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openEuler for RISC-V Servers: Challenges & Roadmap

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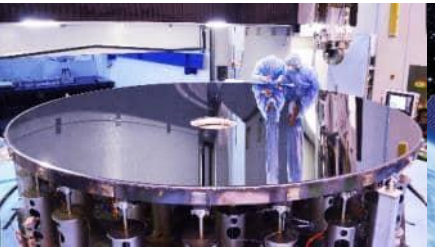
May 2025

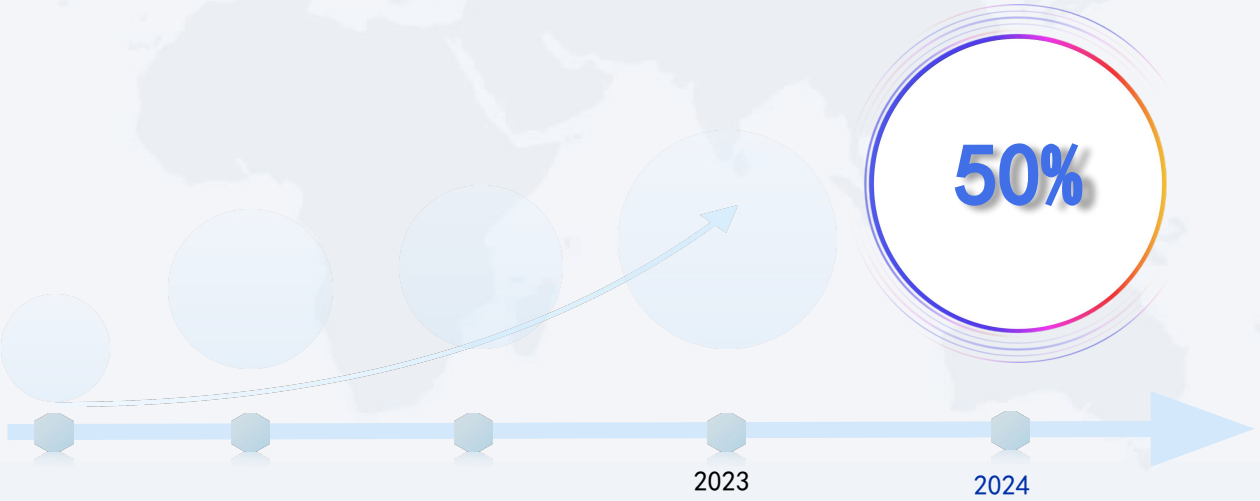





Content

Introduction of openEuler Community

- RPM based Linux Distro, *not just another centos*
- Open-sourced in 2019
- Mainly deployed on servers
- Website: https://www.openeuler.org/



IDC: Chinese Server OS market share (2024)

Users
3.69M

SIGs
109

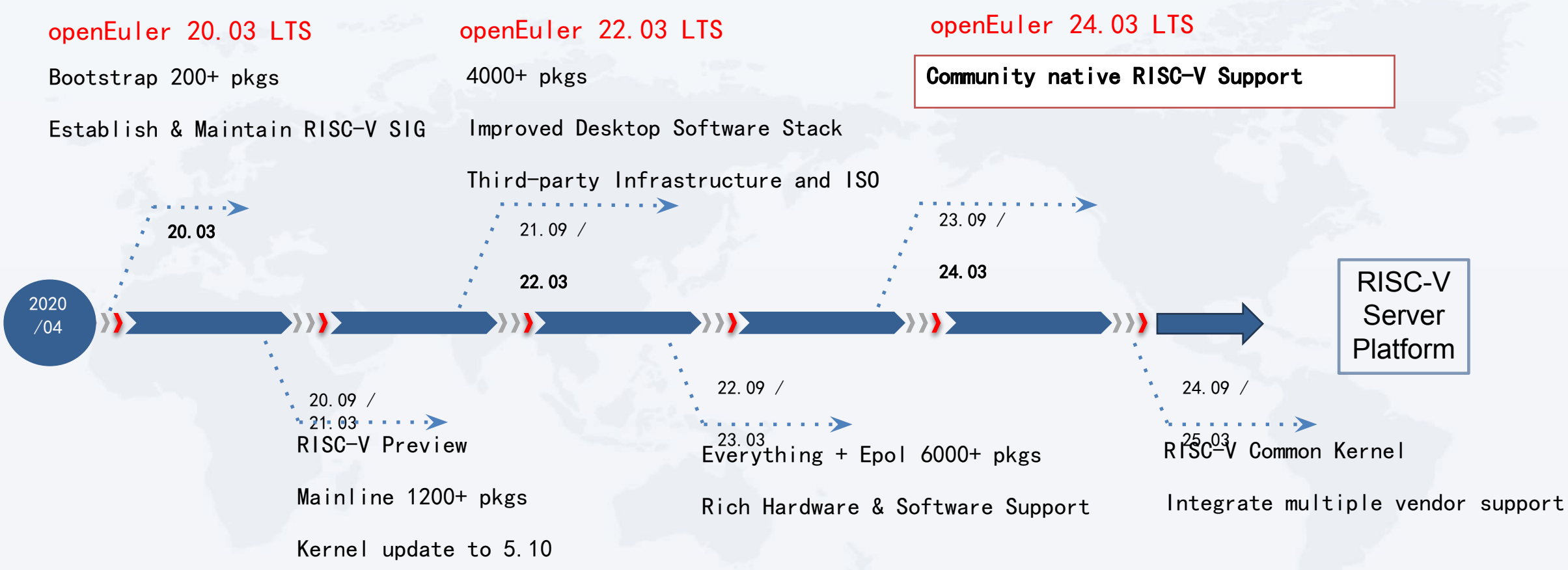
Community Contributors
20,771

Total Deployment
10M

Organization Members
1,854

Updated on 2024/11/20

openEuler RISC-V Milestones



LTS Version: released every 2 years and maintained for 4 years

Innovation Version: released every 6 months and maintained for 6 months

openEuler 24.03 LTS for RISC-V

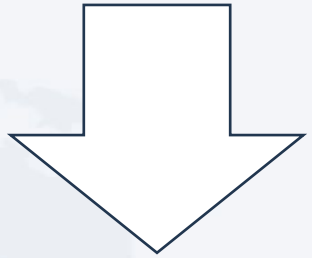
- **Released** by the openEuler Community
- **Developed** for Server & Desktop Scenarios
- **6000+ SRPMs** supported
- **Distinctive Features**: UEFI, Hotfix, Penglai TEE, etc.

- compilation success rate of openEuler Master branch

x86 - 0.3%

ARM - 0.5%

RISC-V - 1.5%



Community Native Support of RISC-V

Community Native RISC-V Support

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Release Plan → EulerMaker → QA → Official ISO

One shared codebase & One build system & One QA standard & One ISO image

openEuler 24.03 LTS

openEuler 24.03 LTS, built on Linux kernel 6.6, is suited for server, cloud, edge, AI, and embedded deployments. With best-in-class features, it delivers brand-new experience to developers and users spanning diverse industries.

