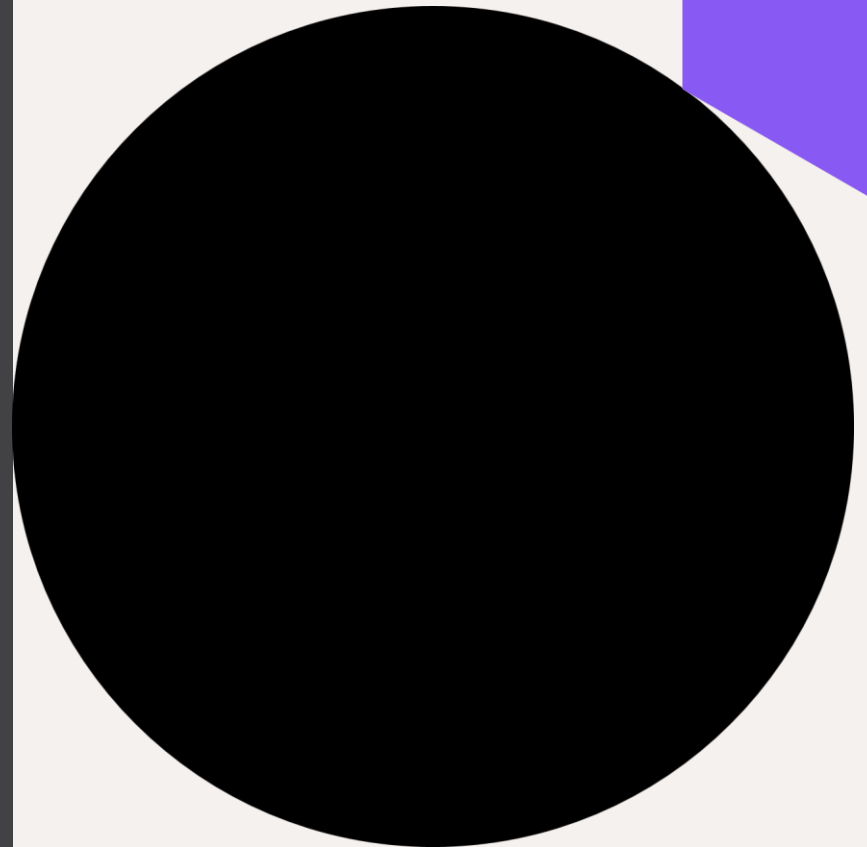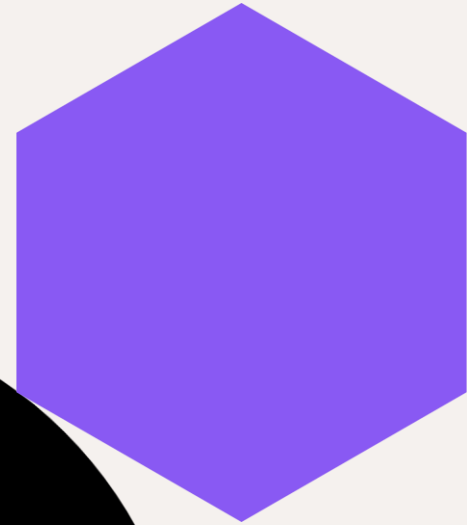# RISC-V customization, HW/SW co-optimization, and Custom Compute

Codasip

RISC-V Summit Europe

Brett Cline

June 6, 2023

→ Traditional approach to hardware design

Codasip

Flexible but slow..?

Choose a general-purpose core and optimize software.

...or fast but hard coded?

Implement fixed-function hardware circuits.

