



openEuler for RISC-V Servers: Challenges & Roadmap

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Content

1

Brief Introduction of openEuler RISC-V

2

Problems and Opportunities of current RISC-V Ecosystem

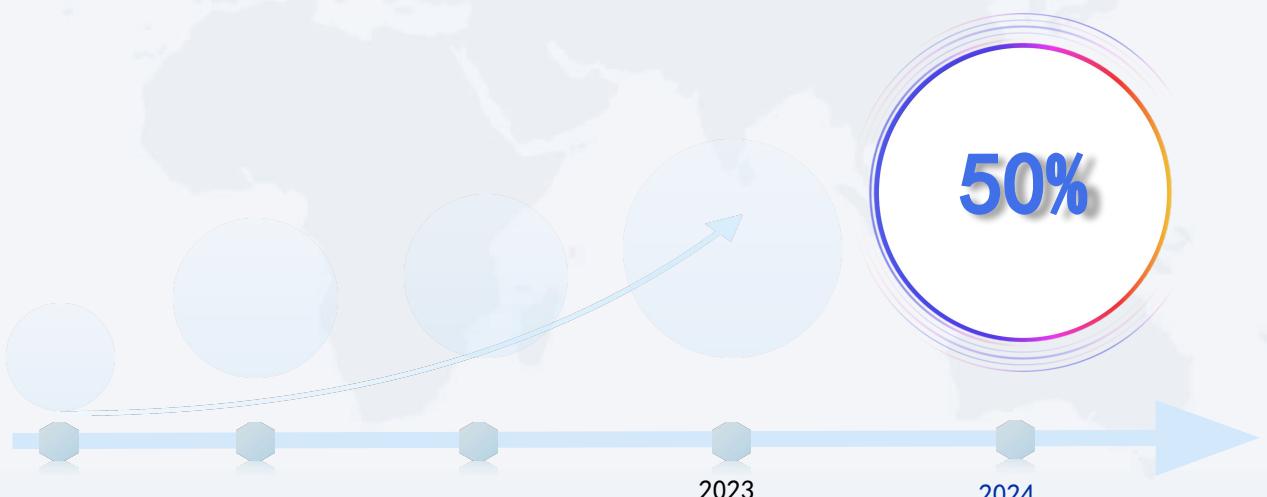
3

Solutions to tackle the Fragmentation

Introduction of openEuler Community



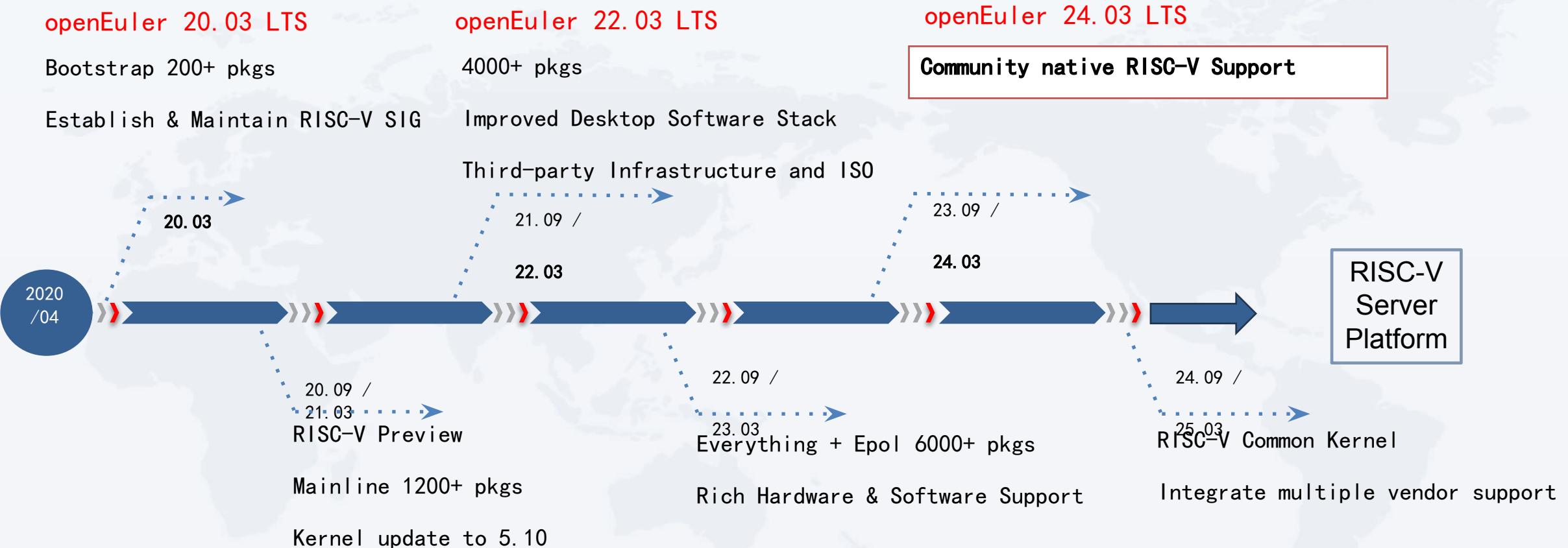
- RPM based Linux Distro, *not just another centos*
- Open-sourced in 2019
- Mainly deployed on servers
- Website: <https://www.openeuler.org/>



IDC: Chinese Server OS market share (2024)



openEuler RISC-V Milestones

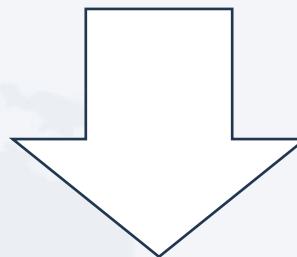


LTS Version: released every 2 years and maintained for 4 years

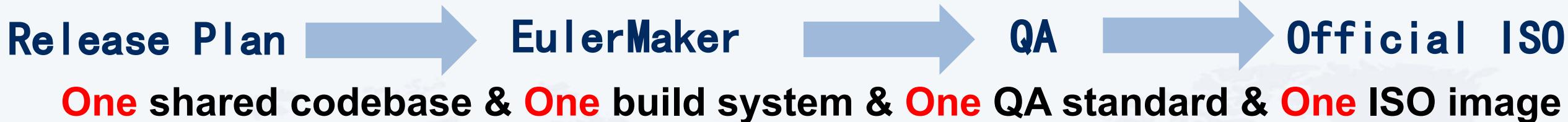
Innovation Version: released every 6 months and maintained for 6 months

