PSLab

A Full-stack Open Experimentation Kit

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PSLab.io
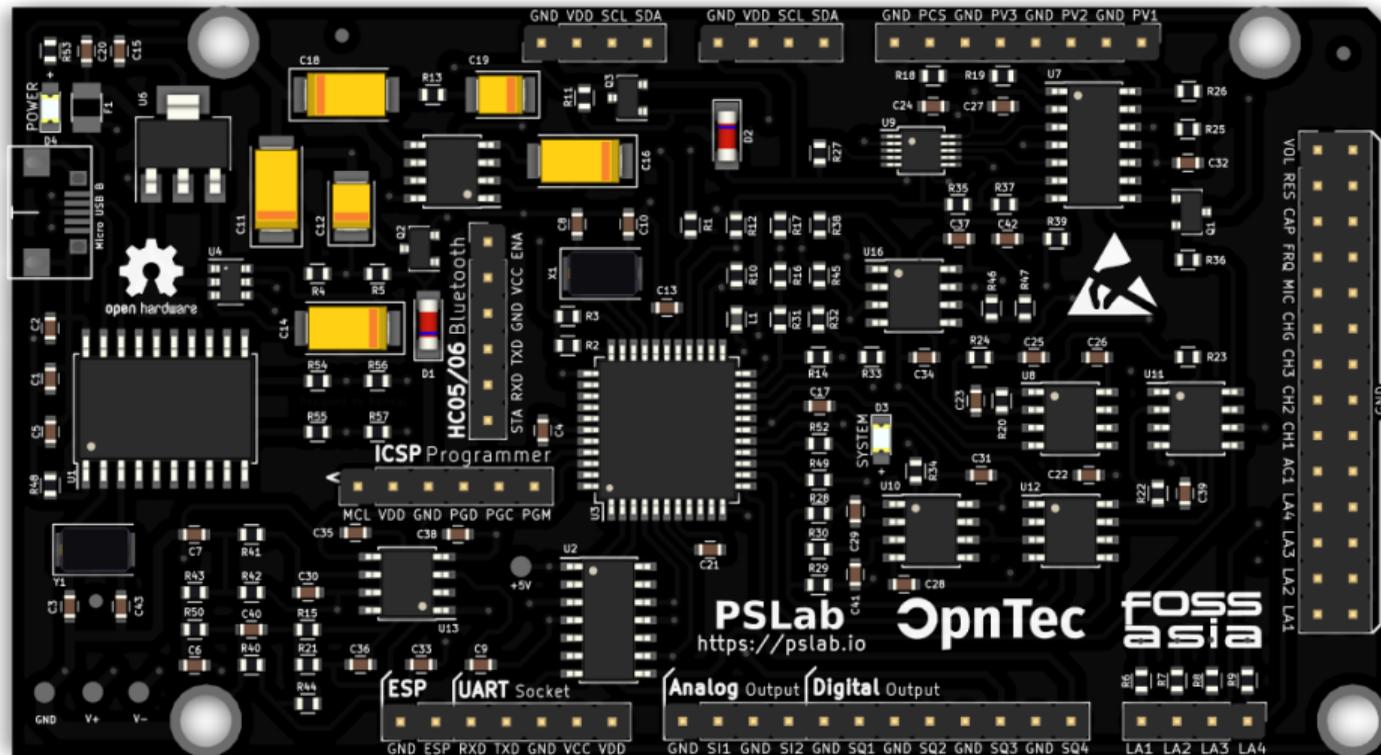
Agenda

Introduction and Hardware

What is PSLab?

▶ open hardware: schematics are fully available
▶ open firmware: sources created with MPLab IDE[1] fully available
▶ open software: libs and apps for both desktop and mobile phones
▶ open tutorials: lots of ideas for experimentation
▶ open documentation: everything you need to build your own from scratch

