DevOps with Kubernetes and Helm

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Cloud Developer Advocate

HELLO!

I am Jessica Deen

I am here because I love technology and community.

I focus heavily on Linux, OSS, DevOps and Containers.

I love Disney and CrossFit/Fitness.

You can find me at @jldeen on GitHub, Twitter, and Instagram.

Disclaimer

The next 60 minutes will NOT make you an expert, but it will:

- **Get you thinking**
- **Show you what’s possible**
- **Give you some sample code for you to get started on your own time**

GOING DIGITAL

1 million/hour
new devices coming online by 2020

12 years
average age of S&P 500 corporations by 2020

60% computing
in the public cloud by 2025

What we hear from developers

I need to create applications at a competitive rate without worrying about IT

New applications run smoothly on my machine but malfunction on traditional IT servers

My productivity and application innovation become suspended when I have to wait on IT

What we hear from IT

I need to manage servers and maintain compliance with little disruption

I'm unsure of how to integrate unfamiliar applications, and I require help from developers

I'm unable to focus on both server protection and application compliance

IT stress points

Security threats

Datacenter efficiency

Supporting innovation

Cloud is a new way to think about a datacenter

Traditional model

Dedicated infrastructure for each application

Purpose-built hardware

Distinct infrastructure and operations teams

Customized processes and configurations

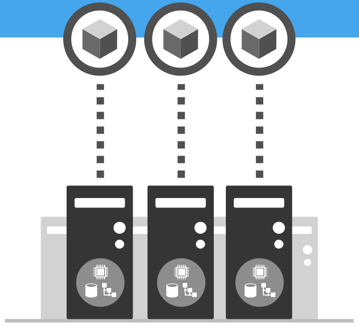
Cloud model

Loosely coupled apps and micro-services

Industry-standard hardware

Service-focused DevOps teams

Standardized processes and configurations

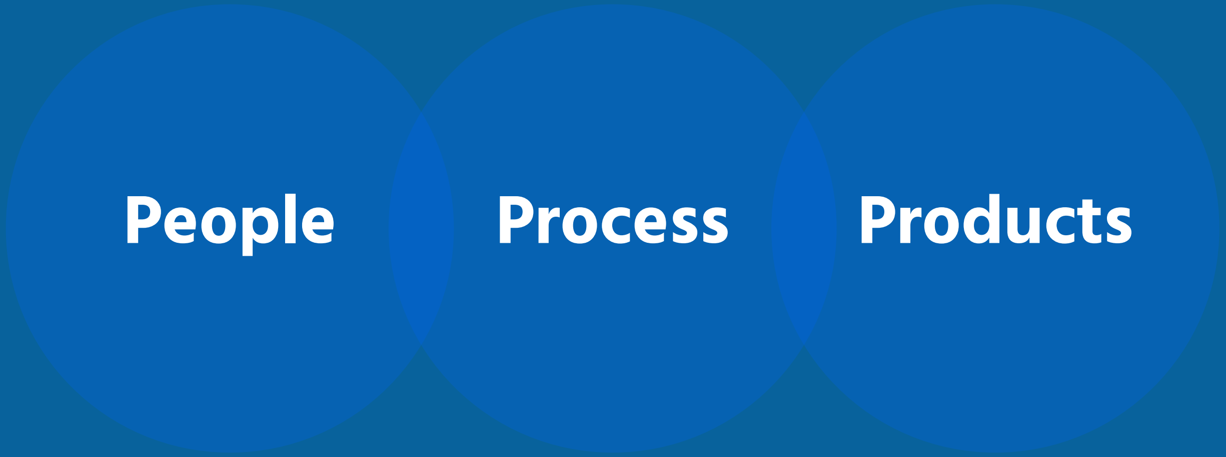


Servers

Services

Microsoft

DevOps: The Three Stage Conversation



DevOps is the union of people, process, and products to enable continuous delivery of value to our end users.

-Donovan Brown

http://bit.ly/WhatIs-DevOps

Key DevOps Practices

Infrastructure as Code	Continuous Integration	Continuous Deployment
Automated Testing	Release Management	Performance Monitoring
Availability Monitoring	Load Testing & Auto Scale	Automated Recovery (Rollback & Roll Forward)

DevOps Benefits

IT Performance Metrics

	2015	2016	2017
Deployment Frequency	30x more frequent	200x more frequent	46x more frequent
Lead Time for Changes	200x faster	2,555x faster	440x faster
Mean Time to Recover (MTTR)	168x faster	24x faster	96x faster
Change Failure Rate		3x lower (1/3 as likely)	5x lower (1/5 as likely)

Source: *https://puppetlabs.com*

Why Containers?

