Introduction to Docker

{Microsoft Student Partner}

Agenda

Section 1:

What is Docker

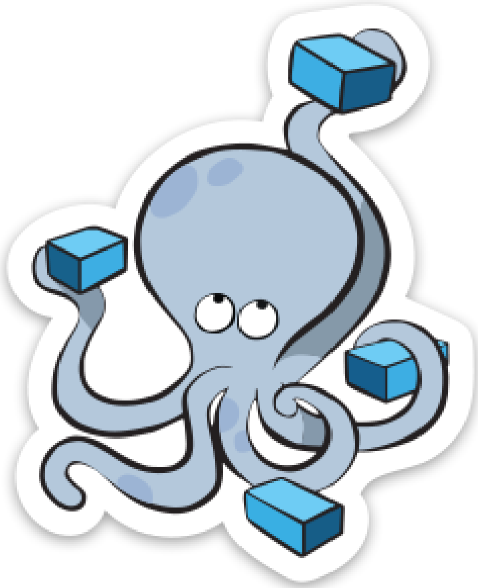
What is Docker Not

Basic Docker Commands
Dockerfiles

Section 2:

Anatomy of a Docker image

Docker volumes



Section 3:

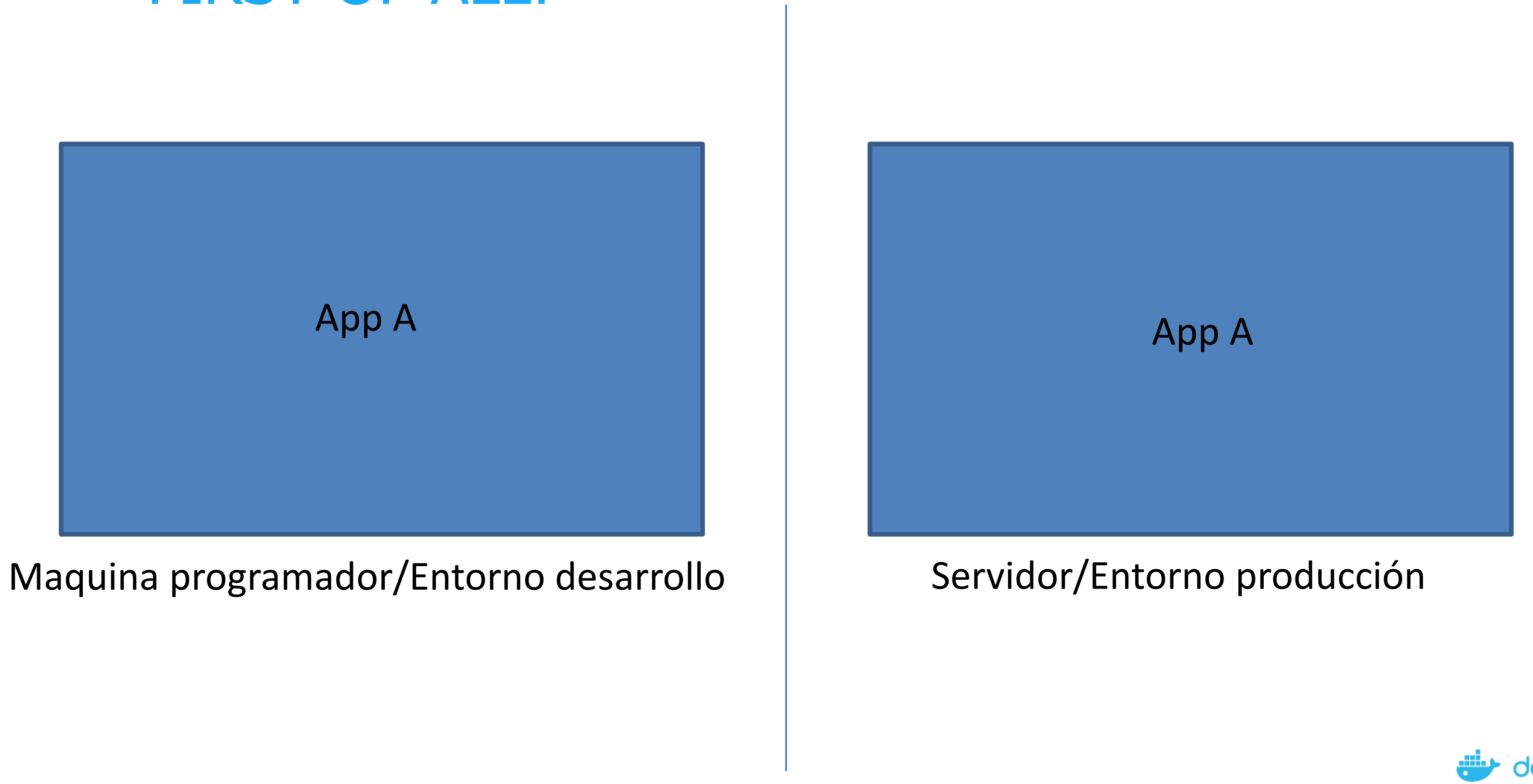
Networking

Section 4:

Docker compose / stacks

Demo

FIRST OF ALL!


