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Training and
Certification

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OPEN INNOVATION LABS

DevOps Culture and Practice Enablement

Containers, Registries, OpenShift (Kubernetes) Overview

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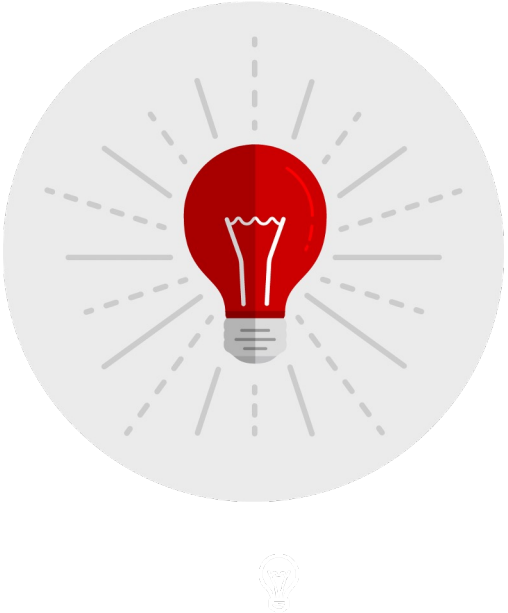
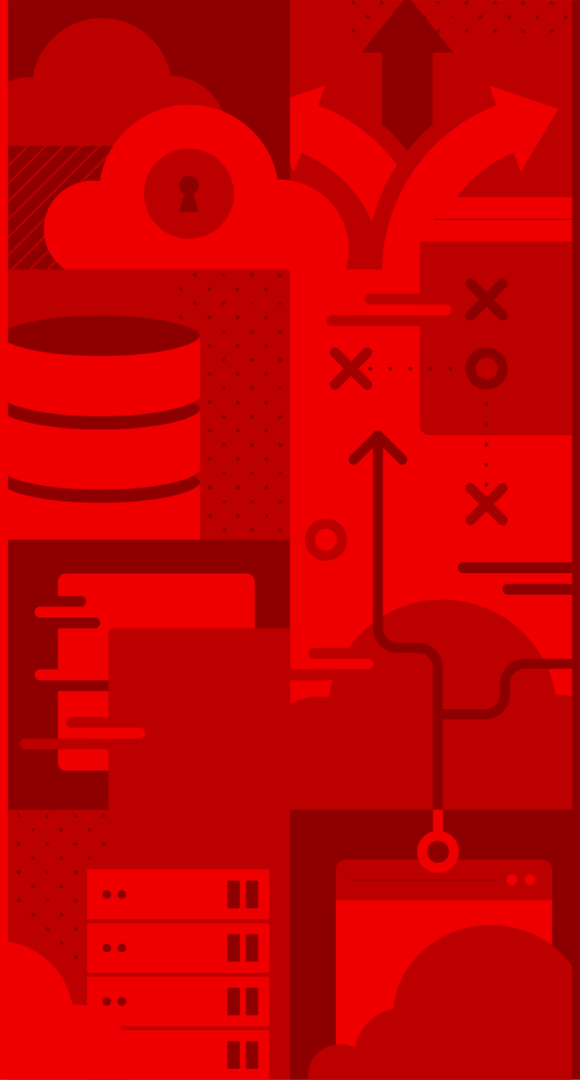
Topics



Containers
What are containers?

Registries (Image Registries)
What are container images and image registries?

OpenShift / Kubernetes
What exactly is OpenShift and Kubernetes?



Containers

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Container

A container is basically a running, virtualized application in a self-contained package. Containers are based on a **container image** which consists of the entire runtime environment including:

- The application
- All libraries and dependencies
- Additional binaries needed by the application
- Configuration files needed to run the application

