# Why to Cloud Native

Karthik Gaekwad

@iteration1

Principal Engineer, Oracle Cloud

Innotech OKC

# Hello

- I’m Karthik Gaekwad
- NOT a DBA

ORACLE
Cloud Native Labs

- https://cloudnative.oracle.com/
- Cloud Native evangelist at Oracle Cloud
- Previous: developer on the Oracle Managed Kubernetes Team.

@iteration1

# Hello

ORACLE
Cloud Native Labs

ORACLE StackEngine
Mentor Graphics NATIONAL INSTRUMENTS SIGNALSCIENCES

- Been in Industry 15 years.
- In general, I like building stuff with friends.
  - A maintainer for Gauntlt- Open source security scanner.
- Love Teaching and building community.
  - Run Devopsdays Austin, Container Days, Cloud Austin.
  - Chair All Day Devops Cloud Native track.
  - LinkedIn Learning Author for Learning Kubernetes (and more).

# Need an OCI Trial Account?

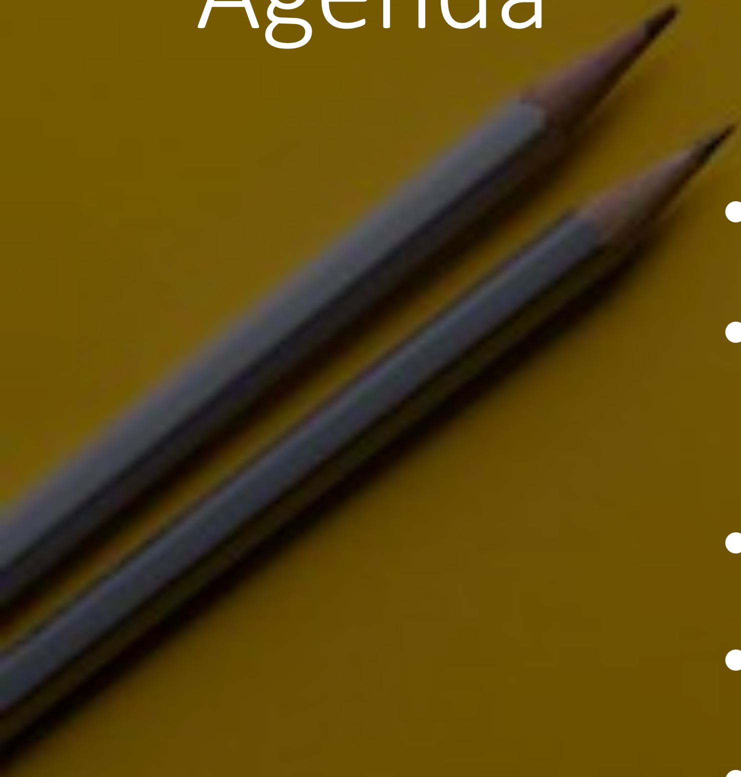
ORACLE®

Cloud Infrastructure

**http://bitly.com/ocicloud**

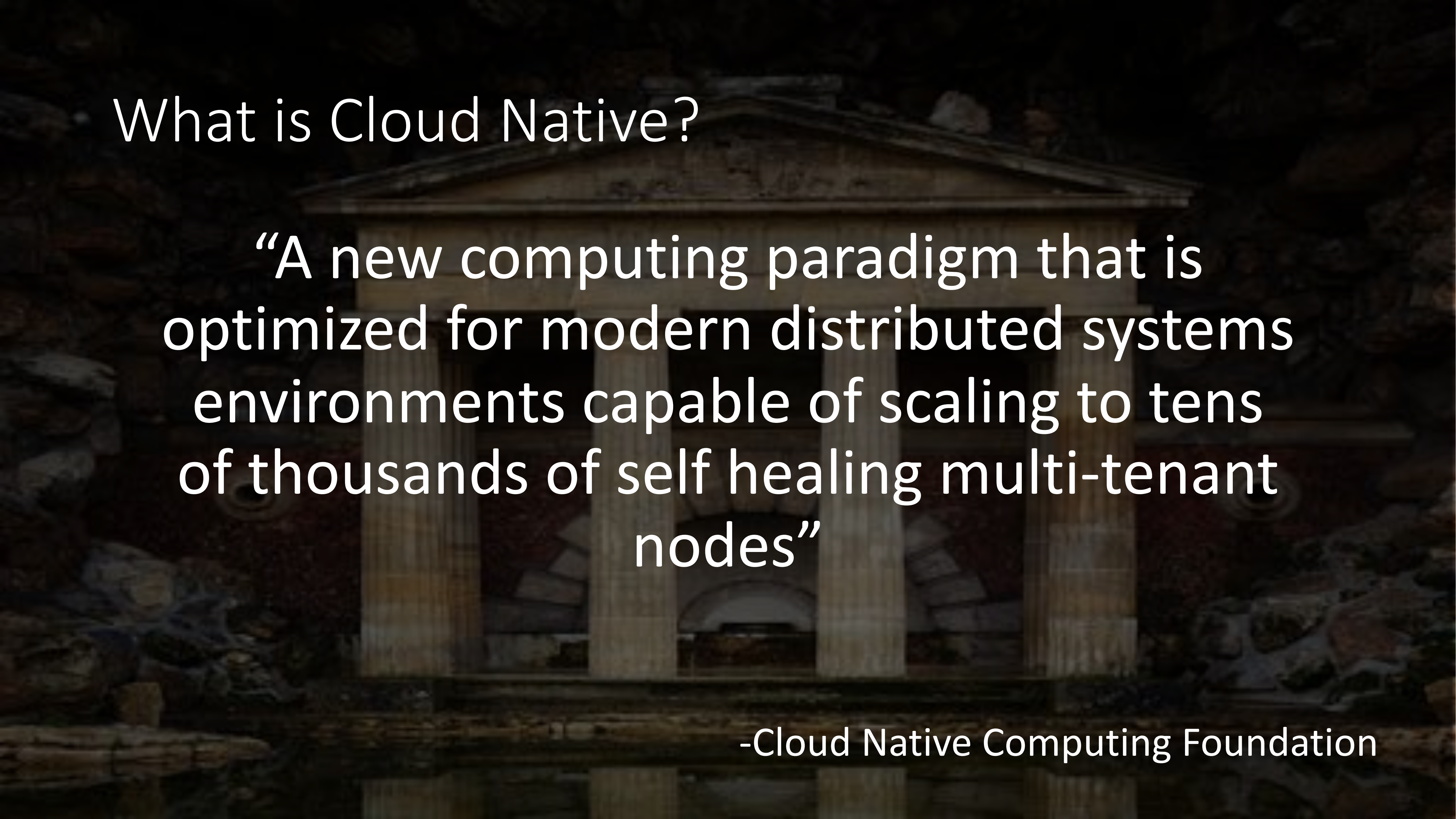
My questions for you..

# Agenda



- What is cloud native?
- Where are we today in the cloud native world?
- The Cloud Native ecosystem.
- Cloud Native adoption.
- Challenges.

# What is Cloud Native?

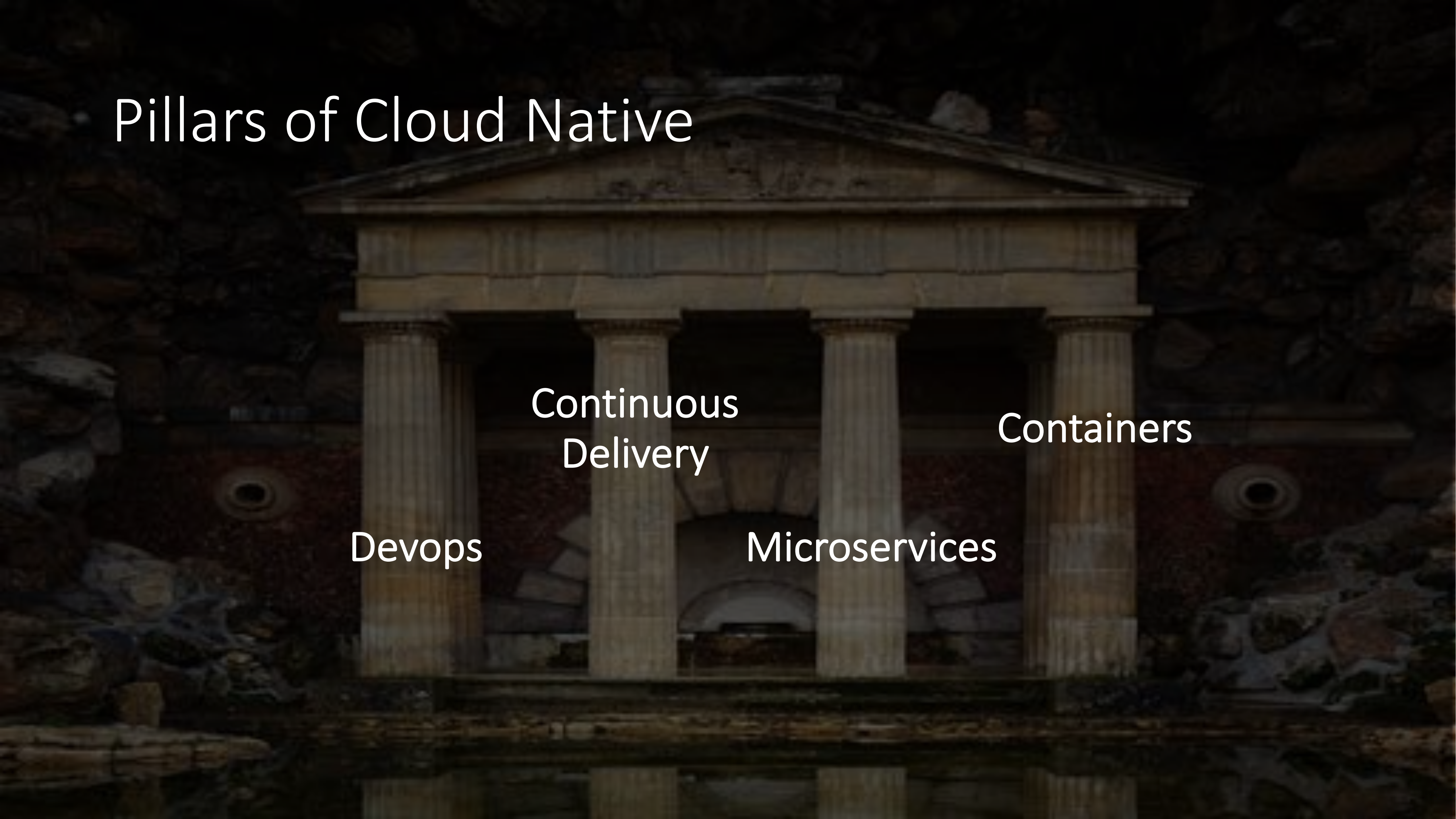


# What is Cloud Native?

“A new computing paradigm that is optimized for modern distributed systems environments capable of scaling to tens of thousands of self healing multi-tenant nodes”

