ESP32 and Python

2025-03-27
PyVo - Brno

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Espressif team

Juraj Michálek

- Wokwi and MicroPython on-line
- Thonny - IDE
- Juppyter notebook with ESP32
- How to build custom MicroPython with new extensions like SDL3

Eren Terzioğlu

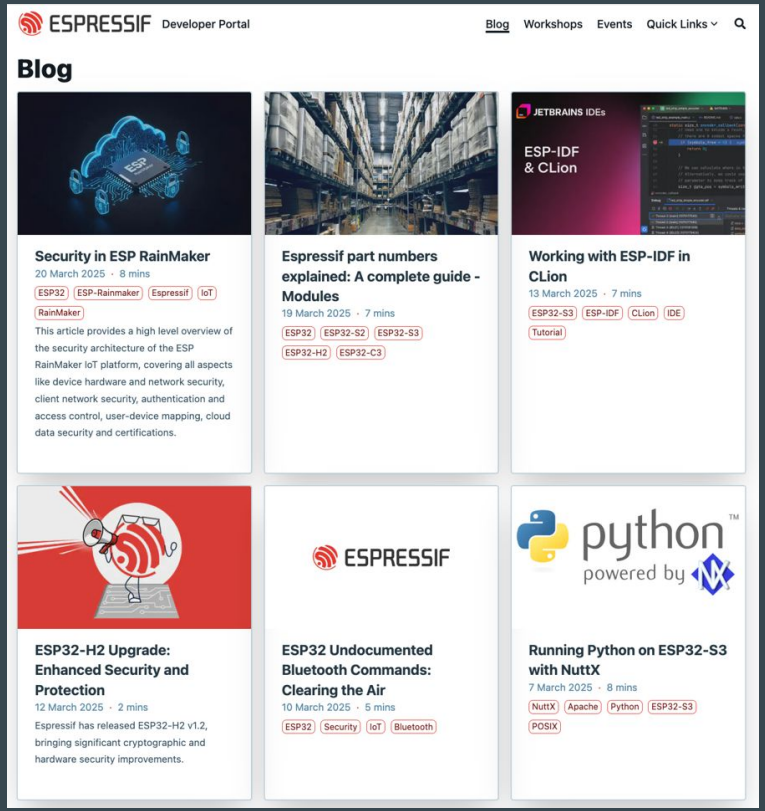
- NuttX and Python

Andrej Šimkovič

- FriStack at UNIZA
- Reliability of ESP-NOW in IoT networks

Developer Portal

developer.espressif.com

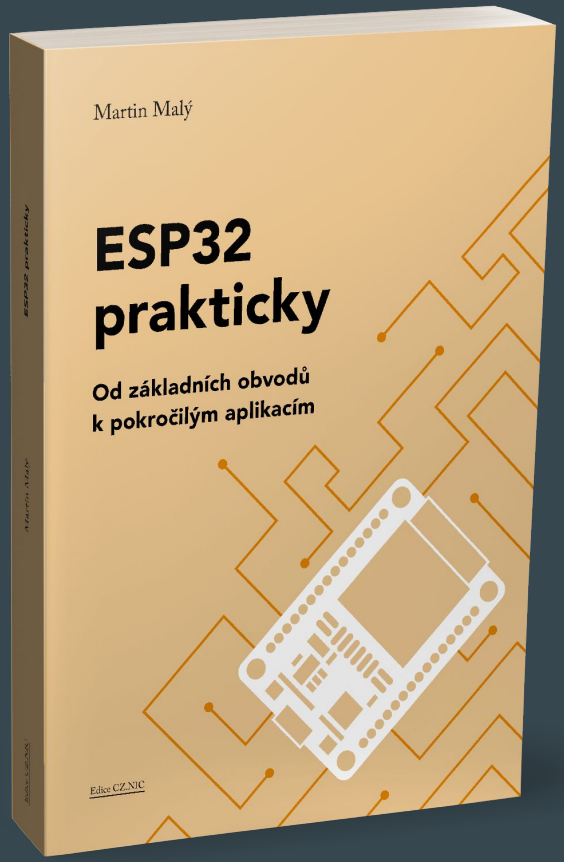


GitHub: https://github.com/espressif/developer-portal/

ESP32 prakticky

https://espx.cz

https://github.com/espx-cz

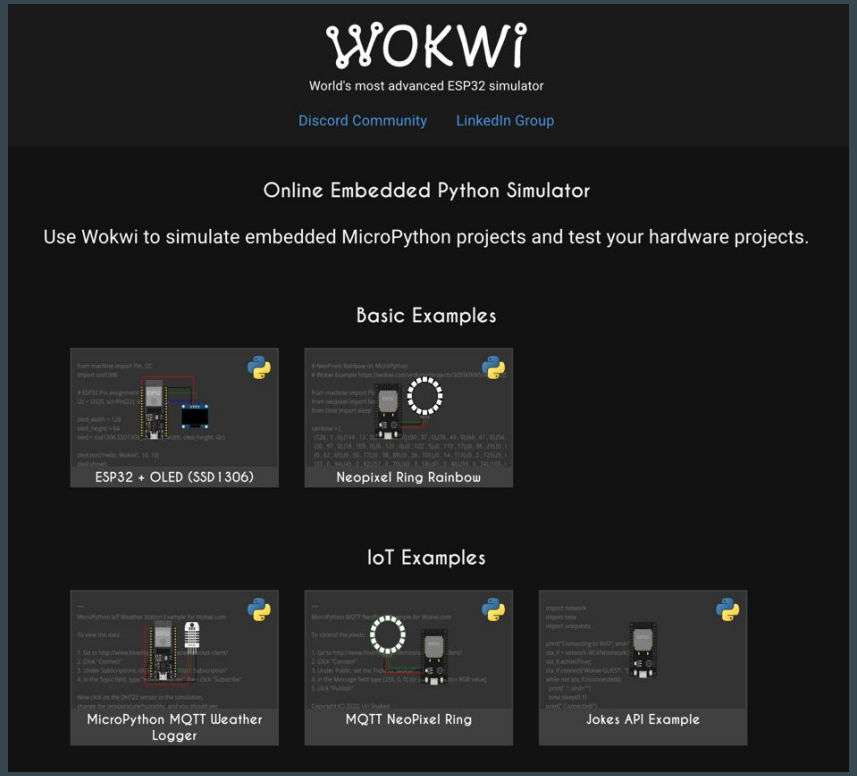


wokwi.com/micropython

