Red Hat
Enterprise Linux

Moving away from Docker and leaving its risks behind

OCI based projects Podman, Buildah, Skopeo & CRI-O.

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Senior Distinguished Engineer
Portfolio Architectures

Red Hat

Container tools landscape is changing. Why?

Since Open Container Initiative (OCI) there are several new projects

What needs do these projects address?

What are these projects and when should I use them?

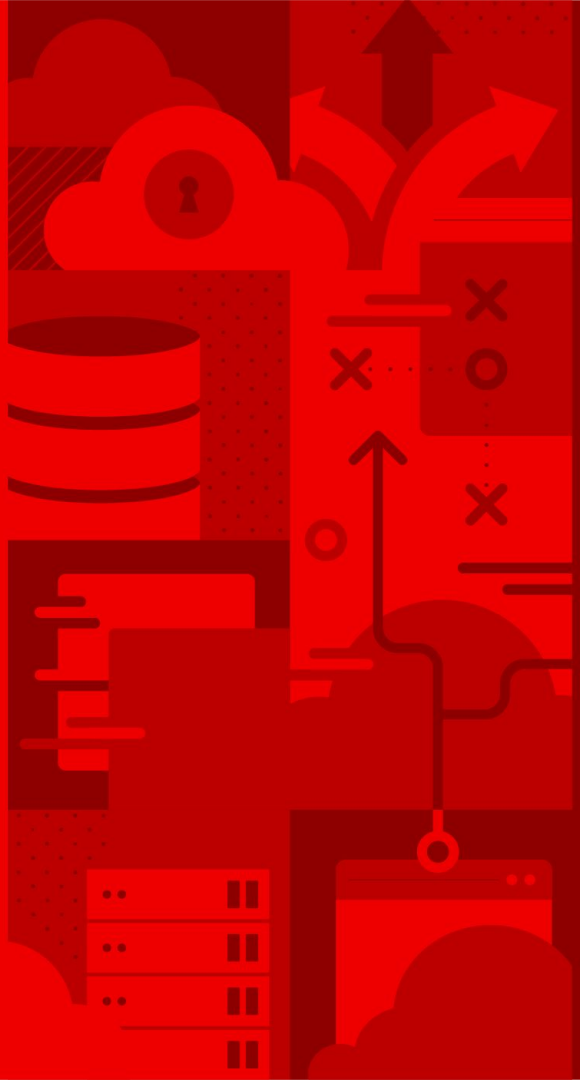
What specific security concern does each address?

Early concerns with Docker

Since the early days enterprise users of Docker had concerns

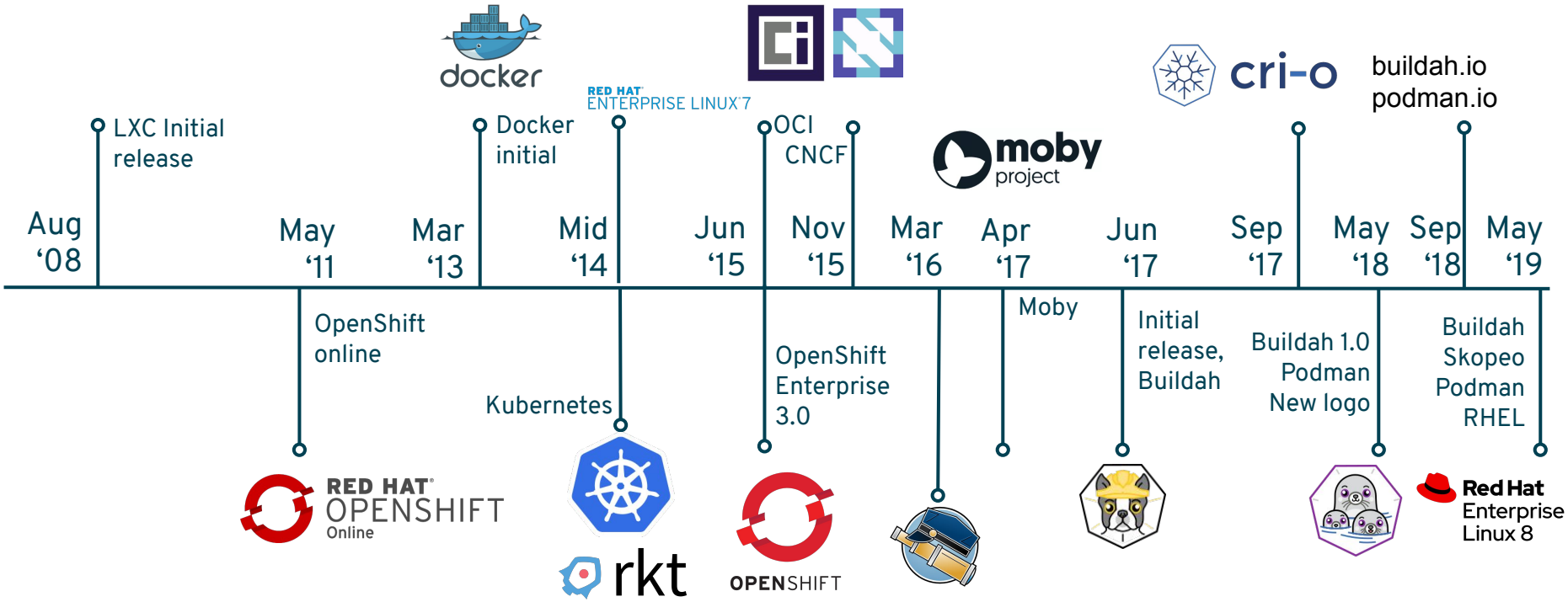
- Build requires a “big fat” daemon on every host
- Regression for integration with container platforms Kubernetes/OpenShift
- Build has secret handling issues
- Root/privileged concerns at runtime
- Root/privileged concerns with daemon
- Build requires a running container

- Docker, Red Hat et al. June 2015
- Two specifications
  - Image format
    - How to package an OCI Image with sufficient information to launch the application on the target platform
  - Runtime
    - How to launch a “filesystem bundle” that is unpacked on disk
- Version 1.0 of each released July 19th 2017
- Distribution spec started in April, 2018.



