Linux Distros on RISC-V PC/Server

status update

Wei Fu <wefu@redhat.com>

RISC-V Ambassador @ RISC-V Foundation

Senior Software Engineer @ Platform Enablement, Red Hat Software (Beijing) Co.,Ltd.

Nov 19th 2021 @ RISC-V Day Tokyo 2021 Autumn

RISC-V Days Tokyo2021 Autumn

AGENDA

Distro — **Linux Distros on RISC-V**

Demo info — **Run Fedora on RISC-V Hardware**

Status — **The software component**

Future — **RISC-V PC & Server**

Part I

Linux Distros on RISC-V

Fedora

Debian

Arch-Linux

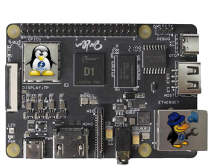
Gentoo

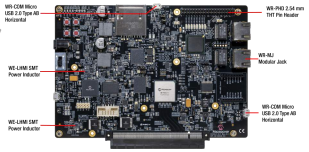
.....

Red Hat

Summary

More and more hardware supported in 2022



rpmbuild on RISC-V
by Richard Jones

August 10, 2016

October 15, 2016

The 1st bootstrap

The 2nd bootstrap

Jan 29 , 2018

March , 2018

The 3rd bootstrap

Koji
For RISC-V build farm

April 15, 2018

Aug , 2018

Graphic Desktop is enabled on a real RISC-V Hardware

Red Hat Join RISC-V Foundation

Jul, 2019
IBM is a Founding member of Foundation

Fedora 33

Fedora Bootstrap

QEMU

Since Fedora has an **upstream first policy** and it also applies to Fedora/RISC-V.

We need all the key patchsets for **toolchain**, **Linux kernel** and **glibc** to be merged, then we can do the **final** bootstrap on RISC-V.

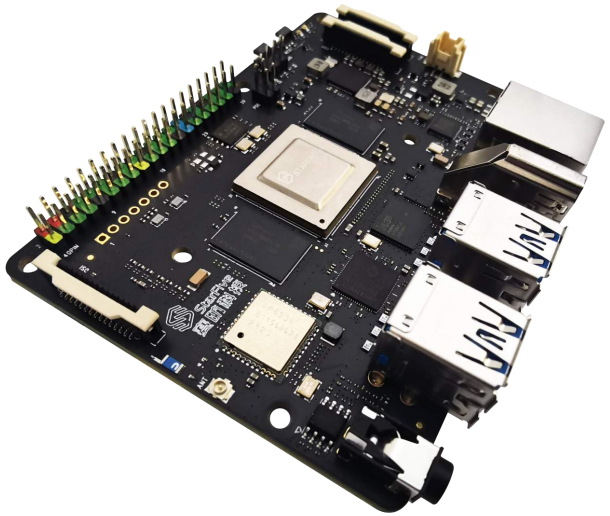
Info Source:

Most of info comes from Richard Jones and his weblog: https://rwmj.wordpress.com/

RISC-V Koji maintainer: David Abdurachmanov

Red Hat

Summary



Red Hat

The Status of Fedora on RISC-V

XFCE

Minimal

Developer

Fedora

Bootable: OpenSBI->U-Boot->GRUB on QEMU&Hardware
package management: dnf + rpm
Build system: Koji
Status: In maintenance，**Fedora 33**

