THINGS I WISH I KNEW ABOUT CONTAINERS SOONER

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THANK YOU FOR BEING HERE.

WHO IS THIS FOR?

The container converts

The container curious

The container curmudgeons

WHAT DO I HOPE YOU GET FROM THIS

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- Insight - A new way to think about something
- Perspective - See where someone else might be
- Knoweldge - Learn something new

HOW DID WE GET TO THIS TOPIC

WHERE ARE WE GOING

- What is a Container
- Linux Technologies
- Working with Containers

WHAT ARE CONTAINERS?

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Containers are groups of processes running on a Linux system that are isolated from each other.

Podman-in-Action

THEY ARE LIKE VIDEO GAME CARTRIDGES

- Lightweight
- Self-Contained
- Portable

OKAY, BUT WHY?

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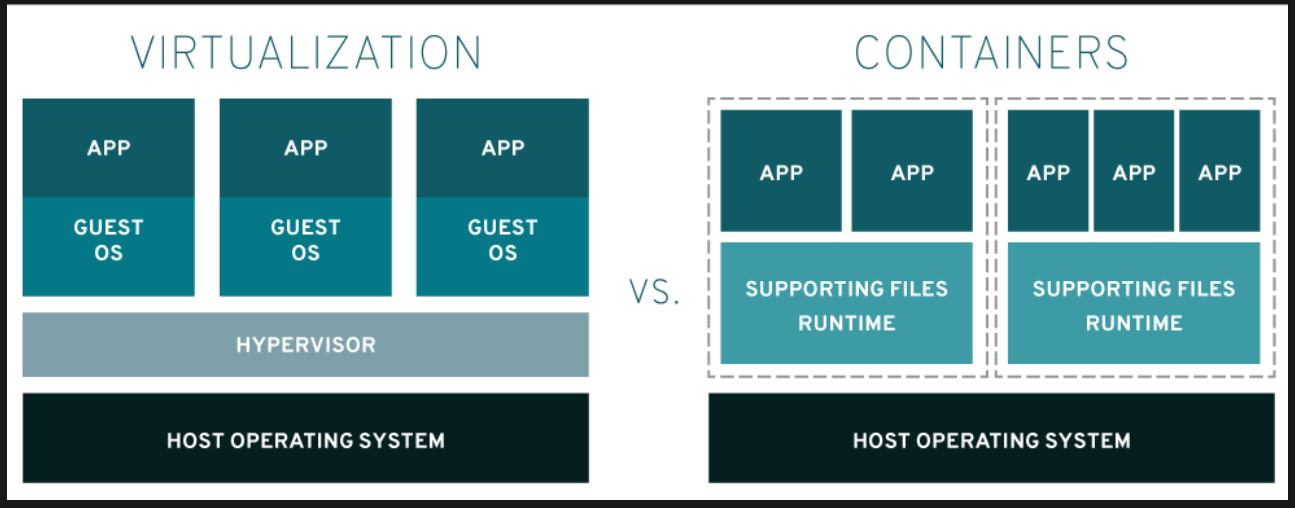
Containers as isolated processes, leads to better resource usage and a higher desnity for a single host.



CONTAINER TERMINOLOGY

Container Image - Base static image file.

example: RHEL Universal Base Image (UBI)

Container Engine - Software (Podman, Docker) for running containers on a single machine.

Container Orchestrators - Software for running containrs across multiple machines (Kubernetes, Swarm)

LINUX TECHNOLOGIES

- Namespaces
- CGroups
- SECCOMP
- SELinux

NAMESPACES

Linux Namespaces - Wikipedia

Namespaces are a feature of the Linux kernel that partitions kernel resources such that one set of processes sees one set of resources while another set of processes sees a different set of resources.

CGROUPS

From https://man7.org/linux/man-pages/man7/cgroups.7.html

Control groups, usually referred to as cgroups, are a Linux kernel feature which allow processes to be organized into hierarchical groups whose usage of various types of resources can then be limited and monitored.

SECCOMP

Container Security Guide

Secure Computing Mode (seccomp) is a kernel feature that allows you to filter system calls to the kernel from a container.

SELINUX

https://stopdisablingselinux.com/

WORKING WITH CONTAINERS

- Container Engines and Runtimes
- Container Storage
- Container Networking

CONTAINER ENGINE

Docker and Podman are popular container engines

- Interface with end-users
- Interface with image registries
- Interface with container runtimes

CONTAINER RUNTIME

Examples of container runtimes are runc and crun

- Manage the container life-cycle.
- Setup the cgroups and namespaces.
- Manage storage and network setup.
- Run and manage the container

CONTAINER VOLUMES

Persistent data and Ephemeral processes

PERSISTENT STORAGE

- Bind Mounts
- Volumes

BIND MOUNTS

Bind mounts allow one part of the filesystem to be mounted in another place in the file system.

```
# mount --bind /var/log/httpd /home/admin/logs
```

BIND MOUNTS IN CONTAINERS

Bind mounts in containers are a way to provide persistent storage by decoupling filesystem storage from the container.

- Provide files for a web server
- Share additional/updated config files
- Test code changes

EXAMPLE BIND MOUNT

```
podman run -d --rm --name ghost-app1
--network ghost-network --
ip=10.89.0.10 -v
/var/srv/containers/ghost-
content:/var/lib/ghost/content:Z ghost
```

CONTAINER VOLUMES

- Can be re-used amongst containers
- Stored as a file in container storage.

CONTAINER COMMUNICATION

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- App/Host to Container

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- App/Host to Container
- Container to Container

APP/HOST AND CONTAINER

The easiest way to talk to a container is through any of the exposed ports.

```
$ podman image inspect docker.io/library/httpd:latest
"Config": {
                "ExposedPorts": {
                    "80/tcp": {}
                },
```

CONTAINER TO CONTAINER

Containers can communicate with each other if they are on the same network.

```
$ podman network ls
NETWORK ID    NAME        DRIVER
2a3689189ffd  podman      bridge
$ podman inspect 2a3689189ffd
"Networks": {
    "ghost-network": {
         "EndpointID": "",
         "Gateway": "10.89.0.1",
         "IPAddress": "10.89.0.2",
         "IPPrefixLen": 24,
         "IPv6Gateway": "",
         "GlobalIPv6Address": "",
         "GlobalIPv6PrefixLen": 0,
         "MacAddress": "4e:34:cc:bd:92:b5",
         "NetworkID": "ghost-network"
```

CONTAINER ORCHESTARITON

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BUT NOT REALLY...

EXAMPLE

```
#!/bin/bash

podman run -d --rm --name ghost-app1  --network ghost-network
podman run -d --rm --name ghost-app2  --network ghost-network
podman run -d --rm -v /root/custom-nginx.conf:/etc/nginx/nginx
```

IN REVIEW

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THE THINGS I WISH I KNEW SOONER

1. Containers aren't scary, just a game cartridge
2. CGroups, Namespaces, etc. It's JUST Linux
3. Storage and Networking were really key to learn.

QUESTIONS?

THANK YOU!