- 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

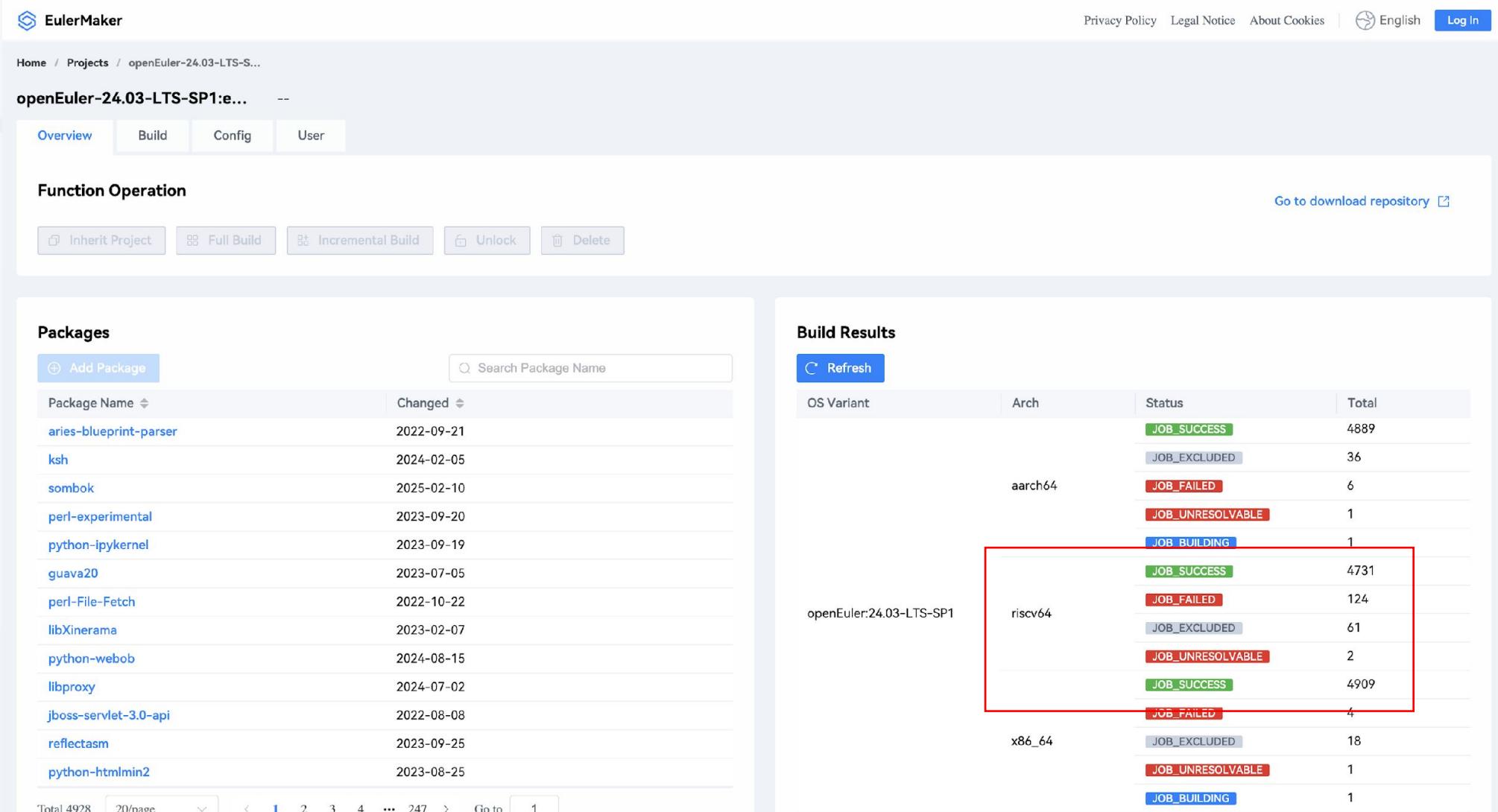
[Release Notes](#) | [Installation Guide](#) | [White Paper](#) | [Lifecycle](#)

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) 	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 

□ EulerMaker Support for RISC-V Architecture enabled



The screenshot displays the EulerMaker web interface, specifically the 'openEuler-24.03-LTS-SP1' project page. The top navigation bar includes links for Home, Projects, Overview, Build, Config, User, Privacy Policy, Legal Notice, About Cookies, English, and Log In.

Function Operation section:

- Buttons: Inherit Project, Full Build, Incremental Build, Unlock, Delete.
- Text: Go to download repository.

Packages section:

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

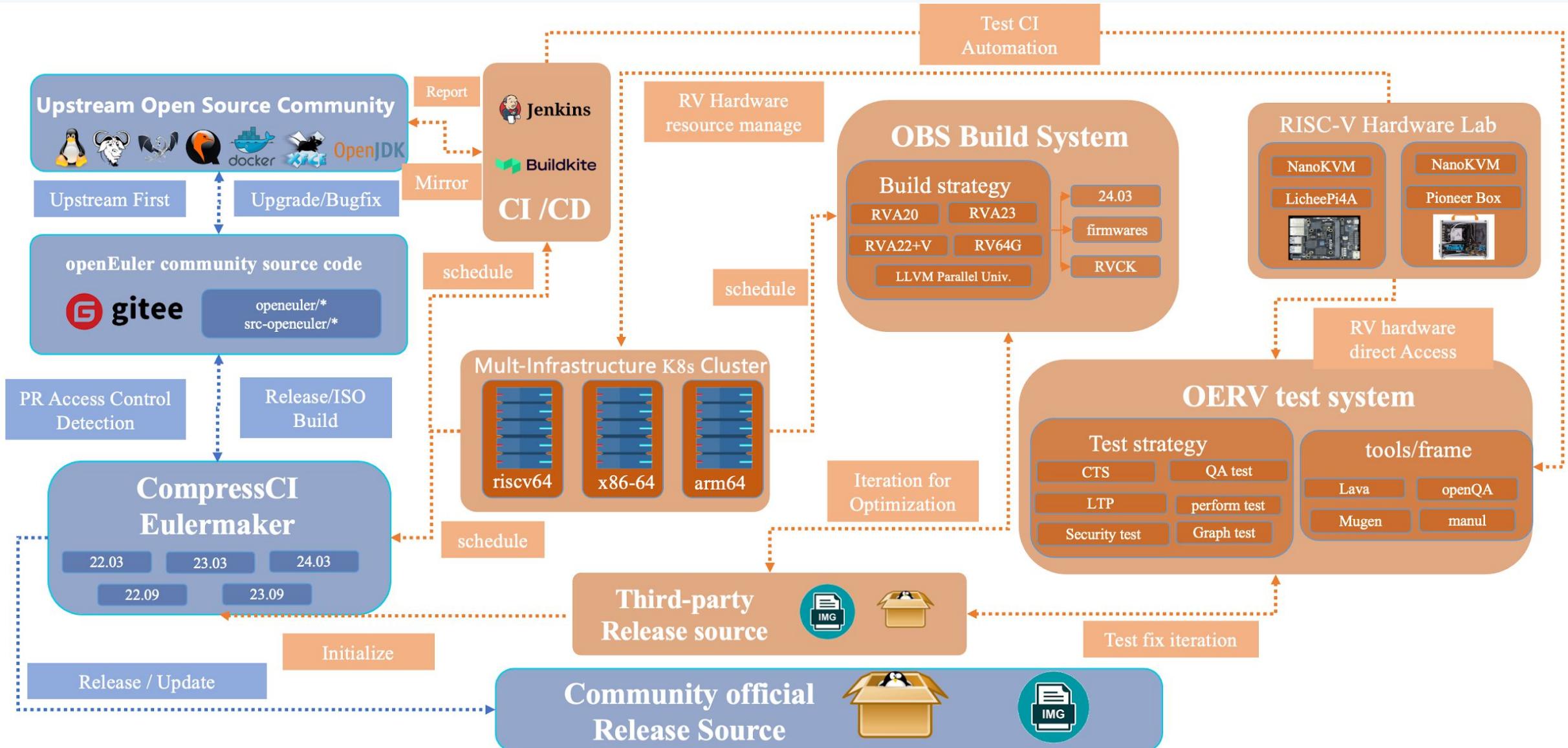
Total 4928 20/page < 1 2 3 4 ... 247 > Go to 1

