Containers, Containers, Containers

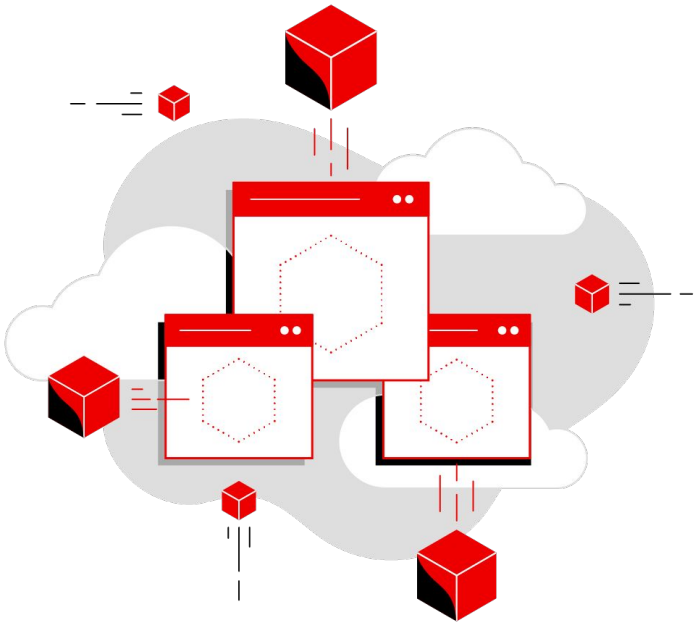
Not Steve Ballmer

Florian Moss
Solution Architect

Red Hat

I want to f**** apologize for this but you have to endure this

...it will get easier at the end!



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A brief history of containers

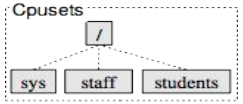
2000:
JAILS ADDED TO FREEBSD

2001:
LINUX -VSERVER PROJECT

2003:
SELINUX ADDED TO LINUX MAINLINE

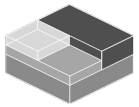
2005:
FULL RELEASE OF SOLARIS ZONES

2006:
PROCESS CONFINEMENT

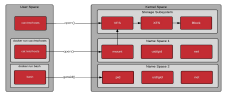


2007:
GPC RENAMED CGROUPS

2008:
LINUX CONTAINER PROJECT (LXC)



2008:
KERNEL & USER NAMESPACES



2013:
DOTCLOUD PYCON LIGHTNING TALK

2013:
DOTCLOUD BECOMES DOCKER

2013:
RED HAT ENTERPRISE LINUX

2014:
GOOGLE KUBERNETES

2015:
RED HAT CONTAINER PLATFORM

2015:
STANDARDS VIA OCI AND CNCF

2000
2005
2010
2015

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WHAT ARE CONTAINERS?

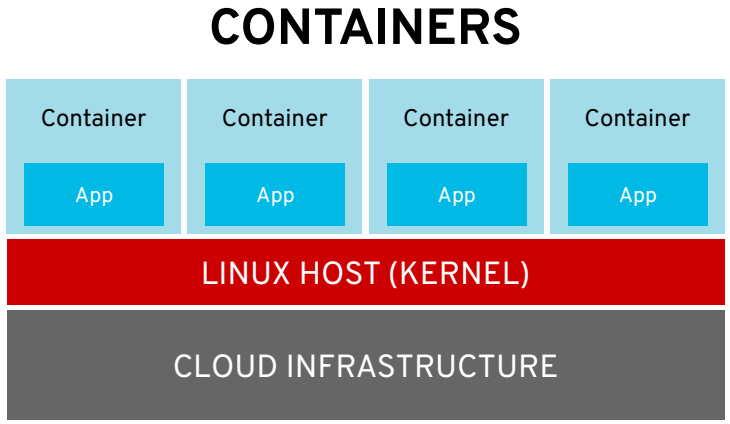
The Internet is wrong

Important corrections

- Containers do not run ON docker.
- Containers are processes - they run on the Linux kernel. Containers are Linux.
- The docker daemon is one of the many user space tools/libraries that talks to the kernel to set up containers

Way of

- Packaging app with all its dependencies
- Securing Isolation of Applications
- Eliminating need for VM Hypervisor
- Having apps portability ⇒ Build once, run everywhere



- Integrated in Linux OS - #theosmatters
- Fully Open Source

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WHAT ARE CONTAINERS?

