Hardware Revolution

August 2018

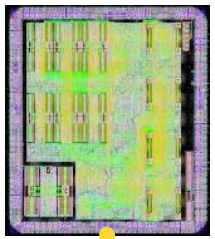
SiFive

Timeline
From Invention to Today

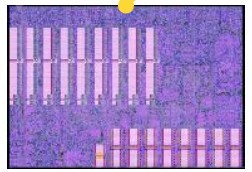
May 2010 — Started RISC-V Project

May 2010 — Started Development of RISC-V Core Generator

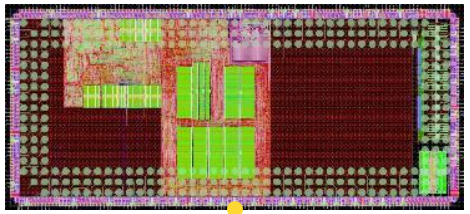
May 2011 — Raven-1



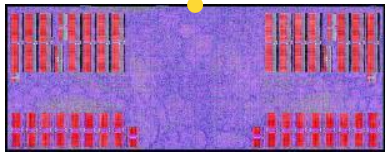
Apr 2012 — EOS14



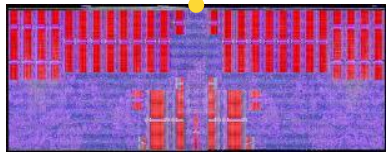
Aug 2012 — Raven-2



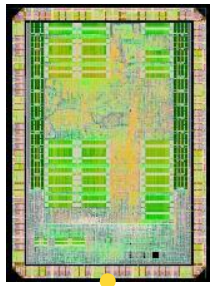
Aug 2012 — EOS16



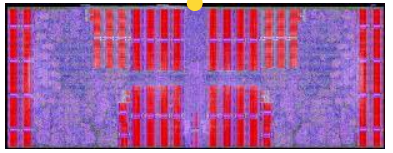
Feb 2013 — EOS18



Jul 2013 — Raven-3



Jul 2013 — EOS20



Sep 2014 — Raven-3.5

Mar 2014 — EOS22

Nov 2015 — SiFive

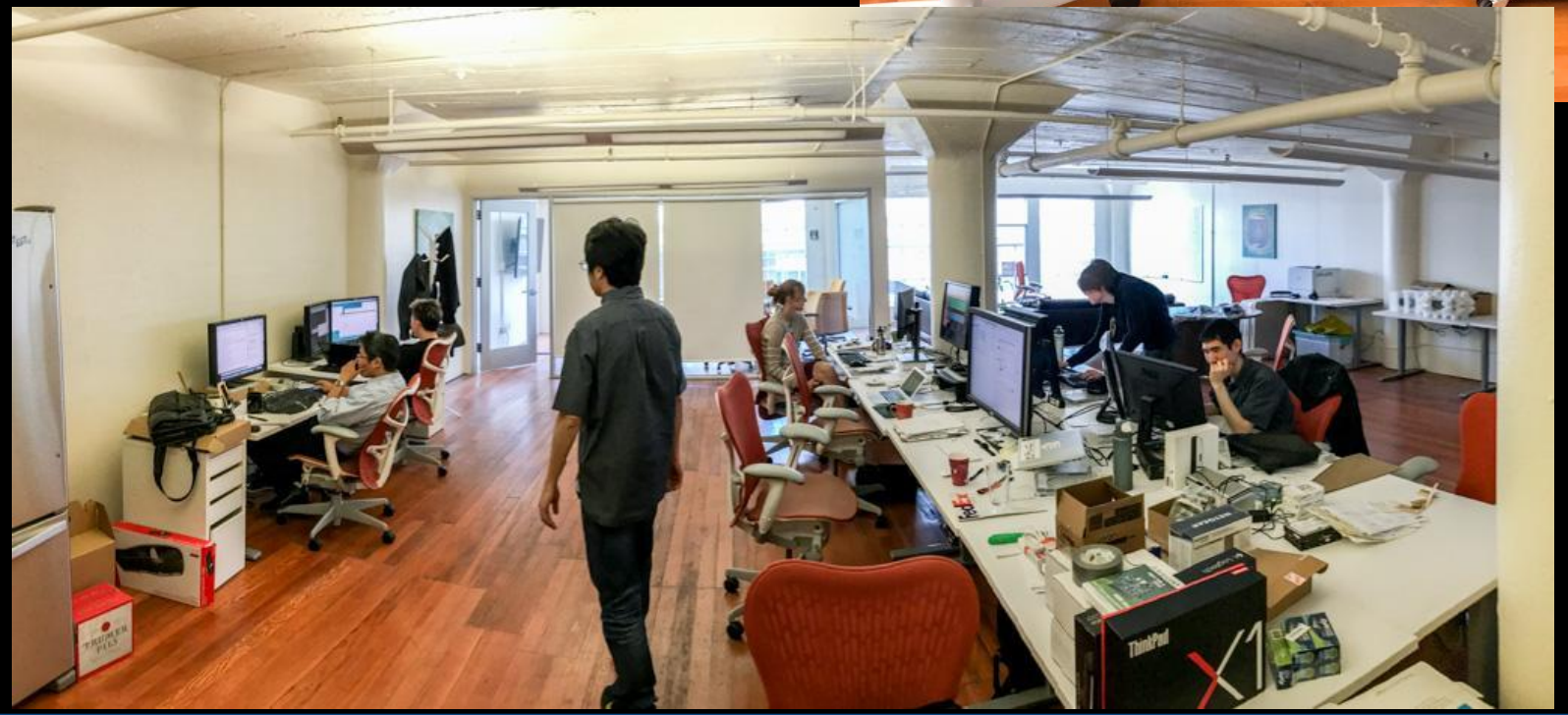
Jul 2015 — Freedom Everywhere Shipping in 60+ Countries