App A
App A
Maquina programador/Entorno desarrollo
Servidor/Entorno producción

Section 1:

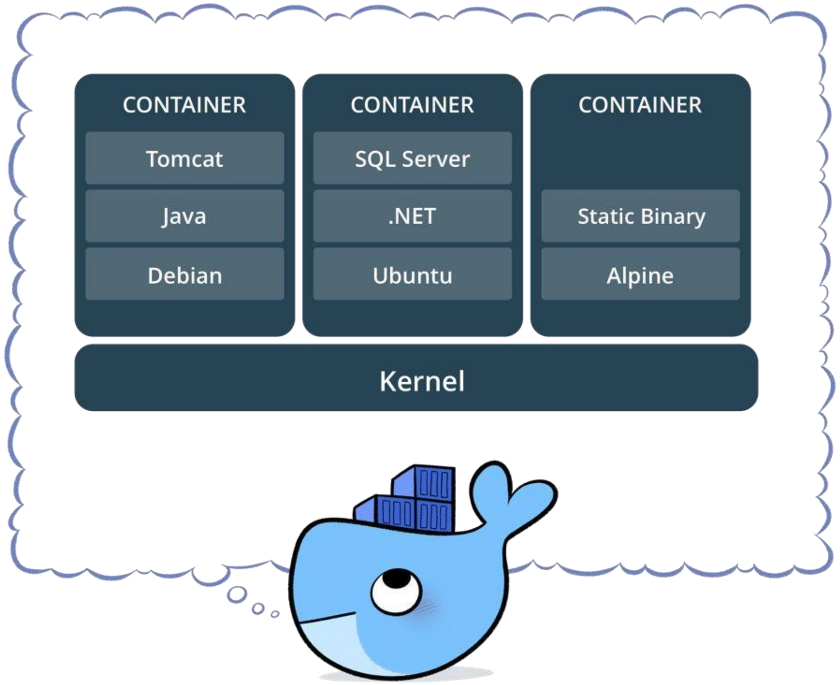
What is Docker

Basic Docker Commands

Dockerfiles

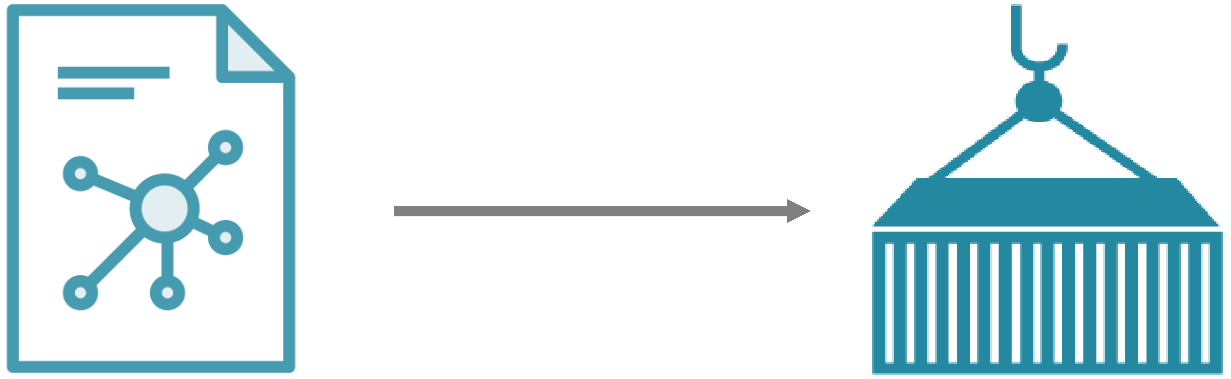
docker

What is a container?



- Standardized packaging for software and dependencies
- Isolate apps from each other
- Share the same OS kernel
- Works for all major Linux distributions
- Containers native to Windows Server 2016

The Role of Images and Containers



Docker Image

Docker Container

Example: Ubuntu with Node.js and Application Code

Created by using an image. Runs your application.