Codasip

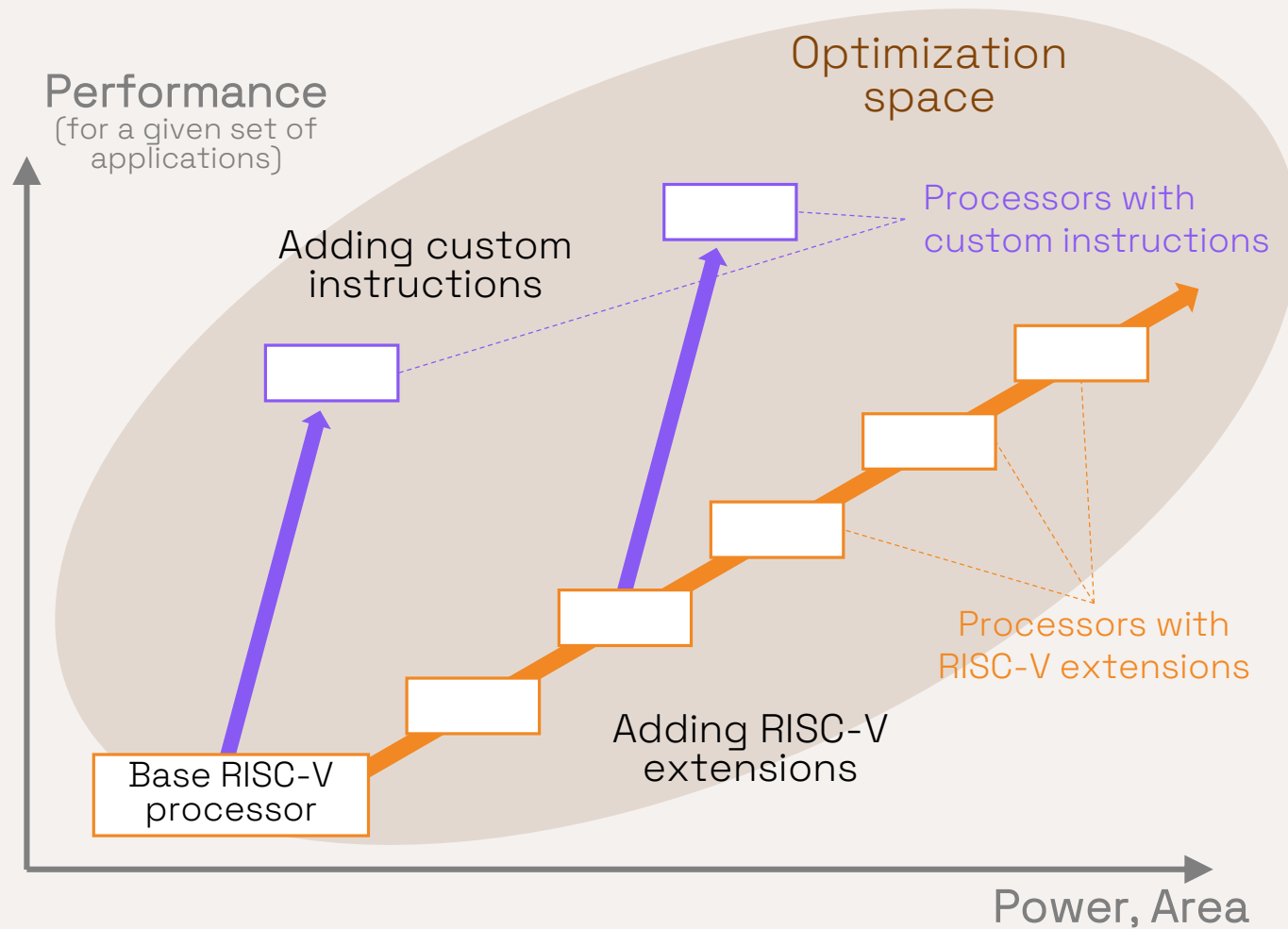You don't have to chose any longer.