Planned EOL: 2026/05

Release Notes | Installation Guide | White Paper | Lifecycle

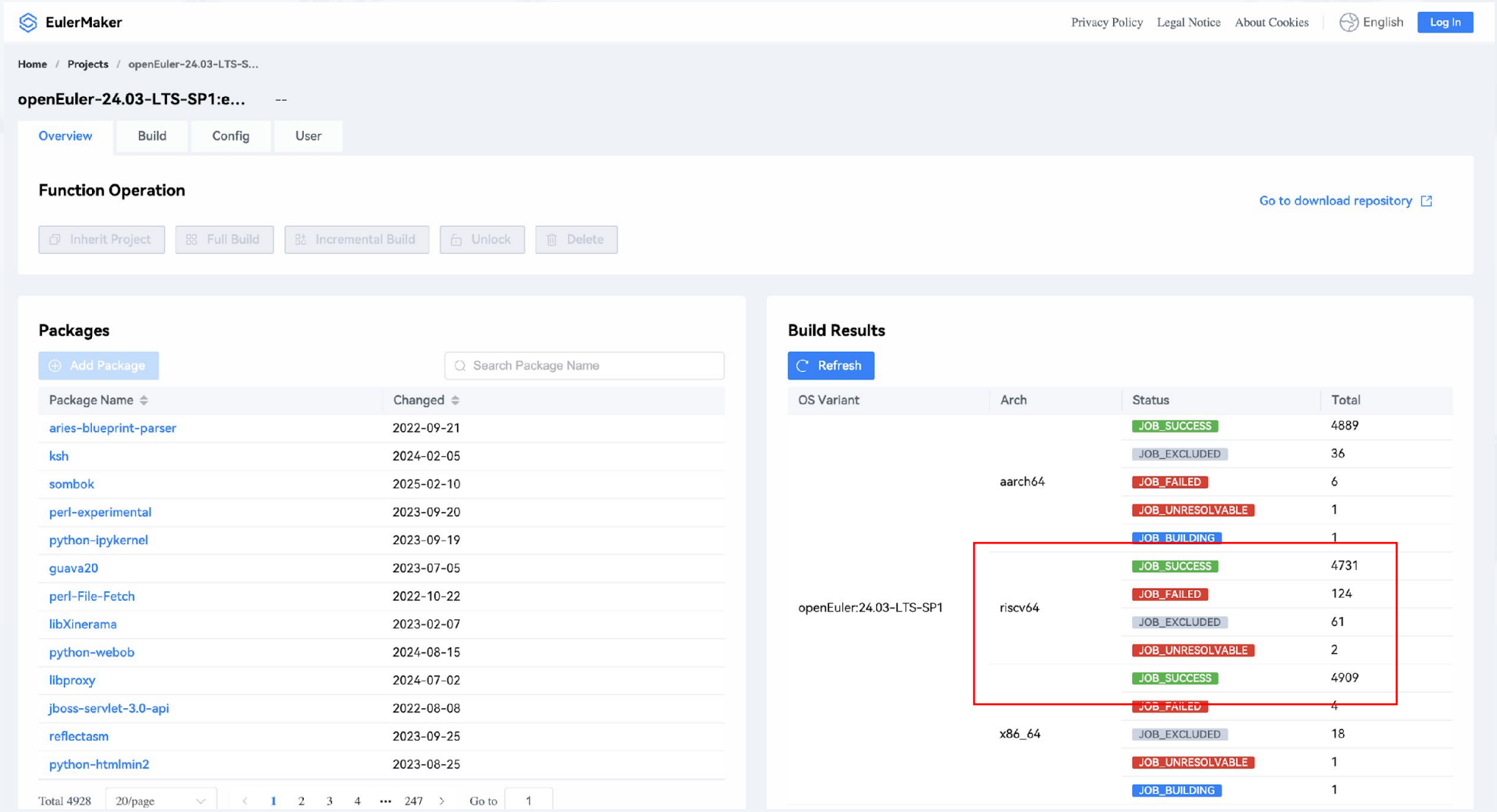
Architecture: x86_64 | AArch64 | ARM32 | loongarch64 | riscv64

Scenario: Server | Embedded | Edge Cloud | Cloud Computing

Type	Size	Mirror Site	Integrity Check	Download
Offline Standard ISO	3.9 GiB	Shanghai-Jiao-Tong-University (1	SHA256	Download
Offline Everything ISO	17.6 GiB	Shanghai-Jiao-Tong-University (1	SHA256	Download
Network Install ISO	906.0 MiB	Shanghai-Jiao-Tong-University (1	SHA256	Download

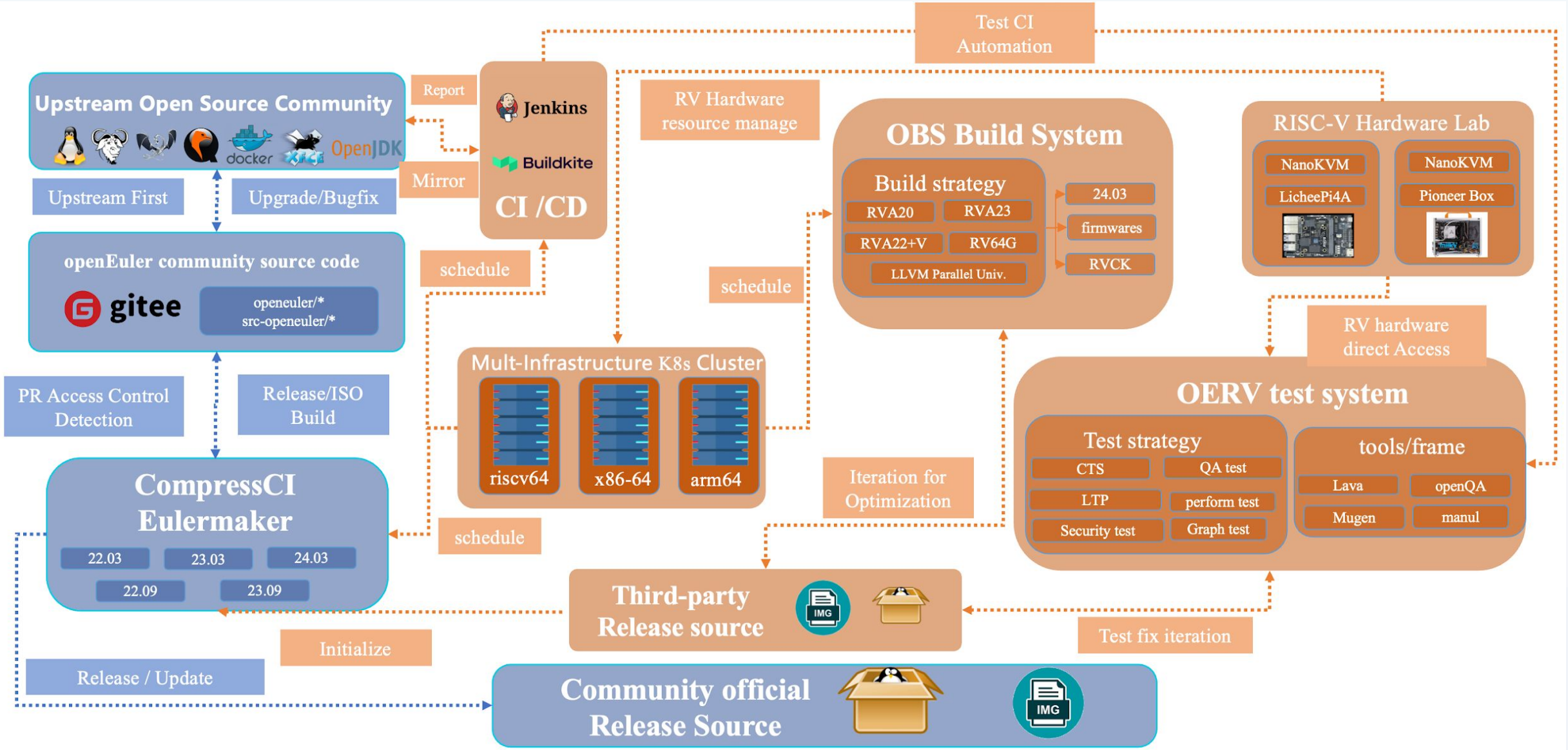
Unified Build System for Multi-Architecture

