



中国科学院
CHINESE ACADEMY OF SCIENCES

openEuler for RISC-V Servers: Challenges & Roadmap

Yanjun Wu yanjun@iscas.ac.cn

Deputy Director and Chief Engineer

Institute of Software, Chinese Academy of Sciences (ISCAS)

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1

Brief Introduction of openEuler RISC-V

2

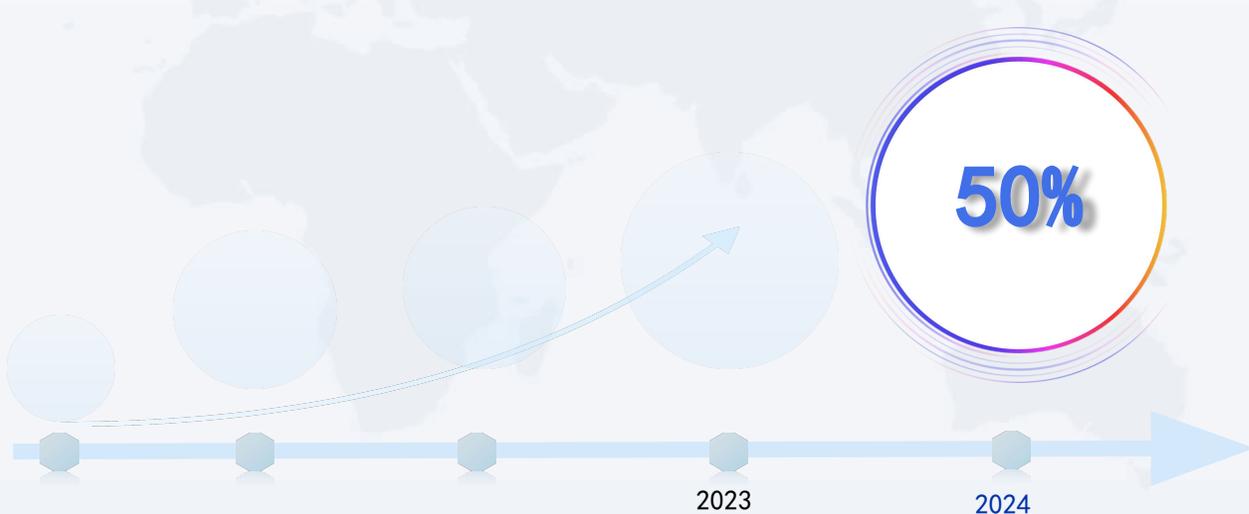
Problems and Opportunities of current RISC-V Ecosystem

3

Solutions to tackle the Fragmentation



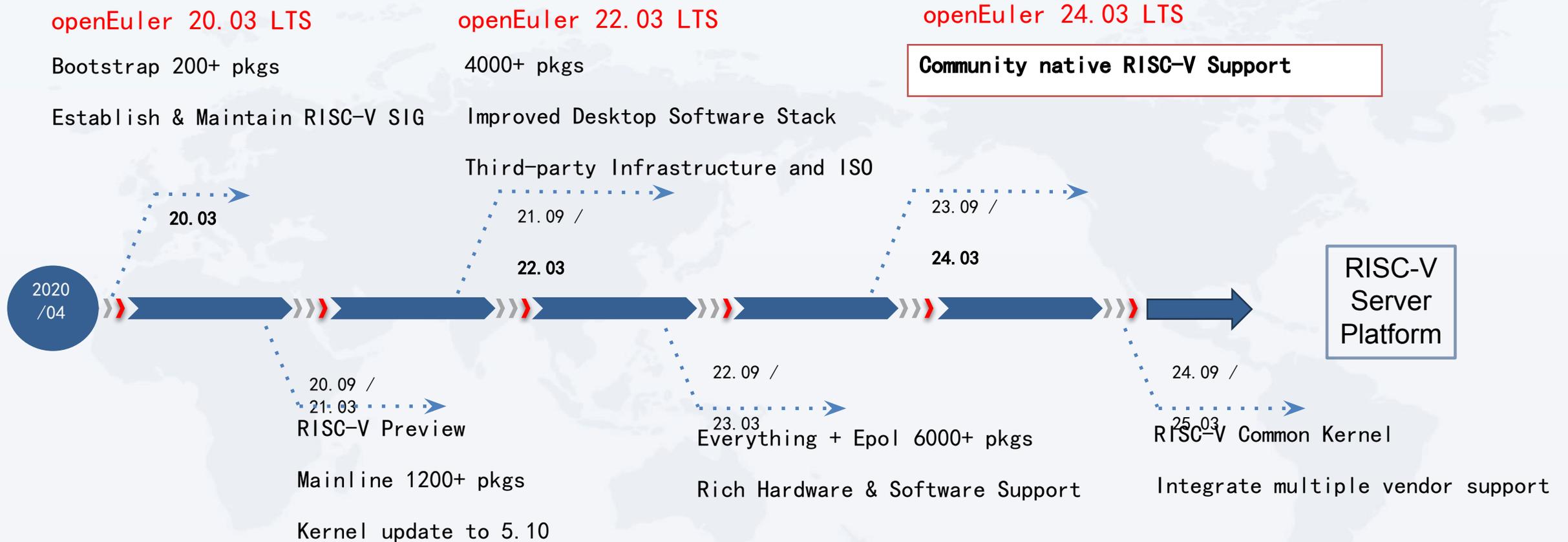
- RPM based Linux Distro, *not just another centos*
- Open-sourced in 2019
- Mainly deployed on servers
- Website: <https://www.openeuler.org/>



IDC: Chinese Server OS market share (2024)



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

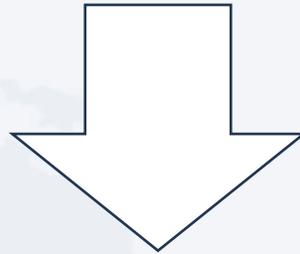
- **Released** by the openEuler Community
- **Developed** for Server & Desktop Scenarios
- **6000+ SRPMs** supported
- **Distinctive Features:** UEFI, Hotfix, Penglai TEE, etc.