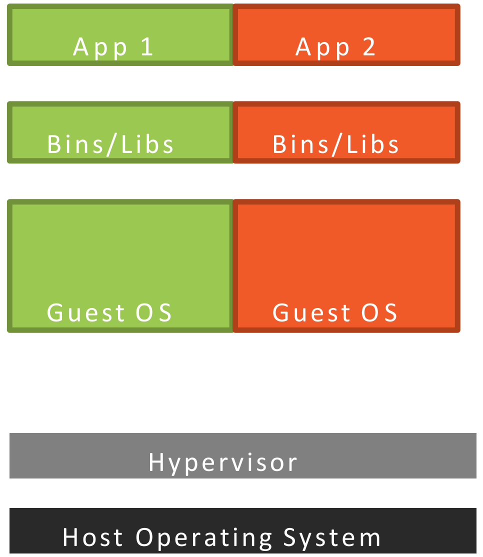
Docker containers are NOT VMs

- Easy connection to make
- Fundamentally different architectures
- Fundamentally different benefits

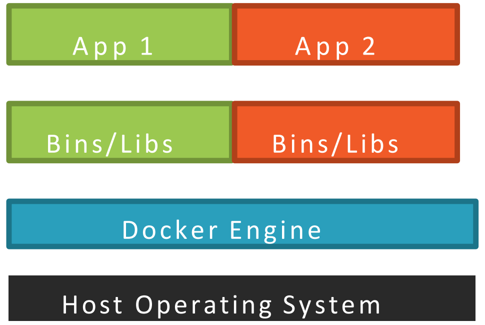
Maquina Virtual

Contenedores

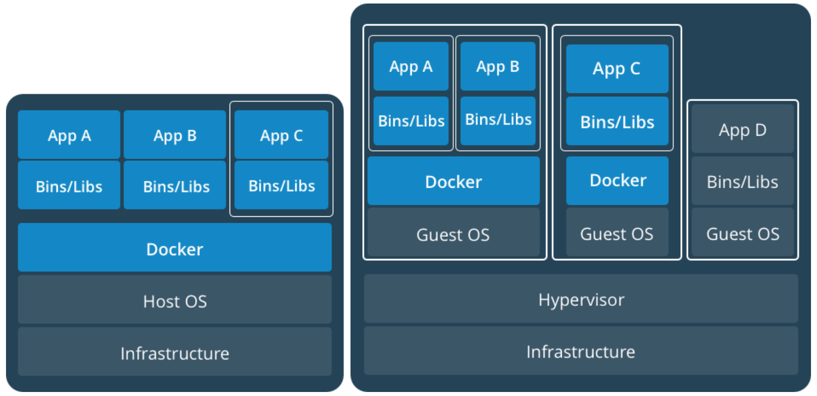
Docker Containers Versus Virtual Machines



Virtual Machines



Docker Containers



What Is Docker?

- Lightweight, open, secure platform
- Simplify building, shipping, running apps
- Runs natively on Linux or Windows Server
- Runs on Windows or Mac Development machines (with a virtual machine)
- Relies on "images" and "containers"

