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

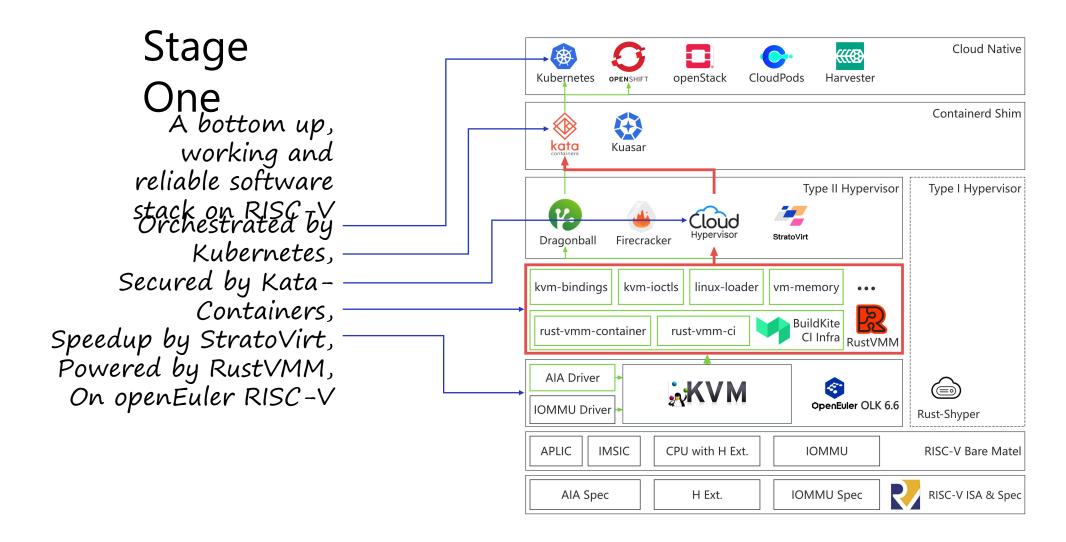
Secure solution on RISC-V platform based on virtualization







