



# RISC-V is Inevitable

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**Open standards and collaboration**  
are strategic to hardware and software  
across industries and geographies.



# The 2023 State of Open Standards

91% of organizations are involved with open standards code



86% of organizations report there is a need for an open standards video streaming codec



Organizations prefer open standards 7 times more than other standards



72% of organizations say their customers prefer products and services based on open standards

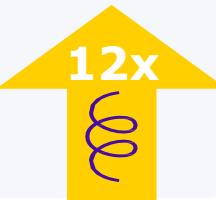


80% of organizations say that increased use of open standards will make them more competitive



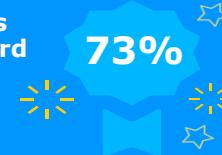
80%

Over the last 3 years, organizations are 12 times more likely to say their value from open standards is increasing rather than decreasing



73%

73% of organizations say that open standard benefits outweigh patent royalty opportunities

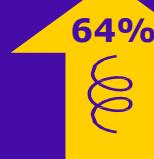


Improved productivity is the #1 reason organizations are increasing their use of open standards

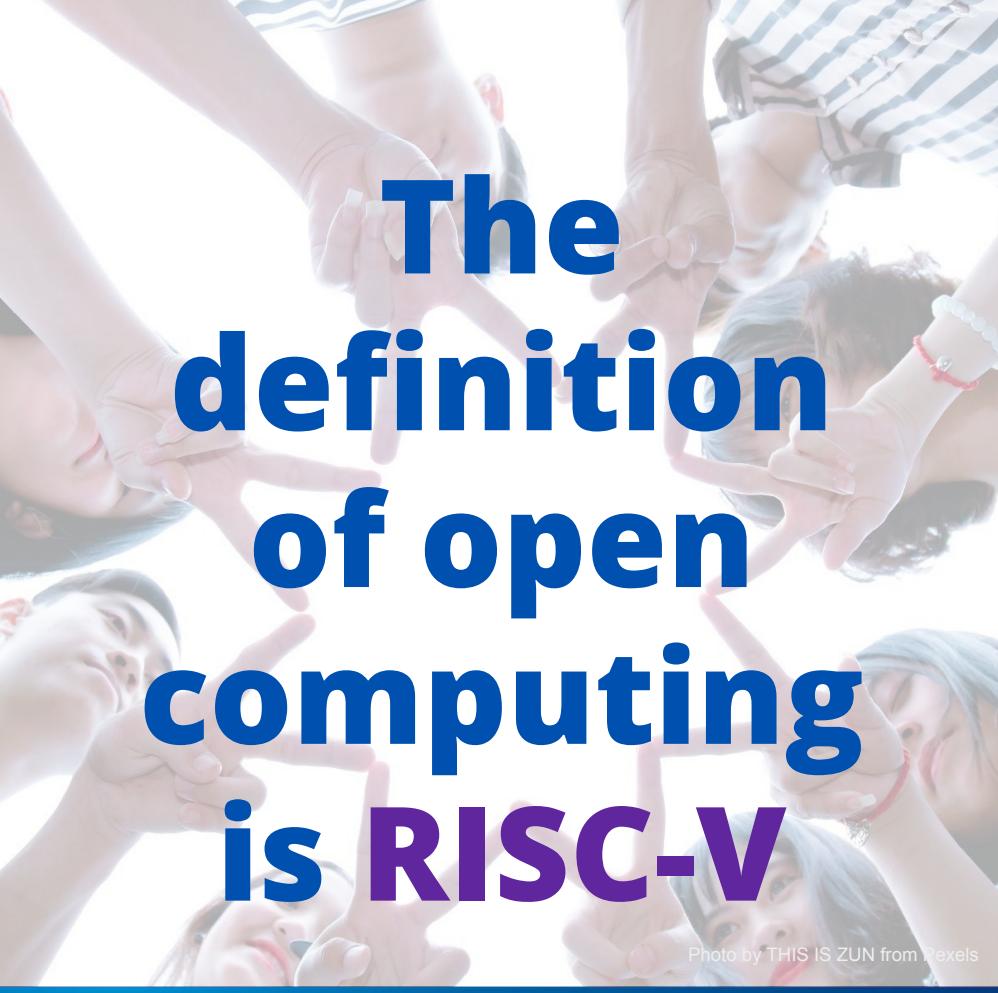


77% of organizations say increasing their use of open standards will improve their cybersecurity