-Cloud Native Computing Foundation

# Pillars of Cloud Native



Continuous Delivery

Containers

Devops

Microservices

# Pillars of Cloud Native: Devops

“DevOps is the practice of operations and development engineers participating together in the entire service lifecycle, from design through the development process to production support.”

**-The Agile Admin blog**
**https://theagileadmin.com/what-is-devops/**

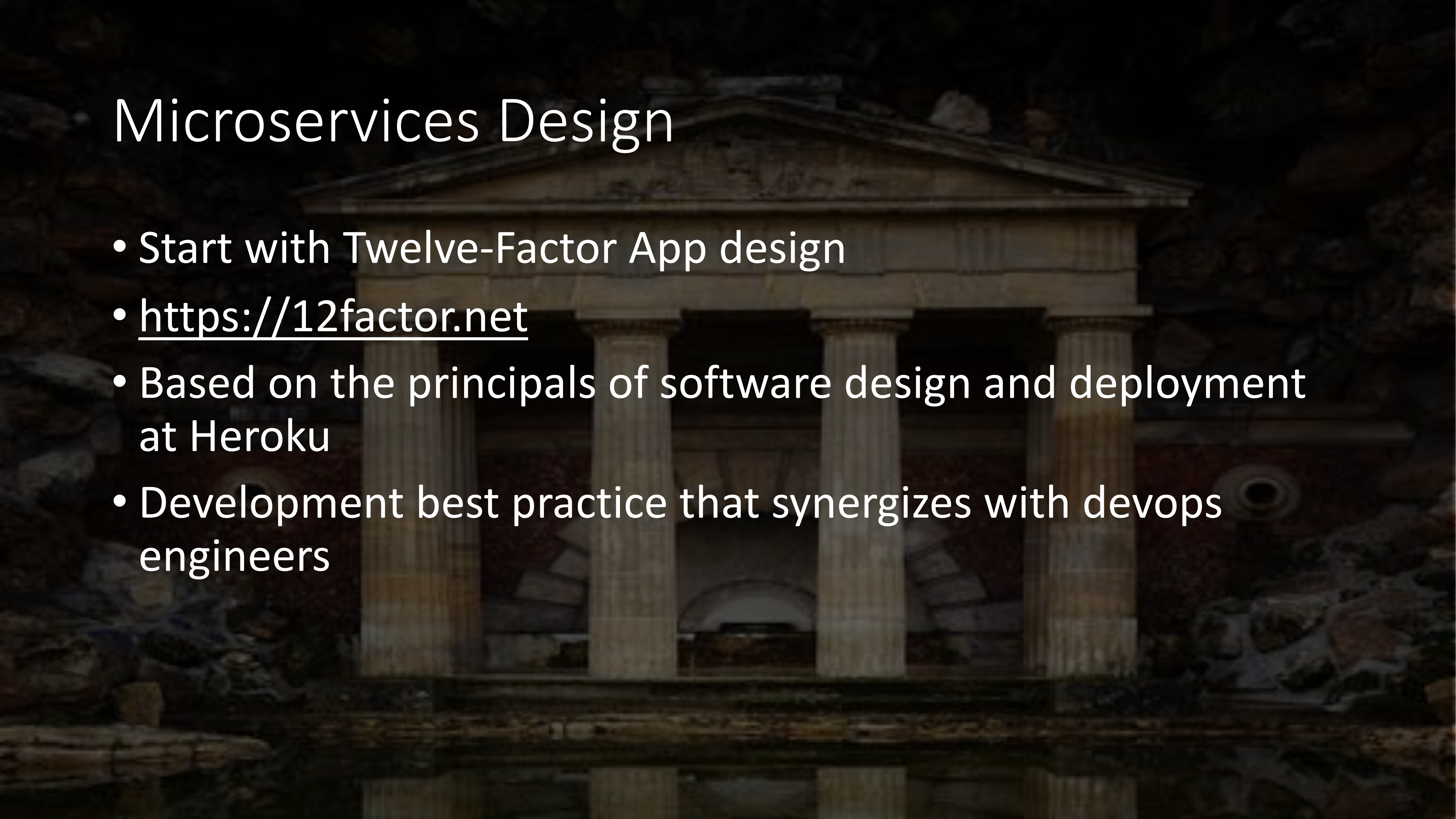
# Pillars of Cloud Native: Devops

- Generally based on principles of CALMS
- Based on the ideas of Automation, Measurement, Sharing
- Emphasis on a Collaborative culture in organizations
- Shifting operations more to the left.
  - Operations teams does more than just “server management”
  - Uses same techniques as developers for systems work

# Pillars of Cloud Native: CD

- Origins in the automation segment of Devops
- Similar to Continuous Integration
  - Frequent code commits into source control
  - Run automated builds against each code commit
  - Result= Detecting errors quicker
- Continuous Delivery
  - Step 1: Continuous Integration
  - Release code builds to end users
  - Result= ship software quicker to end users

# Pillars of Cloud Native: Microservices



# Microservices Design

- Start with Twelve-Factor App design
- https://12factor.net
- Based on the principals of software design and deployment at Heroku
- Development best practice that synergizes with devops engineers

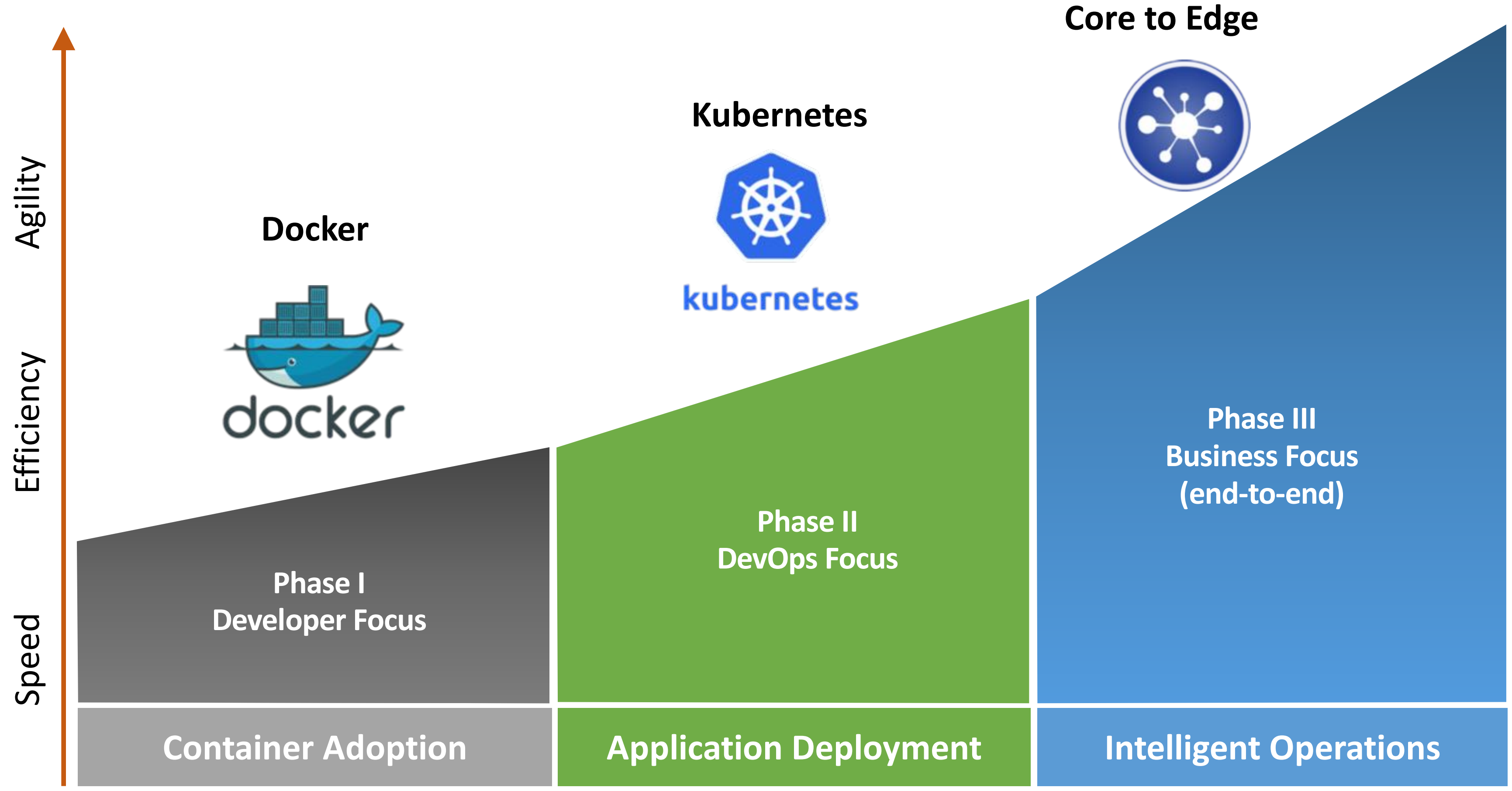
# Twelve Factor App

- Principles:
  - Declarative formats for Automation
  - Clean Contracts with underlying systems
  - Able to deploy to modern cloud platforms
  - Keep your prod and dev systems similar
  - Easily scale up without changes to architecture, tooling, development etc.
- 12 factor apps enable easy container integration