→ A new disruptive force

- Open ISA

- Growing ecosystem

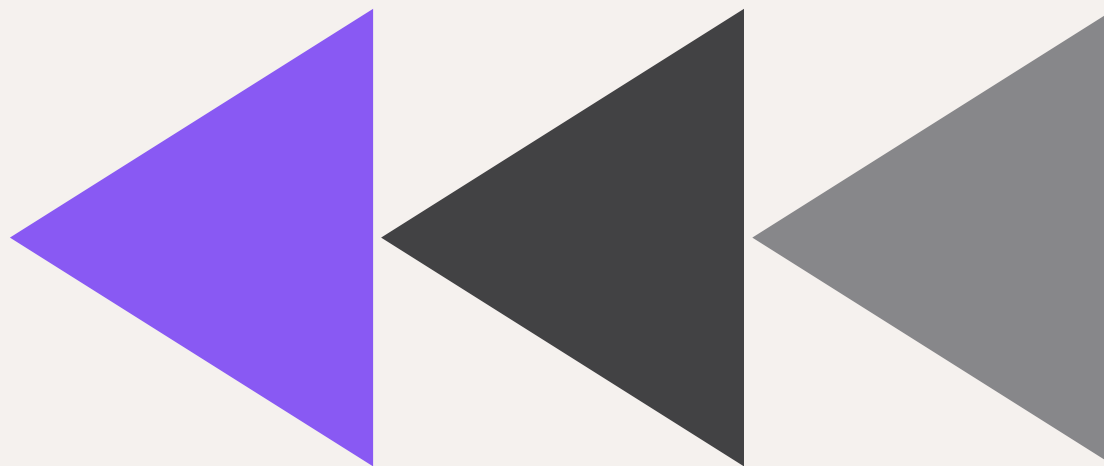- No restrictions

- Customization allowed, and encouraged

→ Counters end of scaling laws

→ Best ISA for Custom Compute

→ Custom instructions for unique workloads

Optimization space

Performance
(for a given set of applications)

Adding custom instructions

Processors with custom instructions

Adding RISC-V extensions

Processors with RISC-V extensions

Base RISC-V processor
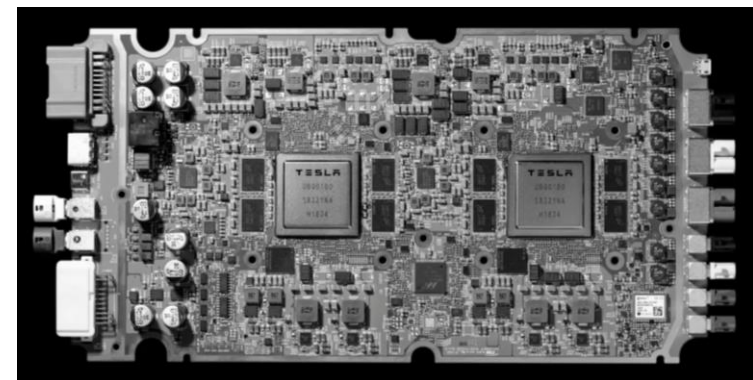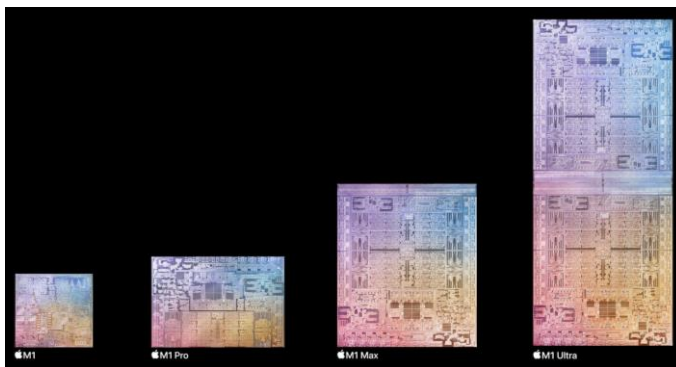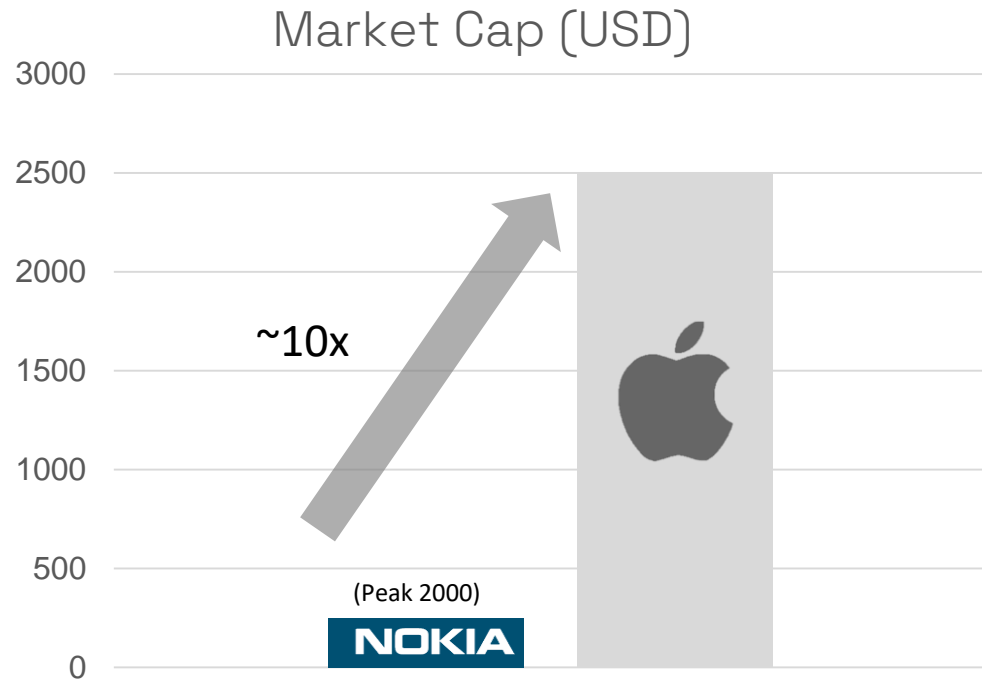
Power, Area

