微服務基礎概念

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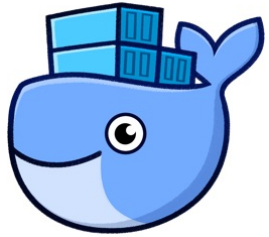
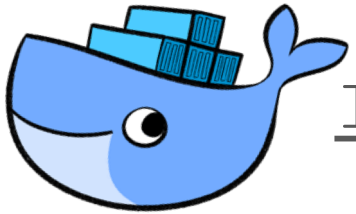
Agenda

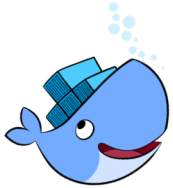


World of Microservices

Lab#1 Docker

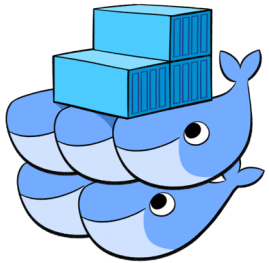


Intro to Kubernetes



Lab#2 Minikube

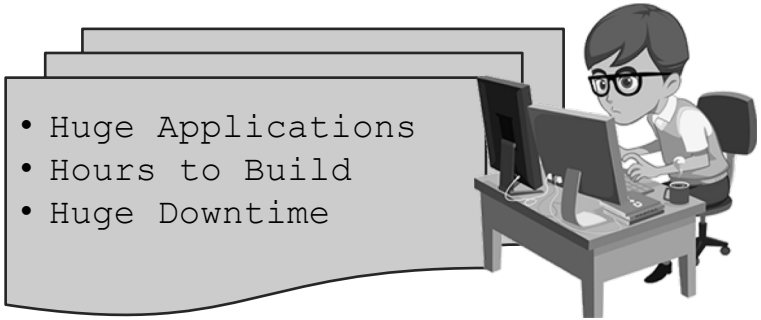
Demo & Case Studies



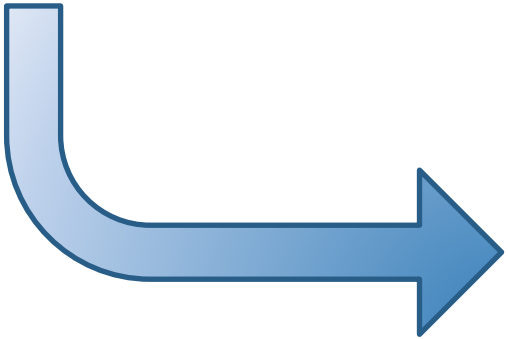
World of Microservices

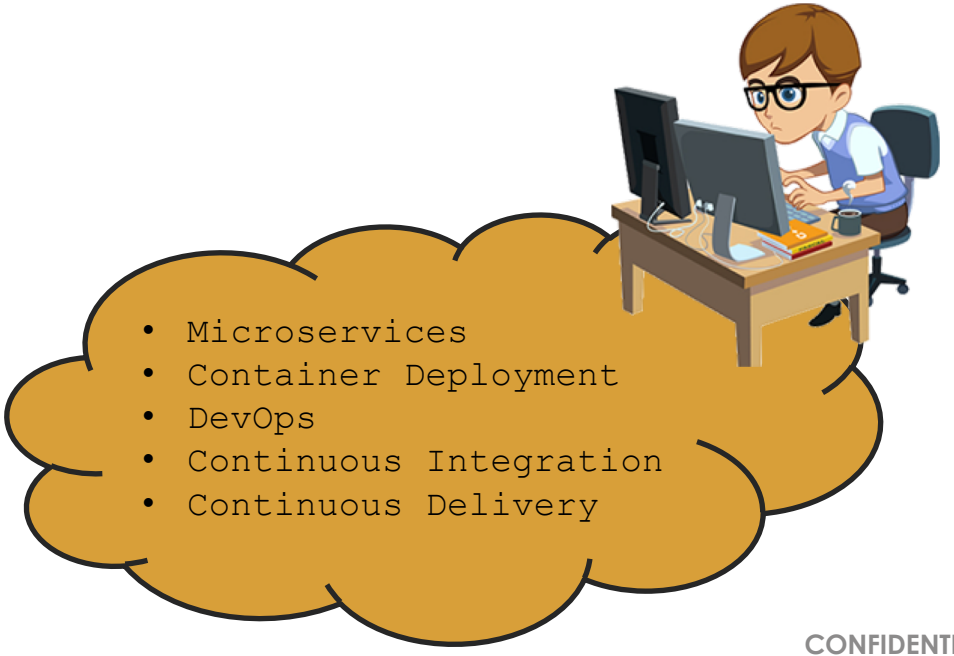
Virtual Machines, Containers, etc.

App Development Changes



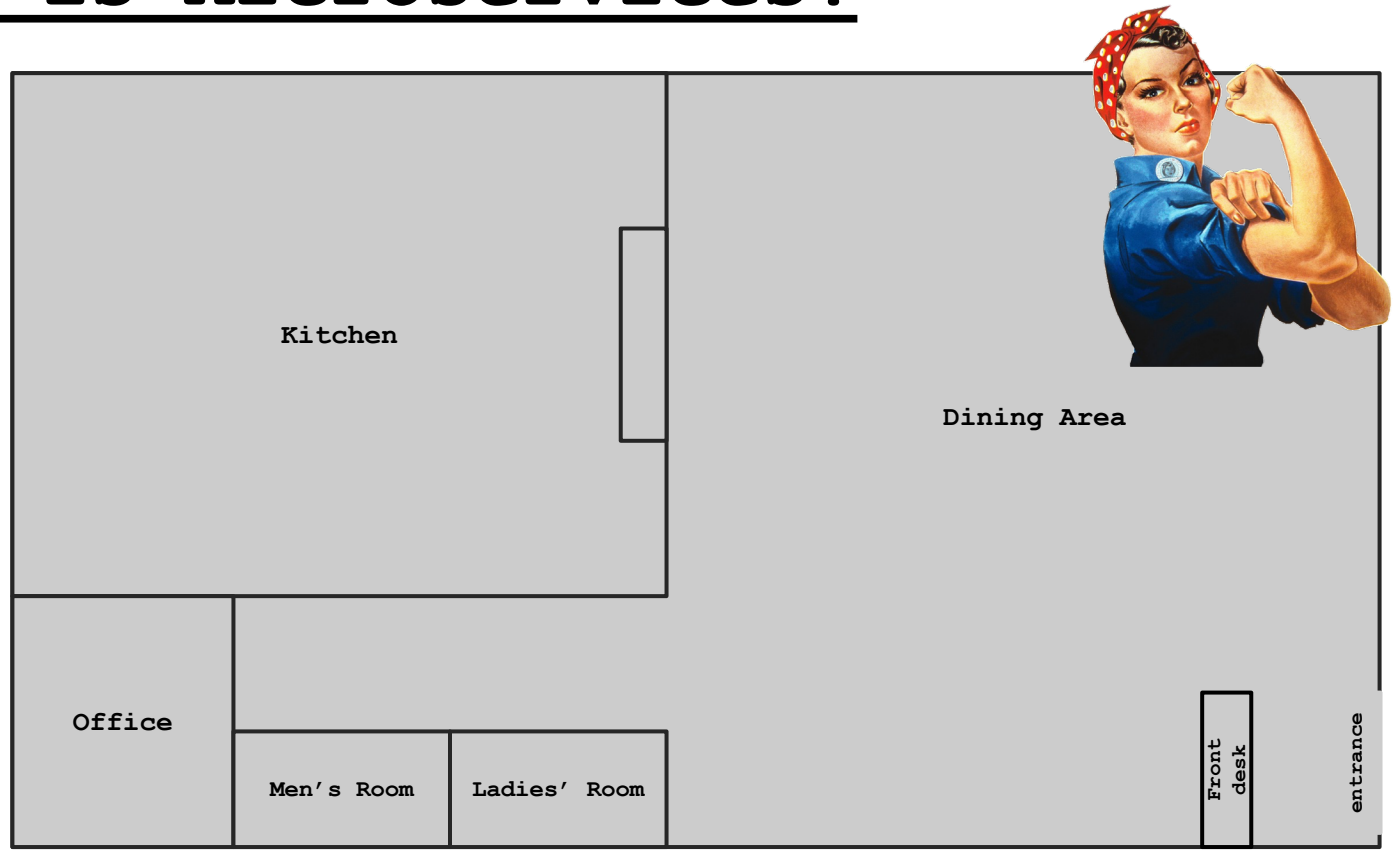
- Huge Applications
- Hours to Build
- Huge Downtime





- Microservices
- Container Deployment
- DevOps
- Continuous Integration
- Continuous Delivery

What is Microservices?



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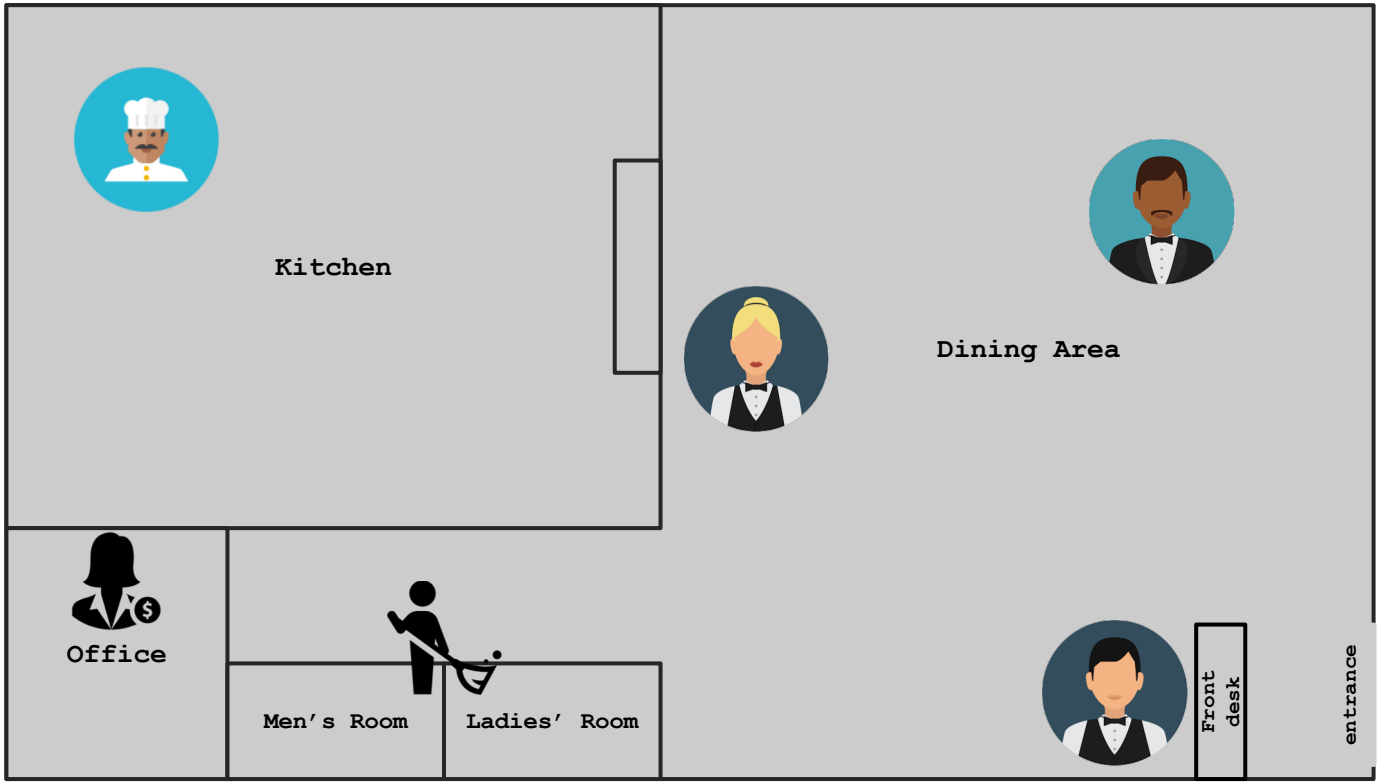