Developers

- Enable 'write-once, run-anywhere' apps
- Enables microservice architectures
- Great for dev/test of apps and services
- Production realism
- Growing Developer Community

Operations

- Portability, Portability, Portability
- Standardized development, QA, and prod environments
- Abstract differences in OS distributions and underlying infrastructure
- Higher compute density
- Easily scale-up and scale-down in response to changing business needs

DevOps

What is a Container?

Not a real thing. An application delivery mechanism with **process isolation** based on several **Linux kernel** features.

Namespaces (what a process can see)

- PID
- Mount
- Network
- UTS
- IPC
- User
- Cgroup

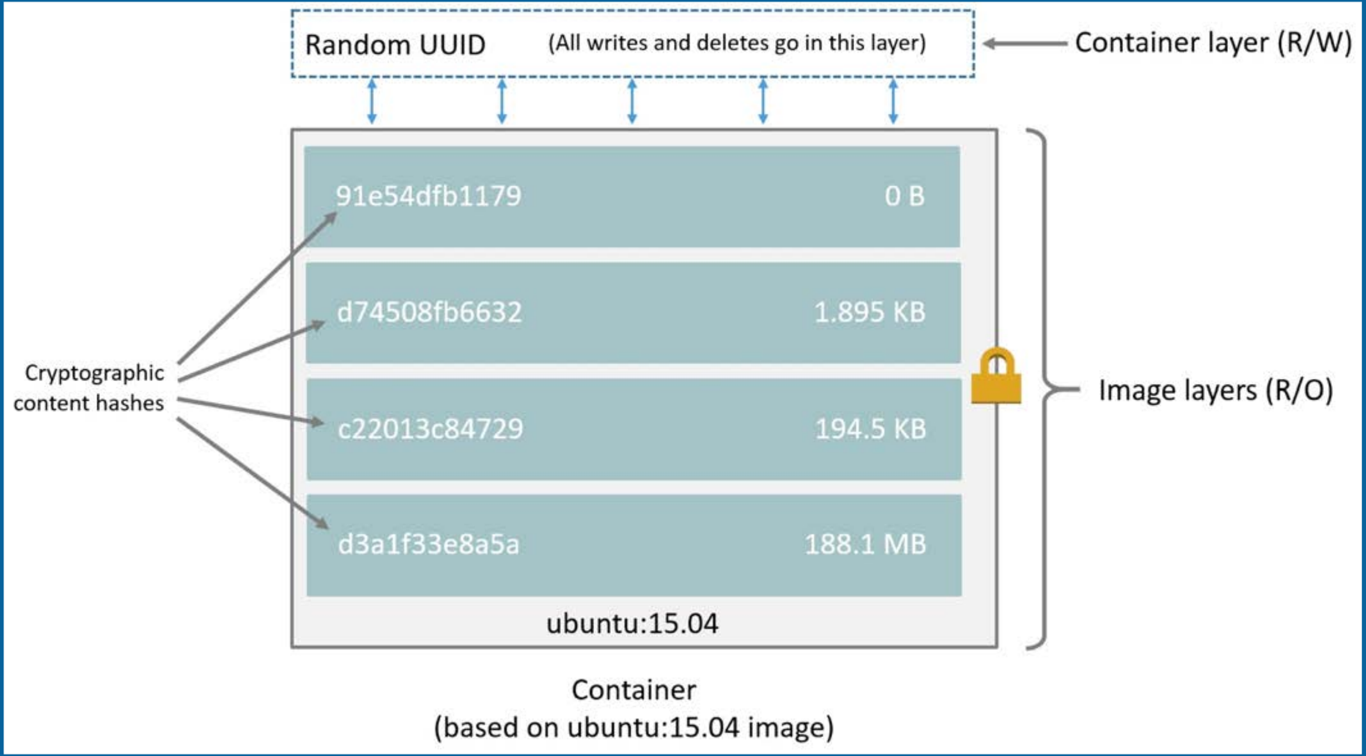
Cgroups (what a process can use)