Containers are Linux

Container innovation continues ....



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How did Docker change containers?

Docker Daemon

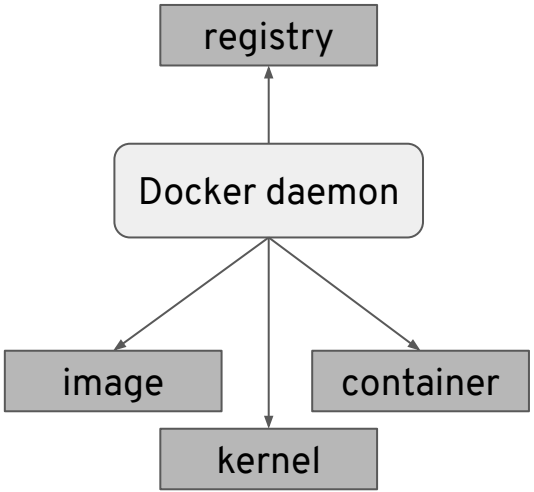
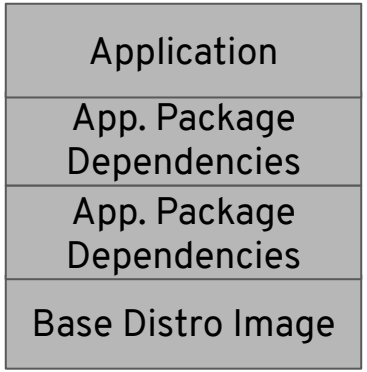
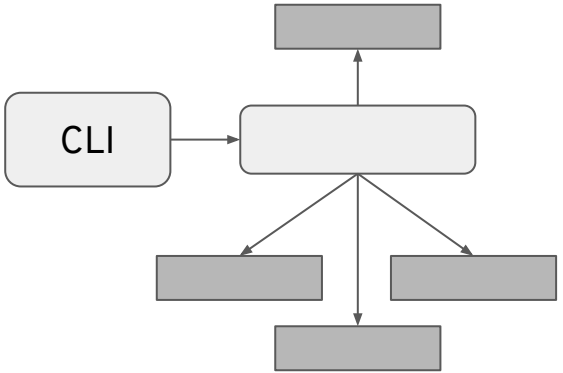
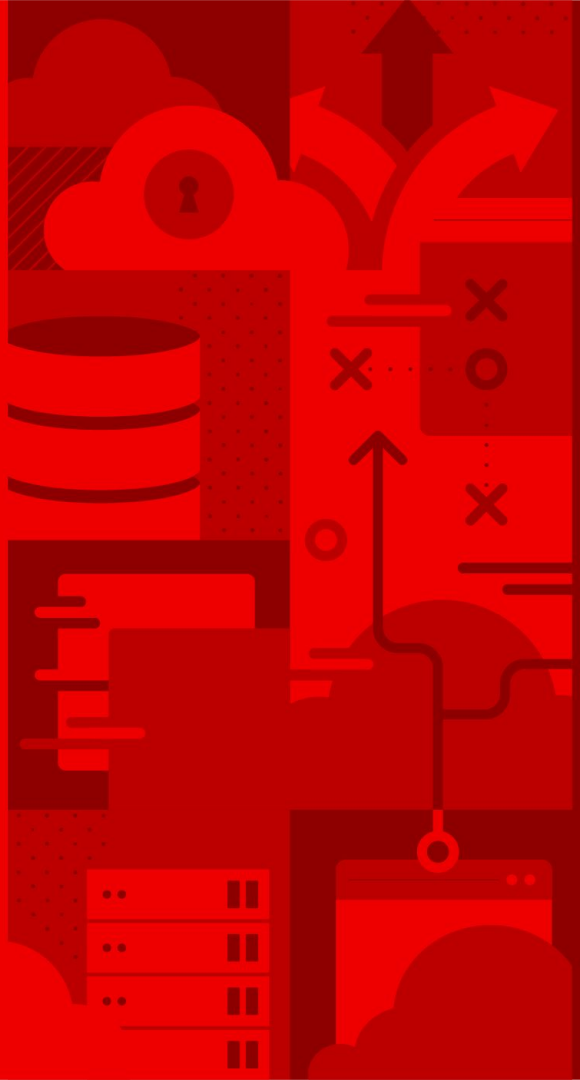


Image Layers



Docker CLI





Skopeo.
The first break away.