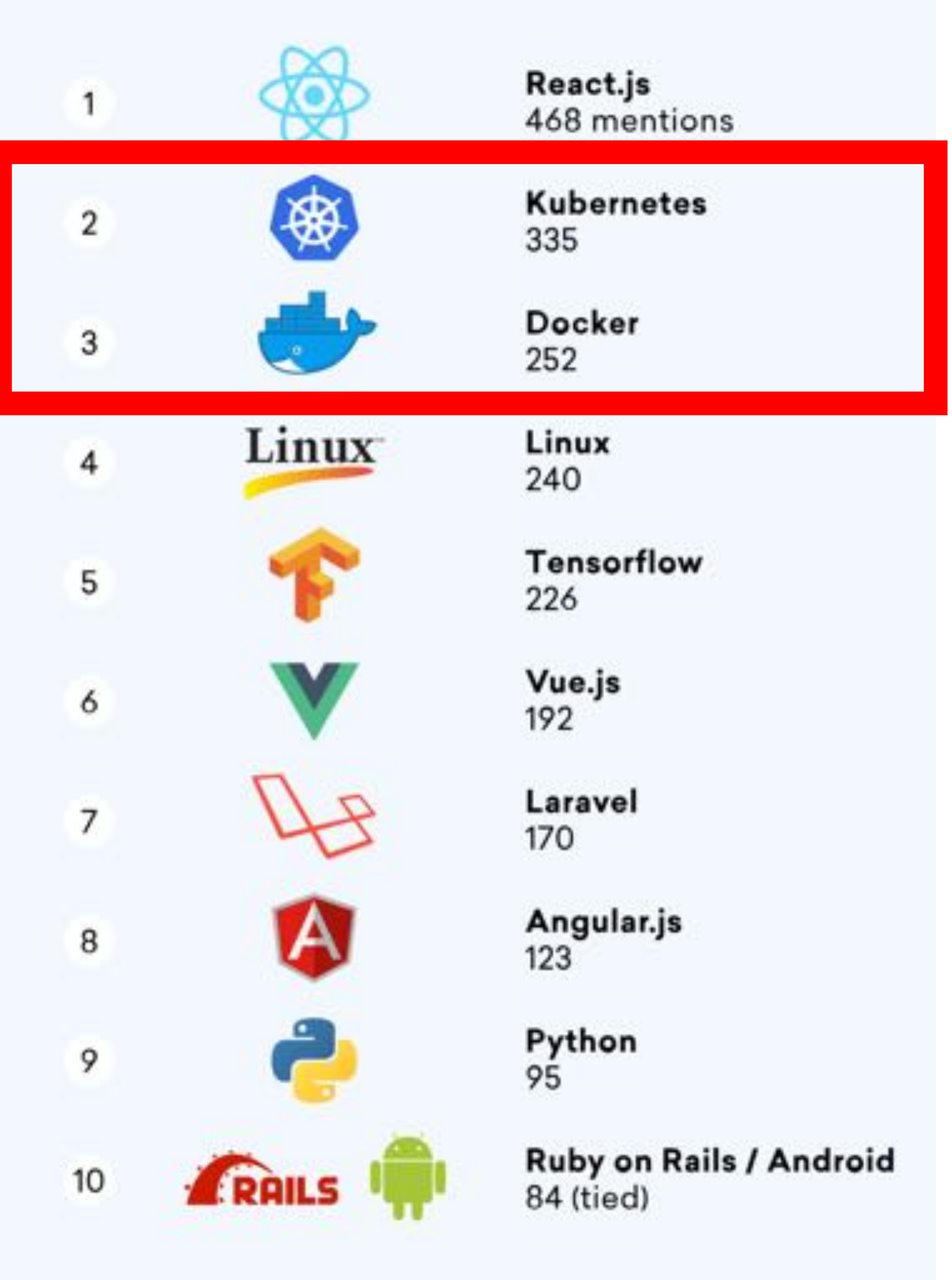
# Pillars of Cloud Native: Containers

- Way to package applications
- Fits really well as a packaging strategy for microservices
- Not a new concept
- Popularized by the growth of Docker, and Kubernetes

# Pillars of Cloud Native: Containers



| | | | |
|---|---|---|---|
| Focus<br>Applications<br>Automation<br>Community | Developer adoption<br>Dev/Test apps<br>Simple orchestration<br>Individual developers | DevOps deployment<br>Production apps<br>Advanced orchestration<br>Teams & lines of business | End-to-end integration<br>Digital business apps<br>Serverless, DevSecOps, & ML<br>Cloud native enterprises |



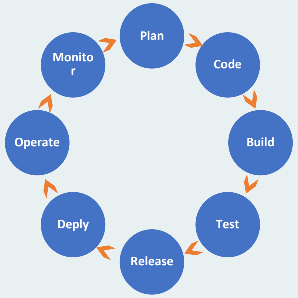
| | |
|---|---|
| 1 | React.js<br>468 mentions |
| 2 | Kubernetes<br>335 |
| 3 | Docker<br>252 |
| 4 | Linux<br>240 |
| 5 | Tensorflow<br>226 |
| 6 | Vue.js<br>192 |
| 7 | Laravel<br>170 |
| 8 | Angular.js<br>123 |
| 9 | Python<br>95 |
| 10 | Ruby on Rails / Android<br>84 (tied) |

# Developer Trends in the Cloud: Open source Digital Ocean Survey, October 2018

Respondents=4300

https://www.digitalocean.com/currents/october-2018/

# Evolution of Development and Deployment

|  | Development Process | Application Architecture | Deployment and Packaging | Application Infrastructure |
|---|---|---|---|---|
| ~ 1980<br>~ 1990 | Waterfall | Monolithic | Physical Server | Datacenter |
| ~ 2000 | Agile | N-Tier | Virtual Servers | Hosted |
| ~ 2010<br>Now | DevOps<br><br>Plan<br>Code<br>Build<br>Test<br>Release<br>Deply<br>Operate<br>Monitor | Microservices | Containers | Cloud |

# Cloud Native Usecases

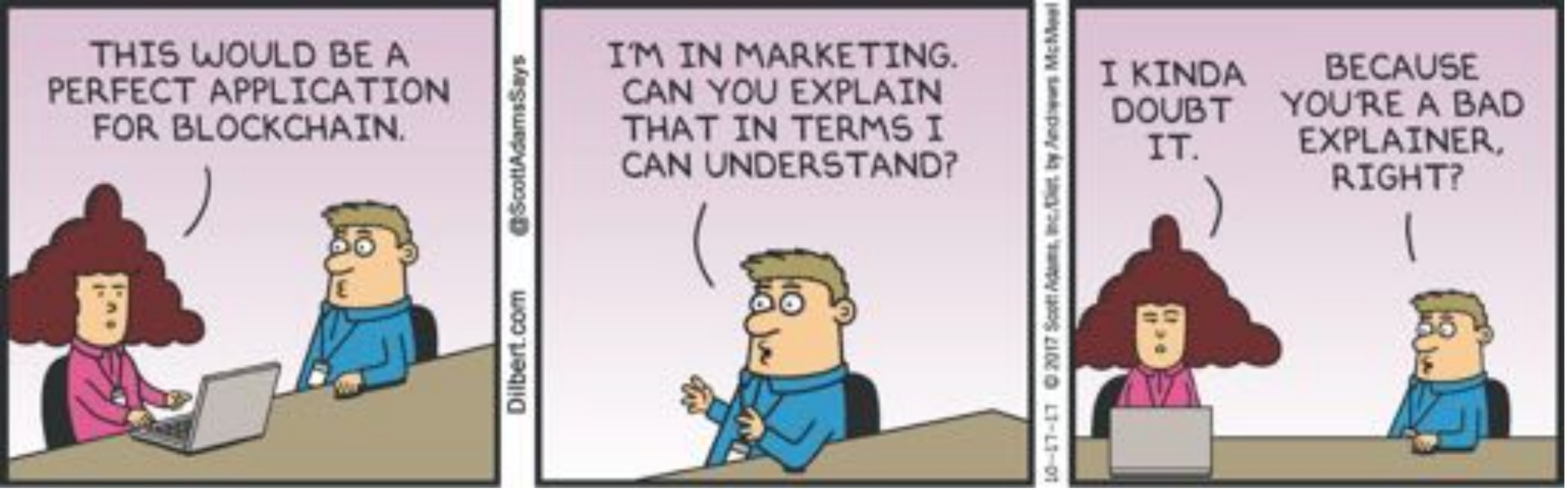
# Key Container Use Cases

| | Share | Container Use Cases | Orchestration Use Cases |
|---|---|---|---|
| Development | 65% | Developer productivity; Consistent appstacks in Dev, Test & Production | Automated deploys to accelerate application release cadence |
| CI/CD/DevOps | 48% | Containerized dependencies; Container registries; | Rolling updates and reversals |
| Operations | 41% | Standardized environments for dev, testing and operations | Resilient, self-healing systems; High Availability; Elastic Scalability |
| Refactor Legacy Apps | 34% | Refactor from N-tier to portable containerized applications | Run distributed, stateful apps on scale-out infrastructure |
| Migrate to Cloud | 33% | Move entire appstacks and see them run identically in the cloud | Cloud bursting; Reduce infrastructure costs by avoiding over-provisioning |
| New Microservice Apps | 32% | Create small purpose-built services that can be assembled to scalable custom applications | Dynamically manage large-scale microservices infrastructure |

