From RustVMM to Kata-Containers:

THE DEVELOPMENT OF H EXT. BASED SOFTWARE ECOSYSTEM

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BACKGROUND

The virtualization software has a wide audience nowadays, they have proven themselves a very important software stack, to study and industry.
Due to the absence of SoCs with H ext., these software are not properly ported to or verified on real hardware.
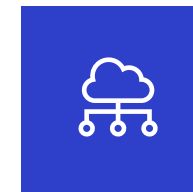
OBJECTIVES
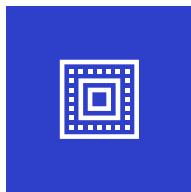
HW VERIFIED

Work closely with hardware providers, all software are well tested

UPSTREAM FIRST

Focus on contributing to upstream, affecting and benefits all distributions

SECURE SOLUTION

Secure solution on RISC-V platform based on virtualization

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RISC-V VIRTUALIZATION ROADMAP

Stage One

A bottom up, working and reliable software stack on RISC-V Orchestrated by Kubernetes, Secured by Kata-Containers, Speedup by StratoVirt, Powered by RustVMM, On openEuler RISC-V
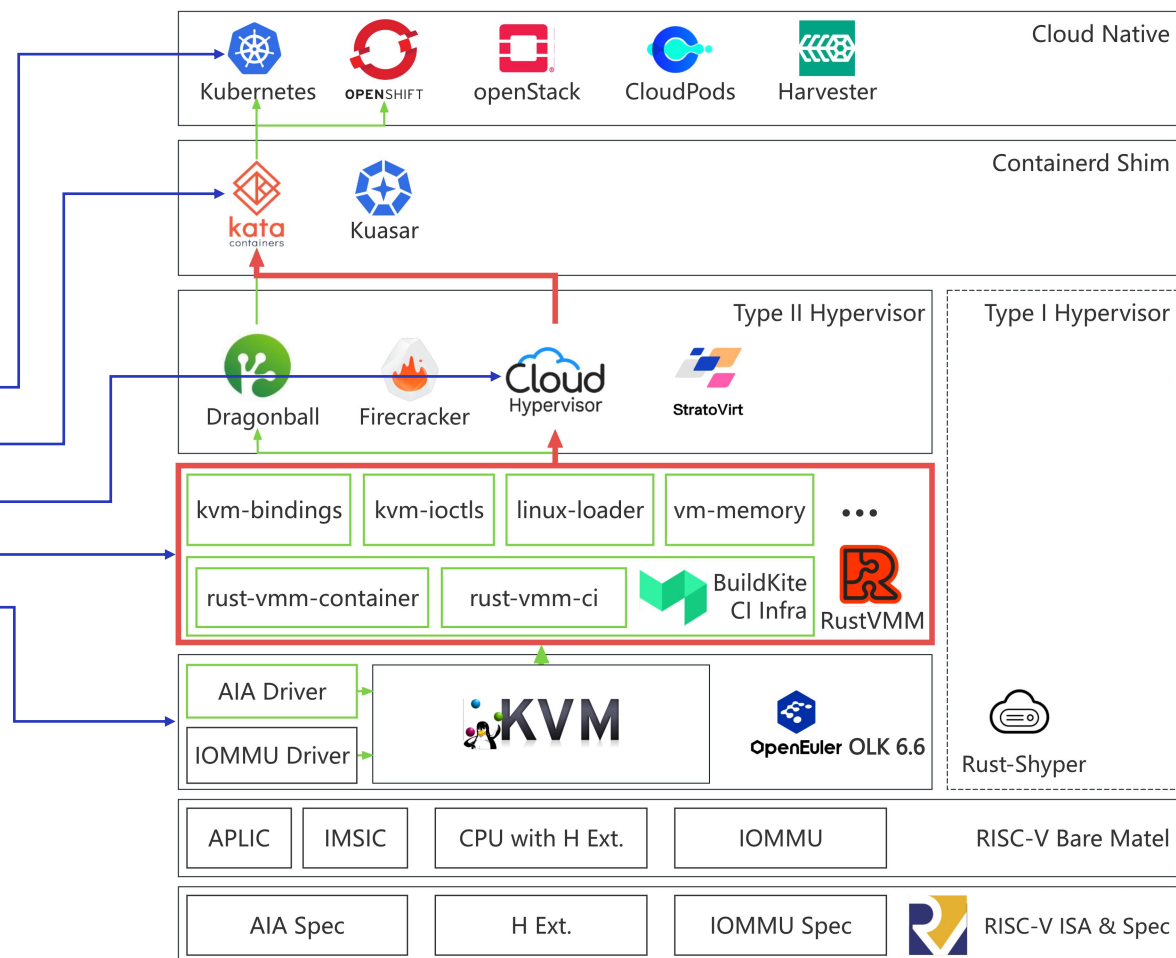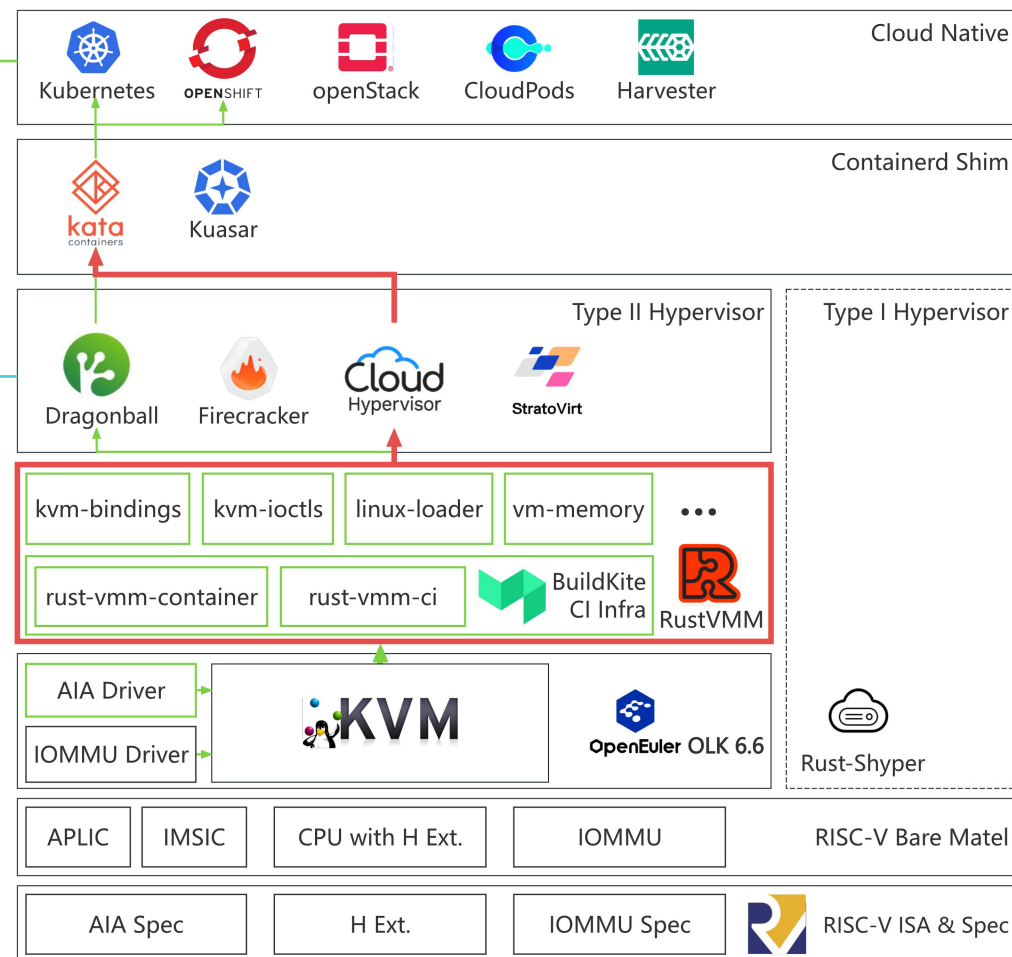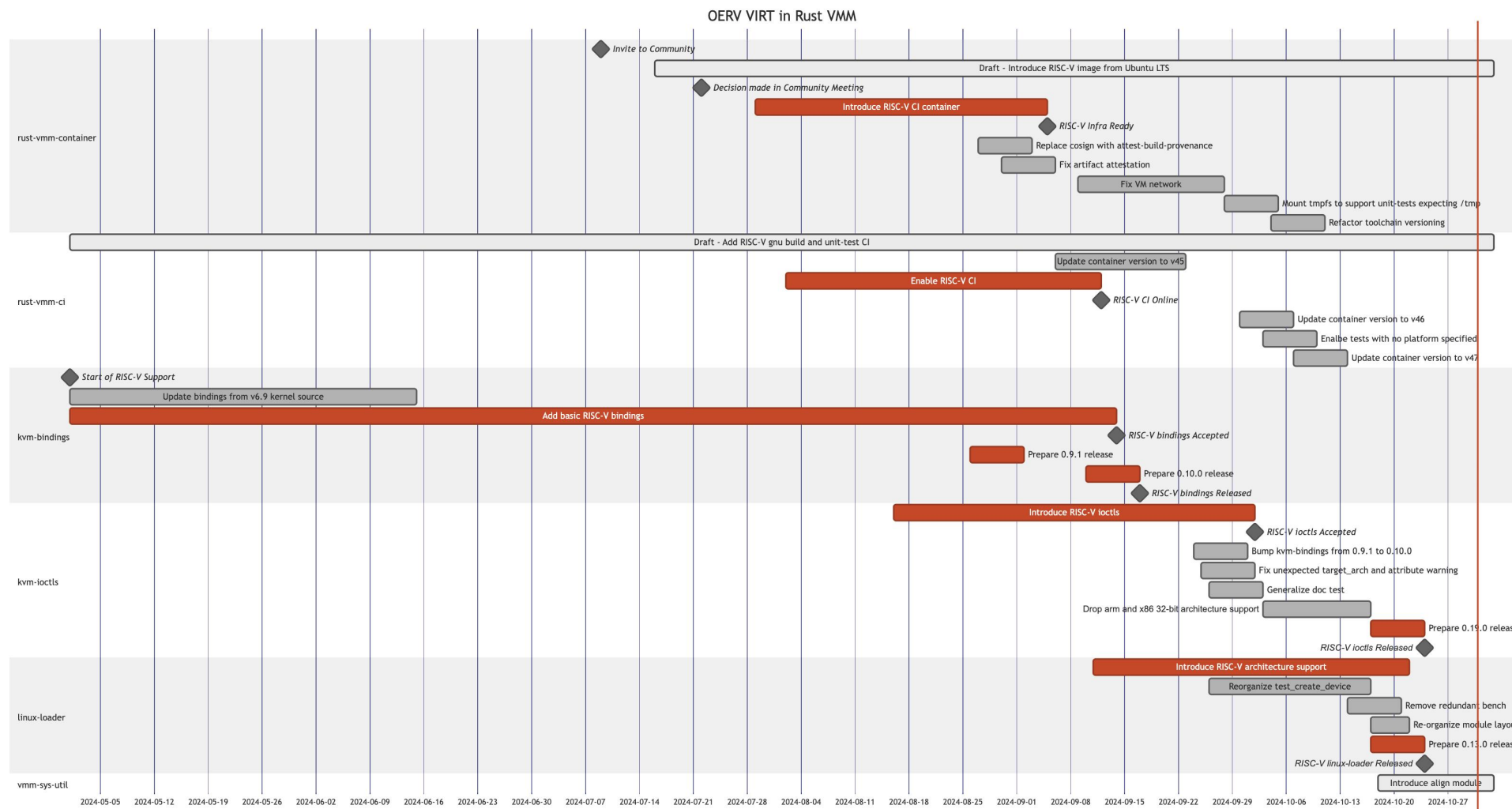
RISC-V VIRTUALIZATION ROADMAP

