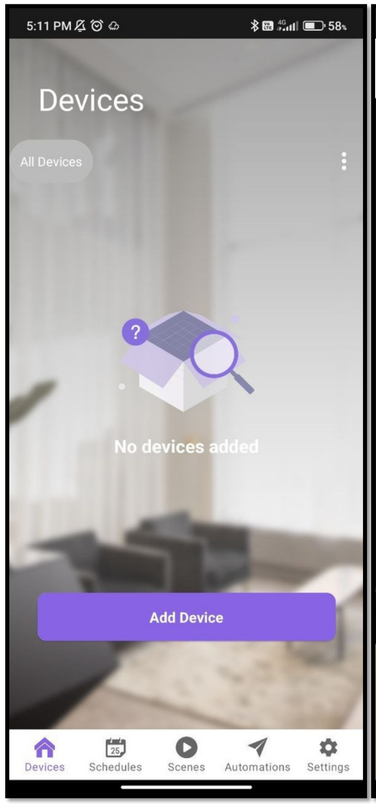
4. Flash

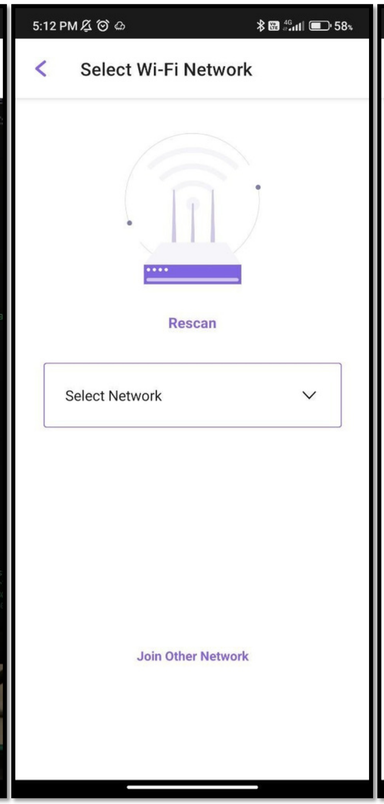
5.You should see a QR code in terminal

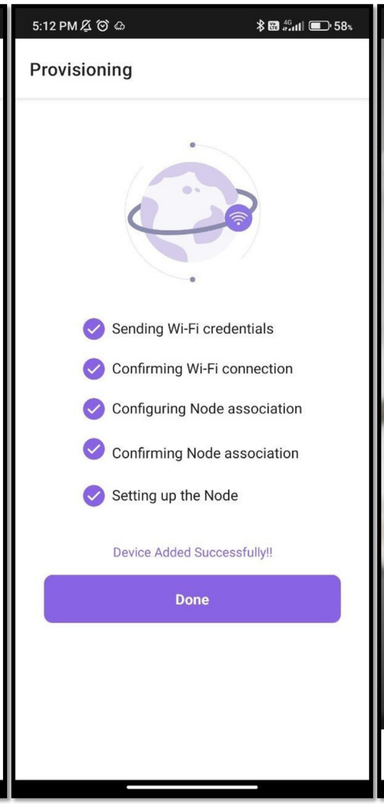


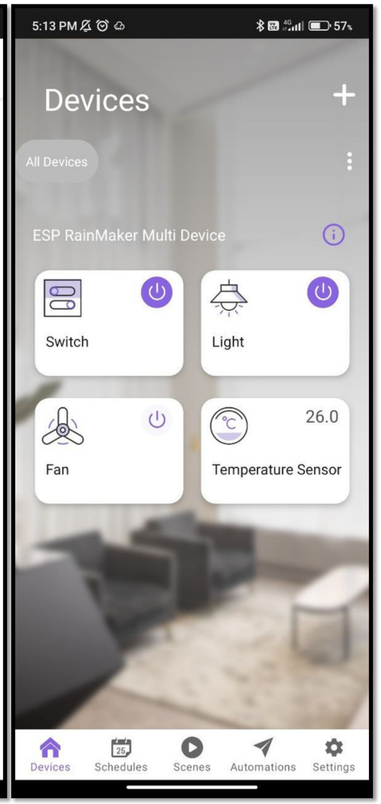
VScode: Multi Device (hands-on)

