Let’s Get Running with Containers!

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Emerging Technologies

Red Hat

Install podman or podman desktop

- Linux
  - Podman or podman desktop
- MacOS
  - Podman desktop
- Windows
  - Podman desktop

Install Instructions: https://podman.io/docs/installation

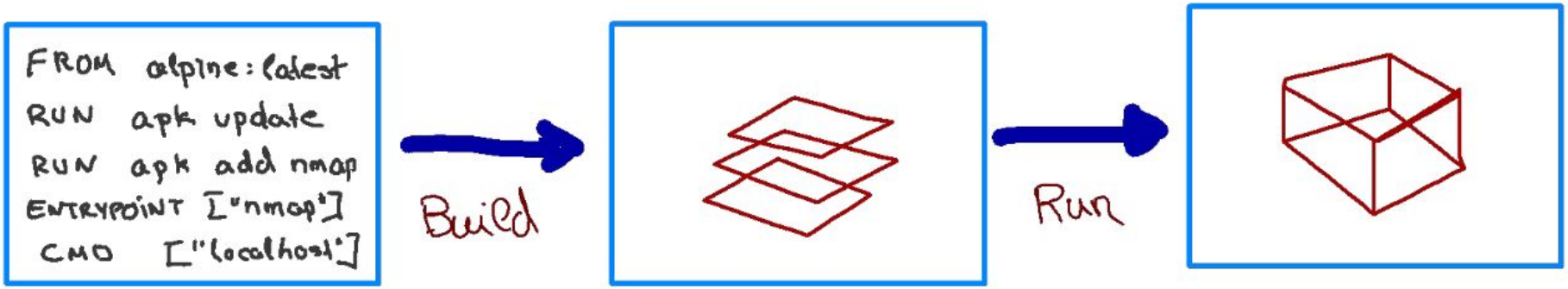
What are Containers?

- Extremely portable and lightweight
- Easy to share
- Fully packaged software
    - All dependencies included
- Used for
    - Development
    - Training
    - Deployment

What are Containers?

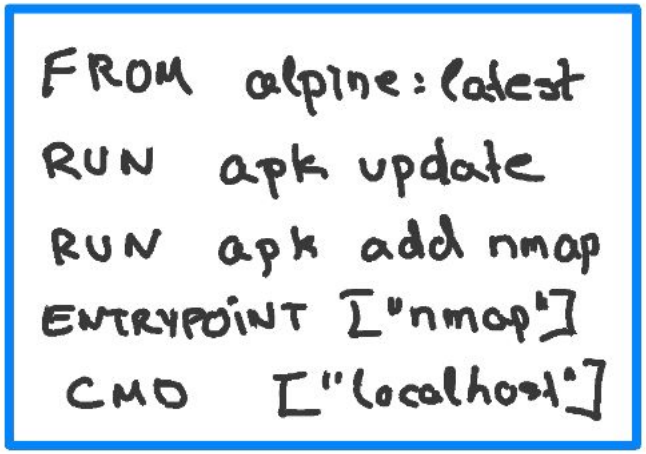
- Normal Linux processes with...
  - Constrained Resources - **cgroups**
  - Isolation - **namespaces (mount, pid, user, networking)**
  - Extra Security - **SELinux, Seccomp, Capabilities**

