Docker and Kubernetes

What I learned at @DevOpsGirls Workshop

Disclaimer

Overview of Workshop Goals

0. Docker concepts

1. Docker basics - basic commands to run containers and pull images

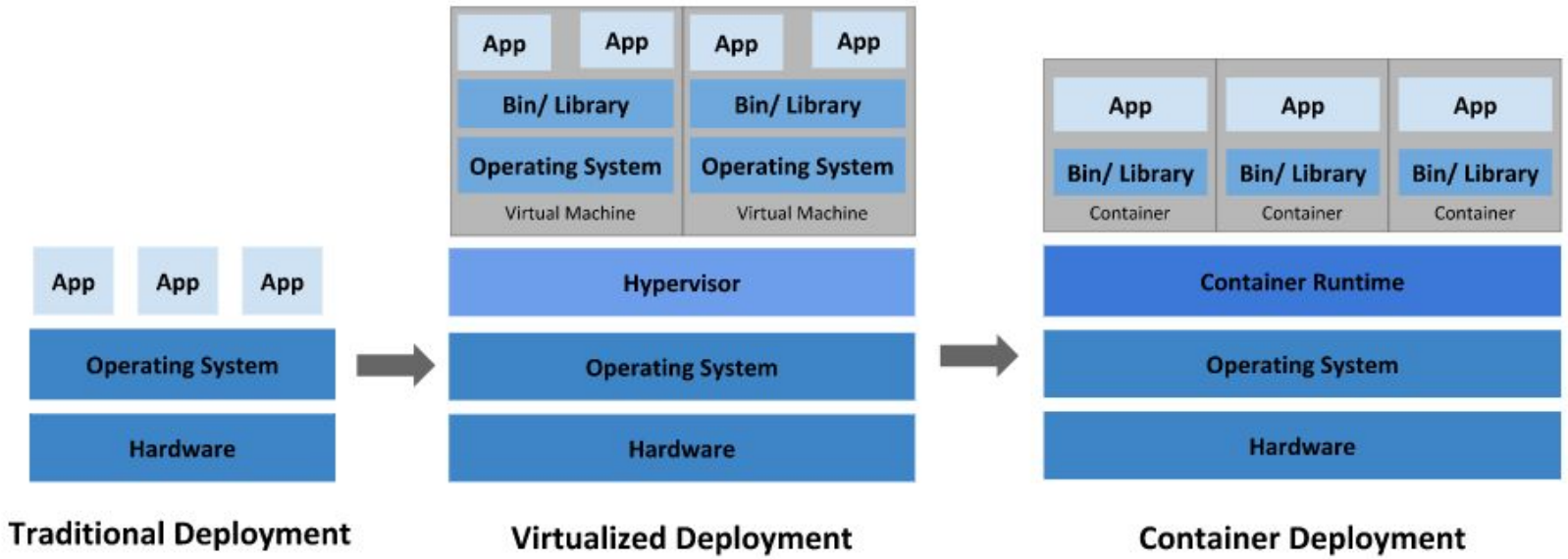
2. Creating Docker images

3. Docker tagging - what are tags, how to publish your images

4. Kubernetes concepts - what it is, why companies use it
5. Kubernetes basics and the command line - creating our first objects
6. Deployments and Services - making pods available and updating them at scale
7. Labels - tying everything together

Why?

The Problem


App
App
App
Operating System
Hardware
Traditional Deployment
App
App
App
App
Bin/ Library
Bin/ Library
Operating System
Operating System
Virtual Machine
Virtual Machine
Hypervisor
Operating System
Hardware
Virtualized Deployment
App
App
App
Bin/ Library
Bin/ Library
Bin/ Library
Container
Container
Container
Container Runtime
Operating System
Hardware
Container Deployment