Contribute: https://github.com/wokwi

EDC24: Flash Less, Do More: The Magic of Virtual Hardware

Hint: Hit pause to see state of GPIOs

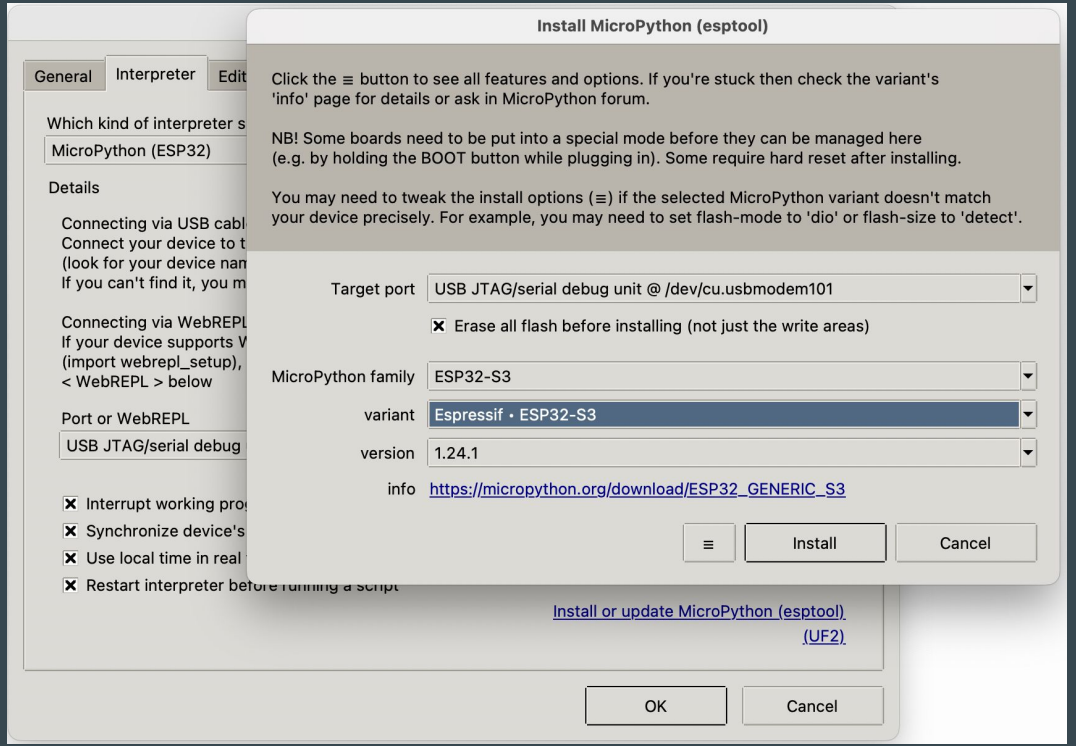


Thonny

Python IDE for beginners

https://thonny.org/

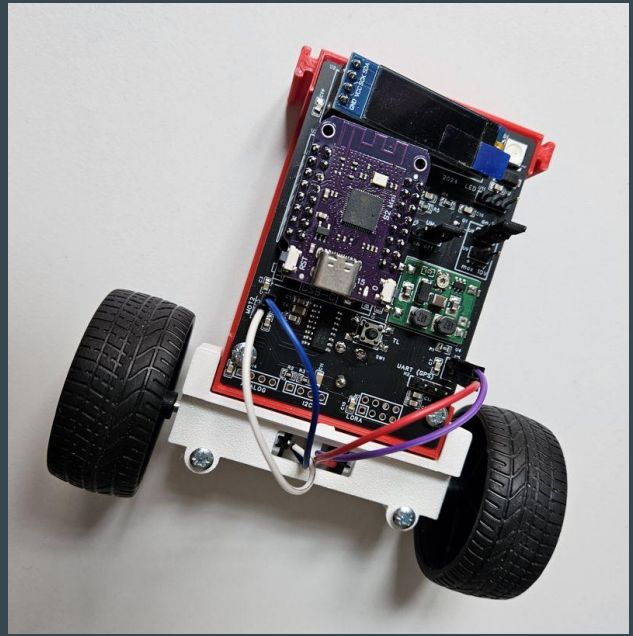
Flash MicroPython directly from IDE



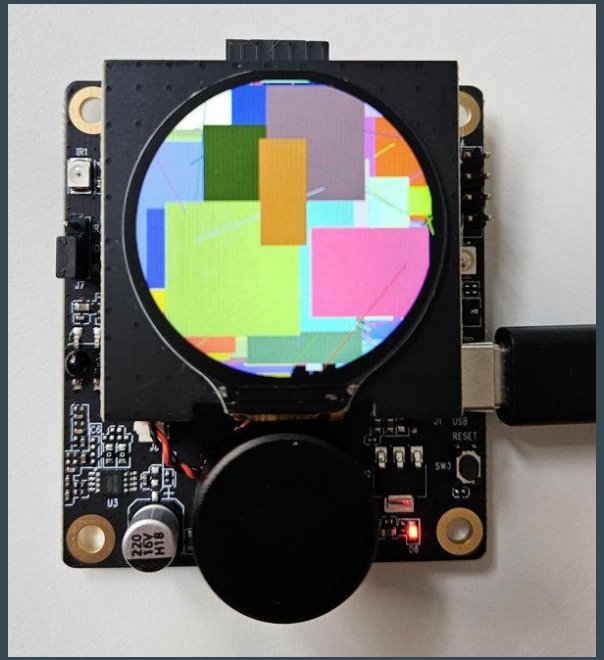
Racing Car in MicroPython

ESP32-S2 - WiFi controller car

UNIZA



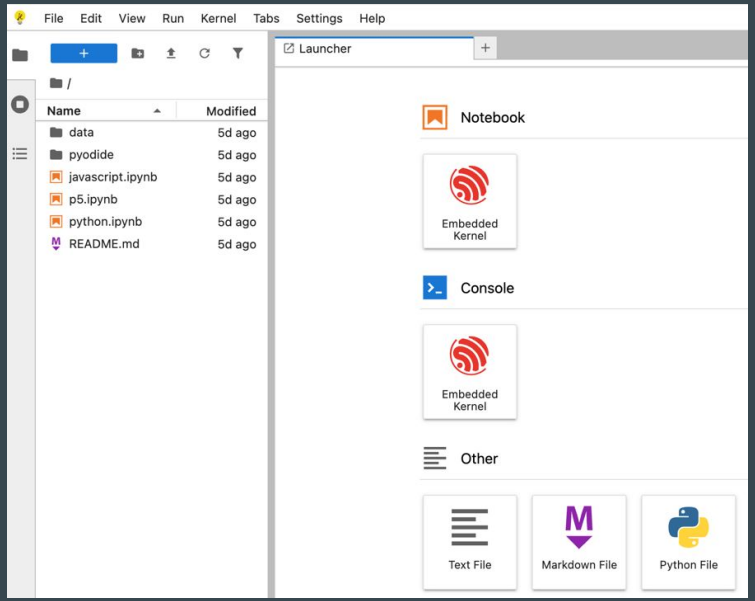
Lines demo - ESP32-C3-lcdkit



Graphical driver implemented in Python code

https://github.com/russhughes/gc9a01py/blob/main/lib/gc9a01py.py

Jupyter Lite - MicroPython - ESP32



https://espressif.github.io/jupyter-lite-micropython/lab/index.html

