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CloudNativeCon

Europe 2026

#KubeCon #CloudNativeCon

What's new in bootc and composefs: a lot!

Colin Walters, Red Hat



bootc: we boot containers!

- Part of CNCF as Sandbox since Nov 2024
- There's a kernel and bootloader in your OCI image
- Your OS → OCI container → bare metal | cloud (**directly**)
- Transactional updates, readonly rootfs by default, good integration w/SELinux and much more
- Goal: symmetric support for bare metal and virt/cloud
- `podman run --privileged <image> bootc install to-filesystem /dev/nvme1n1`
- Good integration with systemd/UAPI: e.g. soft reboots, Unified Kernel Images
- Good integration with podman ecosystem: Logically bound images





Bootc features



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- **Soft reboot** - kernel stays running, systemd restarts
 - Opt in: `bootc upgrade --apply --soft-reboot=auto`
 - Concern VS: Turning it on and off again - state leakage
- **system-reinstall-bootc**: Building block to convert an existing system
- **Kured integration**: `bootc` is a natural fit for Kubernetes (but works outside it)
- Lots more: Improved upgrade staging, many installation improvements
- Much work on next generation backend features: factory reset (improved state management), unified storage and **composefs**!

bootc-dev/bcvk - New assoc. project!



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- It's **bootc virtualization kit** (was not actually intended to be xkcd-level difficult to pronounce)
- Key goal: Streamline container -> CI/local virt dev cycle

```
podman build -t localhost/myimage → bcvk ephemeral run-ssh  
localhost/myimage
```

- Like bootc: uses kernel/initramfs+userspace from your image, wraps qemu/libvirt
- Sidestep cloud metadata: ssh keys auto-injected via systemd credentials
- rootfs is just the container store mounted via virtiofs: Fast: no data transformations!

```
bcvk libvirt run localhost/myimage → Full persistent install
```

10s interlude: Kubevirt devs/users: Let's make this the default!

- “containerdisks” are a hack (that made sense at the time)
- “virtiofs-root-of-container-storage with kernel in image” captures so many use cases!
- (But doesn't apply to bare metal)

composefs: Reliability of disk images, flexibility of files



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- CNCF Sandbox project since Nov 2024
- **Ambitious goal: Unified mechanism for efficient verified, immutable versioned filesystem trees - backing not just bootc but also e.g. podman, containerd, flatpak etc.**
- Architecture: “metadata EROFS” w/fsverity ➡ fsverity files in object store
- One key advantage: *Shared data on disk and in memory* between host and apps!
- Original C implementation stable, but maintenance mode.
- Finishing rewrite in Rust 🦀, stabilizing on-disk formats and APIs
- Lots of feature expansion: awesome OCI integration!, hardening, fuzzing (new tar-core Rust crate!)

Composefs: let's talk integrity!



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- Booting: Firmware → Secure Boot → bootloader (e.g. systemd-boot) → UKI → digest of root filesystem
 - RUN `bootc container ukify ...`
- OCI (app) image: Kernel-based signature over EROFS as OCI artifact → `cfscctl oci mount` → `runc | crun`
 - apart from writable upper but you are using `podman run --read-only` right? (right??)

Come chat with us!



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- Interested in any/all of these technologies between firmware and OCI? Or are you just using bootc and want to pitch your most desired feature? 😊 Come talk to us, we'll be at the community booth!
- <https://github.com/bootc-dev/bootc> and <https://github.com/composefs/composefs-rs>
- Scan the QR code for a link to this talk for more info and to leave feedback!



bootc

