

State of the Arch: Fedora on RISC-V

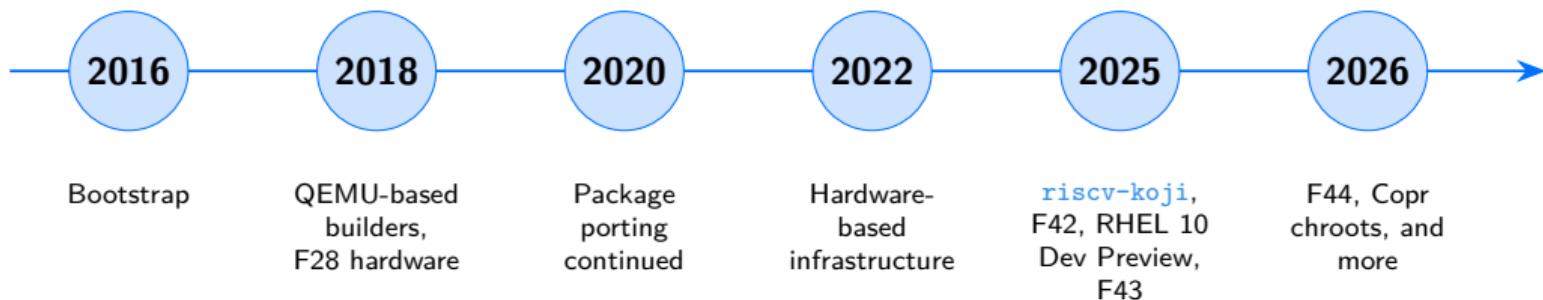
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— 31 Jan 2026, FOSDEM

Credits

- David Abdurachmanov
- Jennifer Berringer
- Andrea Bolognani
- Kevin Fenzi
- Wei Fu
- Neil Hanlon
- Richard W.M. Jones
- Marcin Juszkiewicz
- Charles Mirabile
- Jason Montleon
- ... and many others!

A rough timeline



Recent work in Fedora RISC-V land

- riscv-koji.fedoraproject.org — migrated to a new Koji server
 - ↪ now running on Fedora Infrastructure
- F43 rebuild and the ‘debugedit’ [saga](#)
- Upstreaming of changes from a ‘dist-git’ overlay to Fedora proper
- Fedora images now built with standard infra (Koji + ‘kiwi’)
- ~~ RISC-V chroots in Fedora ‘Copr’ (QEMU-emulated) — [details](#)

The hardware situation

Prior art

Refer to RISC-V hardware: where are we?,
Emil Renner Berthing, FOSDEM 2025.

- ↳ It covers SoCs & boards from 2018-2024

SiFive ‘HiFive Premier P550’ (2024)



On my desk

-
- Based on ESWIN EIC7700 SoC
 - **Upstream status:** Some drivers are merged (e.g. pinctrl, reset); **pending:** clock, PCIe, and more

Tenstorrent ‘Blackhole’ (2025)



SoC in ‘p100a’ & ‘p150a’



‘p100a’ (desktop variant)

-
- RISC-V “AI accelerator” as a PCIe card. Use-case: LLM inferencing/training
 - **Upstream status:** Drew Fustini [posted patches to LKML](#). Can boot mainline kernel, with caveats

Milk-V ‘Titan’ (2025/2026)



CPU: UltraRISC ‘DP1000’



Fedora on Titan, RISC-V Summit NA 2025

-
- Spec: RVA22, no vector extension, 8 cores, 16MB L3 cache — [details](#). ETA: “soon”
 - ~ 1.5–3x performance increase compared to SiFive P550. Simple benchmark: [‘xz’ scaling](#)
 - **Upstream status:** some patches are merged (e.g. PLIC); needs device tree and PCIe patches

Just in: Milk-V ‘Jupiter 2’ (2026)

- ~~ Announced in Jan 2026: milkv.io/jupiter2
- Based on SpacemiT ‘K3’; 8-core CPU, 2.4GHz
- Claims:
 - RVA23-ready, RVV 1.0, 16-core SoC
 - Hypervisor 1.0, AIA, and RV IOMMU extensions
 - Full hardware virt for CPU, memory, interrupts, and I/O

Upcoming: Tenstorrent ‘Atlantis’ (2026?)



‘Ascalon’ CPU for Atlantis — running on a Synopsys HAPS-100 FPGA

- RVA23-compliant. High-performance CPU. ETA: ~Q3 2026
- Emulated board [merged](#) in QEMU 10.0.0. Linux upstreaming [started](#)
- Seen at RISC-V Summit NA 2025

Performance: ‘xz’ scaling: P550 vs. Titan

Threads	P550 (Real)	DP1000 (Real)	Speedup
1	40m 26s	27m 55s	1.45x
4	10m 41s	7m 24s	1.44x
8	11m 31s	3m 55s	2.94x

Summary:

- Benchmark: LZMA2 compression of a Fedora Linux 43 ISO file — [details](#)
- Single core: ~45% performance lead for DP1000
- Multicore: At 8 threads, DP1000 is **~3x faster**