Repositories in China

https://isrc.iscas.ac.cn/mirror/fedora-riscv/

http://openkoji.iscas.ac.cn/pub/

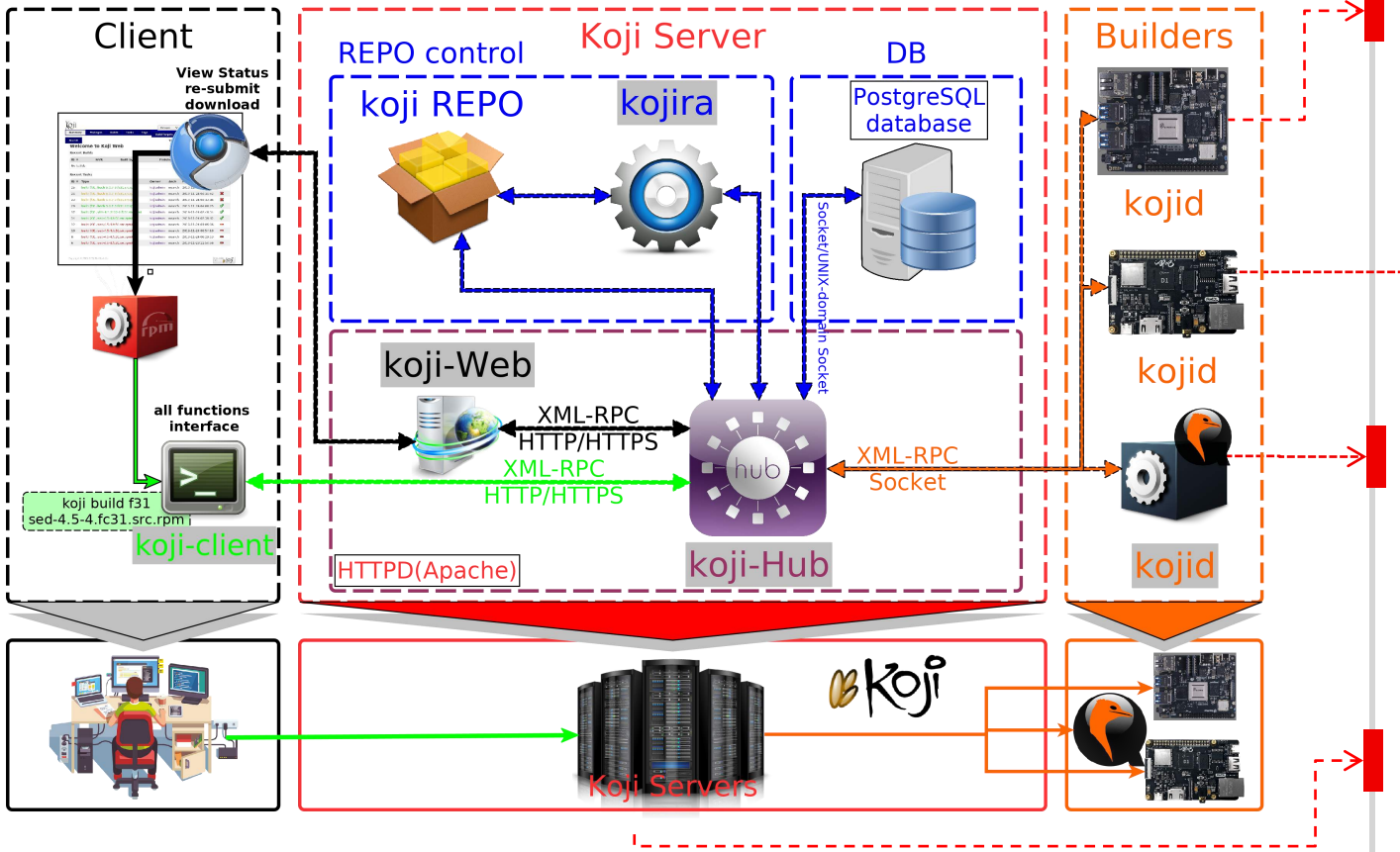
Info Source:

http://fedora.riscv.rocks/repos-dist/
https://dl.fedoraproject.org/pub/alt/risc-v/
https://mirror.math.princeton.edu/pub/alt/risc-v/

Red Hat

Koji Build System for RPMs & Image

Koji builds RPMs for the Fedora Project and EPEL.



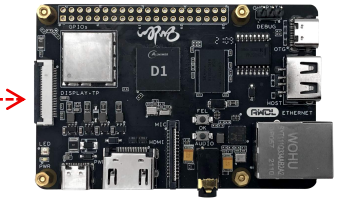
We are working on some Koji server for RV64 in China:

StarFive: https://fedora.starfivetech.com/koji/

ISCAS: https://openkoji.iscas.ac.cn/koji/

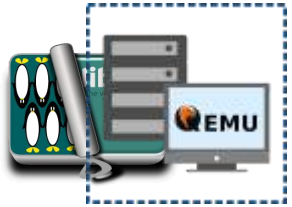
Oepkgs: https://oepkgs.net/

Starlight VisionFive



Nezha

We will have MORE, like ...



