Galvanize Deep Learning Workshop

Objectives

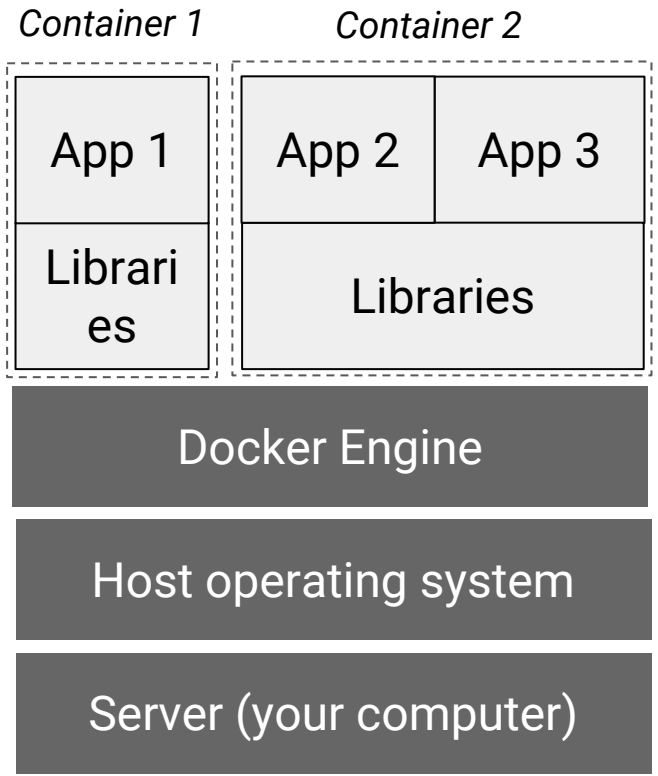
- Docker motivation
- What is Docker?
- How to make a Docker container
- Docker components
- Docker volumes
- Why we are using Docker in this course
- Docker command reference
- References

Docker motivation

From founder and CTO of Docker Soloman Hykes, as motivation for Docker:

“Shipping code to the server should not be hard.”

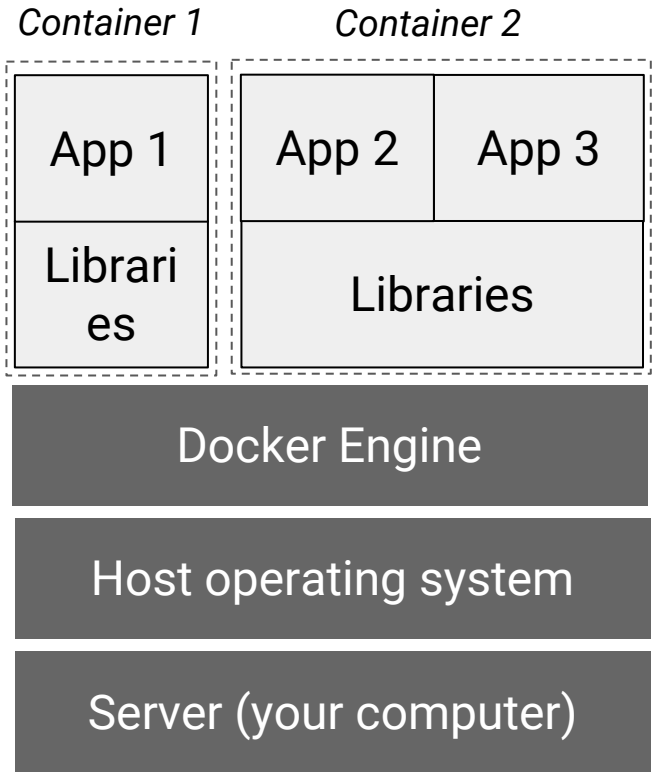
The developer can specify what’s inside the container, and IT just needs to handle the container.



No matter where the container goes, what’s inside will work the same way.

What is Docker

- Docker is an open-source project based on Linux containers.
- Docker is a software *containerization* platform.
- A docker *container* is a stand-alone piece of software that includes everything needed to run it.
- Containers are isolated from each other, but can share libraries where possible.
- Containers are created with Linux, but share a *kernel* with almost any type of OS.



A kernel is the central part of the OS.

Docker Timeline and Popularity

Docker was made open source in 2013 by Soloman Hykes at dotCloud.

Main contributors in 2016: Docker team, Cisco, Google, Huawei, IBM, Microsoft.

Has been downloaded more than 13 billion times as of 2017.

Main reasons for popularity:

Ease of use: Build and test it on your laptop and it will run anywhere.

Speed: Containers are sandboxed environments running on the kernel that take up fewer resources and are faster to start-up than virtual machines.

