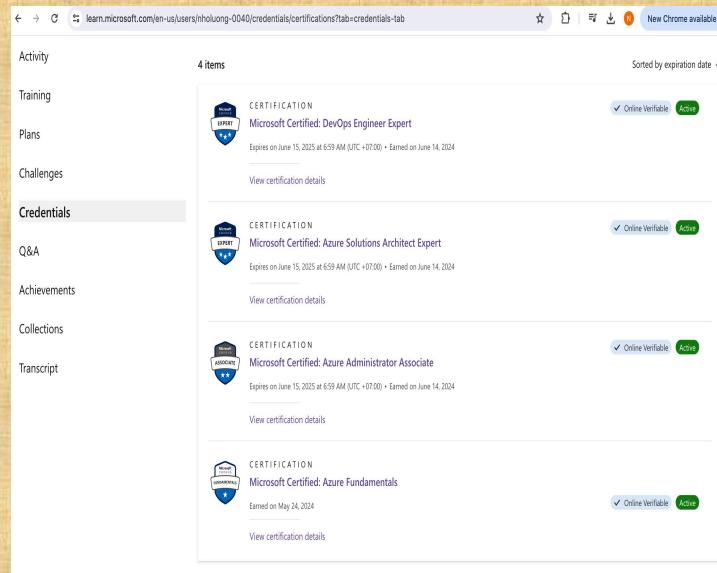
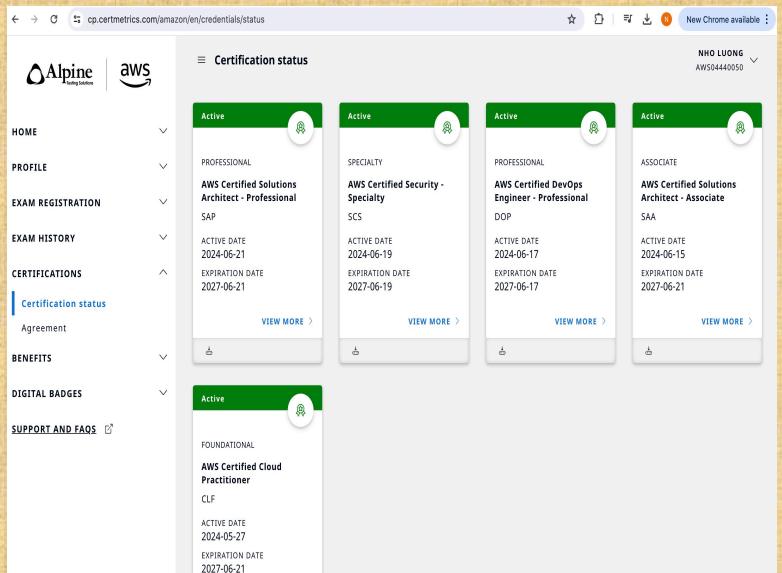


DevOps for Beginners

Author: Nho Luong
Skill: DevOps Engineer Lead



The screenshots show the user's certification status across different platforms:

- AWS Certifications (cp.certmetrics.com/Amazon):**
 - AWS Certified Solutions Architect - Professional (SAP)**: Active, Issued on June 16, 2024, Expires on June 15, 2025.
 - AWS Certified Security - Specialty (SCS)**: Active, Issued on June 19, 2024, Expires on June 19, 2025.
 - AWS Certified DevOps Engineer - Professional (DOP)**: Active, Issued on June 17, 2024, Expires on June 15, 2025.
 - AWS Certified Solutions Architect - Associate (SAA)**: Active, Issued on June 15, 2024, Expires on June 21, 2025.
- Microsoft Certifications (learn.microsoft.com):**
 - Microsoft Certified: DevOps Engineer Expert**: Active, Issued on June 14, 2024, Expires on June 15, 2025.
 - Microsoft Certified: Azure Solutions Architect Expert**: Active, Issued on June 14, 2024, Expires on June 15, 2025.
 - Microsoft Certified: Azure Administrator Associate**: Active, Issued on June 14, 2024, Expires on June 15, 2025.
 - Microsoft Certified: Azure Fundamentals**: Active, Issued on May 24, 2024.



