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Libre Silicon in IoT

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Few have achieved what many would have thought impossible; bringing together a distributed community of engineers, then designing, prototyping, and fabricating a custom RISC-V SoC. The project was largely a success - in the first revision no less!

Designated PyFive, the intent was a libre silicon MCU capable of easily running Micropython and CircuitPython. It was designed and tested from the ground-up using open-source design & synthesis tools as well as an open-source PDK (Physical Design Kit). PyFive was one of 40 designs selected for MPW-1 in 2020, the first run of the Google-sponsored eFabless and Skywater foundry collaboration. There is now a GroupFund campaign which is truly the first of its kind.

Since then, the community has created a follow-up project called ICE-V Wireless which targets IoT. This board pairs an ESP32-C3 and an iCE40 FPGA (notably with OSS CAD suite support from YosysHq). The ESP32 BLE5 / WiFi module is fully capable of standing up on its own two legs without the FPGA. However, having fabric capable of hosting a soft-core CPU with peripherals next to the radio opens a world of possibilities for the average SoC designer on a budget.

This talk will go into detail on the successes and challenges encountered along the way, interfacing & tooling between Linux and a custom ASIC, and bringing up a custom Wireless device with Linux and Zephyr.

With platforms like PyFive and ICE-V, what future doors might be opened with libre silicon in the Linux IoT space?

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Yes

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