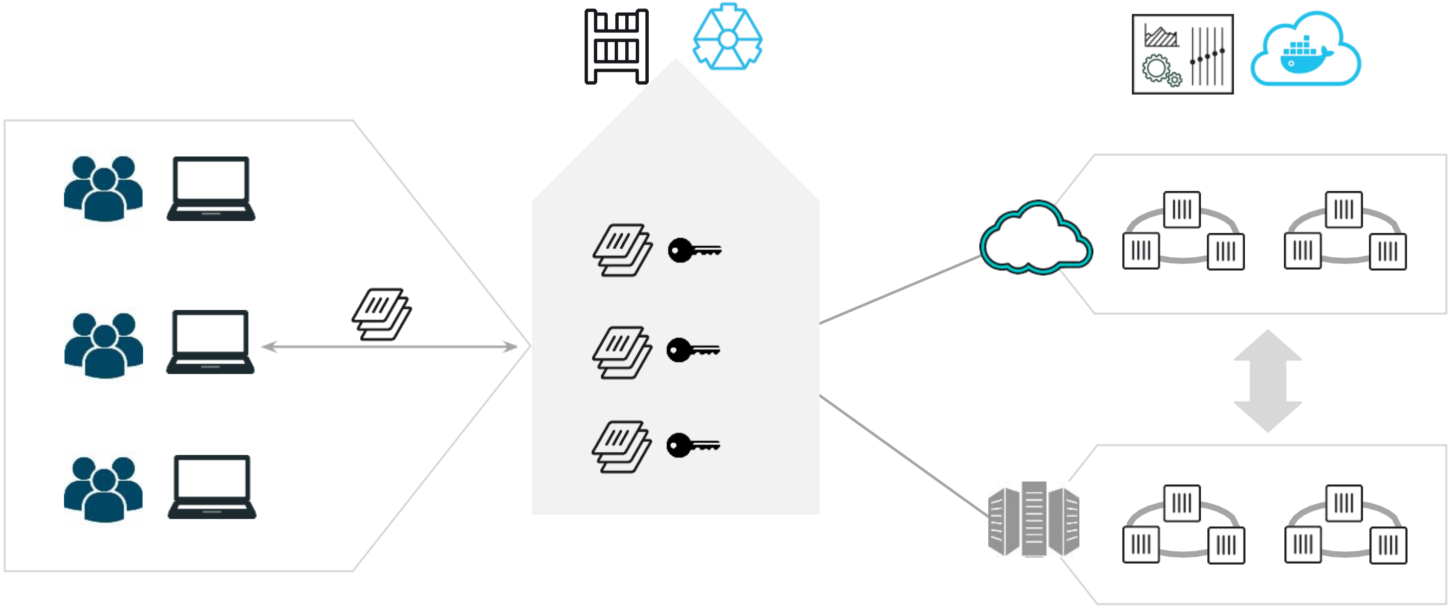
Using Docker: Build, Ship, Run Workflow

Developers | **IT Operations**

BUILD
Development Environments

SHIP
Create & Store Images

RUN
Deploy, Manage, Scale



Some Docker vocabulary

Docker Image

The basis of a Docker container. Represents a full application

Docker Container

The standard unit in which the application service resides and executes

Docker Engine

Creates, ships and runs Docker containers deployable on a physical or virtual, host locally, in a datacenter or cloud service provider

Registry Service (Docker Hub(Public) or Docker Trusted Registry(Private))

Cloud or server based storage and distribution service for your images

Basic Docker Commands

```
$ docker image pull node:latest

$ docker image ls
$ docker container run -d -p 5000:5000 --name node node:latest

$ docker container ps


$ docker container stop node(or <container id>)

$ docker container rm node (or <container id>)

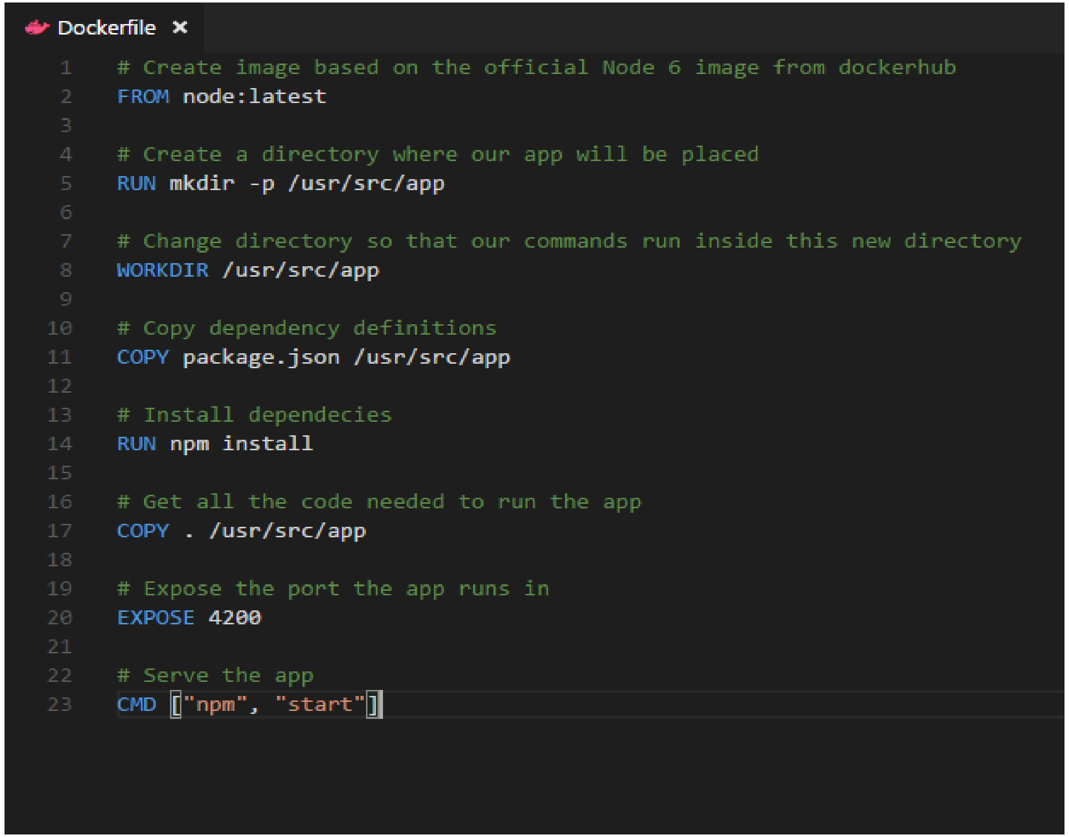
$ docker image rmi (or <image id>)

$ docker build -t node:2.0 .

$ docker image push node:2.0

$ docker --help
```