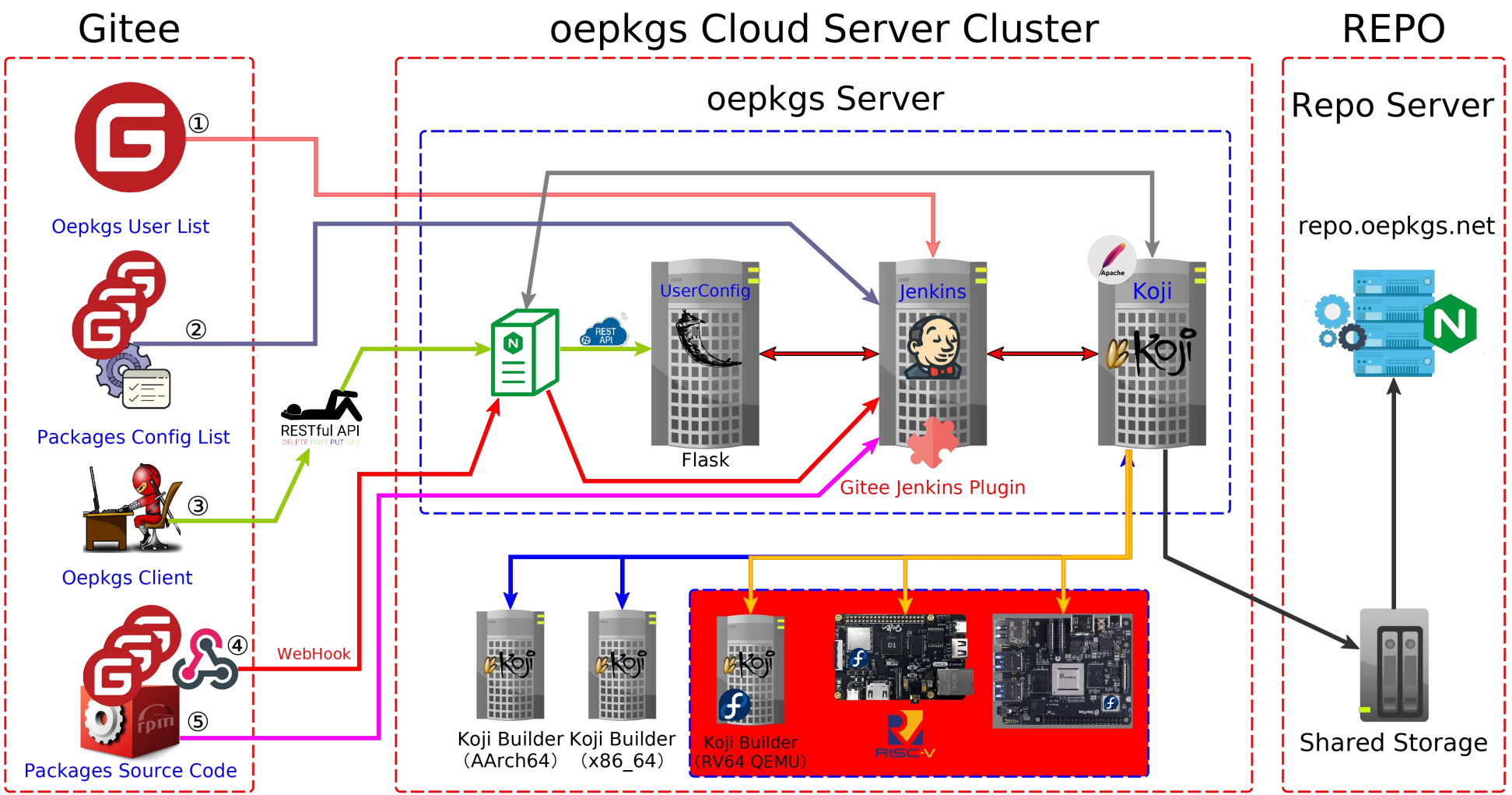
QEMU VMs(on x86_64)

An x86_64 server for all central infrastructure

Main sever, repository creation and VMs with backup(separate NVMe).

Red Hat

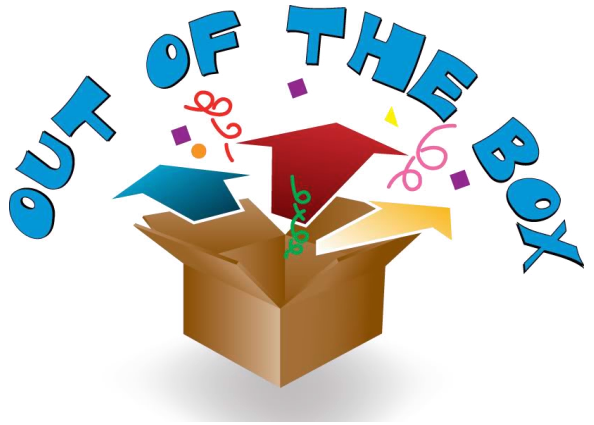
oepkgs Build System for RPMs & Image



oepkgs

Red Hat

Supported Targets



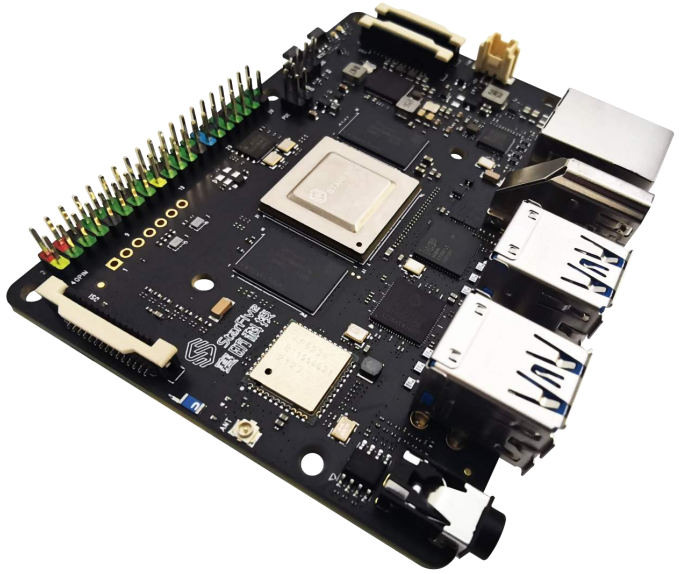
StarFive 赛昉科技

LIBERTAD AMIGOS RASGOS PRIMERO

JingHong Platform - JH7100

Fedora Images can run on Starlight and **ViSionFive**.