RISC-V VIRTUALIZATION ROADMAP

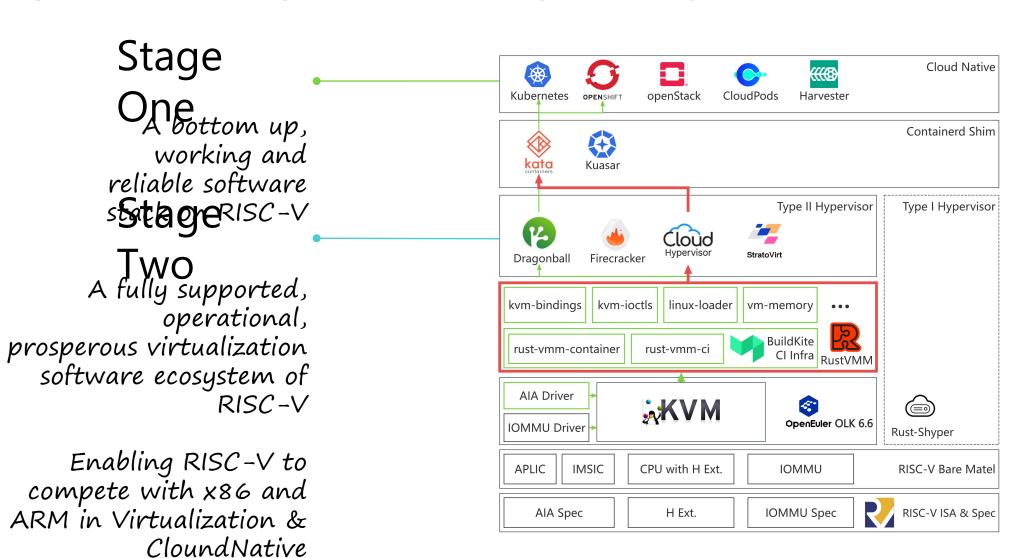






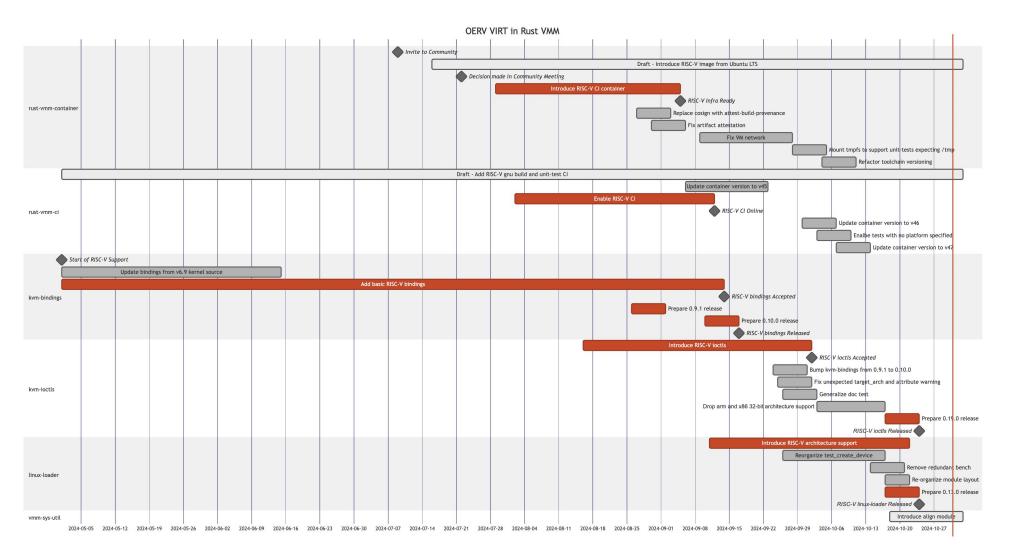


RISC-V VIRTUALIZATION ROADMAP





RustVMM UPSTREAM STATUS





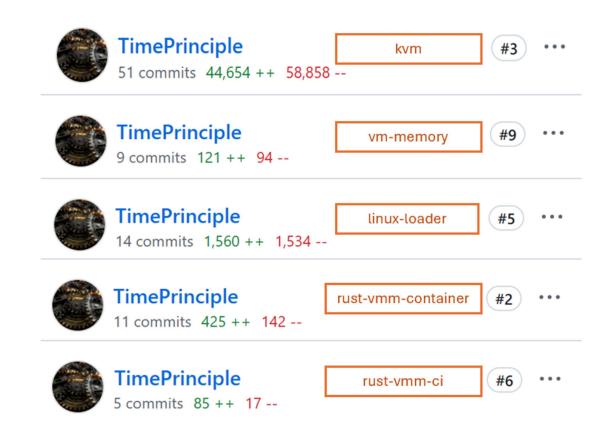




RustVMM CONTRIBUTIONS

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.

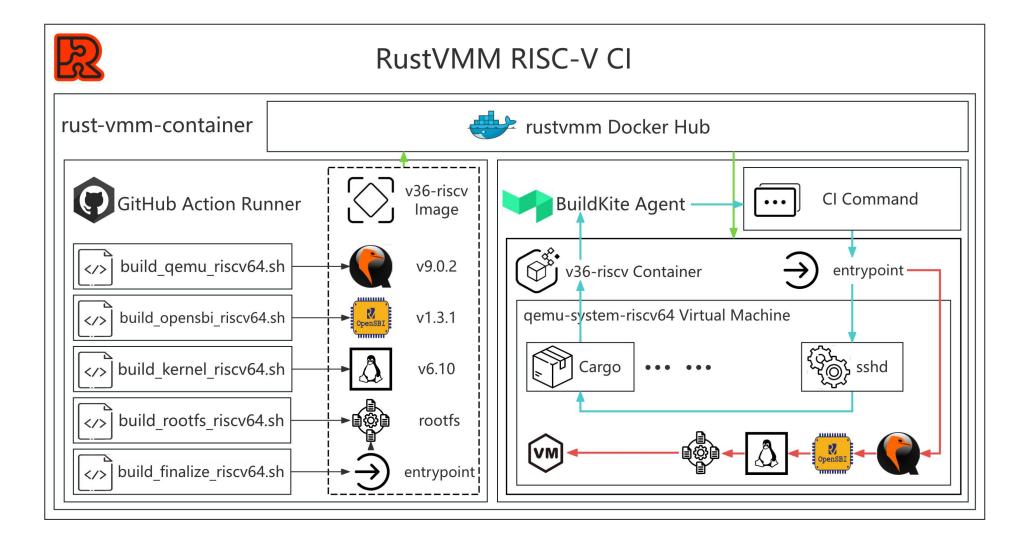
This significant breakthrough fills the gap in the RISC-V virtualization ecosystem, and provides developers with efficient, secure, and reliable virtualization solutions.