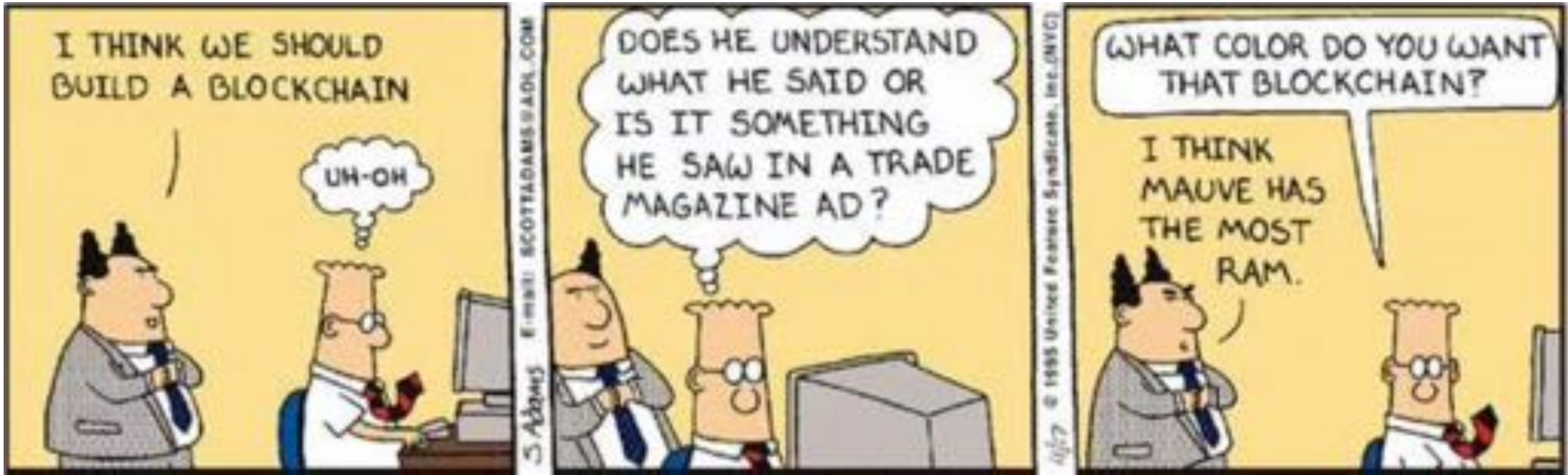
SOURCE: THE EVOLUTION OF THE MODERN SOFTWARE SUPPLY CHAIN, DOCKER SURVEY 2016

New Technology??

Must Adopt!!


THIS WOULD BE A PERFECT APPLICATION FOR BLOCKCHAIN.
I'M IN MARKETING. CAN YOU EXPLAIN THAT IN TERMS I CAN UNDERSTAND?
I KINDA DOUBT IT.
BECAUSE YOU'RE A BAD EXPLAINER, RIGHT?
Dilbert.com @ScottAdamsSays
10-17-17 © 2017 Scott Adams, Inc./Dist. by Andrews McMeel

# Business and Engineering


I THINK WE SHOULD BUILD A BLOCKCHAIN
UH-OH
DOES HE UNDERSTAND WHAT HE SAID OR IS IT SOMETHING HE SAW IN A TRADE MAGAZINE AD?
WHAT COLOR DO YOU WANT THAT BLOCKCHAIN?
I THINK MAUVE HAS THE MOST RAM.
S. Adams E-mail: SCOTTADAMS@AOL.COM
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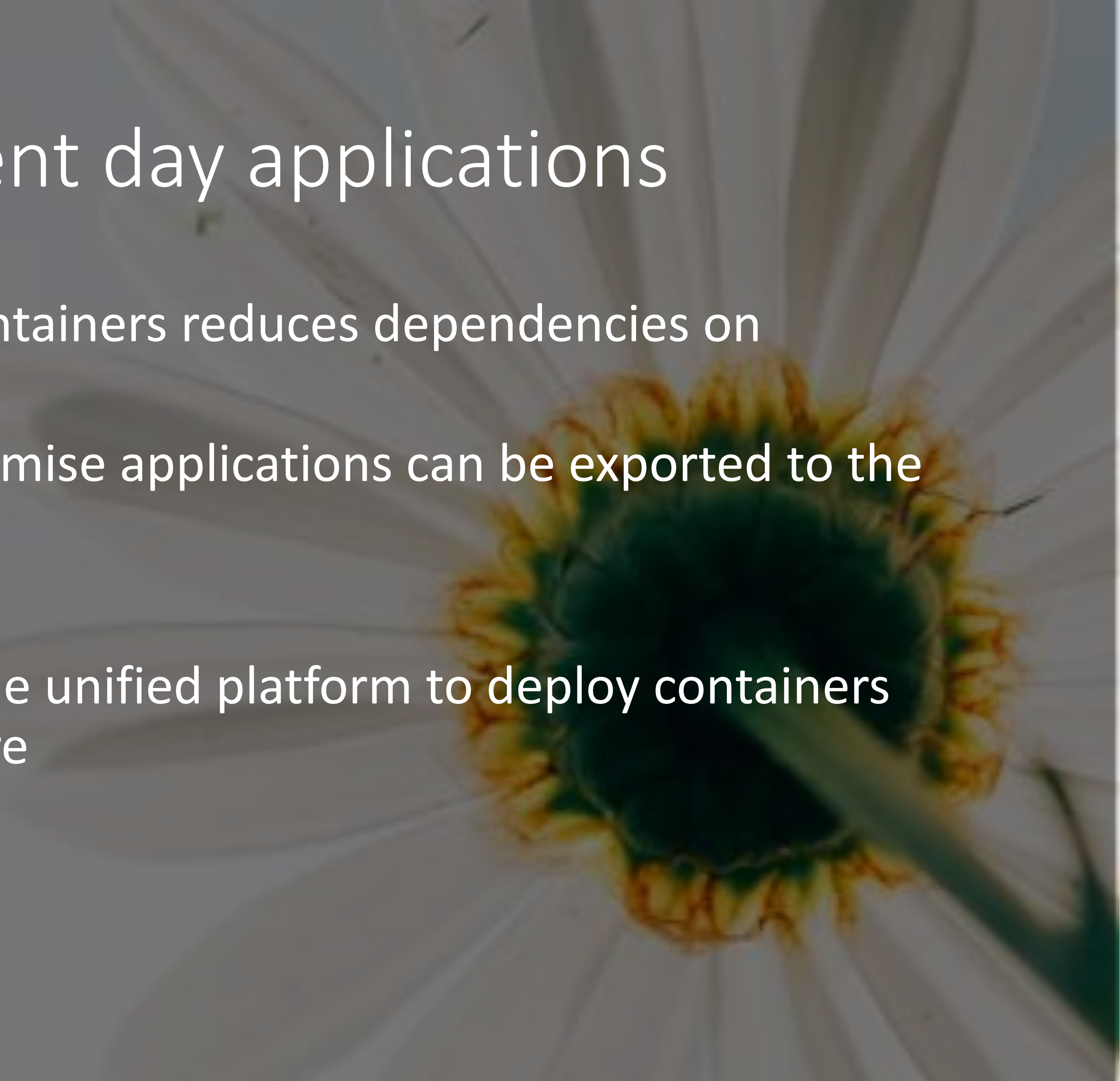
# The Business Case for Cloud Native

- Quicker Time to Deliver
- Modernizing present day applications
- Develop new applications quickly
- Improve speed of innovation

# Quicker Time To Deliver

- Containers + Microservices allows for a common language between your development and operations teams
  - Shared Understanding…
  - Allows for IT in general to practice a devops culture
  - Less friction between various teams in the organization
- Practicing Continuous Delivery allows you to ship faster
  - Process of making changes becomes easily
  - Reduces perceived risk of making changes