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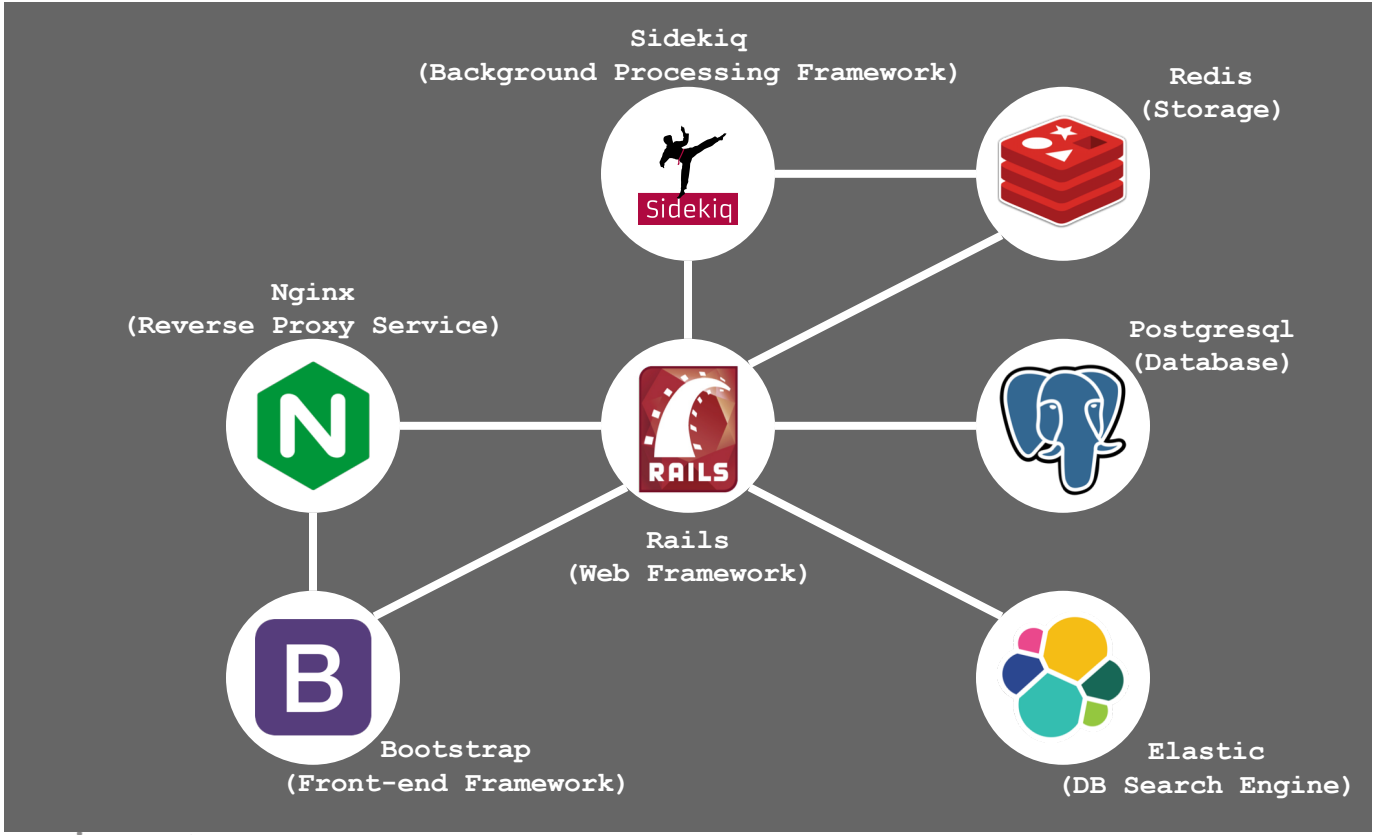

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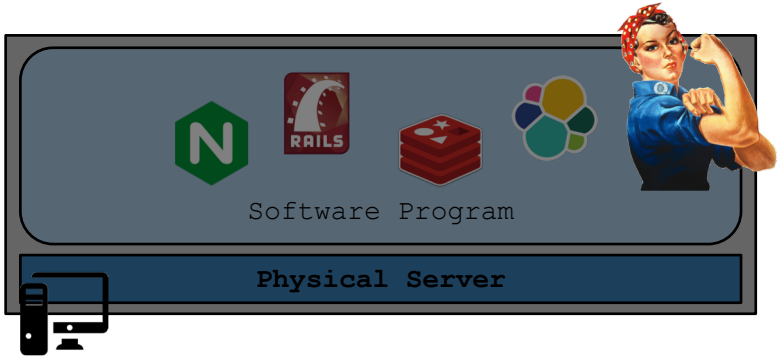
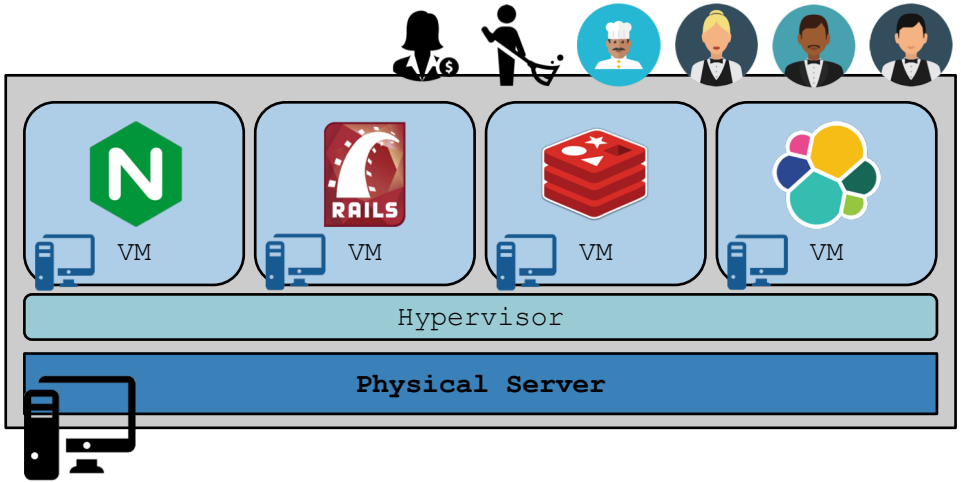
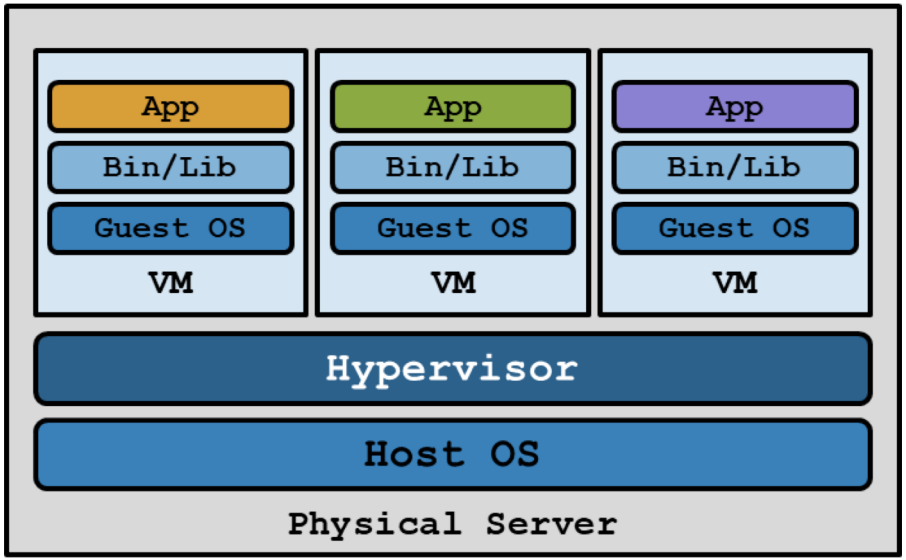
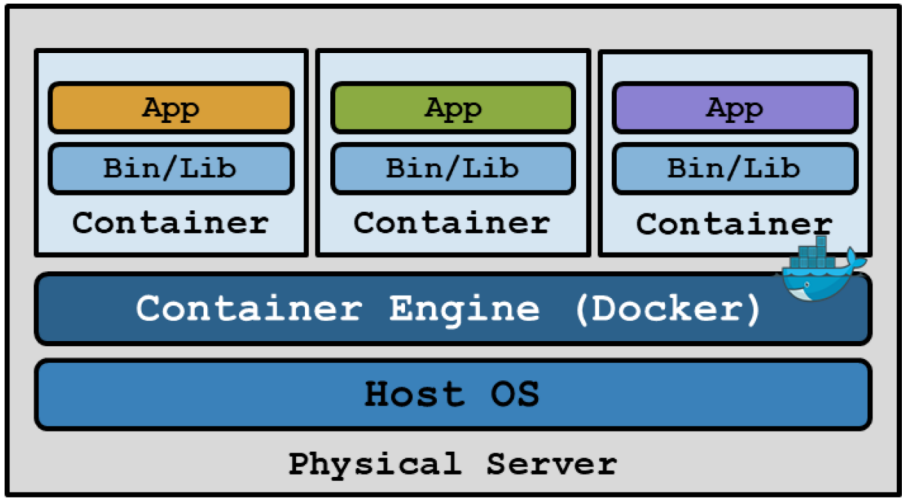


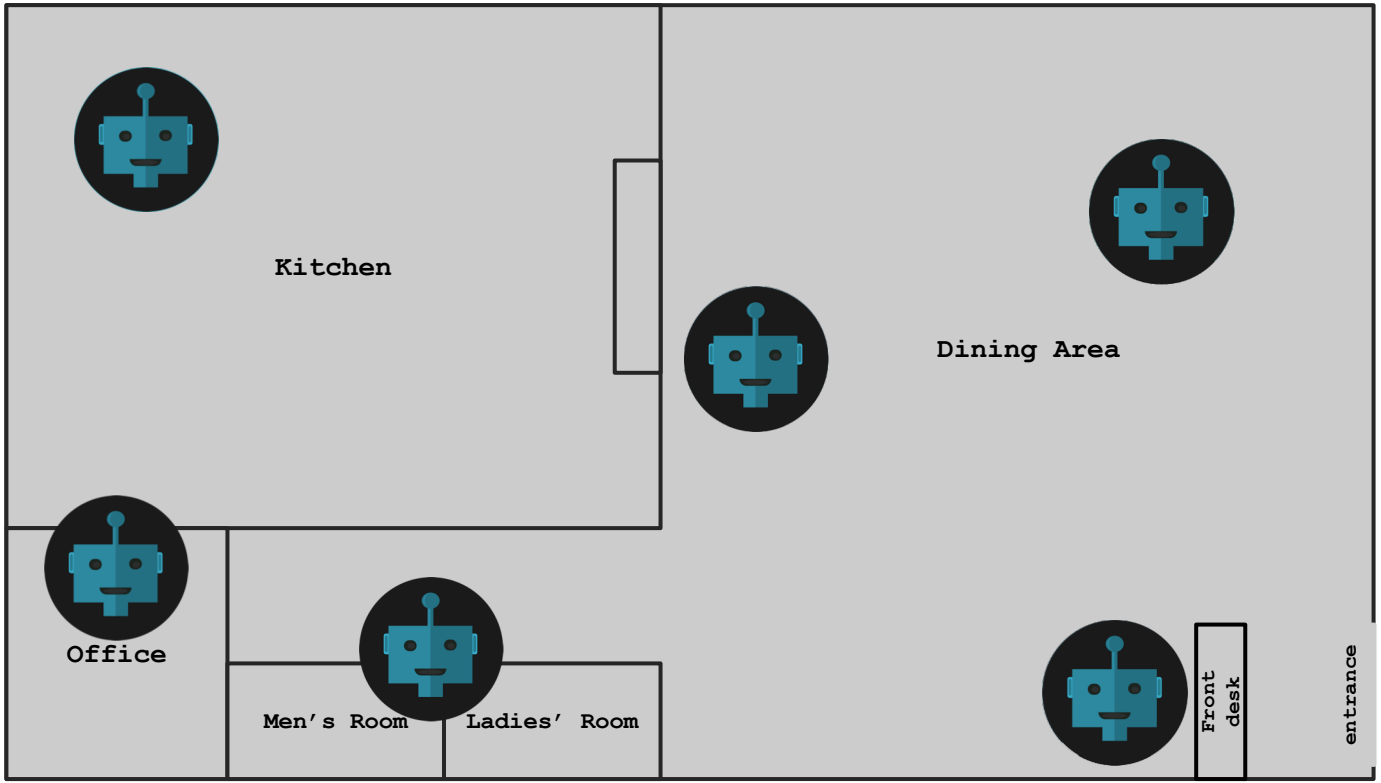


What is Microservices?