Container Images



Containerfile | Image | Container

Container Images



Containerfile

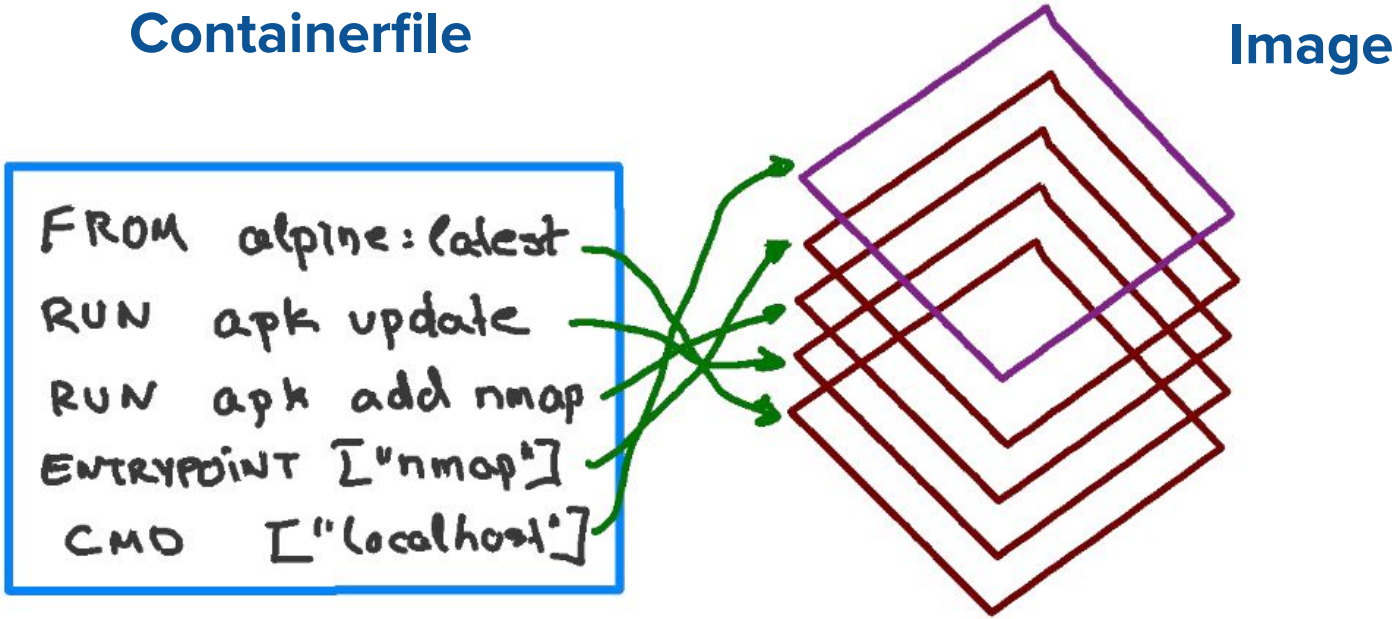
FROM - Base image to use

RUN - Commands to run when building the container image. Can have multiple RUN commands and each RUN command creates a new layer

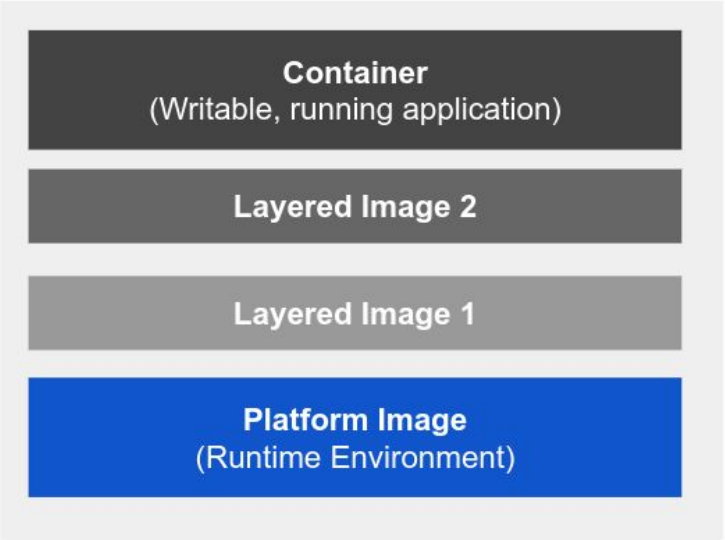
ENTRYPOINT - Used to make the container run the same command every time it is started. This cannot be overwritten via the command line

CMD - The command and/or parameters for the container to run when started. This can be overwritten via the command line

Container Images



Container Images



A application sandbox
- Each container is based on an image that holds necessary config data
- When you launch a container, a writable layer is added on top of the image

A static snapshot of the container configuration
- Layer images are read-only
- Each image depends on one or more parent images

An Image that has no parent
- Platform images define the runtime environment, packages and utilities necessary for containerized application to run

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Container Images

- **Base layer**: rootfs + json file description
- **Additional layers**: packages + updated json file
- Tarball of above

An image tag is a label applied to a container image in a repository that distinguishes a specific image from other images. Typically, the tag represents a version number of some sort.