Benefits

DEVELOPERS

- CLOUD-NATIVE APPS
- SIMPLIFY PACKAGING
- SIMPLIFY TESTING
- FREEDOM

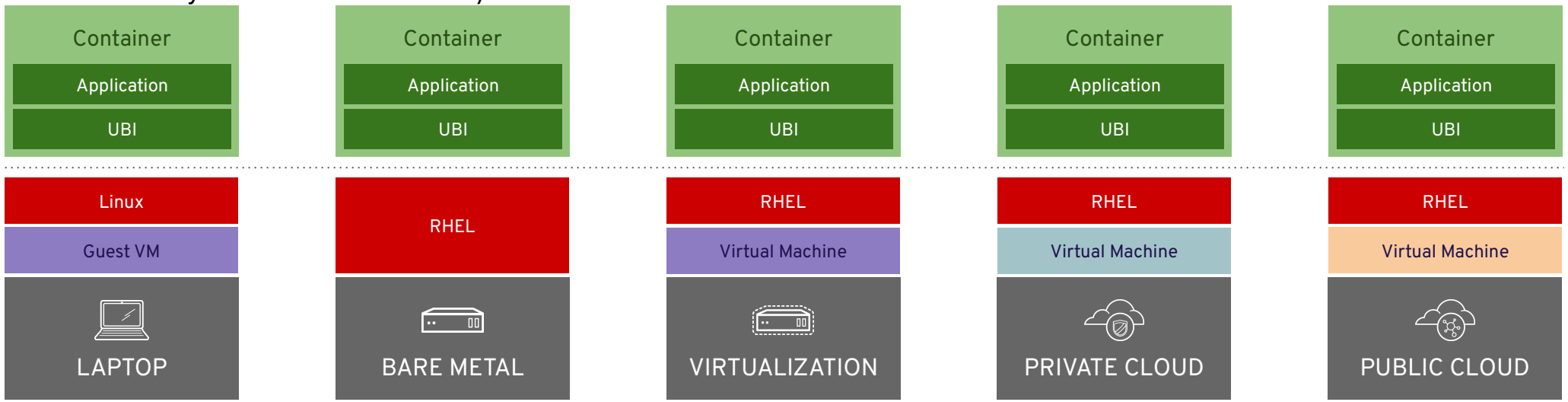
IT OPERATIONS

- CONSISTENT APP DEPLOYS
- AUTOMATED APP DEPLOYS & LC
- IMPROVED APP PERFORMANCE
- MULTI-CLOUD CONSISTENCY

BUSINESS LEADERS

- ENABLE DEVOPS CULTURE
- ENABLE HYBRID CLOUD
- REDUCE VM LICENSING COSTS
- ACCELERATE APP-DEV CYCLES

- Apps isolation vs Resources isolation (containers vs vms)
- Portability across all infras - CI / CD



UBI: Red Hat Universal Base Image - Standardize your deps OS

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Virtual Machine vs. Containers