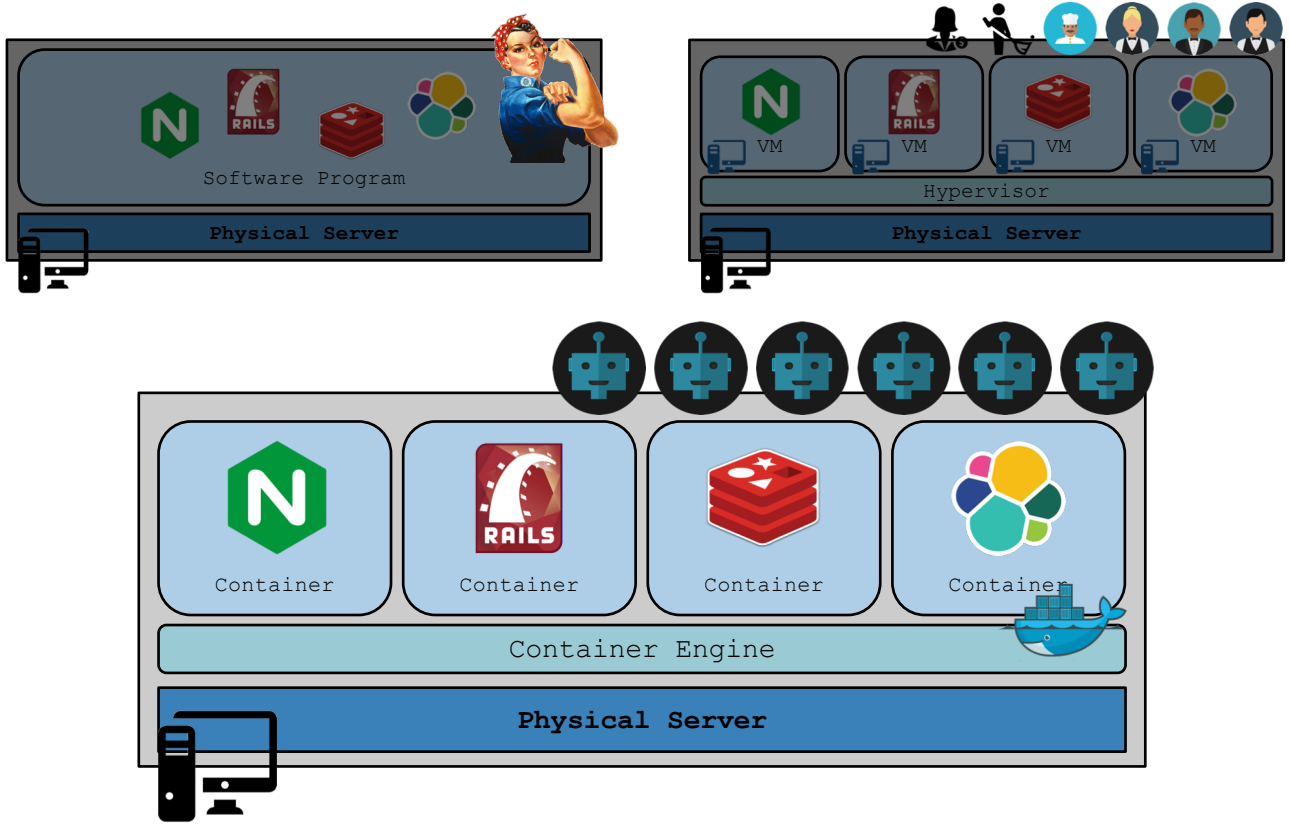




What is Microservices?

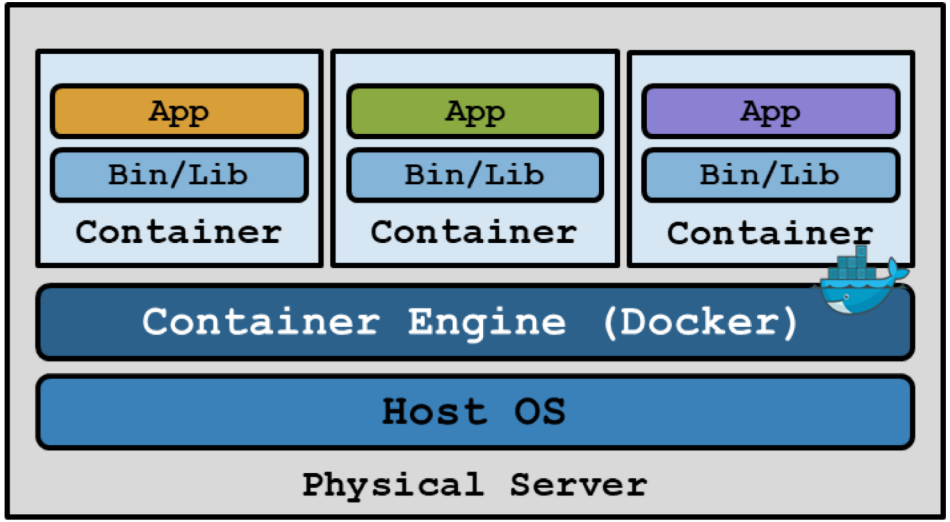


What is Microservices?

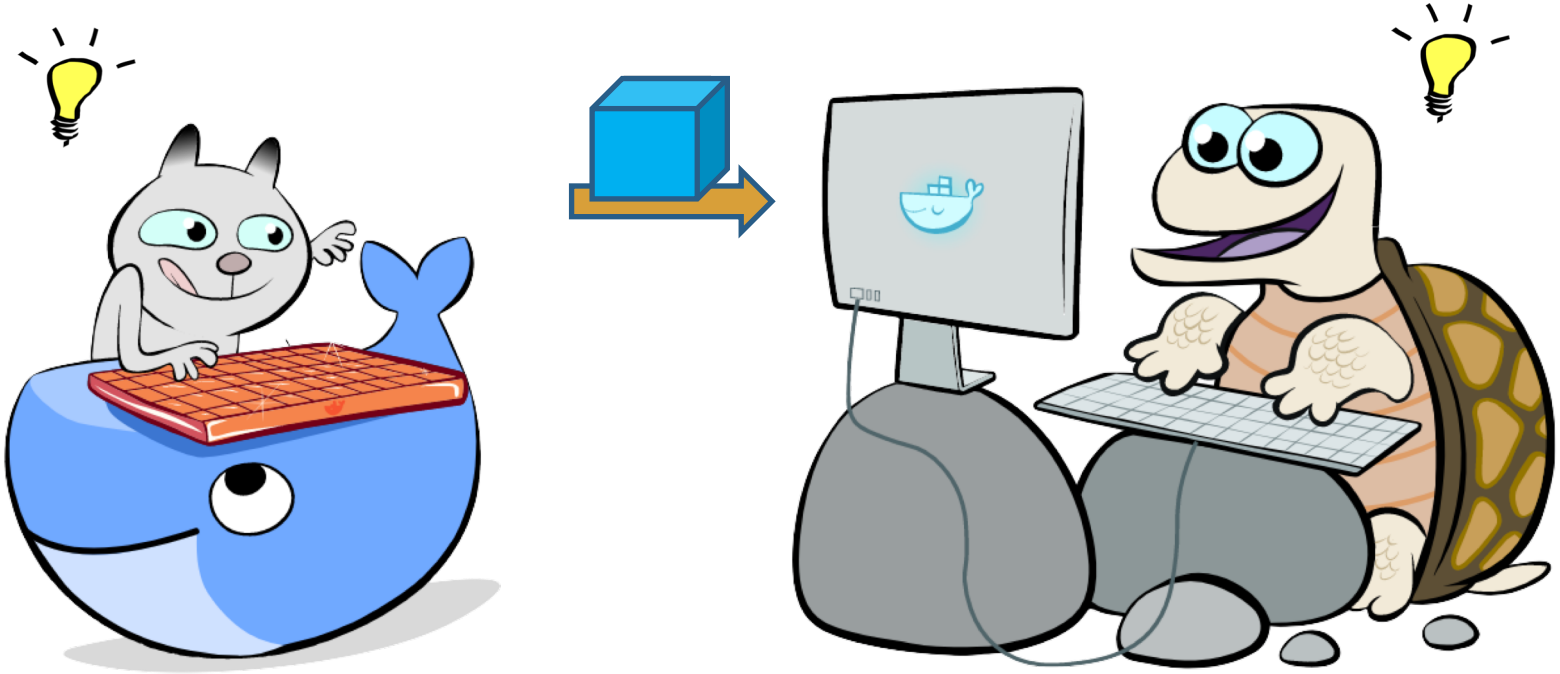


Containers

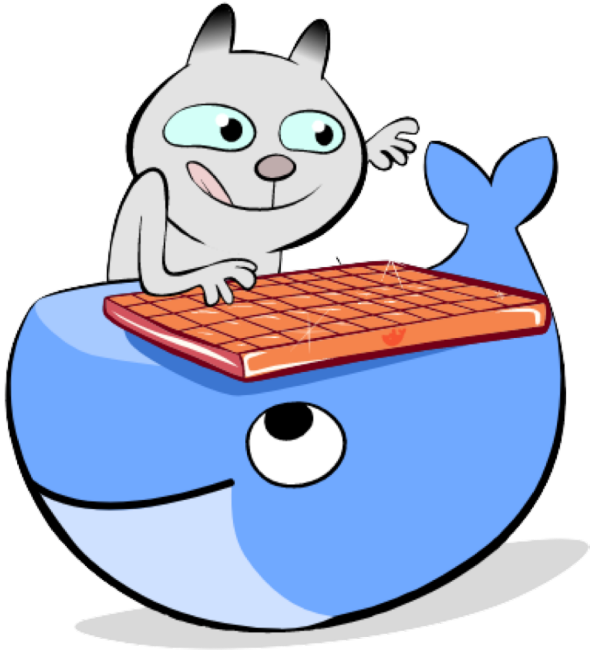
- Light-weighted
- Isolated Apps
- Simple Version Control
- Fast Delivery
- Portability

