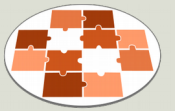
The State of Open Source Processors and Open Source Silicon

Stefan Wallentowitz @ Tensilica Day 2017

LibreCores

Free and Open
Digital Hardware



FOSSi
Foundation

Karen Arnold, CC0

Open Source Processors vs. ISAs

- Important difference: ISA vs. Implementation

- Open Instruction Set Architecture (ISA)
  - Define the basic interface between SW and HW
  - “ISAs don’t matter, ISAs do matter” (K. Asanovic)
  - Can have proprietary implementations
  - Closed ISA: Patents on parts in the ISA

Benefits of an Open ISA

- Innovation and broader market
- Boost open source ecosystem
  - Availability of hardware
  - Shared tools and software ecosystem
- Reduced costs
- “Real” architecture research and education
- Closed ISAs change with their companies

Popular Open ISAs

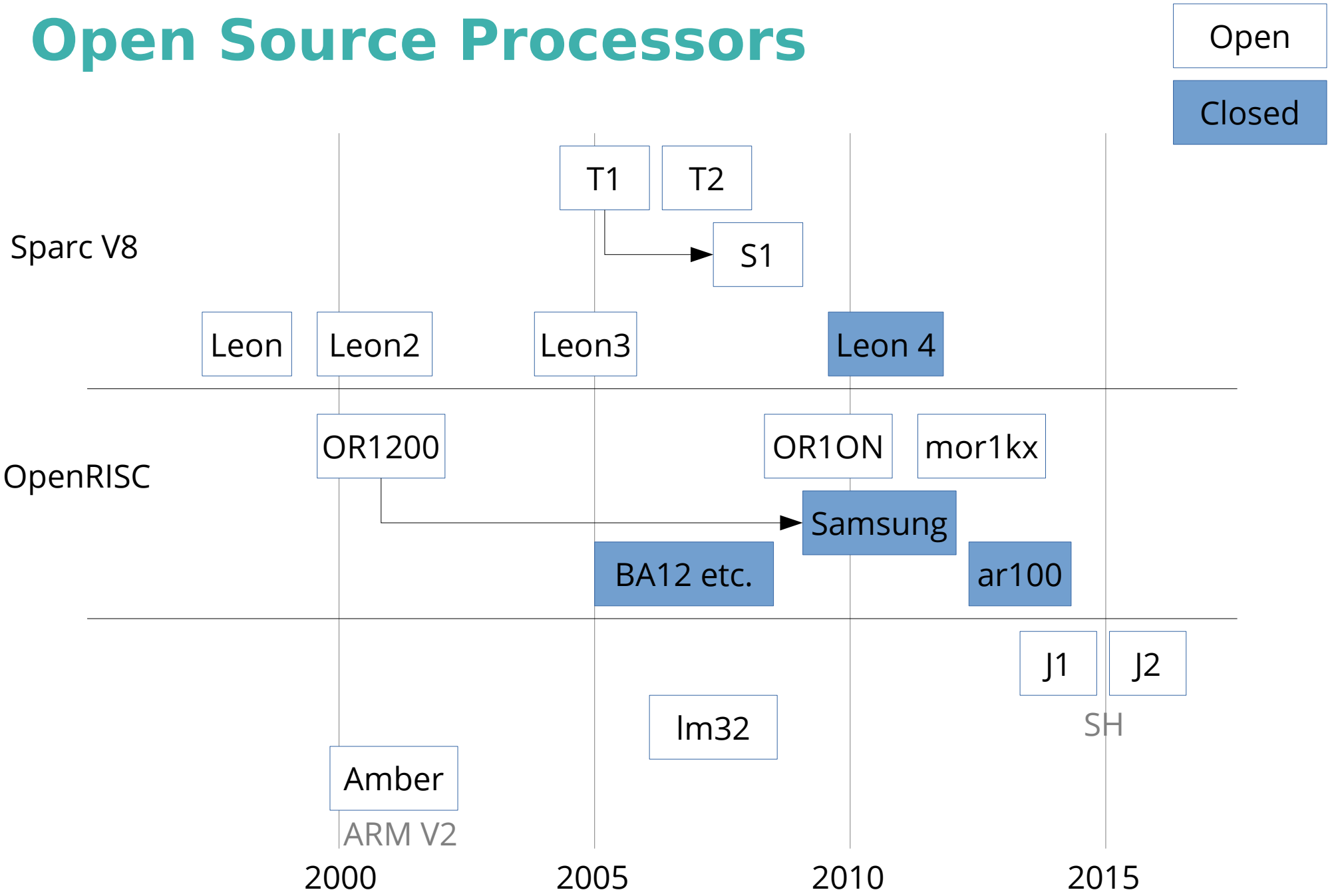
- Sparc V8:
  - 32-bit ISA by Sun (1990)
  - Adopted as (now inactive) IEEE 1754-1994
- OpenRISC
  - Started as a student project, first release: 2000
  - Active, but small community