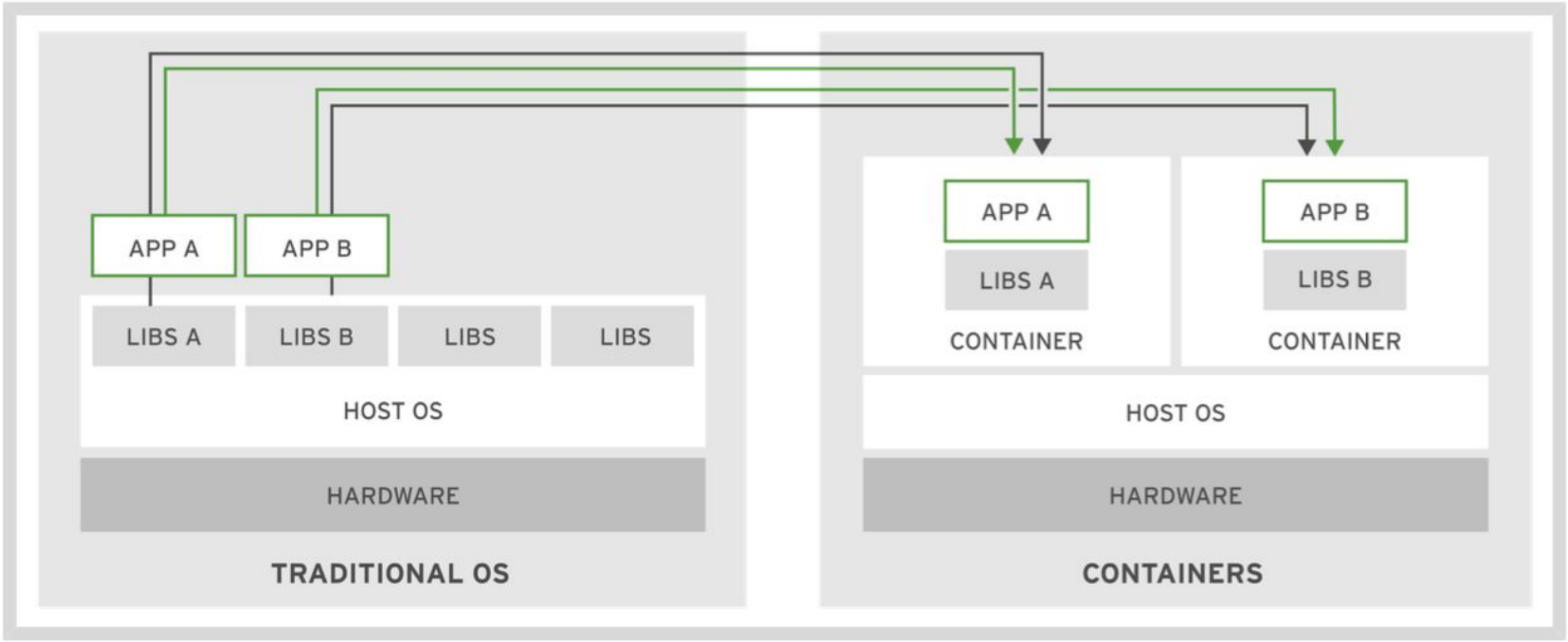

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Image

....an immutable set of file layers and meta-data
....think about a blueprint/set of instructions
....this is what we “distribute”

```
FROM registry.access.redhat.com/ubi8/ubi:8.1

RUN yum --disableplugin=subscription-manager -y module enable php:7.3 \
  && yum --disableplugin=subscription-manager -y install httpd php \
  && yum --disableplugin=subscription-manager clean all

ADD index.php /var/www/html

RUN sed -i 's/Listen 80/Listen 8080/' /etc/httpd/conf/httpd.conf \
  && sed -i 's/listen.acl_users = apache,nginx/listen.acl_users =/' /etc/php-fpm.d/www.conf \
  && mkdir /run/php-fpm \
  && chgrp -R 0 /var/log/httpd /var/run/httpd /run/php-fpm \
  && chmod -R g=u /var/log/httpd /var/run/httpd /run/php-fpm

EXPOSE 8080
USER 1001
CMD php-fpm & httpd -D FOREGROUND
```

How do I make an image? Buildah.