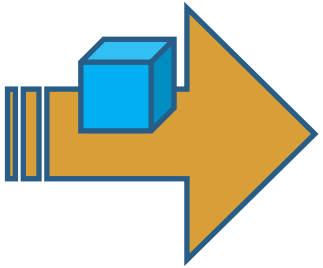


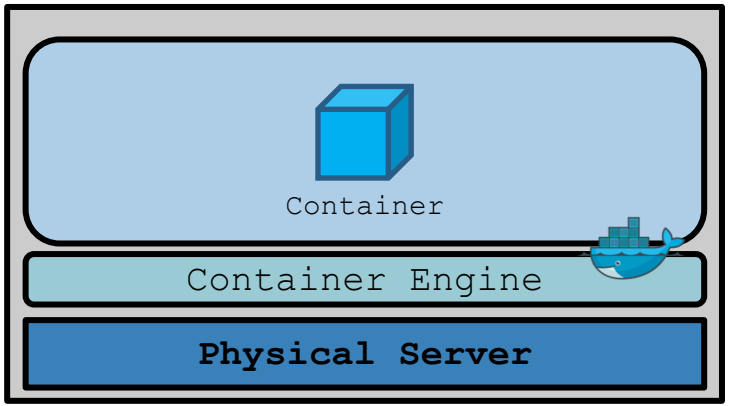
Containers



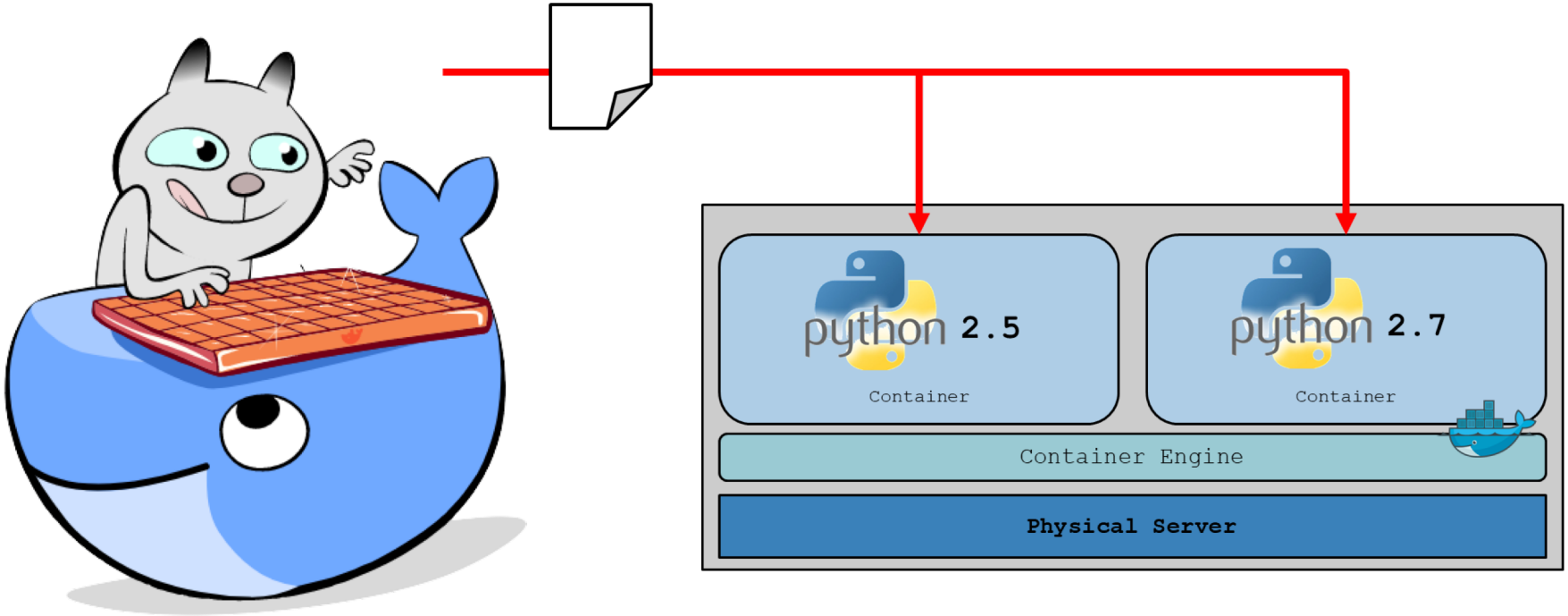
Containers - Local Development







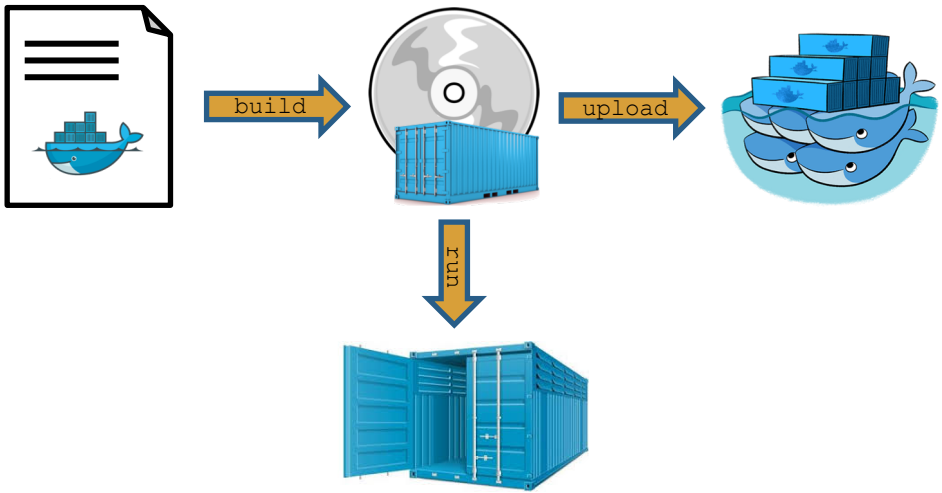
Containers – Simplified Testing



Docker

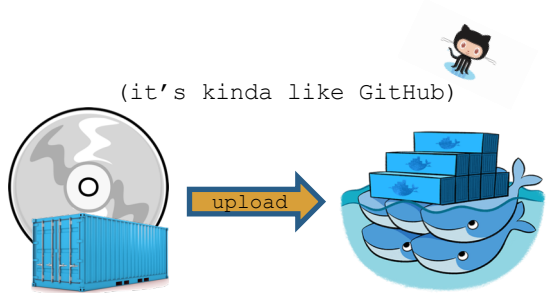
Docker provides a uniformed wrapper around a software package

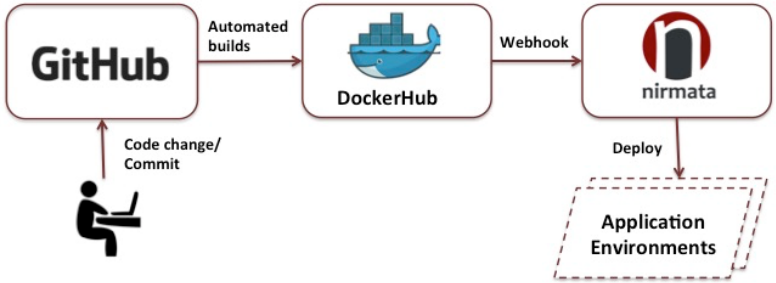
- Containers
- Images
- Dockerfile
- Docker Registry



Docker Hub / Store

- https://hub.docker.com/
- https://store.docker.com/
- ***Public*** Docker Registry
- Additional Features
  1. Automated Builds
  2. Webhooks
  3. Organizations





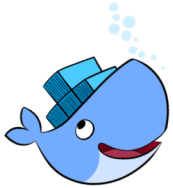
https://github.com/acinwinstack/minikube-intro-workshop

Lab#1 Docker

Installation; HelloWorld; Docker Commands!

Lab1.1 - Installation (Windows)

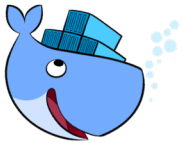
- https://docs.docker.com/engine/installation/
- https://download.docker.com/win/stable/Docker%20for%20Windows%20Installer.exe
- Windows 10 Pro with Hyper-V
- Windows Server 2016



Lab1.1 - Installation (Mac)

- https://docs.docker.com/engine/installation/
- https://docs.docker.com/docker-for-mac/install/

- Mac 2010 hardware model or newer
- MacOS El Capitan 10.11 or newer
- At least 4GB RAM

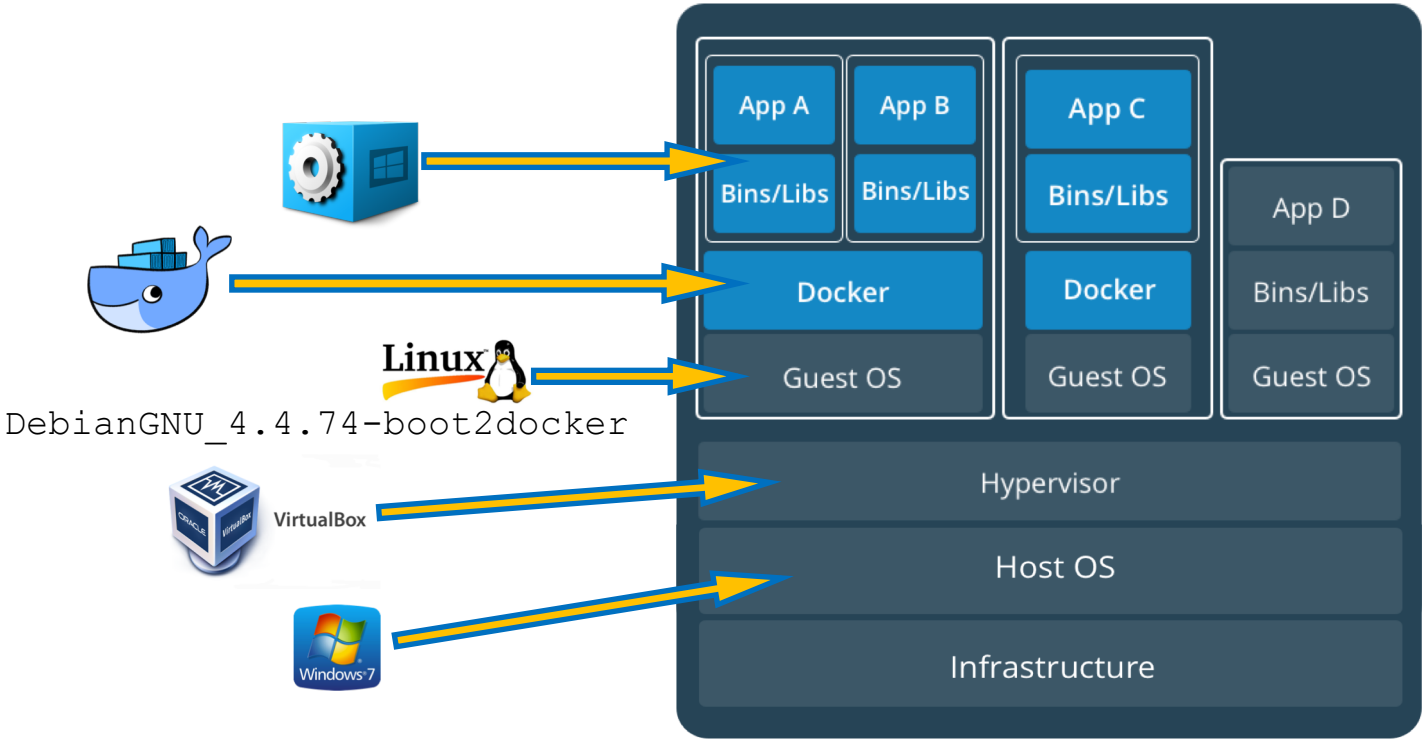


Lab1.1 - Installation (Toolbox)

- https://docs.docker.com/engine/installation/
- https://docs.docker.com/toolbox/overview/

- Any Windows system Docker for Windows doesn't support
- Any Mac system Docker for Mac doesn't support
- Docker Toolbox $\begin{cases} git \\ virtualbox \end{cases}$

Lab1.1 - Installation (Toolbox)



Lab1.1 - Installation (Linux)

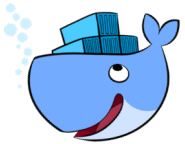
- https://docs.docker.com/install/#server
- Enterprise Edition 

- Community Edition 

The easy way (CE):

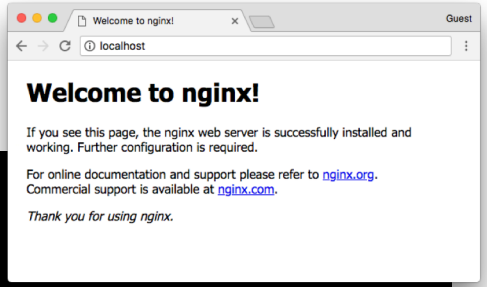
curl -fsSL "https://get.docker.com/" | sh

sudo systemctl start docker



Lab1.2 - Docker Commands

```
$ docker pull nginx
$ docker login
$ docker tag nginx <username>/nginx
$ docker push <username>/nginx
$ docker run -itd nginx
$ docker ps
$ docker run -itd -p 80:80 --name test nginx:1.12.2
$ curl localhost
$ docker rm -f <containerID>
```



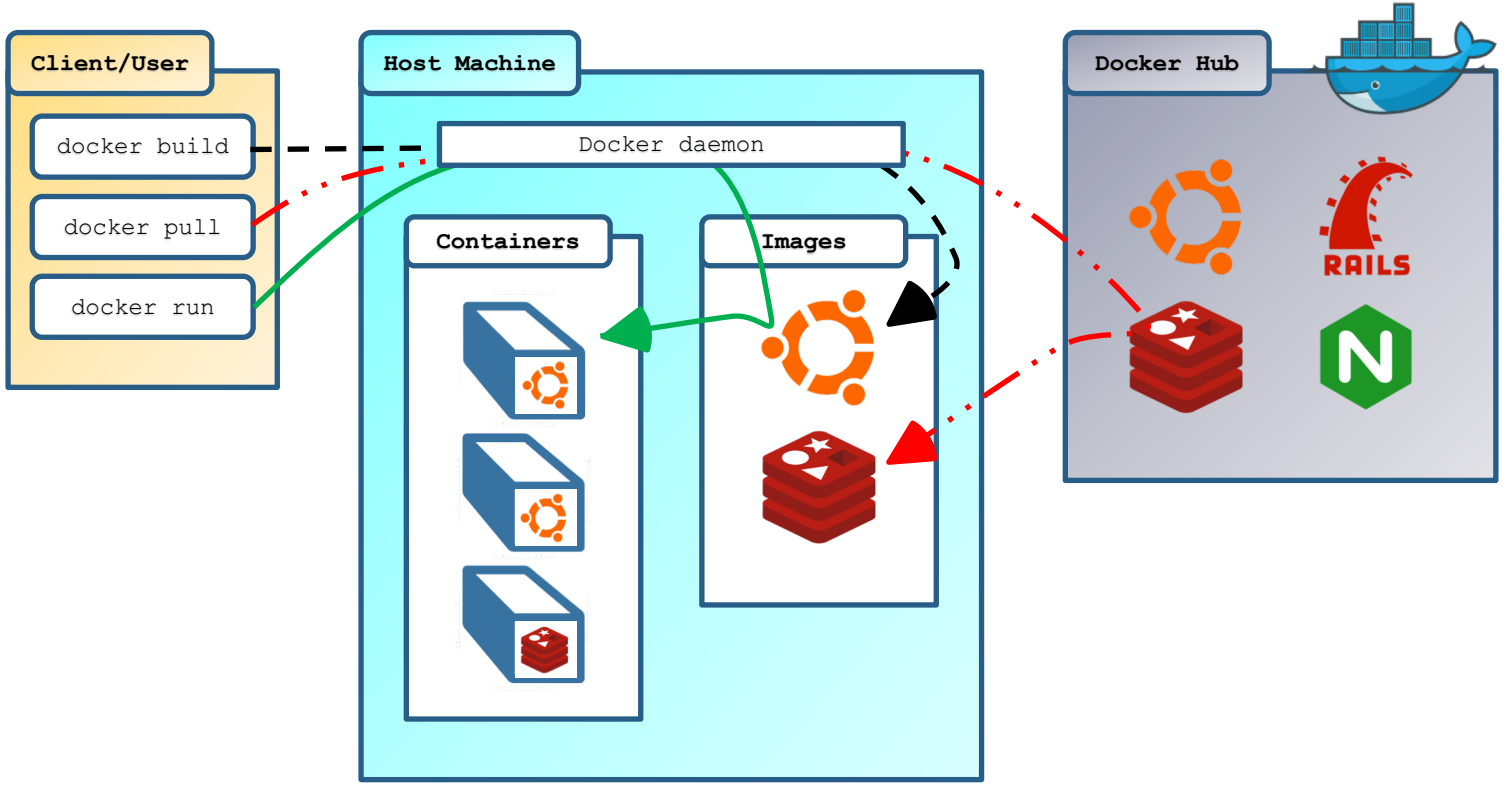
Lab1.2 - Docker Commands

```
$ git clone https://github.com/acinwinstack/minikube-intro-workshop.git
$ cd minikube-intro-workshop/
```

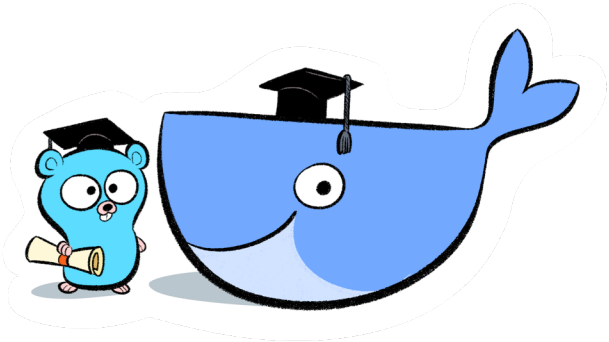
```
$ docker build -t <username>/helloworld:v1 ./build/
$ docker images
$ docker run -itd --name test2 -p 8080:80 \
  <username>/helloworld:v1
$ curl localhost:8080
```

```
$ docker push <username>:helloworld:v1
```

How does it work?