The SOlution

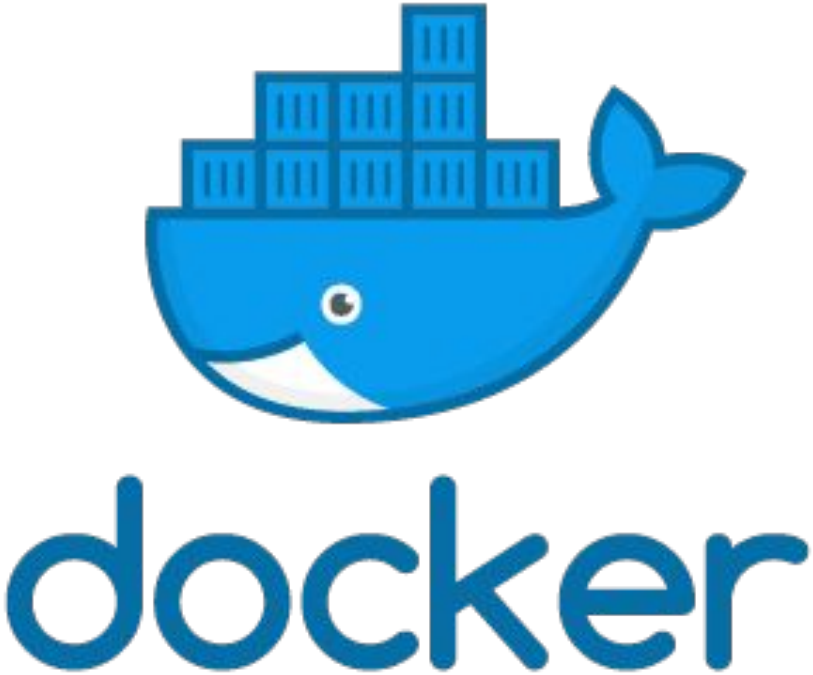
https://scotch.io/@pavan-belagatti/pokemon-go-a-successful-kubernetes-story

Why Use Docker?

- Portability
- Isolation
- Solves the issue of deploying applications against OS installed on hardware that had been purchased
- CI + CD
- Abstraction

Why Use Kubernetes?

- Manage containers
- Abstraction
- Built in redundancies+failure tolerance
- Speeds up release lifecycle
- Powerful benefits with Docker


docker

Docker Setup

- You need to install docker on Windows/ Mac
- Signup to Docker Hub
- Signup for Google cloud to use GKE
- (can also use AWS and Azure)

Installing Docker on windows:

- If you don’t have enterprise or pro you’ll need Docker Toolbox
- You need to enable virtualisation on your BIOS
- I completed the workshop in google cloud’s terminal because my CPU wasn’t virtualisation enabled

What is Docker?

From wikipedia:

“Docker is a set of platform as a service products that use OS-level virtualization to deliver software in packages called containers. Containers are isolated from one another and bundle their own software, libraries and configuration files; they can communicate with each other through well-defined channels.”

Used by: Spotify, Yelp, eBay, Expedia, Groupon, ING, The New York Times, Oxford University Press, PayPal, Shopify, The Washington Post and Uber.

Intro to Docker

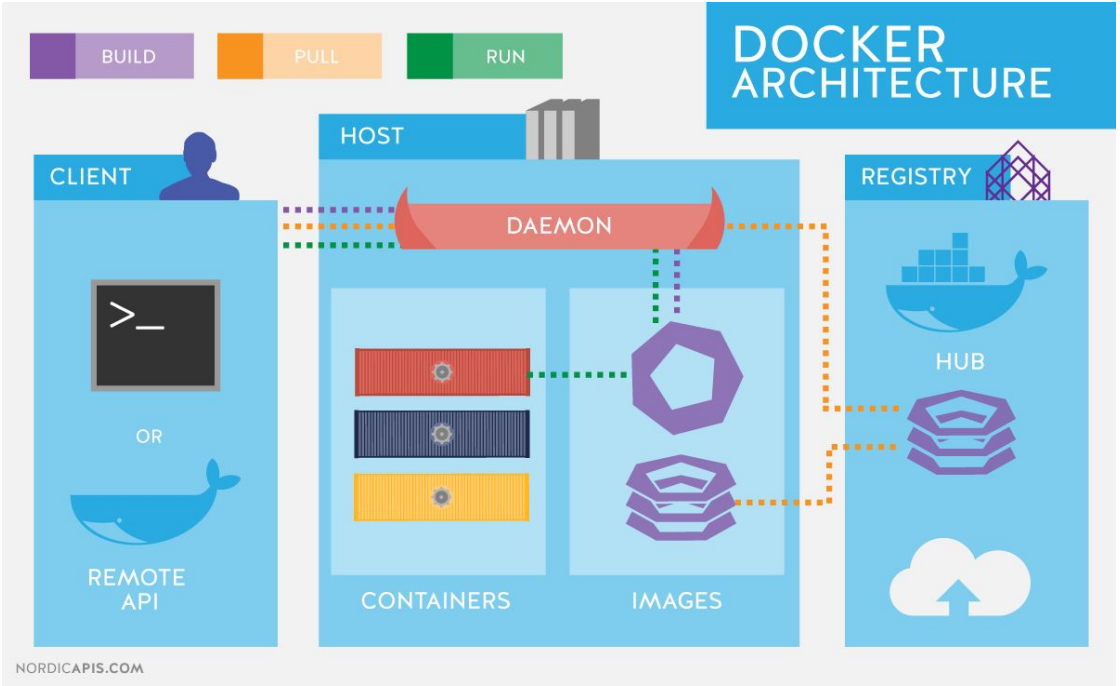
Key Terms:

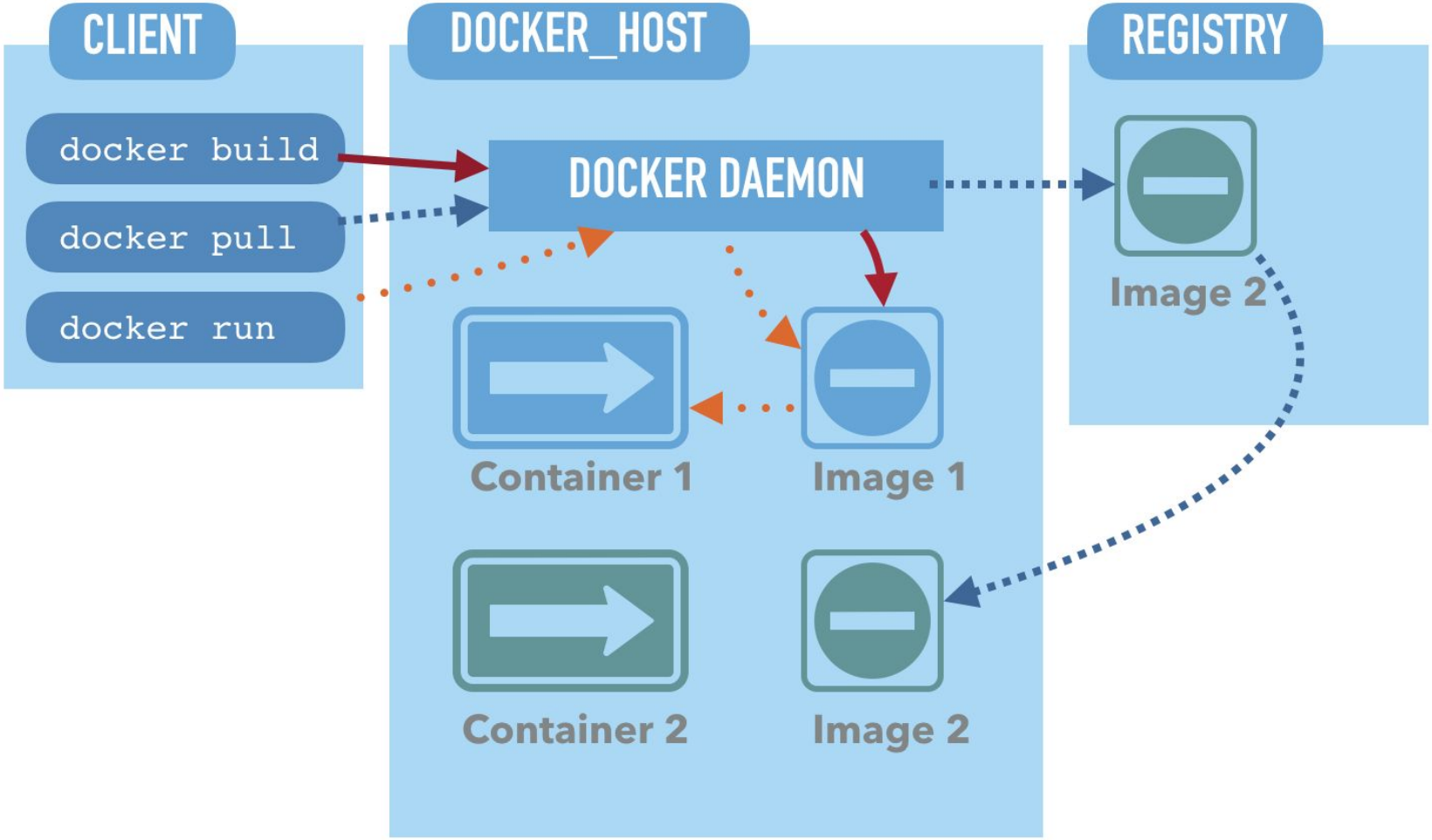
Client

Host

Registry

Image/Container




CLIENT
docker build
docker pull
docker run
DOCKER_HOST
DOCKER DAEMON
Container 1
Image 1
Container 2
Image 2
REGISTRY
Image 2

