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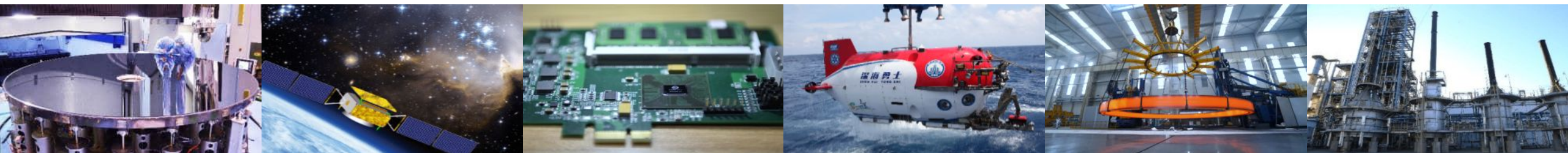
# openEuler for RISC-V Servers: Challenges & Roadmap

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Deputy Director and Chief Engineer

Institute of Software, Chinese Academy of Sciences (ISCAS)

May 2025



1

**Brief Introduction of openEuler RISC-V**

2

**Problems and Opportunities of current RISC-V Ecosystem**

3

**Solutions to tackle the Fragmentation**

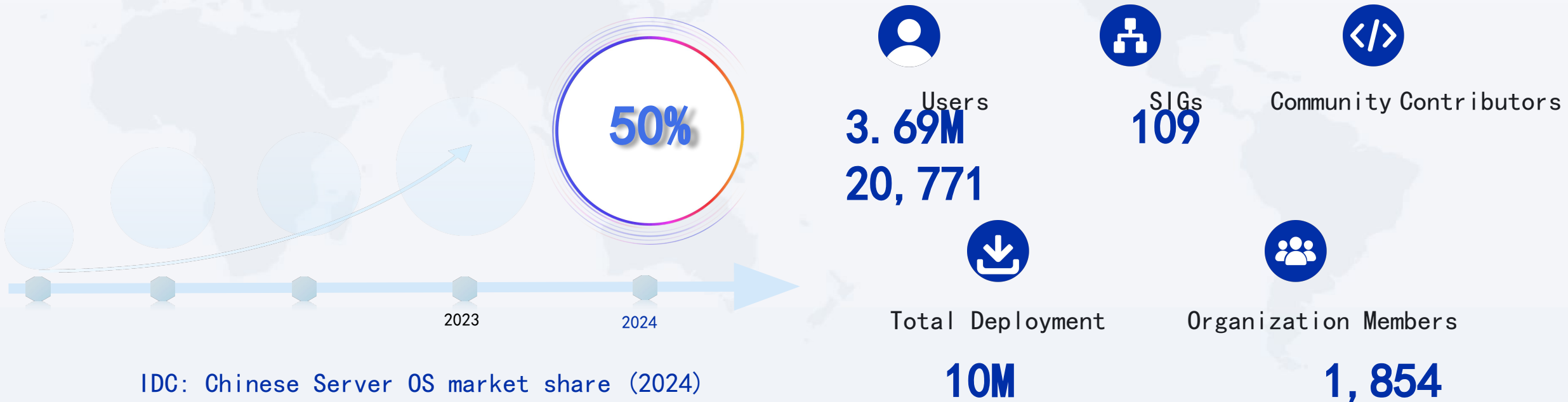
# Introduction of openEuler Community



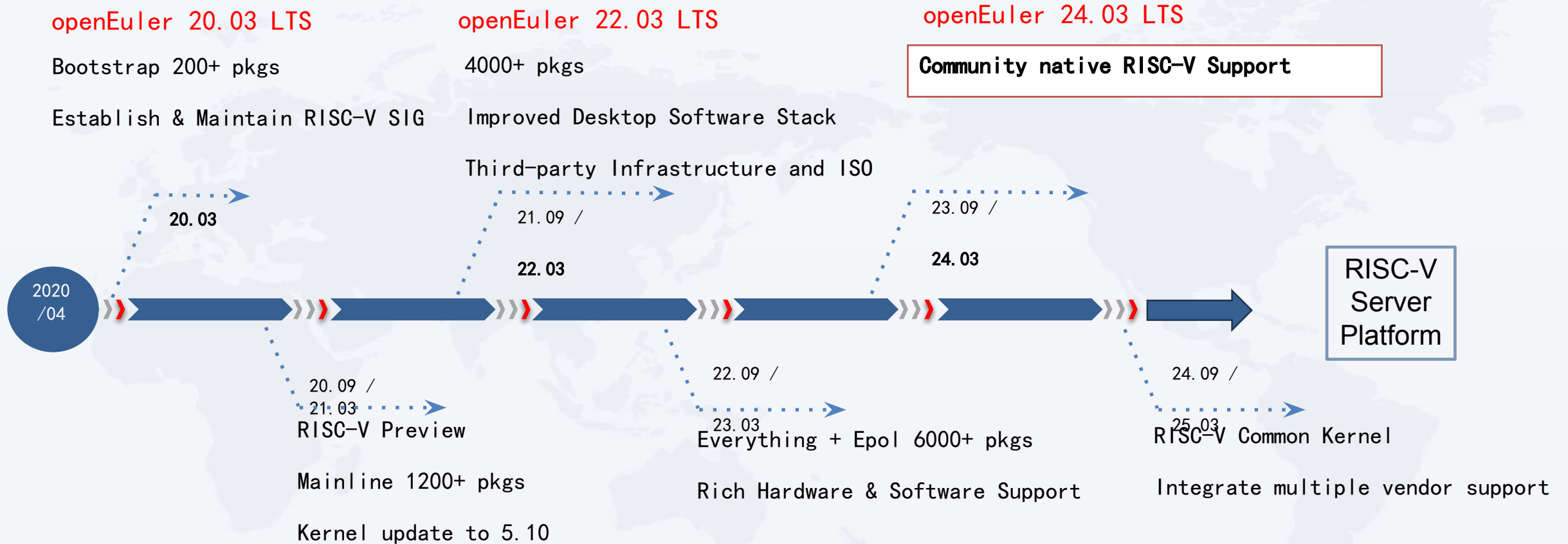
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- RPM based Linux Distro, *not just another centos*
- Open-sourced in 2019
- Mainly deployed on servers
- Website: <https://www.openeuler.org/>



# 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**

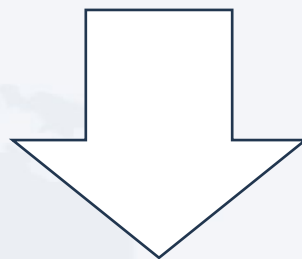
- ❑ **Released** by the openEuler Community
- ❑ **Developed** for Server & Desktop Scenarios
- ❑ **6000+ SRPMs** supported
- ❑ **Distinctive Features:** UEFI, Hotfix, Penglai TEE, etc.

❑ 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 <span>?</span>	3.9 GiB	Shanghai-Jiao-Tong-University (1 <span>▼</span> )	SHA256 <span>🔗</span>	<div>Download <span>↓</span></div>
Offline Everything ISO <span>?</span>	17.6 GiB	Shanghai-Jiao-Tong-University (1 <span>▼</span> )	SHA256 <span>🔗</span>	<div>Download <span>↓</span></div>
Network Install ISO	906.0 MiB	Shanghai-Jiao-Tong-University (1 <span>▼</span> )	SHA256 <span>🔗</span>	<div>Download <span>↓</span></div>



## EulerMaker Support for RISC-V Architecture enabled

 EulerMaker

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Home / Projects / openEuler-24.03-LTS-S...

openEuler-24.03-LTS-SP1:e... --

Overview | Build | Config | User

Function Operation

[Go to download repository](#)