□ compilation success rate of openEuler Master branch

x86 - 0.3%

ARM - 0.5%

RISC-V - 1.5%



Community Native Support of RISC-V



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

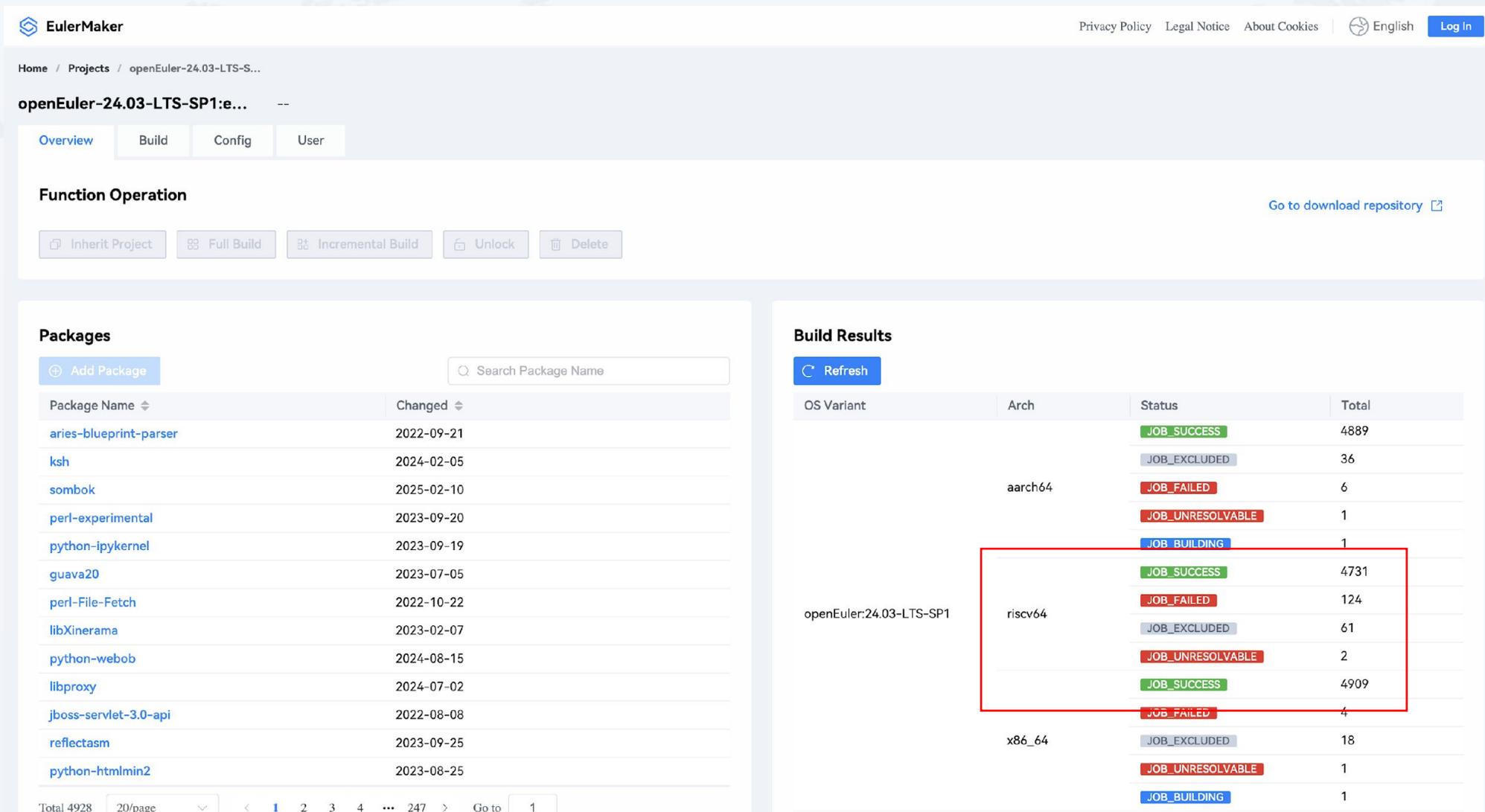
[Release Notes](#) | [Installation Guide](#) | [White Paper](#) | [Lifecycle](#)

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) v	SHA256 🔗	Download ↓
Offline Everything ISO ?	17.6 GiB	Shanghai-Jiao-Tong-University (1) v	SHA256 🔗	Download ↓
Network Install ISO	906.0 MiB	Shanghai-Jiao-Tong-University (1) v	SHA256 🔗	Download ↓

□ EulerMaker Support for RISC-V Architecture enabled



The screenshot displays the EulerMaker web interface. At the top, there is a navigation bar with the EulerMaker logo, links for Privacy Policy, Legal Notice, About Cookies, and a language selector set to English. A 'Log In' button is also present. Below the navigation bar, the breadcrumb trail shows 'Home / Projects / openEuler-24.03-LTS-S...'. The main content area is titled 'openEuler-24.03-LTS-SP1:e...' and features a tabbed interface with 'Overview', 'Build', 'Config', and 'User' tabs. Under the 'Function Operation' section, there are buttons for 'Inherit Project', 'Full Build', 'Incremental Build', 'Unlock', and 'Delete'. A link 'Go to download repository' is also visible. The 'Packages' section on the left contains an 'Add Package' button and a search bar. Below it is a table listing various packages and their last changed dates. The 'Build Results' section on the right features a 'Refresh' button and a table showing the status of builds for different OS variants and architectures. A red box highlights the 'riscv64' architecture results for 'openEuler:24.03-LTS-SP1', showing a mix of successful, failed, and excluded jobs.

Packages

Package Name	Changed
aries-blueprint-parser	2022-09-21
ksh	2024-02-05
sombok	2025-02-10
perl-experimental	2023-09-20
python-ipykernel	2023-09-19
guava20	2023-07-05
perl-File-Fetch	2022-10-22
libXinerama	2023-02-07
python-webob	2024-08-15
libproxy	2024-07-02
jboss-servlet-3.0-api	2022-08-08
reflectasm	2023-09-25
python-htmlmin2	2023-08-25