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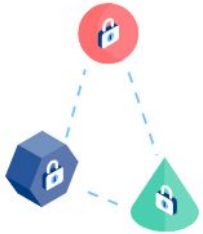
Container Registry

- Stores the image layers
- Hub of container images
- Images are pushed to and pulled from here

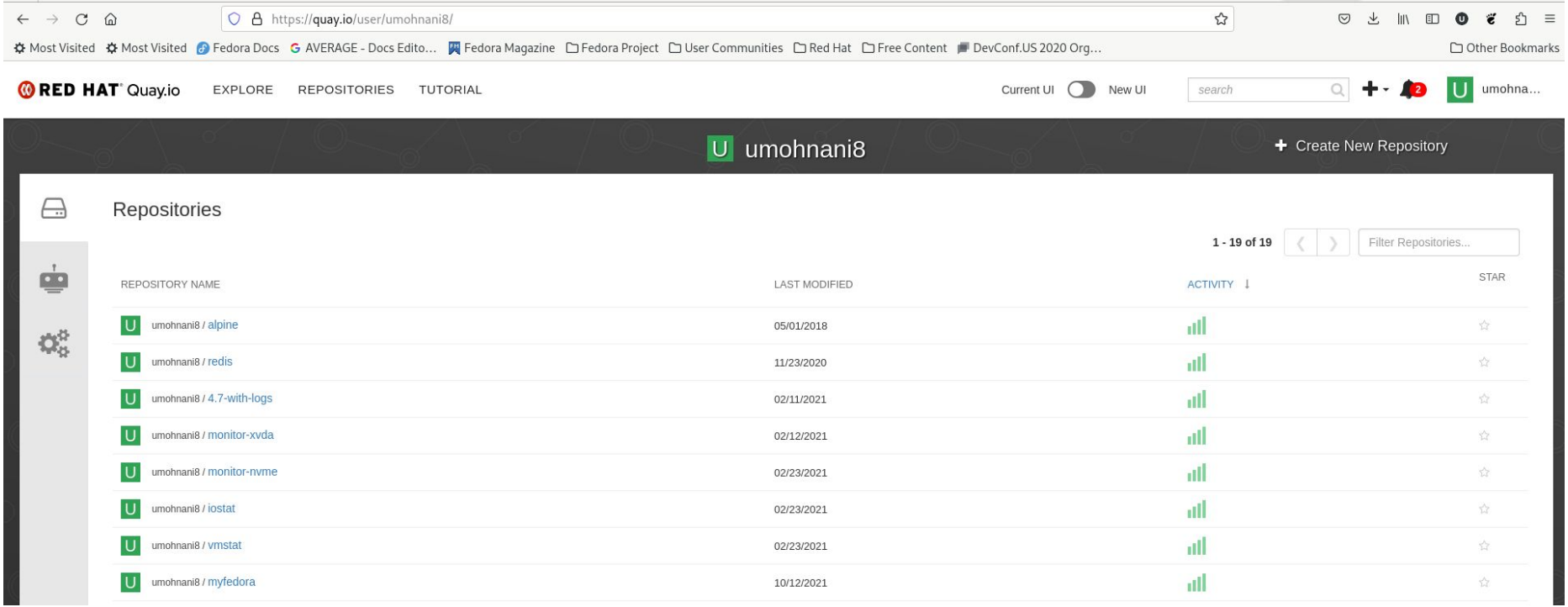
umohnani | Search by repository name | All Content | Create repository

umohnani / **foo1** Contains: No content | Last pushed: 3 months ago	Security unknown	☆ 0	⬇ 1	Public
umohnani / **foobar** Contains: No content | Last pushed: 4 months ago	Security unknown	☆ 0	⬇ 0	Public
umohnani / **bf-1** Contains: Image | Last pushed: 6 months ago	Security unknown	☆ 0	⬇ 4	Public
umohnani / **pacman** Contains: Image | Last pushed: 10 months ago	Security unknown	☆ 0	⬇ 12	Public
umohnani / **joke-image** Contains: Image | Last pushed: 11 months ago	Security unknown	☆ 0	⬇ 3	Public
umohnani / **myimage** Contains: No content | Last pushed: about 2 years ago	Security unknown	☆ 0	⬇ 51	Public