(NB: P550 == SiFive ‘HiFive Premier P550’ with 4 cores, while DP1000 has 8 cores)

Performance: Fedora ‘binutils’ build

Time	P550	DP1000	Speedup
Real (wall clock)	29m 34s	12m 10s	2.43x
User	39m 42s	19m 15s	2.06x
Sys	5m 52s	2m 24s	2.44x

Summary:

- Benchmark: `fedpkg mockbuild -r fedora-43-riscv64 -- --without testsuite`
- DP1000 slashes kernel-time by half (with higher IPC, 16MB LLC)
- ~2.5x build speedup; DP1000 scales well at 8 cores

See also: Vector benchmarks and more

- [RISC-V Vector \(RVV\) benchmarks](#), maintained by Olaf Bernstein
- [Benchmarking SpacemIT X60 and others](#), Rich Jones and Andrea Bolognani

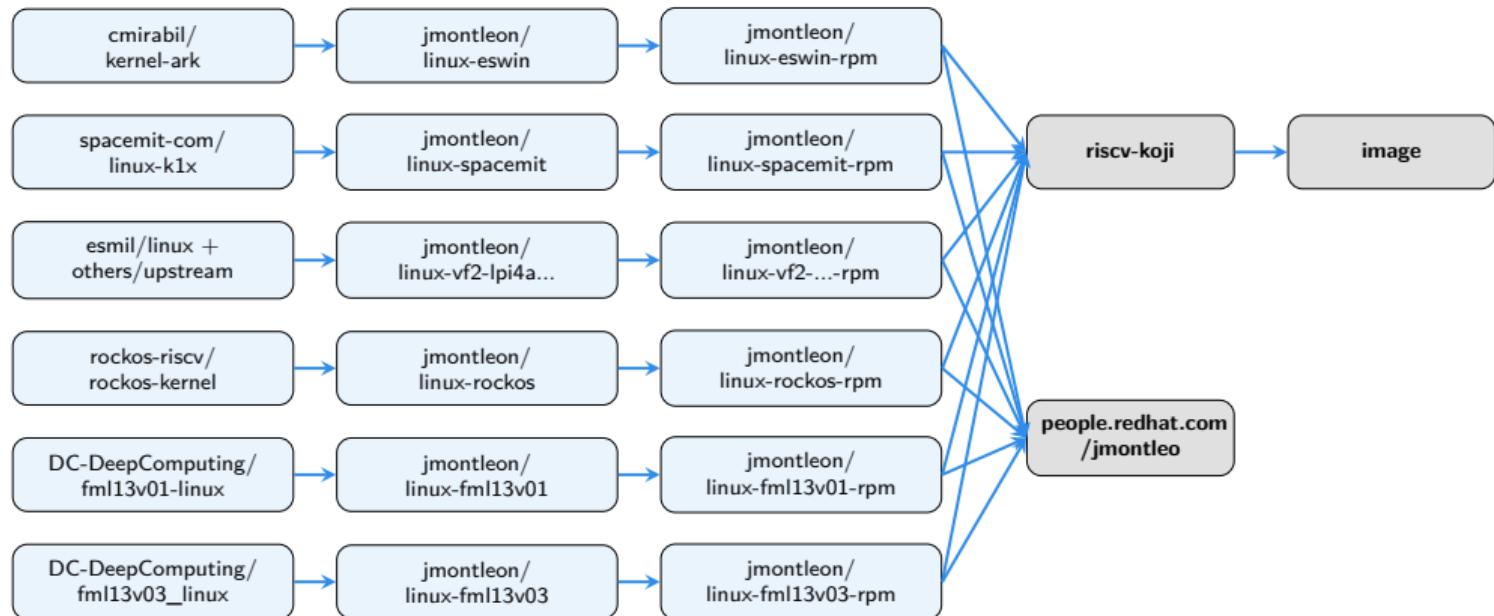
What board to pick?

Much of the advice from Emil's [last year's talk](#) still stands.

- **VisionFive 2**: cheap and hassle-free, RV64GC-based, has upstream support
- **SiFive 'HiFive Premier P550'**: reasonable performance
 - heavy-duty packages (kernel, GCC, etc) get built on this
- **Milk-V Jupiter** or **Banana Pi BPI-F3**: for vector support (RVV 1.0)
- ~~ When they're here: Tenstorrent **Atlantis**, Milk-V **Titan** and **Jupiter 2**

Plans for Fedora Linux 44 and beyond

Fedora RISC-V kernel builds: today (F43)