- Memory
- CPU
- Blkio
- Cpuacct
- Cpuset
- Devices
- Net_prio

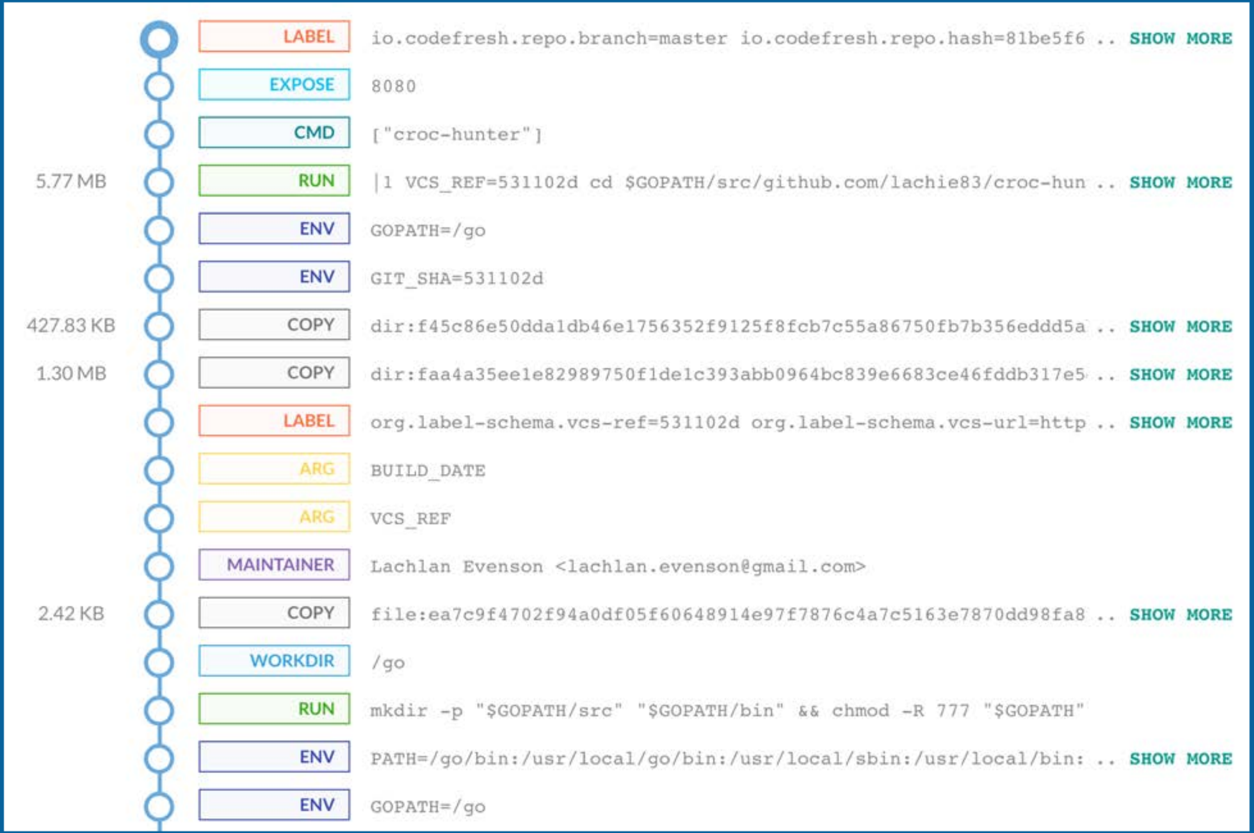
What is docker

- Open Source Container Runtime
- Mac, Linux, Windows Support
- Command Line Tool
- “Dockerfile” format
- The Docker image format with layered filesystem

