

# Status of Fedora's RISC-V Porting Efforts

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## Summary

The Fedora Project has been at the forefront of RISC-V readiness for several years now. A recent major milestone is the release of community-supported Fedora 42 RISC-V images alongside official primary architecture images (`x86_64` and `aarch64`). The vast majority of packages are ported to RISC-V. While there are some challenges toward making RISC-V a primary architecture, these are largely a matter of time before they sort themselves out.

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## Challenges

A selection of important packages still need work: LLVM, Linux kernel, R language, OpenJDK, Clang, LibreOffice, CMake, Cython, some Golang libraries, and a few more. Refer to the Fedora RISC-V tracker for more.

Some of these packages have already been built on RISC-V hardware using modified Fedora sources. They need further investigation—such as debugging failing tests, submitting patches to their corresponding upstream projects and collaborating with relevant maintainers.

## Emulated RISC-V with QEMU

QEMU, the open-source machine emulator and virtualizer, comes with a RISC-V emulator. It has good support for RISC-V guests and emulates a few different development boards. On Fedora you can get it by installing the package `qemu-system-riscv-core`. To see the full list of supported boards—known as “machine types” in QEMU parlance—such as SiFive’s *HiFive Unleashed*, run: `qemu-system-riscv64 -machine help`.

**What board to choose?** Unless you’re developing for a specific board, go with the `virt` board. It is not tied to any specific hardware, and is designed for use in virtual machines. QEMU command-line is complex, see the “References” section for instructions to get started with QEMU’s RISC-V emulator on Fedora. For example, the Fedora images “`Fedora-Server-Host-Generic`” and “`Fedora-Cloud-Base-Generic`” aren’t tied to specific hardware, and can be tested with QEMU.

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## Porting Progress

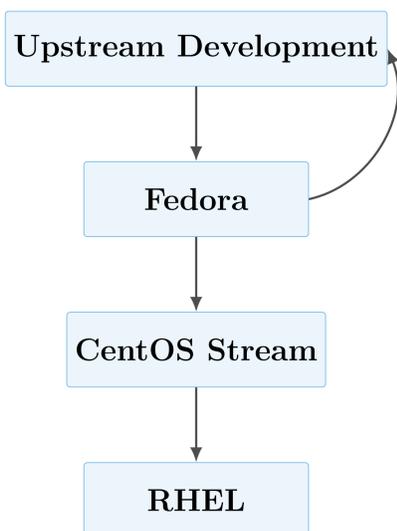
Most Fedora packages build and work on RISC-V today. A small selection of packages still need porting, or work is already underway. A way to measure the porting progress is by tracking the number of *unresolved dependencies*—that is, whether all of a package’s dependencies (“deps”) can be satisfied within the repository. Summary across last 3 Fedora releases:

- 6943 unresolved deps across 777 packages for F40
- 3881 unresolved deps across 478 packages for F41
- 372 unresolved deps across 137 packages for F42

We see that from F40→F41, there’s a 44% reduction in unresolved dependencies; **while from F41→F42, we see a 90.4% reduction during the Fedora 42 development cycle**, showing a *dramatic* improvement.

Fedora currently builds for `RV64GC`. The switch to `RVA23` profile can happen as soon as compatible hardware becomes widely available.

## Flow of Changes to Fedora & Further



One of Fedora’s core tenets is *Upstream First*—wherever possible, all useful changes to open source software should be shared back with their corresponding upstream projects.

Thus, Fedora and its maintainers always strive to contribute any RISC-V specific changes back to upstream. This reduces the long-term maintenance burden of carrying downstream-specific changes, and a broader range of users will benefit.

## Path to Primary Architecture

1. **Finish porting** the remaining packages.
2. **Datacenter-grade hardware**—today’s developer boards are promising, but don’t match x86 or ARM performance for general computing. True primary architecture status requires rackable servers with traditional server-management features. As RISC-V continues gaining traction, these hardware limitations will likely resolve with time.
3. **A RISC-V build system** available to regular Fedora packagers, so they can build their software for RISC-V, a work in progress.

Porting and build system work can proceed in parallel.

## Get Involved

Whether you have RISC-V hardware or not, there are **many ways to contribute**: help port the remaining set of packages to Fedora mainline, test and report bugs in packages you care about, debug test failures, submit patches upstream and improve documentation, and more.

If you’re curious, drop by the Fedora RISC-V Matrix channel, or write to Fedora RISC-V special interest group (SIG) discussion forum—see the “Contact” section below.

## Contact

- **Fedora RISC-V SIG Discussion**: <https://discussion.fedoraproject.org/tags/c/project/7/risc-v-sig>
- **Fedora Matrix Channel**—most of the active discussion happens here: <https://chat.fedoraproject.org/#/room/#riscv:fedoraproject.org>
- **Kashyap Chamarthy**, [kchamart@redhat.com](mailto:kchamart@redhat.com)

## References

- *Fedora 42 RISC-V image availability*: <https://discussion.fedoraproject.org/t/fedora-42-risc-v-non-official-images-are-available/148866>
- *Fedora RISC-V Tracker*: <https://abologna.gitlab.io/fedora-riscv-tracker/>
- *Fedora RISC-V on QEMU*: <https://fedoraproject.org/wiki/Architectures/RISC-V/QEMU>
- *QEMU RISC-V emulator*: <https://www.qemu.org/docs/master/system/target-riscv.html>