Create An Organization

Create and manage users and grant access to your repositories.


https://quay.io/user/umohnani8/
Most Visited
Most Visited
Fedora Docs
AVERAGE - Docs Edito...
Fedora Magazine
Fedora Project
User Communities
Red Hat
Free Content
DevConf.US 2020 Org...
Other Bookmarks
RED HAT Quay.io
EXPLORE
REPOSITORIES
TUTORIAL
Current UI
New UI
search
umohna...
umohnani8
Create New Repository
Repositories
1 - 19 of 19
Filter Repositories...
REPOSITORY NAME
LAST MODIFIED
ACTIVITY
STAR
umohnani8 / alpine 05/01/2018
umohnani8 / redis 11/23/2020
umohnani8 / 4.7-with-logs 02/11/2021
umohnani8 / monitor-xvda 02/12/2021
umohnani8 / monitor-nvme 02/23/2021
umohnani8 / iostat 02/23/2021
umohnani8 / vmstat 02/23/2021
umohnani8 / myfedora 10/12/2021

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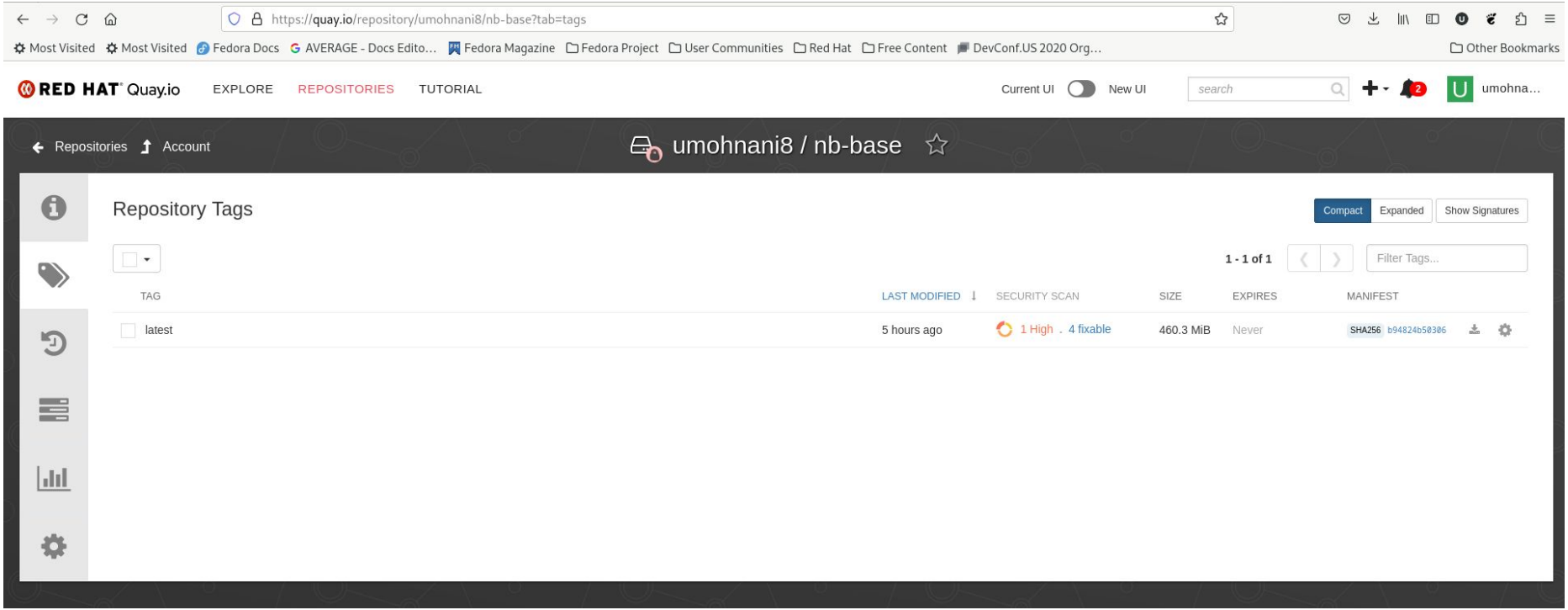
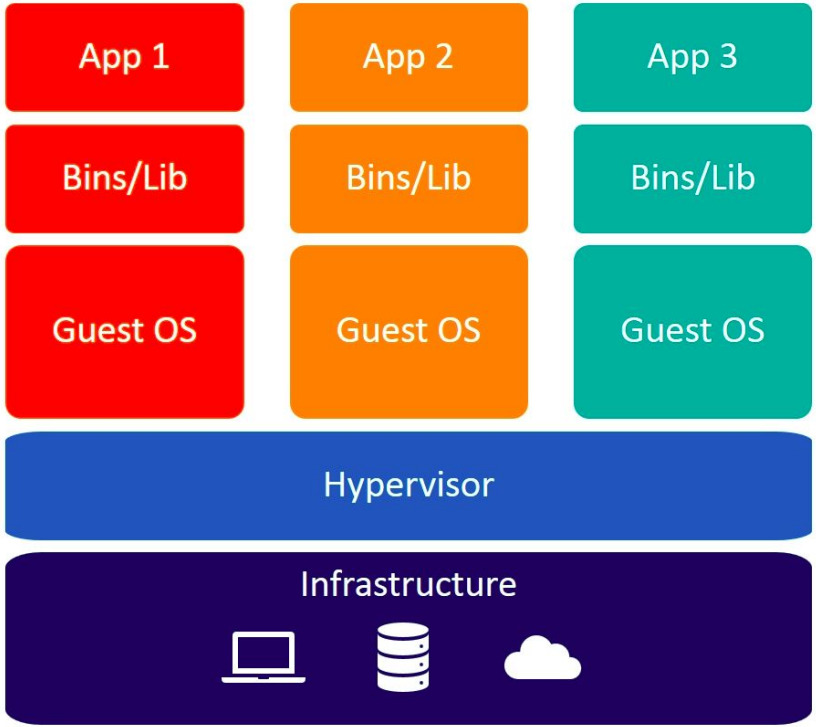
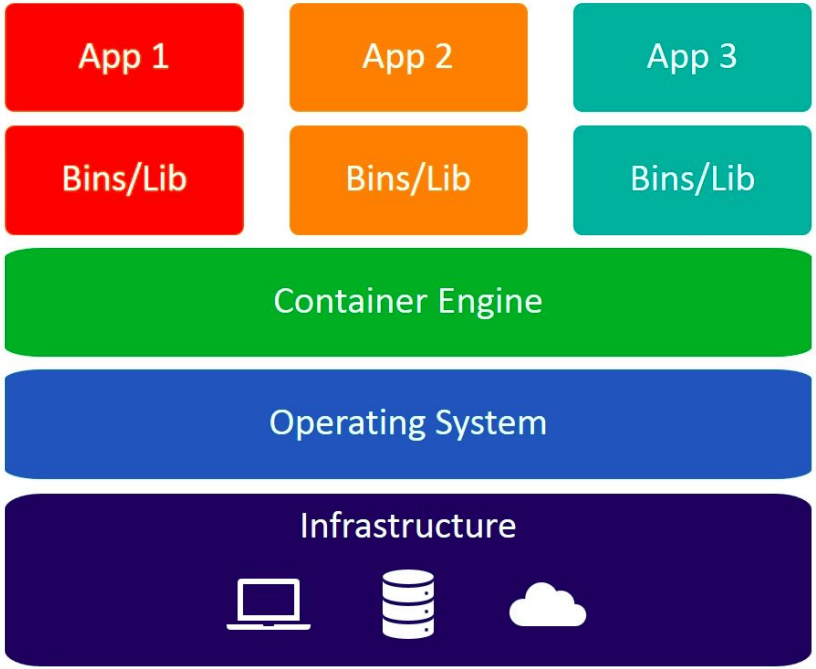

https://quay.io/repository/umohnani8/nb-base?tab=tags
Most Visited
Most Visited
Fedora Docs
AVERAGE - Docs Edito…
Fedora Magazine
Fedora Project
User Communities
Red Hat
Free Content
DevConf.US 2020 Org…
Other Bookmarks
RED HAT Quay.io
EXPLORE
REPOSITORIES
TUTORIAL
Current UI
New UI
search
umohna…
Repositories
Account
umohnani8 / nb-base
Repository Tags
Compact
Expanded
Show Signatures
1 - 1 of 1
Filter Tags...
TAG
LAST MODIFIED
SECURITY SCAN
SIZE
EXPIRES
MANIFEST
latest
5 hours ago
1 High . 4 fixable
460.3 MiB
Never
SHA256 b94824b50306