- EulerMaker Support for RISC-V Architecture enabled



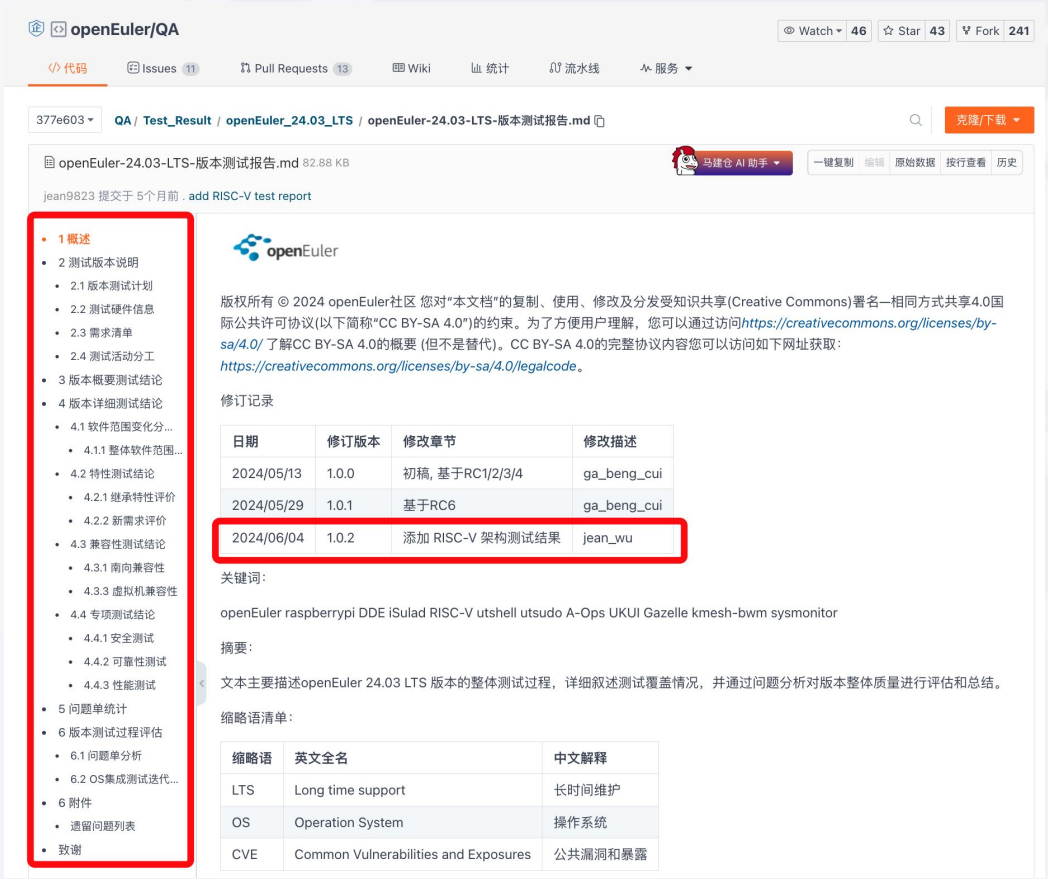
Dual Circulation to Accelerate Iteration of RISC-V Version

- Maintain dual infrastructure to accelerate openEuler package



Unified QA Standard for Multi-Architecture

- Unified release testing strategy
- Utilizes openEuler Mugen: 9 test categories, **900+ suites**, **6000+ cases**
- Automated testing coverage **over 80%**



Test Item	Test Content
Function Test	Testing the functionality of the OS using the Mugen automation framework.
Performance Test	unixbench,netperf izone,fio,stream, lmbench
Security Test	namp, openscap, gpgcheck,sbom, CVE
Kernel Test	LTP, syzkaller, trinity, mmtests, posix
Long Stability Test	LTP stress(7*24h)
Compiler Test	dejagnu, jotai, Anghabench, csmith, yarpgen, jdk
Southbound Compatibility Test	Execute hardware compatibility testing using the OEC-Hardware automation testing tool.
GUI Test	Perform relevant testing of desktop features using openQA.
Feature Test	Test the third-party features supported by RISC-V in openEuler.

openEuler 24.03 LTS Testing Strategy

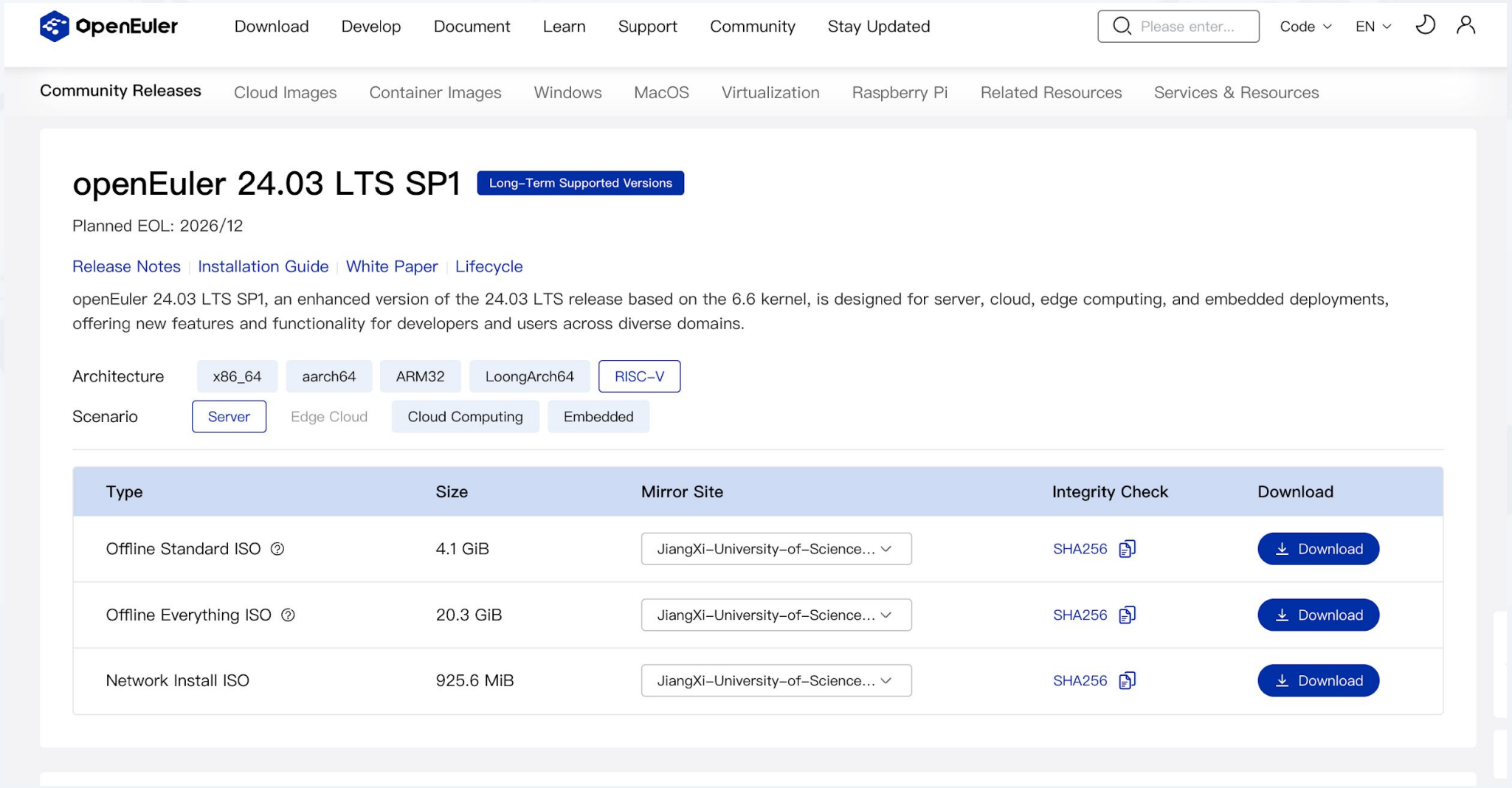
https://gitee.com/openeuler/QA/tree/master/Test_Strategy/openEuler_24.03_LTS