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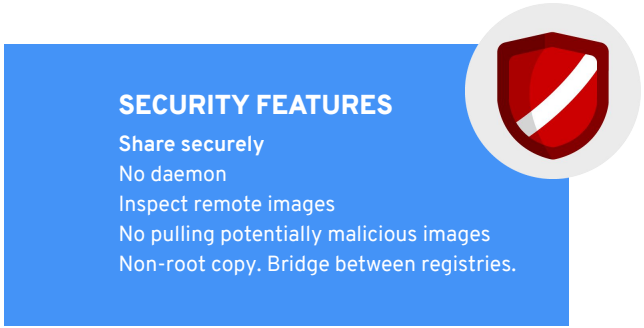
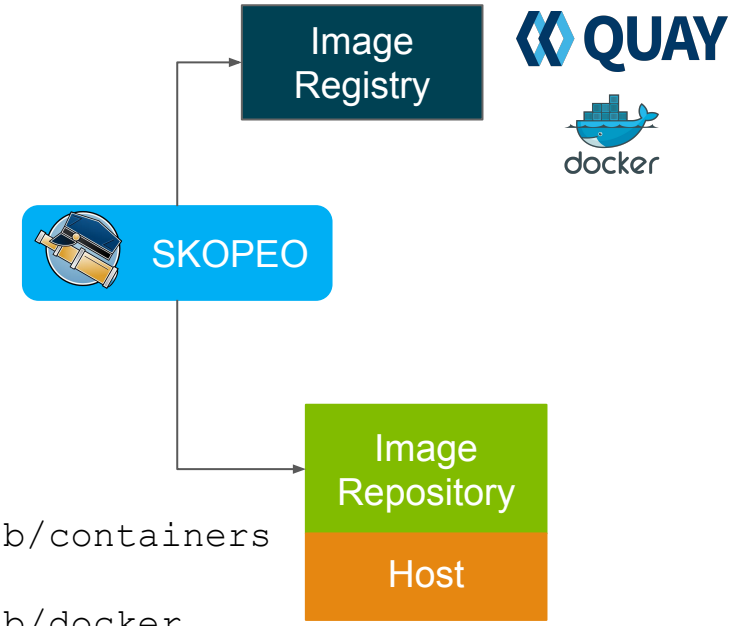
IMAGE COPY WITH SKOPEO

- Built for interfacing with Docker registry
- CLI for images and image registries
- Rejected by upstream Docker ¯_(ツ)_/¯
- Allows remote inspection of image meta-data - no downloading
- Can copy from one storage to another





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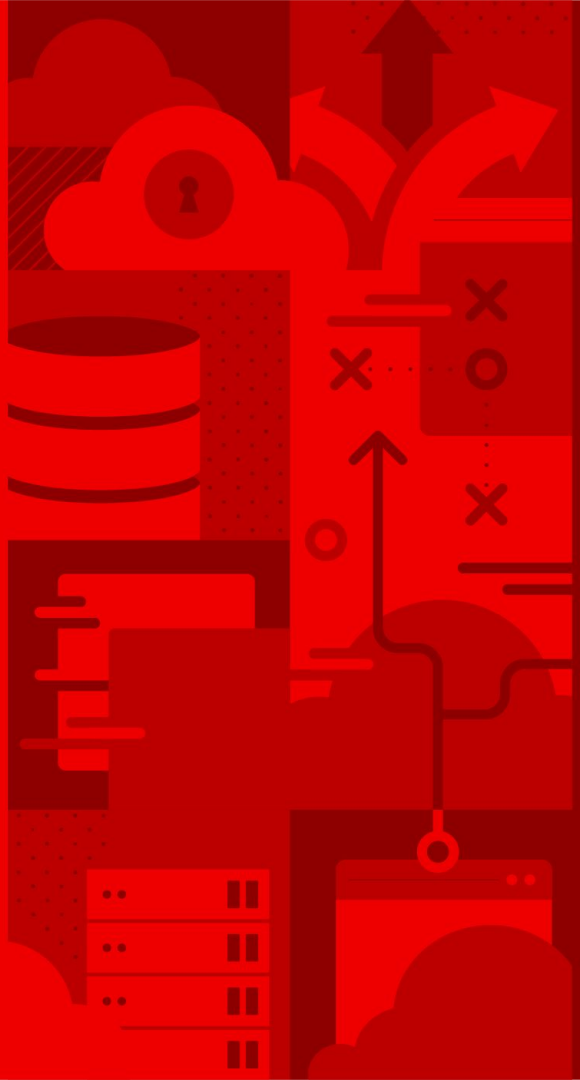
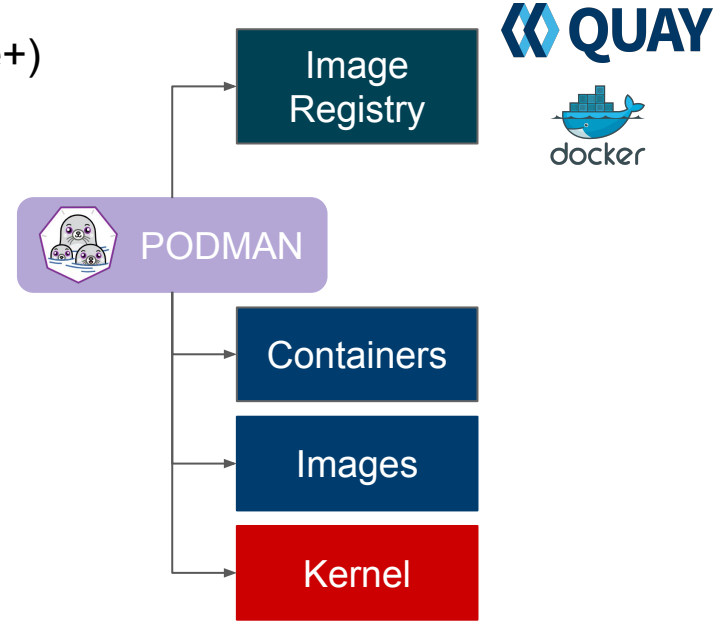