RISC-V: The new star open ISA

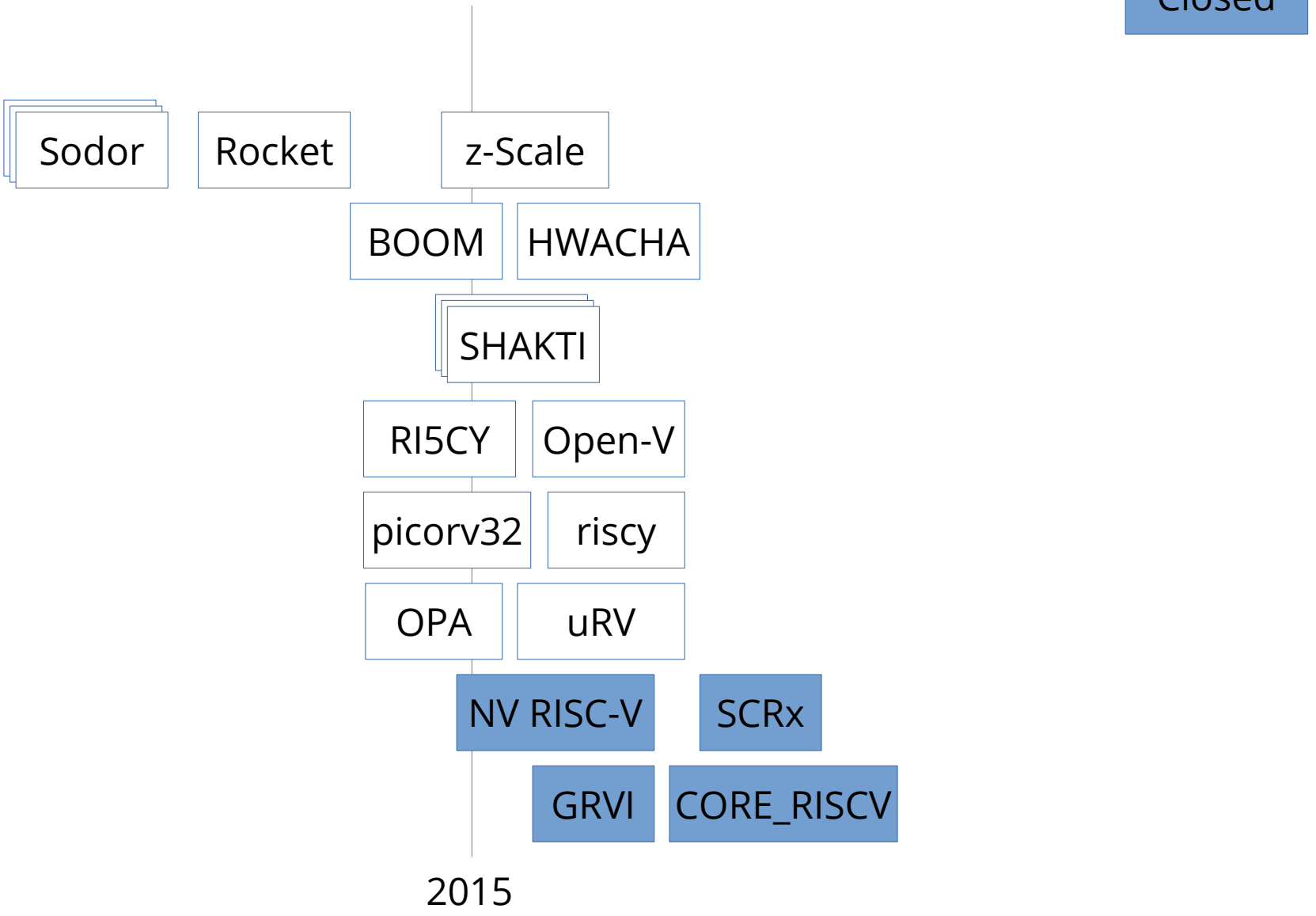
- Started in 2010, UCB Aspire Lab
- Based on standard RISC principles
- Base standard extensions (32, 64, 128 bit)
- Integral design concept: custom extensions
- RISC-V Foundation governs the ISA
  - Many industry members
  - A lot of traction