https://www.redhat.com/en/topics/containers

Containers

Julia Evans
@b0rk

containers aren't magic

These 15 lines of bash will start a container running the fish shell. Try it!
(download this script at bit.ly/containers-arent-magic)

```
wget bit.ly/fish-container -O fish.tar       # 1. download the image
mkdir container-root; cd container-root      #
tar -xf ../fish.tar                          # 2. unpack image into a directory
cgroup_id="cgroup_$(shuf -i 1000-2000 -n 1)" # 3. generate random cgroup name
cgcreate -g "cpu,cpuacct,memory:$cgroup_id"  # 4. make a cgroup &
cgset -r cpu.shares=512 "$cgroup_id"         #    set CPU/memory limits
cgset -r memory.limit_in_bytes=1000000000 \  #
      "$cgroup_id"                           #
cgexec -g "cpu,cpuacct,memory:$cgroup_id" \  # 5. use the cgroup
    unshare -fmuipn --mount-proc \           # 6. make + use some namespaces
    chroot "$PWD" \                          # 7. change root directory
    /bin/sh -c "                             #
        /bin/mount -t proc proc /proc &&     # 8. use the right /proc
        hostname container-fun-times &&      # 9. change the hostname
        /usr/bin/fish"                       # 10. finally, start fish!
```

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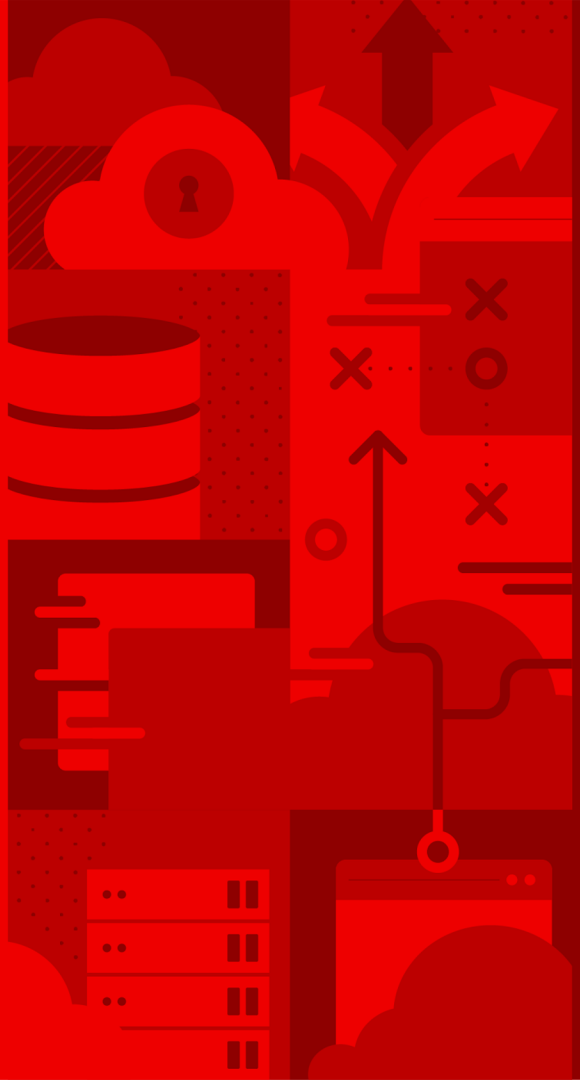
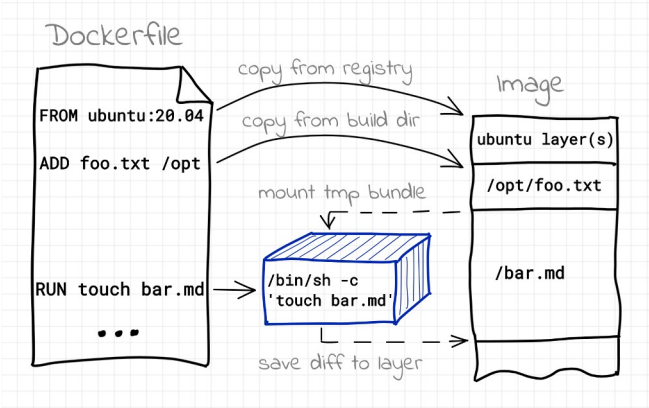
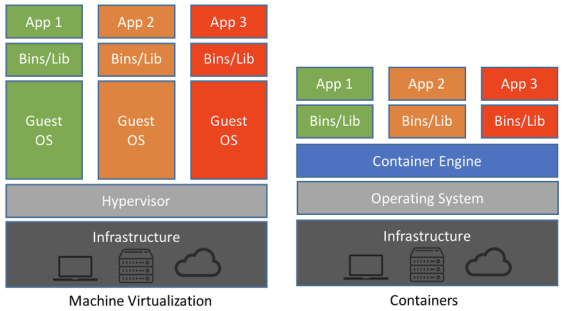


