

# Open-source FPGA EDA: Automate, Advocate and Advance FPGA Technology

From a research project, to open-source tool suites and commercial (e)FPGAs

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# About Me

## Academia

- Fudan University (BS, 2007-2011)
- EPFL (MS -> PhD, 2011-2017)
- University of Utah (Post-doc, Research Assistant Professor, Adjunct Professor, 2018-2022)

## Open-source

- Maintainer of OpenFPGA
- Maintainer of skywater 130nm eFPGA IPs
- Contributor of Verilog-to-Routing (VTR)

## Industry

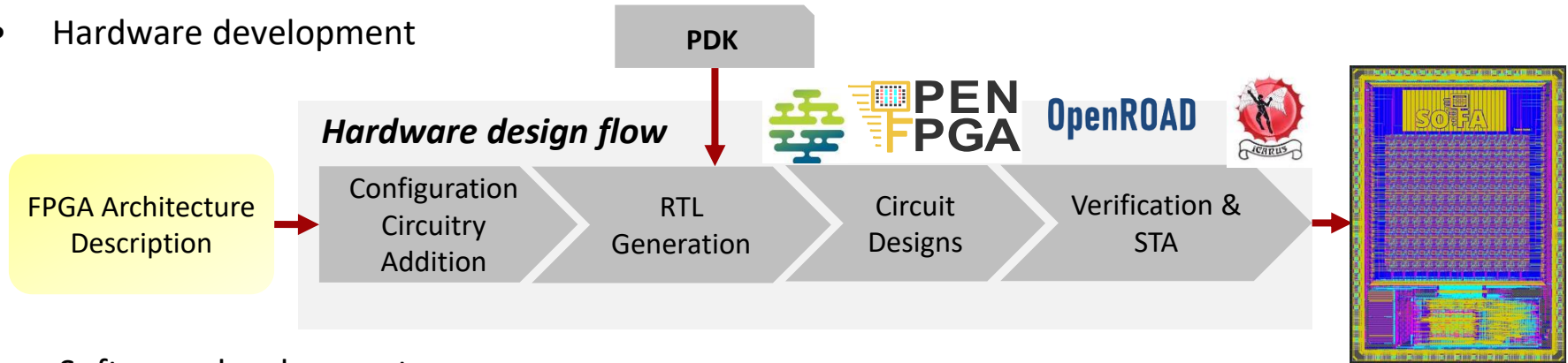
- Chief Engineer at Rapidsilicon, 2021-2022
- CTO at RapidFlex, 2023 - Present



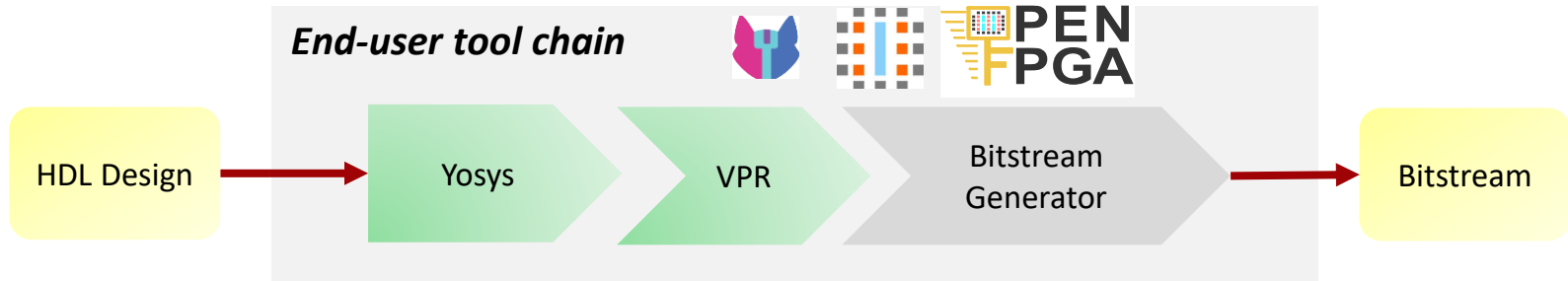
# Open-Source FPGA Technology

- Yesterday: Only industrial leaders can prototype FPGAs with a team size of 100+!
- Today: We can prototype FPGAs using open-source tools with a team size of <10!

