Beginning Docker

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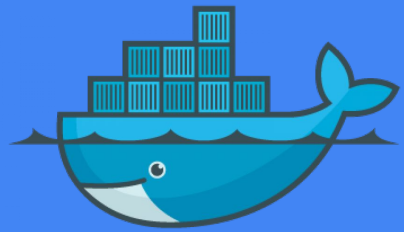


Preliminary Notes

Docker Overview

Defining Terminology

Docker Interaction

Building Images with Dockerfiles

Multiple Containers with Compose

Presentation Subtopics

Preliminary Notes

Containerization and Virtualization

Not a full OS

Runs off a Separate Container Engine

Smaller Overhead

Create a Segmented Environment

Self-contained OS

Uses a Hypervisor

Larger Overhead

Create a Segmented Environment

Docker Overview

What even is Docker?

Docker is a vastly popular application containerization platform

Pro-open source toolkit

Works on multiple operating systems

Written in Golang

Why use Docker?

Docker is a way to package software so that it can run on any hardware

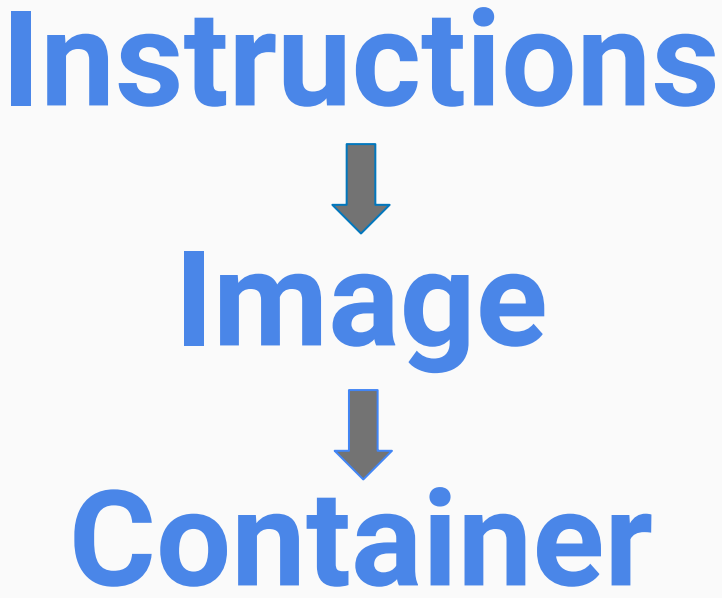
Prevent applications from reaching primary OS

Extremely lightweight

Commonly used with CI/CD

Defining Terminology

States



Docker Terminology

Instructions	Commands and arguments used to build an image
Image	Base state of an instance when a container is spun up
Container	Containerized running application
Volume	File mount point for multi-environment interaction
Engine/Daemon	Service that manages building and running docker containers
CLI	Tool used to interact with the Docker daemon
Hub	Registry of all available Docker images

Docker Interaction

CLI Usage

Generally, CLI usage can be boiled down to:

```
docker <subcommand> [options]
```

There exists a number of basic subcommands that are used consistently

Common Arguments

```
-it          = Interactive
--rm         = Remove image when finished
-d           = Daemonize the container
-v           = Mount a volume between the container and host system
-t           = Tag an image with a name
-p <H:C>     = Specify Host:Container networking ports
```

Pulling an Image

SYNTAX

`docker pull <image:tag>`

```
❯ docker pull alpine
Using default tag: latest
latest: Pulling from library/alpine
59bf1c3509f3: Pull complete
Digest: sha256:21a3deaa0d32a8057914f36584b5288d2e5ecc984380bc0118285c70fa8c9300
Status: Downloaded newer image for alpine:latest
docker.io/library/alpine:latest
```