76% of organizations say that increased use of open standards will make them more innovative



64% of organizations say open standards delivered increasing value over the past three years



# The definition of open computing is RISC-V

Photo by THIS IS ZUN from Nexels

**RISC-V is the most prolific  
and open Instruction Set  
Architecture in history**

- RISC-V is inevitable
- RISC-V enables the best processors
- RISC-V is rapidly building the strongest ecosystem

# RISC-V is inevitable

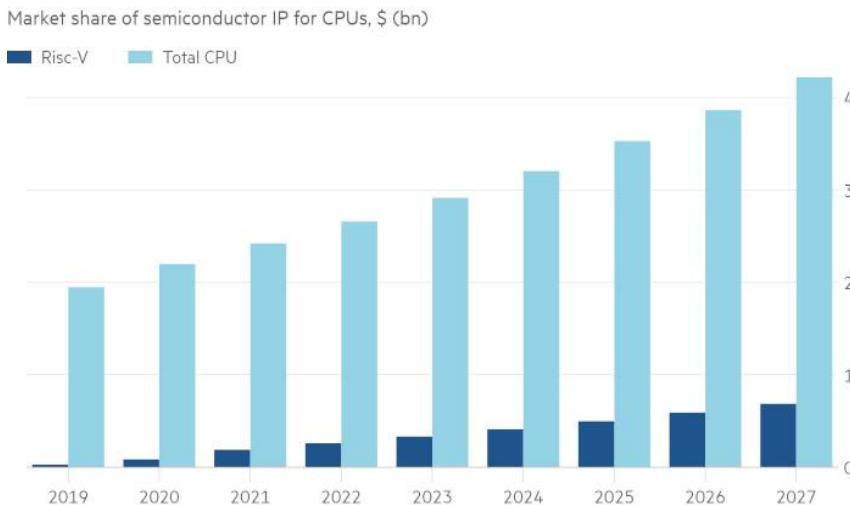
**Mission: RISC-V is the industry standard ISA across computing**

-  >10 Billion RISC-V cores already shipped
-  Innovation and adoption moving rapidly across all domains
-  Demand at every performance level (low to ludicrous)
-  Shared investment is driving the fastest growing ecosystem



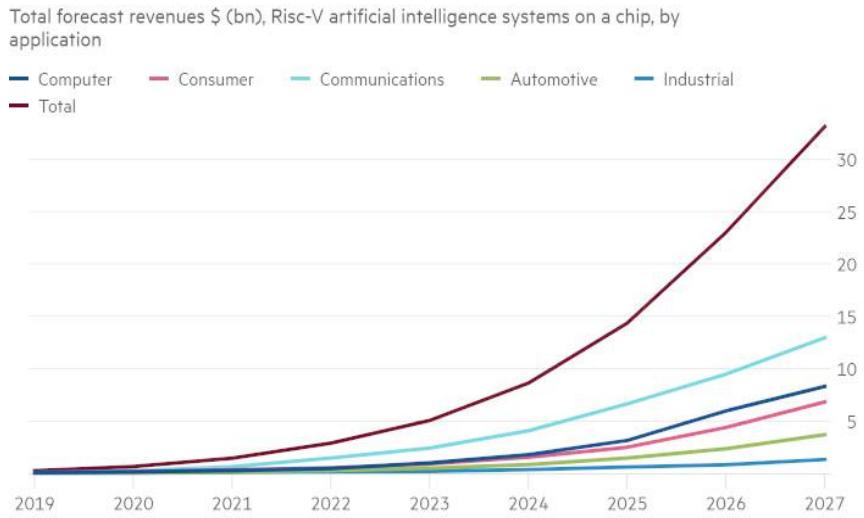
# RISC-V semiconductor IP total market share forecast to grow from 1% to 16% by 2027

Semico Research forecasts that 62.4B RISC-V chips will ship by 2024.