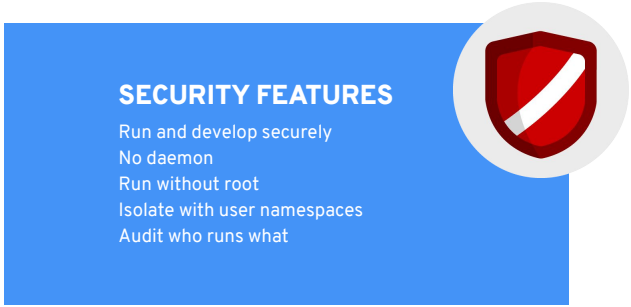
Podman.
The daemonless client for developers and beyond.

The new container CLI

podman

- @ podman.io
- Client only tool, based on the Docker CLI. (same+)
- No daemon!
- Storage for
  - Images - `containers/image`
  - Containers - `containers/storage`
- Runtime - `runc`
- Shares state with CRI-O and with Buildah!





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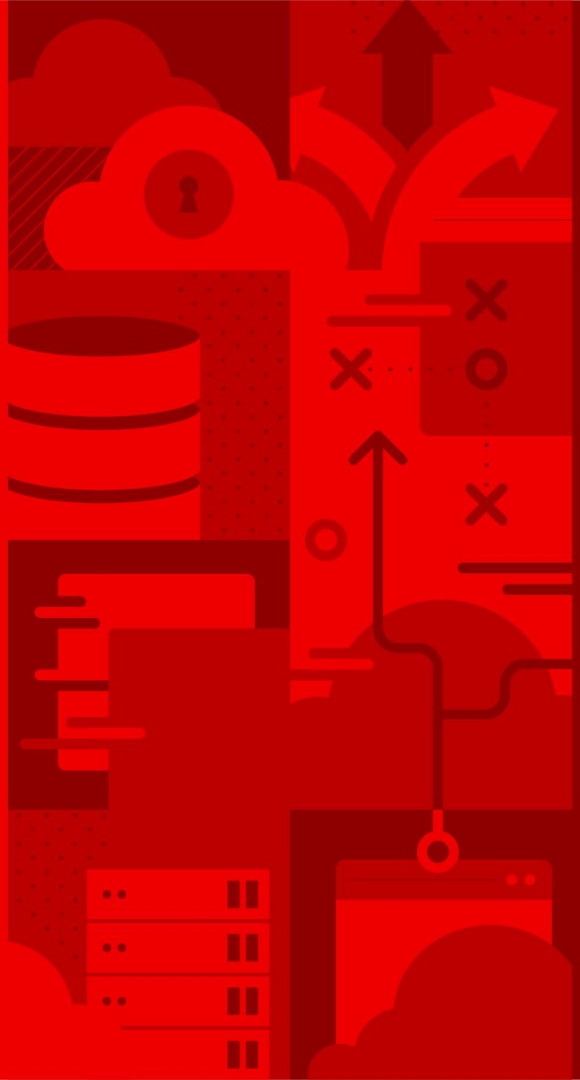
podman

Developer's experience

- Provides a familiar command line experience compatible with the Docker CLI
- Great for running, building, and sharing containers outside of Kubernetes/OpenShift
- **Build and run containers as non-root (enhanced user namespaces)**
- Can be wired into existing infrastructure where the docker daemon/cli are used today
- Use existing Dockerfiles
- Simple command line interface, **no client-server architecture**
- Docker compatible health checks



Podman Demo

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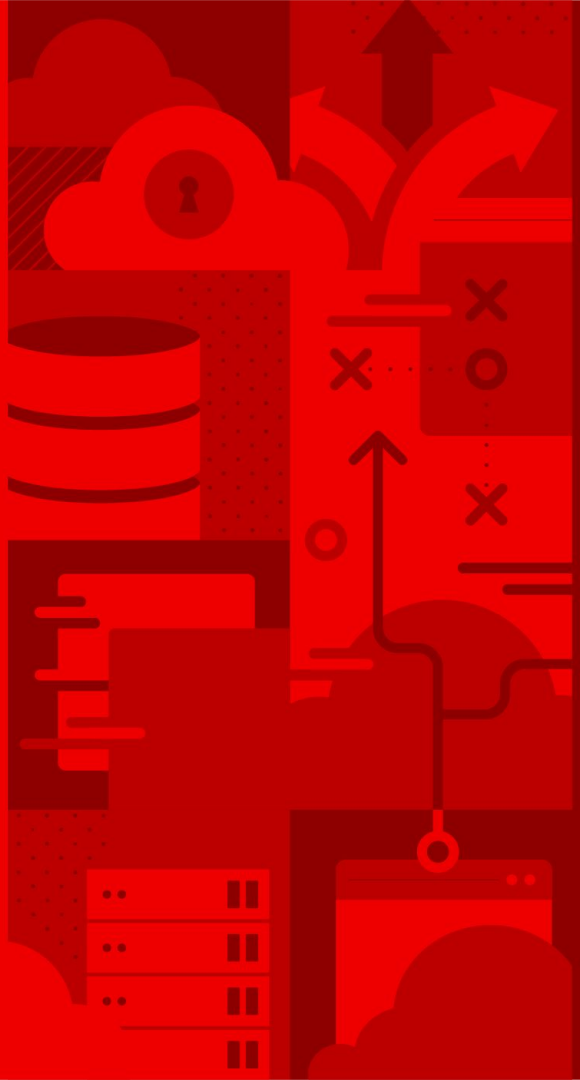
podman