U-Boot & Linux kernel are upstreaming.



No.	Description
1	RISC-V U74 Dual-Core 64-bit RV64GC ISA SoC
2	2 x 4GB LPDDR4 RAM
3	2.4GHz Wi-Fi and Bluetooth 4.2 (BLE)
4	40 Pin GPIO Header
5	MIPI-DSI Connector
6	PMIC
7	USB Type-C Connector
8	LCD to HDMI IC
9	HDMI 2.0 Connector
10	2 x MIPI-CSI Connector
11	Gigabit Ethernet (RJ45 Connector)
12	4 x USB 3.0 Host Type-A
13	3.5mm Audio Jack (4-pole stereo audio output)
14	Micro-SD SDXC Card Slot

fedora remix

XFCE

Red Hat

Info Source:

https://www.starfivetech.com/site/newsdetail/568

Starlight

StarFive
赛昉科技

LIBERTAD
AMIGOS
RASGOS
PRIMERO

Red Hat

Supported Targets

Allwinner Technology

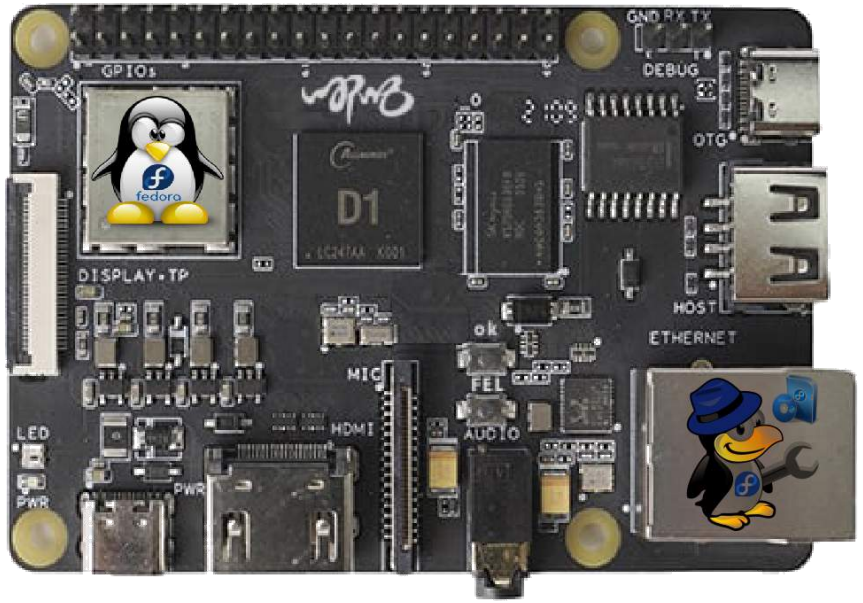
XRAD TECH 深圳全志在线

LIBERTAD AMIGOS RASGOS PRIMERO

Allwinner D1

Fedora Images can run on this development platform.

U-Boot & Linux kernel are upstreaming.