Dockerfile – Linux Example



Dockerfile

```
# Create image based on the official Node 6 image from dockerhub
FROM node:latest

# Create a directory where our app will be placed
RUN mkdir -p /usr/src/app

# Change directory so that our commands run inside this new directory
WORKDIR /usr/src/app

# Copy dependency definitions
COPY package.json /usr/src/app

# Install dependecies
RUN npm install

# Get all the code needed to run the app
COPY . /usr/src/app

# Expose the port the app runs in
EXPOSE 4200

# Serve the app
CMD ["npm", "start"]
```

- Instructions on how to build a Docker image
- Looks very similar to “native” commands
- Important to optimize your Dockerfile

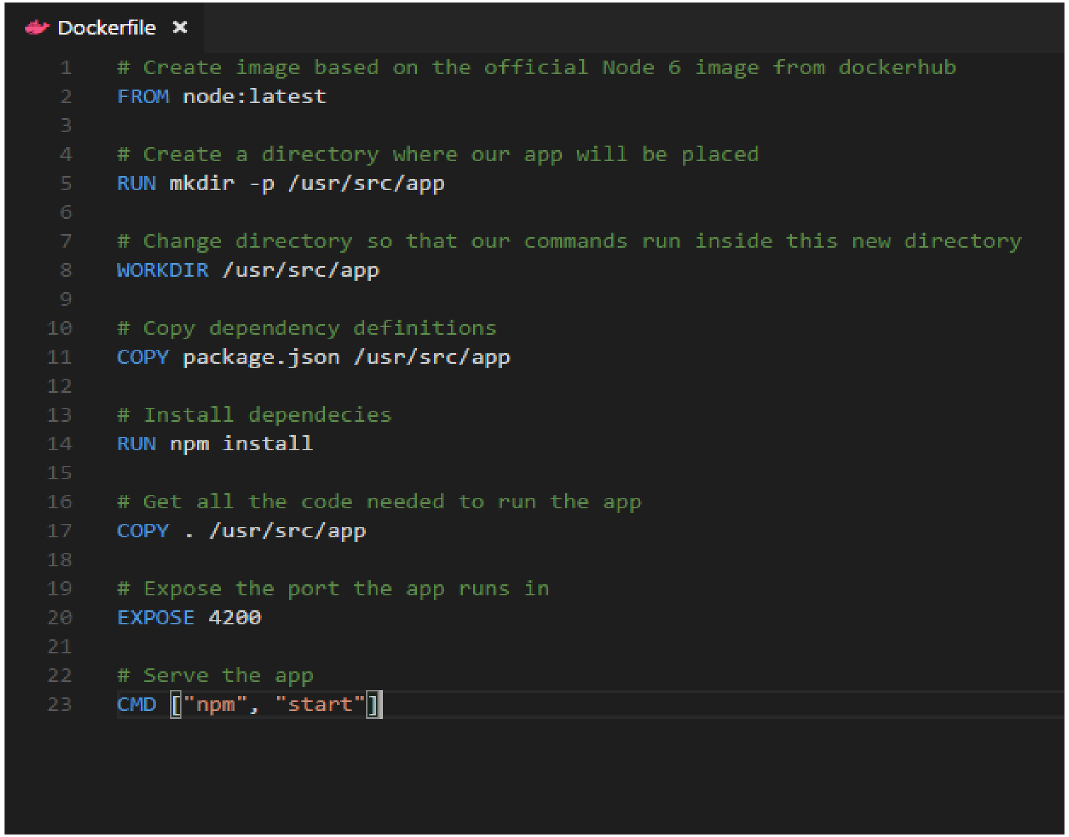
Section 2:

Anatomy of a Docker Container

Docker Volumes

Volume Use Cases

Let’s Go Back to Our Dockerfile



Dockerfile ×

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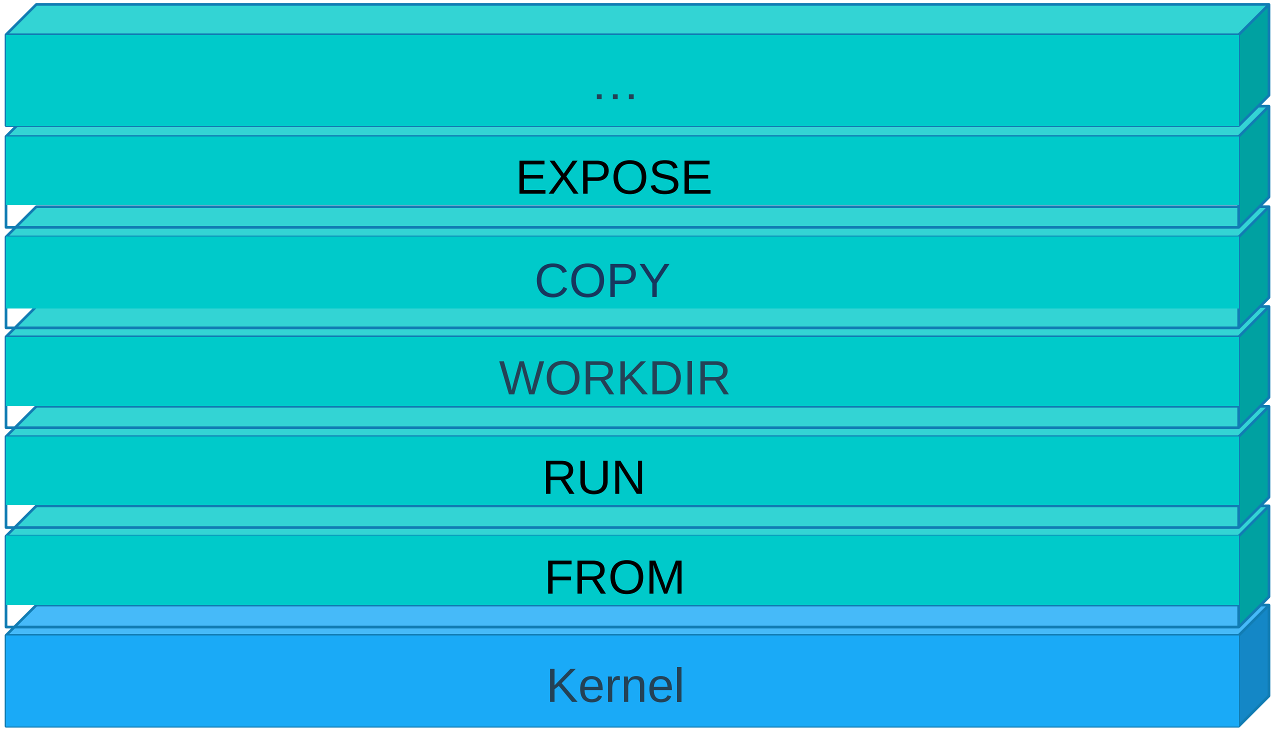
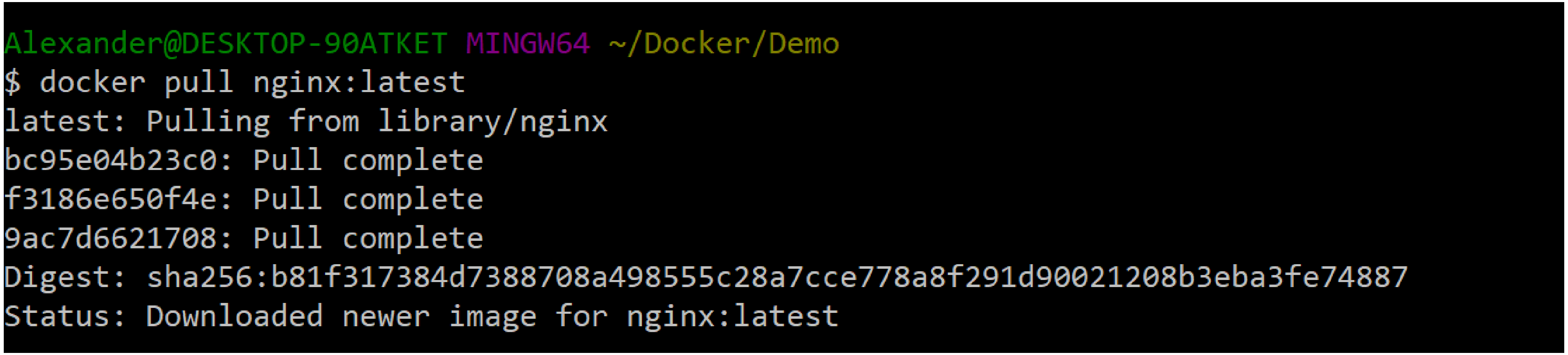
EXPOSE 4200