Starting a Docker Container

SYNTAX

`docker run [options] <image:tag>`

```
❯ docker run -it alpine
/ # whoami
root
/ # ls -al
total 64
drwxr-xr-x    1 root     root          4096 Feb 14 20:52 .
drwxr-xr-x    1 root     root          4096 Feb 14 20:52 ..
-rwxr-xr-x    1 root     root             0 Feb 14 20:52 .dockerenv
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 bin
drwxr-xr-x    5 root     root           360 Feb 14 20:52 dev
drwxr-xr-x    1 root     root          4096 Feb 14 20:52 etc
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 home
drwxr-xr-x    7 root     root          4096 Nov 24 09:20 lib
drwxr-xr-x    5 root     root          4096 Nov 24 09:20 media
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 mnt
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 opt
dr-xr-xr-x  221 root     root             0 Feb 14 20:52 proc
drwx------    1 root     root          4096 Feb 14 20:52 root
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 run
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 sbin
drwxr-xr-x    2 root     root          4096 Nov 24 09:20 srv
dr-xr-xr-x   13 root     root             0 Feb 14 20:52 sys
drwxrwxrwt    2 root     root          4096 Nov 24 09:20 tmp
drwxr-xr-x    7 root     root          4096 Nov 24 09:20 usr
drwxr-xr-x   12 root     root          4096 Nov 24 09:20 var
/ #
```

Querying Images

SYNTAX

```
docker image[s] [options]
```

```
❯ docker images
REPOSITORY   TAG       IMAGE ID       CREATED         SIZE
alpine       latest    c059bfaa849c   2 months ago    5.59MB
```

Querying Running Containers

SYNTAX

```
docker ps [options]
```

OR

```
docker container ls [options]
```

```
❯ docker ps
CONTAINER ID   IMAGE     COMMAND              CREATED         STATUS
7ed5e722242b   httpd     "httpd-foreground"   4 seconds ago   Up 3 seconds
```

Building Images with Dockerfiles

What is a Dockerfile?

Set of Docker-specific instructions

Used for creating a custom image

Builds upon an existing image, whether local sourced or from DockerHub

Dockerfile Syntax

FROM	Specify a base image to utilize
WORKDIR	Sets the default working directory for Dockerfile commands
RUN	Execute a specified command while building the image
ADD/COPY	Move files into the docker image, either from a local or remote location
EXPOSE	Listen on a specific port during container runtime
ENV	Set an environment variable
ENTRYPOINT	Run an executable on container startup. Can take arguments
CMD	Run an executable on container startup. Ignored if arguments are specified

Building an Image

SYNTAX

`docker build [options] <context>`

```
FROM alpine:latest

RUN echo hello > file.txt

ENTRYPOINT cat file.txt
```

```
❯ docker build -t alpine-dfile .
[+] Building 0.4s (6/6) FINISHED
 ⇒ [internal] load build definition from Dockerfile
 ⇒ ⇒ transferring dockerfile: 113B
 ⇒ [internal] load .dockerignore
 ⇒ ⇒ transferring context: 2B
 ⇒ [internal] load metadata for docker.io/library/alpine:latest
 ⇒ CACHED [1/2] FROM docker.io/library/alpine:latest
 ⇒ [2/2] RUN echo hello > file.txt
 ⇒ exporting to image
 ⇒ ⇒ exporting layers
 ⇒ ⇒ writing image sha256:adaa50db2cd61662fcdf24638cacbf0dec631fa9b8e4cd25c93bf4da84aca843
 ⇒ ⇒ naming to docker.io/library/alpine-dfile

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
❯ docker run alpine-dfile
hello
```

Dockerfile Demos

Multiple Containers with Compose

Compose

Compose is a way to compile all Docker operations into one command

Can utilize all three states - Dockerfile → Image → Containers

Often used for spinning up multiple containers at once

File necessary: `docker-compose.yml`

Compose Syntax

Utilizes similar syntax to that of a Dockerfile

```
version: "3.9"
services:
  web:
    build: .
    ports:
      - "5000:5000"
  redis:
    image: "redis:alpine"
```

Compose Reference

Compose Demos

Thank you!

Questions?

Docker Installation: https://docs.docker.com/get-docker

Code: https://github.com/d3adzo/beginning-docker