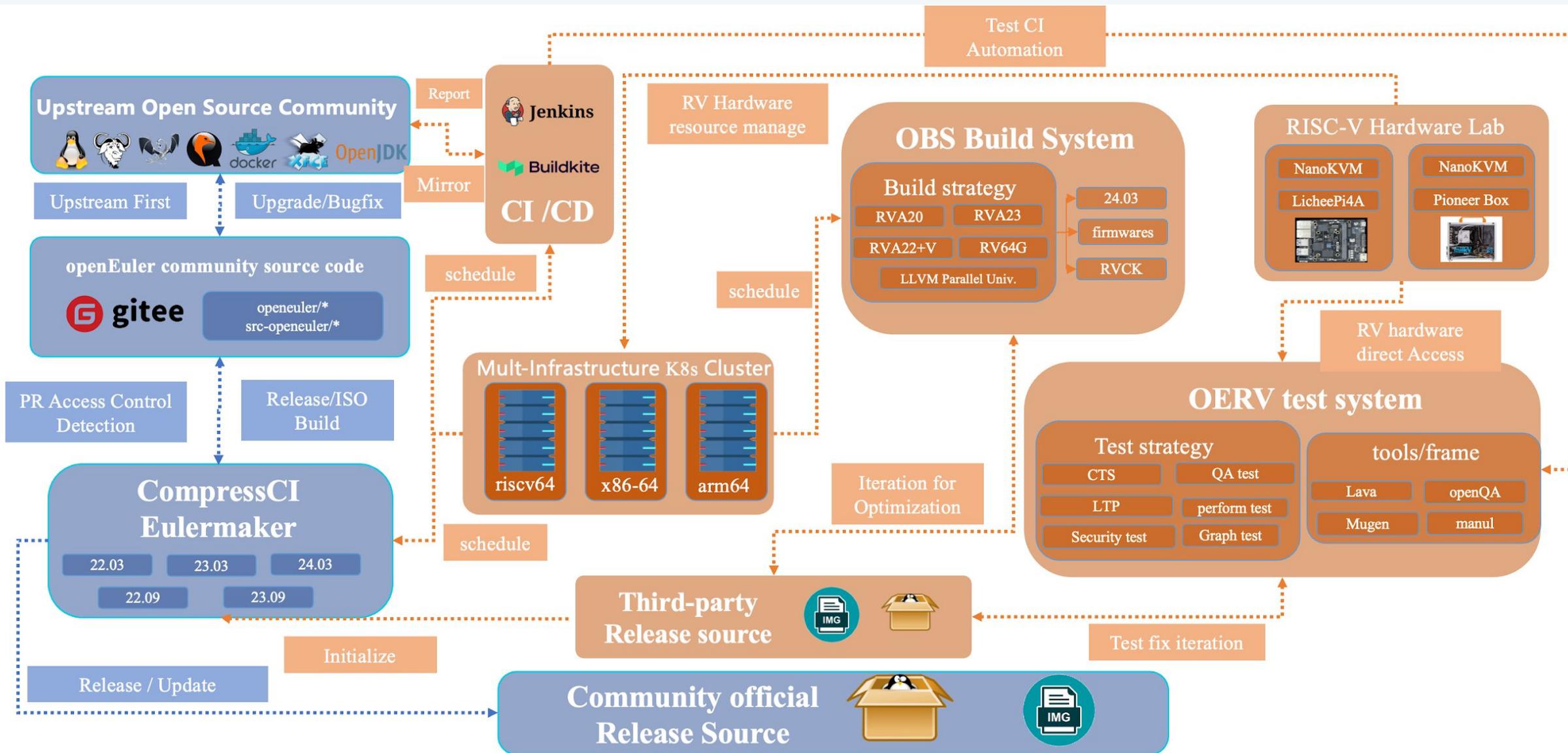
Total 4928 20/page

Build Results

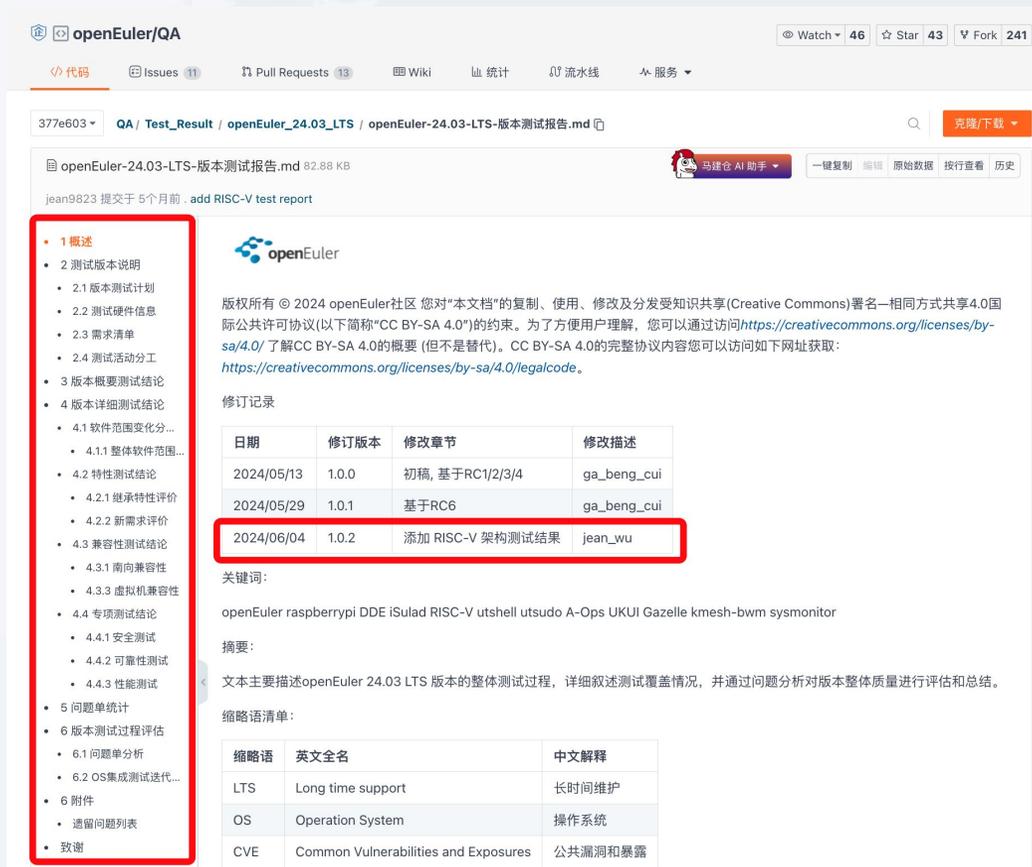
OS Variant	Arch	Status	Total
	aarch64	JOB_SUCCESS	4889
		JOB_EXCLUDED	36
		JOB_FAILED	6
		JOB_UNRESOLVABLE	1
		JOB_BUILDING	1
openEuler:24.03-LTS-SP1	riscv64	JOB_SUCCESS	4731
		JOB_FAILED	124
		JOB_EXCLUDED	61
		JOB_UNRESOLVABLE	2
		JOB_SUCCESS	4909
		JOB_FAILED	4
	x86_64	JOB_EXCLUDED	18
		JOB_UNRESOLVABLE	1
		JOB_BUILDING	1

Dual Circulation to Accelerate Iteration of RISC-V Version

□ Maintain dual infrastructure to accelerate openEuler package



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



openEuler/QA

377e603 / QA / Test_Result / openEuler_24.03_LTS / openEuler-24.03-LTS-版本测试报告.md

openEuler-24.03-LTS-版本测试报告.md 82.88 KB

jean9823 提交于 5个月前 · add RISC-V test report

- 1 概述
- 2 测试版本说明
 - 2.1 版本测试计划
 - 2.2 测试硬件信息
 - 2.3 需求清单
 - 2.4 测试活动分工
- 3 版本概要测试结论
- 4 版本详细测试结论
 - 4.1 软件范围变化分...
 - 4.1.1 整体软件范围...
 - 4.2 特性测试结论
 - 4.2.1 继承特性评价
 - 4.2.2 新需求评价
 - 4.3 兼容性测试结论
 - 4.3.1 南向兼容性
 - 4.3.3 虚拟机兼容性
 - 4.4 专项测试结论
 - 4.4.1 安全测试
 - 4.4.2 可靠性测试
 - 4.4.3 性能测试
- 5 问题单统计
- 6 版本测试过程评估
 - 6.1 问题单分析
 - 6.2 OS集成测试迭代...
- 6 附件
 - 遗留问题列表
- 致谢

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修订记录

日期	修订版本	修改章节	修改描述
2024/05/13	1.0.0	初稿, 基于RC1/2/3/4	ga_beng_cui
2024/05/29	1.0.1	基于RC6	ga_beng_cui
2024/06/04	1.0.2	添加 RISC-V 架构测试结果	jean_wu

关键词:
openEuler raspberrypi DDE iSulad RISC-V utshell utsudo A-Ops UKUI Gazelle kmesh-bwm sysmonitor

摘要:
文本主要描述openEuler 24.03 LTS 版本的整体测试过程, 详细叙述测试覆盖情况, 并通过问题分析对版本整体质量进行评估和总结。

缩略语清单:

缩略语	英文全名	中文解释
LTS	Long time support	长时间维护
OS	Operation System	操作系统
CVE	Common Vulnerabilities and Exposures	公共漏洞和暴露

Test Item	Test Content
Function Test	Testing the functionality of the OS using the Mugen automation framework.
Performance Test	unixbench,netperf,iozone,fio,stream,Imbench
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.