Aug 2016 — RISC-V Foundation

Nov 2016 — RISC-V Foundation Exceeds 100+ Members

Oct 2017 — Freedom Unleashed Multicore Linux


TP-LINK
TRIPP-LITE

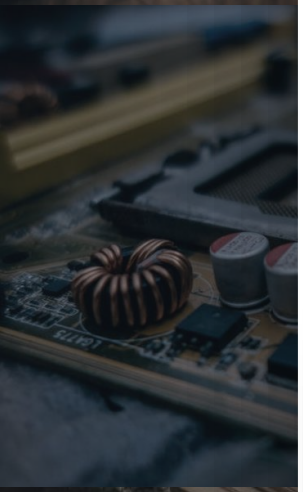

ThinkPad
X1

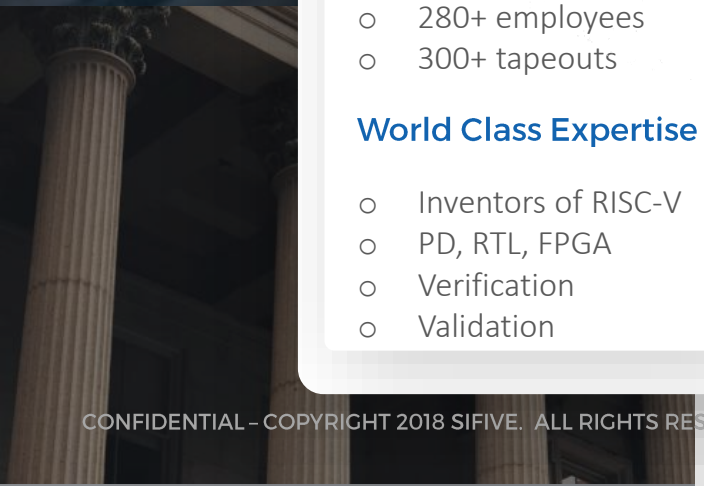

FRAGILE
嚴禁拋擲精密部品
tsmc
台灣積體電路製造股份有限公司
Taiwan Semiconductor Manufacturing Company, Ltd.
OPEN INNOVATION PLATFORM™