# Modernizing present day applications

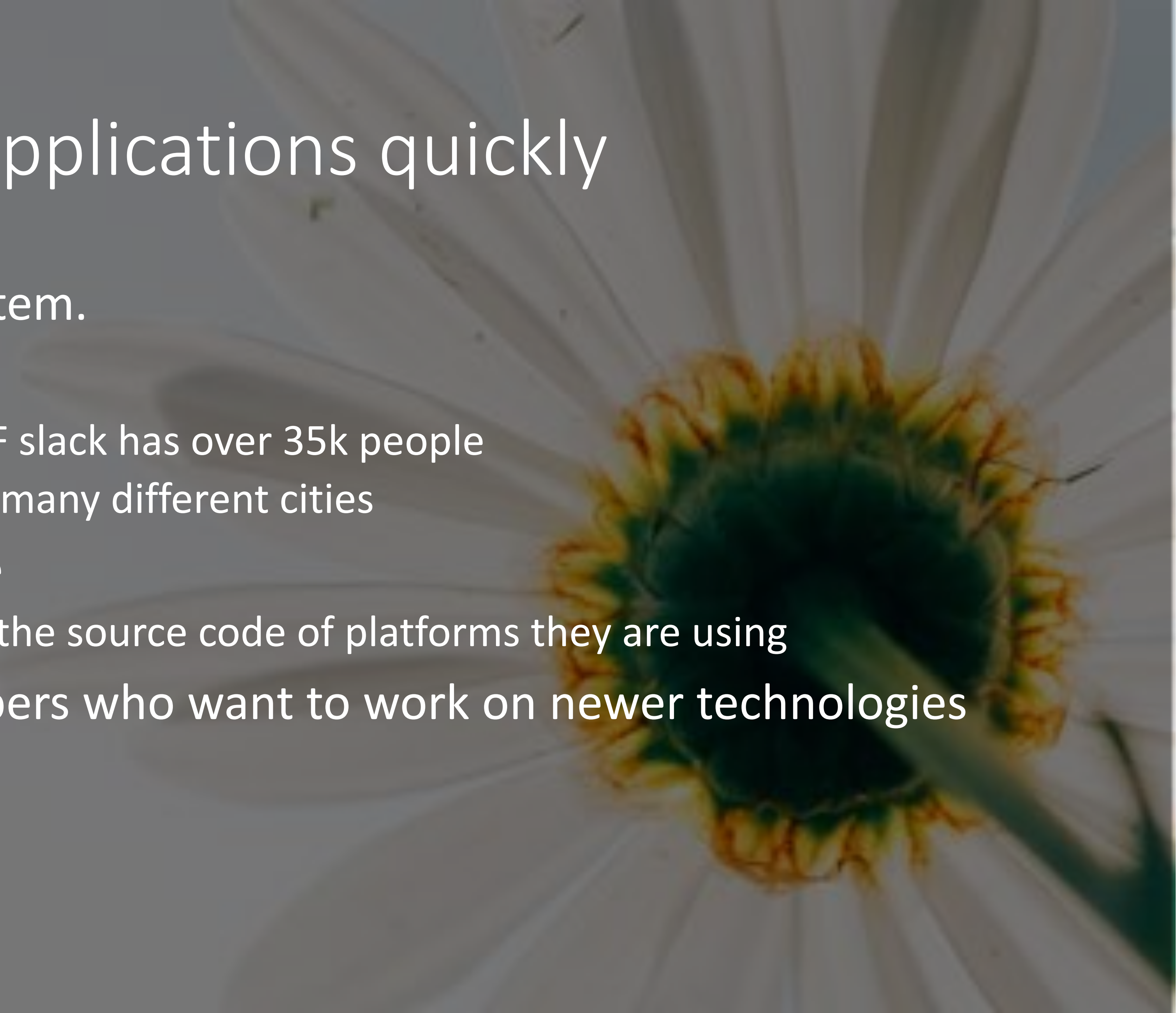


- Shipping applications in containers reduces dependencies on underlying infrastructure
- As a result, previous on premise applications can be exported to the cloud.

- Kubernetes provides a single unified platform to deploy containers across all your infrastructure

# Develop new applications quickly

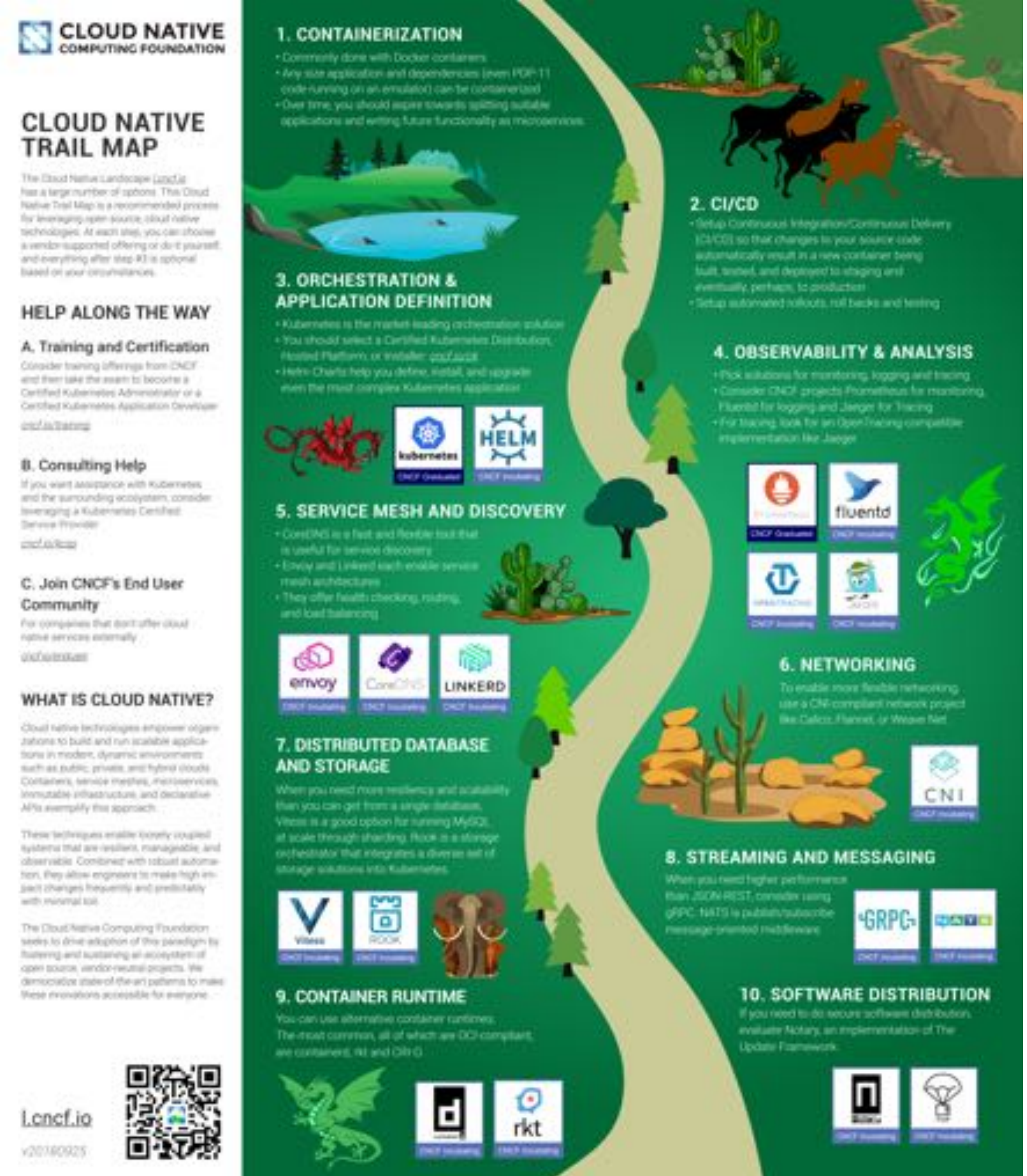
- Rich technical ecosystem.
- Large community
  - Kubernetes and CNCF slack has over 35k people
  - Plenty of meetups in many different cities
- Based on opensource
  - Developers can read the source code of platforms they are using
- Easier to find developers who want to work on newer technologies



# Improve speed of innovation

- Cloud Native brings a new culture, technology and processes to accelerate innovation in organizations.
- Devops, CI/CD, Containerization modernizes your existing development teams
- Allows them to go much faster than before.

# CNCF Trail Map



## CLOUD NATIVE TRAIL MAP

The Cloud Native Landscape l.cncf.io has a large number of options. This Cloud Native Trail Map is a recommended process for leveraging open source, cloud native technologies. At each step, you can choose a vendor-supported offering or do it yourself, and everything after step #3 is optional based on your circumstances.

## HELP ALONG THE WAY

### A. Training and Certification

Consider training offerings from CNCF and then take the exam to become a Certified Kubernetes Administrator or a Certified Kubernetes Application Developer

cncf.io/training

### B. Consulting Help

If you want assistance with Kubernetes and the surrounding ecosystem, consider leveraging a Kubernetes Certified Service Provider

cncf.io/kcsp

### C. Join CNCF's End User Community

For companies that don't offer cloud native services externally

cncf.io/enduser

## WHAT IS CLOUD NATIVE?

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

The Cloud Native Computing Foundation seeks to drive adoption of this paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects. We democratize state-of-the-art patterns to make these innovations accessible for everyone.

l.cncf.io

v20180925

## 1. CONTAINERIZATION

- Commonly done with Docker containers
- Any size application and dependencies (even PDP-11 code running on an emulator) can be containerized
- Over time, you should aspire towards splitting suitable applications and writing future functionality as microservices

## 2. CI/CD

- Setup Continuous Integration/Continuous Delivery (CI/CD) so that changes to your source code automatically result in a new container being built, tested, and deployed to staging and eventually, perhaps, to production
- Setup automated rollouts, roll backs and testing

## 3. ORCHESTRATION & APPLICATION DEFINITION

- Kubernetes is the market-leading orchestration solution
- You should select a Certified Kubernetes Distribution, Hosted Platform, or Installer: cncf.io/ck
- Helm Charts help you define, install, and upgrade even the most complex Kubernetes application

## 4. OBSERVABILITY & ANALYSIS

- Pick solutions for monitoring, logging and tracing
- Consider CNCF projects Prometheus for monitoring, Fluentd for logging and Jaeger for Tracing
- For tracing, look for an OpenTracing compatible implementation like Jaeger

## 5. SERVICE MESH AND DISCOVERY

- CoreDNS is a fast and flexible tool that is useful for service discovery
- Envoy and Linkerd each enable service mesh architectures
- They offer health checking, routing, and load balancing

## 6. NETWORKING

To enable more flexible networking, use a CNI-compliant network project like Calico, Flannel, or Weave Net

## 7. DISTRIBUTED DATABASE AND STORAGE

When you need more resiliency and scalability than you can get from a single database, Vitess is a good option for running MySQL at scale through sharding. Rook is a storage orchestrator that integrates a diverse set of storage solutions into Kubernetes.

## 8. STREAMING AND MESSAGING

When you need higher performance than JSON-REST, consider using gRPC. NATS is publish/subscribe message-oriented middleware.

## 9. CONTAINER RUNTIME

You can use alternative container runtimes. The most common, all of which are OCI-compliant, are containerd, rkt and CRI-O.