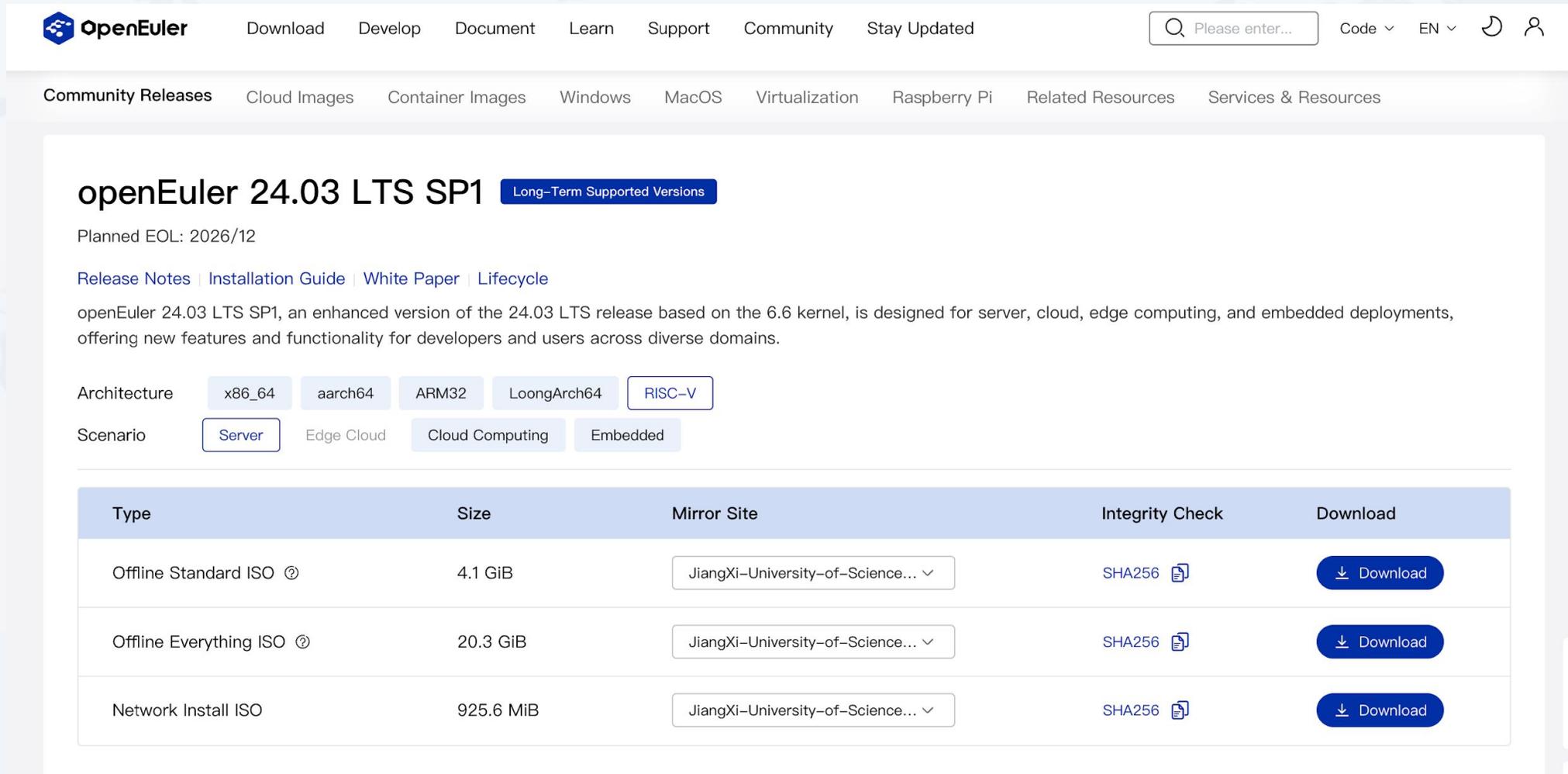
openEuler 24.03 LTS Testing Strategy

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

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



The screenshot shows the OpenEuler website interface. At the top, there is a navigation bar with links for Download, Develop, Document, Learn, Support, Community, and Stay Updated. A search bar is present on the right. Below the navigation bar, there are several category links: Community Releases, Cloud Images, Container Images, Windows, MacOS, Virtualization, Raspberry Pi, Related Resources, and Services & Resources.

The main content area features the heading "openEuler 24.03 LTS SP1" with a "Long-Term Supported Versions" badge. Below this, it states "Planned EOL: 2026/12" and provides links for "Release Notes", "Installation Guide", "White Paper", and "Lifecycle". A descriptive paragraph follows: "openEuler 24.03 LTS SP1, an enhanced version of the 24.03 LTS release based on the 6.6 kernel, is designed for server, cloud, edge computing, and embedded deployments, offering new features and functionality for developers and users across diverse domains."

Below the text, there are filter buttons for "Architecture" (x86_64, aarch64, ARM32, LoongArch64, RISC-V) and "Scenario" (Server, Edge Cloud, Cloud Computing, Embedded). The "RISC-V" architecture and "Server" scenario are selected.