tsmc
PUT DOWN GENTLY
精密部品嚴禁拋擲
FRAGILE
嚴禁拋擲精密部品
tsmc


EVA AIR Cargo
CUSTOMER SERVICE


BONDED
WAREHOUSE





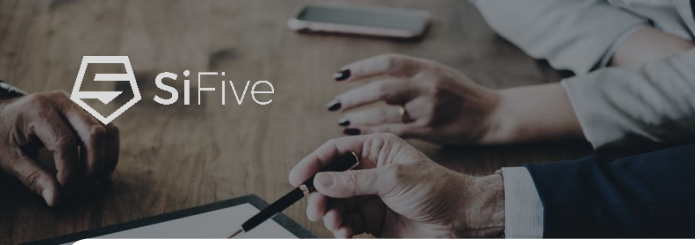
SiFive
Global Presence and Reach

SiFive Worldwide Presence

- 10 offices
- 280+ employees
- 300+ tapeouts

World Class Expertise

- Inventors of RISC-V
- PD, RTL, FPGA
- Verification
- Validation



Team

Inventors, Founders, Industry Leaders

Naveed Sherwani
CEO

Shiva Natarajan
CFO

Sunil Shenoy
VP HW Engineering

Shafy Eltoukhy
VP Operations

Jack Kang
VP Product

Mark Wright
VP Custom SoC Sales

Yunsup Lee
CTO

Krste Asanovic
Chief Architect

Andrew Waterman
Chief Engineer

Brad Holtzinger
VP Sales

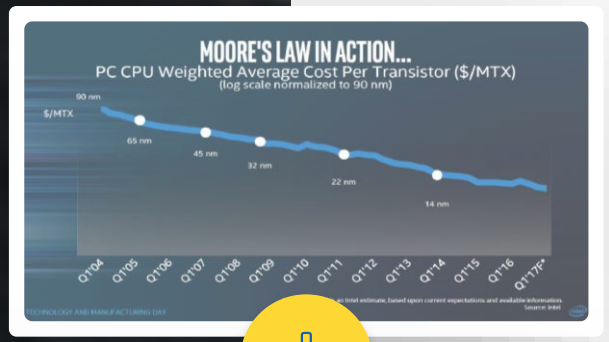
Jeff Mulhausen
VP Marketing

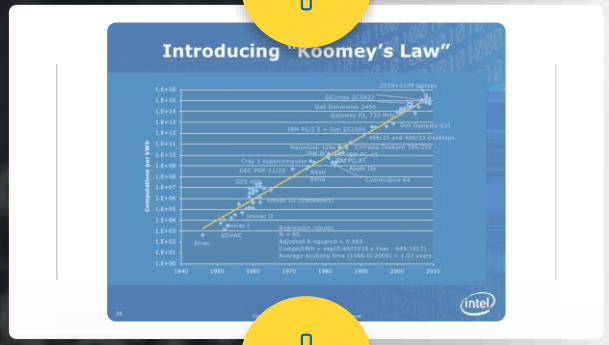
Thomas Xu
SiFive China Leader

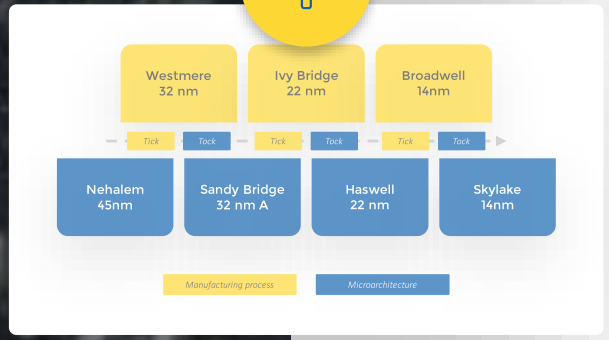
The SiFive Management Team combines the inventors of the RISC-V ISA with seasoned industry executives.

SiFive

Hardware
Laws and Consequences







01 Predictable Performance Advances

02 Cost per Computation reduced steadily

03 Low incentive to build custom hardware

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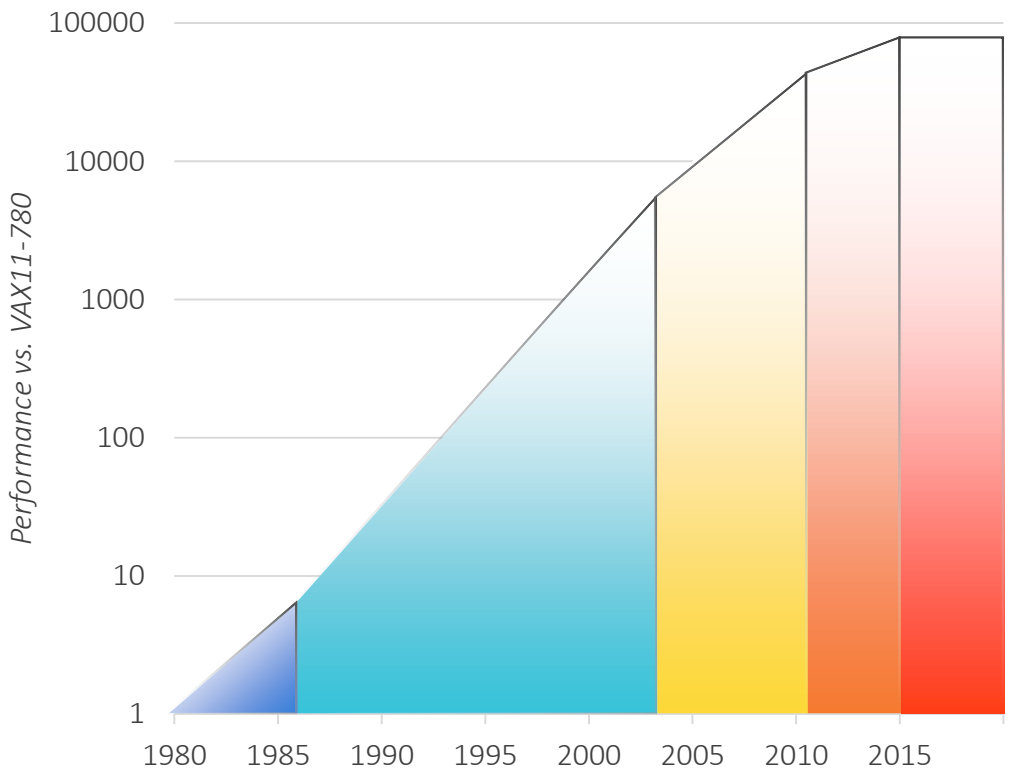
Going Over the Edge



Based on SPECIntCPU. Source: John Hennessy and David Patterson, Computer Architecture: A Quantitative Approach, 6/e. 2018

- *CISC 2X / 3.5 yrs (22%yr)*
- *RISC 2X / 1.5 yrs (52%/yr)*
- *End of Dennard Scaling = Multicore 2X / 3.5 yrs (23%/yr)*
- *Amdahl's Law = 2X / 6 yrs (12%/yr)*
- *End of the Line? 2X / 20 yrs (3%/yr)*