Inherit Project

Full Build

Incremental Build

Unlock

Delete

Packages

+ Add Package

Search Package Name

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

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

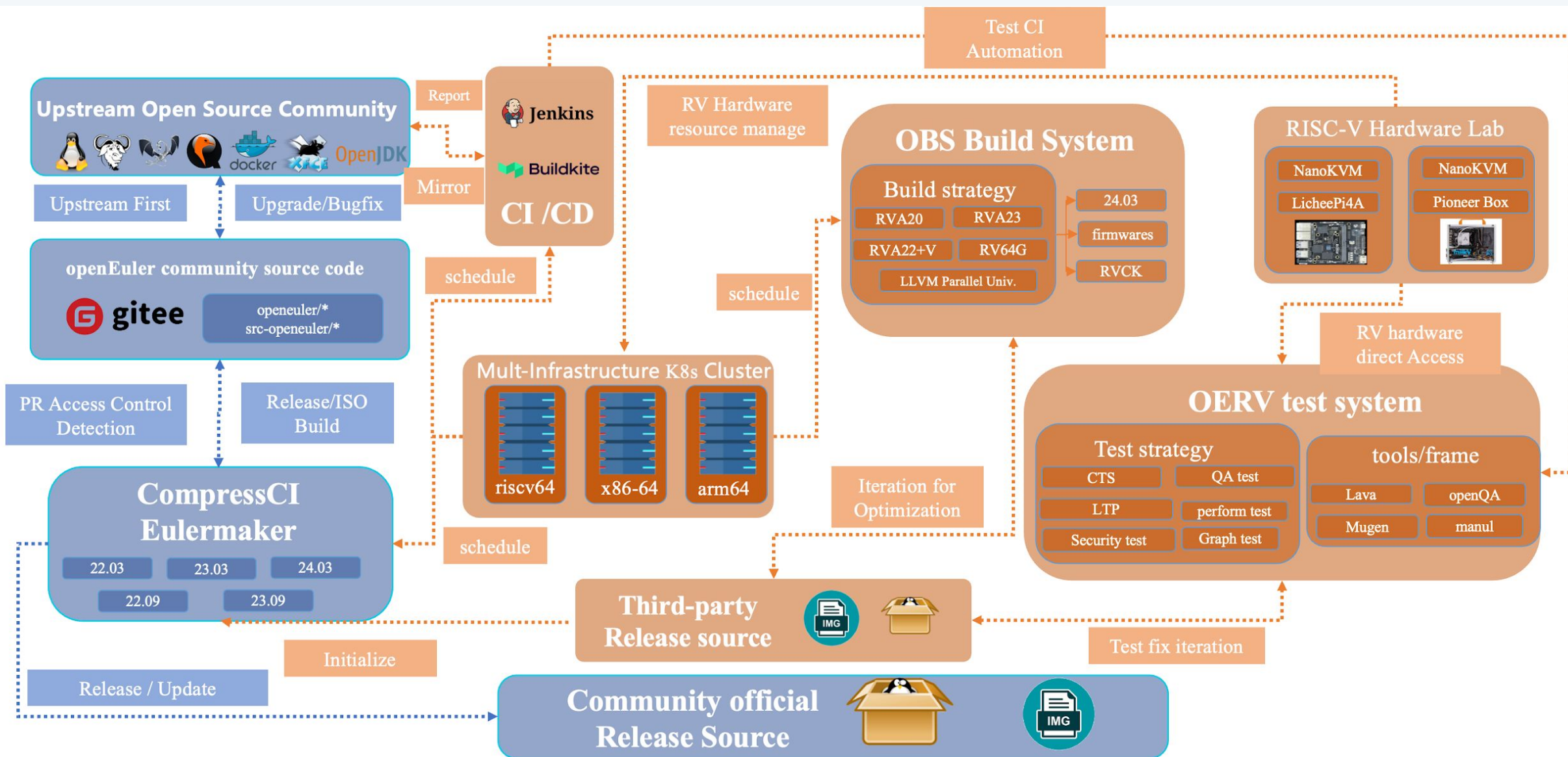
Build Results

Refresh

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	JOB_SUCCESS	4731
		JOB_FAILED	124
		JOB_EXCLUDED	61
		JOB_UNRESOLVABLE	2
		JOB_SUCCESS	4909
	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 Item	Test Content
Function Test	Testing the functionality of the OS using the Mugen automation framework.
Performance Test	unixbench,netperf izeone,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/QA

Watch 46Star 43Fork 241

CodeIssues 11Pull Requests 13Wiki统计流水线服务

377e603QA / 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.md82.88 KB

马建仓 AI 助手一键复制编辑原始数据按行查看历史

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

openEuler

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<https://creativecommons.org/licenses/by-sa/4.0/legalcode>.