DESIGN OF RustVMM RISC-V CI







STRATOVIRT ON SPACEMIT FPGA

```
✓ Serial-COM9 ×

          23.231414] usbhid: USB HID core driver
         23.261859] riscv-pmu-sbi: SBI PMU extension is available
23.264954] riscv-pmu-sbi: 16 firmware and 18 hardware counters
23.452744] xt_time: kernel timezone is -0000
23.467965] IPVS: Registered protocols (TCP, UDP)
23.487760] IPVS: Connection hash table configured (size=4096, memory=32Kbytes)
         23.529479] IPVS: ipvs loaded.
23.529479] IPVS: ipvs loaded.
23.589508] Initializing XFRM netlink socket
23.613998] NET: Registered PF_INET6 protocol family
23.762101] Segment Routing with IPv6
          23.785935] In-situ OAM (IOAM) with IPv6
          23.821529] sit: IPv6, IPv4 and MPLS over IPv4 tunneling driver
          23.913769] NET: Registered PF_PACKET protocol family
          23.941291] Bridge firewalling registered
         23.959490] can: controller area network core
23.977849] NET: Registered PF_CAN protocol family
24.003476] can: raw protocol
24.015794] can: broadcast manager protocol
24.031790] can: netlink gateway - max_hops=1
24.054134] 8021q: 802.1Q VLAN Support v1.8
     24.054134] 8021q: 802.1Q VLAN Support v1.8
24.078046] Key type dns_resolver registered
26.302122] Loading compiled-in X.509 certificates
28.118556] Btrfs loaded, zoned=no, fsverity=no
28.212635] riscv-aplic 430500000.interrupt-controller: 255 interrupts forwarded to MSI base 0x0000000430600000
28.345558] printk: legacy console [ttyS0] disabled
28.416770] 418000000.uart0: ttyS0 at MMIO 0x418000000 (irq = 11, base_baud = 625000) is a 16550A
28.456798] printk: legacy console [ttyS0] enabled
28.491590] printk: legacy console [ttyS0] enabled
28.491590] printk: legacy bootconsole [sbi0] disabled
28.491590] printk: legacy bootconsole [sbi0] disabled
110.880464] clk: Not disabling unused clocks
110.896085] PM: genpd: Disabling unused power domains
287.609555] Initramfs unpacking failed: invalid magic at start of compressed archive
294.226524] Freeing initrd memory: 524288K
294.279360] Freeing unused kernel image (initmem) memory: 2320K
294.287958] Run /init as init process
        294.287958] Run /init as init process
        294.292650]
                                       with arguments:
        294.296564]
                                            /init
        294.299730]
294.304628]
                                       with environment:
                                            HOME=/
       294.3079771
                                             TERM=linux
Init from initramfs
Running sysctl: OK
Saving 256 bits of non-creditable seed for next boot
Mounting cgroupfs hierarchy: OK
Starting iptables: OK
Starting dhcpcd...
dhcpcd-9.4.1 starting
[ 309.216253] random: crng init done
                                                                                                                                                                                                                                                                                                                       硬件环境:进迭时空高性能
 dhcp_vendor: Invalid argument
forked to background, child pid 148
                                                                                                                                                                                                                                                                                                                                 服务器芯片 FPGA 原型
no interfaces have a carrier
Welcome to Buildroot
buildroot login:
```





CLOUD-HYPERVISOR ON QEMU VIRT

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







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

- · RustVAM
- StratoVirt
- · Dragonball
- CloudHypervisor
- Firecracker
- KataContainers



Xinhao Yi TexasOct

- Kubernetes component images
- Kubeadm deployment support

THANKS