→ Hardware/software co-optimization

Shift left

Codasip Custom Compute

Custom Compute is not new...

it is highly rewarded today

Market Cap (USD)

~10x

(Peak 2000)

Market Cap (USD)

~8x
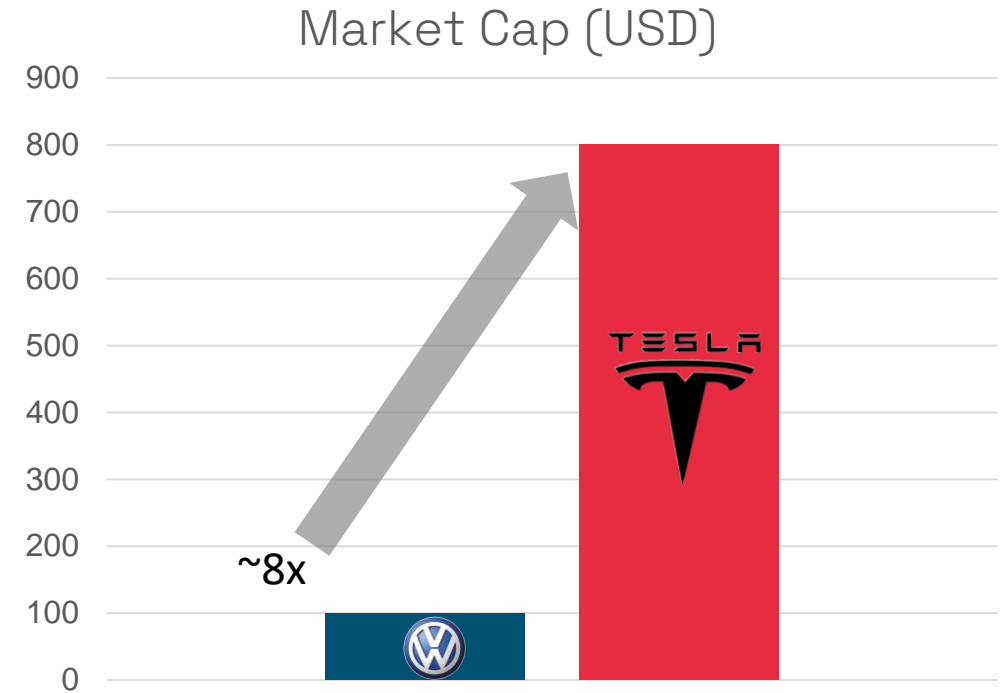
Custom Compute + benefits of a custom SoC