Images

Docker Images

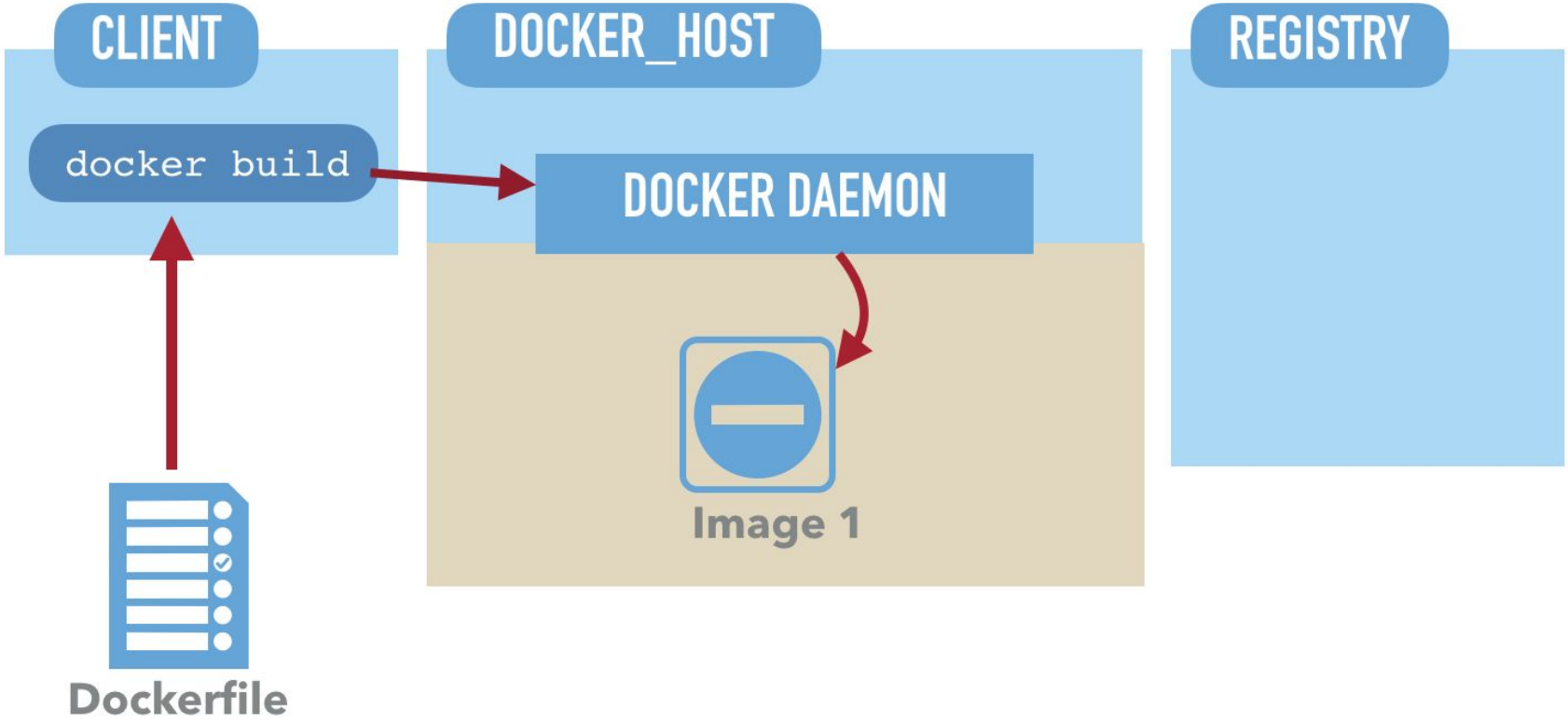
Before we start making Docker images, it's best if we familiarize ourselves with how images are stored in your Docker host (effectively, your laptop). Run the following command to get a list:

```
docker images
```