Docker Layered Filesystem

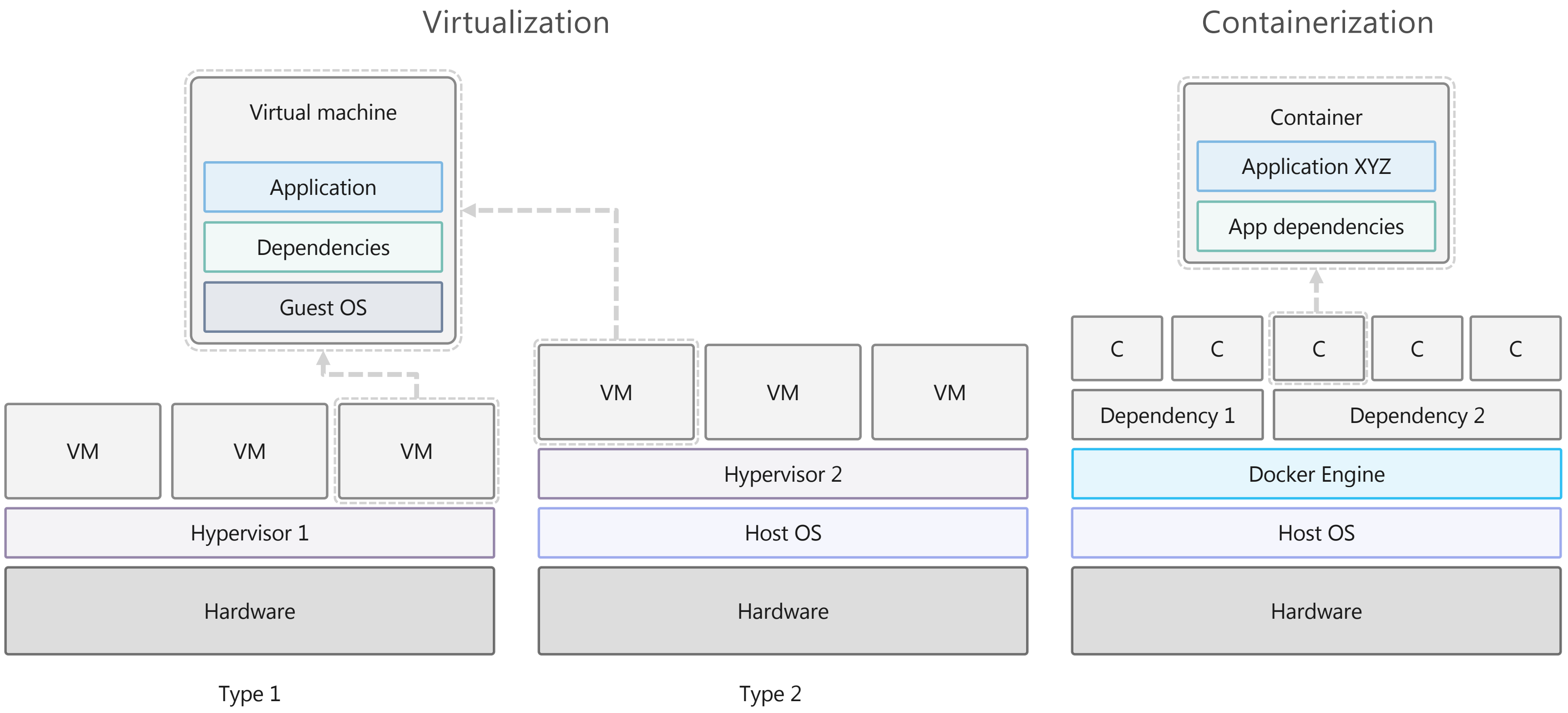


Docker Layered Filesystem

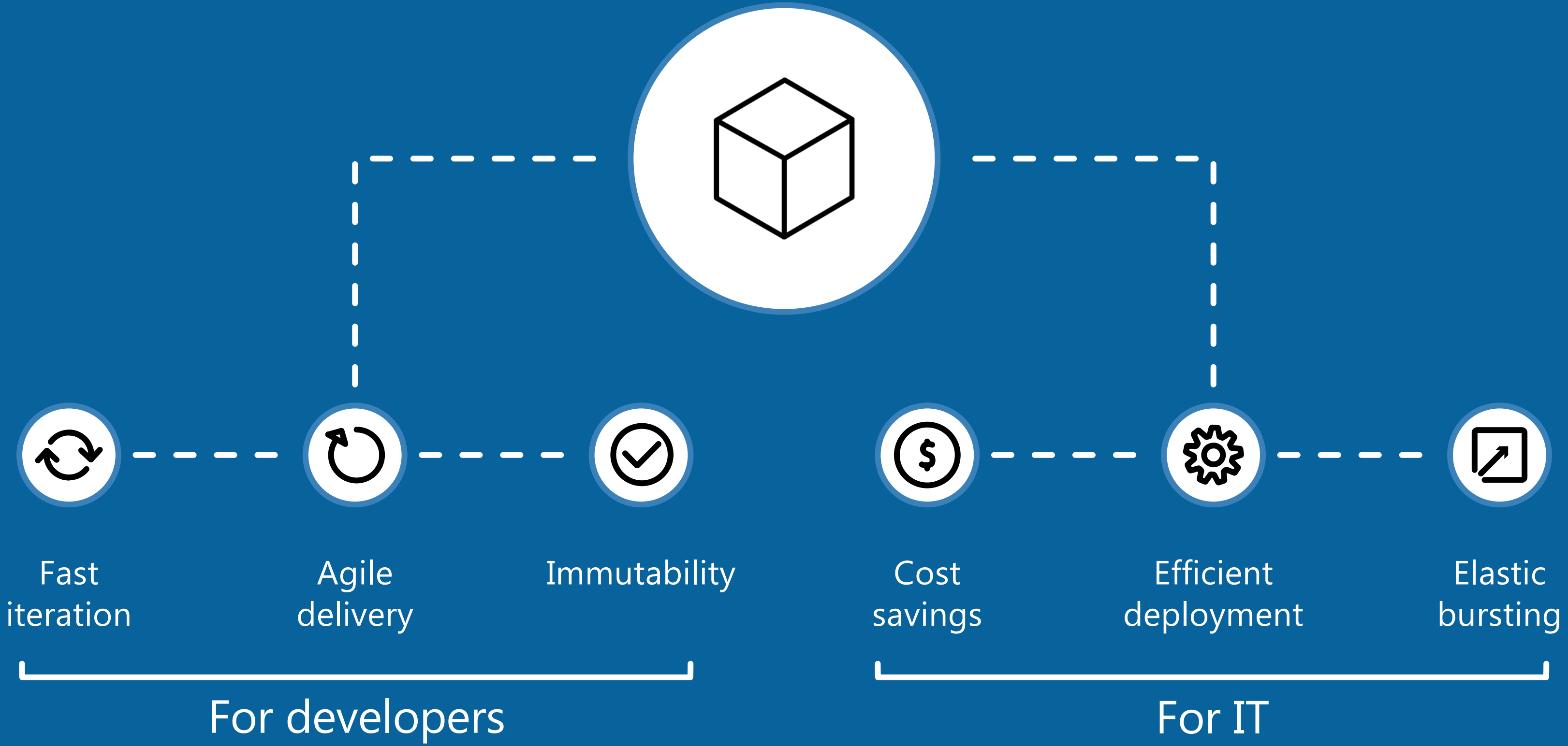


	LABEL	io.codefresh.repo.branch=master io.codefresh.repo.hash=81be5f6 ..	SHOW MORE
	EXPOSE	8080	
	CMD	["croc-hunter"]	
5.77 MB	RUN	|1 VCS_REF=531102d cd $GOPATH/src/github.com/lachie83/croc-hun ..	SHOW MORE
	ENV	GOPATH=/go	
	ENV	GIT_SHA=531102d	
427.83 KB	COPY	dir:f45c86e50dda1db46e1756352f9125f8fcb7c55a86750fb7b356eddd5a ..	SHOW MORE
1.30 MB	COPY	dir:faa4a35ee1e82989750f1de1c393abb0964bc839e6683ce46fddb317e5 ..	SHOW MORE
	LABEL	org.label-schema.vcs-ref=531102d org.label-schema.vcs-url=http ..	SHOW MORE
	ARG	BUILD_DATE	
	ARG	VCS_REF	
	MAINTAINER	Lachlan Evenson <lachlan.evenson@gmail.com>	
2.42 KB	COPY	file:ea7c9f4702f94a0df05f60648914e97f7876c4a7c5163e7870dd98fa8 ..	SHOW MORE
	WORKDIR	/go	
	RUN	mkdir -p "$GOPATH/src" "$GOPATH/bin" && chmod -R 777 "$GOPATH"	
	ENV	PATH=/go/bin:/usr/local/go/bin:/usr/local/sbin:/usr/local/bin: ..	SHOW MORE
	ENV	GOPATH=/go	