Expanding HW with esp-box

ESP32-S3-BOX-3

https://www.espressif.com/en/news/ESP32-S3-BOX-3

Open source

https://github.com/espressif/esp-box

Cool example:

https://github.com/espressif/esp-box/tree/master/examples/esp_joystick/joystick_controller

MicroPython - Conway's Game of Life

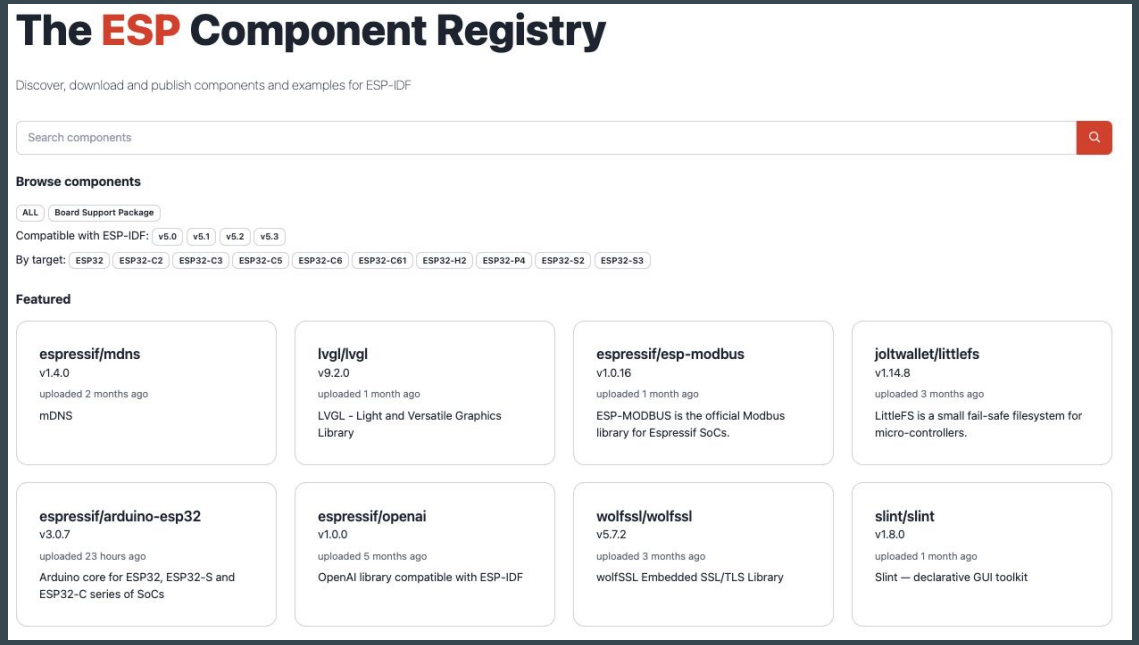
https://github.com/georgik/esp32-conways-game-of-life-python

Using MicroPython custom build with SDL3 API

Custom build of MicroPython

Let’s add some more functionality to MicroPython

- MicroPython - https://github.com/micropython/micropython
- Board Support Package (BSP) - https://components.espressif.com/components?q=tags:bsp
- SDL3 (port for ESP-IDF) - https://components.espressif.com/components/georgik/sdl
- ESP-IDF v5.3 - https://github.com/espressif/esp-idf



https://components.espressif.com/

Example: https://components.espressif.com/components/espressif/i2c_bus/

MicroPython - custom build

```
# ESP-IDF v5.3
. ./export.sh
# MicroPython repo + recursive submodules
cd ports/esp32
make BOARD=ESP32_GENERIC_S3 BOARD_VARIANT=SPIRAM_OCT
idf.py -B build-ESP32_GENERIC_S3_SPIRAM_OCT build flash monitor
```

MicroPython - custom build

User Linux or macOS

Windows

- build on Windows suffers from build issues, reasonable alternative WSL2
- E.g. using Fedora Remix for WSL
- build of ESP-IDF app in WSL is way faster than build directly on Windows