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

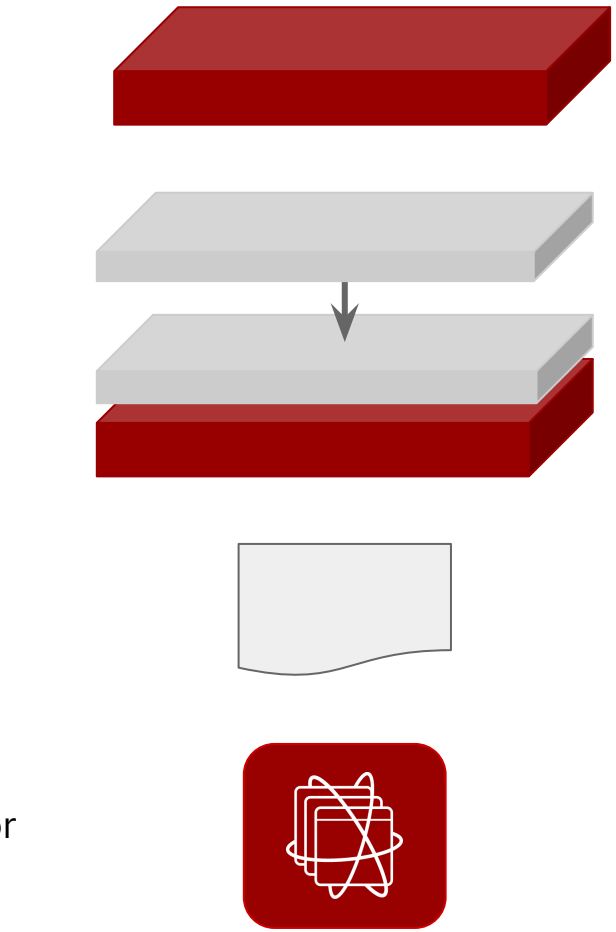
buildah

Start from an existing image or from scratch

Generate new layers and/or run commands on existing layers

Commit storage and generate the image manifest

Deliver image to a local store or remote OCI / docker registry



hands-on to see it in action

https://lab.redhat.com

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Container

....an instantiation of an image that is mutable
....if the image is the blueprint, the container is the house
....this is what we are “running”

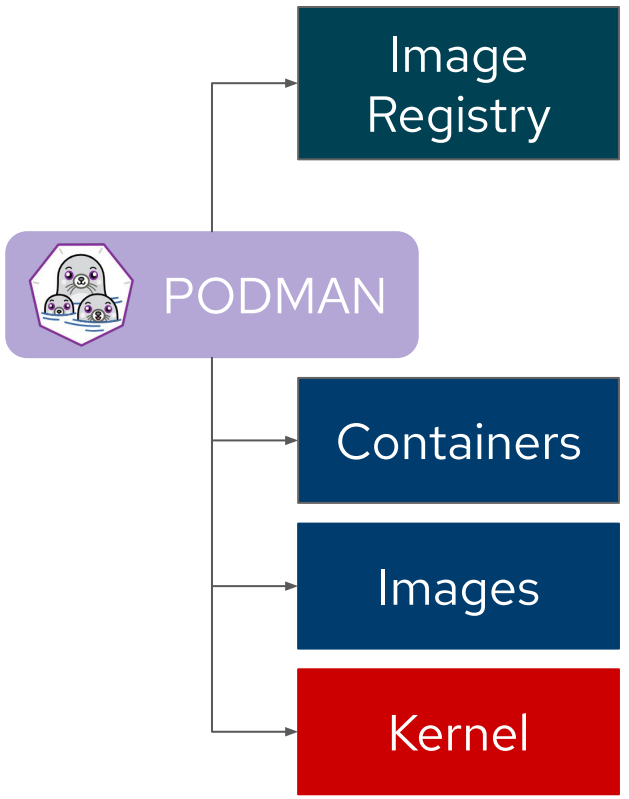
```
[root@41a215b684a8 ~]# podman ps -a
CONTAINER ID  IMAGE                           COMMAND               CREATED         STATUS                     PORTS                   NAMES
90fc2b5be35b  localhost/rhel8-httpd:latest  /usr/sbin/httpd -...  17 seconds ago  Exited (0) 7 seconds ago  0.0.0.0:8081->80/tcp  inspiring_euclid
[root@41a215b684a8 ~]#
```

How do I interact with/run my image? Podman.

PODMAN

The new container CLI

- A daemon-less CLI/API for running, managing, and debugging OCI containers and pods
- Fast and lightweight
- Leverages runC
- Provides a “docker-like” syntax for working with containers
- Standard CNI networking
- Provides systemd integration and advanced namespace isolation
- Shares state with CRI-O and with Buildah!
- Remote management Varlink / Restfull API



SECURITY FEATURES

Run and develop securely
No daemon
Run without root
Isolate with user namespaces
Audit who runs what