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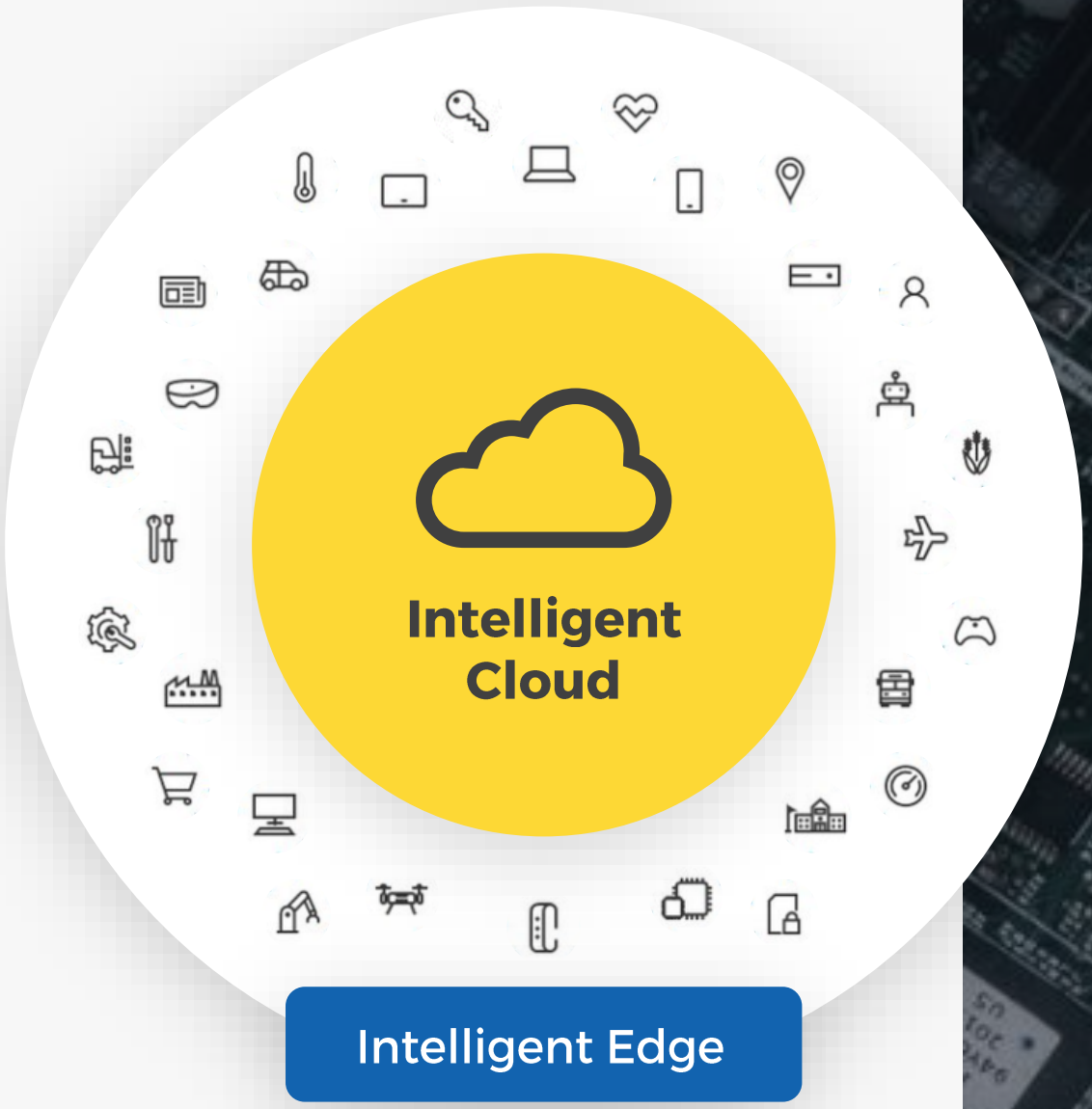

Going Over the Edge

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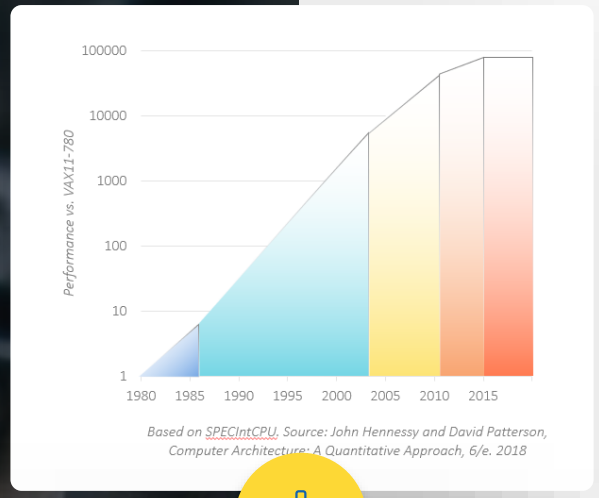
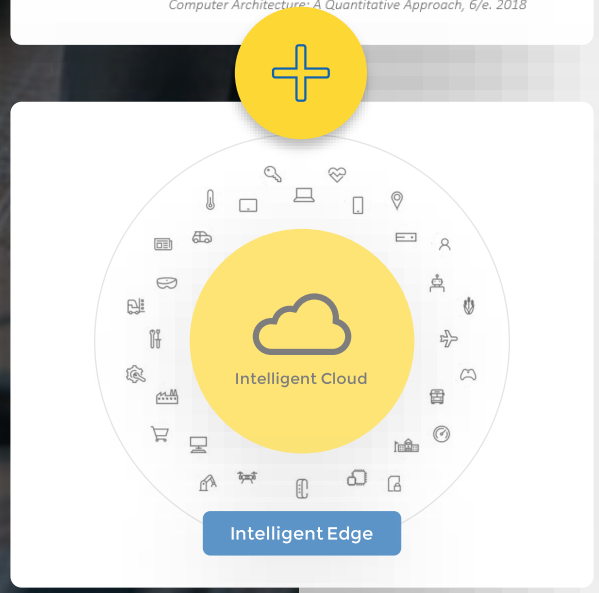
Going Over the Edge