Container Engines

- Reassembles rootfs from the layers in the image onto local disk (COW)
- Creates a container runtime config (another json file) from runtime parameters (flags, options)
- Launches a container runtime (runc, crun)



Virtual Machines



Containers

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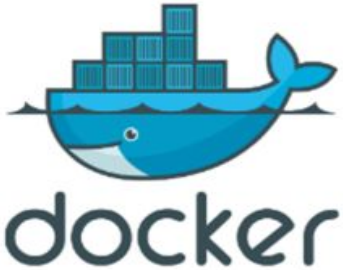
Open Container Initiative

- Container Image (packaging)
- Container Runtime (launching)
- Container Registry (storing)
- OCI: Any image can run on any runtime and can be pushed to any registry



cri-o

podman

skopeo

buildah

OPEN CONTAINER INITIATIVE

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When Working with Containers...

- Build - **buildah**
- Run & Develop locally - **podman**
- Store/Share - **skopeo**
- Run in a Production Cluster - **CRI-O**

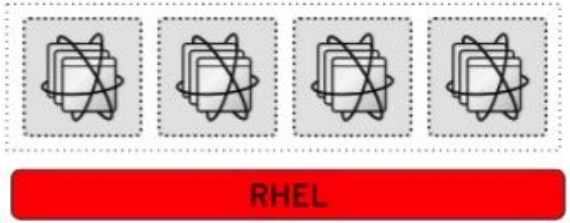
buildah

Build OCI/docker Images

skopeo

Inspect, copy, & sign Images

podman



run, manage, debug containers

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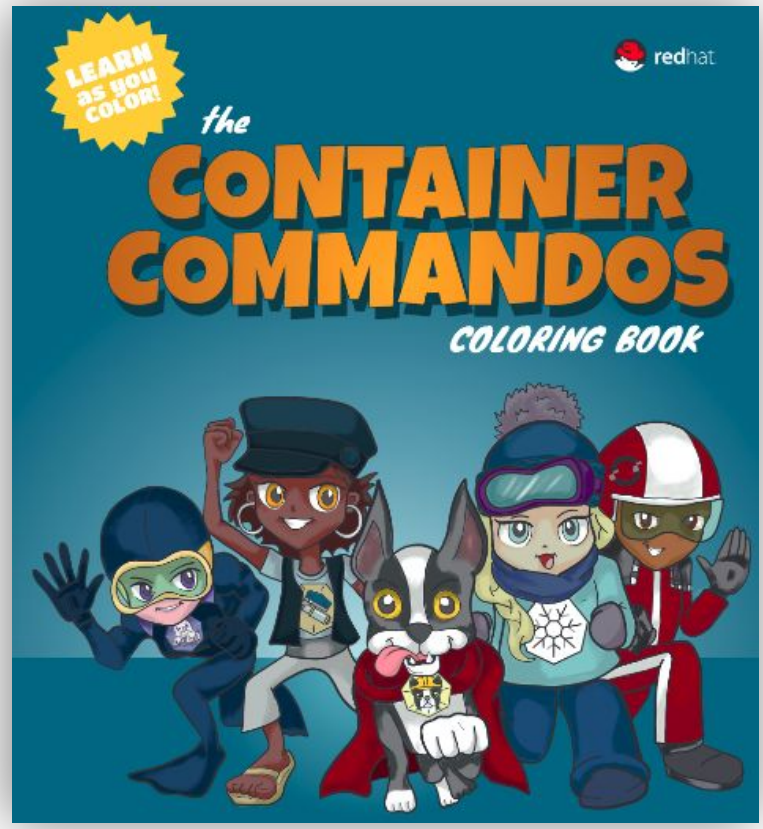
buildah

podman

skopeo

cri-o



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All tutorials are located at

https://github.com/umohnani8/tutorials

Clone the repo locally:

```
git clone github.com/umohnani8/tutorials
```

Tutorial 1 - cowsay

1. Have podman or podman desktop installed
2. Follow instructions at https://github.com/umohnani8/tutorials/tree/main/containers/cowsay
3. Create a file called **Containerfile** with the following instructions
4. Make sure you are in the same directory as your **Containerfile**
   a. Check directory contents with **ls**
5. Build it with **podman build -t myimage .**
6. Run the built image with **podman run myimage**