A table lists the available ISO images:

Type	Size	Mirror Site	Integrity Check	Download
Offline Standard ISO 	4.1 GiB	JiangXi-University-of-Science... 	SHA256 	Download
Offline Everything ISO 	20.3 GiB	JiangXi-University-of-Science... 	SHA256 	Download
Network Install ISO	925.6 MiB	JiangXi-University-of-Science... 	SHA256 	Download

Open Source Server Software Stack

Visualization ✓ Mail Server ✓



Database ✓ Container ✓



kubernetes

Web ✓ Hotfix Service ✓

ROS



OpenEuler

SAMBA



POSTFIX



DOVECOT



MariaDB



Jenkins



MySQL



StratoVirt



iSulad

NGINX



redis



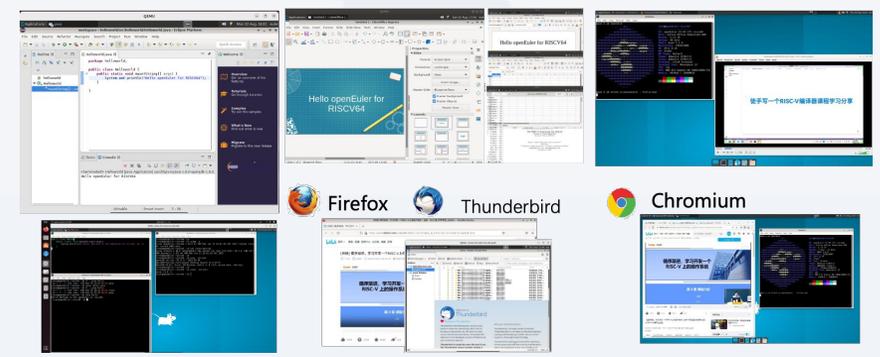
Buildkite

Open Source Software Stack for Desktop Environment

DE. ✓ browser ✓ Mailbox ✓ Player ✓

Graph Editor ✓ VNC ✓ Network System ✓

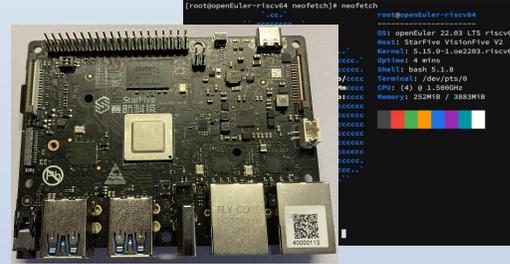
Document Processing System ✓ Print System ✓



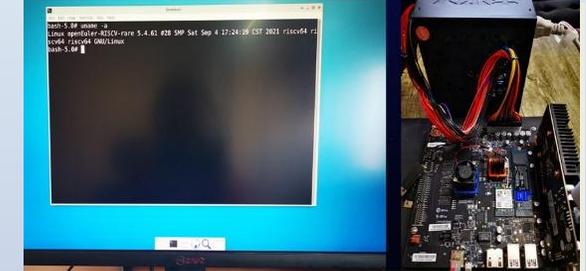
10+ DVBs supported



StarFive VisionFive 2



SiFive Unmatched



Sophgo Pioneer



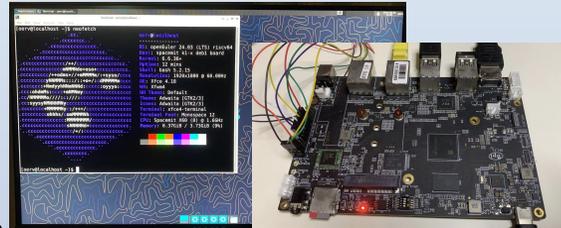
LicheePi 4A



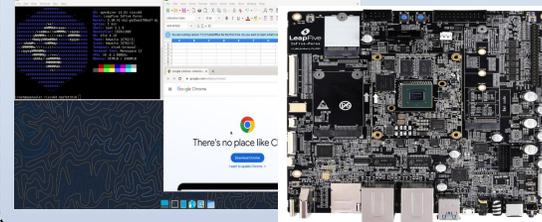
Nezha D1



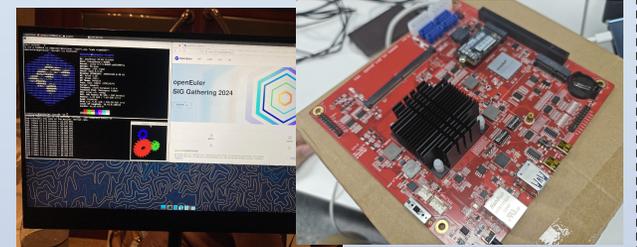
Banana Pi BPI-F3



LeapFive Poros



XiangShan Nanhu



1

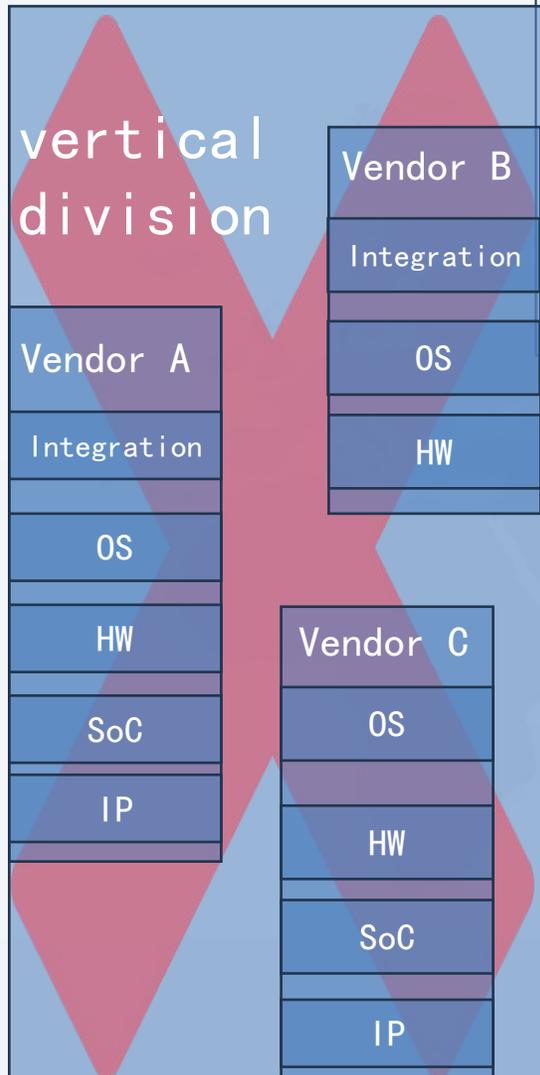
Brief Introduction of openEuler RISC-V

2

Problems and Opportunities of current RISC-V Ecosystem

3

Solutions to tackle the 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.

horizontal ecology

Integration Providers



OS Vendors



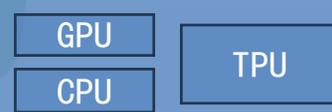
OEMs ODMs



IC Vendors



IP Vendors



Problem 1: Slow Upstream Acceptance



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

The screenshot shows a search results page on Gitee for the keyword 'kernel'. The search bar at the top contains 'kernel' and a search icon. To the right of the search bar are filters: 'Status: Normal', 'Type: All', 'Language: All', and 'Label: All'. Below the search bar, there are seven search results, each with a repository icon, a repository name, a description, and a 'Last updated' timestamp. The results are:

- kernel-config**: Config files for openEuler RISC-V kernel packages for supported hardware. Last updated: 4 months ago.
- th1520-kernel**: package config -> <https://gitee.com/src-oerv/kernel-config/tree/th1520>. Last updated: 9 months ago.
- jh7110-kernel**: package config -> <https://gitee.com/src-oerv/kernel-config/tree/jh7110>. Last updated: 10 months ago.
- meles-kernel**: </> C/C++ Meles-V Meles. Last updated: 1 year ago.
- sg2042-kernel**: package config -> <https://gitee.com/src-oerv/kernel-config/tree/sg2042>. Last updated: over 1 year ago.
- d1 kernel**: package config -> <https://gitee.com/src-oerv/kernel-config/tree/d1>. Last updated: over 1 year ago.
- jh7100-kernel**: package config -> <https://gitee.com/src-oerv/kernel-config/tree/jh7100>. Last updated: over 1 year ago.