Take me to the open processors!

Open Source Processors



RISC-V Processors



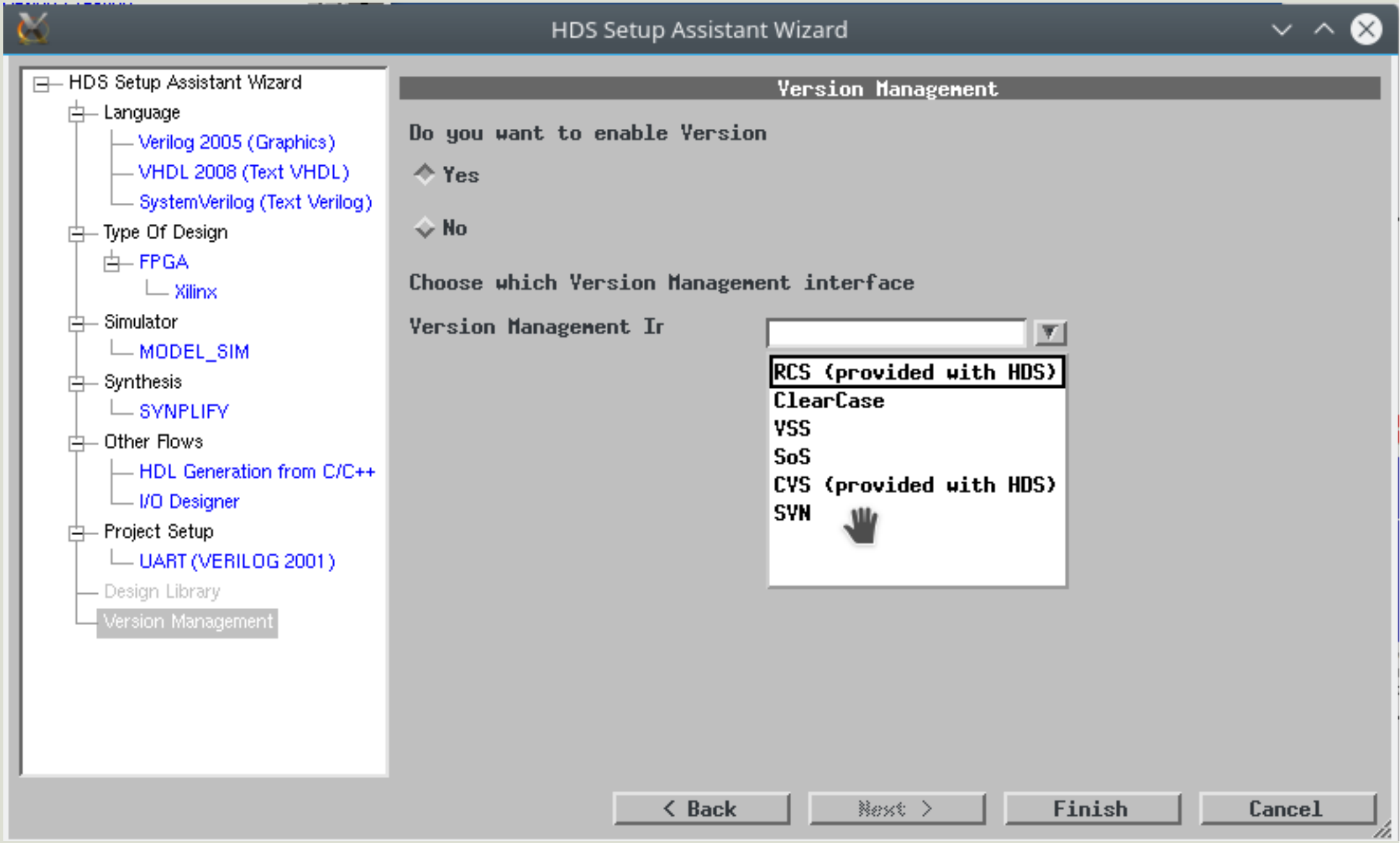
LowRISC: An open RISC-V SoC

- Not-for-profit, since 2014
- “Linux of the Hardware World”
- Goal: Produce entirely open SoC, high-quality, secure base for derived works
- Features:
  - Tagged memory
  - Minion cores
- Three releases so far, next in March
- Other activities: RISC-V LLVM

Free and Open Source Silicon

- Hardware was open in the beginning, but
  - Dense integration into single chips
  - It has become a critical, expensive venture
- Uprising of “Open Source Digital Design”
  - First significant wave with opencores.org
  - FPGAs are probably the key enabler
  - Recently: many open source hardware projects
- But: Development of open source “IP” still in its very beginning, learn from software and makers

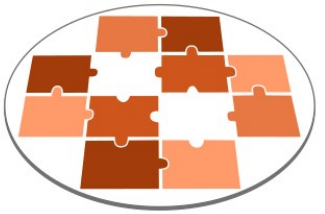
When I think of hardware development...



Screenshot from Mentor Graphics HDL Designer v2016.1 (own work)

How can we improve that, especially for FOSSi?

FOSSi Foundation



- Non-profit organization
  - Started from OpenRISC community
  - Not happy with stagnation of opencores.org
  - Goal: Advance “Free and Open Source Silicon”
- Three main activities of FOSSi
  - Community hub LibreCores.org
  - Licensing
  - Community Involvement, Conference