Docker Hub: the free app-store for Docker images

Modularity and Scalability: An application can be divided into multiple containers but those containers can communicate.

Making a Docker container from scratch (1/3)

A text *Dockerfile* defines what's in your container:

```
# Use an official Python runtime as a parent image
FROM python:2.7-slim

# Set the working directory to /app
WORKDIR /app

# Copy the current directory contents into the container at /app
ADD . /app

# Install any needed packages specified in requirements.txt
RUN pip install --trusted-host pypi.python.org -r requirements.txt

# Make port 80 available to the world outside this container
EXPOSE 80

# Define environment variable
ENV NAME World

# Run app.py when the container launches
CMD ["python", "app.py"]
```

Source: Docker Docs, Getting Started

Making a Docker container from scratch (2/3)

Put the *Dockerfile* and other files that define your application in the same directory and then build them into a *Docker Image* using the *Docker Client*:

```
$ ls
Dockerfile              app.py                  requirements.txt
```

```
docker build -t friendlyhello .
```

View the *Docker Image* “friendlyhello” that you’ve created:

```
$ docker images

REPOSITORY              TAG                 IMAGE ID
friendlyhello           latest              326387cea398
```

Source: Docker Docs, Getting Started

Making a Docker container from scratch (3/3)

Use the *Docker Client* and your *Docker Image* to build your container:

```
docker run -p 4000:80 friendlyhello
```

You can see what containers are presently running:

```
$ docker container ls
CONTAINER ID        IMAGE               COMMAND
1fa4ab2cf395        friendlyhello       "python app.py"
```

Note: we won't be doing all these steps. We'll be downloading and building a tensorflow image from *Docker Hub*.

Source: Docker Docs, Getting Started

Docker Components

Docker Client (laptop)

$ docker build
$ docker run
$ docker start
$ docker stop
$ docker pull
$ docker push

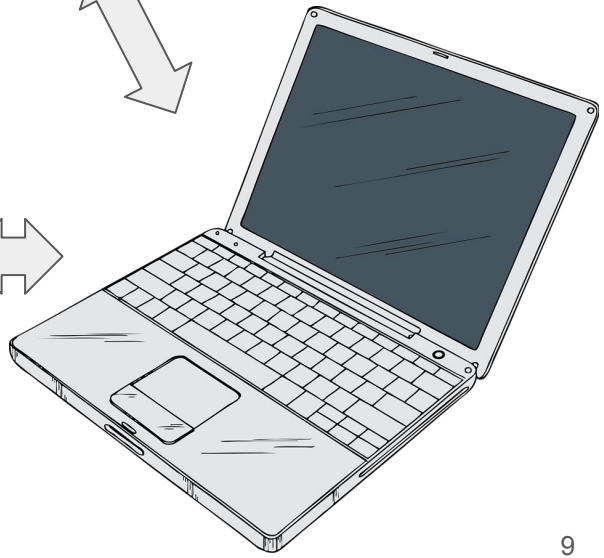
Docker Host (laptop)

Images

Containers

Volumes (where data persists)

Daemon (executes the commands)



Docker Volumes

- Docker volumes are the preferred way of persisting data needed and created by containers.
- Containers by themselves have a writable layer (you can store data in a container without using a volume), but a volume is better because:
  - it doesn't increase the size of the container using it
  - the volume exists outside of the lifecycle of the container
  - the volume can be shared with other containers
- You can create a volume when a container is made.
- You can move data back and forth between the host file system and the docker volume.

```
docker cp /tmp/my_data/. my_container:/my_data
```

Why we use Docker for this workshop

- You all are on different operating systems, but we'd like to make sure that Tensorflow works the same way for all of you during this part-time course.
    - Don't have much time for debugging! If we didn't use Docker, we'd be debugging in Linux, Windows, and Mac operating systems.
- Perfect application for Docker!
- The CE (Community Edition) is free.

- Install Docker Ubuntu Linux
- Install Docker Mac
- Install Docker Toolbox for Windows and older versions for Mac

Docker command reference (1/2)

Basic Docker commands

Command	Description
`docker run <image>`	Make and start a container from an image
`docker start <name | id>`	Start a pre-existing container
`docker stop <name | id>`	Stop a container
`docker ps`	Show running containers
`docker ps -a`	Show running and stopped containers
`docker rm <name | id>`	Removes a container

Docker command reference (2/2)

Docker reference

Command	Description
`docker`	Show available docker commands
`docker COMMAND --help`	Gets help on COMMAND
`docker logs <id>`	Return log of container (including browser link and token)

References

- Docker Documentation
- Docker on Github
- Docker Hub
- Solomon Hykes talk at Twitter, 2 Oct. 2013
- Preethi Kasireddy - Beginner friendly docker concepts