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




## openEuler 24.03 LTS Testing Strategy

[https://gitee.com/openeuler/QA/tree/master/Test\\_Strategy/openEuler\\_24.03\\_LTS](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](https://gitee.com/openeuler/QA/tree/377e603220df44ed44b3763c45e8333d9a641dd3/Test_Result/openEuler_24.03_LTS)

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

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### openEuler 24.03 LTS SP1

Long-Term Supported Versions




Planned EOL: 2026/12

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

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.

Architecture x86\_64 aarch64 ARM32 LoongArch64 RISC-V

Scenario Server Edge Cloud Cloud Computing Embedded

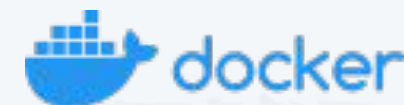
Type	Size	Mirror Site	Integrity Check	Download
Offline Standard ISO ②	4.1 GiB	<span>JiangXi-University-of-Science... ▼</span>	SHA256 	<span>Download</span>
Offline Everything ISO ②	20.3 GiB	<span>JiangXi-University-of-Science... ▼</span>	SHA256 	<span>Download</span>
Network Install ISO	925.6 MiB	<span>JiangXi-University-of-Science... ▼</span>	SHA256 	<span>Download</span>

# Open Source Server Software Stack



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Visualization ✓ Mail Server ✓



Database ✓ Container ✓



kubernetes

Web ✓ Hotfix Service ✓

ROS



OpenEuler

SAMBA



MariaDB



POSTFIX



DOVECOT



StratoVirt



iSulad



MySQL



Jenkins



Buildkite

NGINX



# Open Source Software Stack for Desktop Environment

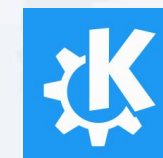
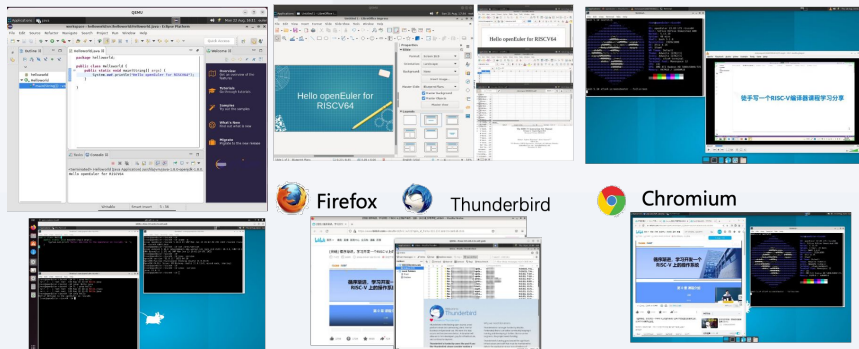


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DE. ✓ browser ✓ Mailbox ✓ Player ✓

Graph Editor ✓ VNC ✓ Network System ✓

Document Processing System ✓ Print System ✓







The bottom of the slide features the logos for RISC-V and OpenEuler, separated by a plus sign, indicating their partnership in the project.

[illegible][illegible][illegible]

A photograph of a computer monitor displaying a terminal window. The terminal shows the command `cat /dev/ttyACM0` and its output: `b1 b2 b3 b4 b5 b6 b7 b8 b9 ba bb bc bd be bf`. Below the monitor, an Arduino Uno board is connected to a USB cable.