Source: Semico Research

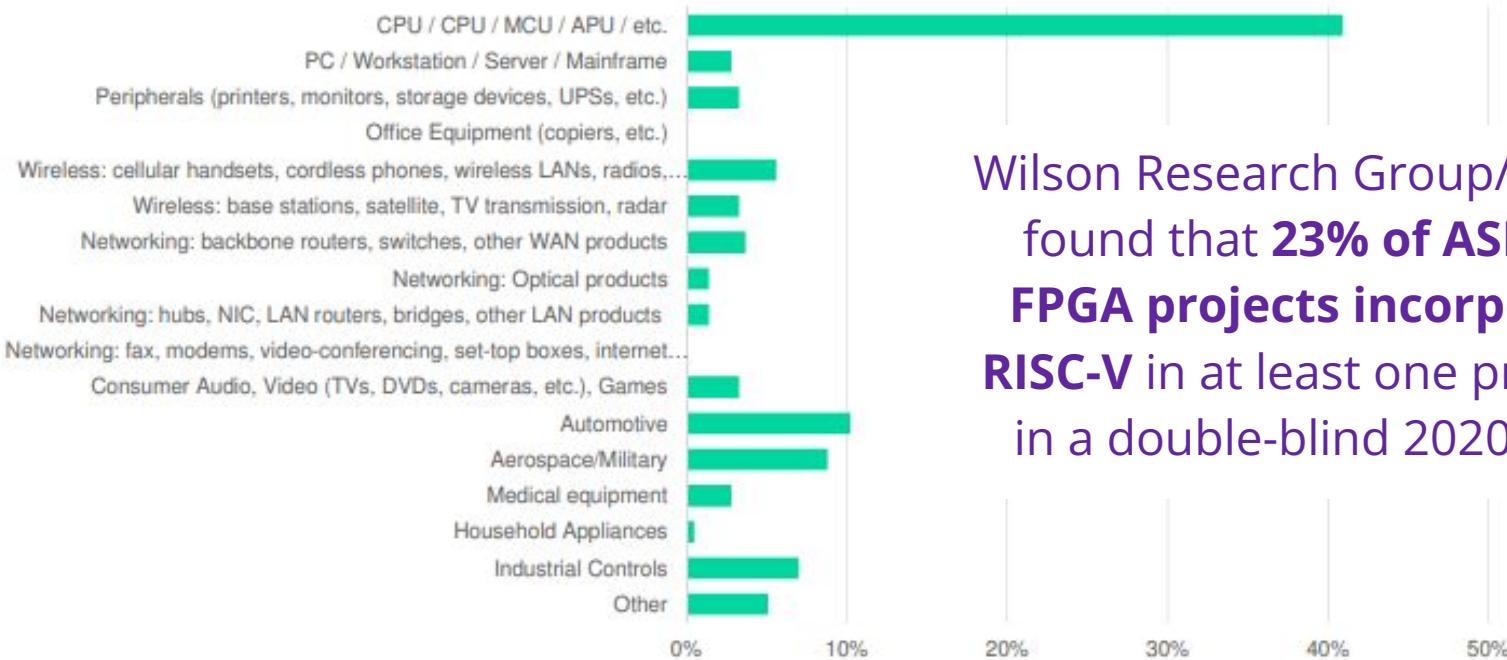
Strongest growth is underway in AI with 25B RISC-V AI SoCs coming to market by 2027, with expected revenue of \$291B.



Source: Semico Research

# Nearly a quarter of designs incorporate RISC-V

## Projects Incorporating RISC-V by Market Segment



Wilson Research Group/Siemens found that **23% of ASIC and FPGA projects incorporated RISC-V** in at least one processor in a double-blind 2020 study.

Source: Tech Design Forum, November 2020

# Billions of collective RISC-V investment



Top 10 RISC-V startups in China have raised close to \$1.18 B in venture capital funding Jun 2023



Bosch, Infineon, Nordic, NXP, Qualcomm announce Joint Venture for open RISC-V hardware Aug 2023



EU [European Chips Act of €15 billion](#)  
adds to €30 billion of public investment  
Feb 2022



RISE launched for Open Source Software development for RISC-V May 2023



EuroHPC JU €270 million for RISC-V chips in HPC Dec 2022

Spain €12.25b Investment including RISC-V lab at BSC May 2022



India Ministry for Electronics & Information Technology launched Digital India RISC-V for commercial SHAKTI & VEGA silicon Apr 2022