But there's more : podman pod

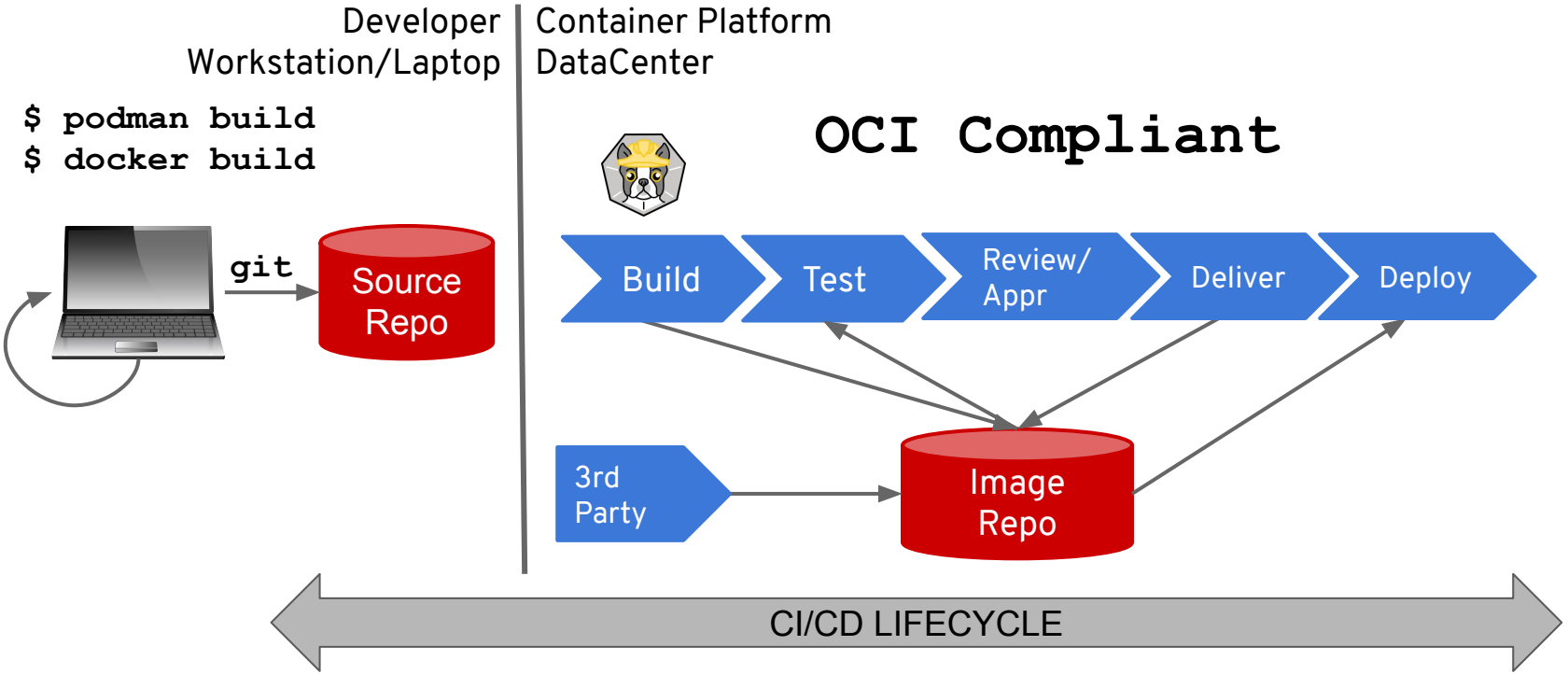
Pods are a group of one or more containers sharing the same network, pid and ipc namespaces.

create	Create a new empty pod
exists	Check if a pod exists in local storage
inspect	Displays a pod configuration
kill	Send the specified signal or SIGKILL to containers in pod
pause	Pause one or more pods
ps	List pods
restart	Restart one or more pods
rm	Remove one or more pods
start	Start one or more pods
stats	Display a live stream of resource usage statistics for the containers in one or more pods
stop	Stop one or more pods
top	Display the running processes of containers in a pod
unpause	Unpause one or more pods



Buildah.
The secure container builder.

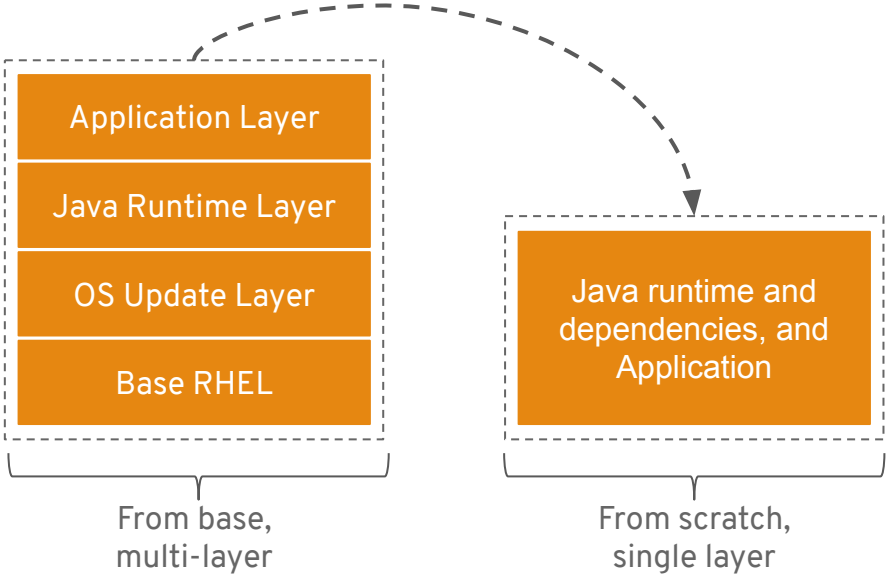
The separation of concerns



Why use Buildah?