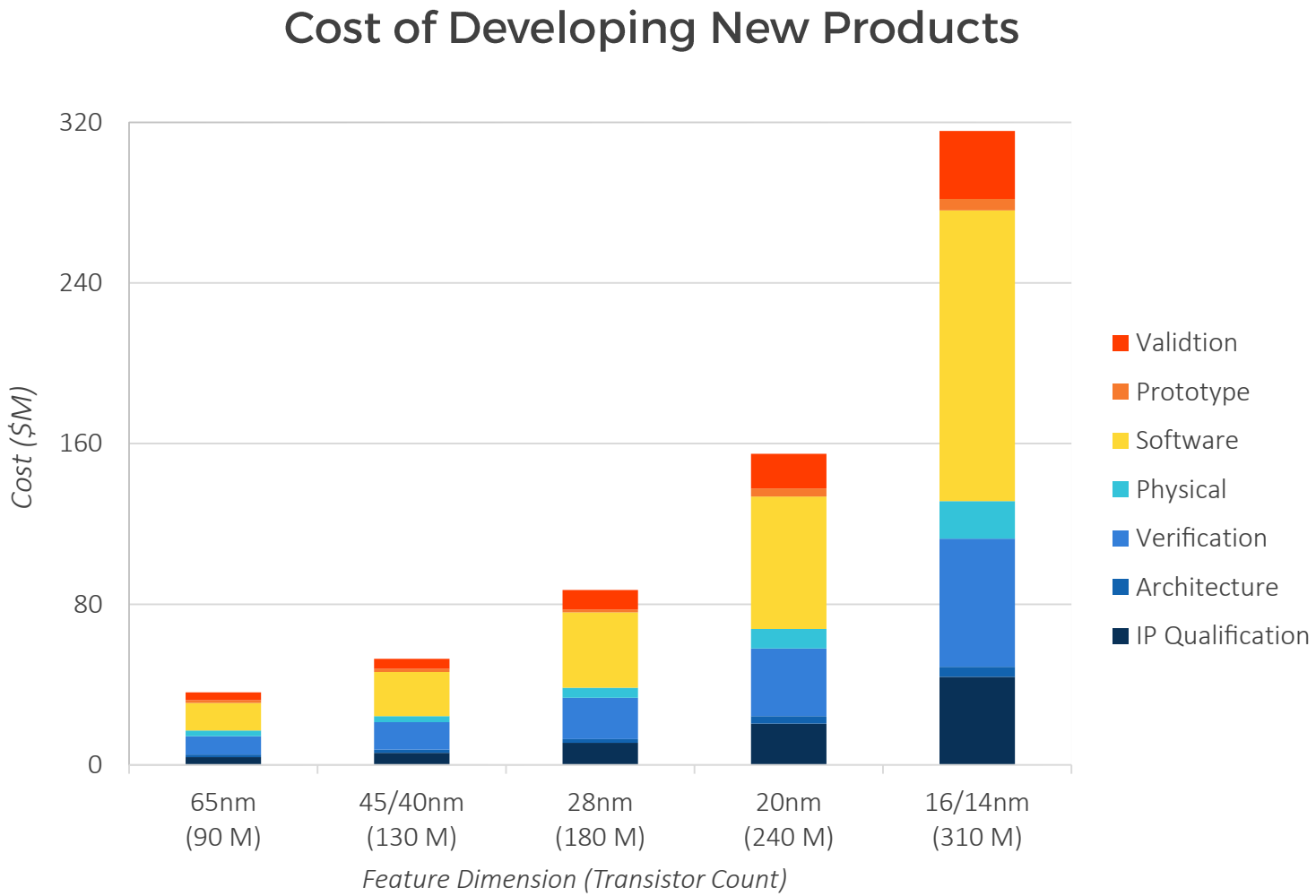
01 More Custom Compute

02 More Custom Hardware

03 For Custom Workloads and Applications

Challenges of Custom Hardware

Too Expensive and Takes Too Long:



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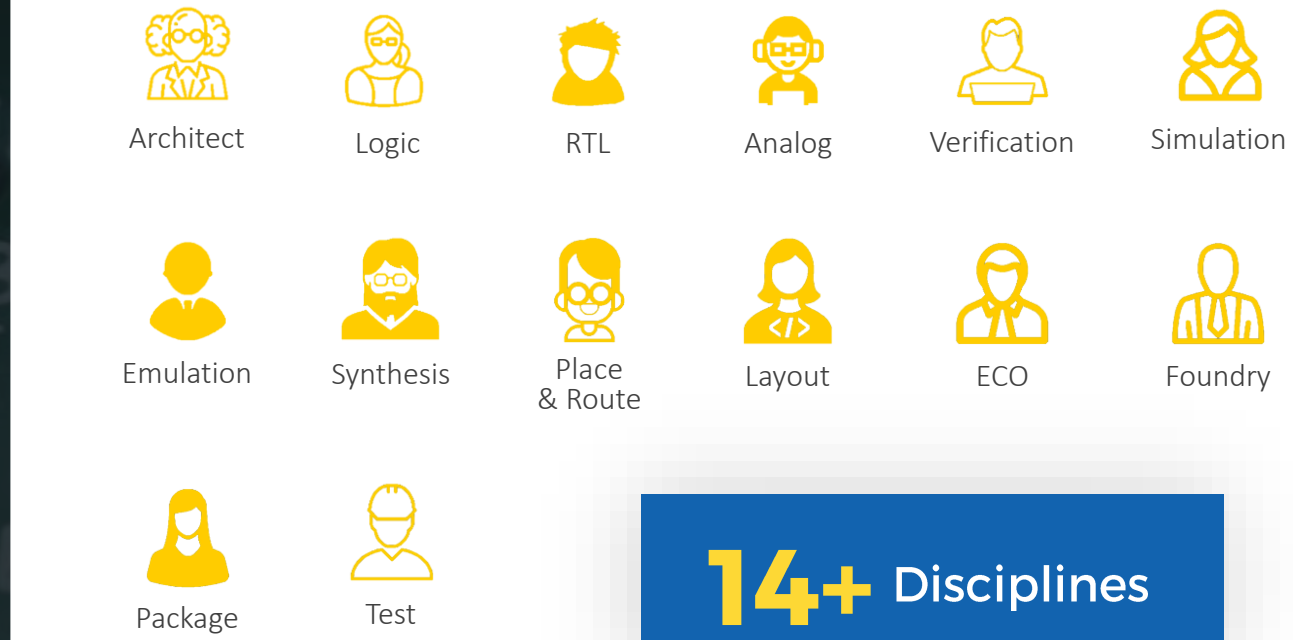
Challenges of Custom Hardware