- Hardware development

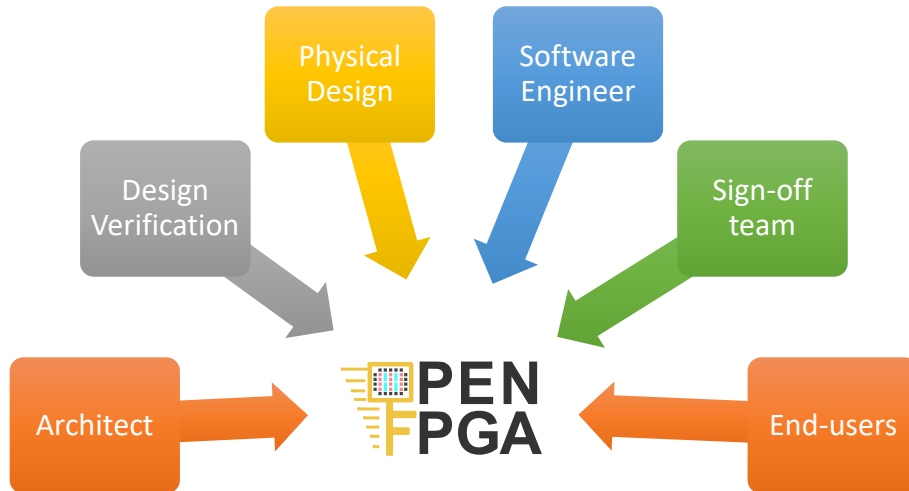


- Software development



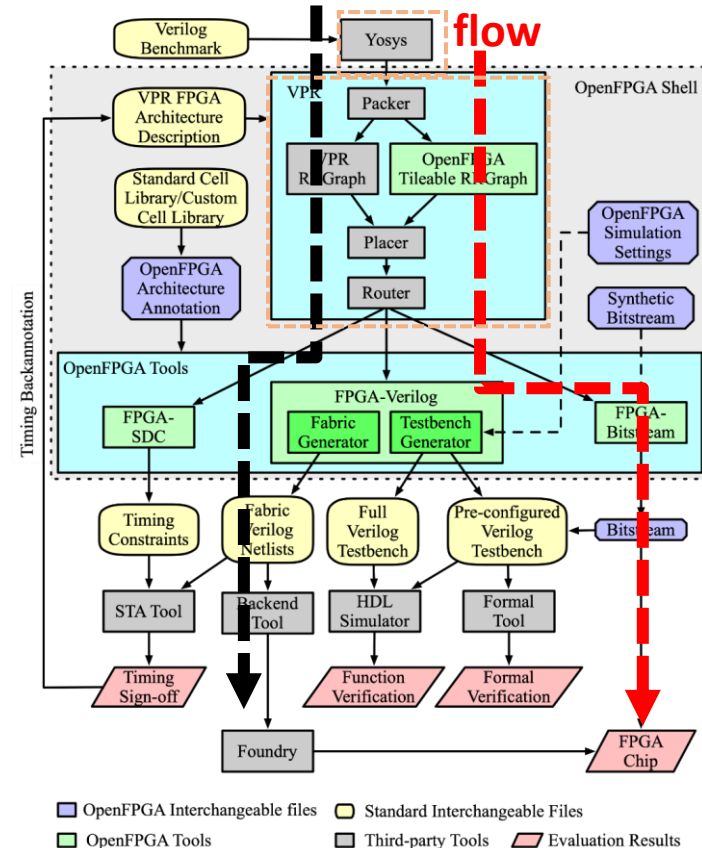
# OpenFPGA Framework

- Fully modularized codebase
- Strong union with open-source community
- Multi-function and unified framework
- Support both standalone FPGA and eFPGA
- Adaptive EDA algorithms for various FPGAs