hands-on to see it in action

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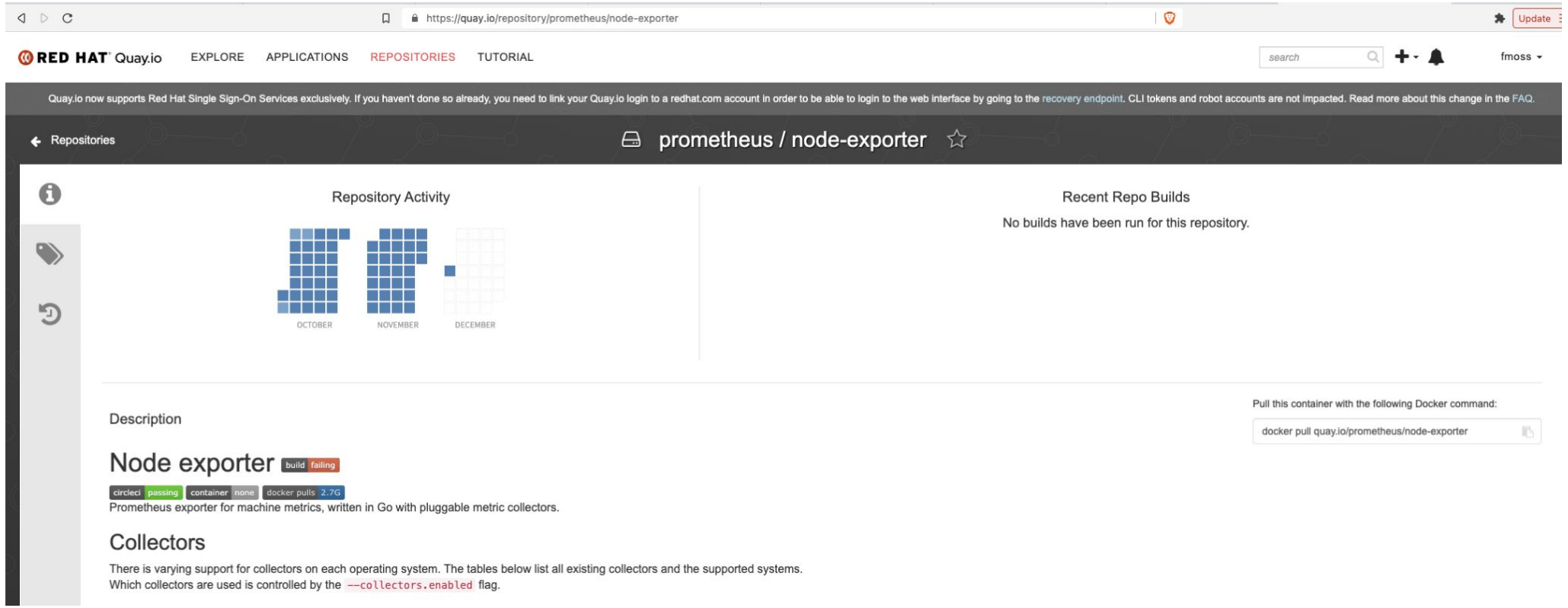
Image Registry

....don't call it container registry, this makes no sense
....stores our images so others can use them



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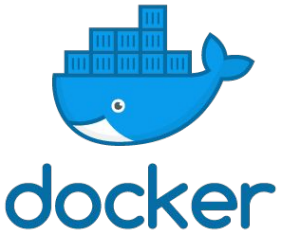
Container Runtime

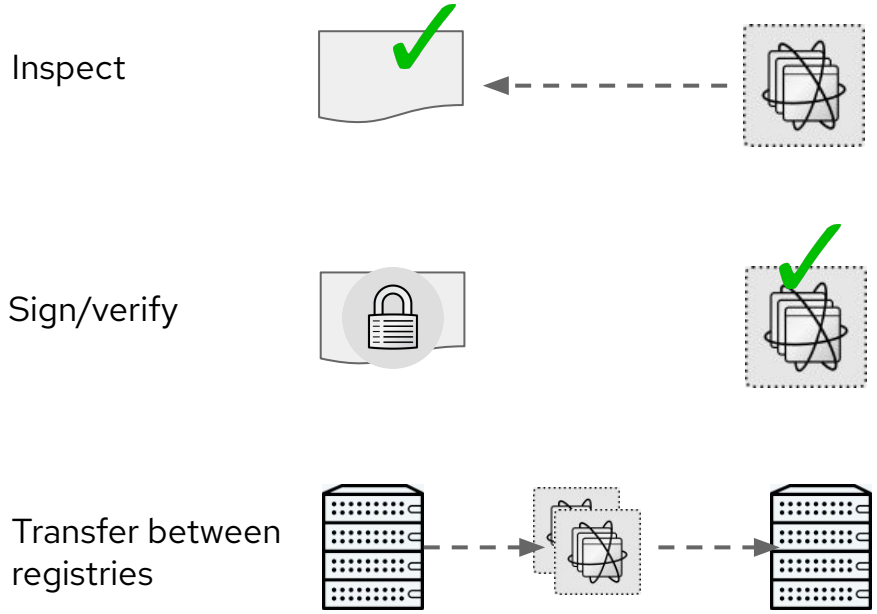
....the part you don't care about
....handles the way your container executes on a machine
....there are different implementations, but you don't care