Commands



```
Commands:
  attach      Attach local standard input, output, and error streams to a running container
  build       Build an image from a Dockerfile
  commit      Create a new image from a container's changes
  cp          Copy files/folders between a container and the local filesystem
  create      Create a new container
  diff        Inspect changes to files or directories on a container's filesystem
  events      Get real time events from the server
  exec        Run a command in a running container
  export      Export a container's filesystem as a tar archive
  history     Show the history of an image
  images      List images
  import      Import the contents from a tarball to create a filesystem image
  info        Display system-wide information
  inspect     Return low-level information on Docker objects
  kill        Kill one or more running containers
  load        Load an image from a tar archive or STDIN
  login       Log in to a Docker registry
  logout      Log out from a Docker registry
  logs        Fetch the logs of a container
  pause       Pause all processes within one or more containers
  port        List port mappings or a specific mapping for the container
  ps          List containers
  pull        Pull an image or a repository from a registry
  push        Push an image or a repository to a registry
  rename      Rename a container
  restart     Restart one or more containers
  rm          Remove one or more containers
  rmi         Remove one or more images
  run         Run a command in a new container
  save        Save one or more images to a tar archive (streamed to STDOUT by default)
  search      Search the Docker Hub for images
  start       Start one or more stopped containers
  stats       Display a live stream of container(s) resource usage statistics
  stop        Stop one or more running containers
  tag         Create a tag TARGET_IMAGE that refers to SOURCE_IMAGE
  top         Display the running processes of a container
  unpause     Unpause all processes within one or more containers
  update      Update configuration of one or more containers
  version     Show the Docker version information
  wait        Block until one or more containers stop, then print their exit codes
```

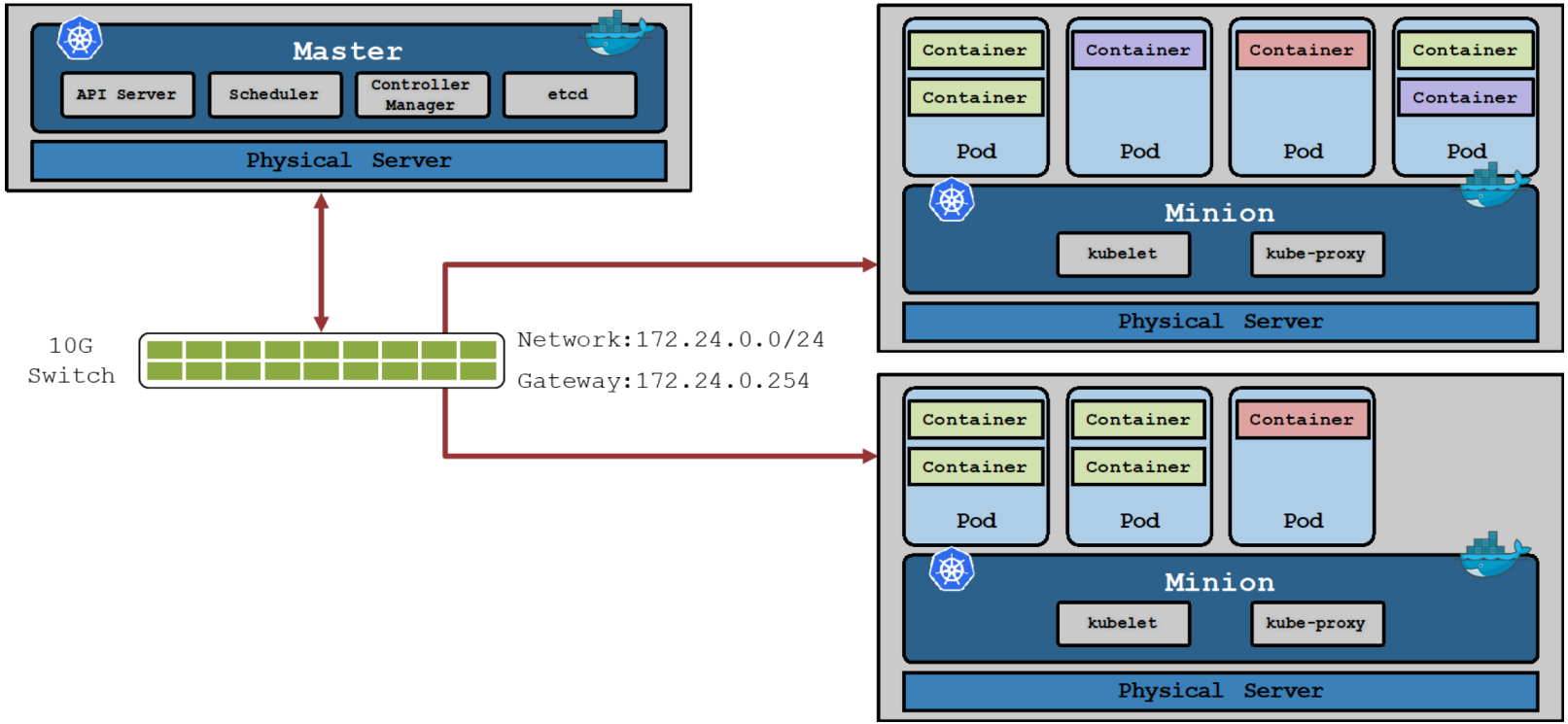
Intro to Kubernetes

*A powerful **container orchestrator** open sourced by Google Inc.*

Introduction

- Κυβερνήτης: Governor, Pilot.
- “K8s”
- Current Release: 1.10+
- https://kubernetes.io/
- Release Roadmap
  https://github.com/kubernetes/kubernetes/milestones/

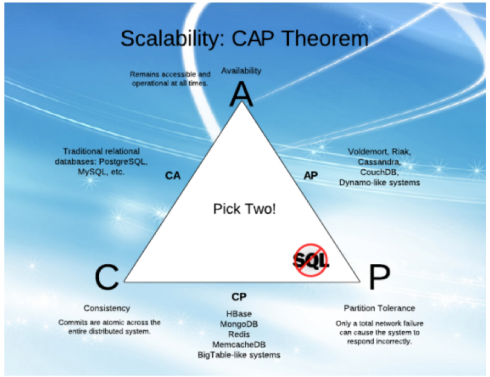
Kubernetes Cluster

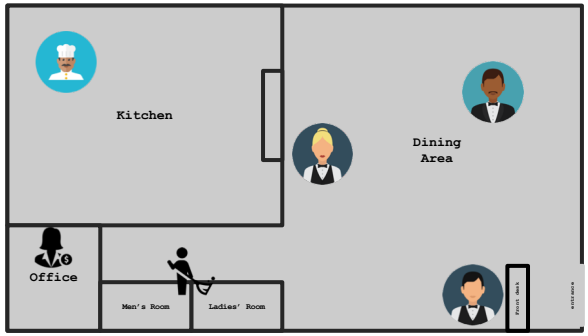


Kubernetes Concepts

- Controllers
  - Deployment
  - Stateful Set
  - Daemon Set
  - Job

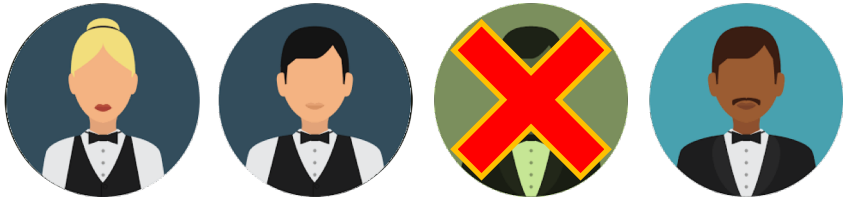
- Service

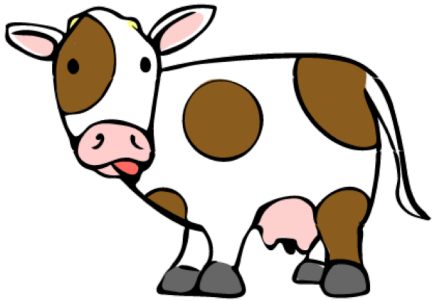




Kubernetes Concepts - Controllers

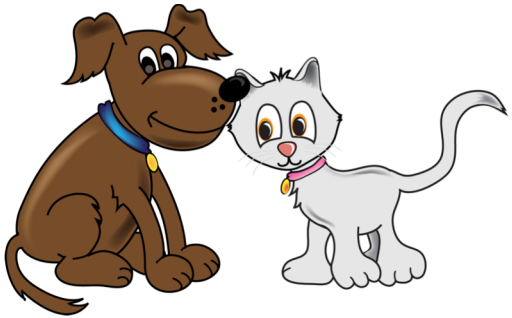
- Deployment
  - Stateless
  - Randomly assigned identities
  - Availability > Consistency
  - ***[Web Frontends]***





Kubernetes Concepts - Controllers

- Stateful Set
  - Keeps states
  - Persistent data
  - Each has its own identity
  - Availability < Consistency
  - ***[Databases]***
  - ***[Message Queues]***



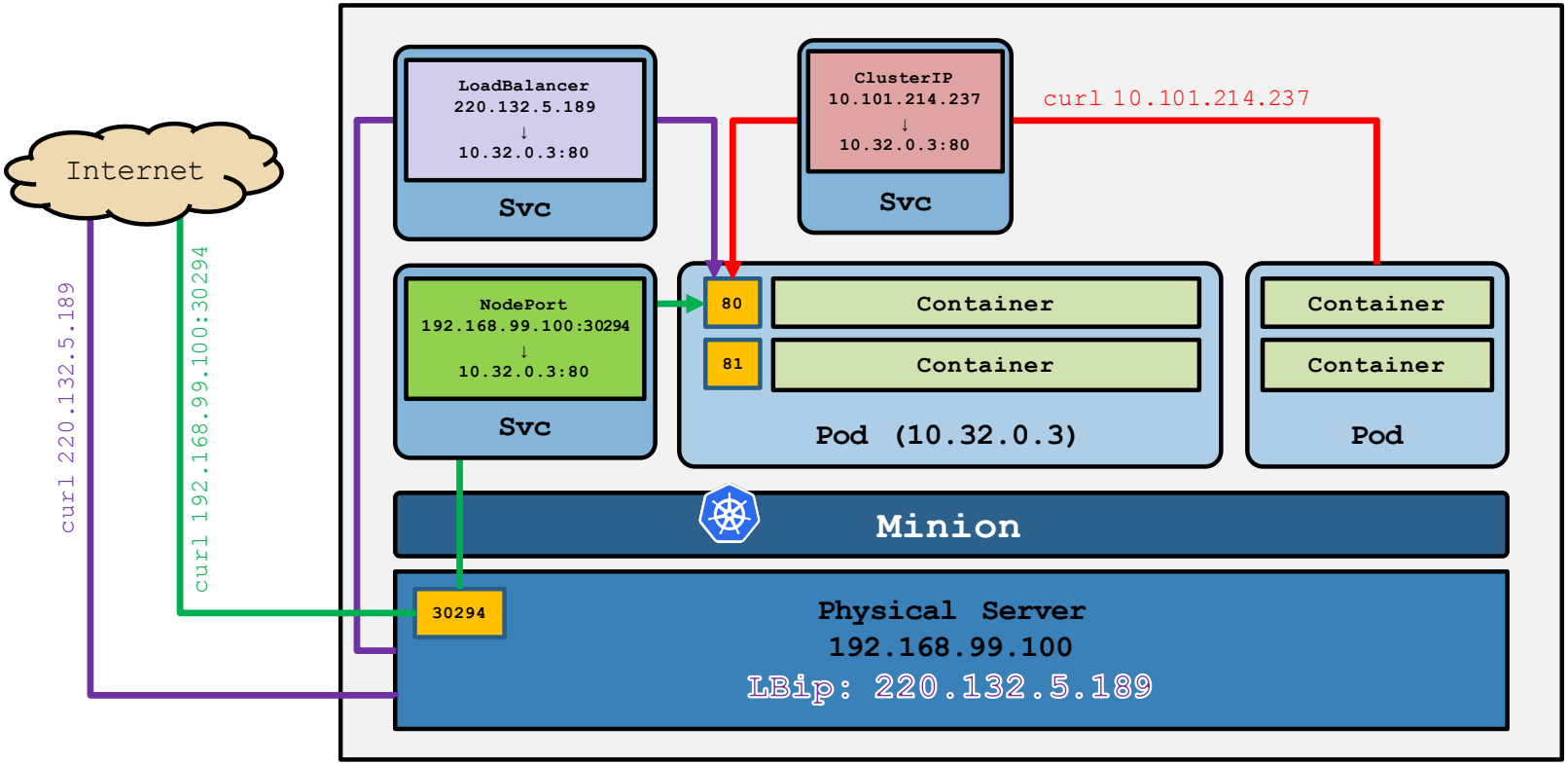
Kubernetes Concepts - Controllers

- Daemon Set
  - Background process
  - One pod per node
  - Node labels
  - ***[Cluster Storage]***
  - ***[Logging]***
  - ***[Node Monitoring]***