Build Results section:

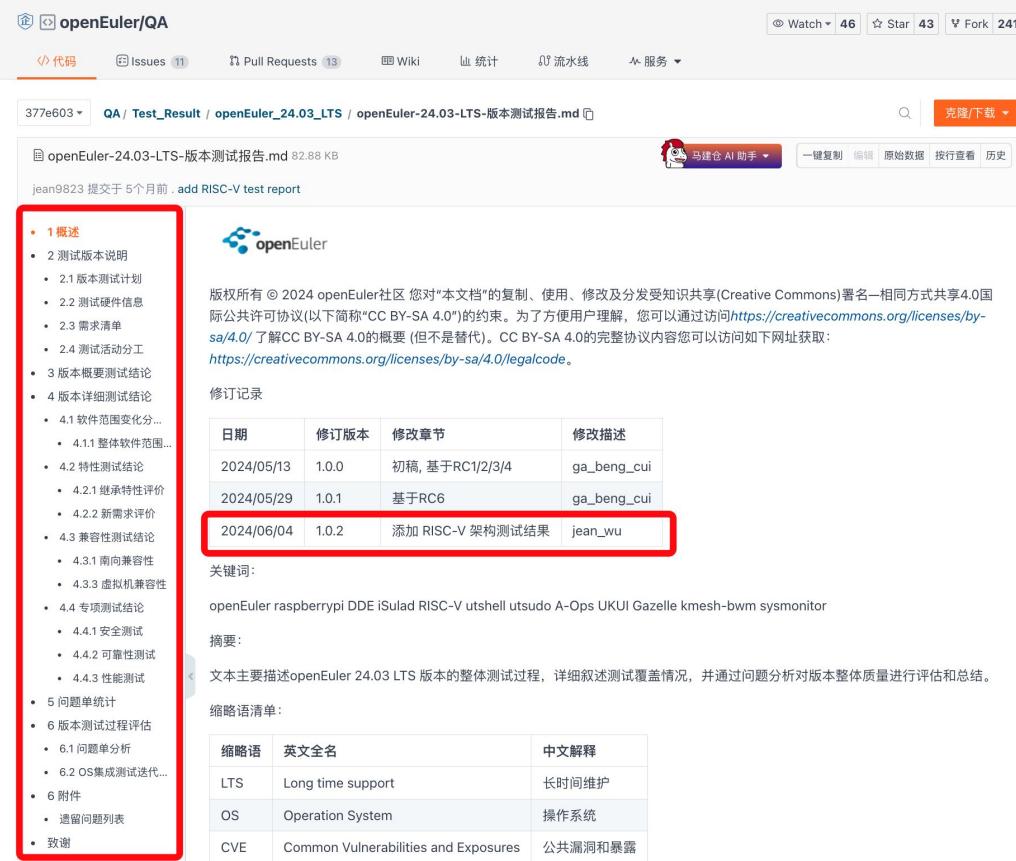
OS Variant	Arch	Status	Total
openEuler:24.03-LTS-SP1	aarch64	JOB_SUCCESS	4889
		JOB_EXCLUDED	36
		JOB_FAILED	6
		JOB_UNRESOLVABLE	1
		JOB_BUILDING	1
riscv64	riscv64	JOB_SUCCESS	4731
		JOB_FAILED	124
		JOB_EXCLUDED	61
		JOB_UNRESOLVABLE	2
		JOB_SUCCESS	4909
x86_64	x86_64	JOB_FAILED	4
		JOB_EXCLUDED	18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



Test Report Summary:

- 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 软件范围变化分析
 - 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
 - 4.3.2 虚拟机兼容性
 - 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**
- 致谢**

Revision History:

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

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, yarpigen, 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.