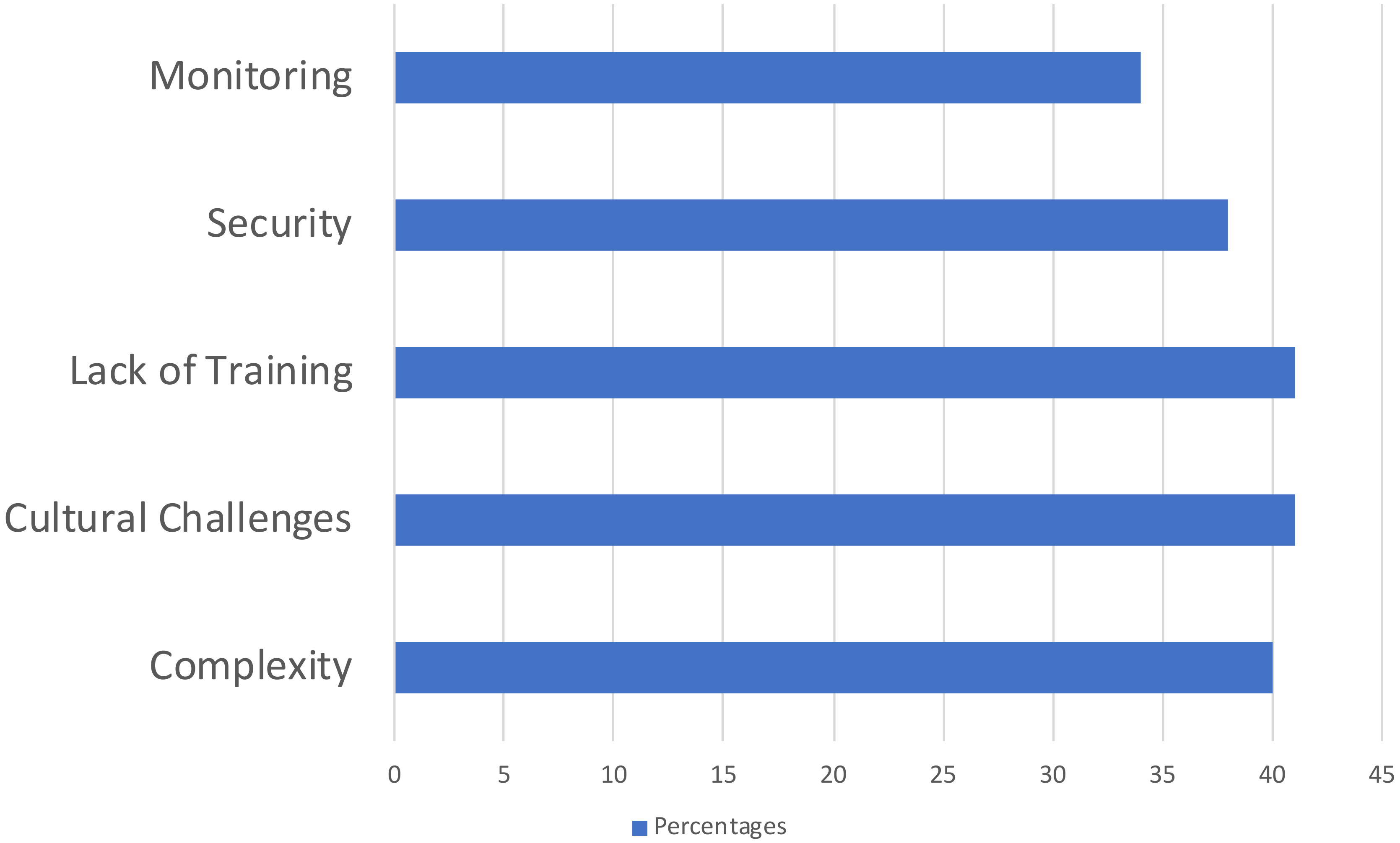
## 10. SOFTWARE DISTRIBUTION

If you need to do secure software distribution, evaluate Notary, an implementation of The Update Framework.

https://landscape.cncf.io/images/landscape.pdf

# Challenges

# Top 5 challenges to cloud native adoption…



https://www.cncf.io/blog/2018/08/29/cncf-survey-use-of-cloud-native-technologies-in-production-has-grown-over-200-percent/

# Other Challenges

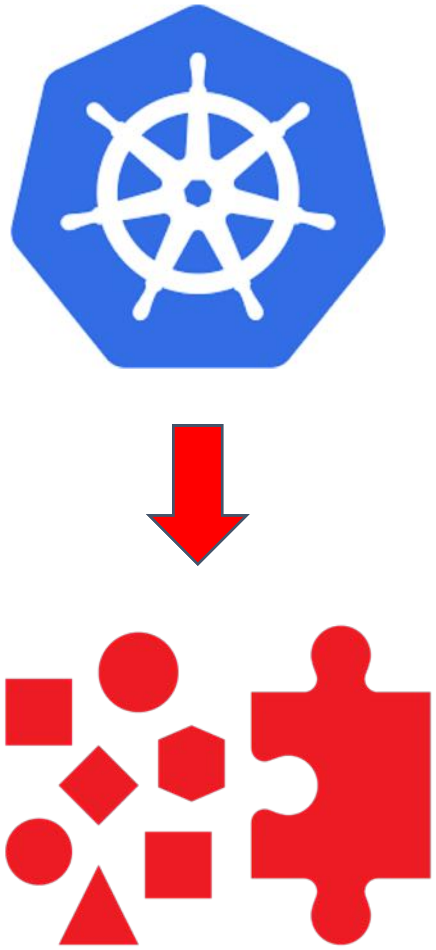
- Storage (30% down from 41%)
- Networking (30% down from 38%)
- Reliability (17% down from 20%)
- Logging (25% down from 32%)
- Scaling (20% down from 24%)

Technical Challenges Decrease

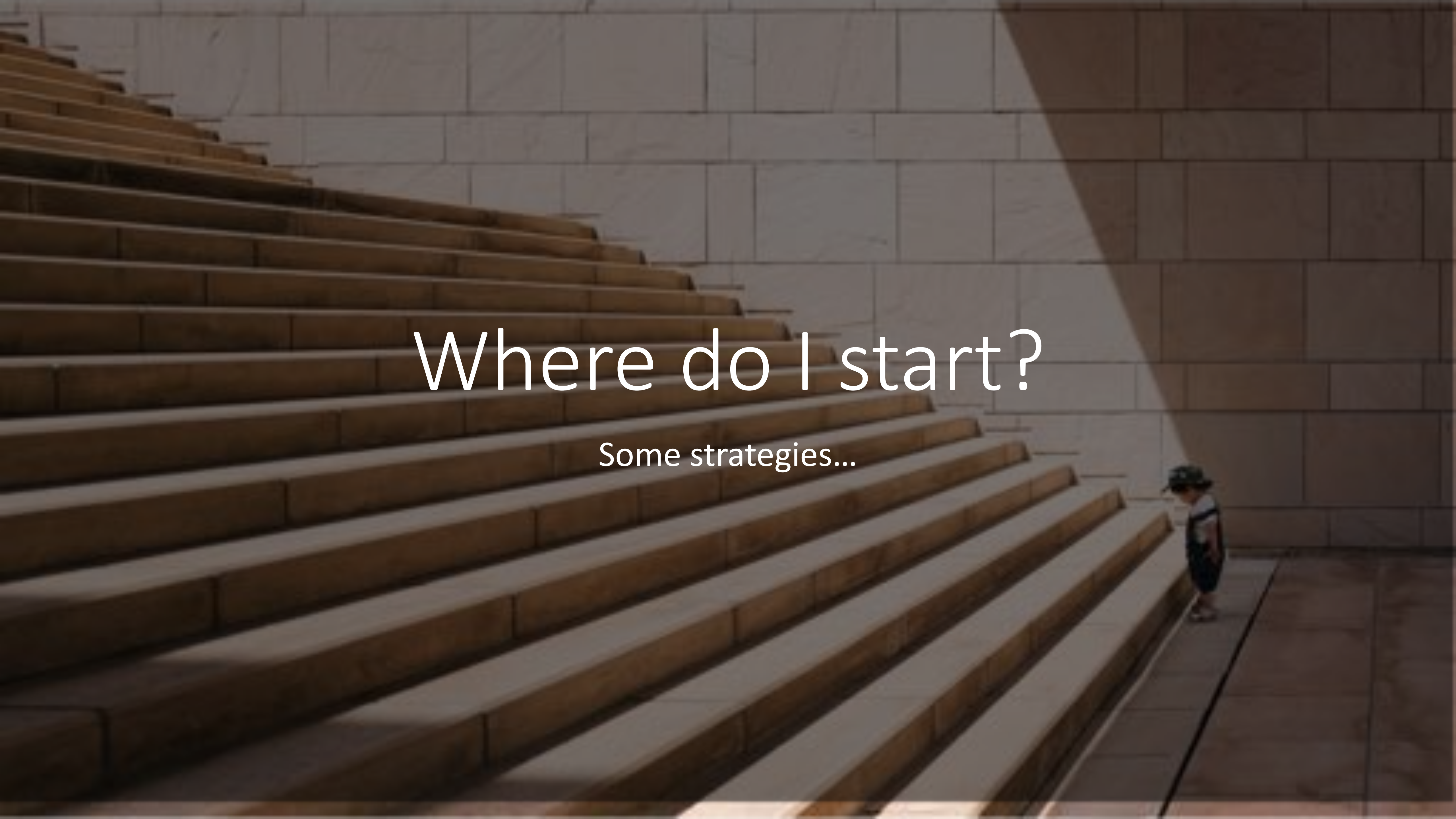
https://www.cncf.io/blog/2018/08/29/cncf-survey-use-of-cloud-native-technologies-in-production-has-grown-over-200-percent/