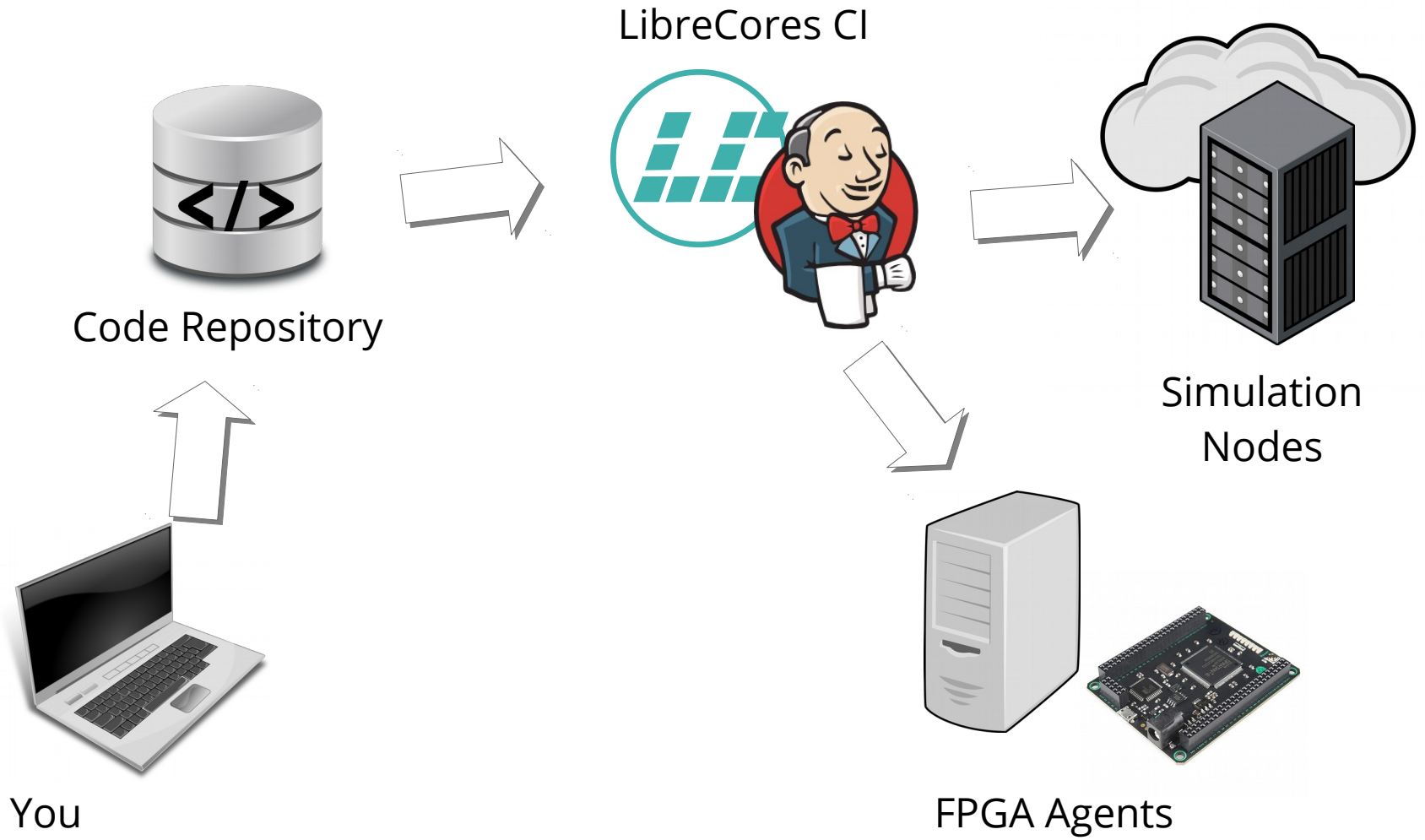
We need more collaboration!

Say Hello to LibreCores!

LibreCores Status & Plans

- Heavy development, currently basic features
  - We don’t host code, others do that better
  - Present metadata around your core
- Focus is on trust, collaboration, integration
- Plans for 2017:
  - Quality Metrics (machine-/community-generated)
  - API-Integration with package managers
  - Extensive tutorials and best-practices
    (How to host, publish, license, etc.)

LibreCores Continuous Integration



The inevitable topic

Licensing

- Area of most confusion
- FOSSi Foundation licensing committee
- Publish articles about license choices
- Roadmap 2017: Three recommendations
  - Permissive license: Solderpad License
  - Weak copyleft: GPL+?, OHDL
  - Strong copyleft: GPL+?, CERN OHL

Community Events

- Upcoming: Open Silicon and RISC-V
  - Munich, 23 March, 2017
  - Krste Asanovic, UC Berkeley: RISC-V
  - Rob Mullins, Alex Bradbury, Uni Cambridge: lowRISC
  - Me: FOSSi Foundation
- Highlight: Our annual conference: ORCONF
  - Started as OpenRISC meeting in 2012
  - Open source digital designs and ecosystem, open source EDA
  - Cambridge 2013 (25 people), Munich 2014 (35), Geneva 2015 (90 people), Bologna 2016 (120 people)

Isn’t that a picturesque place?

Rochdale Canal at Hebden Bridge. Poliphilo via Wikimedia Commons, CC0

ORConf 2017

September 8 – 10, 2017

www.orconf.org

Part of Wuthering Bytes Festival

let's talk!

Find the slides at:
https://speakerdeck.com/wallento

FOSSi Foundation

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