openEuler 24.03 LTS Testing Report

https://gitee.com/openeuler/QA/tree/377e603220df44ed44b3763c45e8333d9a641dd3/Test_Result/openEuler_24.03_LTS

Unified ISO Release

- Innovative Unified ISO for QEMU, SG2042, and TH1520 based on EDK2



Open Source Server Software Stack

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Visualization ✔ Mail Server ✔

Database ✔ Container ✔

Web✔ Hotfix Service ✔

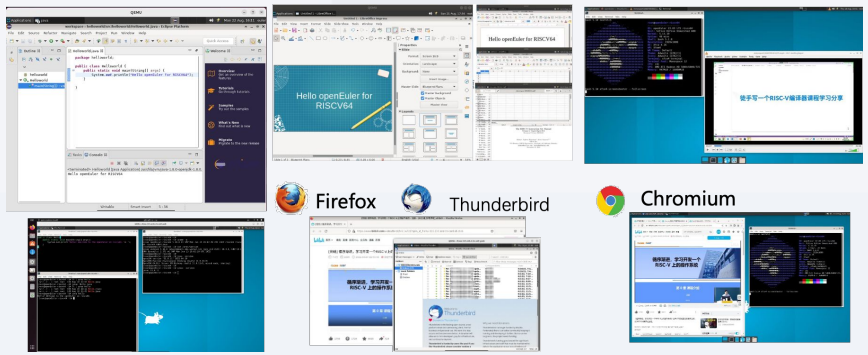
Open Source Software Stack for Desktop Environment