→ Our fundamental beliefs

RISC-V will gain share

HW & SW collaboration

Co-optimization
Custom Compute

Processor selection
↓
Processor ownership

OEMs doing more chips

Big winners
↕
Big losers

→ But there is a talent challenge

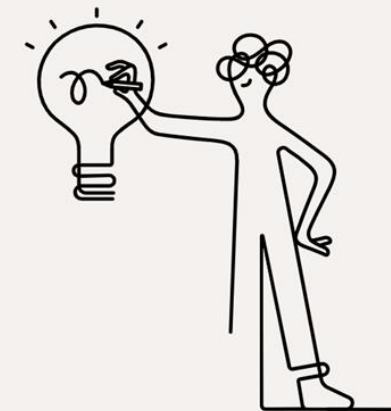**Many processor architects**

Many processor architectures

Processor design
↓
Processor selection

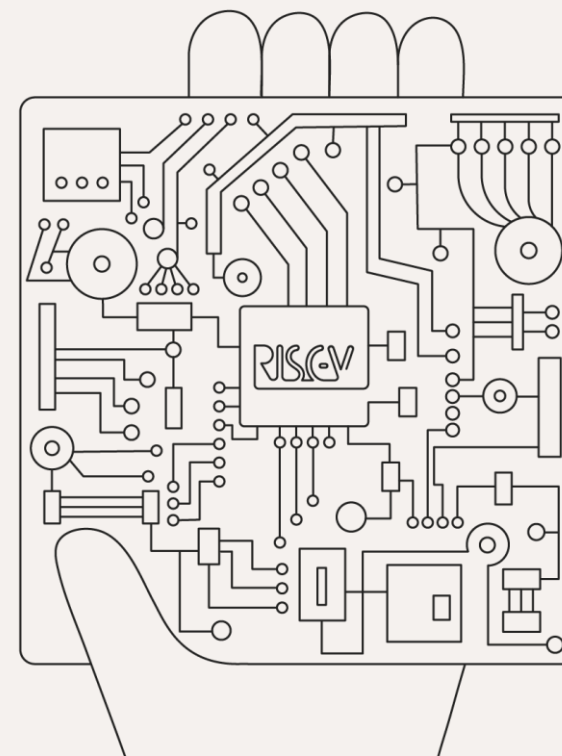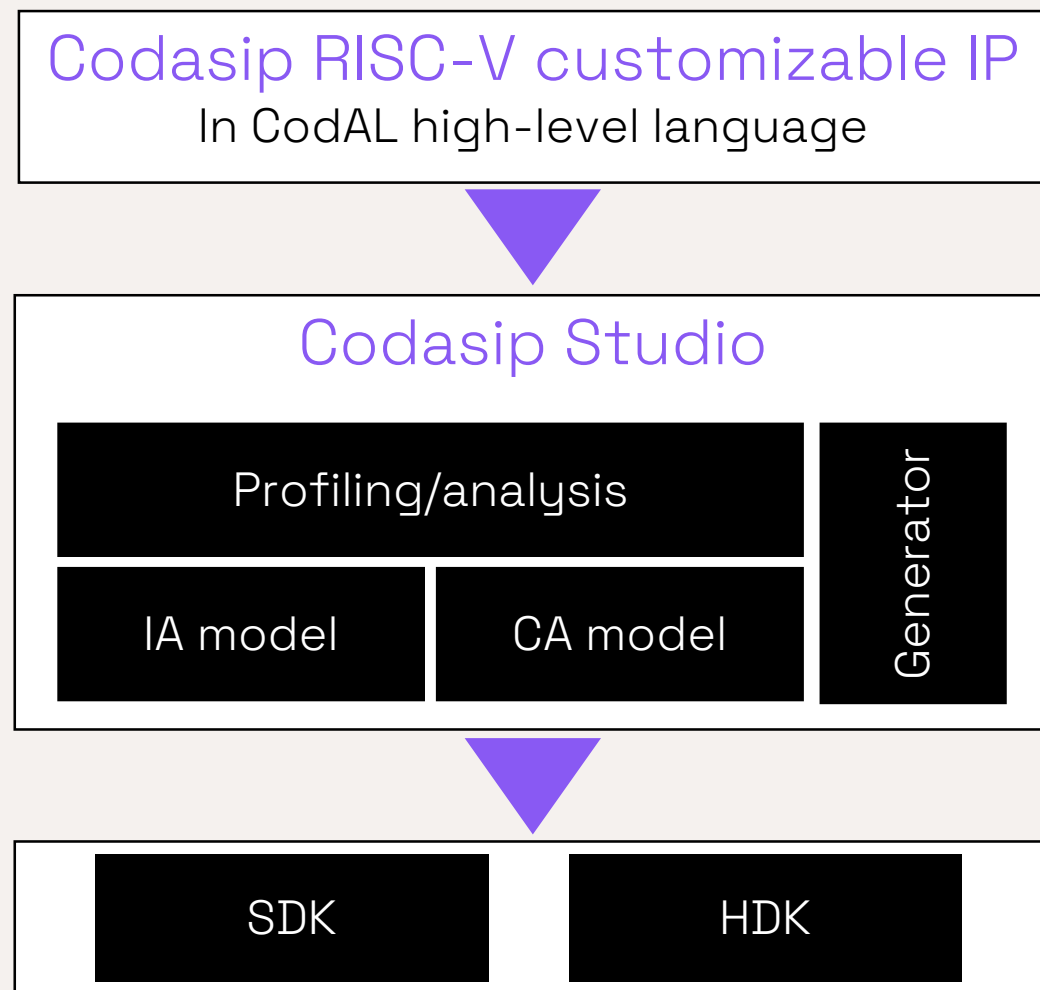Scarcity of skills