1

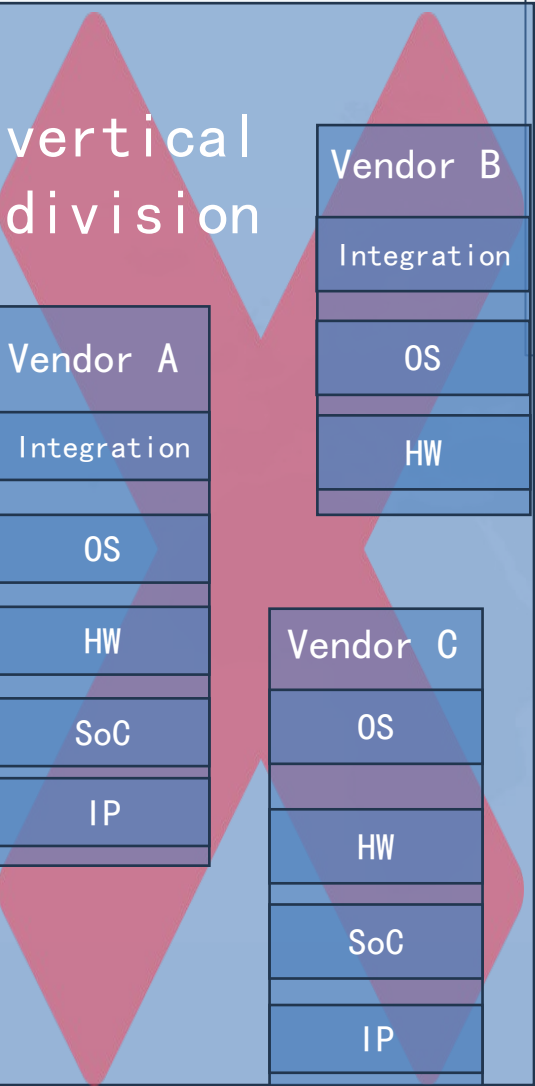
**Brief Introduction of openEuler RISC-V**

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3

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## 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

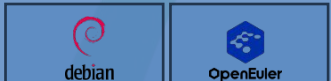
1. Vendors often ship fast by running vertically integrated hardware + software stacks—but that siloed model is hard to sustain.
2. Across the RISC-V ecosystem, more voices and real-world projects are lining up behind solid, shared standards.

## horizontal ecology

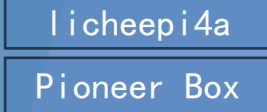
Integration Providers



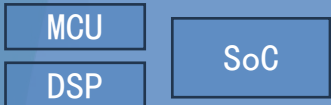
OS Vendors



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.

kernel 🔍 Status: Normal ▾ Type: All ▾ Language: All ▾ Label: All ▾

**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++

Milk-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.**

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

 Open 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 iteration 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 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 a new PR, please make sure you have the following:

9 minutes ago	N-116525-g0b7999481	riscv64	linux	gcc 13 (Ubuntu 13.2.0-4ubuntu3-bb2)	banana_f30SCAS	34	±	4075 / 4075
14 hours ago	N-116524-g077128b310	riscv64	linux	gcc 14 (Debian 14-20240429-1)	RV64GC_Zba_Zbb (Remlab.net)	36	±	4099 / 4099
2024-07-18	N-116330-g45316732ab	s390x	linux	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)		22	±	3726 / 3800
2024-07-11	n6.1.1-156-g630c0b4573	s390x	linux	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)		25	±	3587 / 3700
2024-07-11	n7.0.1-20-g2f8aa8c5	s390x	linux	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)		25	±	3695 / 3800
2024-07-18	N-116330-g45316732ab	s390x	linux	gcc 11 (Ubuntu 11.4.0-1ubuntu1-22.04)		22	±	3726 / 3800



# 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

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# One Fundamental Mission & Four Ecological Plans



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**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