Exposing custom API to REPL - create binding

```
static mp_obj_t bridge_SDL_Init(mp_obj_t flags_obj) {

   int flags = mp_obj_get_int(flags_obj);

   if (!SDL_Init(flags)) {

       mp_raise_msg_varg(&mp_type_RuntimeError, MP_ERROR_TEXT("SDL_Init Error: %s"), SDL_GetError());

   }

   return mp_obj_new_bool(true);

}

static MP_DEFINE_CONST_FUN_OBJ_1(bridge_SDL_Init_obj, bridge_SDL_Init);
```

Bridging REPL and C call

```
static const mp_rom_map_elem_t sdl_module_globals_table[] = {

    { MP_ROM_QSTR(MP_QSTR_SDL_Init), MP_ROM_PTR(&bridge_SDL_Init_obj) },

    { MP_ROM_QSTR(MP_QSTR_SDL_INIT_VIDEO), MP_ROM_INT(SDL_INIT_VIDEO) },



…



};

static MP_DEFINE_CONST_DICT(sdl_module_globals, sdl_module_globals_table);
```

Register for import sdl3

```
const mp_obj_module_t sdl_user_cmodule = {

    .base = { &mp_type_module },

    .globals = (mp_obj_dict_t *)&sdl_module_globals,

};


// Module registration

MP_REGISTER_MODULE(MP_QSTR_sdl3, sdl_user_cmodule);
```

Exposing Rust to Python REPL

https://github.com/georgik/micropython/commits/experimenta/nmea/

Rust no_std code - as ESP-IDF component (library)

Bridge code - similar like exposing API from C

Sample code:

- https://github.com/georgik/esp32-conways-game-of-life-python/blob/main/rust-no_std-nmea/nmea.py

NMEA altitude: 61.70

Data:

- Latitude: 53°21.6801′ N

- Longitude: -7°29.6628′ W

Tips

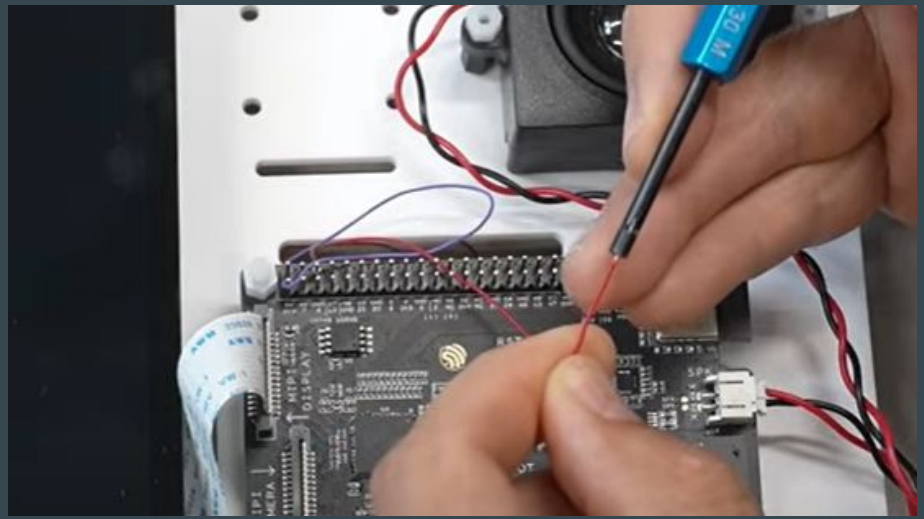
How to “unbrick” ESP32

Many people incorrectly thinks that ESP32 is bricked, in many cases the custom firmware just does not receive UART or USB signals.

Solution: hold BOOT button and press RESET to switch to boot mode

After flashing, just press RESET to return to normal mode.

Wire Wrap Tool



Espressif DevCon 2024 - Tips and Tricks

flow3r

Powered by MicroPython

https://flow3r.garden/

Espressif in Brno

Vlněna Office Park

Espressif Systems (Czech) s.r.o.

Přízova 3, 602 00 Brno

Czechia, Europe

Espressif Developer Conference 2022-2024 - recording

https://www.youtube.com/@EspressifSystems

https://devcon.espressif.com/

Embedded World 2026

Meet us in Nuremberg, Germany

Old games ported to ESP32-P4

OpenTyrian - https://github.com/georgik/OpenTyrian/

Doom / FreeDoom - https://github.com/espressif/esp32-doom

Quake 1 / LibreQuake - https://github.com/espressif/esp32-quake