Tutorial 2 - Github User

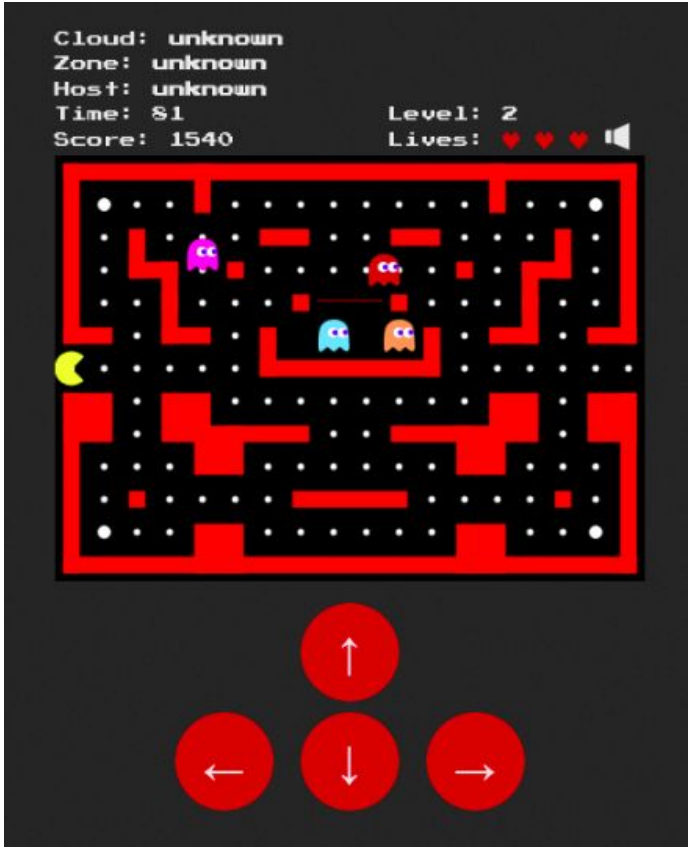
1. Have podman or podman desktop installed
2. Create a python script similar to example shown here - https://github.com/umohnani8/tutorials/tree/main/containers/github-user
3. Create a file called **Containerfile** with instructions to add dependencies and the python script
4. Make sure you are in the same directory as your **Containerfile**
   a. Check directory contents with **ls**
5. Build it with **podman build -t github-user .**
6. Run the built image with **podman run github-user**

Tutorial 3 - Multi stage

1. Have podman or podman desktop installed
2. Follow instructions at Multi-stage build example with Go binary
3. Make sure you are in the same directory as your **Containerfile**
   a. Check directory contents with **ls**
4. Build it with **podman build -t ascii-art-server .**
5. Run the built image with **podman run --rm -p 8080:8080 ascii-art-server**

Let's Play PacMan!

1. Follow the steps here to get pacman running locally
2. Experience with
   a. Building container image
   b. Running the built container image
   c. Play pacman on localhost in browser!



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LABS:

https://developers.redhat.com/learn/rhel

- Scroll down for the podman & buildah tutorials - then explore the others!
- note it was reported if you can't access the labs, try switching from Chrome to Firefox or maybe use incognito or clear browser.
- If having connection issues, it could be because many people are trying to access the lab at once. Try again a bit later.

Resources:

- **Happy 6th Birthday, Kubernetes** :
  https://www.openshift.com/blog/happy-6th-birthday-kubernetes
- **Kubernetes Concepts (and other docs)**
  https://kubernetes.io/docs/concepts/
- **Containers Tools Coloring Book**
  https://github.com/mairin/coloringbook-container-commandos/blob/master/Web.pdf
- **Happy 5th Birthday, OCI:**
  https://www.youtube.com/watch?v=GTTeoN00CI8&list=PLj6h78yzYM2O1wlsM-Ma-RYhfT5LKg0XC
- **Programming Kubernetes O'Reilly**
- **Free ebooks and coloring books**