# Kubernetes & Cloud Native Challenges

- Managing, maintaining, upgrading Kubernetes Control Plane
  - API Server, etcd, scheduler etc….
- Managing, maintaining, upgrading Kubernetes Data Plane
  - In place upgrades, deploy parallel cluster etc….
- Figuring out container networking & storage
  - Overlays, persistent storage etc… - it should just work
- Managing Teams
  - How do I manage & control team access to my clusters?
- Security, security, security



Source: Oracle Customer Survey 2018

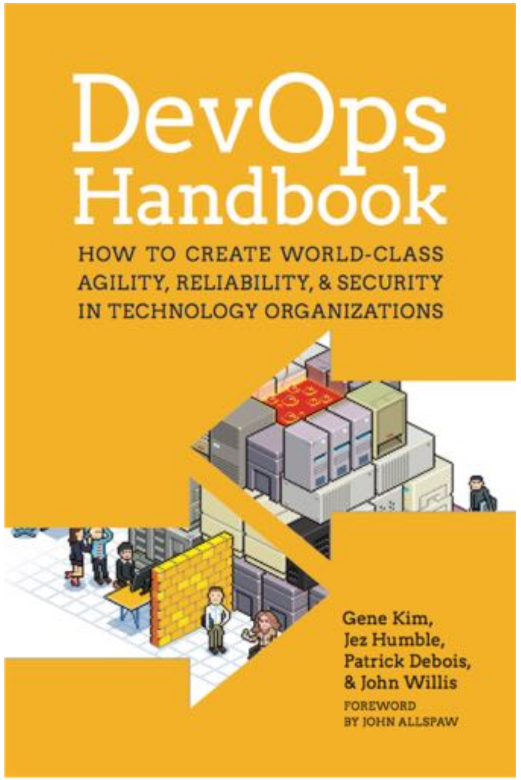


# Where do I start?

Some strategies…

# Silos

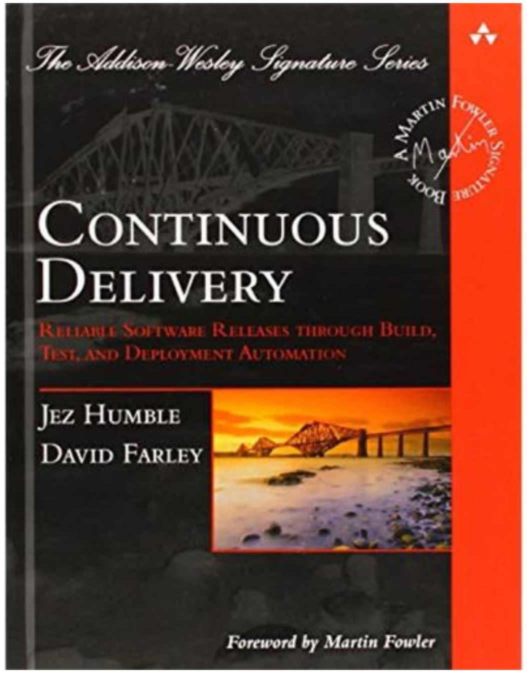
- Heavily siloed organizations can benefit from a devops mindset
- Use containers as a way to break down silos in your engineering orgs


DevOps Handbook
HOW TO CREATE WORLD-CLASS AGILITY, RELIABILITY, & SECURITY IN TECHNOLOGY ORGANIZATIONS
Gene Kim, Jez Humble, Patrick Debois, & John Willis
FOREWORD BY JOHN ALLSPAW

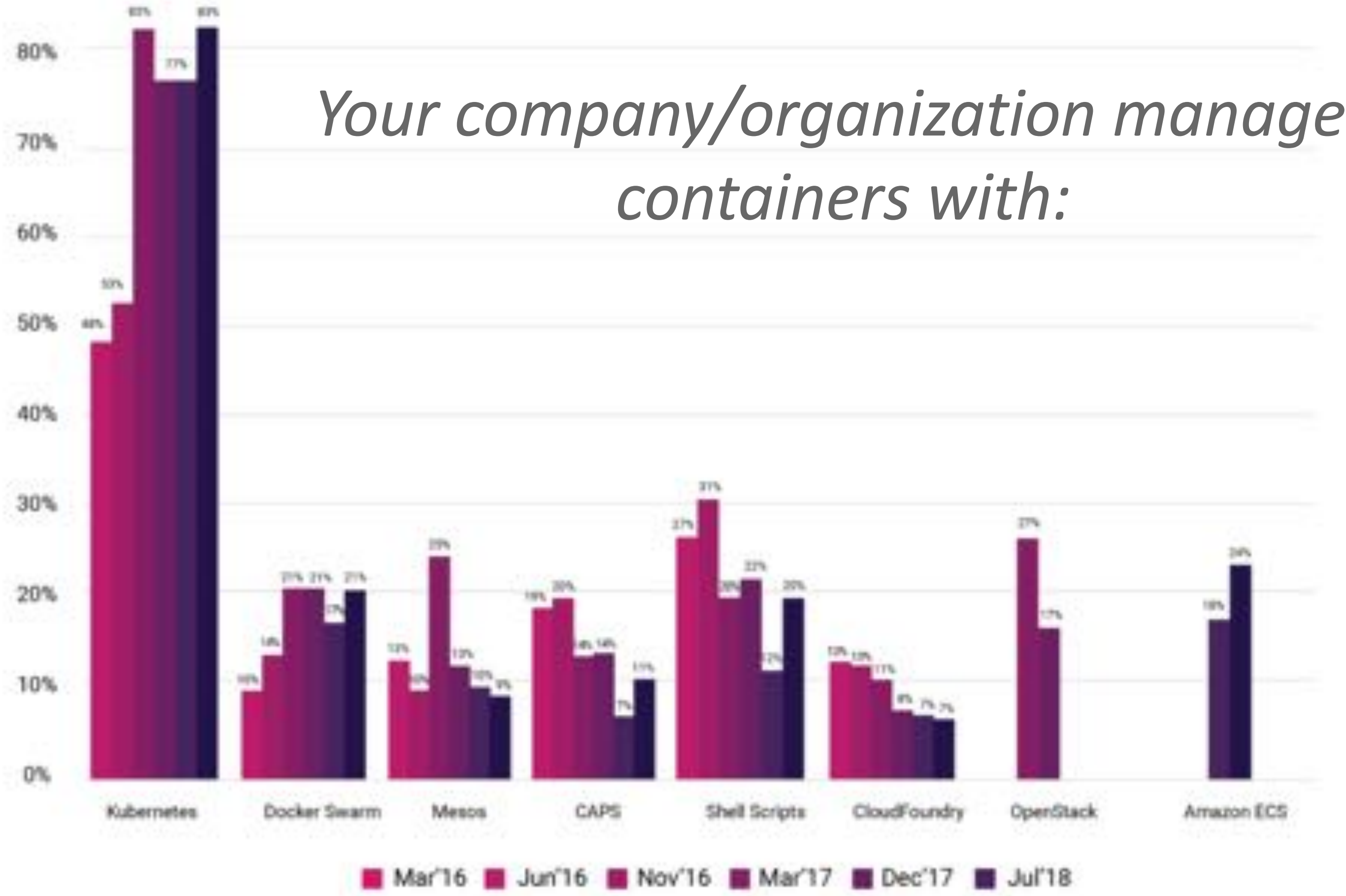
A Novel About IT, DevOps, and Helping Your Business Win
The Phoenix Project
Gene Kim, Kevin Behr, and George Spafford
5

# Releasing Code

- Step 1: Invest in Continuous Integration
- Step 2: Continuous Delivery


The Addison-Wesley Signature Series
A Martin Fowler Signature Book
Continuous Delivery
Reliable Software Releases through Build, Test, and Deployment Automation
Jez Humble
David Farley
Foreword by Martin Fowler

# Orchestration?



*Your company/organization manages containers with:*

Nobody ever got fired for ~~buying IBM.~~

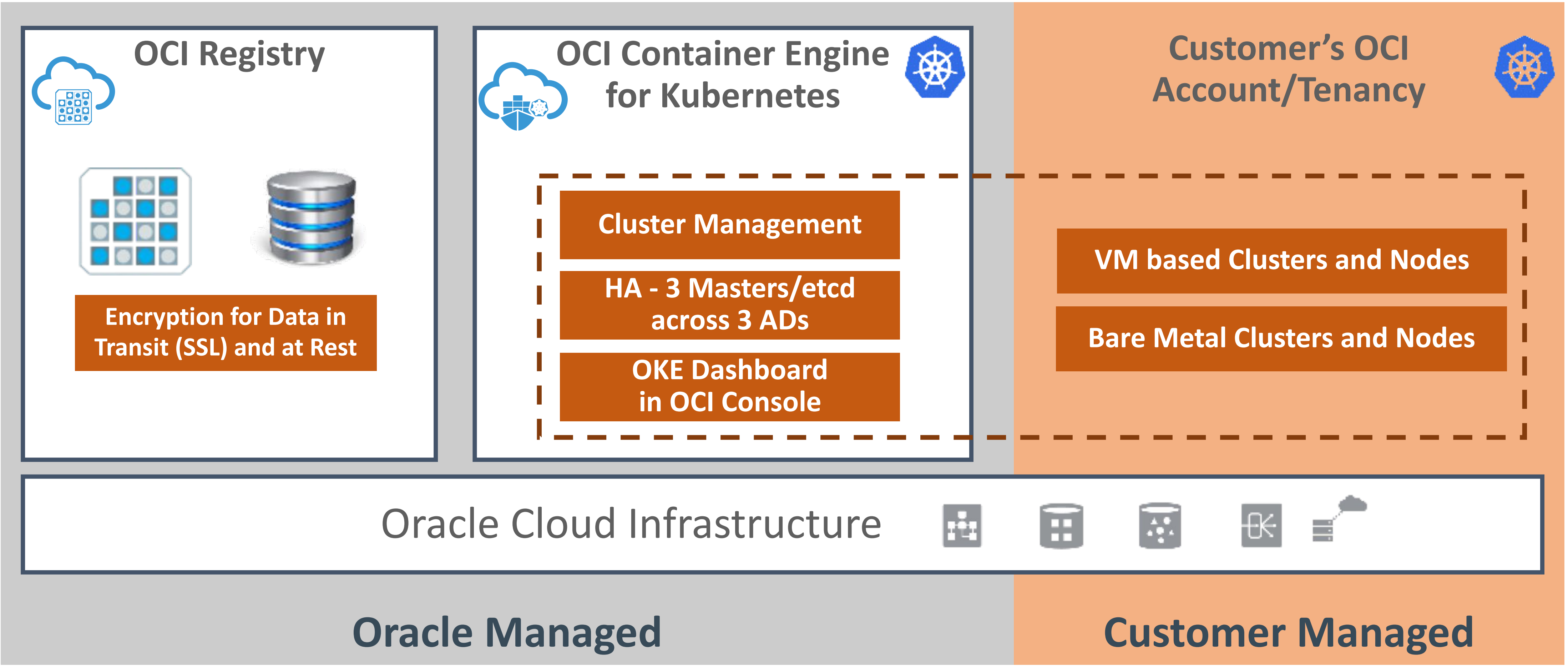
using Kubernetes.