DE. ✔ browser✔ Mailbox ✔ Player ✔

Graph Editor ✔ VNC ✔ Network System ✔

Document Processing System ✔ Print System ✔

RISC-V + OpenEuler

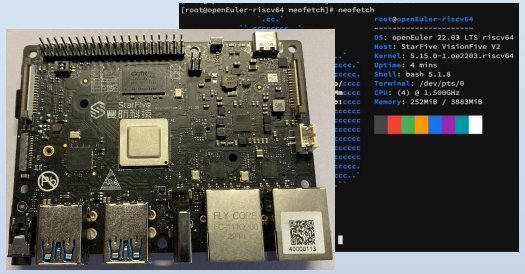


Hardware Supported

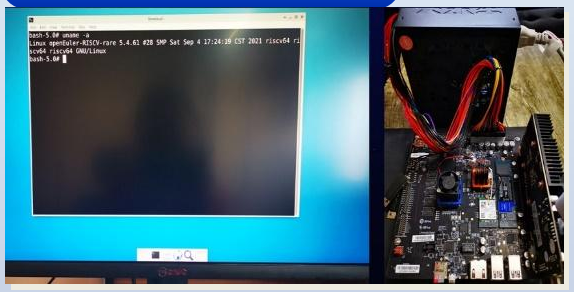
10+ DVBs supported

RISC-V + OpenEuler

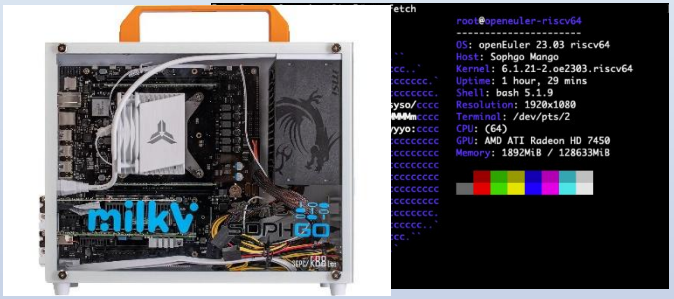
StarFive VisionFive 2



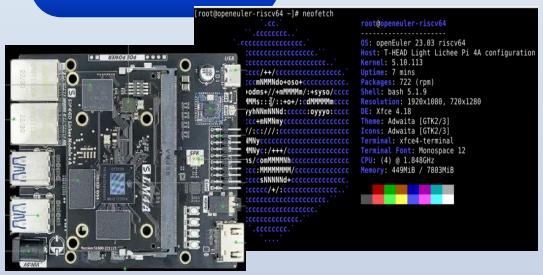
SiFive Unmatched



Sophgo Pioneer

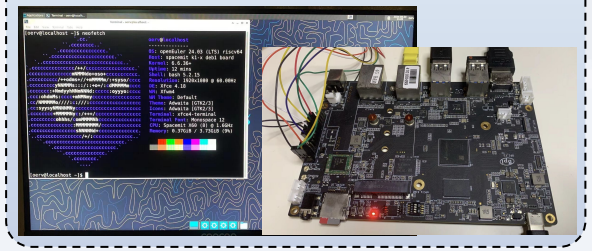


LicheePi 4A

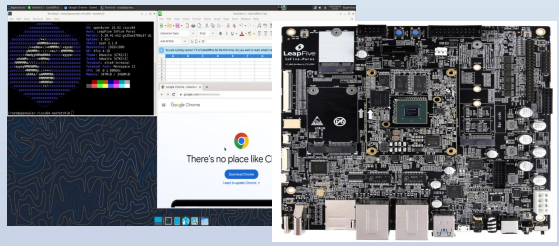


Nezha D1

Banana Pi BPI-F3



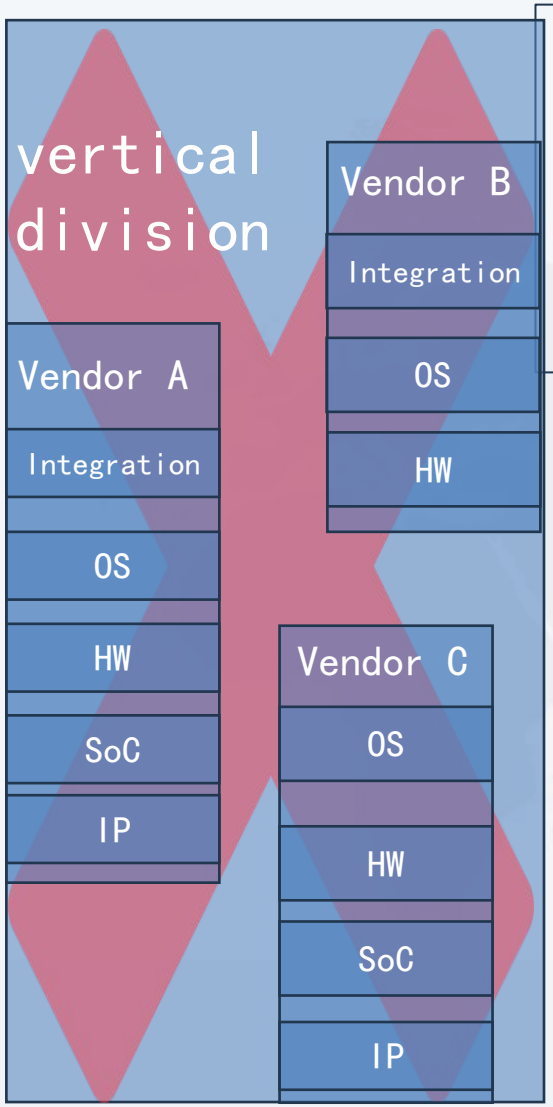
LeapFive Poros



XiangShan Nanhu

Content

Analysis of Fragmentation

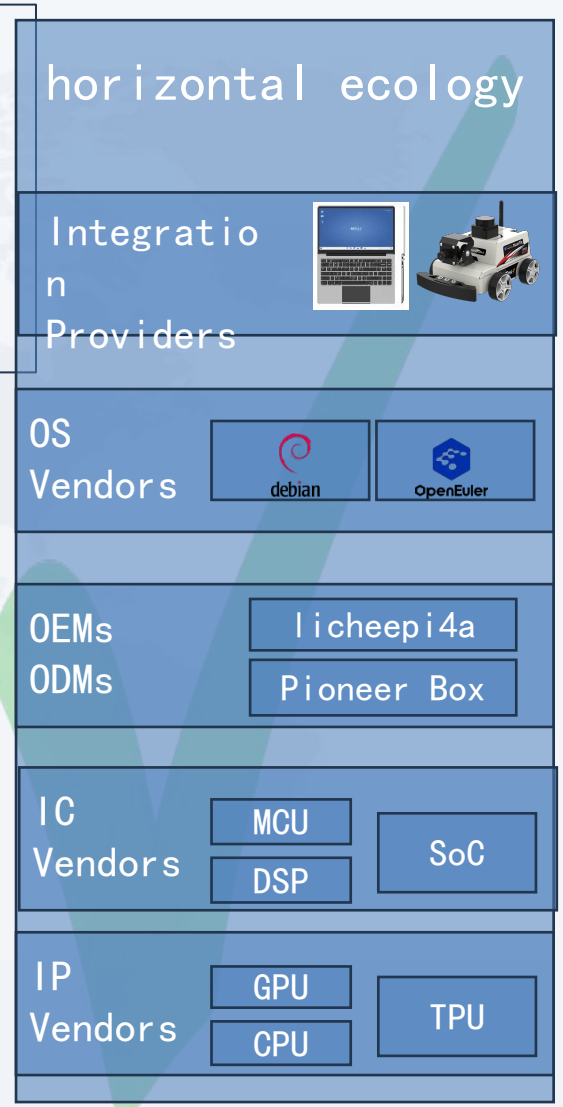


3 Basic Assumptions

1. Moore's Law is limited & computing demand is infinite
2. Software complexity grows non-linearly
3. Few developers can manage rising complexity of software

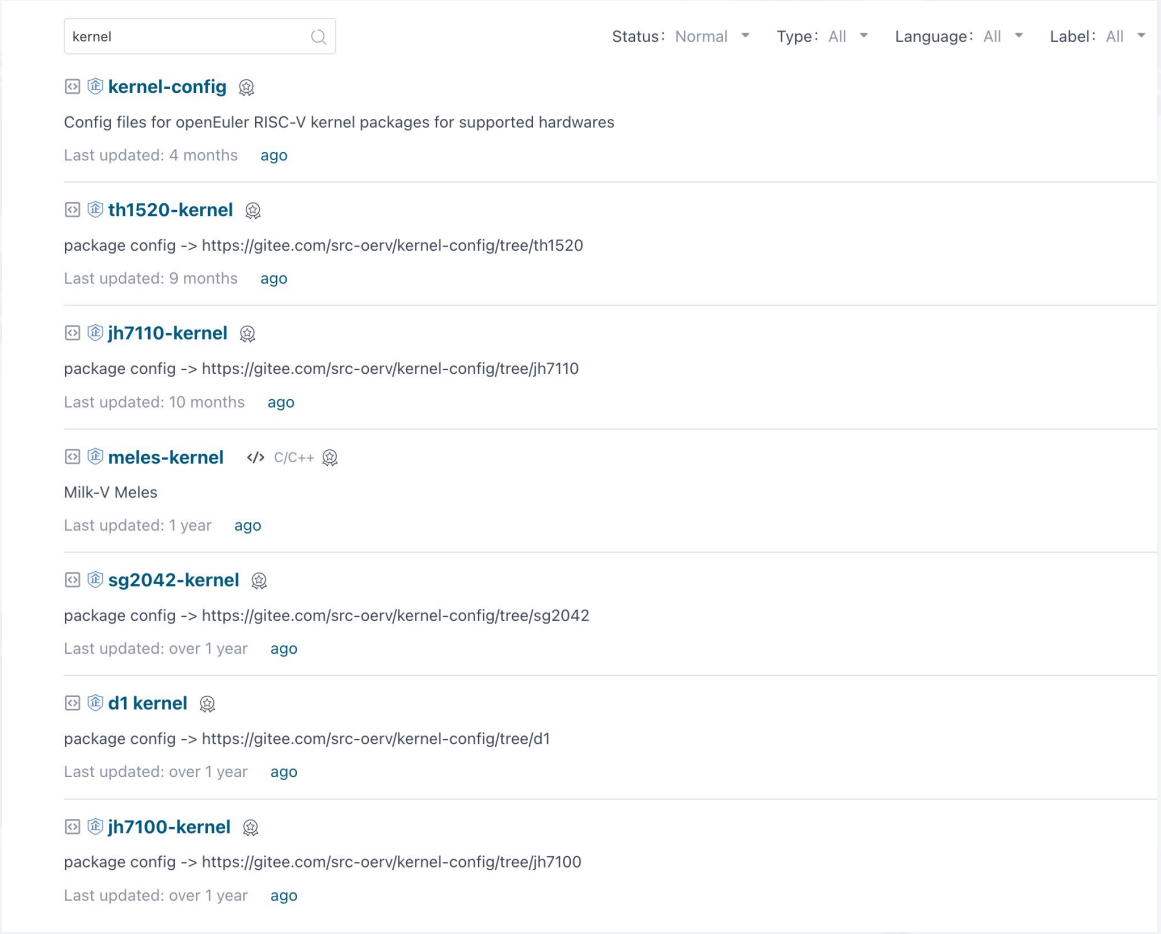
2 Observations

1. Vendors often ship fast by running vertically integrated hardware + software stacks—but that siloed model is hard to sustain.
2. Across the RISC-V ecosystem, more voices and real-world projects are lining up behind solid, shared standards.