This will produce a list of images on your laptop that look like this:

```
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
hello-world         latest              fce289e99eb9        3 weeks ago         1.84kB
busybox             latest              3a093384ac30        3 weeks ago         1.2MB
nginx               latest              7042885a156a        4 weeks ago         109MB
```

Dockerfile


CLIENT
DOCKER_HOST
REGISTRY
docker build
DOCKER DAEMON
Image 1
Dockerfile

Dockerfile cont

For the next section, we're going to be modifying our Dockerfile so that 1.) We replace the configuration, and 2.) We insert our `index.html` file. We'll do this by changing the `Dockerfile` so it looks like this:

```
FROM nginx:mainline-alpine
RUN rm /etc/nginx/conf.d/*
ADD wassup.conf /etc/nginx/conf.d/
ADD index.html /usr/share/nginx/html/
```

The `RUN` directive runs the command specified (in this case, `rm /etc/nginx/conf.d/*` - which cleans out the configuration directory for Nginx). The `ADD` directive adds the files from your current directory into the image's directories. What we're doing here is we're basically:

1.) Referencing the `nginx:mainline-alpine` image to start with

2.) Removing existing configuration files

3.) Adding a new configuration file (`wassup.conf`)

4.) And adding a new index.html file.

Overview of Workshop Docker content

- Docker concepts
- Pulled images from registry
- Viewed images via CLI
- Ran a container
- Made our own docker images with dockerfile + viewed on browser
- Learned about tags, and created a repository on Docker Hub

https://github.com/DevOps-Girls/from-docker-to-kubernetes

kubernetes

What is Kubernetes?

From Kubernetes.io:

“Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation. It has a large, rapidly growing ecosystem. Kubernetes services, support, and tools are widely available.”

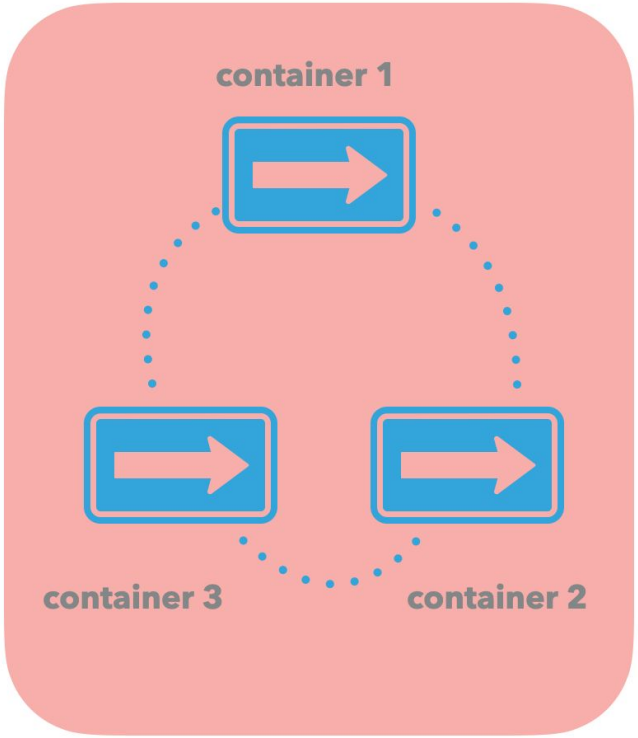
Used by: *google, shopify, slack, deliveryhero*