fedora remix

XFCE

Info Source:
https://fedoraproject.org/wiki/Architectures/RISC-V/Allwinner

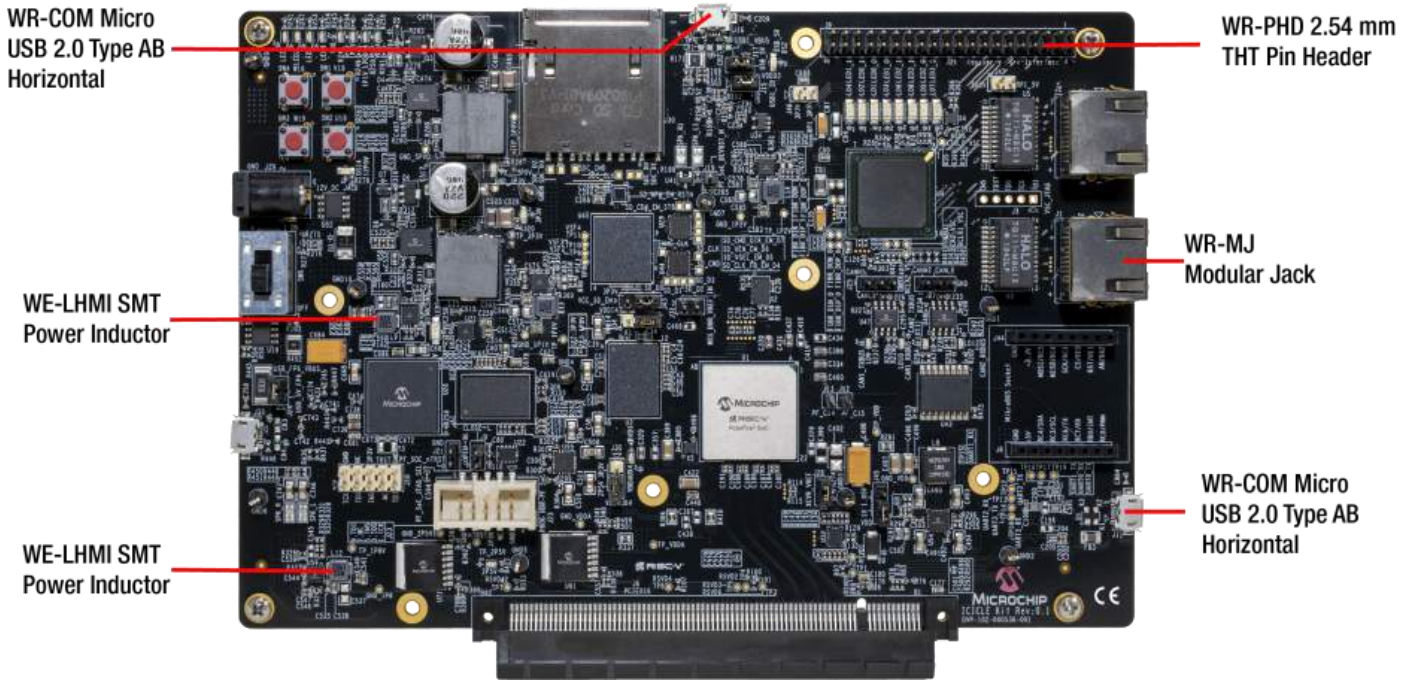
Red Hat

Supported Targets

MICROCHIP

PolarFire SoC Icicle Kit

Fedora Image can run on this open-spec FPGA-enabled, SiFive U540 based PolarFire SoC platform. Waiting a new version of hardware.



Info Source:

https://linuxgizmos.com/risc-v-based-polarfire-soc-debuts-on-499-dev-board/

Red Hat

Targets

SiFive

LIBERTAD AMIGOS RASGOS PRIMERO

openembedded

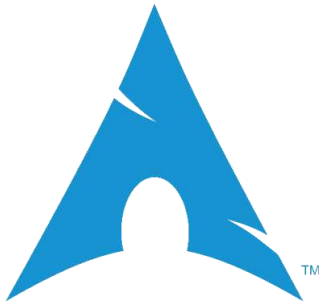
HiFive Unmatched - SiFive Freedom U740

Fedora Images can run on this high-performance platform in a PC form factor once we get the board.

Info Source:
https://www.sifive.com/boards/hifive-unmatched

Red Hat

The Status of Linux Distro on RISC-V



Arch-Linux

Bootable: yes, OpenSBI + U-Boot on QEMU and Hardwares
package management: pacman + bsdtar
Build system: Arch Build System(ABS) , but currently using devtools (systemd-nspawn)
Status: under development

Debian

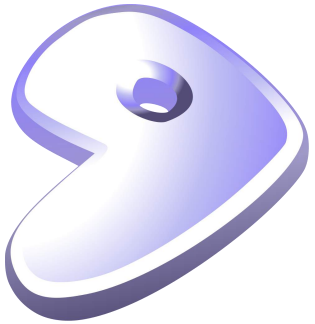
Bootable: Yes, on QEMU and Hardware
package management: apt + deb
Build system: buildd
Status: In maintenance

Info Source:

Arch: Felix Yan(晏然), Sequencer(刘玖阳)
Debian: https://wiki.debian.org/RISC-V
https://riscv.org/exchange/software/

Red Hat

The Status of Linux Distro on RISC-V



Gentoo

Bootable: Yes, OpenSBI + U-Boot on QEMU&hardware
package management: emerge + portage
Build system: portage
Status: **stage4 bootable Image**

openEuler

Bootable: Yes, OpenSBI + U-Boot on QEMU and Hardwares
package management: dnf + rpm
Build system: OBS, Koji or oepkg
Status: **stage3 bootable image**

Info Source:

Gentoo: https://github.com/dlan17， 蓝一勋， 曹野@RIOS
Chromium OS: 曹野@RIOS

Red Hat

The Status of Embedded Linux on RISC-V

Slackware

Bootable: No, chroot from Fedora Image
package management: slackpkg+pkgtools
Status: under development

OpenWRT, Buildroot Yocto/OpenEmbedded

Bootable: yes, BBL or U-boot
package management: buildtime or Opkg
Build system: Cross-compilation
Status: In maintenance

Info Source:

Slackware: https://github.com/fede2cr/slackware_riscv
https://riscv.org/exchange/software/

Red Hat

The Status of Linux Distro on RISC-V

Android

Bootable: Yes, OpenSBI + U-Boot on QEMU and C910
package management: apk
Build system: Android Studio
Status: demo can run on C910, ART is underdevelopment

chromium

Chromium OS

Bootable: stage3 rootfs, need to be tested with FW
package management:
Build system: cros_sdk
Status: **stage3(console)，in reproduce, then moving forward**

Info Source:

openEuler: openEuler RISC-V SIG， 中科院软件所

Android： https://github.com/T-head-Semi/aosp-riscv

https://plctlab.github.io/aosp/create-a-minimal-android-system-for-riscv.html

Red Hat

Linux distribution on RISC-V

From www.codasip.com

We would like to support more targets based on standard RISC-V Spec.