Problem 1: Slow Upstream Acceptance

Upstream acceptance of core software like Linux Kernel lags behind productization, causing maintenance fragmentation.



Problem 2: ISA and SPECs Still Under Development

RV64G

RVA20

RVA22

RVA22+

RVA23

BRS

Server Platform Spec

Server SoC Spec

Vendors strive to market products, but the ratification of ISA and SPECs are relative slow compared.

Problem 3: Incomplete Software and Hardware Ecosystem

The software and hardware ecosystem remain incomplete, with infrastructure development as a bottleneck

- Insufficient software support for RISC-V in upstream
- Lack of multi-hardware test environment,

CI、Docker Images, Test Suite etc.

RISE Build Farm

Owned by Paul Walmsley ···
Last updated: Jun 20, 2024 by Brian Harrington · 1 min read · Legacy editor

About

The RISE Developer Infrastructure WG is in the process of setting up a build and simulator test farm for key open-source software components that run on RISC-V. Currently the build farm is running on Google Cloud Platform (GCP), where the projects have a set of virtual machines for disposal.

Active Projects

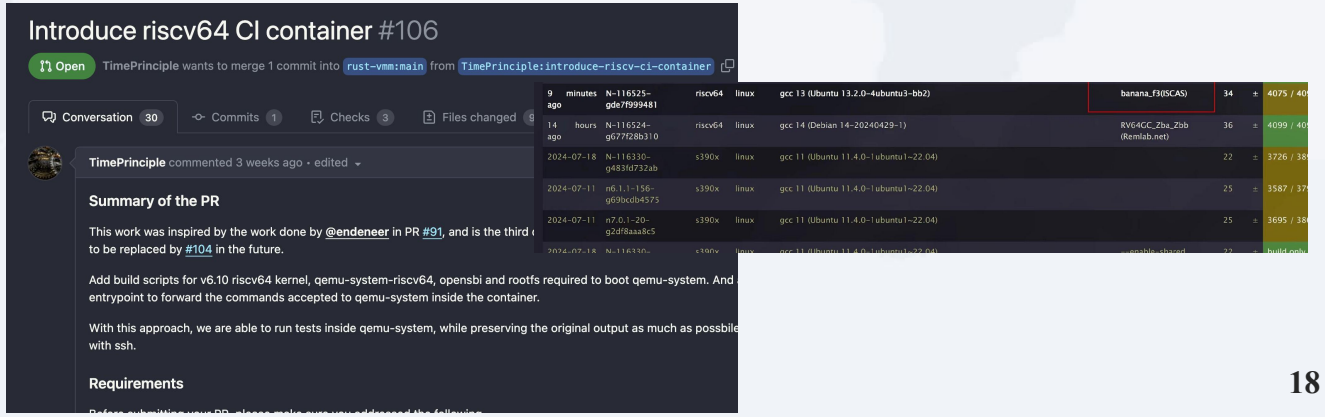
- RISE Linux Kernel CI (Björn Töpel, Conor Dooley)
- RISE GCC CI (Patrick O'Neill, Edwin Lu)
- RISE GCC Fuzz CI (Patrick O'Neill, Edwin Lu)
- RISE LLVM Fuzz CI (Patrick O'Neill, Edwin Lu)
- RISE GLIBC CI (Patrick O'Neill, Edwin Lu)

Past Projects

- RISE OpenJDK CI (Ludovic Henry)

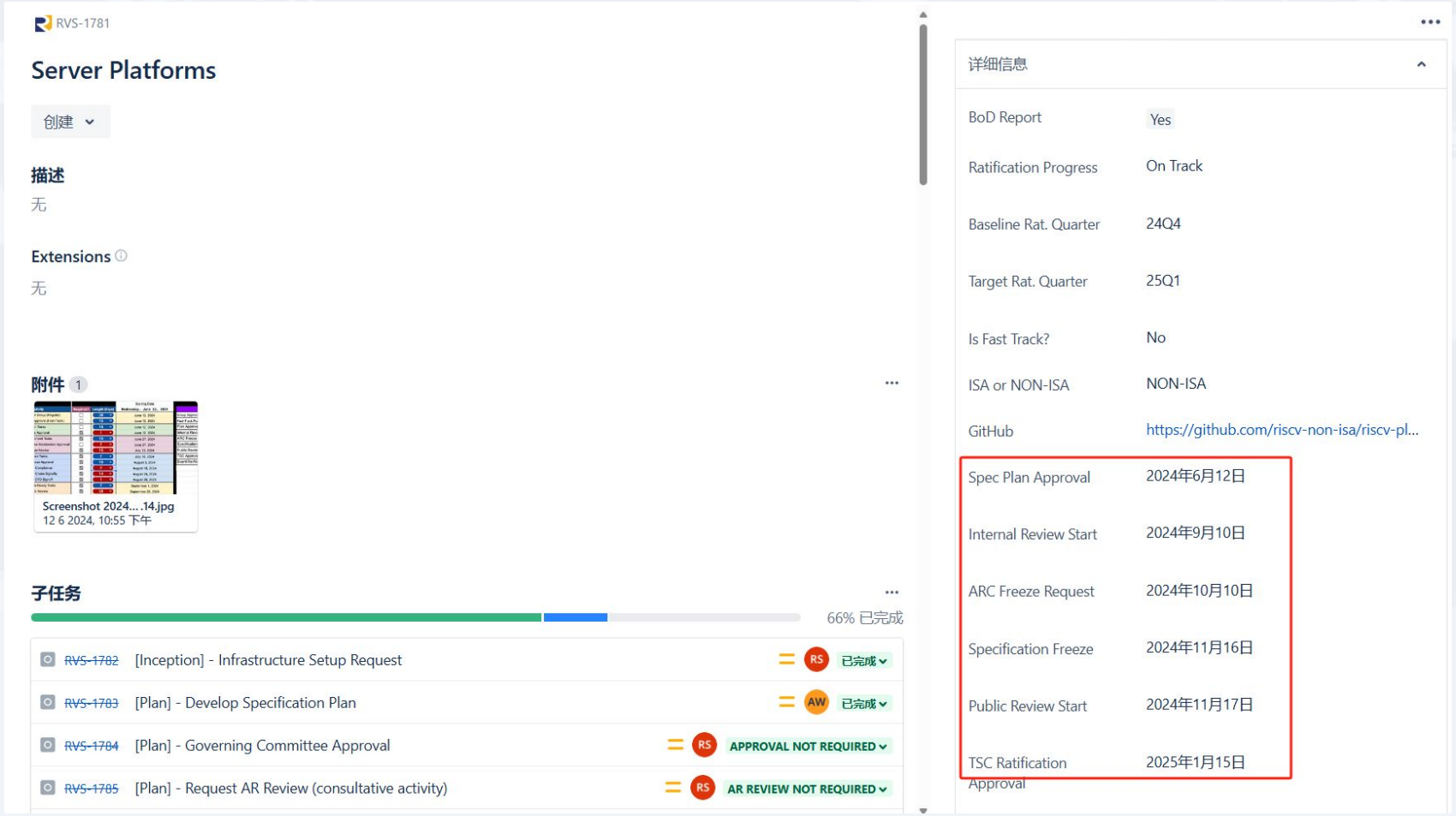
TODO/Improvements

- PoC Github Runners on GKE
- Add Terraform scripts for automating tasks (add/remove projects, add/remove VMs, add/remove Runners, ...)