SKOPEO

Skopeo was originally created for remote inspection of image metadata. It has grown into a comprehensive tool and library to inspect, sign, and transfer images

- Inspect image manifests
- Sign and verify image manifests
- Pull / push images
- Currently the only tool capable of copying images between registries
- Disconnected environments
- Same code base as the /containers/image library which is used by buildah, podman, & CRI-O



SECURITY FEATURES

Share securely
No daemon
Inspect remote images
No pulling potentially malicious images
Non-root copy. Bridge between registries.

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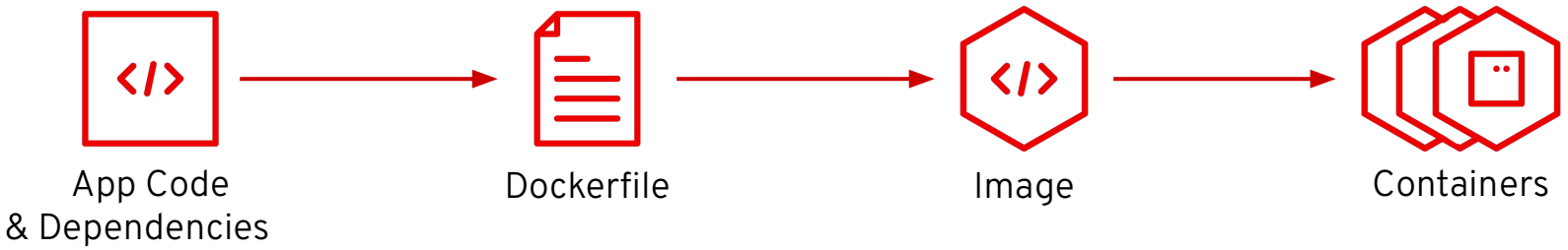
Containerizing Applications

Containerization Process



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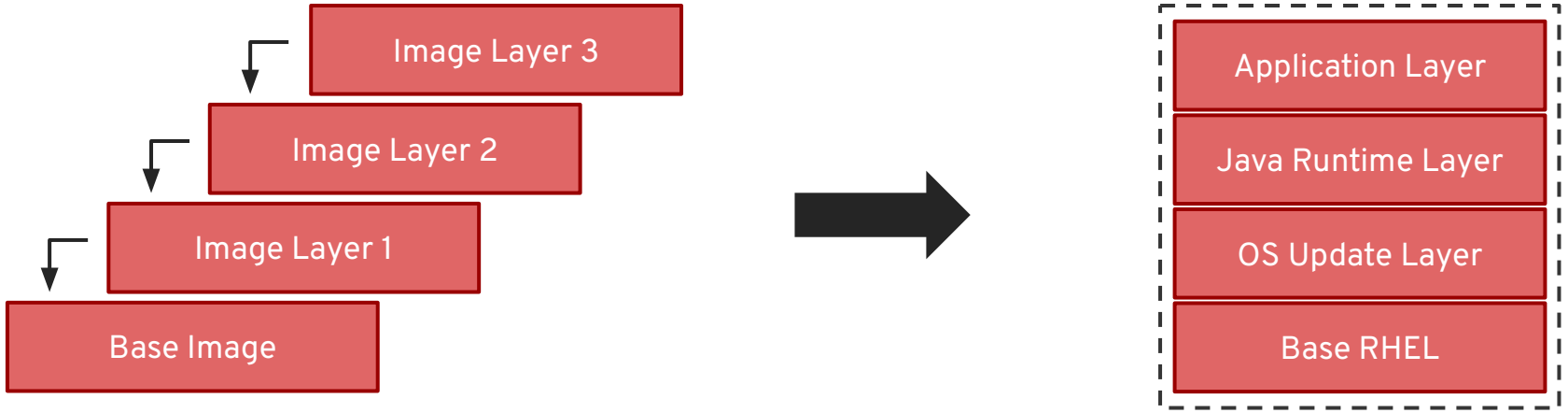
Containerizing Applications