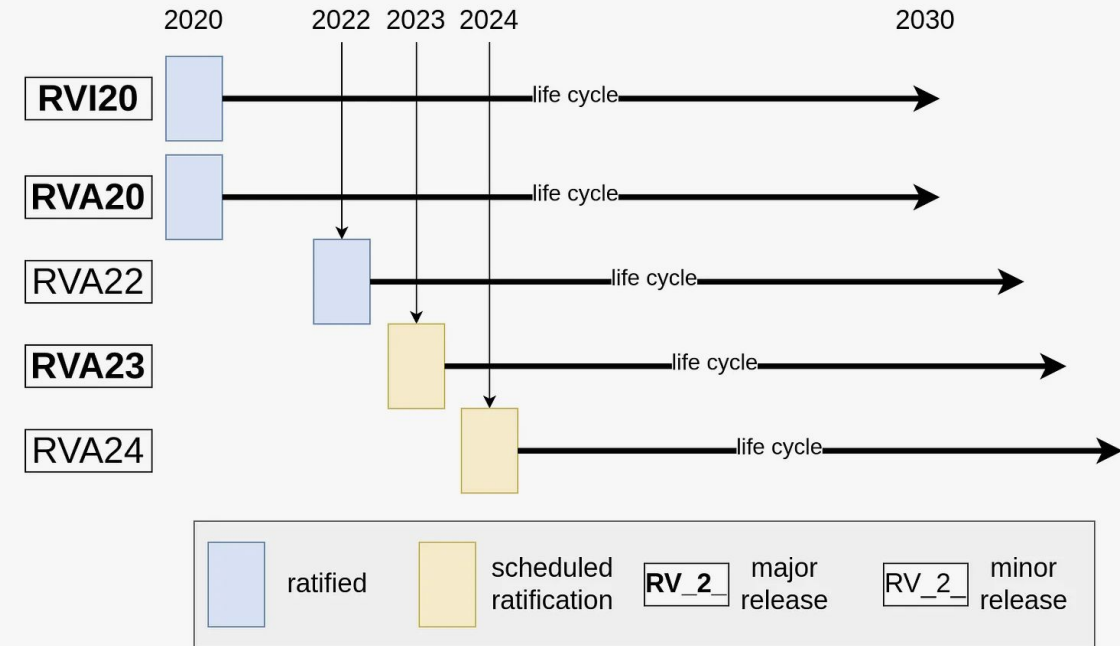
**RVA23:** <https://lf-riscv.atlassian.net/browse/RVS-2708>

**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	

 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

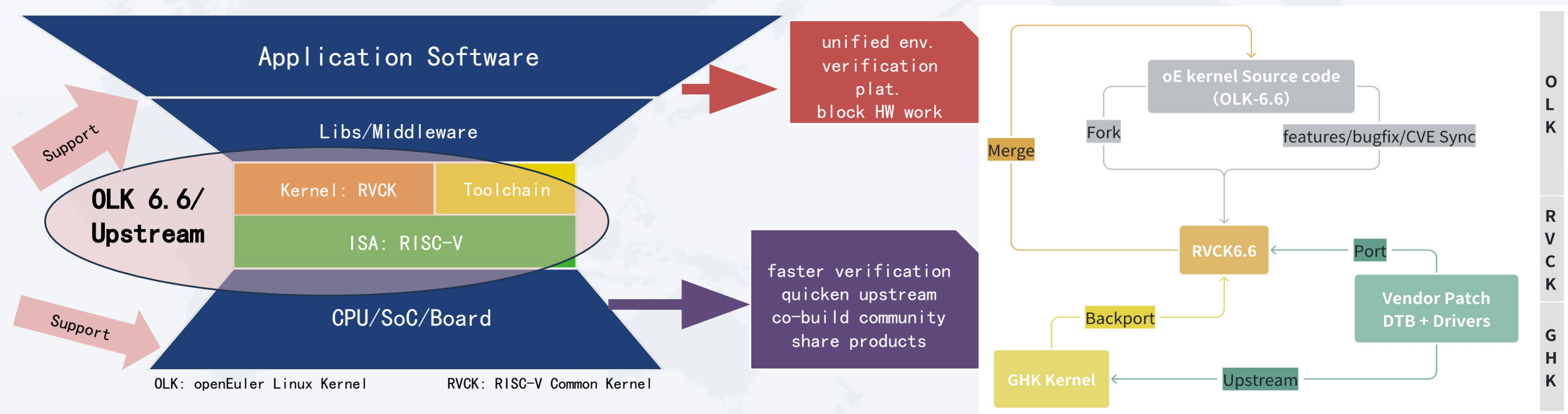
如下为接口变更检查结果，目标分支为openEuler-24.09，请PR提交者check差异信息