Stage One

A bottom up, working and reliable software stack on RISC-V

Stage Two

A fully supported, operational, prosperous virtualization software ecosystem of RISC-V

Enabling RISC-V to compete with x86 and ARM in Virtualization & CloundNative

RustVMM UPSTREAM STATUS

OERV VIRT in Rust VMM
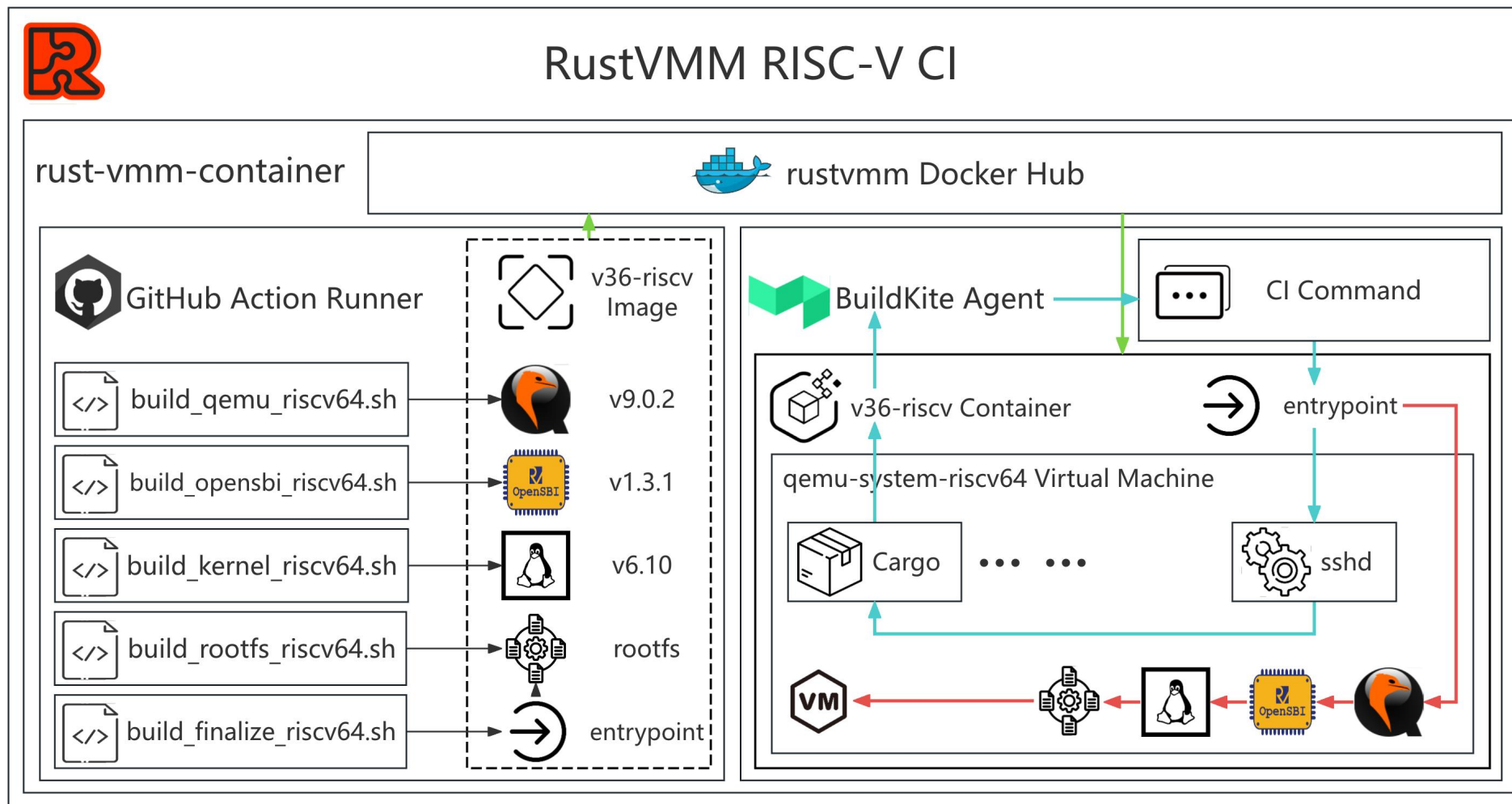
RustVMM CONTRIBUTIONS

In October 2024, after six months of research on RISC-V CI and RISC-V RustVMM counterpart, with a total of **90** commits and **107,490** lines of code changes, the RustVMM libraries officially announced complete support for RISC-V architecture. Which makes RISC-V the third officially supported architecture.

This significant breakthrough fills the gap in the RISC-V virtualization ecosystem, and provides developers with efficient, secure, and reliable virtualization solutions.

TimePrinciple
51 commits   44,654 ++   58,858 --   kvm   #3   ...

TimePrinciple
9 commits   121 ++   94 --   vm-memory   #9   ...

TimePrinciple
14 commits   1,560 ++   1,534 --   linux-loader   #5   ...

TimePrinciple
11 commits   425 ++   142 --   rust-vmm-container   #2   ...

TimePrinciple
5 commits   85 ++   17 --   rust-vmm-ci   #6   ...