Opportunity! The Best Time to Solve Problems

- RISC-V is about to enter a golden era of high-performance computing!
- The RISC-V Server Platform Spec draft is becoming stable!
- openEuler 24.03 LTS is the preferred choice for RISC-V fundamental software baseline!



Content

One Fundamental Mission & Four Ecological Plans

RVAize Standards Evolution Plan
The basis for iteration

Advance openEuler RISC-V and ecosystem development per upstream standards like RISC-V Server Platform, Boot and Runtime Services, and RVA23 Profile.

RVCI Strategic Infrastructure Plan
The promotion of upstream native development

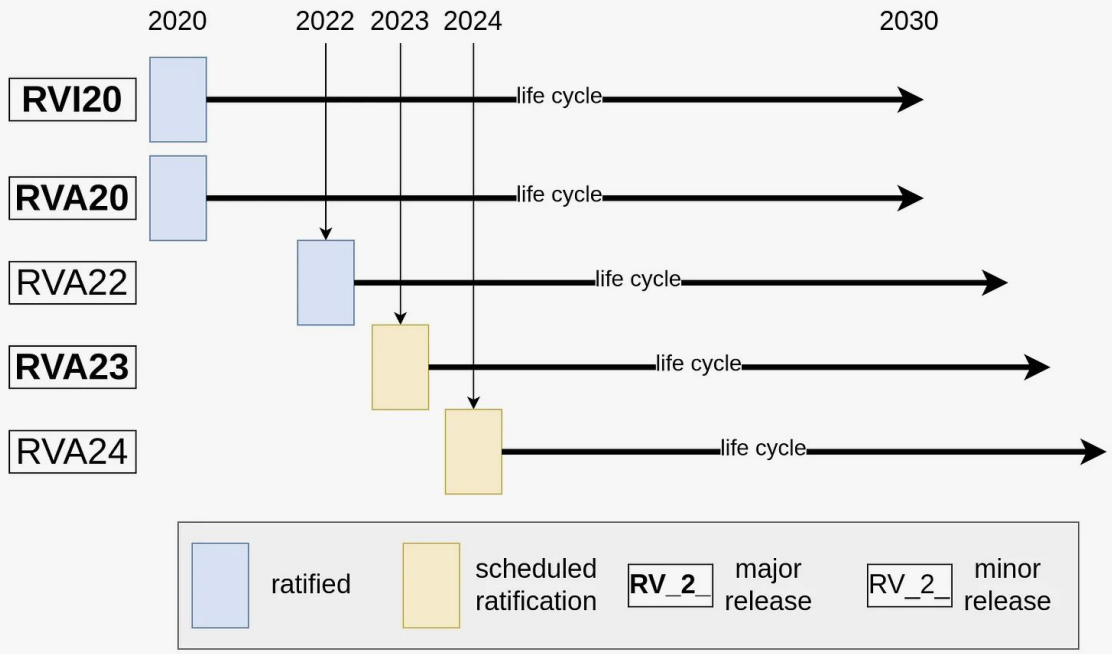
RVCK Kernel Homogeneity Plan
Enhance kernel compatibility

RAVA Test Completion Plan
Improve hardware support quality

RVAize Standards Evolution Plan

Guiding Version Iteration and Updates

Adhere to RISC-V profiles



Key upstream standards concerned

RVA23: https://lf-riscv.atlassian.net/browse/RVS-2708

Server Platforms: https://lf-riscv.atlassian.net/browse/RVS-1781

Boot and Runtime Services: https://lf-riscv.atlassian.net/browse/RVS-1193

Vector: https://lf-riscv.atlassian.net/browse/RVG-125

Hypervisors : https://lf-riscv.atlassian.net/browse/RVG-143

RVCI Strategic Infrastructure Plan

- Provide RISC-V CI gatekeeping support for openEuler to promote **community native development**
- Challenge & Solution: Insufficient computing power & Distributed compilation method

openeuler-ci-bot 拥有者 26 分钟前

Check Name		Build Result	Build Details
check_binary_file		✅SUCCESS	#82
check_package_yaml_file		✅SUCCESS	
check_consistency		✅SUCCESS	
check_spec_file		✅SUCCESS	
riscv64	check_build	✅SUCCESS	#74
	check_install	✅SUCCESS	
	check_license	✅SUCCESS	
x86_64	check_build	✅SUCCESS	#82
	check_install	✅SUCCESS	
	check_license	✅SUCCESS	
aarch64	check_build	✅SUCCESS	#82
	check_install	✅SUCCESS	
	check_license	✅SUCCESS	