Red Hat

My RISC-V dev board collections

Red Hat

Part III

The software component

RISC-V®

Red Hat

The Status of RISC-V Firmware and Linux

OpenSBI

Firmware for RISC-V, upstream **main** branch,
generic platform with the right **dtb** file.
NO patch required for most of platform

U-boot

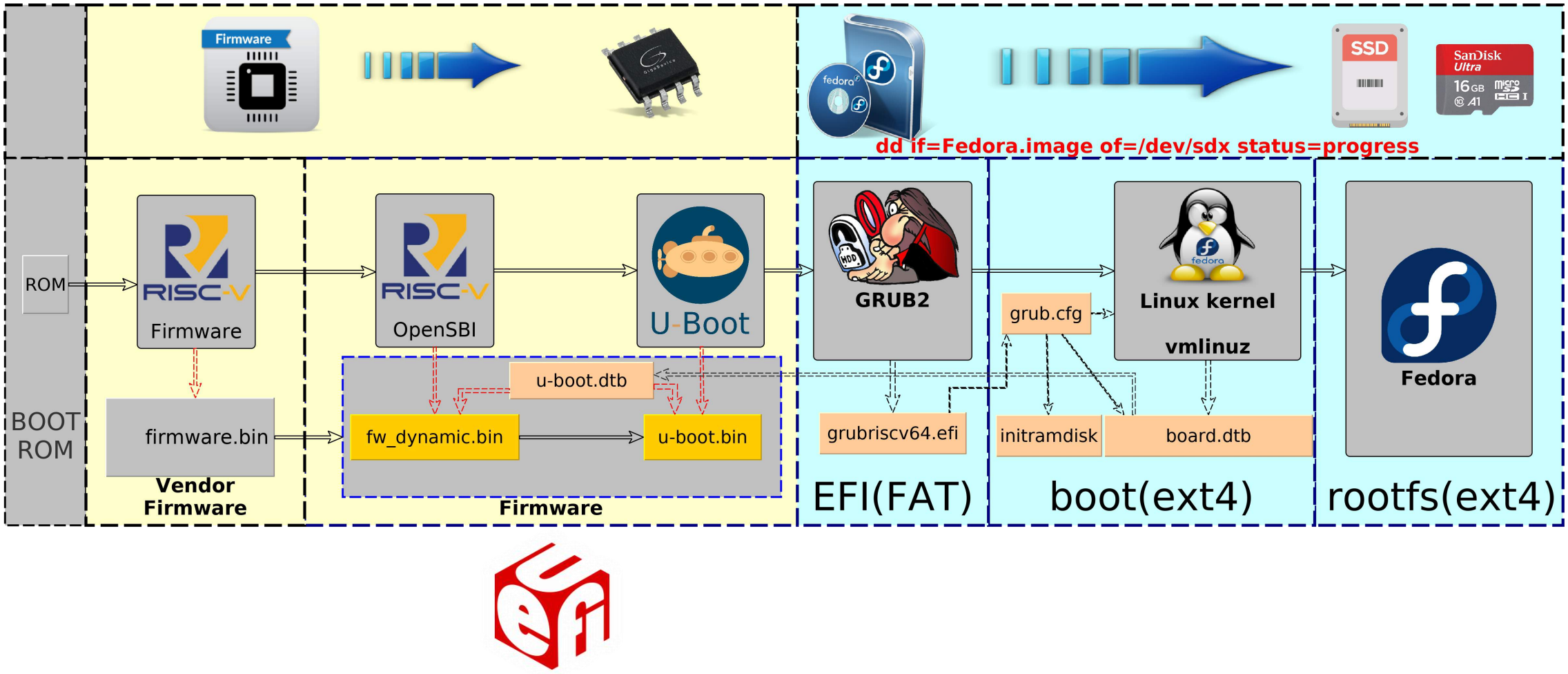
The latest u-boot(upstream, **main)**with **some patches** works fine on RISC-V, can boot some **Linux** distros.

GRUB2

The RISC-V support has been merged, need some patches, but can boot some **Linux** distros now.