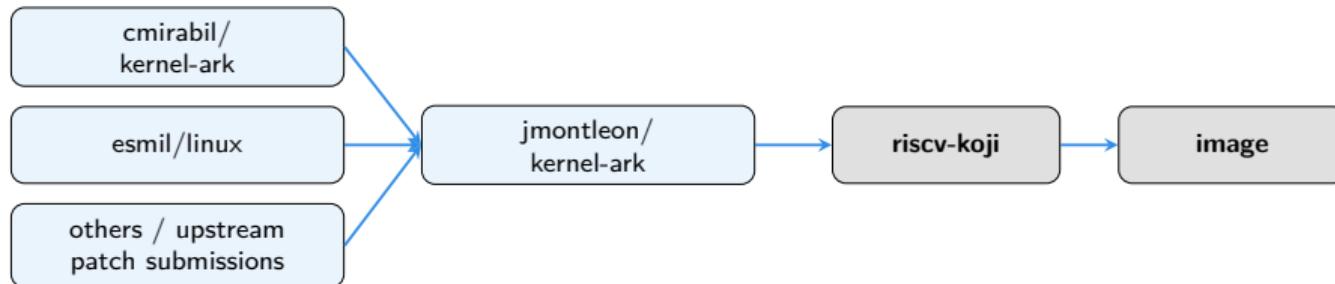


Slide credit: Jason Montleon

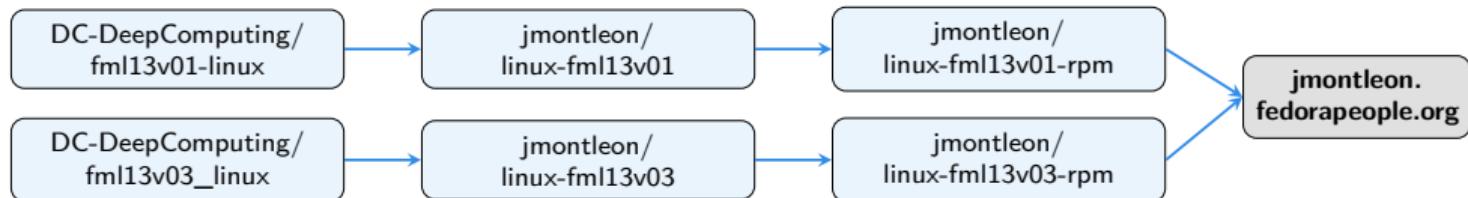
A “unified” kernel for multiple boards

- A single kernel that can boot across different boards
- Rebase/forward-port vendor trees onto mainline
 - ↪ integrate into a single Fedora tree
- Details: Jason Montleon’s [kernel-ark](#) repo

Kernel build flow: future (F44+)



LTS Alternatives



Unified kernel, continued: boards

Board	SoC
Banana Pi BPI-F3	SpacemiT K1
Bit-Brick K1	SpacemiT K1
DeepComputing fml13v01	JH7110
DeepComputing fml13v03	EIC7702
Lichee Pi 4A	TH1520
Milk-V Jupiter	SpacemiT K1 / M1
Milk-V Mars	JH7110
Milk-V Megrez	EIC7700
OrangePi R2S	Ky X1 (SpacemiT K1)
OrangePi RV	JH7110
OrangePi RV2	Ky X1 (SpacemiT K1)
Pine64 STAR64	JH7110
Pine64 STARPro64	EIC7700
SiFive HiFive P550	EIC7700
SiFive HiFive Unmatched	FU740
StarFive VisionFive 2	JH7110
StarFive VisionFive 2 Lite	JH7110S
UltraRISC DP1000 EVB	UR-DP1000

- List maintained by Jason
- Testing is a group effort
- Next: switch to upstream drivers for EIC7700 (no complete device tree yet)

Chip away at the RISC-V tracker

- A handful of packages still need work: kernel, shim, LLVM, OpenJDK, and more
- Investigate test failures, work upstream, submit patches
- Details: see the [Fedora RISC-V tracker](#)

Hardware in the Fedora datacenter

- Most of the current hardware is running under people's desks
- Expect to rack datacenter-grade RVA23 systems “soon”
- [Working](#) with the Fedora Infra team on technical requirements

ISA profile readiness: RVA23?

- Fedora's current baseline: RV64GC
- Waiting on a reference platform ('SpacemiT K3' or 'Atlantis'?)
- Linux ecosystem readiness:
 - See Drew Jones' talk on how [the RISC-V software ecosystem is primed for the latest ISA extensions](#), RISC-V Summit, NA 2025
 - RVA23 kernels will (should) support RV64GC userspace
 - `riscv_hwprobe()` — a syscall to reliably detect RISC-V extensions

Get involved

- ~~ Many ways to contribute!
- Test packages you care about, kernels, debug test/build failures
- Communication:
 - Fedora [Matrix channel](#) — active discussion happens here
 - Discussion [forum](#)

References

- [1] Fedora 43 RISC-V images. https://riscv-koji.fedoraproject.org/koji/search?match=glob&type=package&terms=Fedora-*-Generic*.
- [2] Fedora RISC-V tracker. <https://abologna.gitlab.io/fedora-riscv-tracker/>.
- [3] A poster session on Fedora RISC-V, RISC-V Summit, Paris 2025.
<https://kashyapc.fedorapeople.org/fedora-risc-v-paris2025-extended.pdf>.
- [4] An update on Fedora's RISC-V port, 2024.
<https://pretalx.com/devconf-cz-2024/talk/Q7XB3M/>.
- [5] Fedora RISC-V on QEMU.
<https://fedoraproject.org/wiki/Architectures/RISC-V/QEMU>.
- [6] Fedora RISC-V Matrix.
<https://chat.fedoraproject.org/#/room/#riscv:fedoraproject.org>.