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, ...)

Introduce riscv64 CI container #106

 TimePrinciple wants to merge 1 commit into `rust-vm:main` from `TimePrinciple:introduce-riscv-ci-container`

Conversation 30 · Commits 1 · Checks 3 · Files changed 6

 TimePrinciple commented 3 weeks ago · edited

Summary of the PR

This work was inspired by the work done by @endeneer in PR #91, and is the third to be replaced by #104 in the future.

Add build scripts for v6.10 riscv64 kernel, qemu-system-riscv64, opensbi and rootfs required to boot qemu-system. And endpoint to forward the commands accepted to qemu-system inside the container.

With this approach, we are able to run tests inside qemu-system, while preserving the original output as much as possible with ssh.

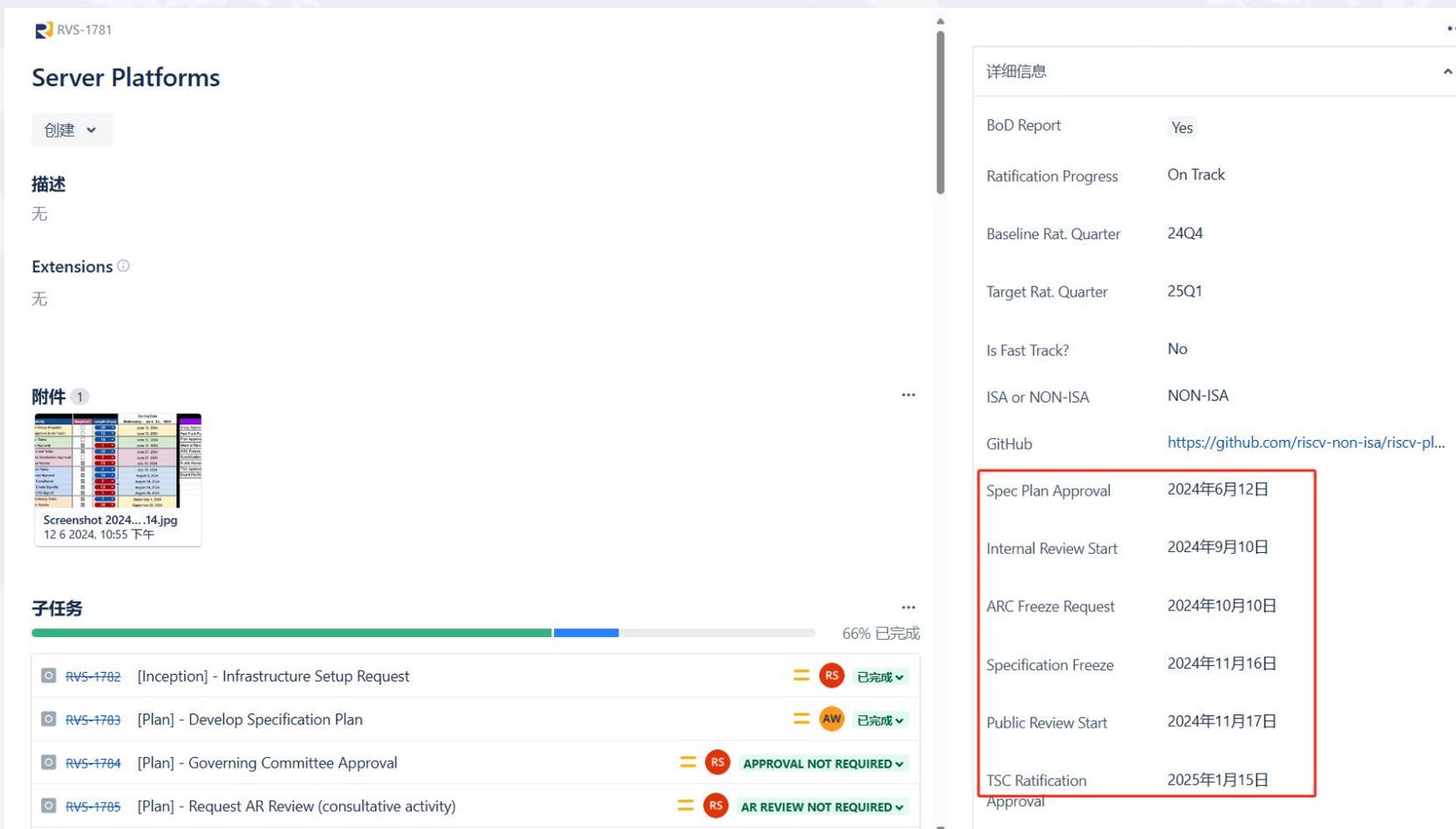
Requirements

Before submitting your PR, please make sure you address the following:

Age	Author	Commit	OS	Architecture	Compiler	Test Results
9 minutes ago	N-116525-g6b7f999481		linux	riscv64	gcc 13 (Ubuntu 13.2.0-4ubuntu3-bb2)	banana_F3(5CAS) 34 ± 4075 / 40
14 hours ago	N-116524-g67728b310		linux	riscv64	gcc 14 (Debian 14-20240429-1)	RV64GC_Zba_Zbb (Remlib.net) 36 ± 4099 / 40
2024-07-18	N-116330-g4836722ab		linux	s390x	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)	22 ± 3726 / 38
2024-07-11	n6.1.1-156-g69acc04572		linux	s390x	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)	25 ± 3587 / 37
2024-07-11	n7.0.1-20-g2f8aaabcs		linux	s390x	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)	25 ± 3695 / 38
2024-07-18	N-116330-g4836722ab		linux	s390x	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)	22 ± 3726 / 38

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!