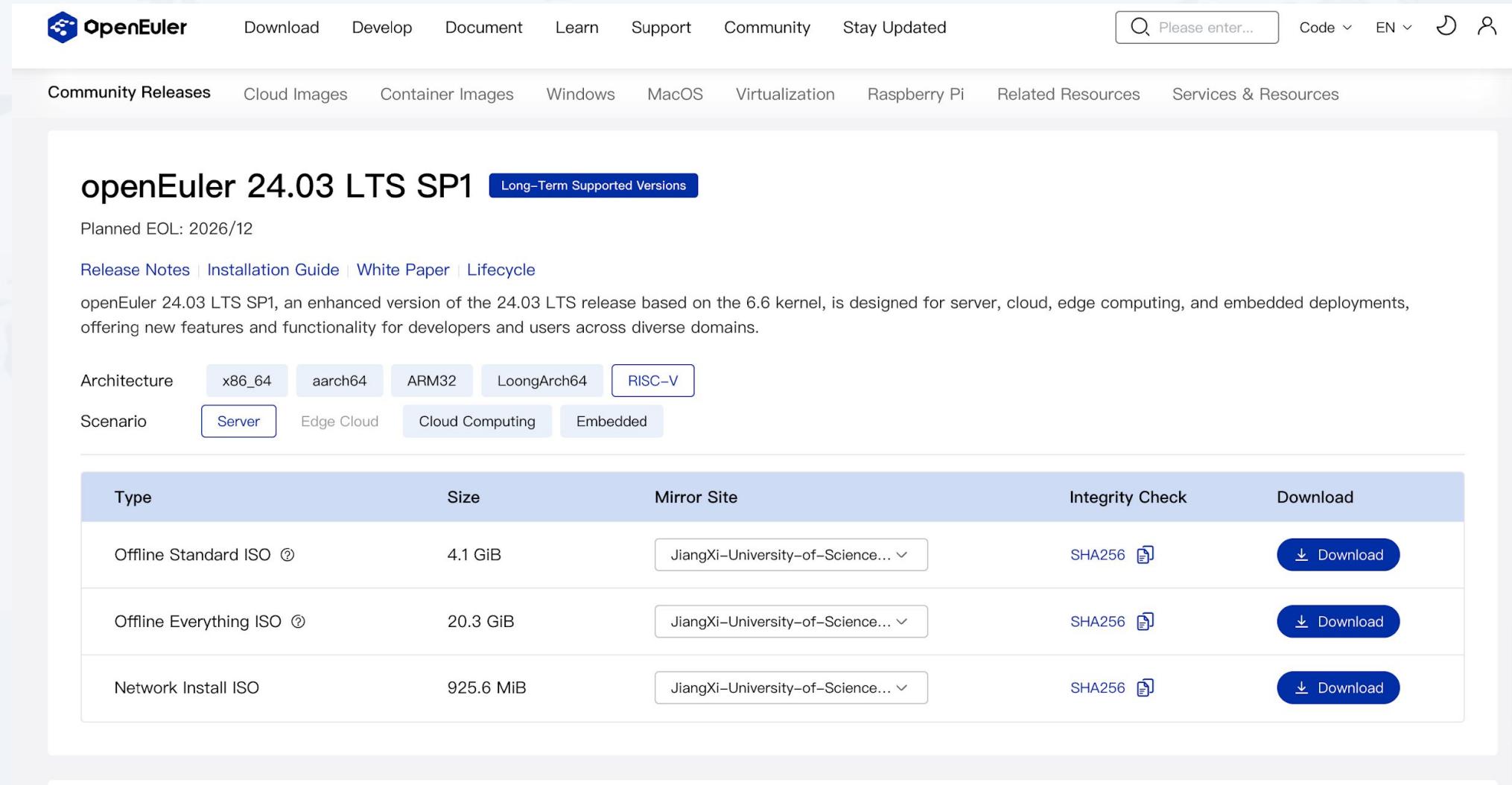
openEuler 24.03 LTS Testing Strategy

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. There is also a search bar, a language switcher (Code EN), and user icons for login and profile.

Below the navigation bar, there is a secondary navigation menu with links for Community Releases, Cloud Images, Container Images, Windows, MacOS, Virtualization, Raspberry Pi, Related Resources, and Services & Resources.

The main content area features a large heading for "openEuler 24.03 LTS SP1" with a "Long-Term Supported Versions" badge. It includes a "Planned EOL: 2026/12" note and links to Release Notes, Installation Guide, White Paper, and Lifecycle.

Below this, there is a brief description of the release: "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."

Filtering options for Architecture (x86_64, aarch64, ARM32, LoongArch64, RISC-V) and Scenario (Server, Edge Cloud, Cloud Computing, Embedded) are shown.

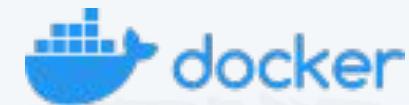
A table provides download links for three types of ISO images:

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 ✓

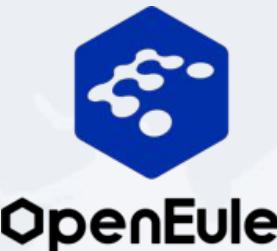


kubernetes



Web✓ Hotfix Service ✓

SAMBA



POSTFIX



NGINX

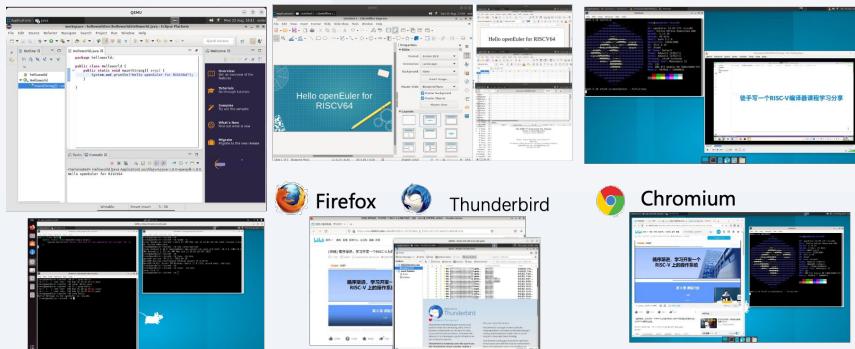


Open Source Software Stack for Desktop Environment

DE. ✓ browser✓ Mailbox ✓ Player ✓

Graph Editor ✓ VNC ✓ Network System ✓

Document Processing System ✓ Print System ✓

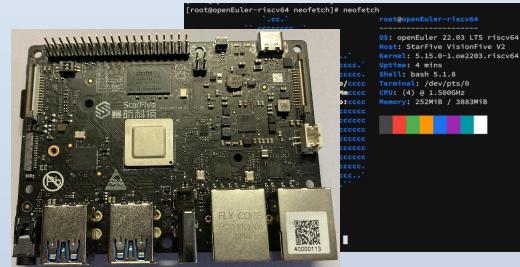


Hardware Supported

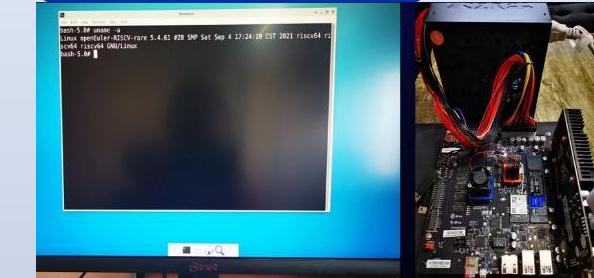
10+ DVBs supported



StarFive VisionFive 2



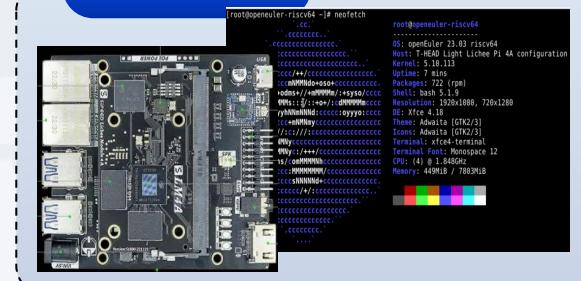
SiFive Unmatched



Sophgo Pioneer



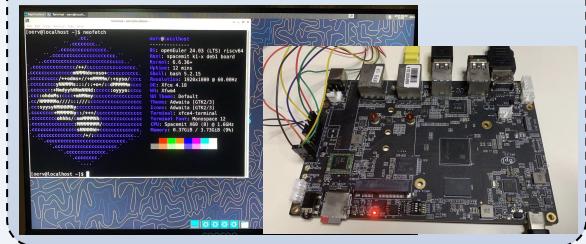
LicheePi 4A



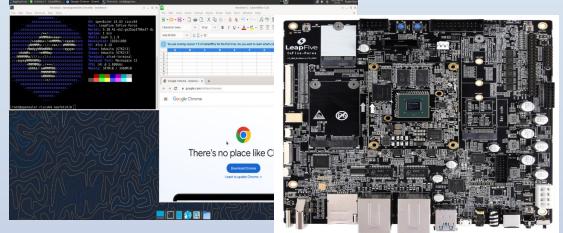
Nezha D1



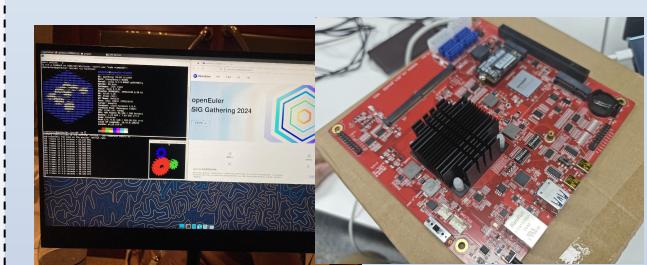
Banana Pi BPI-F3



LeapFive Poros



XiangShan Nanhu



Content

1

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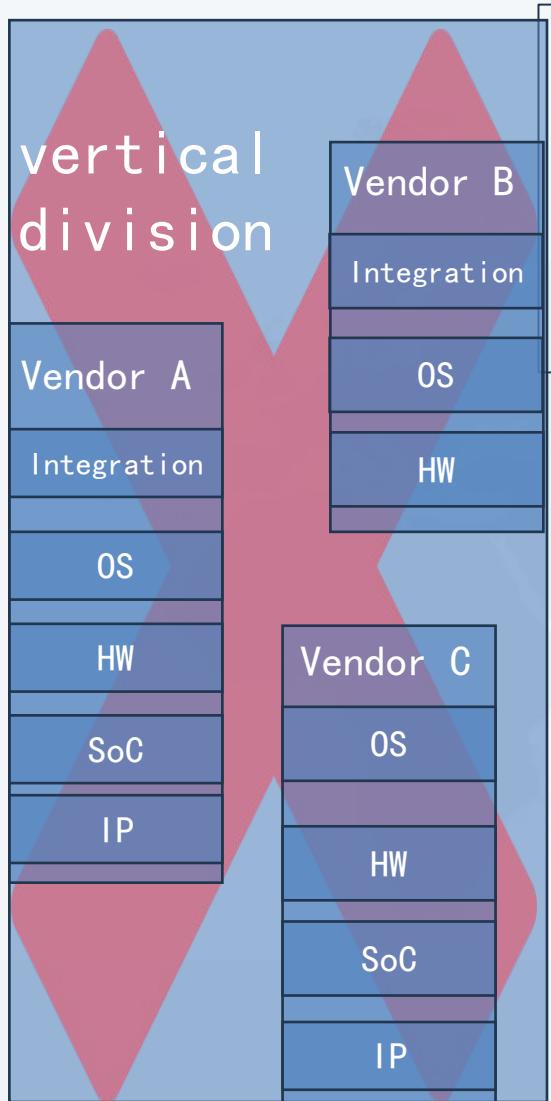
2