buildah

- Now buildah.io
- Builds OCI compliant images
- No daemon - no “docker socket”
- Does not require a running container
- Can use the host’s user’s secrets.
- Single layer, from scratch images are made easy and it ensures limited manifest.
- If needed you can still maintain Dockerfile based workflow



SECURITY FEATURES

Build securely
No daemon
Shrink the attack surface
Fine-grained control of the layers
Run builds isolated
Better secret management

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What does Buildah do?

buildah from - Build up a container root filesystem from an image or *scratch*.

buildah config - Adjust defaults in the image's configuration blob.

buildah run - Run a command in the container's filesystem using *runc*.

NOT like docker run. Like Dockerfile RUN.

buildah mount - Mount the container's root filesystem on the host.

buildah commit - Commit container's changes to a new image.

What does Buildah do?

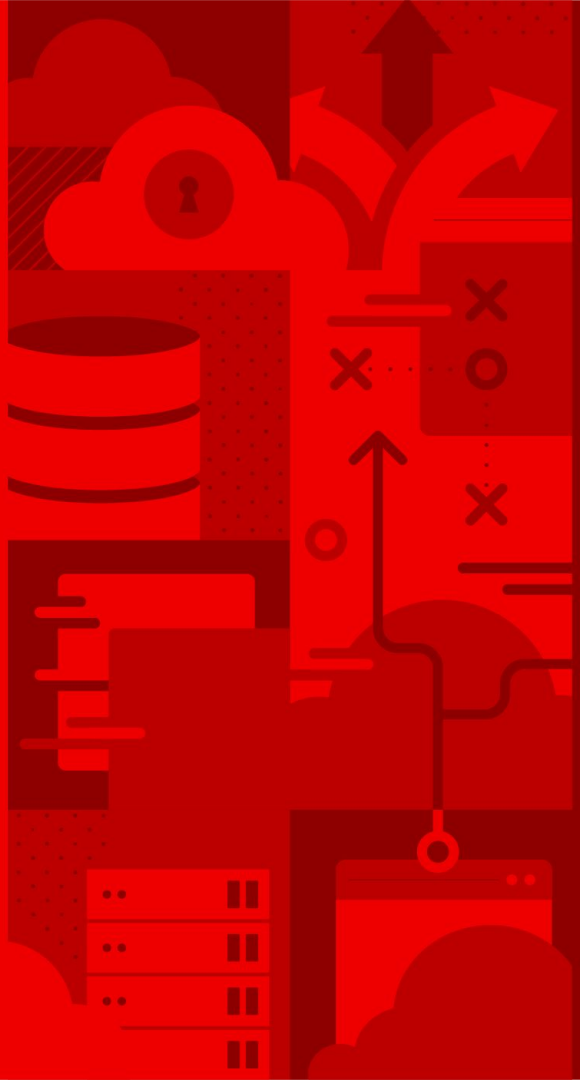
buildah push - Push images to registries (Quay etc.) or a local *dockerd* instance

buildah build-using-dockerfile (a.k.a. buildah bud) - Build images using a Dockerfile for instructions