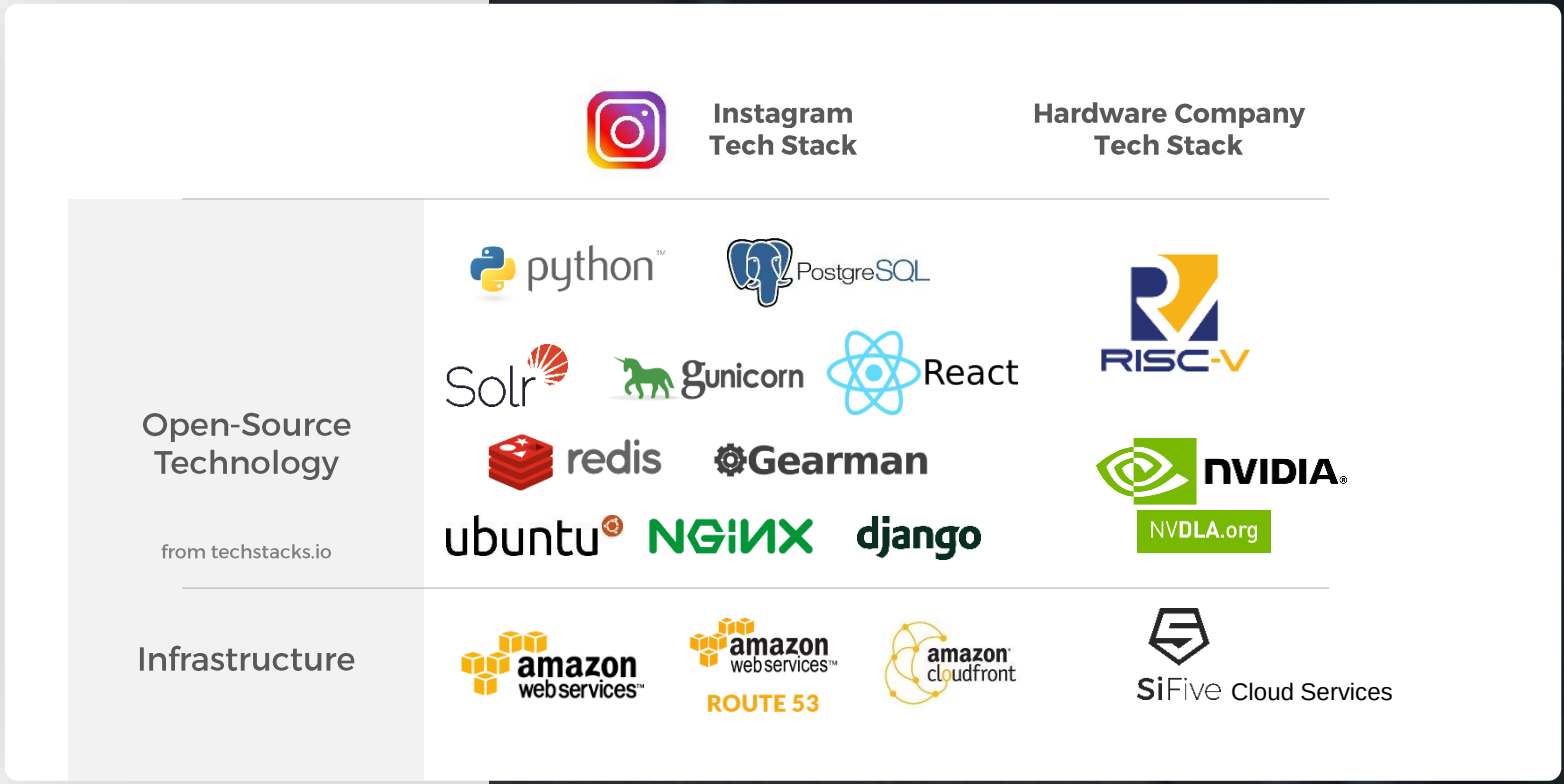
Too Many Experts Needed



14+ Disciplines

SiFive

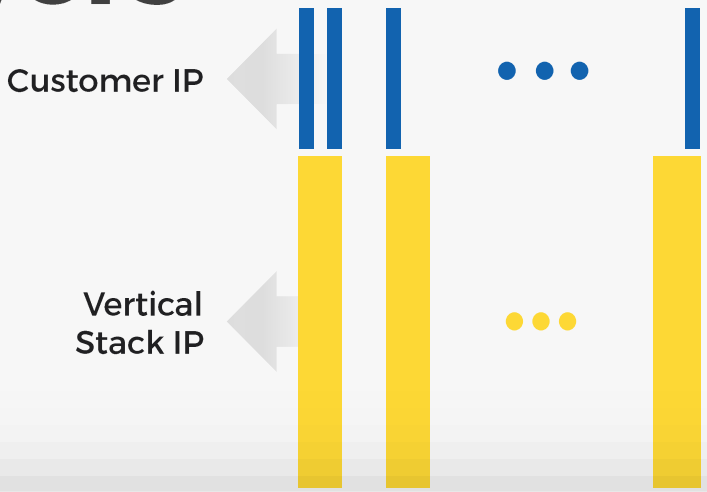
How did Instagram turn into a $1B acquisition with only 13 employees?