Problems and Opportunities of current RISC-V Ecosystem

3

Solutions to tackle the Fragmentation

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



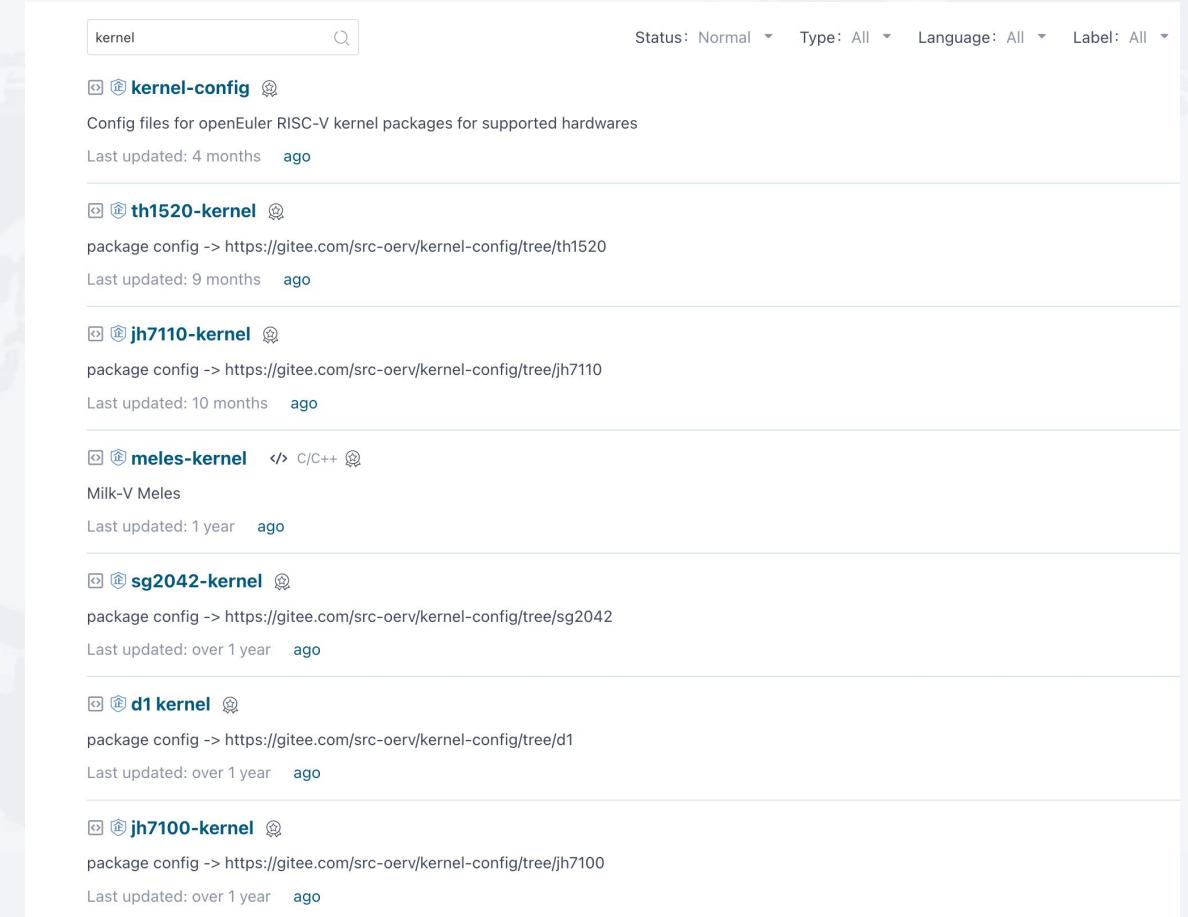
2 Observations

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.



The screenshot shows a search results page for "kernel" on a platform like Gitee. The search bar at the top contains "kernel". Below it, there are several search filters: Status: Normal ▾, Type: All ▾, Language: All ▾, and Label: All ▾. The results list seven entries:

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

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-vmm: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 [@endener](#) in PR #91, and is the third attempt to replace 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 an entrypoint 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.

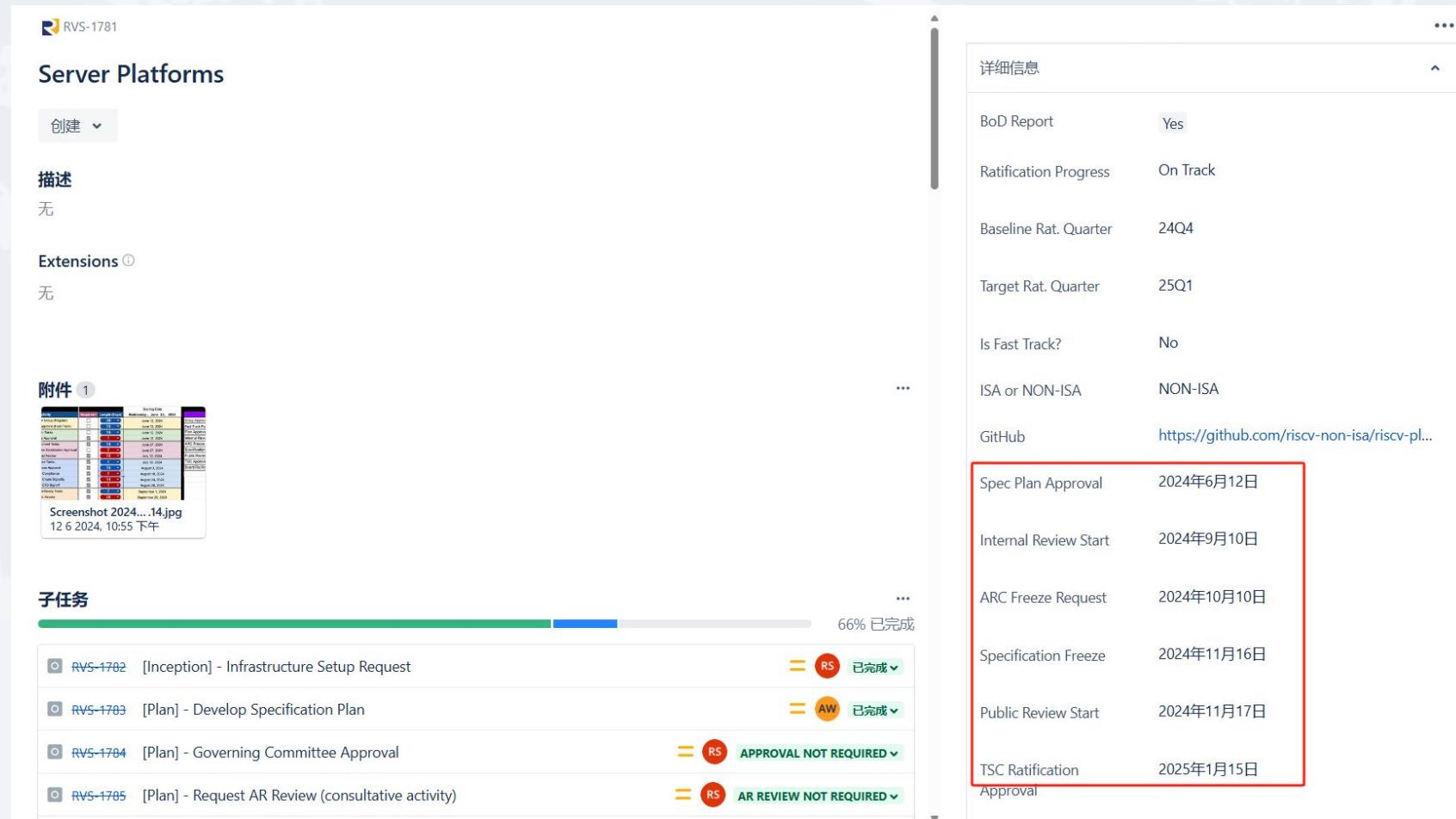
Requirements

Before submitting your PR, please make sure you've met the following:

Category	Requirement	Status
banana_f3(SCAS)	34	4075 / 4075
RVGCC_Zbb_Zbb (Remlab.net)	36	4099 / 4099
RV7728b310	22	3726 / 3726
g4831d732b	25	3587 / 3587
g679cb04575	25	3695 / 3695
g72f8aaac5	22	3651 / 3651
g7300v	22	3699 / 3699
gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)	22	3651 / 3651
gcc 11 (Ubuntu 13.2.0-4ubuntu3-bb2)	34	4075 / 4075
gcc 11 (Debian 14-20240429-1)	36	4099 / 4099
linux	22	3726 / 3726
riscv64	25	3587 / 3587
s390x	25	3695 / 3695

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!