buildah unmount - Oh, it also unmounts container filesystems

Provide a library API that's used by the CLI

Share libraries and on-disk storage with CRI-O



CRI-O.
The OCI runtime abstraction for Kubernetes

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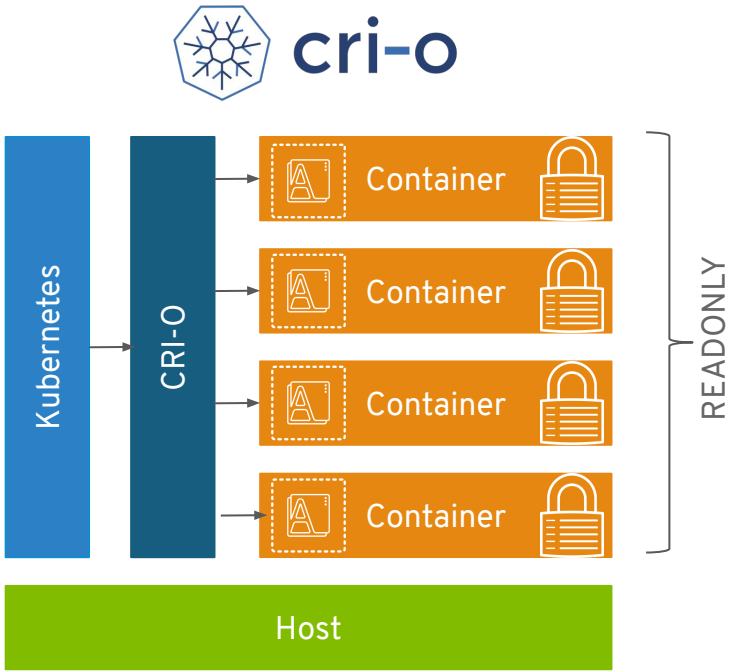
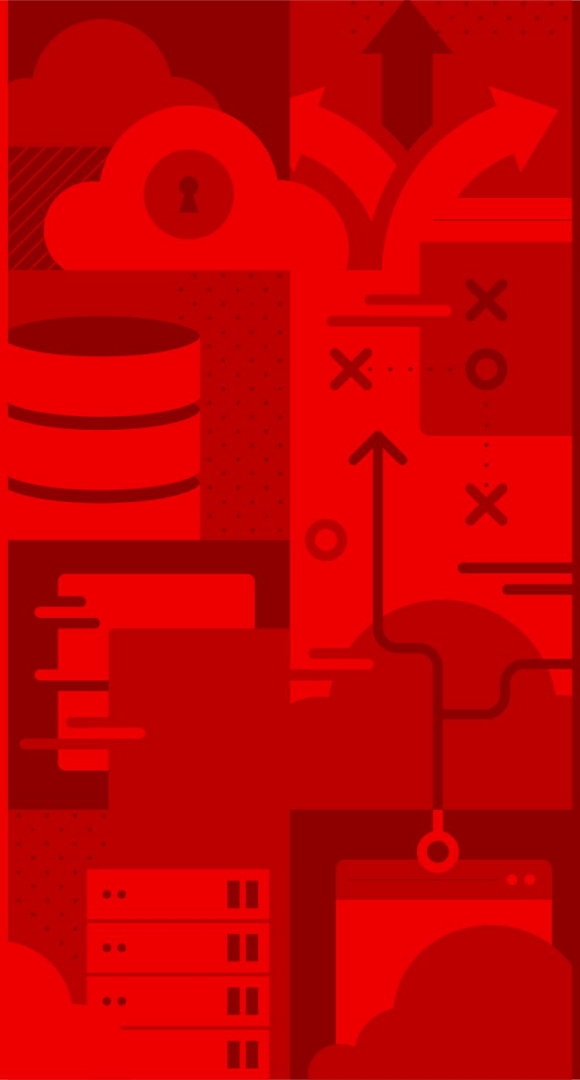
OCI AND CRI-O



- A Kubernetes thing
- Now part of CNCF! (April 8th)
- OCI daemon
- Implements Kubelet Container Runtime Interface (CRI)

SECURITY FEATURES

Run securely in a production cluster
No daemon
Read-only containers
Enable fewer capabilities
User namespaces
FIPS mode support



Where do I find these projects in Red Hat products?

WHERE CAN I FIND THESE AWESOME PROJECTS IN RED HAT PRODUCTS?

Red Hat Enterprise Linux 8

Red Hat OpenShift Container Platform

SECURING THE PLATFORMS

Red Hat chose to move away from Docker to Podman and Buildah can CRI-O in order to provide a more secure environment for containers on both OpenShift Container Platform and RHEL

SMART LIGHT CONTAINERS TOOL

The container-tools package installs Podman, Buildah and Skopeo together.
Users can use these in root or user namespace.

QUICK TIP
Learn more about RHEL 8 and OpenShift Container Platform 4 at Red Hat Summit

CONTINUOUS BUILDING, SECURE RUNTIME

Red Hat OCP has been using Skopeo for efficiency for a number of years. OCP 4 moves to using Buildah by default for building container images. CRI-O is the default container runtime. Use Podman for helping to debug pods and containers.

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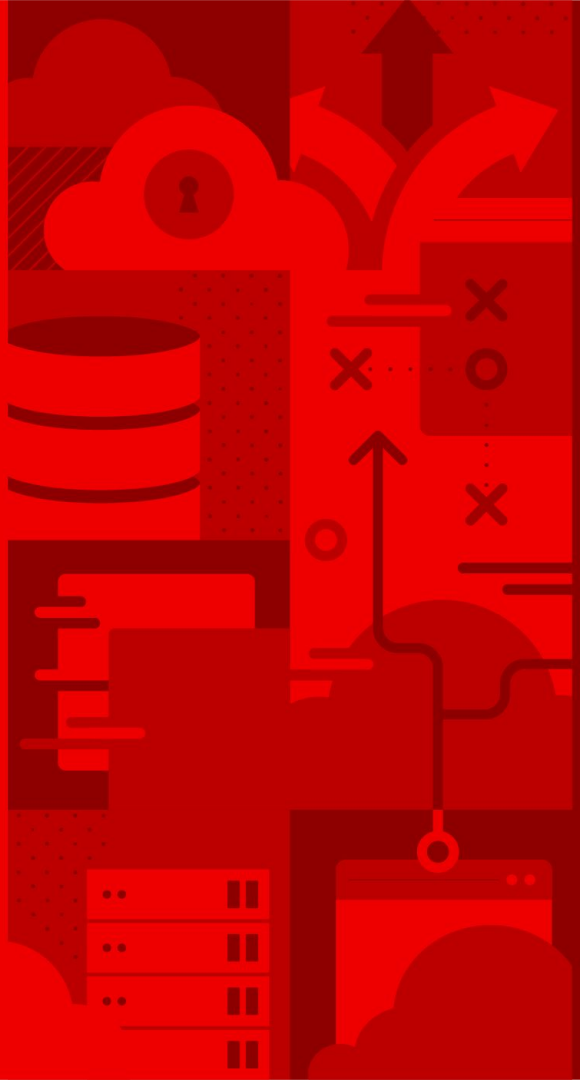

Open source wins. Questions inspire community innovations.

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Why do we have to pull down a container just to inspect it?

Could we decouple kubernetes from the container runtime?