Virtualization versus containerization

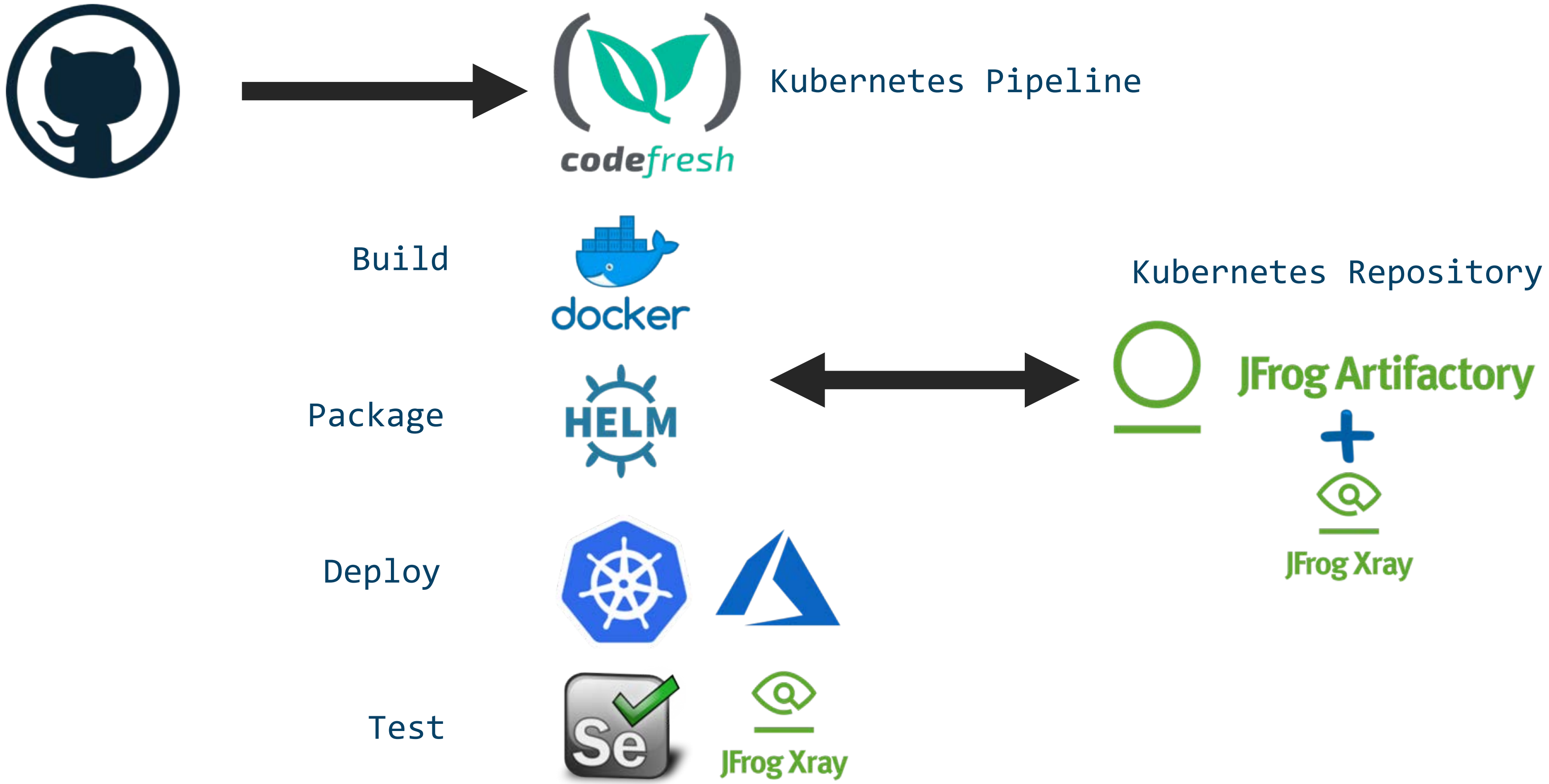


The container advantage



Demo

What did we just do?



Container Orchestration: Kubernetes

What is Kubernetes?

Open source container orchestrator that automates deployment, scaling, and management of applications.

Features include:

- **Automatic bin packing**
- **Self-healing**
- **Horizontal scaling**
- **Service discovery**
- **Load balancing**
- **Automated rollouts and rollbacks**
- **Secret and configuration management**

- **Designed by Google**
  - **Based on their system used to run BILLIONS of containers per week**
- **Over 2,300 contributors**
- **Graduated from CNCF**

Who is using Kubernetes?

Bloomberg box Capital One COMCAST DENSO ebay GitHub

cruise Goldman Sachs indeed intuit Kuelap Layer Morgan Stanley

NAIC National Association of Insurance Commissioners Nasdaq NCSOFT NIPR NATIONAL INSURANCE PRODUCER REGISTRY Olark Pinterest PUSHER

reddit ricardo.ch salesforce SAP Concur shopify showmax Spotify

Spredfast STEELHOUSE textkernel The New York Times ticketmaster twilio twitter

vevo WIKIMEDIA FOUNDATION woorank WP engine zalando zendesk

Walmart	CONCUR	VIACOM	buffer	Home Office
Arkena	Goldman Sachs	monzo	EVE ONLINE	Pearson
The New York Times	box	OpenAI	ticketmaster	SKY
COMCAST	Bloomberg	Pokémon GO	SOUNDCLOUD	unacast.

Azure Kubernetes Service (AKS)

Your Kubernetes Cluster Managed by Azure

Why AKS?

Easy to use:

- Fastest path to Kubernetes on Azure
- Up and running with 3 simple commands
- I argue there are 2.5 commands

Easy to manage:

- Automated upgrades and patching
- Easily scale the cluster up and down
- Self-healing control plane