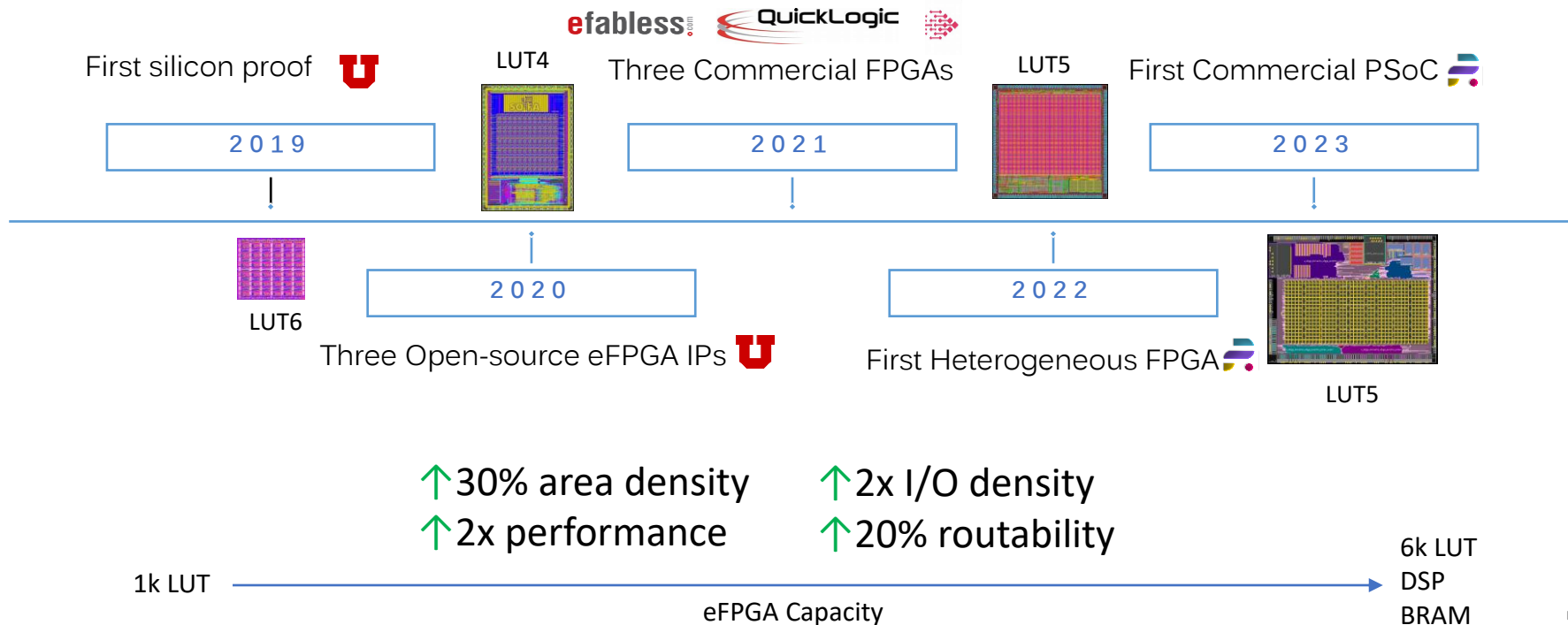
## Chip design flow

## End-user's design flow

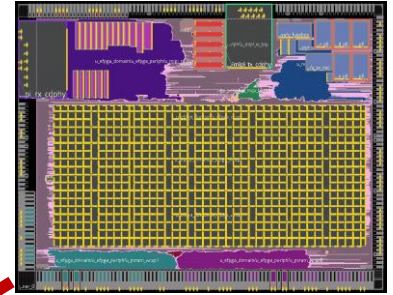
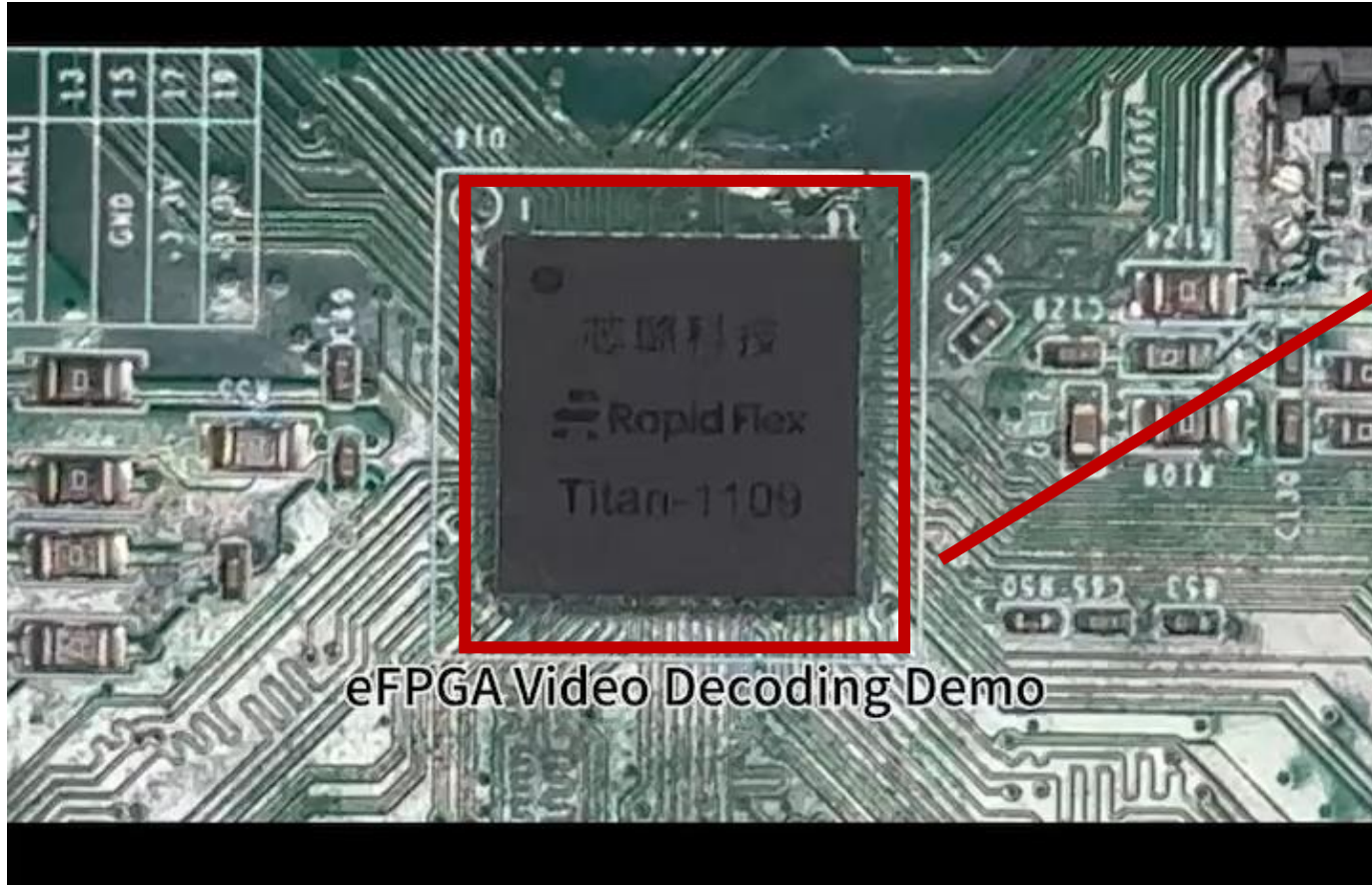


# OpenFPGA Tape-out Milestones

- Technology: Skywater 130nm, UMC22nm, TSMC 22nm, TSMC 16nm, GF12nm
- Engineering team: 3-10



# Silicon Validation: Commercial PSoC



# ArkAngel: RapidFlex GUI for OpenFPGA



**Github:** <https://github.com/lnis-uofu/OpenFPGA>

**Documentation:** <https://openfpga.readthedocs.io/en/master/>

# THANK YOU

Question?

## **A New Book focus on FPGA EDA**

- Commercial FPGA EDA techniques
- Open-source FPGA EDA techniques
- Cover full flow, HLS -> Synthesis -> Implementation -> Bitgen
- Recommended for 4<sup>th</sup> year undergraduate student or higher



**Link:** <https://link.springer.com/book/10.1007/978-981-99-7755-0>