# Biggest Lie: “Kubernetes is easy”

# Kubernetes is complex

- Use a Kubernetes Managed Service
    - Like Oracle Container Engine for Kubernetes, Google Kubernetes Engine etc
- Benefits:
- Enables developers to get started and deploy containers quickly.
- Gives DevOps teams visibility and control for Kubernetes management.
- Combines production grade container orchestration of open Kubernetes, with control, security, IAM, and high predictable performance of cloud infrastructure
- Manage what you really need to manage

# Kubernetes is Complex



OCI Registry

Encryption for Data in Transit (SSL) and at Rest

OCI Container Engine for Kubernetes

Cluster Management

HA - 3 Masters/etcd across 3 ADs

OKE Dashboard in OCI Console

Customer's OCI Account/Tenancy

VM based Clusters and Nodes

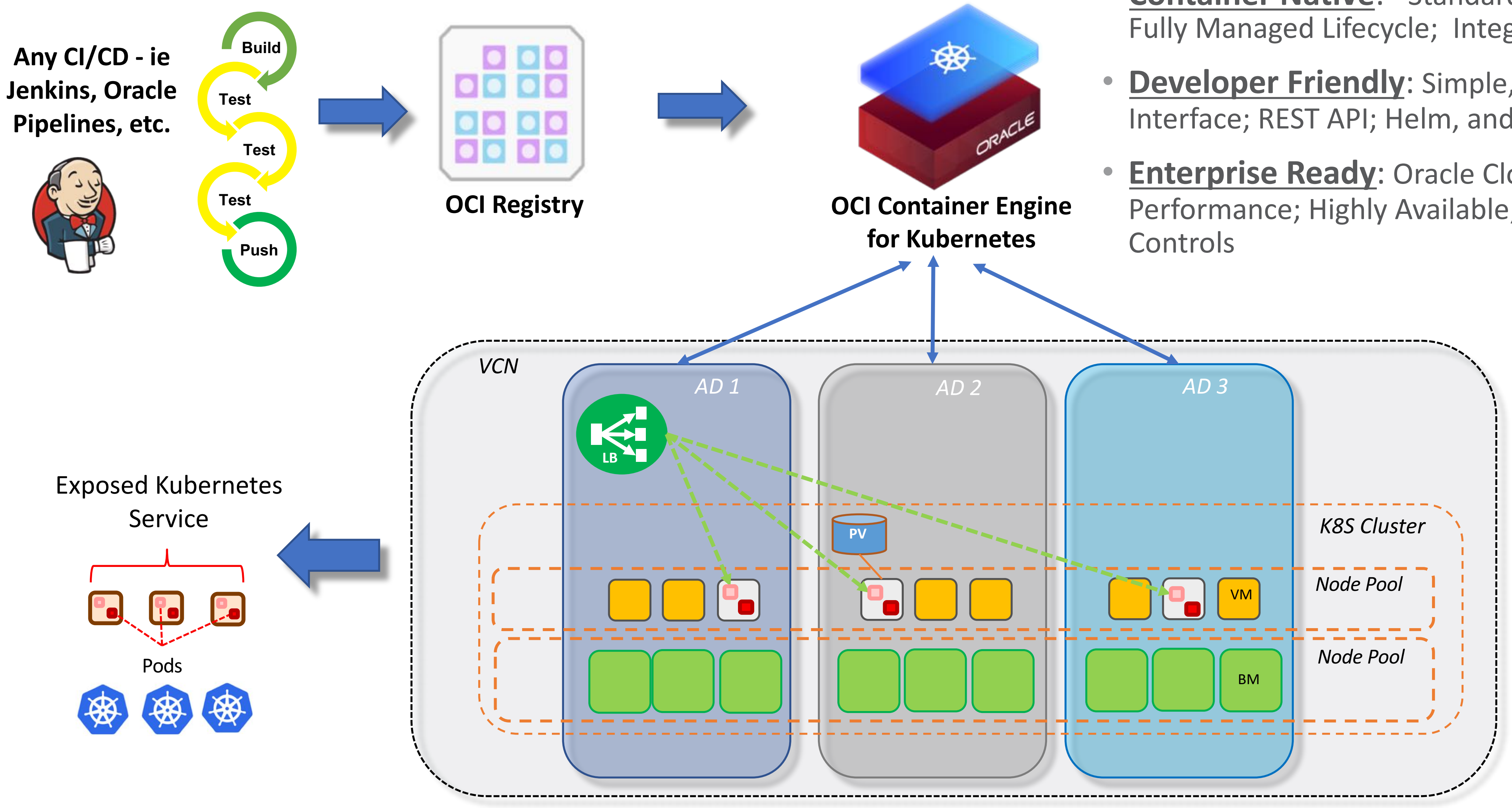
Bare Metal Clusters and Nodes

Oracle Cloud Infrastructure

Oracle Managed

Customer Managed

# End to End Workflow…

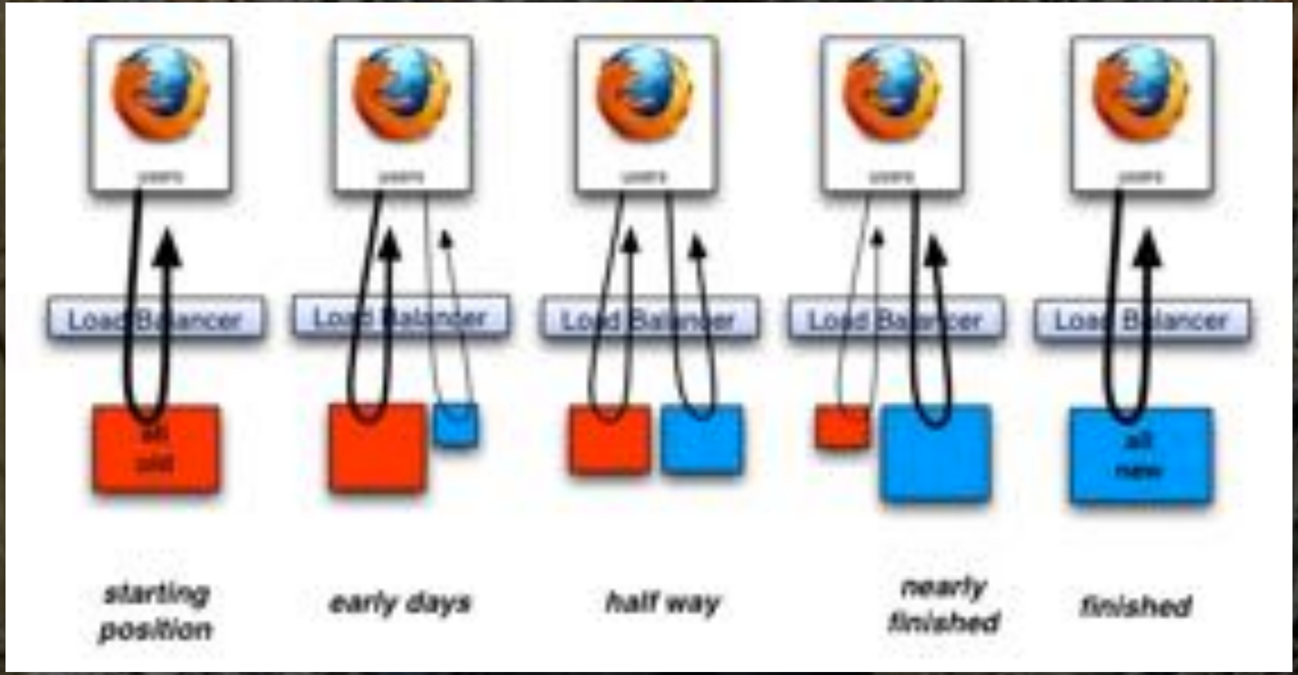


Any CI/CD - ie Jenkins, Oracle Pipelines, etc.
Build
Test
Test
Test
Push
OCI Registry
ORACLE
OCI Container Engine for Kubernetes
VCN
AD 1
AD 2
AD 3
LB
PV
K8S Cluster
Node Pool
VM
Node Pool
BM
Exposed Kubernetes Service
Pods

- **Container Native**: Standard Upstream Kubernetes; Fully Managed Lifecycle; Integrated Registry
- **Developer Friendly**: Simple, Streamlined User Interface; REST API; Helm, and DNS Built-in
- **Enterprise Ready**: Oracle Cloud Infrastructure Performance; Highly Available; Secure with OCI Access Controls

# Take It slow…

## Greenfield OR Strangler application patterns



# KEEP CALM
# AND
# KUBE ON

*@iteration1*