30 years ago

15 years ago

Now

Question:
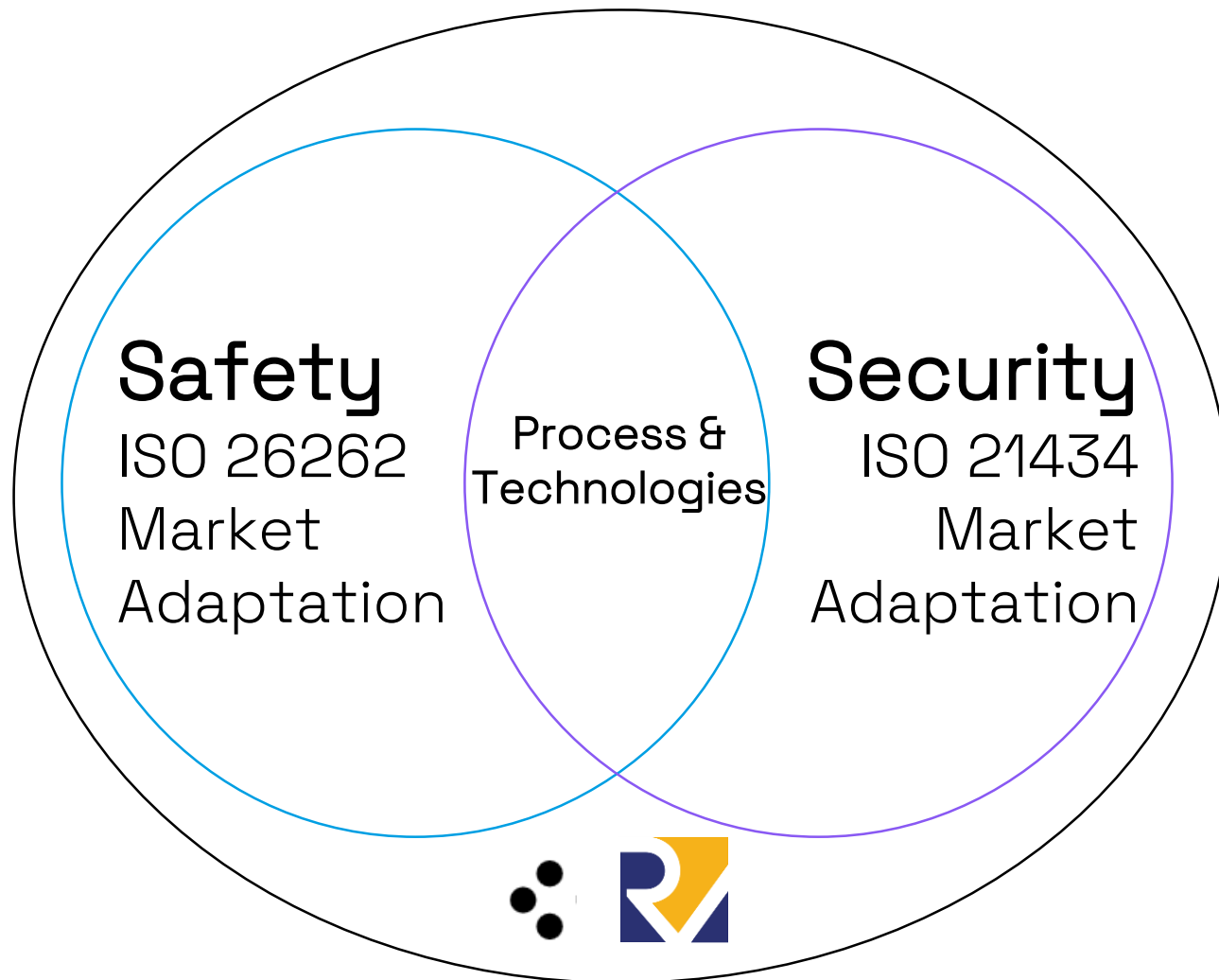How has the industry coped with complexity and limited design skills in the past 50 years?