Red Hat

Standard boot flow for now



Red Hat

Part II

Run Linux Distro on RISC-V

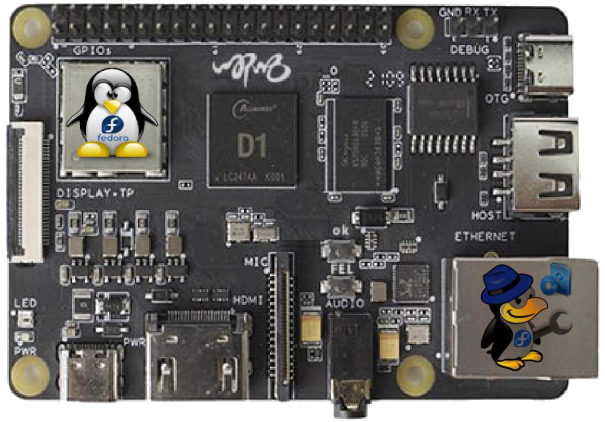
Development tools

Build Firmware

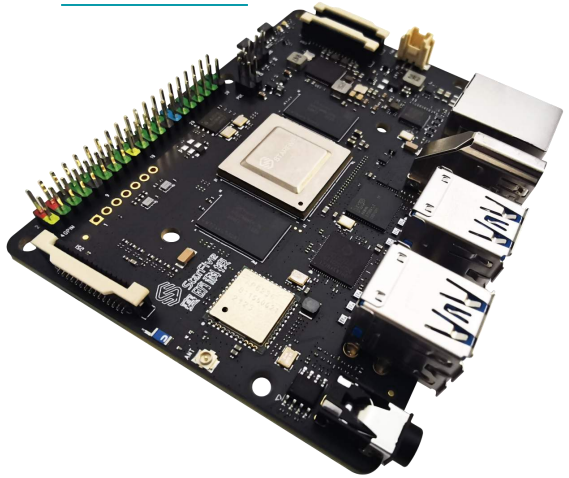
Flash Image to SD

Red Hat

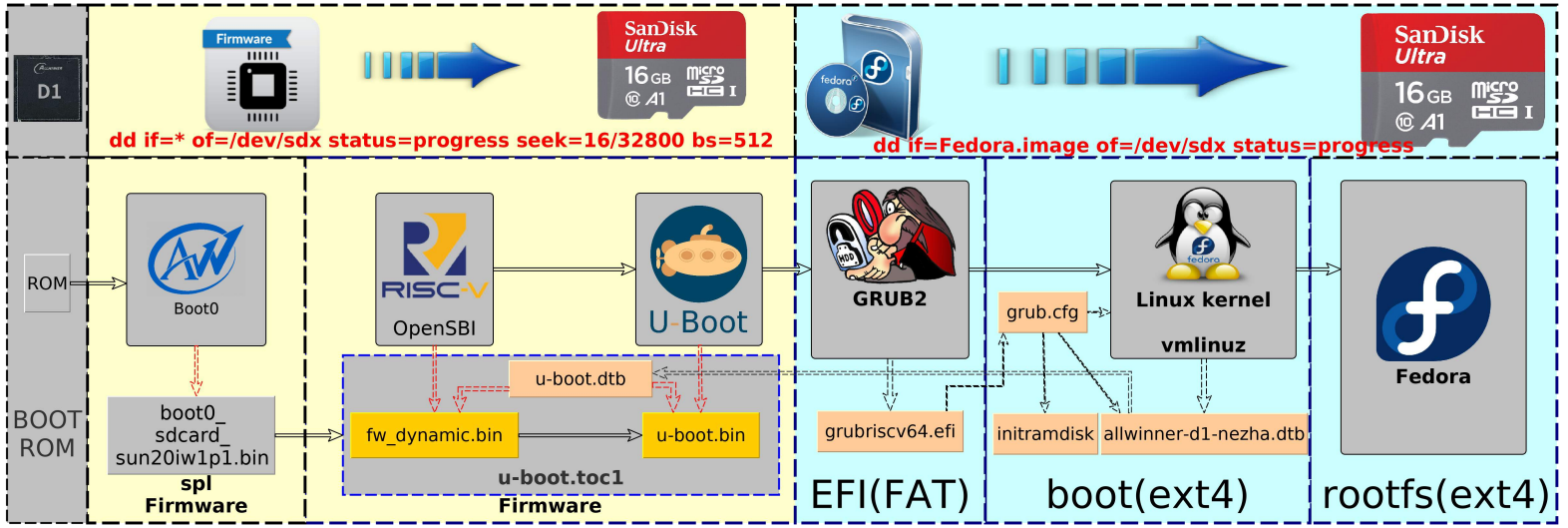
Run Linux Distro on real hardware

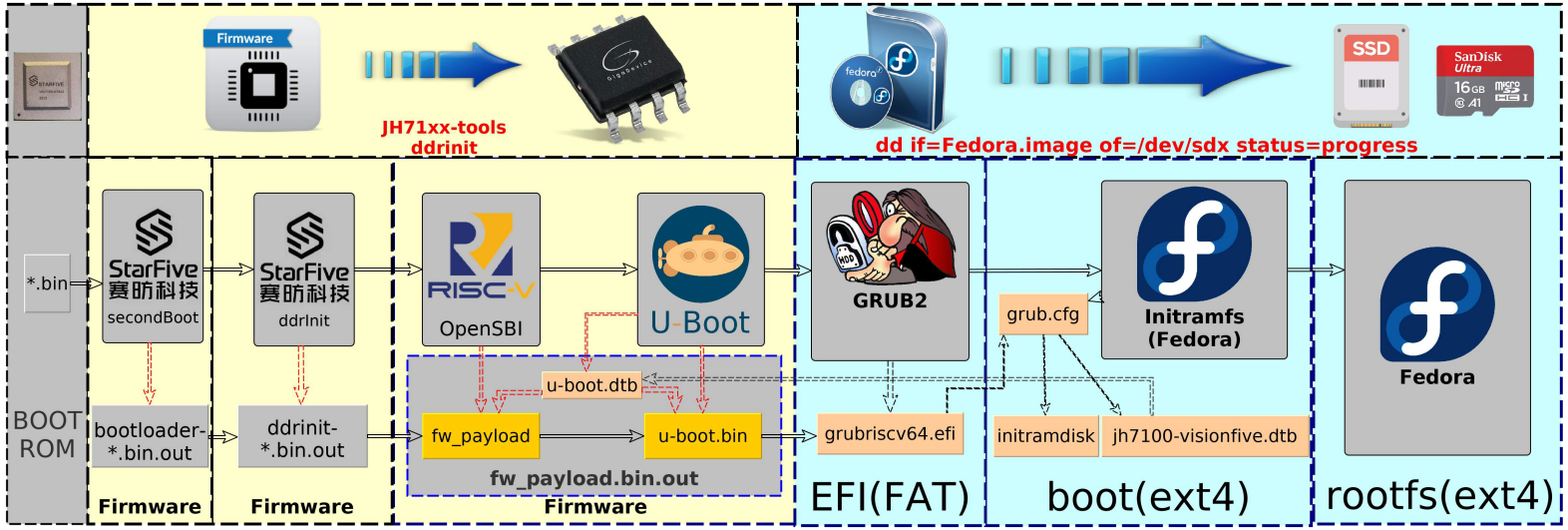


https://fedoraproject.org/wiki/Architectures/RISC-V/Allwinner



https://fedora.starfivetech.com/pub/downloads/BeagleV-release/





Red Hat

Run Linux Distro on real hardware

Red Hat

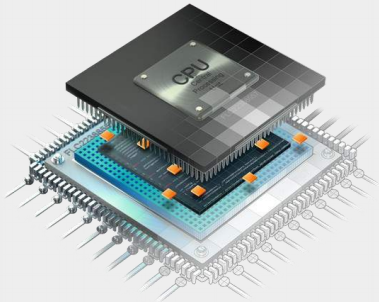
Part IV

Industry standard RISC-V server/PC

Specs

UEFI

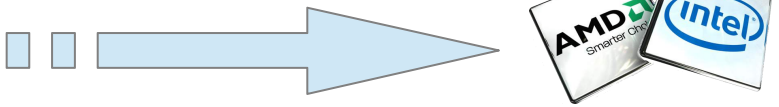
ACPI

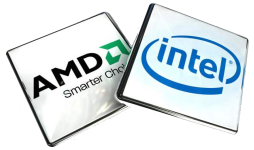


Please try Fedora for RISC-V development

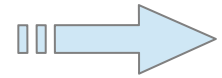
Red Hat

RISC-V Platform Specification





SBSA/SBBR/ACS...



a lot of different RISC-V chips

https://lists.riscv.org/g/tech-unixplatformspec

https://github.com/riscv/riscv-platform-specs

Red Hat

The Status of RISC-V Firmware for PC & Server

https://linuxplumbersconf.org/event/11/sessions/114/#20210921

UEFI: Unified Extensible Firmware Interface.

HPE is currently working on the next RISC-V edk2 port release which incorporates with OpenSBI v0.9 that supports the firmware domains for HSM.
HPE is also working on RISC-V EDK2 OVMF and Starlight platforms. Contributors from HPE :

Abner Chang
Daniel Schaefer

ACPI: Advanced Configuration and Power Interface

Static tables provided by system firmware to the standard ACPI compliant OS for system info and configuration。
Contributors from Ventana Micro Systems:

Sunil V L
Rahul Pathak
Kumar Sankaran
Mayuresh Chitale

Red Hat

Acknowledgments

Abner Chang
Gilbert Chen

Al Stone
Andrea Bolognani
Charles Wei
DJ Delorie
John Feeney
Mark Salter
Richard Jones

David Abdurachmanov

Alistair Francis
Anup Patel
Atish Kumar Patra

Akira Tsukamoto
Drew Fustini
Mikael Frykholm
Stefan O'Rear

Alphabetical Listing by Company Name

... and countless other individuals and companies, who have contributed to RISC-V specifications and software eco-system!

Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

Red Hat