RISC-V: The Open Era of Computing

Calista Redmond CEO, RISC-V International

Welcome to the open era of computing.

RISC-V

RISC-V is the free and open Instruction Set Architecture...

- ... Driven through open collaboration
- ... Enabling freedom of design across all domains and industries
- ... Cementing the strategic foundation of semiconductors

Disruptive **Technology**

Barriers

Complexity

Design freedom

License and Royalty fees

Design ecosystem

Software ecosystem



Legacy ISA

1500+ base instructions Incremental ISA

\$\$\$ – Limited

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Moderate

Extensive

RISC-V ISA

47 base instructions Modular ISA

Free – Unlimited

Free

Growing rapidly. Numerous extensions, open and proprietary cores

Growing rapidly

Industry innovation on RISC-V



Unconstrained **Opportunity**

RISC-V Business Model

Barriers removed

- Design risk
- Cost of entry
- Partner limitations
- Supply chain





Beyond removing barriers, RISC-V fuels our community to seize growing opportunities





By 2025, 40% of application-specific integrated circuits (ASICs) will be designed by OEMs, up from around 30% today.

Custom ICs Based on RISC-V Will Enable Cost-Effective IoT Product Differentiation

Gartner, June 2020

Source: Gartner

RISC-V's open model will spur adoption by cloud service providers and streamline resources for chip vendors

RISC-V

Ecosystem

Impact

RISC-V's free and open model will fuel the ecosystem and stimulate broader innovation for custom ICs to create product differentiation.

RISC-V's open implementation model will improve security because of deeper transparency and traceability.

RISC-V's open business model will encourage varied core and IP developments, helping IoT products to alleviate cost pressure.



Adoption

Cloud service providers and leading OEMs will leverage RISC-V to add product and service value.

> Semiconductor vendors will capitalize on RISC-V and streamline design resources to drive chip innovations and market adoption.

> > Source: Gartner ID: 46523 C

30 billion connected and IoT devices demand security and custom processors



Global Connected and IoT Device Installed Base Forecast

Source – Strategy Analytics research services ,October 2017: IoT Strategies , Connected Home Devices, Tablet and Touchscreen Strategies, Wireless Smartphone Strategies, Wearable Device Ecosystem, Smart Home Strategies



Source: Strategy Analytics

Rapid RISC-V growth led by industrial



Nearly a quarter of designs incorporate RISC-V

Projects Incorporating RISC-V by Market Segment





RISC-V IP, SW, and Tools build momentum

The total market for RISC-V IP and Software is expected to grow from to \$1.07 billion by 2025 at a CAGR of 54.1%



RISC-V°

Source: Tractica

Cloud and data center top

providers like Amazon and Alibaba are designing their own chips.



Automotive

is transforming from autonomous vehicles to infotainment to safety, the whole vehicle relies on innovative electronics.



Industrial IoT

incorporating artificial intelligence in manufacturing and industrial processes.





Mobile and

capability.

wireless continue rapid evolution with each generation of hardware and increased

(()) Consumer and IoT devices bring

incredible innovation and volume with billions of connected devices in the next 5-10 years.

Memory was largest

semiconductor category by sales with \$158 billion in 2018, and the fastest-growing.

RISC-V adoption spans industries and workloads

Nearly 1,400 RISC-V Members across 70 Countries





In 2020, RISC-V membership grew 133%

Dedicated Community



Incredible industry progress

- The European Processor Initiative finalized the first version of its **RISC-V accelerator architecture** and will deliver test chip in 2021.
- The RIOS Lab announced PicoRio, an affordable **RISC-V open source small-board computer** available in 2021.
- Imperas announced first RISC-V verification reference model with UVM encapsulation.
- Seagate announced hard disk drive controller with high-performance RISC-V CPU.
- GreenWaves ultra-low power GAP9 hearables platform enabling scene-aware and neural network-based noise reduction.
- RISC-V°

- Alibaba unveiled RV64GCV core in its Xuantie
 910 processor for cloud and edge servers.
- Microchip released the first SoC FPGA development kit based on the RISC-V ISA.
- Andes released **superscalar multicore and L2** cache controller processors.
- StarFive released the world's first **RISC-V AI** visual processing platform
- SiFive unveiled world's fastest development board for **RISC-V Personal Computers**.
- Micro Magic announced an incredibly fast 64bit RISC-V core achieving 5GHz and 13,000 CoreMarks at 1.1V.