Kubernetes Concepts - Controllers

- Jobs
  - Batch Pattern
  - Run in parallel
  - Run to completion (then exit)
  - Independent but related processes

Kubernetes Concepts - Service

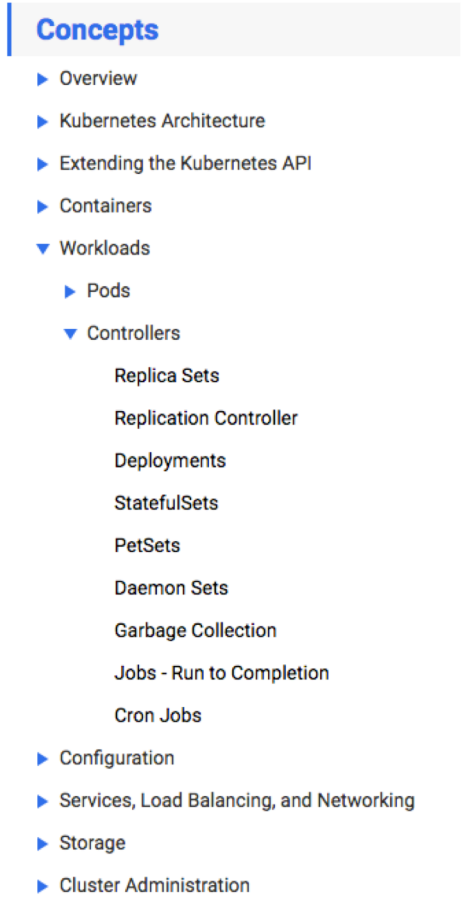


Kubernetes Concepts

There's more!!

So many tools to choose from...

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

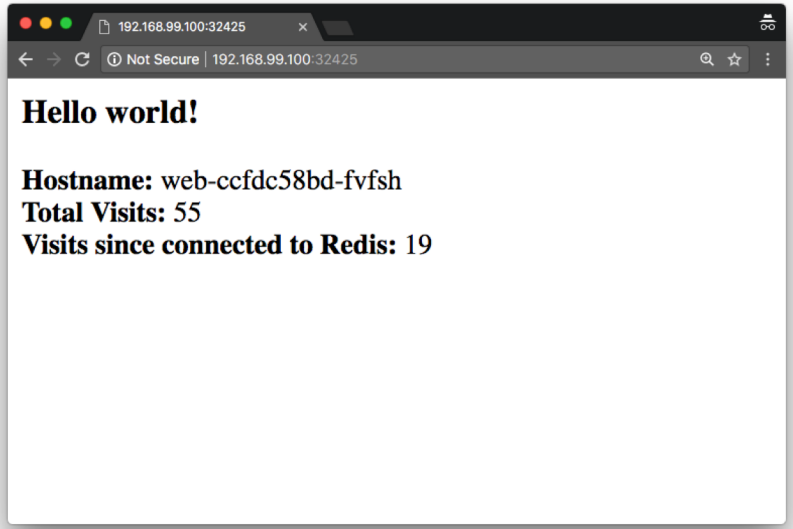


Lab#2 Minikube

Local, single node K8s cluster

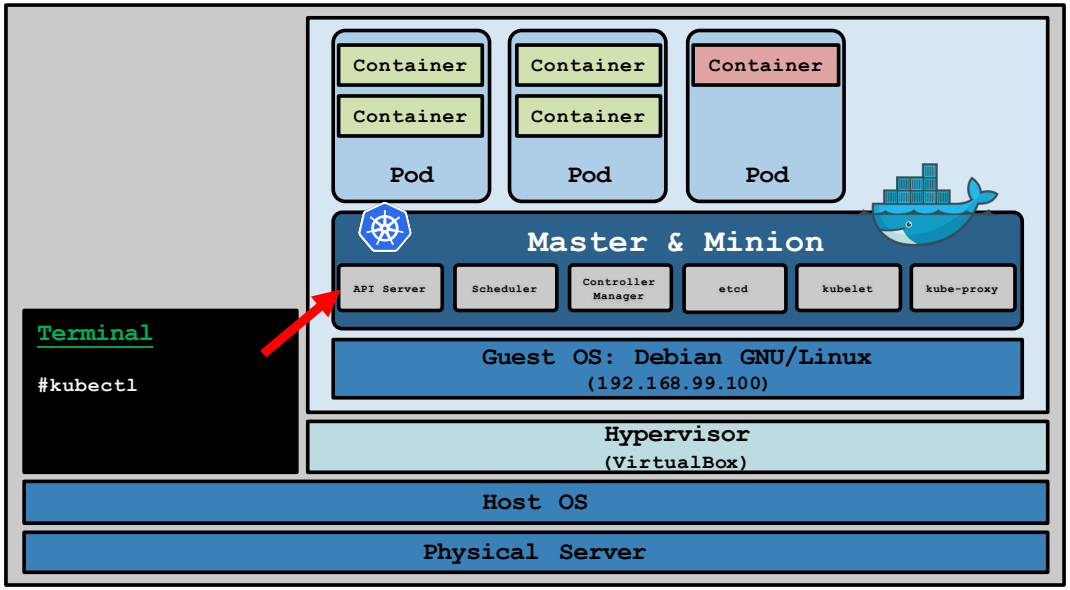
Lab Description

- Single Node
- Persistent Storage
- Rolling update



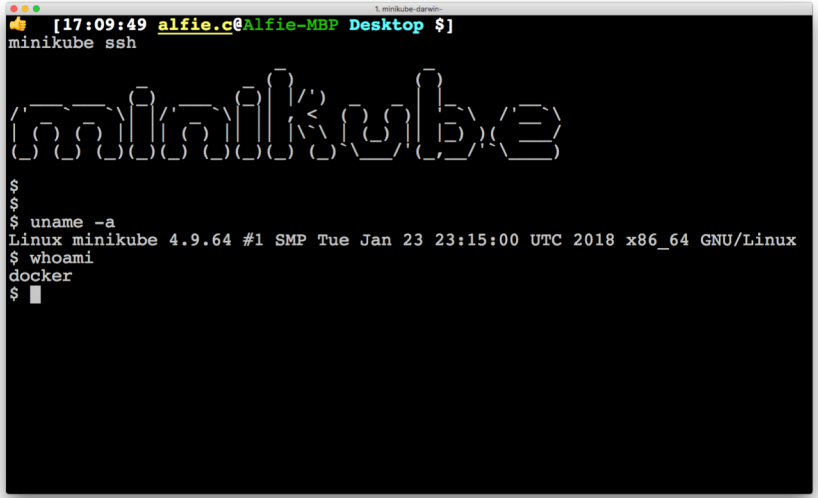
Lab2.1 - Installation

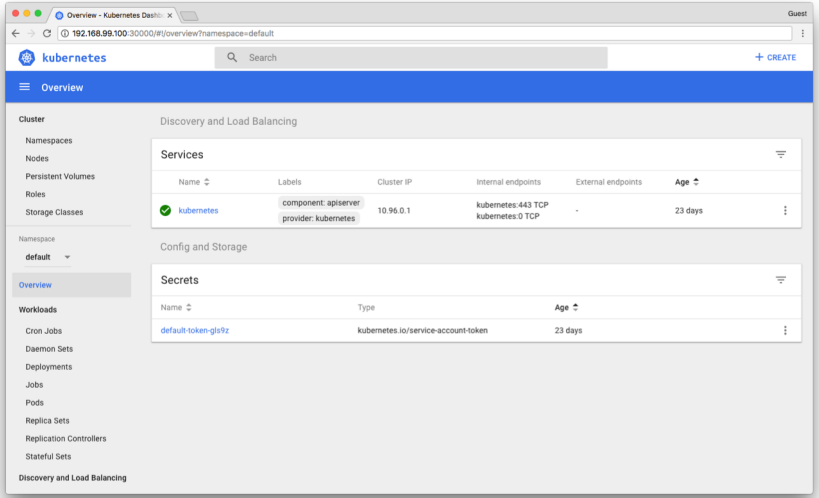
https://kubernetes.io/docs/tasks/tools/install-minikube/



Lab2.2 - Minikube Commands

```
$ minikube start
$ minikube dashboard
$ minikube ssh
$ minikube stop
```





Lab2.3 - Run the Web App

```
$ kubectl apply -f lab1/redis_pod.yml
$ kubectl get po -o wide
  write down the pod IP of redis

$ vi lab1/web_deploy.yml
  Config REDIS_IP

$ kubectl apply -f lab1/web_deploy.yml
```

Lab2.4 - Expose the Web App

```
$ kubectl expose deploy hello-world-deploy \
  --name hello-world-svc \
  --type NodePort \
  --port 80 \
  --target-port 80
$ kubectl get svc
```

write down the NodePort IP of hello-world-svc

```
$ curl <minikube>:NodePortIP
```

Lab2.5 - Persistent Volume

```
$ vi lab2/web_deploy.yml
  Config REDIS_IP
```

```
$ kubectl apply -f lab2/web_deploy.yml
```