表态 回复

openeuler-ci-bot 添加了 ci_successful 标签 26 分钟前

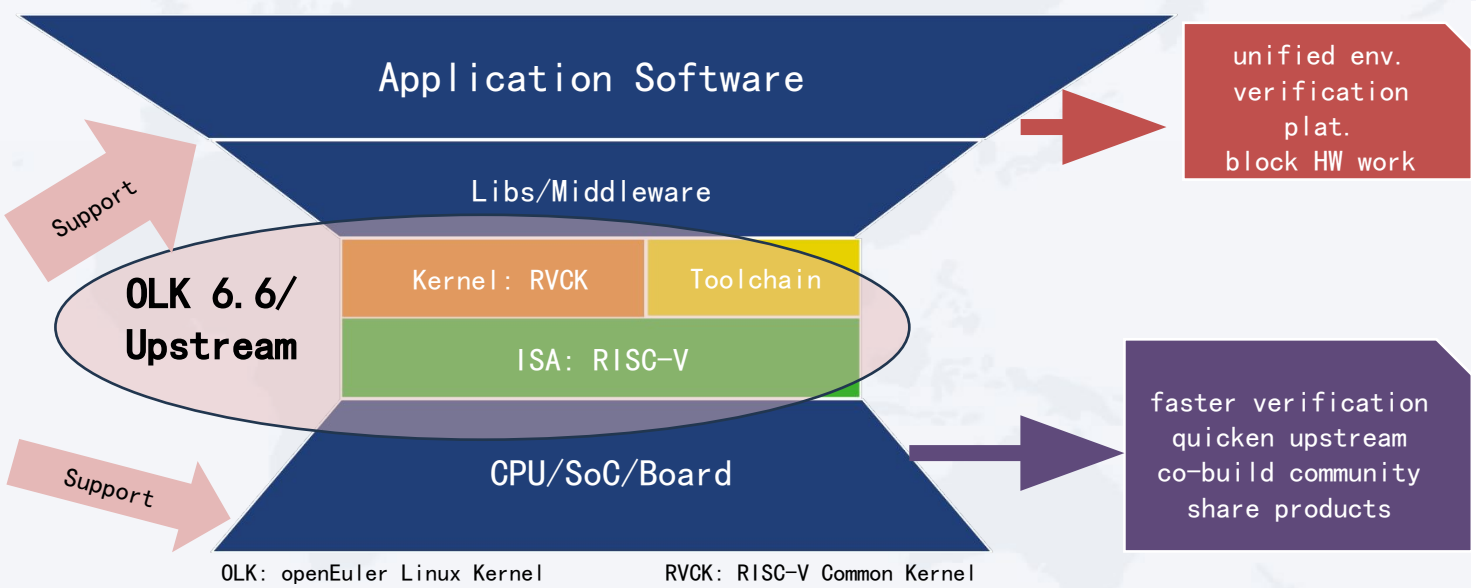
openeuler-ci-bot 拥有者 26 分钟前

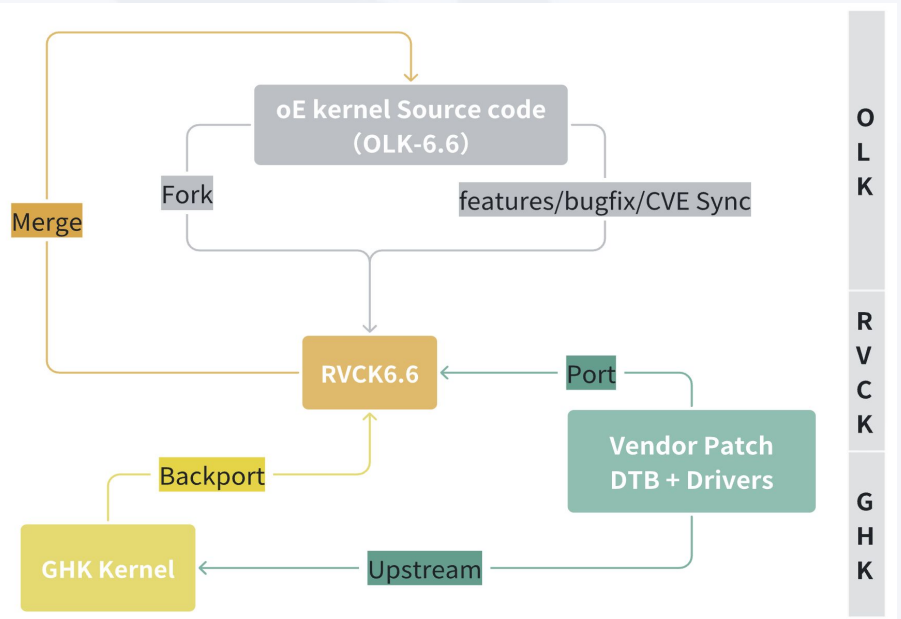
如下为接口变更检查结果，目标分支为openEuler-24.09，请PR提交者check差异信息

Arch Name	Check Items	Rpm Name	Check Result	Build Details
compare_package(x86_64)	add_rpms		✅SUCCESS	#82
	delete_rpms		✅SUCCESS	
	rpm_files		✅SUCCESS	
	rpm_provides		✅SUCCESS	
	rpm_requires		✅SUCCESS	
	rpm_symbol		✅SUCCESS	
compare_package(aarch64)	add_rpms		✅SUCCESS	#82
	delete_rpms		✅SUCCESS	
	rpm_files		✅SUCCESS	
	rpm_provides		✅SUCCESS	
	rpm_requires		✅SUCCESS	
	rpm_symbol		✅SUCCESS	
compare_package(riscv64)	add_rpms		✅SUCCESS	#74
	delete_rpms		✅SUCCESS	
	rpm_files		✅SUCCESS	
	rpm_provides		✅SUCCESS	
	rpm_requires		✅SUCCESS	
	rpm_symbol		✅SUCCESS	

表态 回复

RVCK Kernel Homogeneity Plan

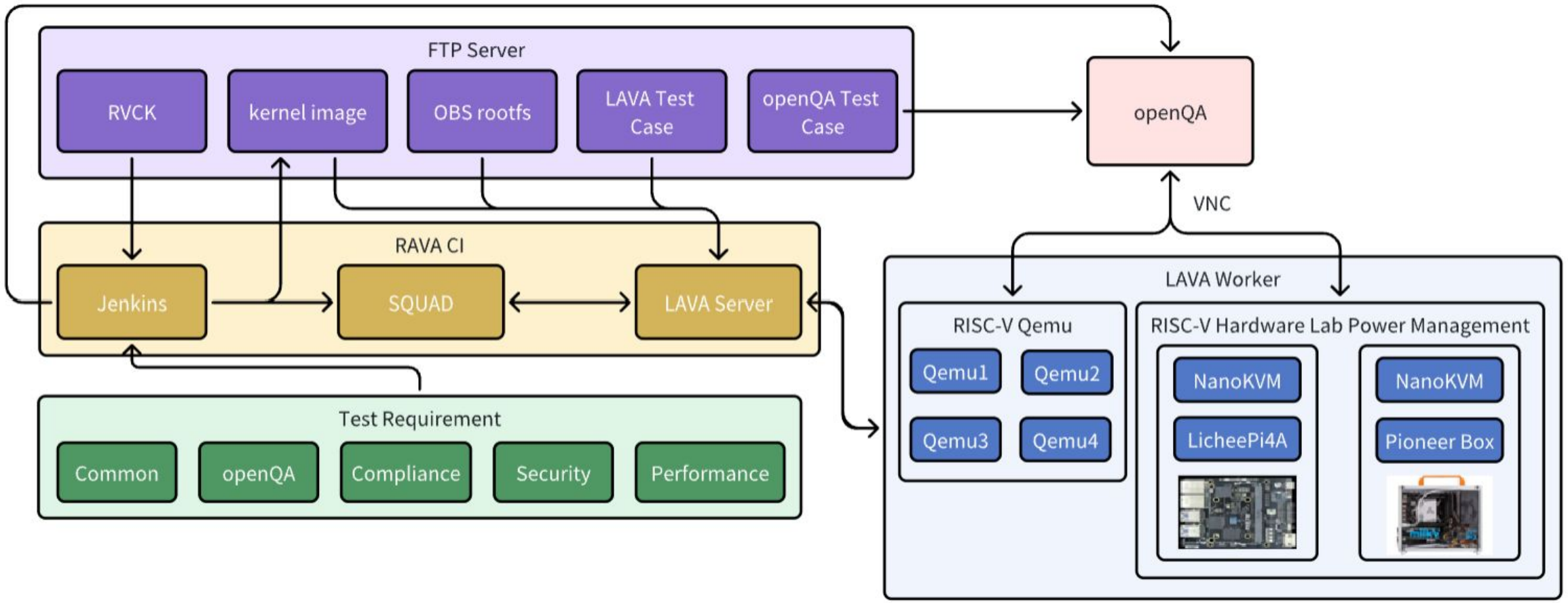




Unify baseline to benefit upstream and downstream ecosystems

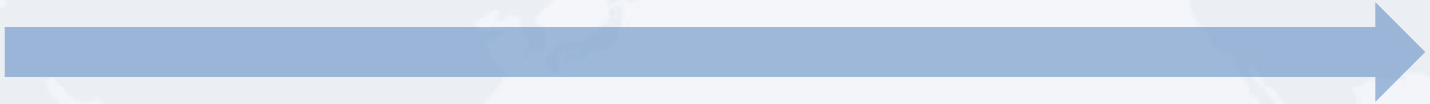
https://github.com/RVCK-Project/kernel-6.6

RAVA Test Completion Plan



Summary: from Fragmentation to Diverse Ecological Visions

work together for the RISC-V software ecosystems



Fragmentation to **de-fragmentation** to diversification

Thanks!