The Lesson from Software
Work at a Higher Level

Raise the level of Engineering Focus

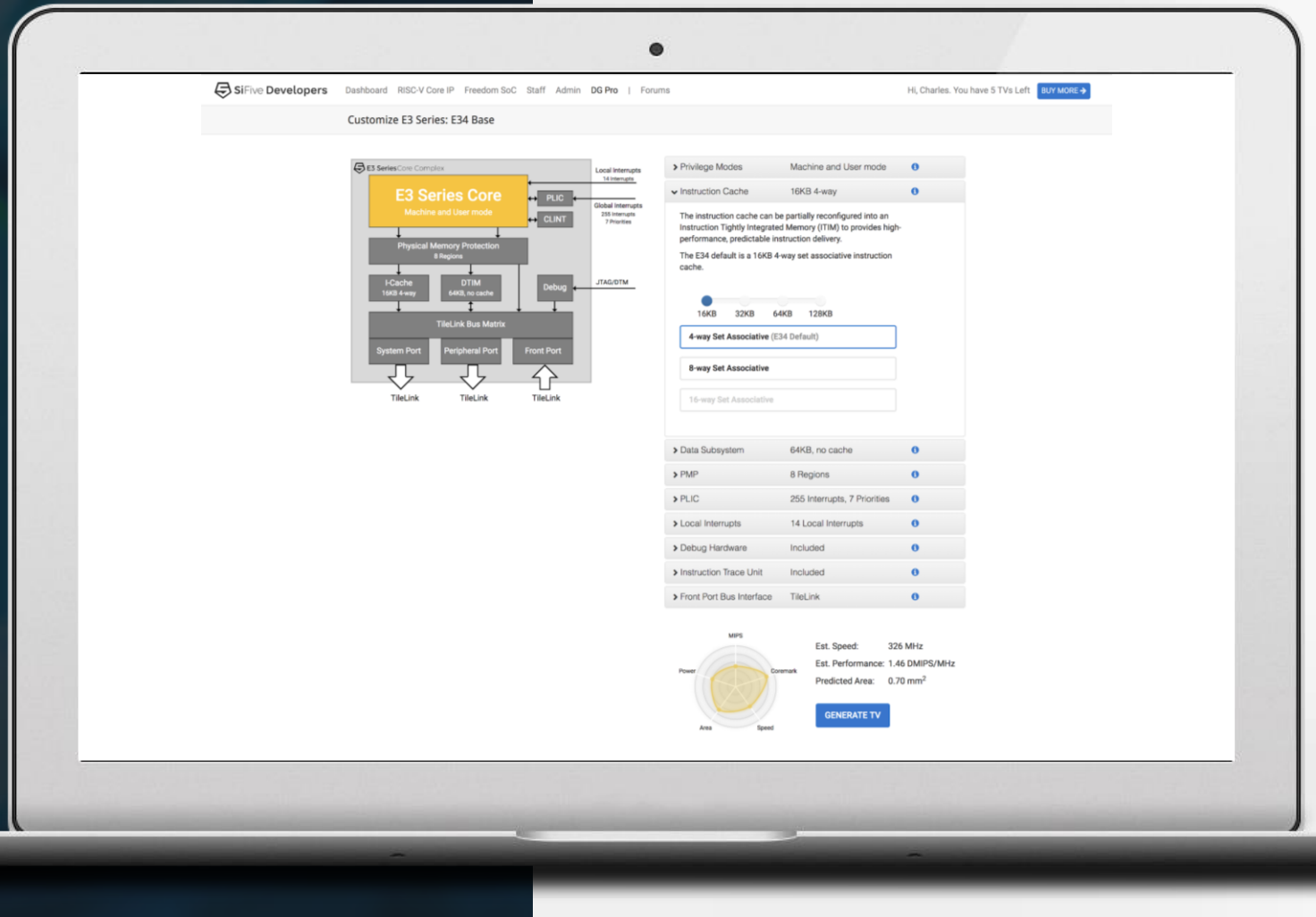
Hardware Design Layers



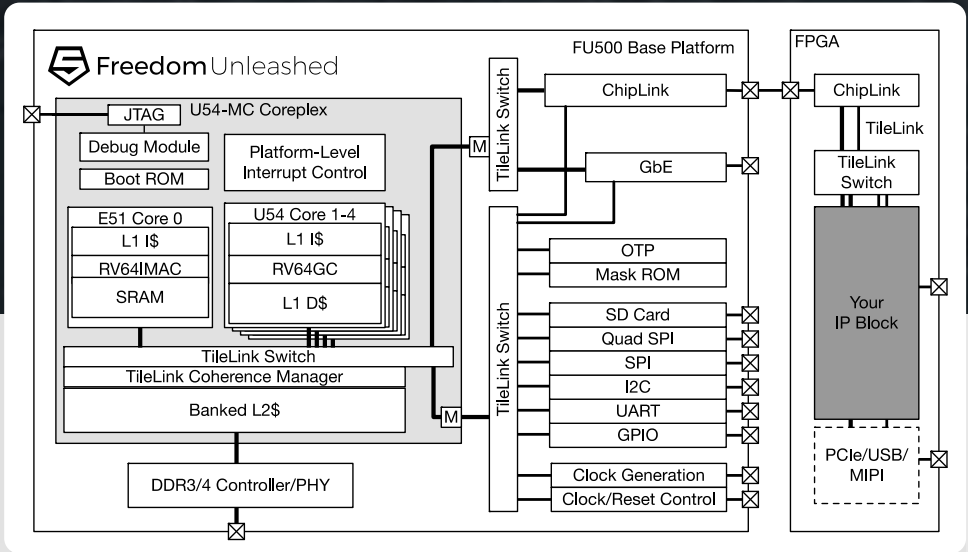
Customer IP SiFive	IP Layer Rambus Cryptography Research ultraSOC ANALOG BITS ememory DOVER MICROSYSTEMS flexlogix Technologies, Inc.
EDA Layer	
Fab Layer	
Package/Test Layer	Cloud-hosted Compute and FPGA

SiFive Designer

IP Customization and Push-Button Configuration



Freedom Unleashed 64-bit Multi-Core RISC-V Linux Platform



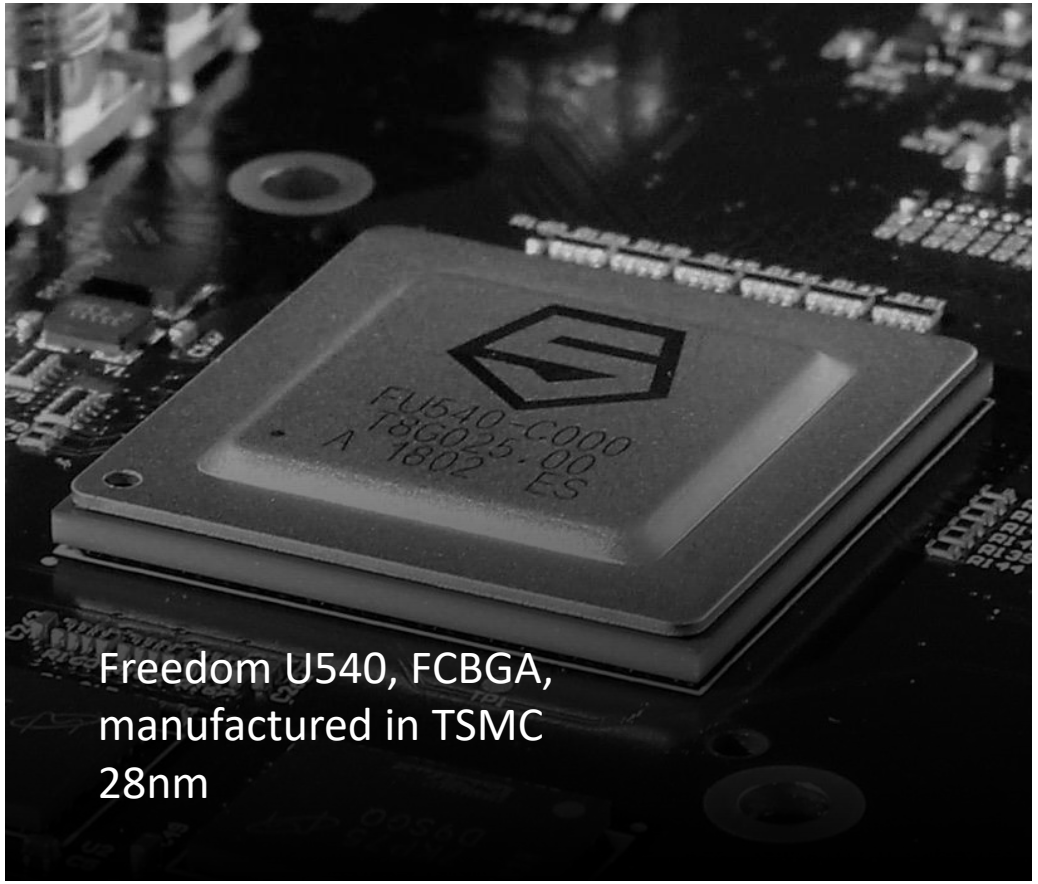
1.5+ GHz U54-MC SiFive CPU

- 1x E51: 16KB L1I$, 8KB DTIM with ECC suppport
- 4x U54: 32KB L1I$, 32KB L1D$ with ECC support
- Single- and Double-precision floating-point support
- 2MB Banked L2$ with directory-based cache-coherence & ECC support

ChipLink

- Serialized Chip-to-Chip Coherent TileLink Interconnect

DDR3/4, GbE, Peripherals



SiFive

Benefits

- Reduced Prototyping Costs
- More Design Starts
- More IP Providers
- More Customization
- More Startups
- Reduced Level of Expertise
- Bring Excitement
- Democratize Access
- Focus on Creating Value
- Help Create a Trillion Dollar Industry