Uses open APIs – 100% upstream Kubernetes

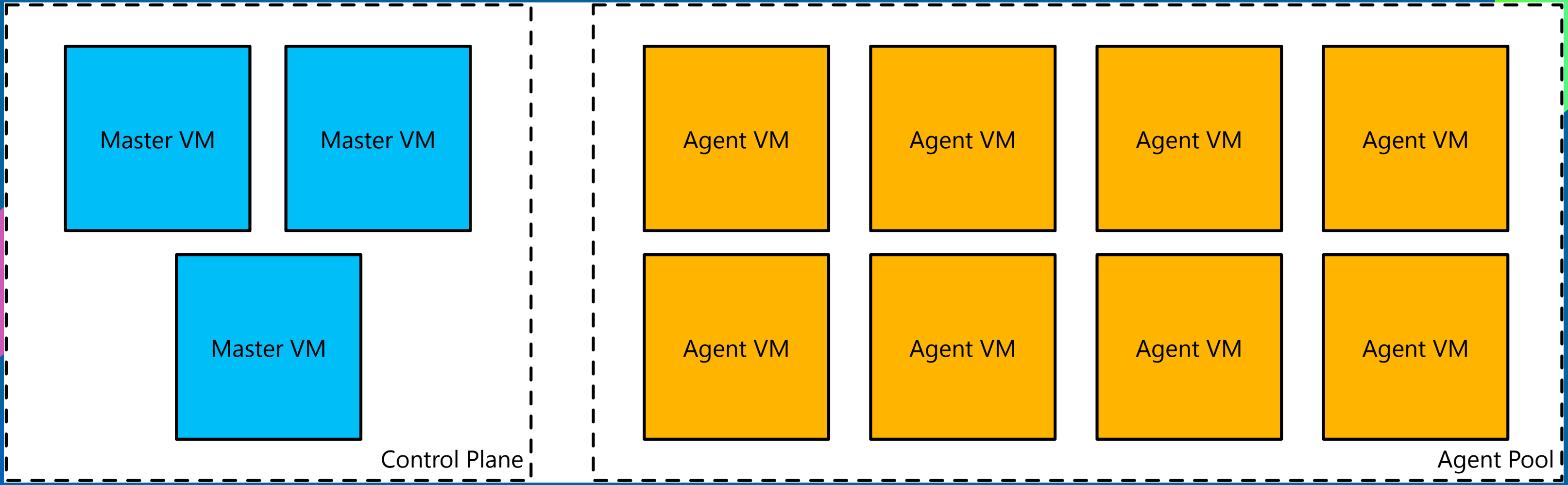
Getting Started with AKS

```
$ az aks create -g myResourceGroup -n myCluster --generate-ssh-keys
\ Running ..

$ az aks install-cli
Downloading client to /usr/local/bin/kubectl ..

$ az aks get-credentials -g myResourceGroup -n myCluster
Merged "myCluster" as current context ..

$ kubectl get nodes
NAME                       STATUS    AGE       VERSION
aks-mycluster-36851231-0   Ready     4m        v1.8.1
aks-mycluster-36851231-1   Ready     4m        v1.8.1
aks-mycluster-36851231-2   Ready     4m        v1.8.1
```

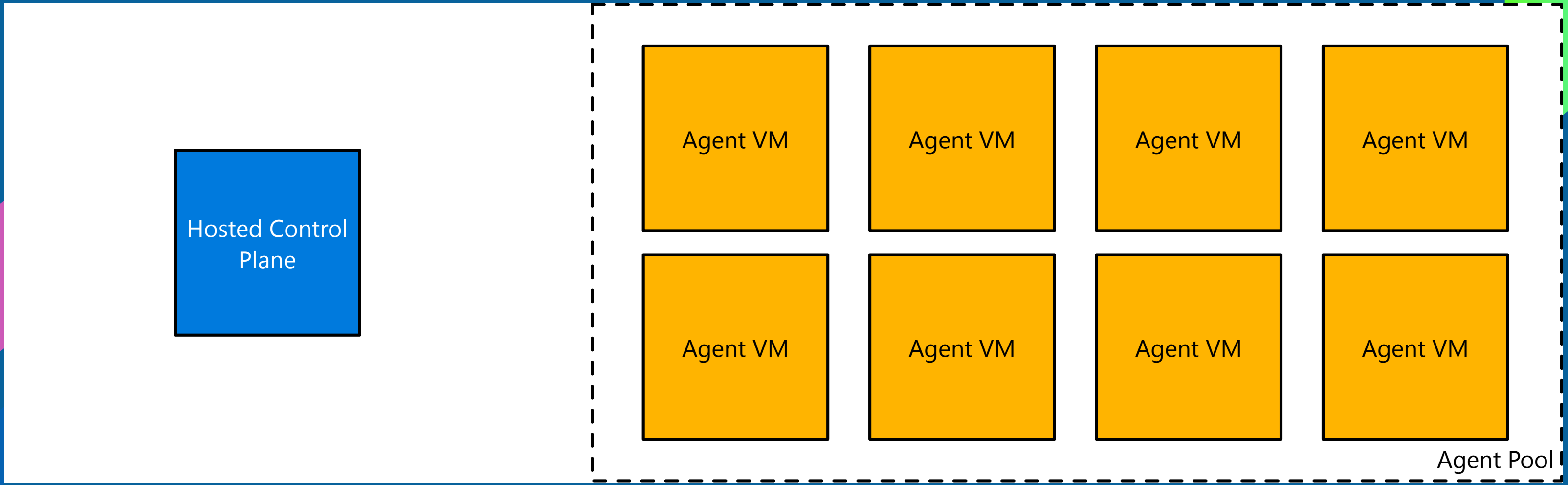
Managing an AKS Cluster

```
$ az aks list -o table
Name                Location    ResourceGroup     KubernetesRelease
ProvisioningState
------------------  ----------  --------------  -------------------  ------------
-------
myCluster           westus2     myResourceGroup                1.7.7  Succeeded

$ az aks upgrade -g myResourceGroup -n myCluster --kubernetes-version 1.8.1
\ Running ..

$ kubectl get nodes
NAME                       STATUS    AGE       VERSION
aks-mycluster-36851231-0   Ready     12m       v1.8.1
aks-mycluster-36851231-1   Ready     8m        v1.8.1
aks-mycluster-36851231-2   Ready     3m        v1.8.1

$ az aks scale -g myResourceGroup -n myCluster --agent-count 10
\ Running ..
```