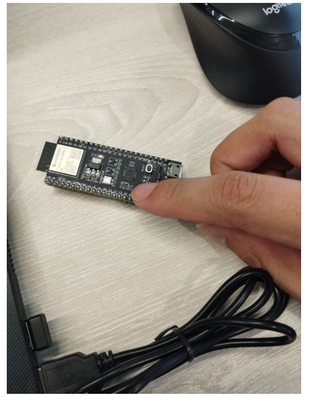
5. Add device on phone’s RainMaker App

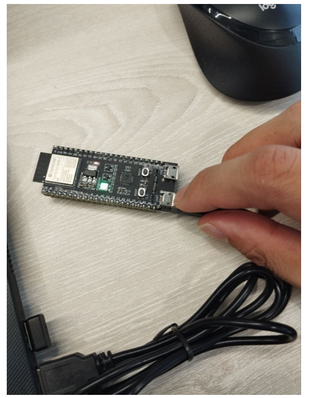






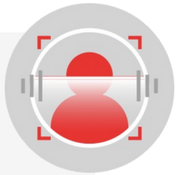






Done

Hands-on Time!



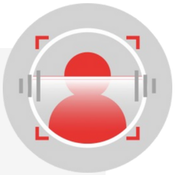
Download RainMaker App and log in

Download RainMaker framework

Flash ‘multi-device’ example into dev kit

On App, add device via QR code

Control RGB LED



Smart Night Light Challenge!

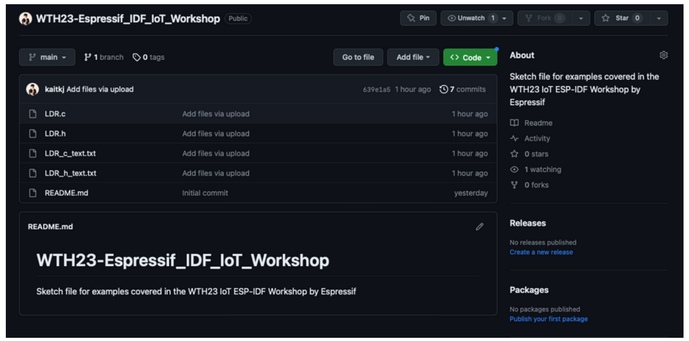
1. ON/OFF control for an external LED via RainMaker App
2. See LDR sensor reading on RainMaker App
3. Using RainMaker App, set automation to ON external LED when it is dark

Smart Night Light Challenge Hints

Lost? Try start from a sample code

Read the code, and work on the taskings in the comments

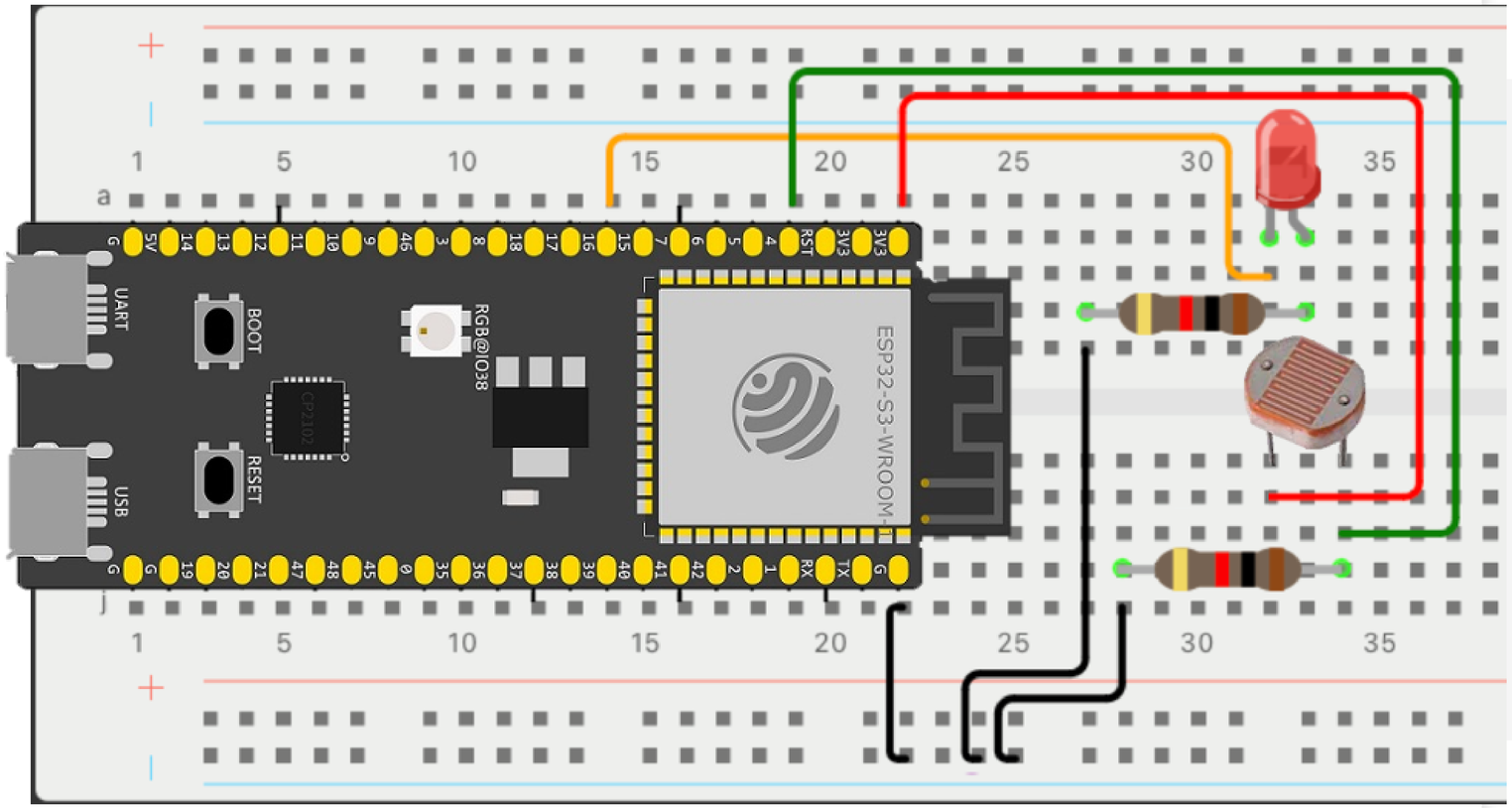
https://github.com/kaitkj/WTH23-Espressif_IDF_IoT_Workshop