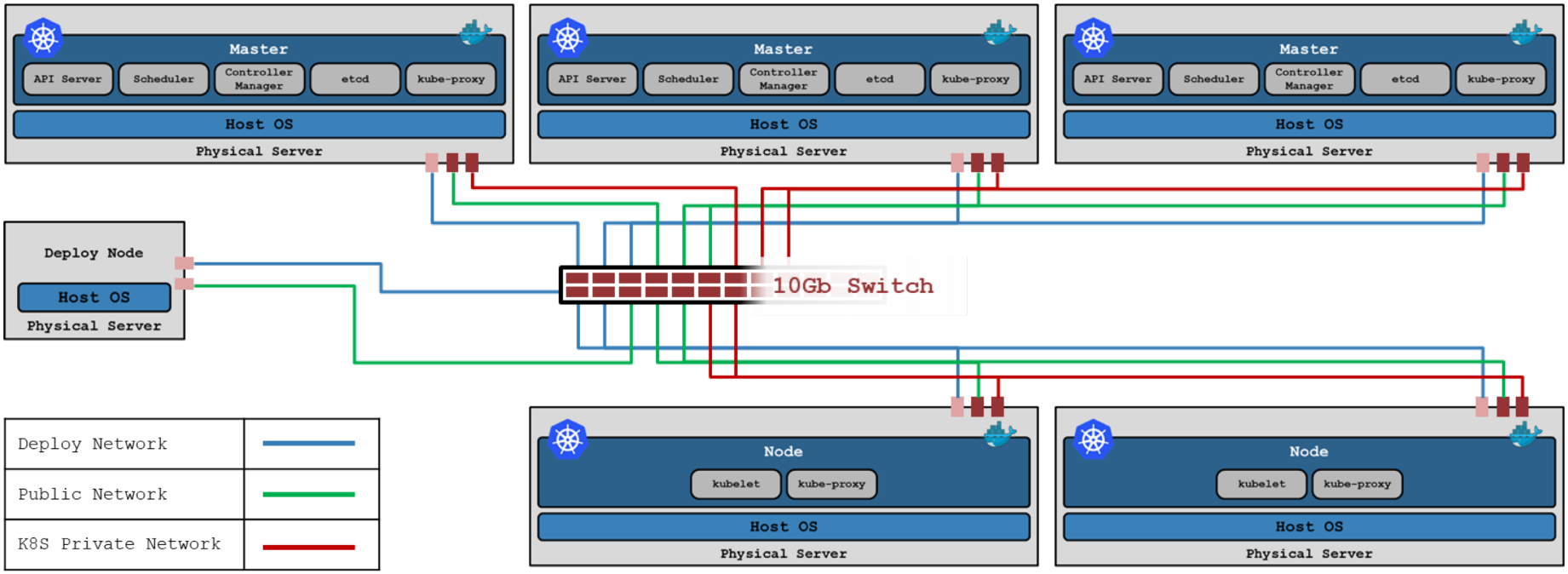
Production Solutions & Case Studies

Infrastructure designs for production, with a successful story to tell

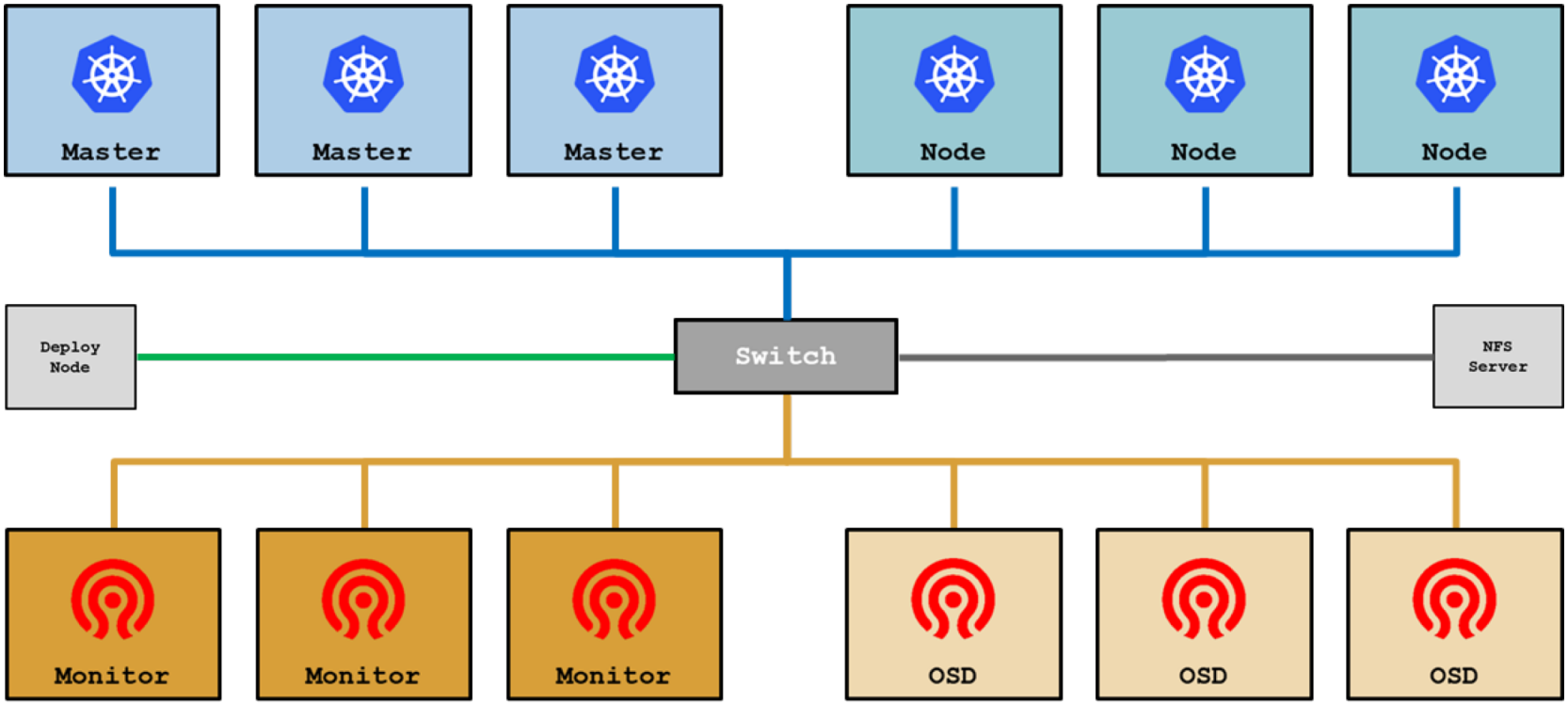
K8s Minimum Specs

節點角色(主機名稱)	硬體項目	規格
Kubernetes Master	CPU	8 Core
	RAM	32GB
	HDD	1TB SATA
	NIC	10Gb ports
Kubernetes Node	CPU	16 Core
	RAM	64GB
	HDD	1TB SATA
	NIC	10Gb ports

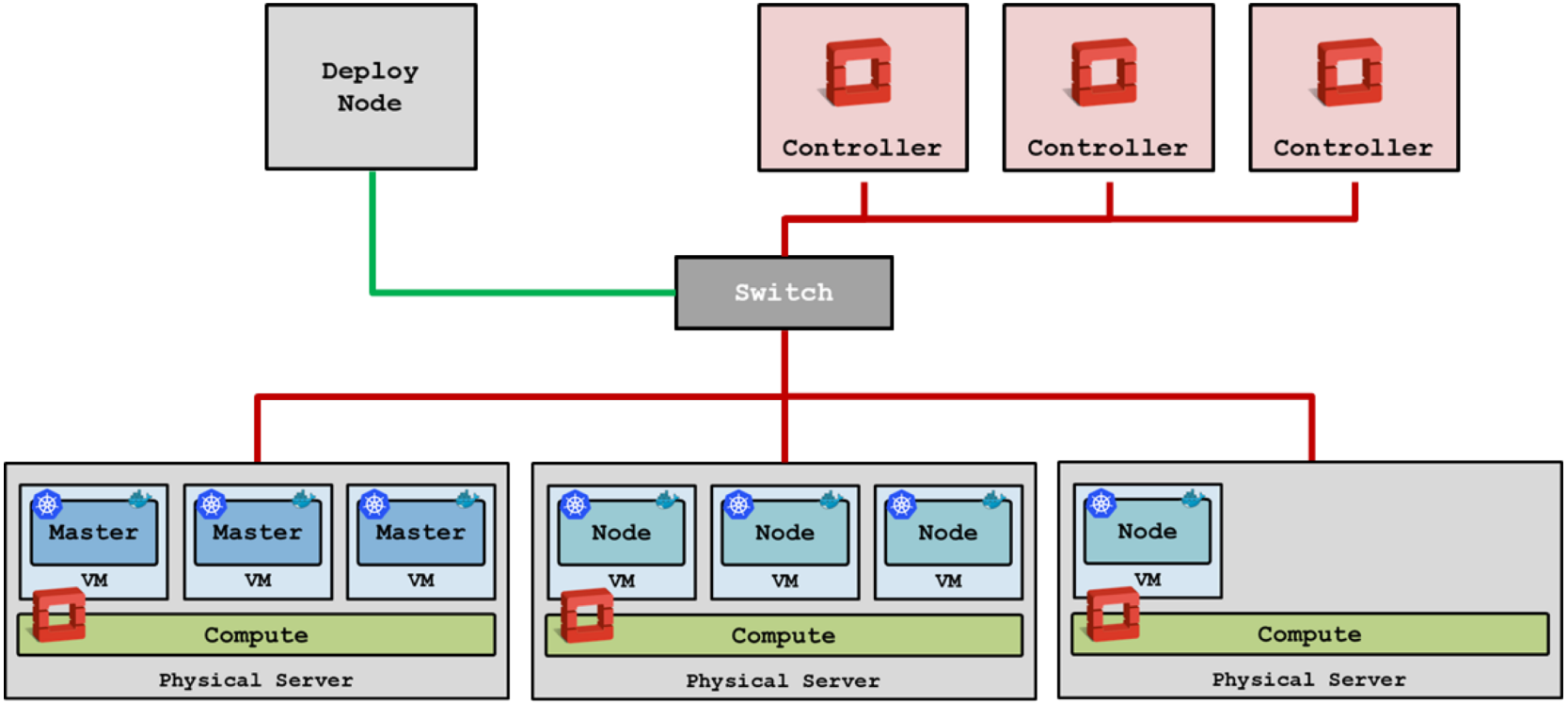
K8s Minimum Architecture (HA)



Kubernetes + Ceph

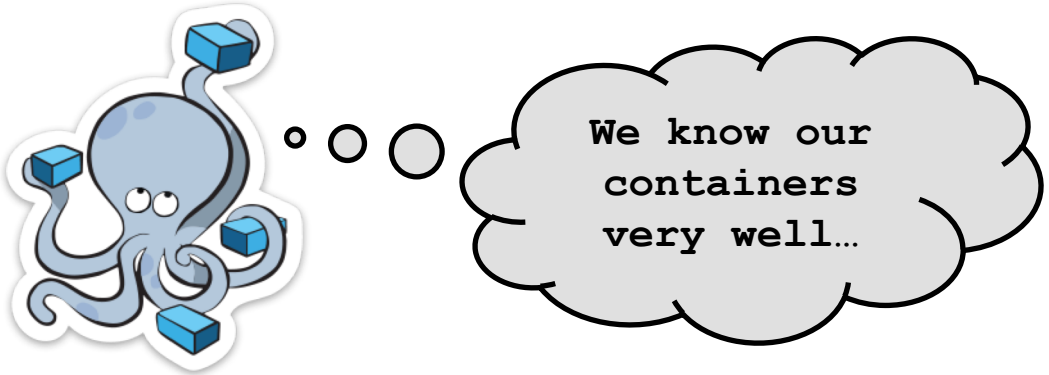


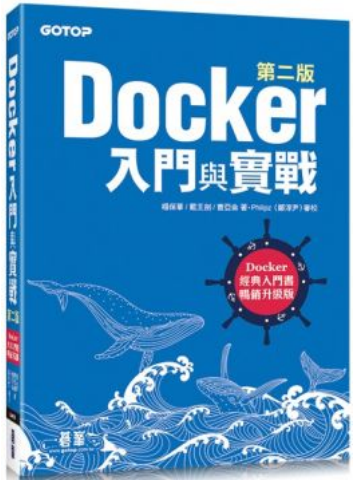
Virtual Kubernetes



A Successful Story – User Background

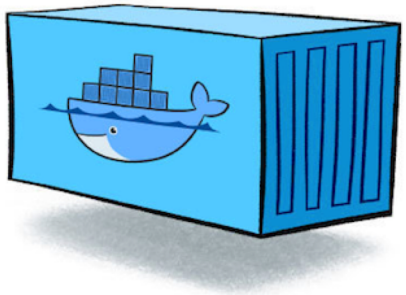
- A Hospital in Taipei
- Java developers
- Already using Docker containers
- CI/CD practice with GitLab + Docker

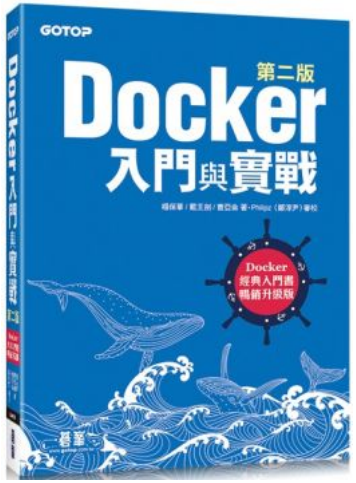




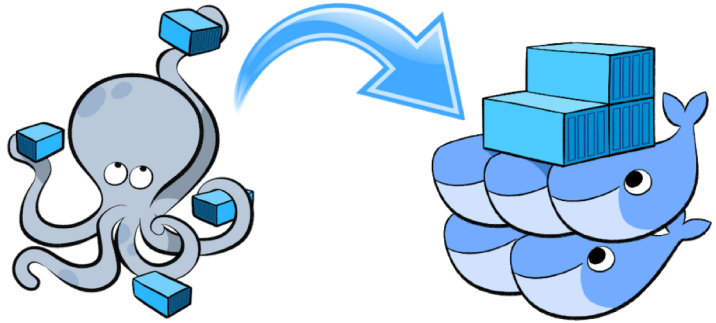
A Successful Story – User Background

- EMR System Applications
- HR Software Applications
- Radiology Information System Applications



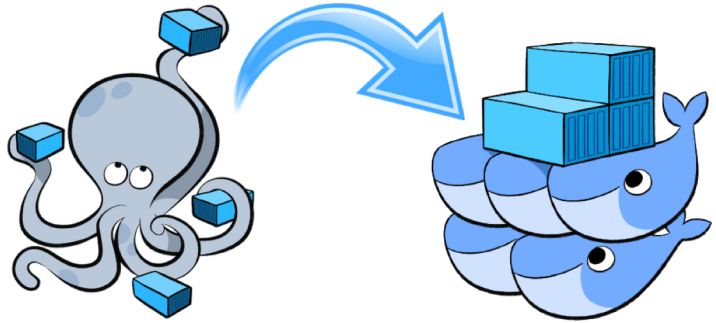


The Challenge



- Docker Swarm is not enough
- Require auto-scaling
- Require multi-tenancy
- Require various deploy methods
- Require S3 storage solution
- Require infrastructure scalability for the future (for both application and storage)
- Require user-friendly interface for both tenants & admins