The screenshot shows the RISC-V Server Platform Spec management interface. On the left, there's a summary section with 'Server Platforms' and a '创建' (Create) button. Below it are sections for '描述' (Description) and 'Extensions'. The '附件' (Attachments) section contains a screenshot of a spreadsheet titled 'Screenshot 2024...14.jpg' from June 12, 2024. The '子任务' (Sub-tasks) section lists four tasks with their status: 'RVS-1702 [Inception] - Infrastructure Setup Request' (Completed), 'RVS-1703 [Plan] - Develop Specification Plan' (Completed), 'RVS-1704 [Plan] - Governing Committee Approval' (Approval Not Required), and 'RVS-1705 [Plan] - Request AR Review (consultative activity)' (AR Review Not Required). On the right, a detailed information panel shows the following data:

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

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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

Guiding Version Iteration and Updates Adhere to RISC-V profiles

Key upstream standards concerned

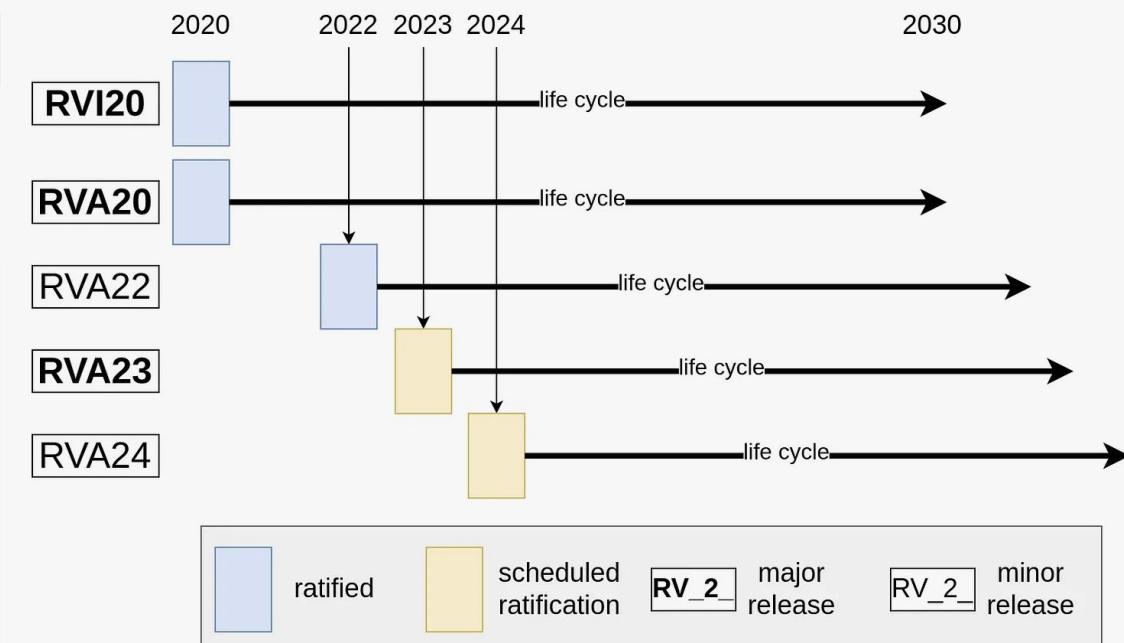
RVA23: <https://lf-riscv.atlassian.net/browse/RVS-2708>