RISC-V is the foundation of the open era of computing

RISC-V°

- ... 2,800+ individuals in 60+ RISC-V work groups and committees
- 283 RISC-V solutions online including cores, SoCs, software, tools and developer boards.
- ... **29 local RISC-V community** groups, with more than **5,400 engineers**
- We're in the news! We have 33k+
 followers on social media and across the last year, we have participated in
 135+ news articles along with amplifying RISC-V community news 450+ times.



Guard against fragmentation

Build technical deliverables Work groups



Compliance + Verification

Testing and compliance suites **Compliance tests**

Learning + Talent

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



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



Visibility

Constant drumbeat through press, media, and original content Industry and regional events **Dedicated RISC-V events**



Marketplace **Exchange**

Online marketplace of providers, products, and services

Technical developer forums

RISC-V delivers incredible member support



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

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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

19

"The future of American industry depends on open source tech, ... RISC-V is gaining traction in the hardware manufacturing space throughout the world, because it lowers barriers to entry and increases chip development speed." -- Wired

"Though the architecture was created a decade ago by university professors, RISC-V has been building its ecosystem for years and has started to hit its stride with big licensees like Western Digital, SiFive, and even NVIDIA itself." -- VentureBeat

"If it succeeds, RISC-V could lower the cost of developing a new chip and help companies of all sizes to build exactly the processors they need."

-- Engadget



www.riscv.org

@risc_v @Calista_Redmond



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Thank you



Benefit of joining RISC-V

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

Membership options



Premier Member Benefits

- Community level benefits plus...
- Use of RISC-V Trademark for commercialization
- Board seat and Technical Steering Committee seat included for \$250k level
- Technical Steering Committee seat included for \$100k level
- Solution listing on RISC-V Exchange
- 4 case studies a year, 2 blogs per month
- 2 social media spotlights per month
- Spotlight member profile
- Inclusion in event promotions

Premier Member Requirements

- Membership open to any type of legal entity, not open to individual members
- \$250k Annual membership includes Board seat and Technical Steering Committee seat
- \$100k Annual membership includes TSC seat

Strategic Member Benefits

- Community level benefits plus...
- Use of RISC-V Trademark for commercialization
- 3 Board reps elected for tier, includes Premier members that do not otherwise have a board seat.
- May lead workgroup and/or committee
- Solution listing on RISC-V Exchange
- 1 case study a year, 1 blog per month
- 1 social media spotlight per month

Community Member Benefits

- Accelerated development, reduced risk through open source, ratified ISA.
- May participate in workgroups, influence strategy and adoption
- 6 support programs in Technical Deliverables, Compliance, Visibility, Learning, Advocacy, and Marketplace
- 1 voting Academic Board rep,
- 1 non-voting Community Board rep
- Member listing on RISC-V website
- Event registration discount

Strategic Member Requirements

- Membership open to any type of legal entity, not open to individual members
- Annual membership based on employee size
 - \$35k for 5,000+ employees
 - \$15k for 500-5,000 employees
 - \$5k for <500 employees
 - \$2.5k for <10 employees / company <2 years old

Community Member Requirements

- Membership open to academic institutions, non-profits, and individuals not representing a legal entity
- No annual membership fee



- **RISC-V Technical Steering Committee** to govern technical strategy, build technical leadership and best practice decision-making
- **RISC-V Learn** encompassing university curricula, online learning and Training Partners
- **RISC-V Ambassadors and Alliances** to reach beyond our community for industry collaboration, leadership, and technical engagement.

RISC-V Exchange to showcase RISC-V cores, SoCs, developer boards, software, tools and other resources.



RISC-V-launched new programs to support member-success

From Embedded to Enterprise

- The EU Horizon 2020 De-RISC platform for aerospace has achieved several hardware and software milestones since it began a year ago.
- The School of Computing at the Tokyo Institute of Technology developed a portable Linux RISC-V SoC design in just 5,000 lines of Verilog.
- Huami released a new RISC-V based
 Al chip for biometric wearables

- CHIPS Alliance announced enhancements to the RISC-V SweRV Core EH2, the world's first dualthreaded, commercial, embedded RISC-V core and SweRV Core EL2, an ultra-small, ultra-low-power RISC-V core.
- Alibaba unveiled its RISC-V RV64GCV core that will be used for its Xuantie 910 processor aimed at cloud and edge servers.