Registries

Container Image

A **container image**, in its simplest definition, is a file which is pulled down from a Registry Server and used locally as a mount point when starting Containers. Container images can be built based on instructions called Dockerfiles.





https://developers.redhat.com/blog/2018/02/22/container-terminology-practical-introduction

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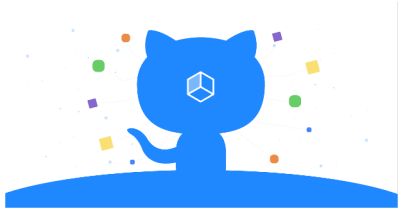
Container Image Registries



A container registry is **a repository, or collection of repositories, used to store container images for Kubernetes, DevOps, and container-based** application development.

https://www.redhat.com/en/topics/cloud-native-apps/what-is-a-container-registry#:~:text=A%20container%20registry%20is%20a,and%20container%2Dbased%20application%20development

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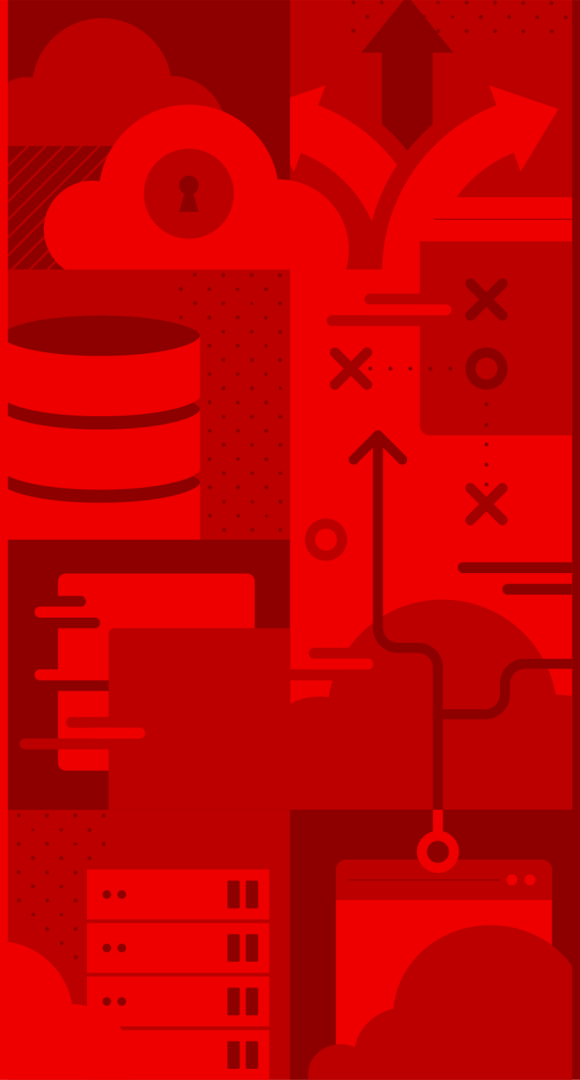

OpenShift & Kubernetes

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OpenShift and Kubernetes

kubernetes

Kubernetes is an open-source container-orchestration system for automating computer application deployment, scaling, and management. It was originally designed by Google and is now maintained by the Cloud Native Computing Foundation (CNCF). Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation

https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/

Red Hat® OpenShift® is an enterprise-ready Kubernetes container platform with full-stack automated operations to manage hybrid cloud, multi-cloud, and edge deployments. Extends existing Kubernetes framework with:

- Routes
- Dashboards (Unified UI)
- Monitoring/Metrics/Logging
- Integrated Developer workflows supporting CI/CD pipelines and S2I

https://www.redhat.com/en/technologies/cloud-computing/openshift

Config Maps and Secrets

A **ConfigMap** is an API object used to store non-confidential data in key-value pairs. Pods can consume ConfigMaps as environment variables, command-line arguments, or as configuration files in a volume. A ConfigMap allows you to decouple environment-specific configuration from your container images, so that your applications are easily portable.

https://kubernetes.io/docs/concepts/configuration/configmap/

A Secret is an object that contains a small amount of sensitive data such as a password, a token, or a key. Such information might otherwise be put in a Pod specification or in a container image. Using a Secret means that you don't need to include confidential data in your application code.

- **Secrets are ENCODED B64 but no ENCRYPTED**

https://kubernetes.io/docs/concepts/configuration/secret/

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