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	

发表 回复

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

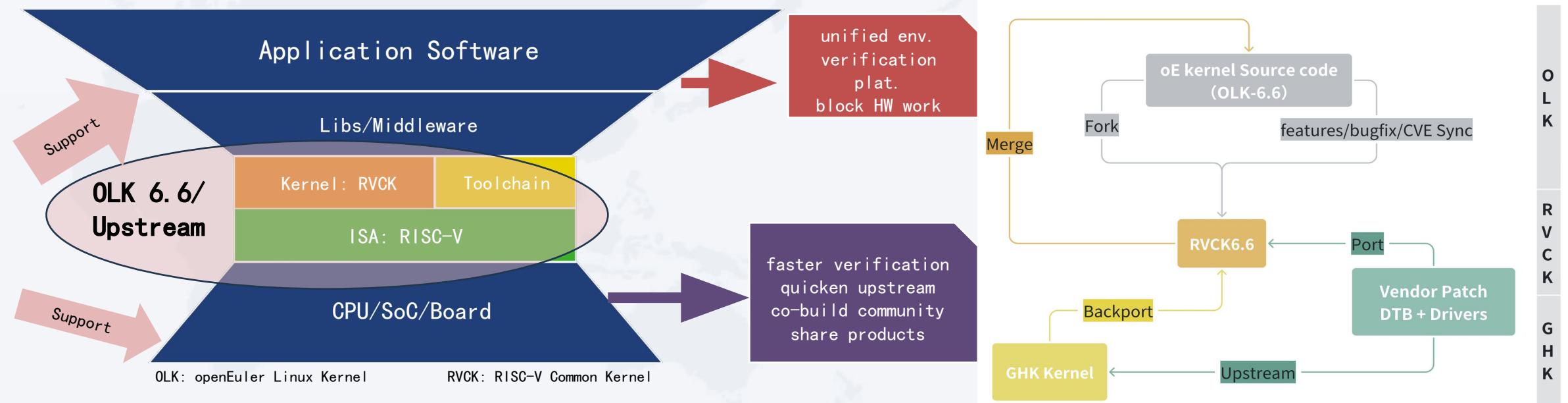
 openeuler-ci-bot 拥有者 26分钟前

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	

发表 回复

RVCK Kernel Homogeneity Plan



Unify baseline to benefit upstream and downstream ecosystems

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



XuanTie 玄铁

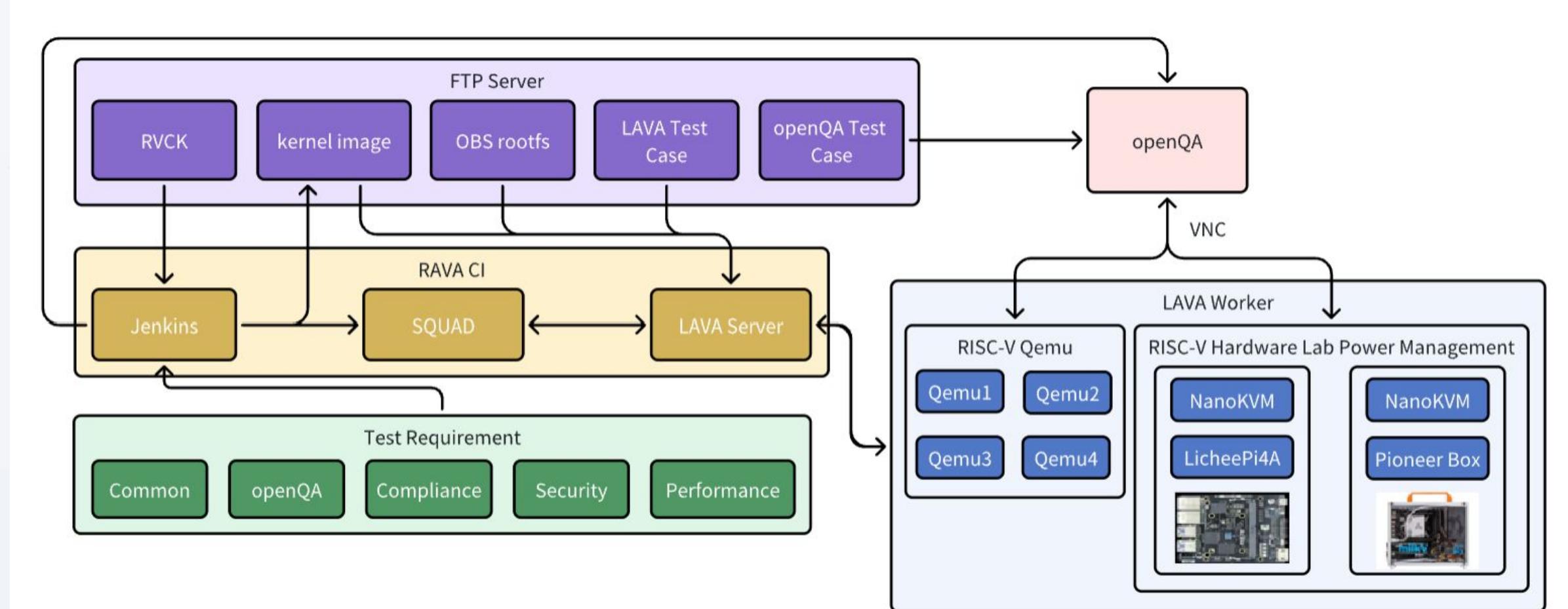
算得 SOPIGO

SPACEMIT
进迭时空

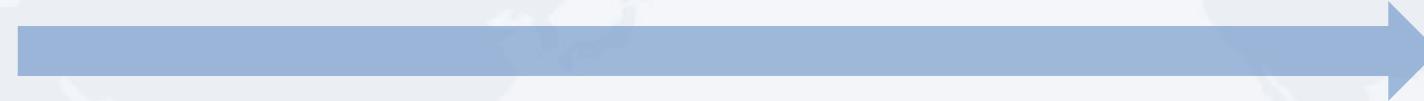
SMARCO
中科睿芯

StarFive
赛昉科技

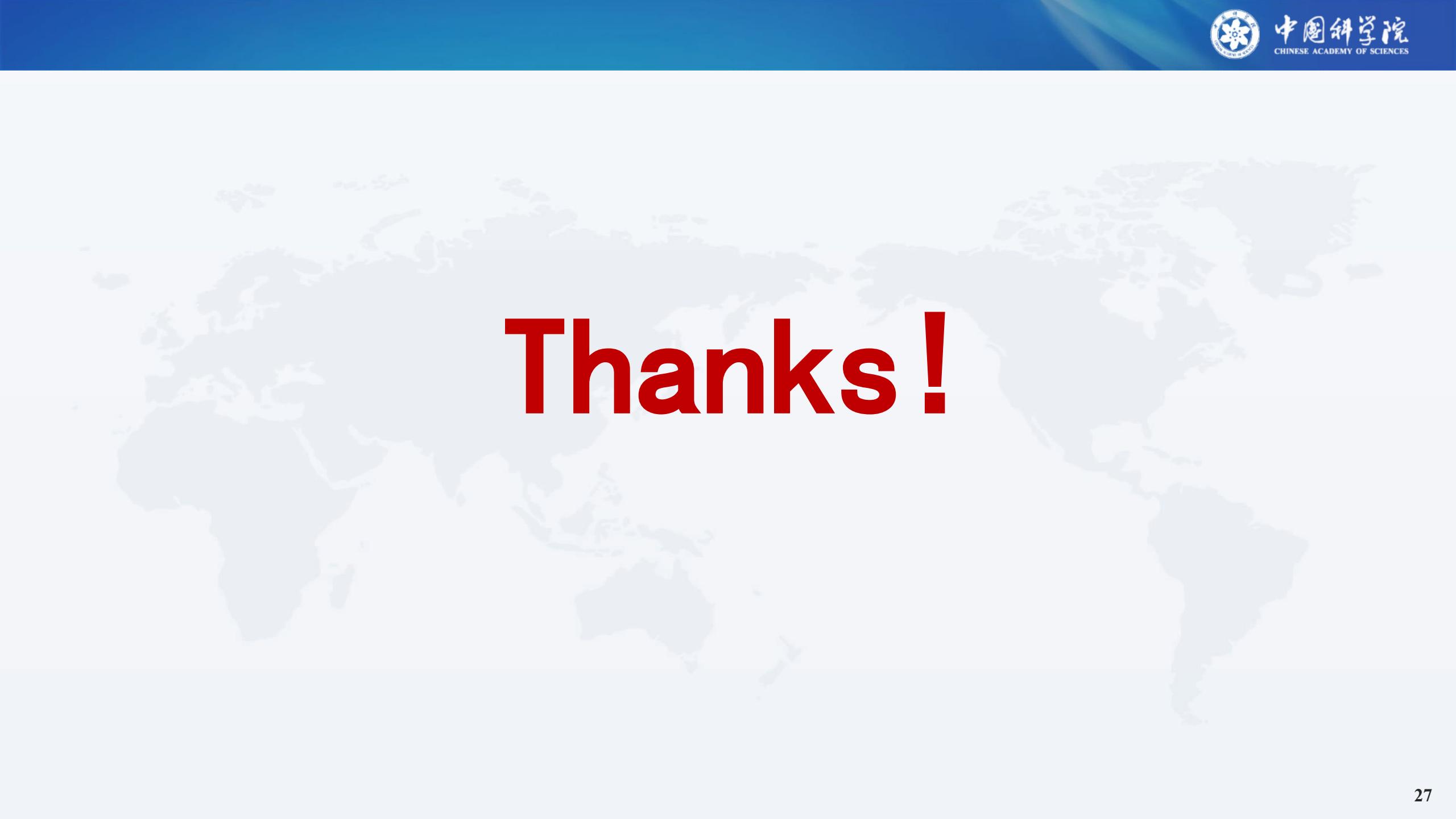
RAVA Test Completion Plan



work together for the RISC-V software ecosystems



Fragmentation to **de-fragmentation** to diversification



Thanks!