Smart Night Light Challenge Hints

Electronics Refresher

1. Identify the components you need to fulfill each function
2. How to use the components
3. Which GPIO pins to use



08

Product Demonstration

Demonstration of ESP32-S3-EYE, ESP32-S3-EV-Board-2 ESP32-S3-BOX-Lite

Product Demonstration

ESP32-S3-EYE

Camera, 1.3’ LCD, MicroSD Card slot, microphone

ESP32-S3-EV-BOARD-2

4.3’ Touchscreen, microphone, Audio codec, GPIO

ESP32-S3-BOX- Lite

2.3’ LCD, microphone, speaker, buttons, GPIO

Further Learning

ESP-IDF

ESP32 + ARDUINO

ESP Arduino

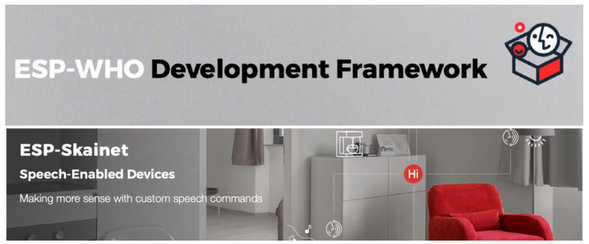
IDF/IDE

ESP SDK MESH

ESP SDK IoT

Wireless Comm

AI/DSP



AI Features

ESP RAINMAKER®

ESP INSIGHTS

Analytics and OTA Updates

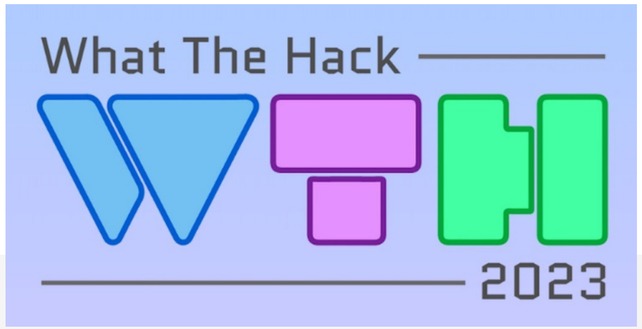
ESP SOLUTION AUDIO

Visual and Audio

ESP Jumpstart

Learn ESP-IDF with ESP Jumpstart

Fireside Chat and Human Library



Learn more about AIoT from the industry experts on
26th Aug 2023
12pm - 1.30pm

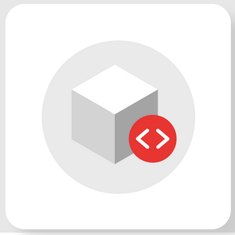
Amey Inamdar

Director of Technical Marketing

Jeroen Domburg

Senior Software & Technical Marketing Manager

Thank you!



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Post Workshop Survey

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