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DESIGN OF RustVMM RISC-V CI

STRATOVIRT ON SPACEMIT FPGA

硬件环境：进迭时空高性能
服务器芯片 FPGA 原型

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```
[    1.765980] loop: module loaded
[    1.775428] virtio_blk virtio0: 1/0/0 default/read/poll queues
[    1.801102] virtio_blk virtio0: [vda] 409600 512-byte logical blocks (210 MB/200 MiB)
[    1.849061] e1000e: Intel(R) PRO/1000 Network Driver
[    1.858984] e1000e: Copyright(c) 1999 - 2015 Intel Corporation.
[    1.874593] usbcore: registered new interface driver uas
[    1.886309] usbcore: registered new interface driver usb-storage
[    1.897347] mousedev: PS/2 mouse device common for all mice
[    1.912481] sdhci: Secure Digital Host Controller Interface driver
[    1.925243] sdhci: Copyright(c) Pierre Ossman
[    1.934513] Synopsys Designware Multimedia Card Interface Driver
[    1.945739] sdhci-pltfm: SDHCI platform and OF driver helper
[    1.958689] usbcore: registered new interface driver usbhid
[    1.969880] usbhid: USB HID core driver
[    1.982907] NET: Registered PF_INET6 protocol family
[    2.002631] Segment Routing with IPv6
[    2.010805] In-situ OAM (IOAM) with IPv6
[    2.017943] sit: IPv6, IPv4 and MPLS over IPv4 tunneling driver
[    2.033309] NET: Registered PF_PACKET protocol family
[    2.045079] 9pnet: Installing 9P2000 support
[    2.054357] Key type dns_resolver registered
[    2.126434] debug_vm_pgtable: [debug_vm_pgtable         ]: Validating architecture page table helpers
[    2.157684] riscv-aplic 0.aplic: 96 interrupts forwarded to MSI base 0x0000000004000000
[    2.181597] printk: legacy console [ttyS0] disabled
[    2.193309] 8000000.serial: ttyS0 at MMIO 0x8000000 (irq = 15, base_baud = 230400) is a 16550A
[    2.211750] printk: legacy console [ttyS0] enabled
[    2.211750] printk: legacy console [ttyS0] enabled
[    2.230189] printk: legacy bootconsole [uart0] disabled
[    2.230189] printk: legacy bootconsole [uart0] disabled
[    2.253515] Legacy PMU implementation is available
[    2.262876] clk: Disabling unused clocks
[    2.272100] PM: genpd: Disabling unused power domains
[    2.282796] ALSA device list:
[    2.288214]   No soundcards found.
[    2.389515] EXT4-fs (vda): mounted filesystem 88ed7ca0-5b1e-4e61-8c0d-ca182d3d7323 r/w with ordered data mode. Quota mode: disabled.
[    2.407829] VFS: Mounted root (ext4 filesystem) on device 254:0.
[    2.421065] devtmpfs: mounted
[    2.561358] Freeing unused kernel image (initmem) memory: 2280K
[    2.570562] Run /sbin/init as init process
--------------------------------------------------------------------------------

        QEMU-VIRT

        Cloud-Hypervisor

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Maintained by: openEuler RISC-V VIRT WG
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```

RISE PROJECT

LK_03_039	QEMU-KVM Message Proxy support	LK_02_030		
LK_03_040	RustVMM rust-vmm-container RISC-V support		ISCAS	Ruoqing He
LK_03_041	RustVMM rust-vmm-ci RISC-V support	LK_03_040	ISCAS	Ruoqing He
LK_03_042	RustVMM kvm-bindings introduce RISC-V bindings	LK_03_041	ISCAS	Ruoqing He
LK_03_043	RustVMM kvm-bindings fam-wrappers & serde support	LK_03_041, LK_03_042	ISCAS	Ruoqing He
LK_03_044	RustVMM kvm-ioctls RISC-V support	LK_03_041, LK_03_043	ISCAS	Ruoqing He
LK_03_045	RustVMM linux-loader RISC-V support	LK_03_041	ISCAS	Ruoqing He
LK_03_046	RustVMM vm-memory RISC-V support	LK_03_041	ISCAS	Ruoqing He
LK_03_047	Cloud-Hypervisor RISC-V support	LK_03_041, LK_03_042, LK_03_043, LK_03_044, LK_03_045 LK_03_046	ISCAS	Ruoqing He
LK_03_048	Dragonball RISC-V support	LK_03_041, LK_03_042, LK_03_043, LK_03_044, LK_03_045, LK_03_046	ISCAS	Ruoqing He

openEuler RISC-V VIRT WG

Honghao Cheng
CHonghaohao

- Rust-Shyper RISC-V AIA

Ruoqing He
TimePrincipl
e

- RustVMM
- StratoVirt
- Dragonball
- CloudHypervisor
- Firecracker
- KataContainers

Xinhao Yi
TexasOct

- Kubernetes component images
- Kubeadm deployment support

THANKS

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