RVS-1781

Server Platforms

创建 ▾

描述
无

Extensions ⓘ
无

附件 1

Screenshot 2024... .14.jpg
12 6 2024, 10:55 下午

子任务 66% 已完成

- RVS-1782 [Inception] - Infrastructure Setup Request **RS** 已完成 ▾
- RVS-1783 [Plan] - Develop Specification Plan **AW** 已完成 ▾
- RVS-1784 [Plan] - Governing Committee Approval **RS** APPROVAL NOT REQUIRED ▾
- RVS-1785 [Plan] - Request AR Review (consultative activity) **RS** AR REVIEW NOT REQUIRED ▾

详细信息

BoD Report	Yes
Ratification Progress	On Track
Baseline Rat. Quarter	24Q4
Target Rat. Quarter	25Q1
Is Fast Track?	No
ISA or NON-ISA	NON-ISA
GitHub	https://github.com/riscv-non-isa/riscv-pl...
Spec Plan Approval	2024年6月12日
Internal Review Start	2024年9月10日
ARC Freeze Request	2024年10月10日
Specification Freeze	2024年11月16日
Public Review Start	2024年11月17日
TSC Ratification Approval	2025年1月15日

1

Brief Introduction of openEuler RISC-V

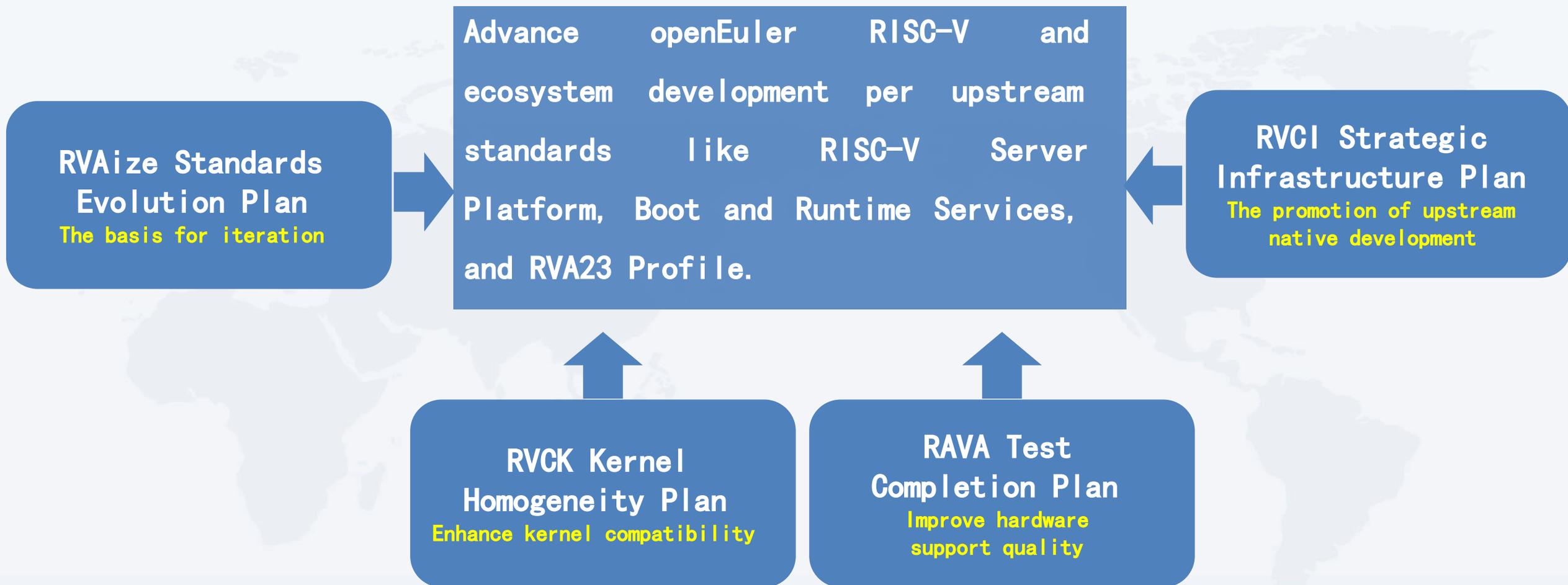
2

Problems and Opportunities of current RISC-V Ecosystem

3

Solutions to tackle the Fragmentation

One Fundamental Mission & Four Ecological Plans



Guiding Version Iteration and Updates Adhere to RISC-V profiles

Key upstream standards concerned

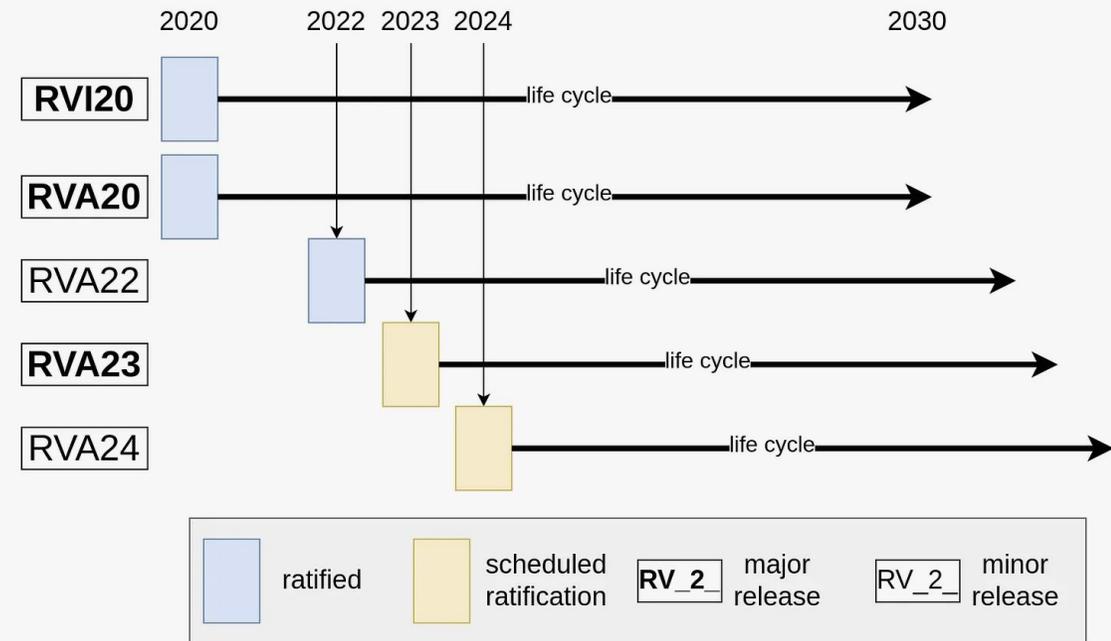
RVA23: <https://lf-riscv.atlassian.net/browse/RVS-2708>