# Serve the app
CMD ["npm", "start"]
```

Each Dockerfile Command Creates a Layer



Docker Image Pull: Pulls Layers



```
Alexander@DESKTOP-90ATKET MINGW64 ~/Docker/Demo
$ docker pull nginx:latest
latest: Pulling from library/nginx
bc95e04b23c0: Pull complete
f3186e650f4e: Pull complete
9ac7d6621708: Pull complete
Digest: sha256:b81f317384d7388708a498555c28a7cce778a8f291d90021208b3eba3fe74887
Status: Downloaded newer image for nginx:latest
```

Docker Volumes

- Volumes mount a directory on the host into the container at a specific location

- Can be used to share (and persist) data between containers
  - Directory persists after the container is deleted
    - Unless you explicitly delete it

- Can be created in a Dockerfile or via CLI

Why Use Volumes

- Mount local source code into a running container

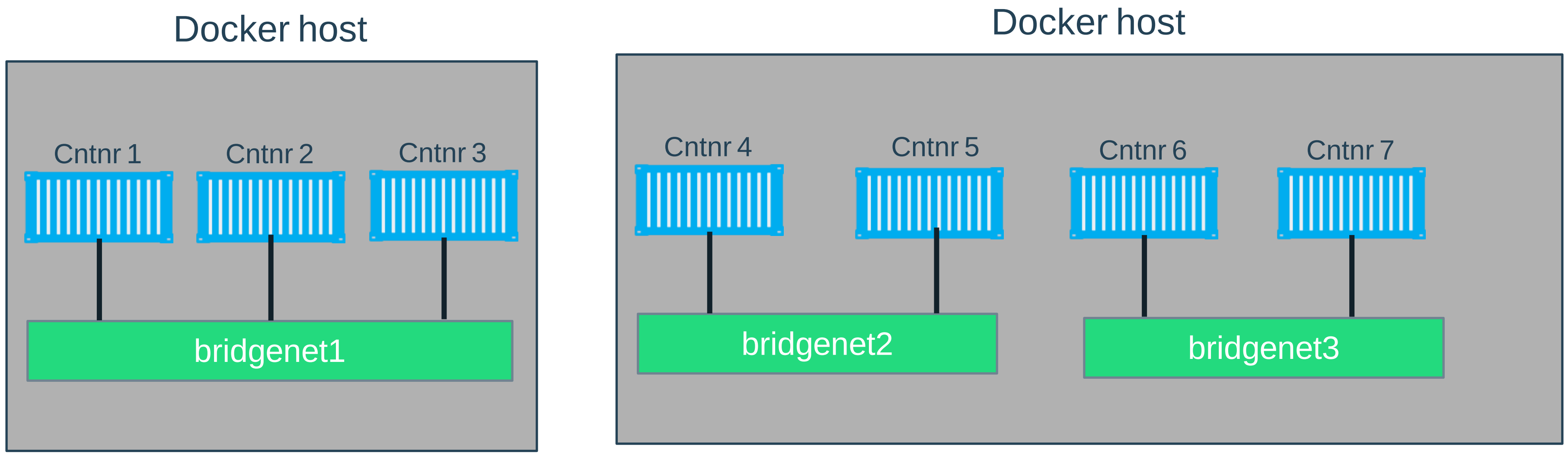
```
docker container run -v $(pwd):/usr/src/app/
myapp
```

- Improve performance
  - As directory structures get complicated traversing the tree can slow system performance

- Data persistence

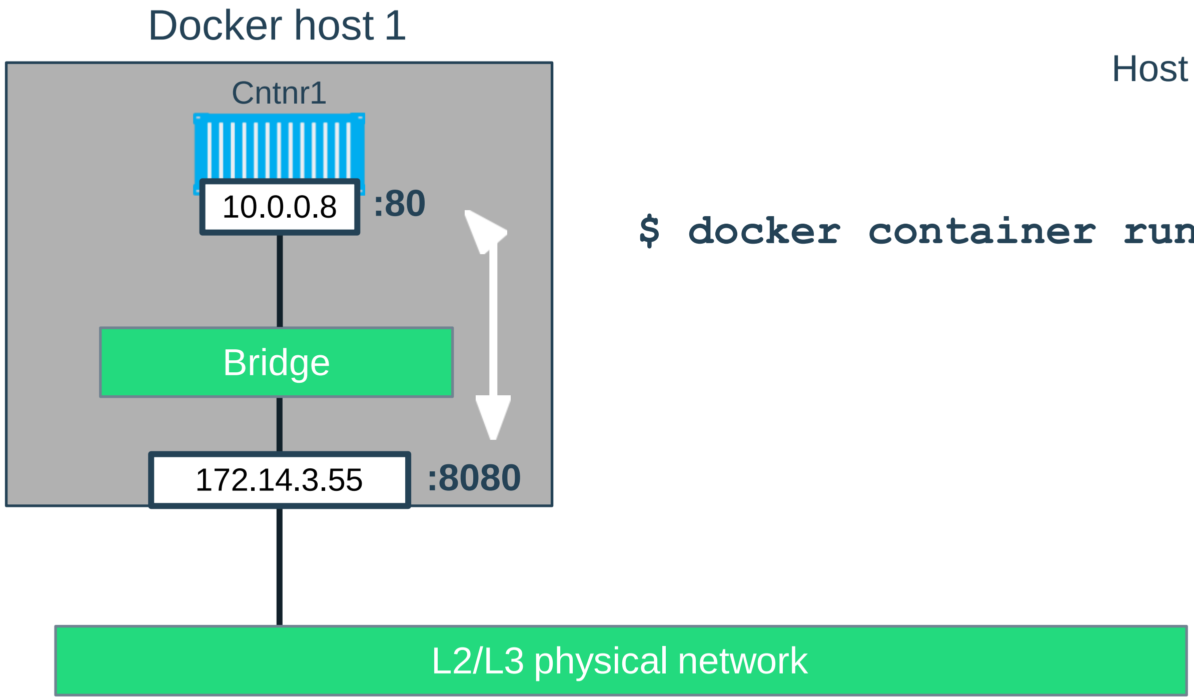
Section 3:
Networking

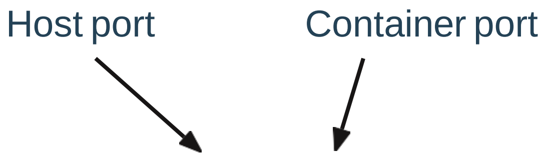
What is Docker Bridge Networking