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



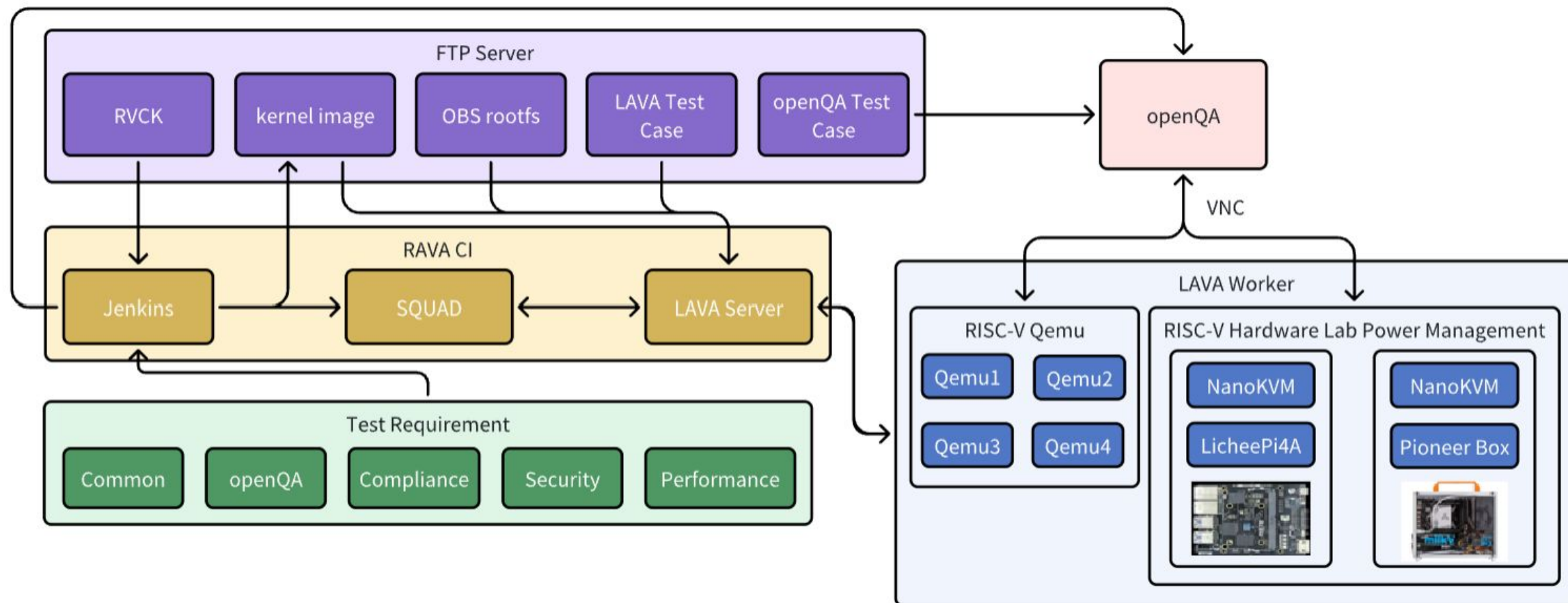
Unify baseline to benefit upstream and downstream ecosystems

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

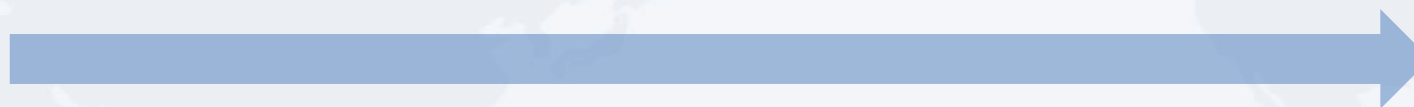
# RAVA Test Completion Plan



中国科学院  
CHINESE ACADEMY OF SCIENCES



work together for the RISC-V software ecosystems



Fragmentation to **de-fragmentation** to diversification



# Thanks !