The Challenge



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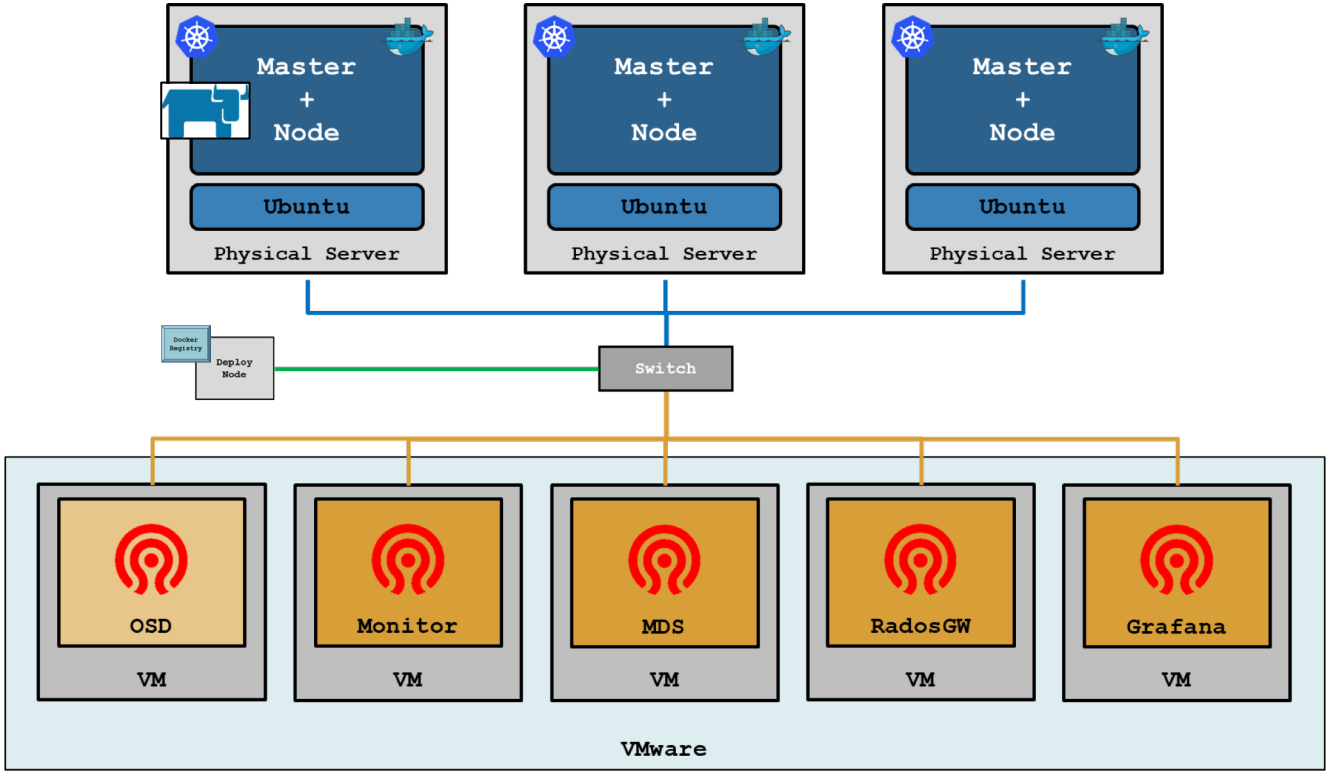
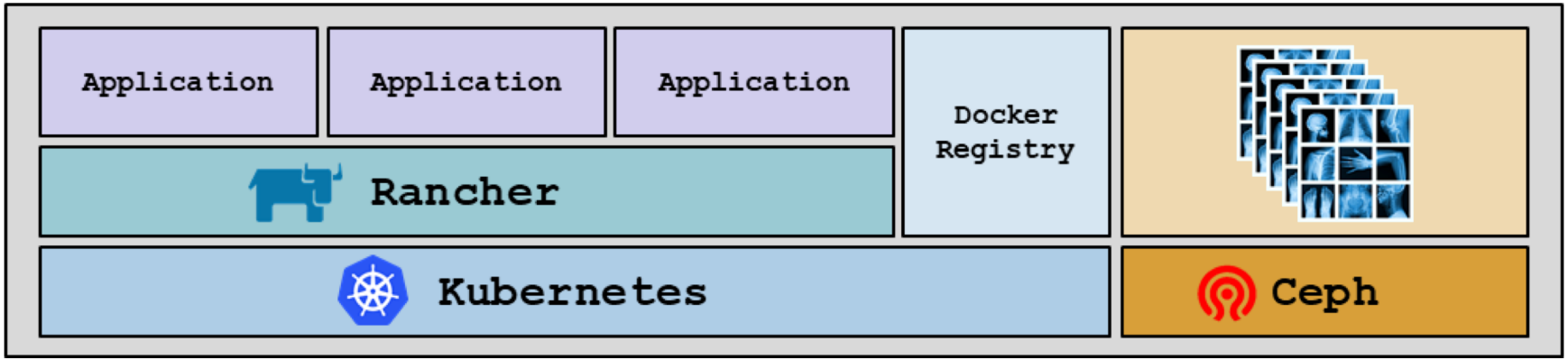
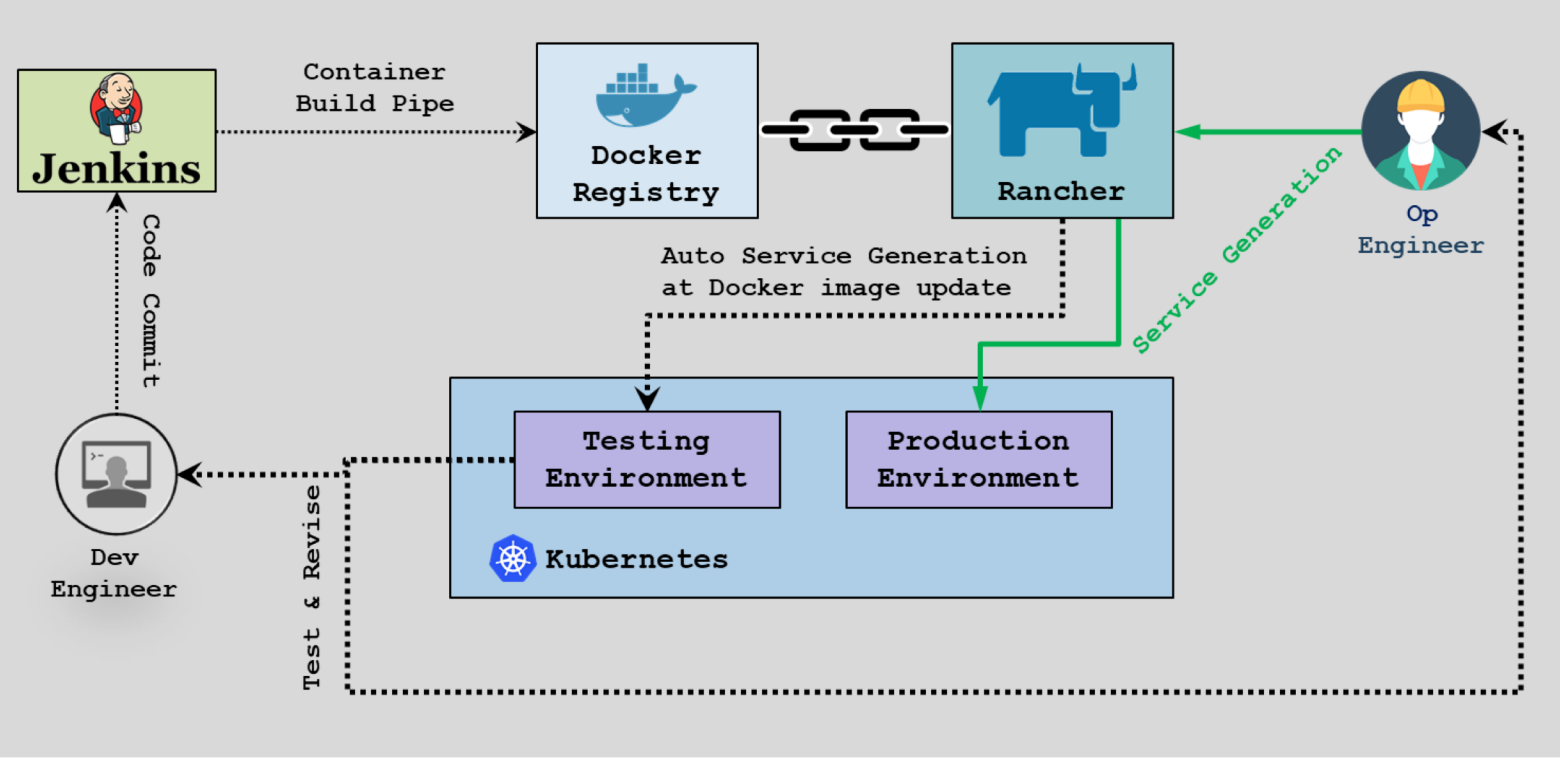
The Solution



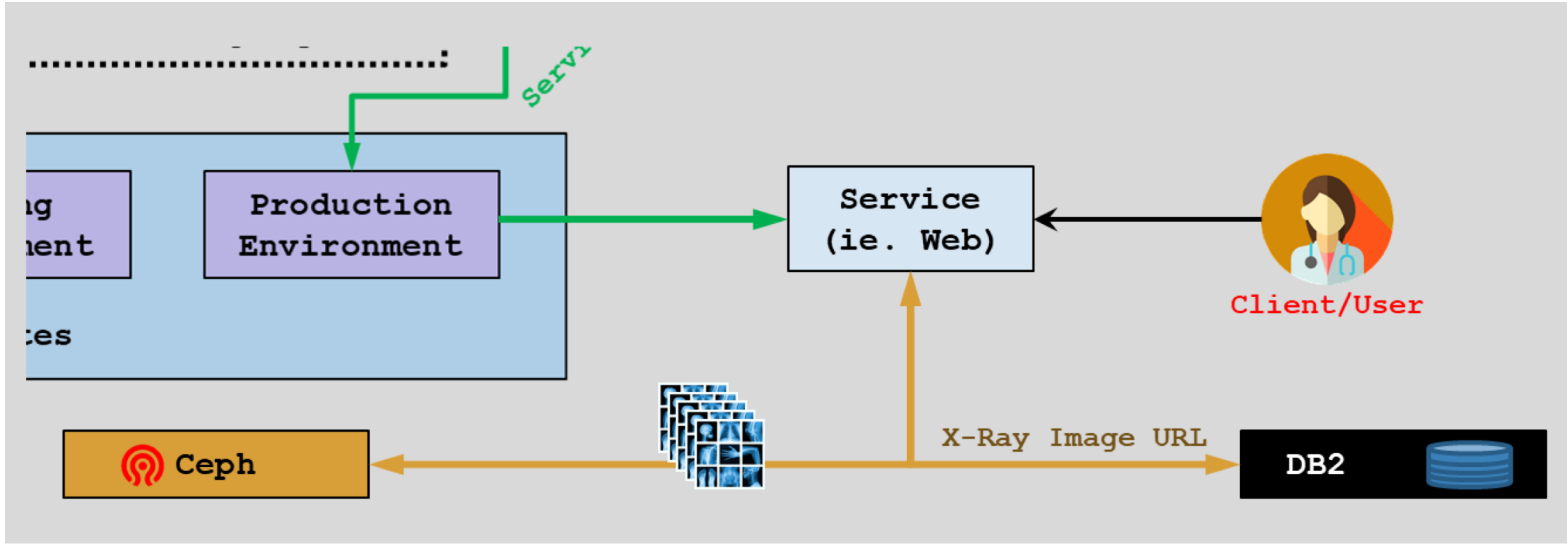
The Solution



The Impact - CI/CD Pipeline



The Impact - Storage Optimization



Conclusion

What should you **REALLY** take away today?

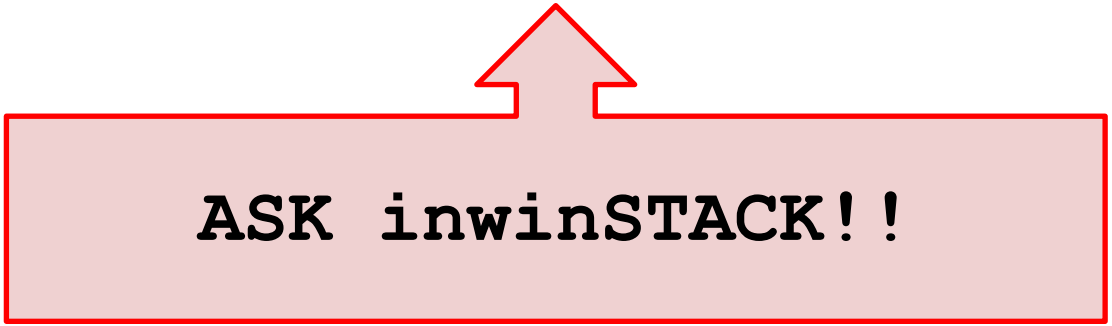
Things to Consider…

- What's best for your app?
  i.e. VMs vs Containers
- What are your customized requirements?
  i.e. Dev? Ops? DevOps?
- What specific open source apps are in interest?
  i.e. Web (wordpress, apache, php);
  DB (redis, postgresql, mongodb); …

Things to Consider…

Determine how much hardware resource is available

Determine what architecture utilizes the most of your resource
(keep application priorities in mind)



The End

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