```
docker network create -d bridge --name bridgenet1
```

Docker Bridge Networking and Port Mapping



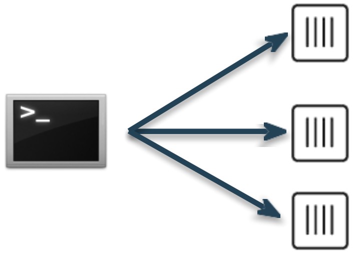


```
$ docker container run -p 8080:80 ...
```

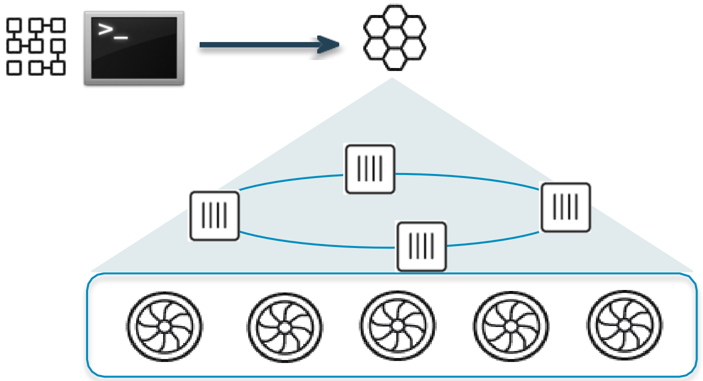
Section 4:
Docker Compose

Docker Compose: Multi Container Applications

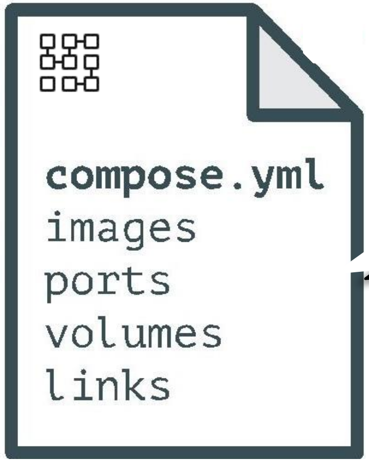
- Build and run one container at a time
- Manually connect containers together
- Must be careful with dependencies and start up order



- Define multi container app in compose.yml file
- Single command to deploy entire app
- Handles container dependencies
- Works with Docker Swarm, Networking, Volumes, Universal Control Plane



Docker Compose: Multi Container Applications



```
version: '2' # specify docker-compose version

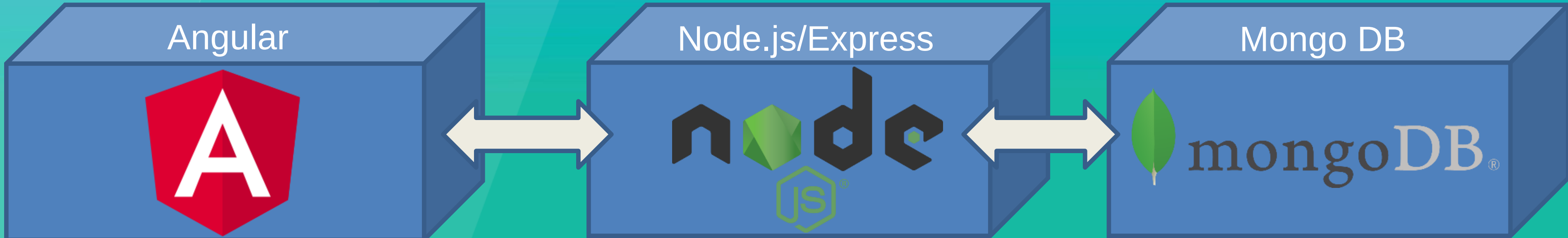
# Define the services/containers to be run
services:
angular: # name of the first service
build: client # specify the directory of the Dockerfile
ports:
- "4200:4200" # specify port forewarding

express: #name of the second service
build: api # specify the directory of the Dockerfile
ports:
- "3977:3977" #specify ports forewarding

database: # name of the third service
image: mongo # specify image to build container from
ports:
- "27017:27017" # specify port forewarding
```

Docker Compose: Scale Container Applications

Demo



docker