Answer:
Automation → EDA tools

→ Processor design tools

Codasip RISC-V customizable IP
In CodAL high-level language

Codasip Studio

Profiling/analysis

IA model | CA model

Generator

SDK | HDK

Codasip

Safety
ISO 26262
Market
Adaptation

Process &
Technologies

Security
ISO 21434
Market
Adaptation

A combined
approach to create
dependable products
for all markets

→ A fundamental security problem

% of memory safety vs. non-memory safety CVEs by patch year
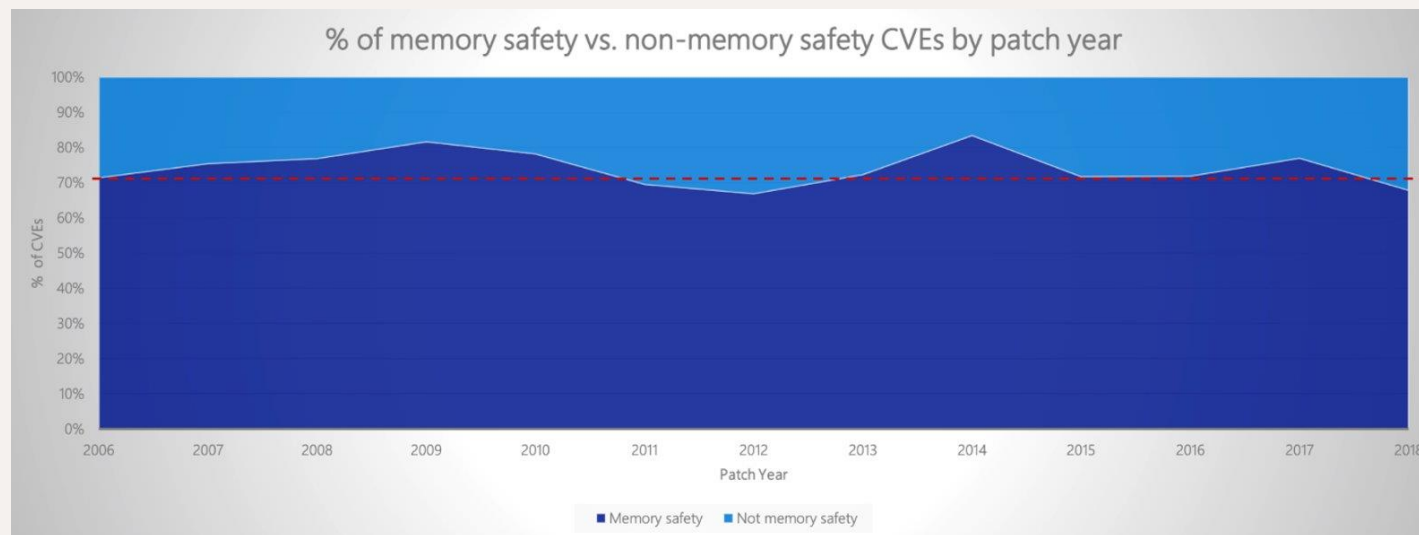
CYBERSECURITY & INFRASTRUCTURE SECURITY AGENCY — **AMERICA'S CYBER DEFENSE AGENCY**

Home / News & Events / Cybersecurity Advisories / Alert

ALERT

OpenSSL 'Heartbleed' vulnerability (CVE-2014-0160)

Last Revised: October 05, 2016   **Alert Code:** TA14-098A

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The Hacker News   ✉ Subscribe to Newsletter

Warning: ███████ **Devices Under Attack! New Security Flaw Exposed**

📅 May 20, 2023   👤 Ravie Lakshmanan

Codasip

What if you could...
customize a security processor based on a
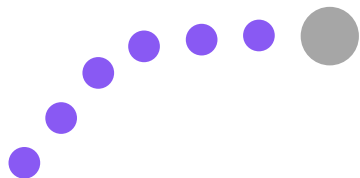starting production core?

...and be protected.
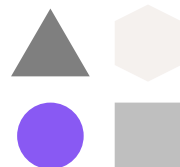
→ Coming soon

CENSORED BY CODASIP MARKETING

Come on Brett, you know you can't show this yet 😬

(seriously, these commercial guys...)

→ Innovation through customization

No more "free improvements" with end of Moore's law

Need to optimize processing to the application

→ Custom Compute

IP and tools to support a hardware / software co-optimization methodology

Architect your ambition

Codasip

Zdenek Prikryl, CTO

RISC-V as an enabler of heterogeneous compute

Demo theatre - Wednesday 10.55

Tariq Kurd, Lead IP Architect

RISC-V code-size reduction with Zc extensions and dictionary compression custom instruction

Technical talk - Thursday 15:00

Come by our booth for a demo!