[1]unfortunately, the IDE and toolchains are not fully open and restricted

PSLab Board

Microcontroller: PIC24EP256GP204

https://github.com/fossasia/pslab-hardware

Apps and Features

Android

Desktop

Stack and Architecture

PSLab Desktop Stack

USB Serial Converter

USB

PSLab Board
pslab-hardware

PIC24 MCU
pslab-firmware

I2C

temperature sensor

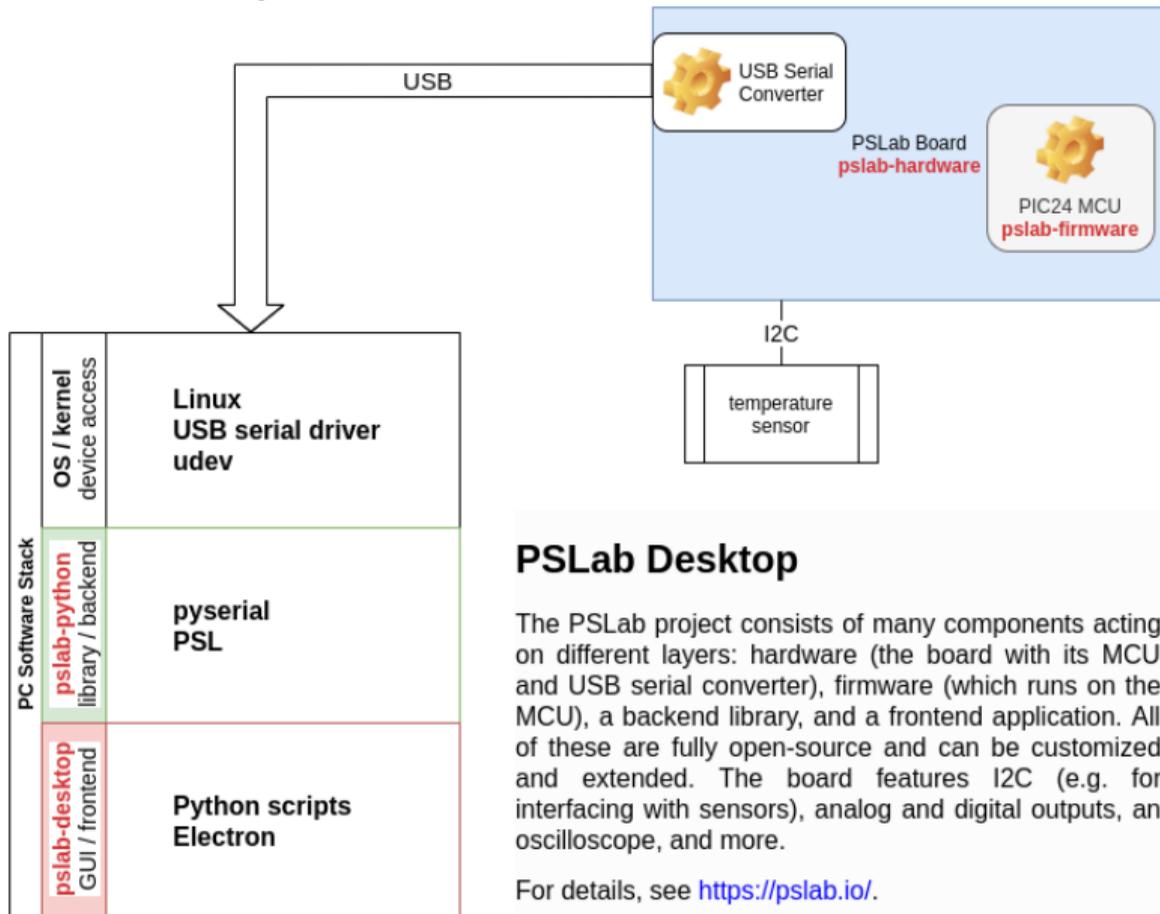|		Linux USB serial driver udev
	OS / kernel device access	
PC Software Stack	**pslab-python** library / backend	pyserial PSL
	pslab-desktop GUI / frontend	Python scripts Electron

PSLab Desktop

The PSLab project consists of many components acting on different layers: hardware (the board with its MCU and USB serial converter), firmware (which runs on the MCU), a backend library, and a frontend application. All of these are fully open-source and can be customized and extended. The board features I2C (e.g. for interfacing with sensors), analog and digital outputs, an oscilloscope, and more.

For details, see https://pslab.io/.

PSLab Desktop Stack and Features

firmware offers a simple protocol allowing for programmatic access
- ▶ offload to advanced peripherals
- ▶ control from host machine

Python library running on desktop grants powerful scripting
- ▶ write small scripts for direct I2C data dumps, logic analyzer output etc
- ▶ quick experimentation with sensors and actors

desktop app has a rich UI, using the Python library under the hood
- ▶ direct GUI access to oscilloscope, logic analyzer, multimeter etc
- ▶ data logging to CSV for further analysis

State of Development

Current Efforts

- ▶ hardware revision with USB-C, UART separation, RTC, SD card reader and more
- ▶ refactoring the Python library and simplifying its APIs
- ▶ implementing I2C proximity sensor
- ▶ adding more features to the desktop app
- ▶ improving the documentation (you can't have enough of it!)

Open Issues

▶ bootloader for firmware upgrades
▶ research in more sensors to interface with, e.g., CCD
▶ setting up a lab of PSLab boards with remote access
▶ autonomous data logging, e.g., to an SD card

Thanks! :)

Special Thanks and Shout-outs

- ▶ Jithin B. P. for the original idea and design
- ▶ Padmal for all the further work on the hardware and firmware
- ▶ Aakash Mallik for the amazing architecture of the desktop app
- ▶ Alexander Bessman for huge improvements in the Python library
- ▶ Christopher Byrd for pushing the documentation forward
- ▶ Hong Phuc Dang, Mario Behling and the whole FOSSASIA community :)

… and to Open UP Summit! \o/

https://pslab.io