Anatomy of Container Images



Container Image Layers

Container Image

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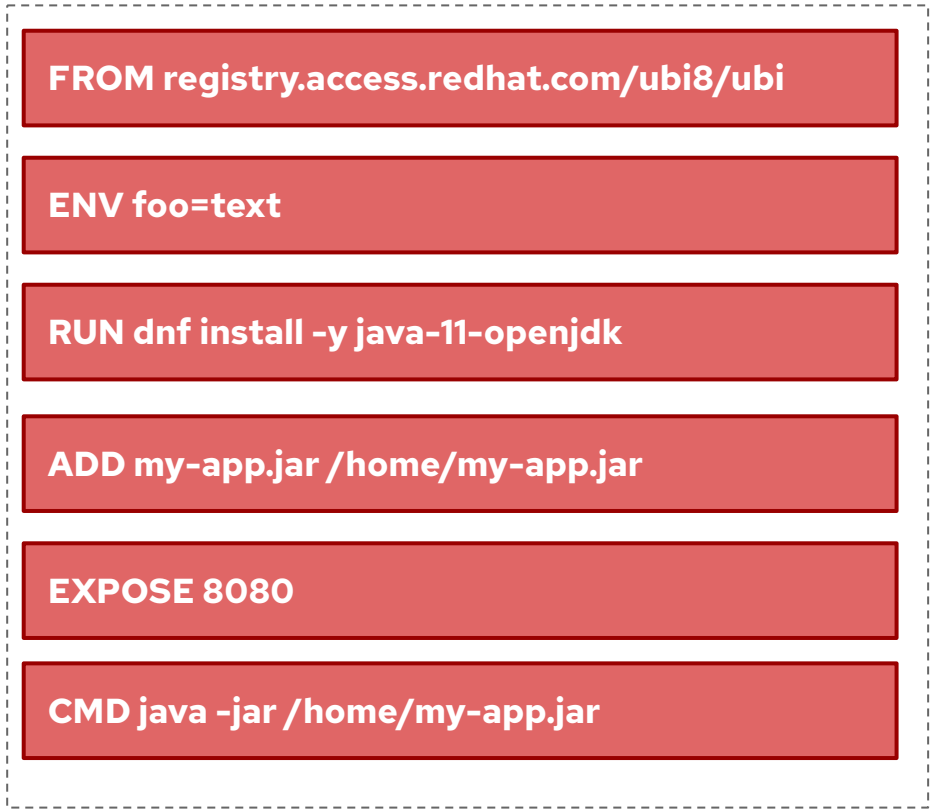
Containerizing Applications

Anatomy of Dockerfiles



1. Inherit from a base image
2. Parameters as environment variables
3. Install dependencies (tooling from base image)
4. Add your app as a new Layer
5. Expose the port your app will use
6. Run the app

Example for Java app

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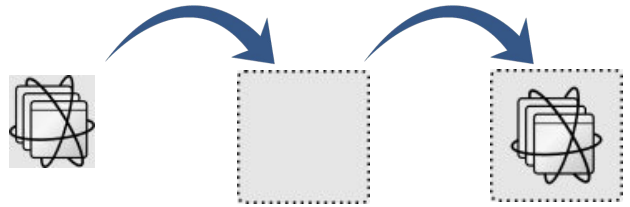
CONTAINERS TOOLS

Providing stability, flexibility and performance with containers and images

- Conform to the OCI image and runtime specifications
- Create, run, and manage, Linux Containers with an enterprise life cycle.
- Daemon-less
- Rootless capable
- OS-native container tooling
- Separation of concerns
- Part of Red Hat Enterprise Linux.
  Available, fully supported at no additional costs
- Check spare slides for labs shortcut