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>



- 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

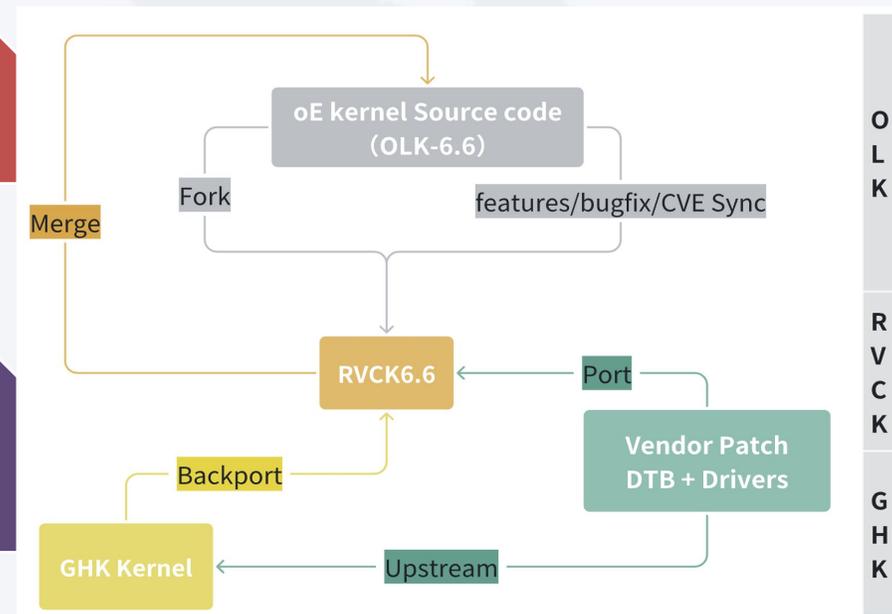
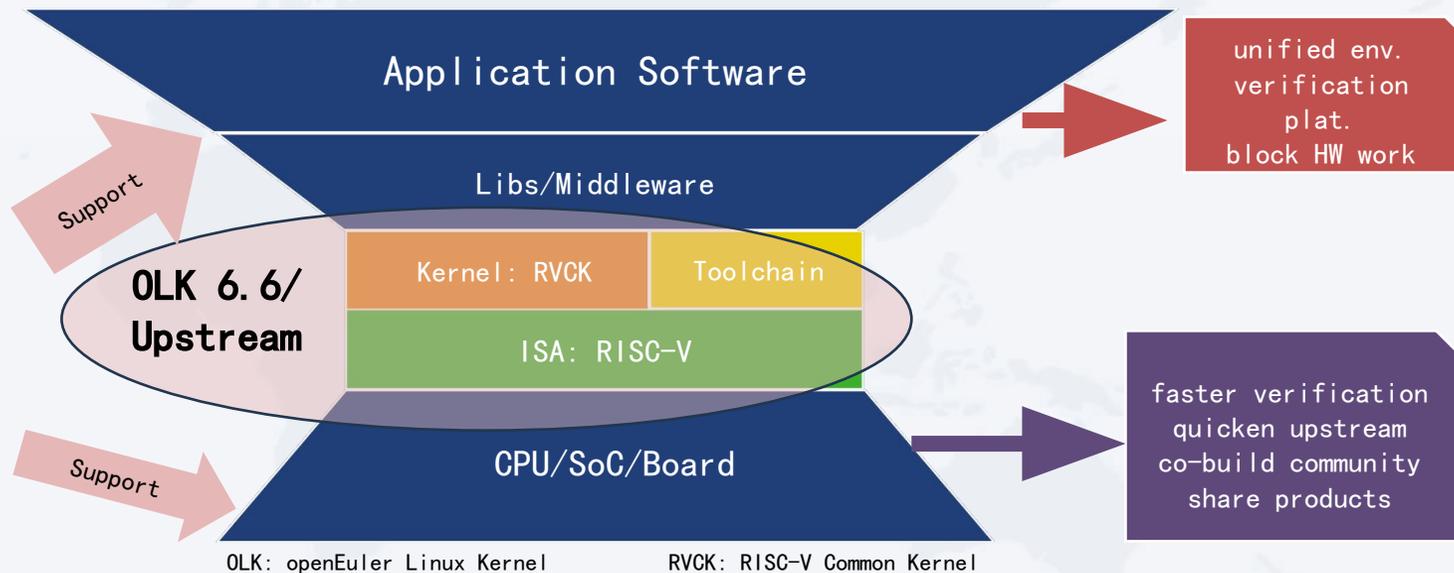
openeuler-ci-bot 拥有者 26 分钟前

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

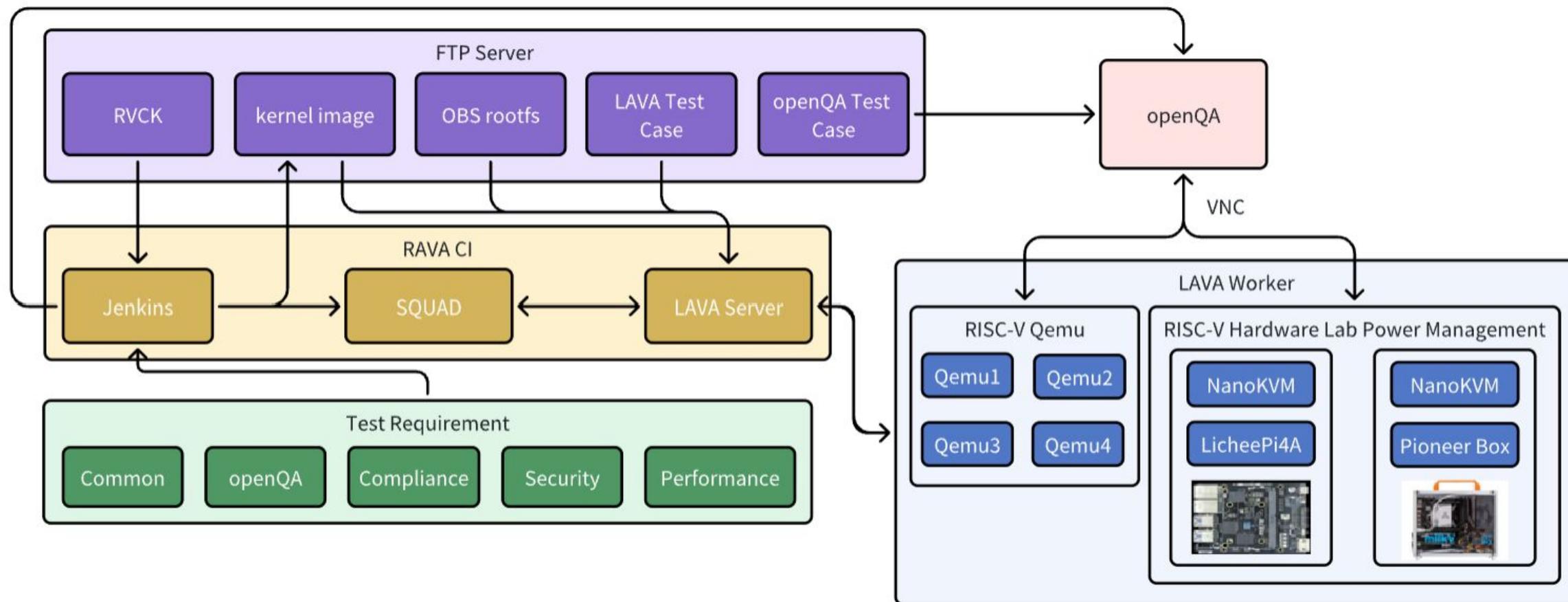
RVCK Kernel Homogeneity Plan



Unify baseline to benefit upstream and downstream ecosystems

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

RAVA Test Completion Plan



work together for the RISC-V software ecosystems



Fragmentation to **de-fragmentation** to diversification



Thanks !