Intel \$1B Innovation Fund To Grow RISC-V (And Attract New Foundry Customers), Joins RISC-V Board Feb 2022

# China semiconductor leadership



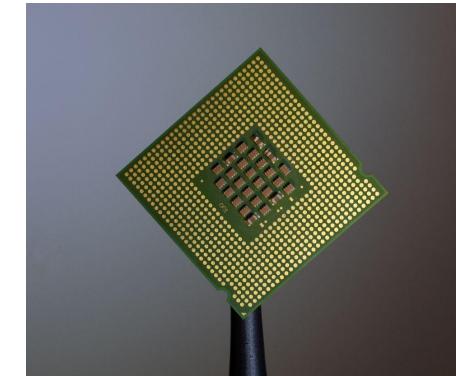
China is home to 7 million software developers, more than any other country.

Source: <https://www.griddynamics.com/>



More than 700 chip related companies raised \$19B in 2022

Source: <https://semiengineering.com>



China's share of the global chip design market projected to rise from 9% in 2020 to 23% by 2030

Source: Semiconductor Industry Association



# Greater China RISC-V Premier Members = Leadership



# Telecom & Consumer Devices



China Mobile releases world's first self-developed LTE-Cat.1 chip based on the RISC-V architecture



RISC-V Android LicheePad4A with AOSP Android 13 for under \$300



Android Open Source Project (AOSP) ported to RISC-V



First Dual-Band Wi-Fi 6 and BLE RISC-V chip



Roma - World's First RISC-V Laptop officially delivered: 8GB RAM and pre-installed with domestic OS



Alibaba's T-Head chip unit demonstrates Android compatibility on RISC-V chips



EdgeQ using AndesCore™ RISC-V license to deliver industry's first fully open and programmable 5G platform with AI



Pixel 6 Titan M2 RISC-V processor, with extra speed and memory, more resilient to advanced attacks



Shipped 650 million RISC-V cores for mobile, automotive, extended reality and IoT solutions, December 2022

IoT

RISC-V will command 28% of the IoT market by 2025

Counterpoint Technology Market Research, September 2021

By 2028, the number of RISC-V processors shipping into IoT will approach 20 billion

Omdia Research, May 2023



Sales of the first RISC-V IoT security "Towngas Chip" have exceeded 1 million pieces



**T-HEAD**

T-Head XuanTie C908 RISC-V core targets AIoT applications



Haawking HX2000 series RISC-V DSPs target industrial automation



Espressif adopts RISC-V for next generation ESP32-C6, with Wi-Fi 6 and BT 5



Bouffalo Lab BL616/BL618 RISC-V MCU supports WiFi 6, Bluetooth 5.2, and Zigbee



CH32V003 RISC-V MCU offers 2KB SRAM, 16KB flash for 10 cents



**T-HEAD**



**Alipay**

Alibaba T-Head and Alipay will release chips for secure payments based on RISC-V



P670 and P470 for wearables, smart home, VR, Industrial IoT



**MICROCHIP**

PolarFire SoC portfolio of multi-core RISC-V SoC FPGA addresses low power embedded and IoT applications

# AI / ML



RISC-V-based AI SoCs will grow 73.6% CAGR to 25B units and \$291B in revenue by 2027

Semico Research, December 2021



Chinese researchers design a RISC-V CPU in under 5 Hours using AI



Xuantie C906 processor Tops MLPerf Tiny v0.7 Benchmark



Andes Technology announce AndesAIRE™, for Efficient AI/ML Solutions



Codasip

L31 and L11 RISC-V embedded cores enable AI/ML edge customization



First fully customizable, 64-bit RISC-V core family for handling large amounts of data for ML, AI, and HPC



SiFive

SiFive Intelligence X280 RISC-V processor picked for use in Google AI compute nodes



esperanto.ai

Industry milestone of generative AI models running on ET-SoC-1, launched SDK enabling acceleration of parallelized HPC workloads

UNTETHER AI

Boqueria AI device features over 1400 RISC-V processors for at-memory compute

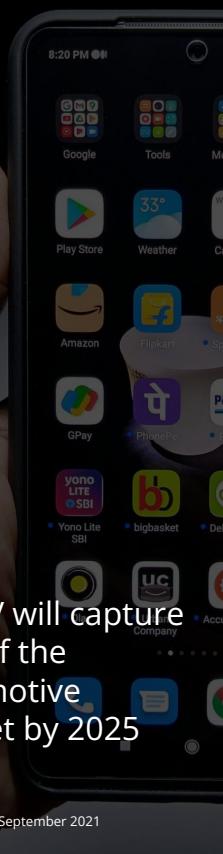


tenstorrent

Tenstorrent ultra high performance RISC-V CPUs and AI accelerators for AI and HPC.