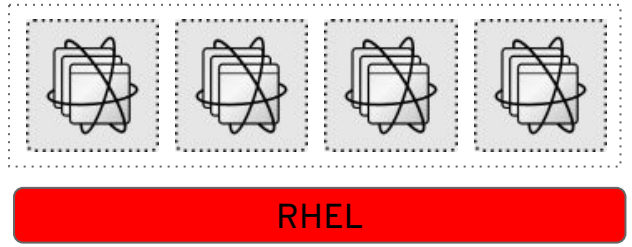
```
#yum module install container-tools
```

buildah



Build OCI/docker Images

podman



run, manage, debug containers

skopeo

Inspect, copy, & sign Images

OPEN CONTAINER INITIATIVE

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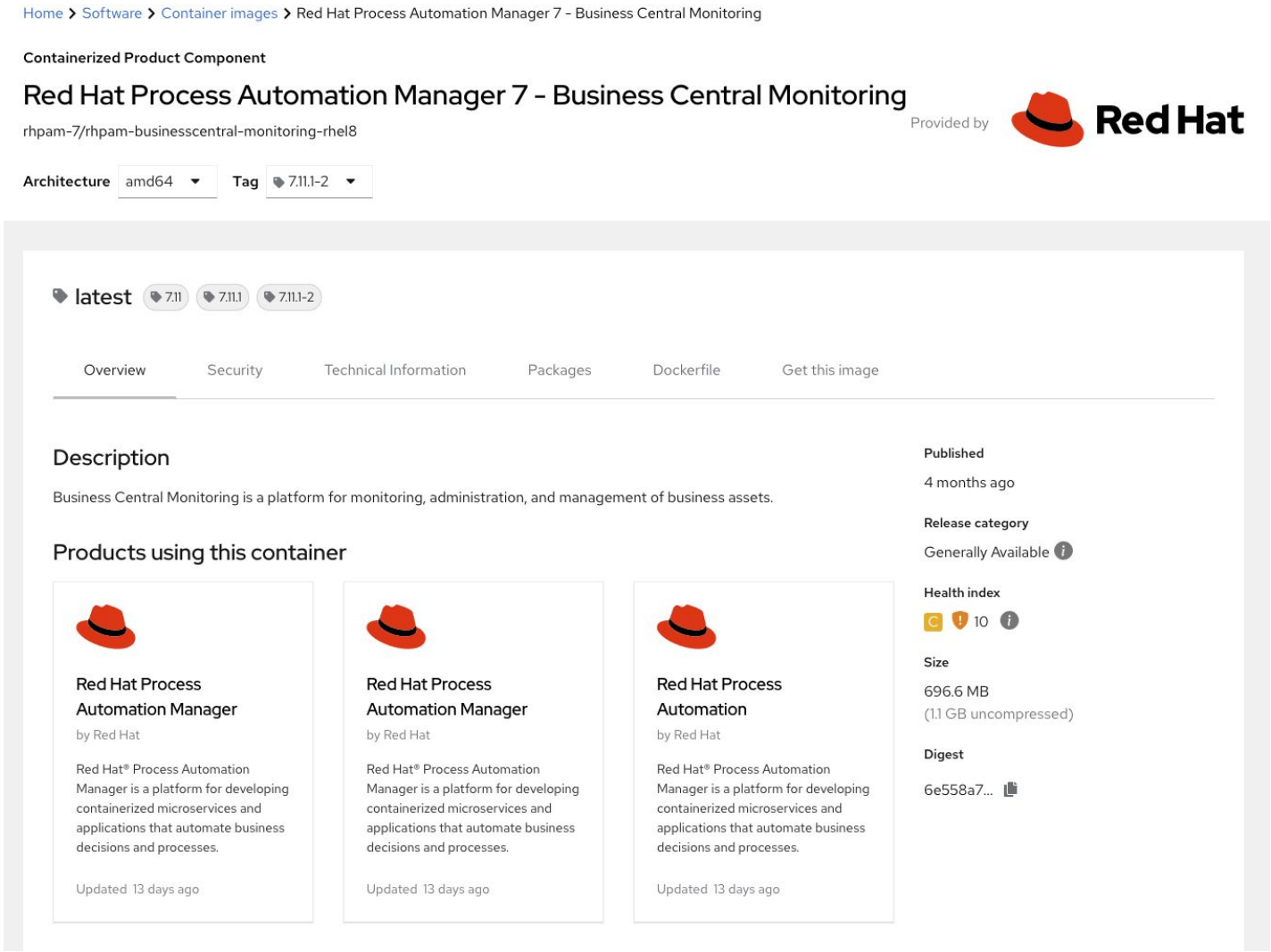
Let's Investigate

Example of a containerized application



>Link<

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