Is it possible to build containers on a cluster without having to install and run a daemon?

How will we design, use, debug containers on the cluster if we don't have client tools because we don't have Docker?

Getting Started

- Download Podman today
  - Package name `podman`
- It won't clash with your existing Docker
- If you feel more adventurous download Buildah too
  - Package name `buildah`
- Or all with : `container-tools`
- Lots of demos and tutorials are available
- Contribute to the projects! (Next page)

podman

buildah

Where can I learn more?

Buildah

https://github.com/containers/buildah

https://buildah.io/

Podman

https://github.com/containers/libpod

https://podman.io/

Skopeo

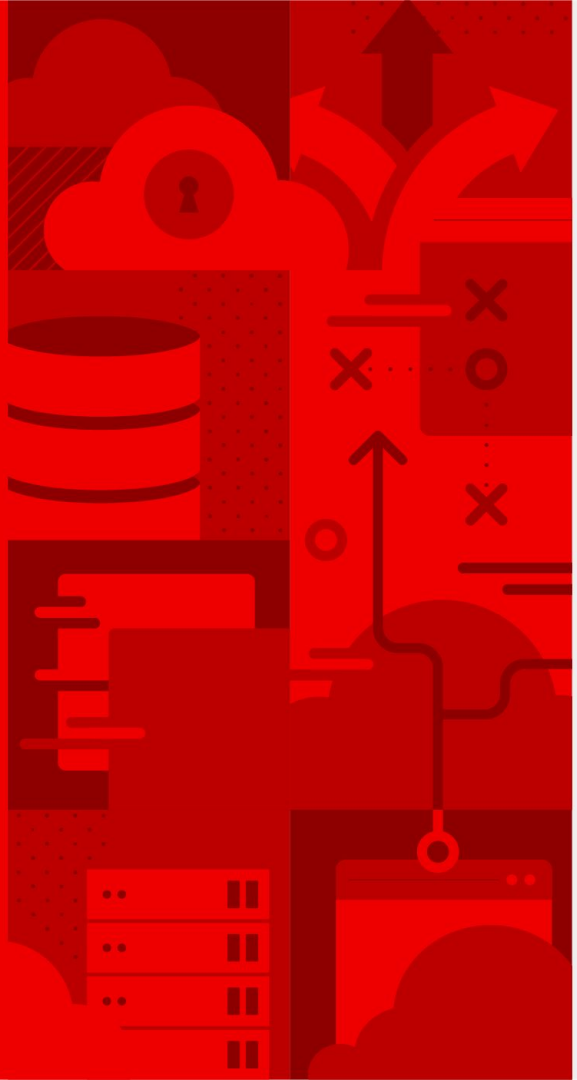
https://github.com/containers/skopeo

Other useful links

https://github.com/opencontainers/runc

https://developers.redhat.com/blog/2019/02/21/podman-and-buildah-for-docker-users

https://www.katacoda.com/courses/containers-without-docker



Thank you

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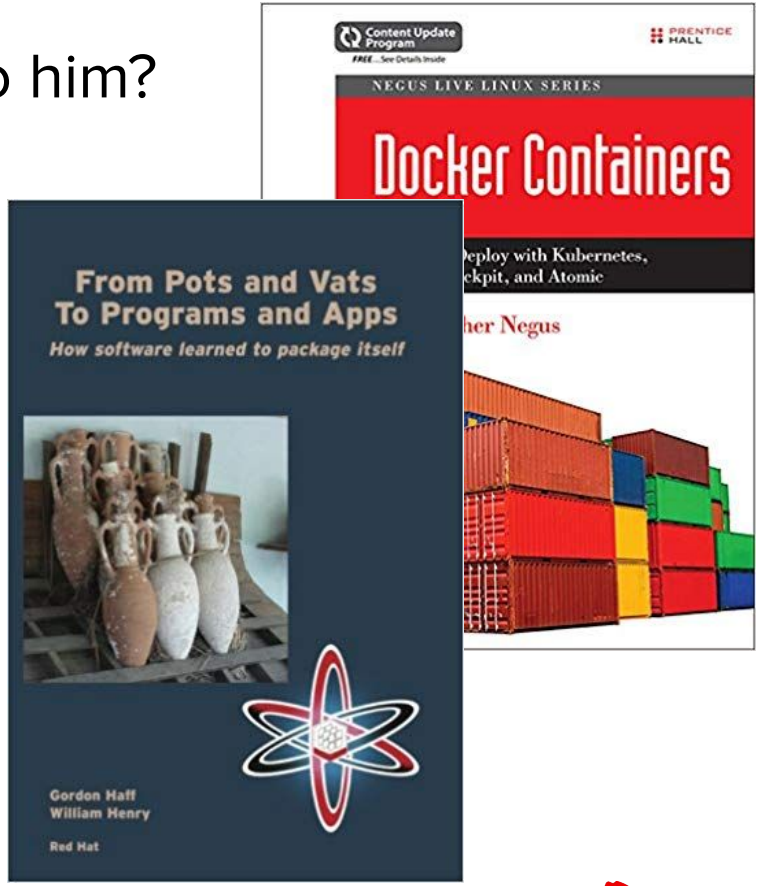
Who is this guy? Why listen to him?

- Started with Docker project when it became open source
- March, April of 2014 - contributed all the manual pages for Docker
- Contributing author to a couple of books on container technology
- Saw the many issues/questions
  - Daemon, Security, Storage, Namespaces
- Contribute to Buildah & Podman



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