

Exploring RISC-V

Introduction

This chapter introduces RISC-V as a technology, an organization, and a community, so that you can better understand the following chapters. By the end of this chapter, you should be able to:

- characterize the difference between the RISC-V ISA and RISC-V International;
- describe the organization around the RISC-V community;
- list the goals of RISC-V International as a community-driven organization.

What is RISC-V?

[RISC processors](#)¹ – short for Reduced Instruction Set Computer – were first designed in the 1980s as an evolution of earlier designs.

In practice, the term RISC-V can refer to several different things depending on context:

- the Instruction Set Architecture (ISA);
- the RISC-V community of users and developers who develop and use the ISA;
- the RISC-V International Association that manages the ISA intellectual property and guides the community in further development and curation;
- the hardware and IP products that are built on the ISA.

As you can see, each of these things revolves around the ISA as the central component, but all of these things are RISC-V. In general, we use RISC-V in conversation to refer to the technology components – the ISA and its various specifications – while the other contexts are the RISC-V community, RISC-V International, and RISC-V hardware, respectively.

What is the RISC-V ISA?

So what exactly is the RISC-V ISA? ISA refers to the Instruction Set Architecture, an abstract model of a computer – in this case, a Reduced Instruction Set Computer (or RISC). The specification for this set of instructions is the 5th generation of RISC processors, which have been in development since the 1980s. Thus we call it RISC-V, with the 5 spelled out as a Roman numeral (partly as a pun referring to “variations” and “vectors”, implying that the creators intended flexibility as an intentional part of the design).

You will learn more about ISAs, RISC processors, and the RISC-V ISA throughout this course.

¹ https://en.wikipedia.org/wiki/Reduced_instruction_set_computer

What is the RISC-V Community?

Unlike technology developed by a company or a consortium, RISC-V is developed by a community, a group of individuals and organizations who all contribute to the development of these specifications. Members of the community come from all walks of life - industry professionals, students, trainers, and anyone else with an interest in open technology and a willingness to learn more about it.

While everyone has their own reason for participating, they all share a common interest in developing an openly available instruction set architecture specification and the ecosystem around it, including:

- physical hardware – processors, development boards, System-on-Chips (SoCs), System-on-Modules (SoMs), and other physical systems;
- “soft” IP processor cores that can be loaded into emulators or onto field-programmable gate array (FPGAs), or written in silicon;
- the entire software stack, from bootloaders and firmware up to full operating systems and applications;
- educational materials, including courseware, curricula, lesson plans, online courses like this one, tutorials, podcasts, lab assignments, even books;
- services, including verification, custom board design, and many more.

All of this community output is recognized on the RISC-V Exchange, an organized section on the RISC-V website that describes the ecosystem in terms of available hardware and software, services, learning materials, and discussion points.

The website also lists much more information about the community, with links to member working groups as well as public mailing lists, organized information on the wiki, and of course the specifications themselves – both the completed, approved versions and the latest specs being developed.

So why do we refer to this as a community rather than a marketplace? The true reason is that we think a community is by far the best way to approach an effort as complex as building a new architecture from scratch, using proven open-source development methods. RISC-V at its heart is a community of highly motivated people focused on the same goals and harnessing the power of working together with many hands to lift a heavy load.

What is RISC-V International?

So RISC-V is indeed a community, and in fact it is a global community spanning more than 40 countries and thousands of people, and at the heart of this community is its home and guiding force – the RISC-V International Association.

RISC-V International, a Swiss non-profit organization, was formed in order to organize the activity around development of the ISA as well as other artifacts including software, non-ISA specifications, testing and compliance frameworks, and much more. RISC-V is organized by and for its members, which include over 200 large and small organizations as well as many hundreds of individual members who participate on their own, apart from companies or universities. The board of directors includes voting representatives from every membership level, so RISC-V is truly an egalitarian, community-based organization.

RISC-V International provides all of the management activities that are required by a global organization – executive management, promotion and marketing, member support, operations support, technical program management, and creative services. It also provides legal support for RISC-V intellectual property, which includes the specifications as well as RISC-V trademarks and imagery.

RISC-V International employs a small staff to assist and guide the community in organizing itself, and it maintains a contract with the Linux Foundation to provide management services, including human resources, IT and tools support, financial support, and more. The Linux Foundation brings many years of experience in running open source foundations and projects that benefits the RISC-V community directly in helping to achieve its mission.

RISC-V International does not produce hardware – instead, it provides the basis for all of its member organizations to create new technology based on the foundational support of the RISC-V ISA. As an open specifications project, RISC-V mainly produces documentation in the form of specifications – the Instruction Set Architecture, testing and debugging specifications, a trace specification, and other related artifacts – that are produced through a collaborative process among thousands of people, with rigorous feedback and oversight. RISC-V International was founded to shepherd this process, curate the specifications using the best practices of both standards organizations and the open source process, and to provide value for both members and the wider community.

You'll learn much more about RISC-V International in the coming chapters.