# Automotive



RISC-V will capture  
10% of the  
Automotive  
market by 2025

Counterpoint, September 2021



Nuclei System Technology NA900 certified compliant with ASIL D requirements of ISO 26262 standards for both systematic fault and random hardware fault



ADAS chips capable of 176 trillion ops per second with 12 RISC-V CPU cores



AndesCore™ N25F-SE RISC-V CPU IP certified to be fully compliant with ISO 26262 functional safety standards for the development of automotive applications.



RISC-V Embedded Workbench for SiFive infotainment, connectivity, and ADAS products



NSITEXE selects ImperasDV for advanced RISC-V processor hardware design verification



Automotive portfolio announced targeting cockpit electrification, ADAS, safety, and others applications



eVocore CPUs for high-performance, real-time compute in datacenter and automotive



SoC.one and Imagination partner to enable adoption of RISC-V for automotive applications

# Data Center & Cloud

RISC-V CPU core market will grow 115% CAGR, capturing >14% of all CPU cores by 2025

Semico Research, December 2021



Milk-V Launches Milk-V Vega, the world's first RISC-V open source 10 Gigabit ethernet switch



RISC-V Catapult cores address a range of markets including data center and high performance computing



Andes Technology N25F RISC-V processor enables performance and low power for Phison X1 Enterprise SSD controller



MTIA v1 AI inference accelerator with two RISC-V processor cores (one with vector) customized for compute and control



tenstorrent

Tenstorrent ultra high performance RISC-V CPUs and AI accelerators for AI and HPC.



1,000-Core RISC-V AI accelerator designed for data centers



Boqueria AI device features over 1400 RISC-V processors for at-memory compute

# High Performance Computing

Significant investments in multiple geographies specifying RISC-V



Terapines ZCC toolchain supports Andes RISC-V processors across a range of markets, including high-performance computing and AI



E4 Computer Engineering, with Università di Bologna and CINECA to build the first operational RISC-V based cluster targeted to the codesign of HPC applications



Semidynamics announces fully customisable, 4-way Atrevido 423 RISC-V core for big data applications



An open-source high-performance RISC-V processor from China Academy Sciences and Peng Cheng Lab



Researchers from the Technical University of Munich (TUM) have designed a chip to implement post-quantum cryptography



HPC-centric software test suite for GCC and LLVM



BSC Develops 4 Open-Source Hardware Components Based on RISC-V

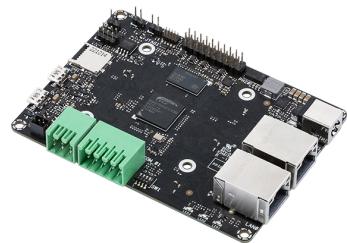


Developing a high-performance RISC-V Out-of-Order processor core for the European eProcessor project

# Development Boards



Powerful Lichee Pi 4A SBC powered by Alibaba T-Head TH1520 processor



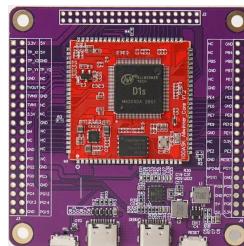
Asus Tinker Board V is the first RISC-V single-board computer (SBC) from ASUS IoT



StarFive RISC-V SBC VisionFive 2 released, featuring JH7110 64-bit CPU



Perf-V is an FPGA demo board designed for the RISC-V open source community by PerfXLab.



DongshanPI-D1s is a RISC-V Development Board for Less Than \$20 powered by Allwinner D1s



Milk-V Pioneer is a developer motherboard based on SOPHON SG2042 in a standard mATX form factor.