Intro to Kubernetes

https://www.youtube.com/watch?v=K38LpW2L2cA

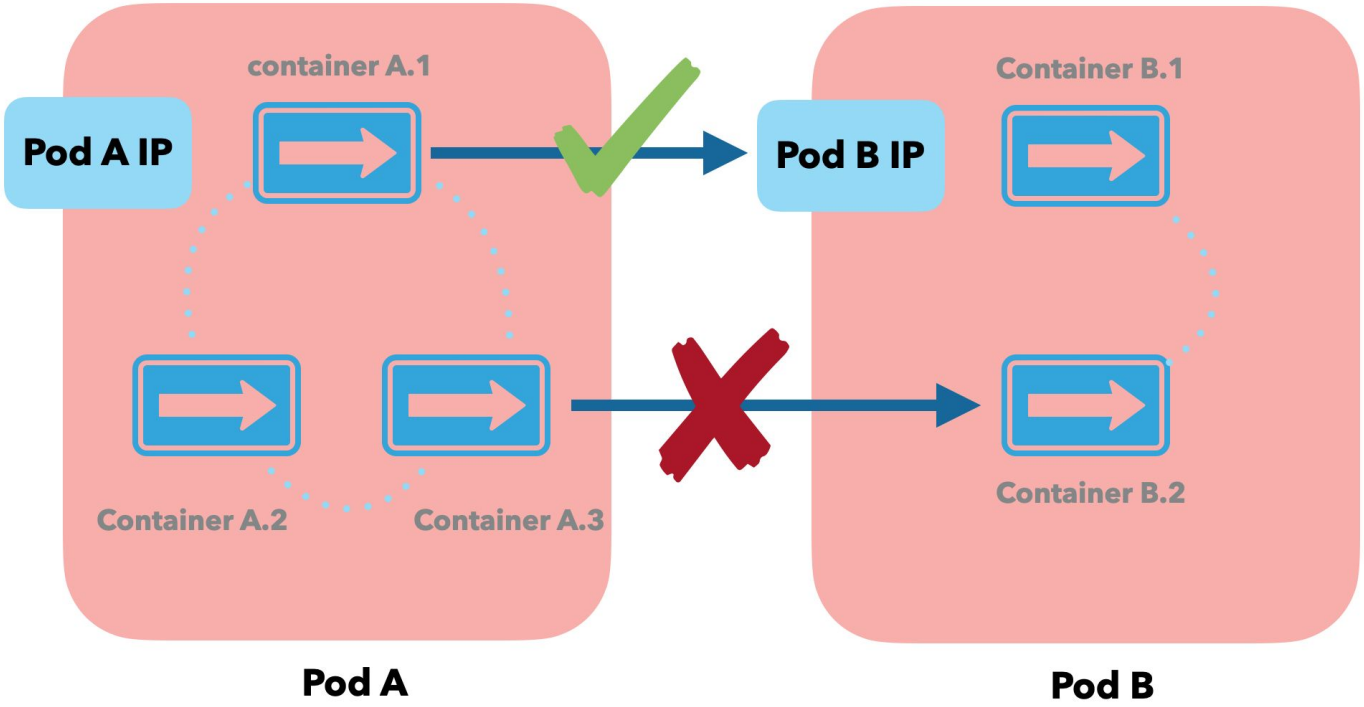
- Core terms: pods, containers, deployment, services, ingress controller
- Can create multiple types of services in Kubernetes
- “If a Docker container provides you with a way to make self-enclosed images, Kubernetes provides you with a way to make them available to the world.”

PODS



Pod

If these pods could talk...



Overview of Workshop Kubernetes Content

- Kubernetes concepts - API server, controller, scheduler, replica, kubelets, kube-proxy
- Running kubernetes commands in GKE - using kubectl command to talk to API server
- Using YAML files to describe+edit pods
- Deployments and services -creating multiple pods
- Deployments and labels/selectors - associating services based on key-value pairs

Challlenges

- During workshop - Sometimes feeling like running commands without understanding them or what they were doing at a high level
- Concepts were hard to grasp

Resources

Repo from workshop: https://github.com/DevOps-Girls/from-docker-to-kubernetes

@DevOpsGirls - twitter, eventbrite

Cybersecurity students! Gabe Wong from the CA Cybersecurity course has been a big help! @gabrielwongau

Intro to Kubernetes video (thanks Gabe!):

https://www.youtube.com/watch?v=K38LpW2L2cA

Presentations about Kubernetes (thanks Gabe!):
https://github.com/cncf/presentations/tree/master/kubernetes

https://nordicapis.com/api-driven-devops-spotlight-on-docker/

DOCS - https://docs.docker.com/, https://kubernetes.io/docs/home/

More Resources - thanks gabe!

https://amazon.qwiklabs.com/ - Qwiklabs provides lab learning environments that help devs and IT pros get hands-on experience with leading cloud platforms and software.

https://www.katacoda.com/courses/kubernetes

https://kubernetesbootcamp.github.io/kubernetes-bootcamp/

Also, I recommend people follow Kelsey Hightower on Twitter if they want to stay up to date with everything Kubernetes
https://twitter.com/kelseyhightower?s=20

Thank You!

Questions?