Kubernetes without AKS



Kubernetes with AKS



Release automation tools

Simplifying the Kubernetes experience

DRAFT

Streamlined Kubernetes development

HELM

The package manager for Kubernetes

BRIGADE

Event-driven scripting for Kubernetes

KASHTI

Visualization dashboard for Brigade

Helm

The best way to find, share, and use software built for Kubernetes

Manage complexity

Charts can describe complex apps; provide repeatable app installs, and serve as a single point of authority

Easy updates

Take the pain out of updates with in-place upgrades and custom hooks

Simple sharing

Charts are easy to version, share, and host on public or private servers

Rollbacks

Use `helm rollback` to roll back to an older version of a release with ease

Azure Container Service (AKS)

Azure Container Instances (ACI)

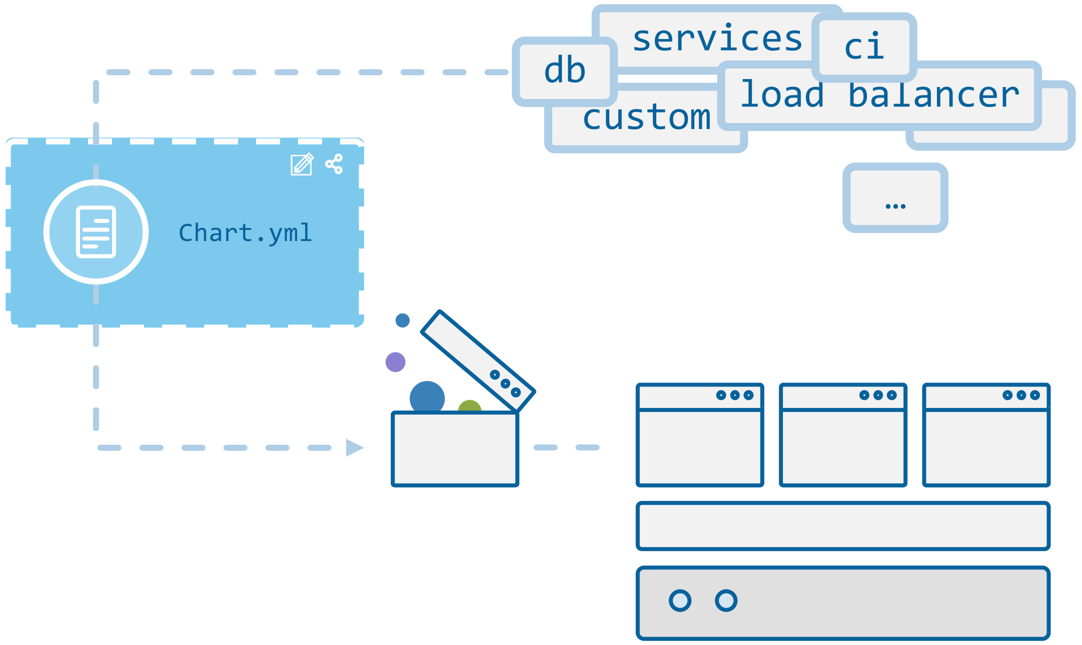
Azure Container Registry

Open Service Broker API (OSBA)

Release Automation Tools

Helm

Helm Charts helps you define, install, and upgrade even the most complex Kubernetes application



Draft

Simple app development and deployment – into any Kubernetes cluster

Simplified development

Using two simple commands, developers can now begin hacking on container-based applications without requiring Docker or even installing Kubernetes themselves

Language support

Draft detects which language your app is written in, and then uses packs to generate a Dockerfile and Helm Chart with the best practices for that language

Demo

5 Kubernetes Best Practices

- Build small containers
- Application architecture
  - Use Namespaces
  - Use helm charts
  - RBAC
- Implement Health checks
- Set requests and limits
- Be mindful of your services
  - Map external services
  - Don’t rely on load balancers

THANKS!

Resources

aka.ms/devops/jaxlondon2018

Any questions?

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