## RISC-V enables profound innovation from low end to high end applications

-  **Inherent and sustainable performance** and efficiency advantage with extensions designed simply, for easy implementation
-  **Design flexibility and freedom** afford increased innovation potential across multiple variables
-  **Supported by massive community**, enabling the most efficient designs scalable to the full spectrum of applications

# RISC-V enables the best processors



# In performance benchmarks, RISC-V is gaining ground really fast

- [Researchers Benchmark Experimental RISC-V Supercomputer](#)
- [XuanTie C906 Tops MLPerf Tiny v0.7 Benchmark](#)
- [MIPS Claims "Best-In-Class Performance" With New RISC-V eVocore CPUs](#)
- [Andes Technology RISC-V Processors Reveal Outstanding Performance and Efficiency in MLPerf Tiny](#)
- [RISC-V Powered Mango Pi Takes on Raspberry Pi Zero at Its Own Game](#)
- [SiFive RISC-V Sees Some Performance Improvements On Ubuntu 22.04](#)
- [Greenwaves top results in MLPerf Tiny for hardware acceleration](#)

Processors in development slated to overtake current proprietary alternatives.



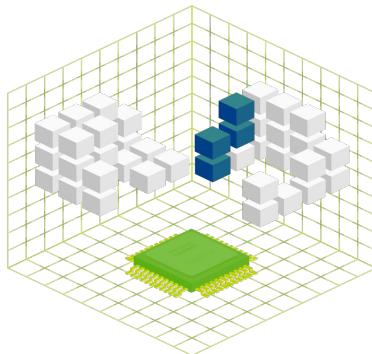
# RISC-V is rapidly building the strongest ecosystem

## RISC-V instrumented with software top of mind

-  **Open standards enable software choice**  
Applications keen to run on RISC-V.
-  **Toolchain and OS support** required for Extension ratification
-  **Single hypervisor standard** to simplify and unify application support
-  **Thousands of software developers** bringing workloads to RISC-V
-  **Strategic imperative and investment** by commercial sector and geographies
-  **Modern design approaches** leveraged for fewer instructions

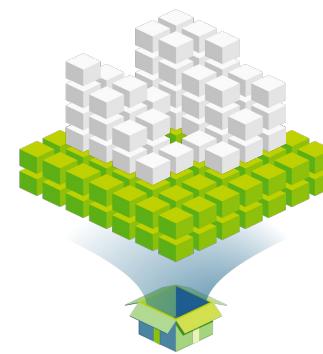


# RISC-V leads on innovation



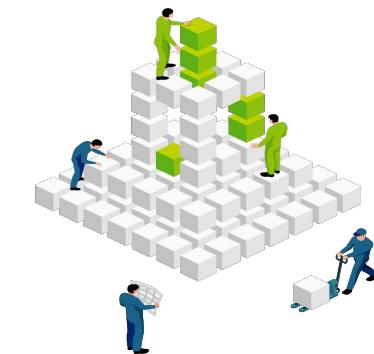
## Domain-specific extensions

Drive the definition of extensions using quantitative and software-driven methodologies to benefit **domain-specific software** workloads and coexistence of **vendor-specific extensions**



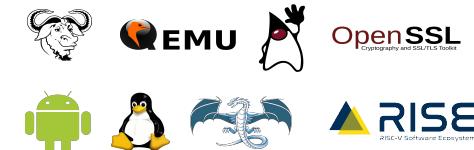
## Platform standardization

Attract independent software vendors and **reduce platform fragmentation** for hardware/software interoperability with off-the-shelf devices and software



## Building a contributor culture

Collaborate closely with major **Open-Source Projects** to better align our standardization and member contributions with each upstream project's processes



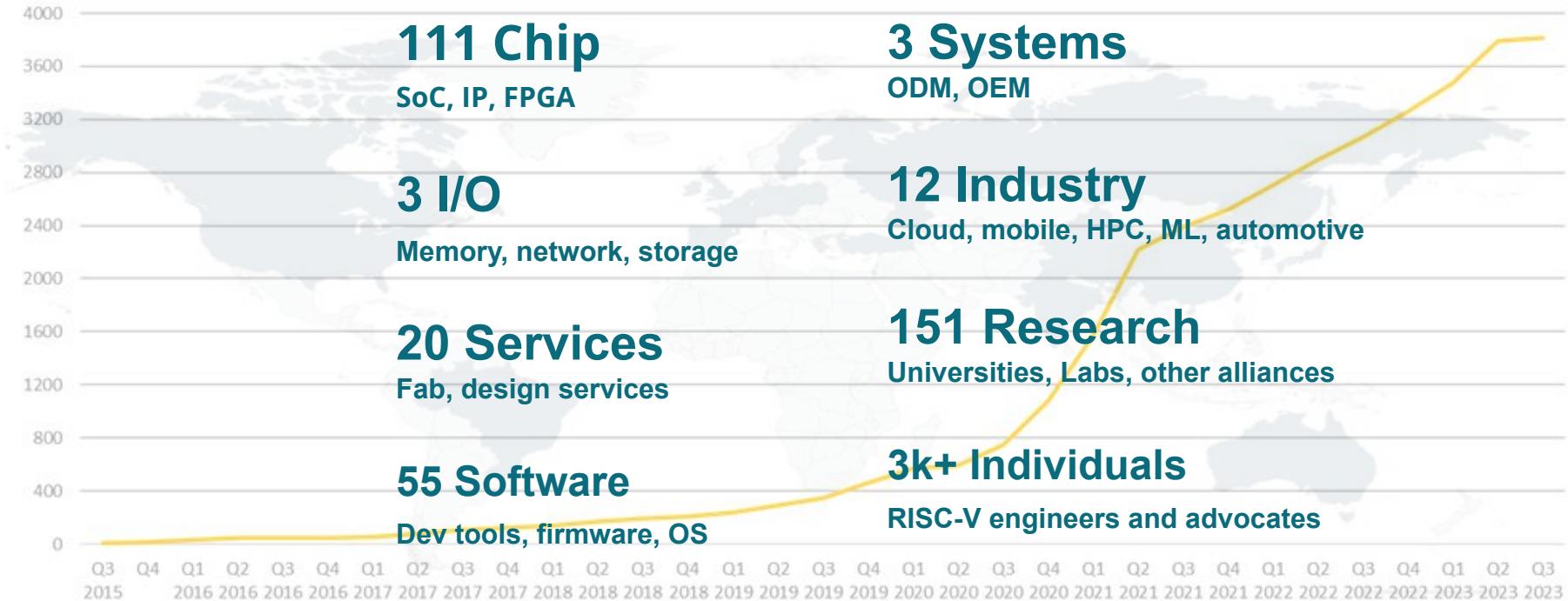


# Accelerating and building the strongest ecosystem



Updated August 2023

# More than 3,820 RISC-V Members across 70 Countries



July 2023



## Technical Deliverables

Technical **governance**  
Build **technical deliverables**  
Guide strategic technical **Work groups**



## Compatibility & Verification

Profiles & Platforms & Architecture  
Compatibility Tests (ACT) &  
Platform Compatibility Tests (PCT)



## Marketing

Create brand value around RISC-V  
**Amplify** member news, content,  
and success with press & analysts  
**Original content** programs  
RISC-V, industry, and regional  
Events



## Learning & Talent

Multi-level **online learning**  
Connecting **universities** with  
labs, tests, and curricula  
**RISC-V Training Partners**  
**Jobs and internships**



## Advocacy + Alliances

**RISC-V Ambassadors**  
Geo and industry **alliances**  
**Local** developer groups and events



## RISC-V Exchange

**Online directory** of providers,  
products, services, and learning  
resources  
Technical **developer forums**

# RISC-V delivers incredible member support



# Benefits of joining RISC-V

- ✓ Accelerate technical traction and insight
- ✓ Contribute technical priorities, approaches, and code
- ✓ Gain strategic and **technical advantage**
- ✓ Increase visibility, leadership, and market insight
- ✓ Fill and increase **engineering skills**, retain and attract talent
- ✓ Build **innovation partner** network and customer pipeline
- ✓ Deepen, engage, and lead in local and industry developer network
- ✓ Showcase **RISC-V products**, services, training, and resources





RISC-V is a community of passionate,  
dedicated, and invested stakeholders

**As individuals**

**As companies**

**As universities**

**As public institutions and non-profits**

**As nations**

**As one Global, connected movement**

**Build RISC-V into  
your company  
strategy, and your  
personal mission**



# RISC-V is Inevitable

## This is the open era of computing.



[www.riscv.org](http://www.riscv.org)



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