DevOps is the combination of cultural philosophies, practices, and tools that increases an organization's ability to deliver applications and services at high velocity

Amazon Web Services(AWS)

DevOps is a collaborative and multidisciplinary effort within an organization to automate continuous delivery of new software versions, while guaranteeing their correctness and reliability

A Survey of DevOps Concepts and Challenges - L Leite

DevOps is the outcome of applying the most trusted principles from the domain of physical manufacturing and leadership to the IT value stream.

The DevOps Handbook.

DevOps relies on bodies of knowledge from Lean, Theory of Constraints, the Toyota Production System, resilience engineering, learning organizations, safety culture, human factors, and many others.

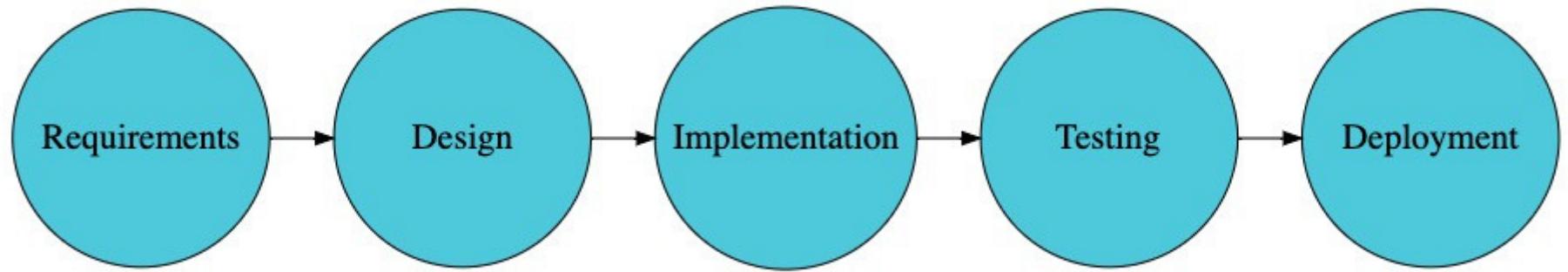
The DevOps Handbook.

The result is world-class reliability, stability, and security at ever lower cost and effort; and accelerated flow and reliability through the technology value stream, including Product Management, Development, QA, IT Operations, and Infosec.

The DevOps Handbook.

EVOLUTION TO DEVOPS

WATERFALL



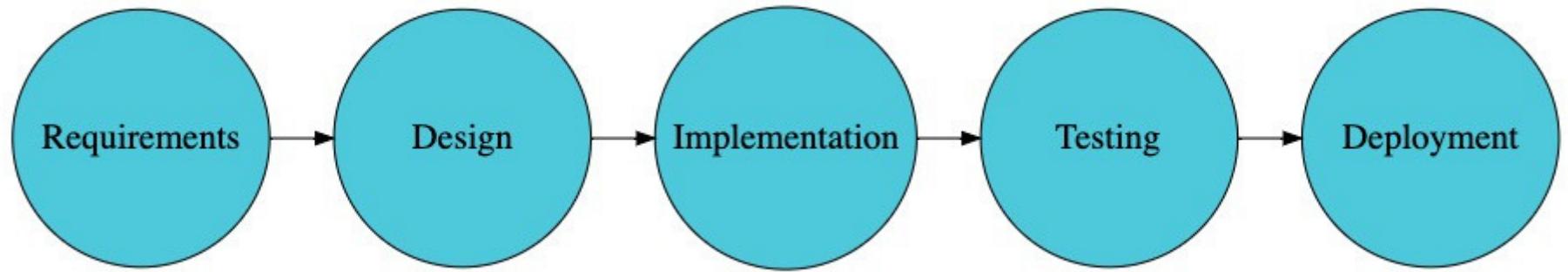
Waterfall

3 KEYS TO GREAT SOFTWARE

ENHANCED COMMUNICATION

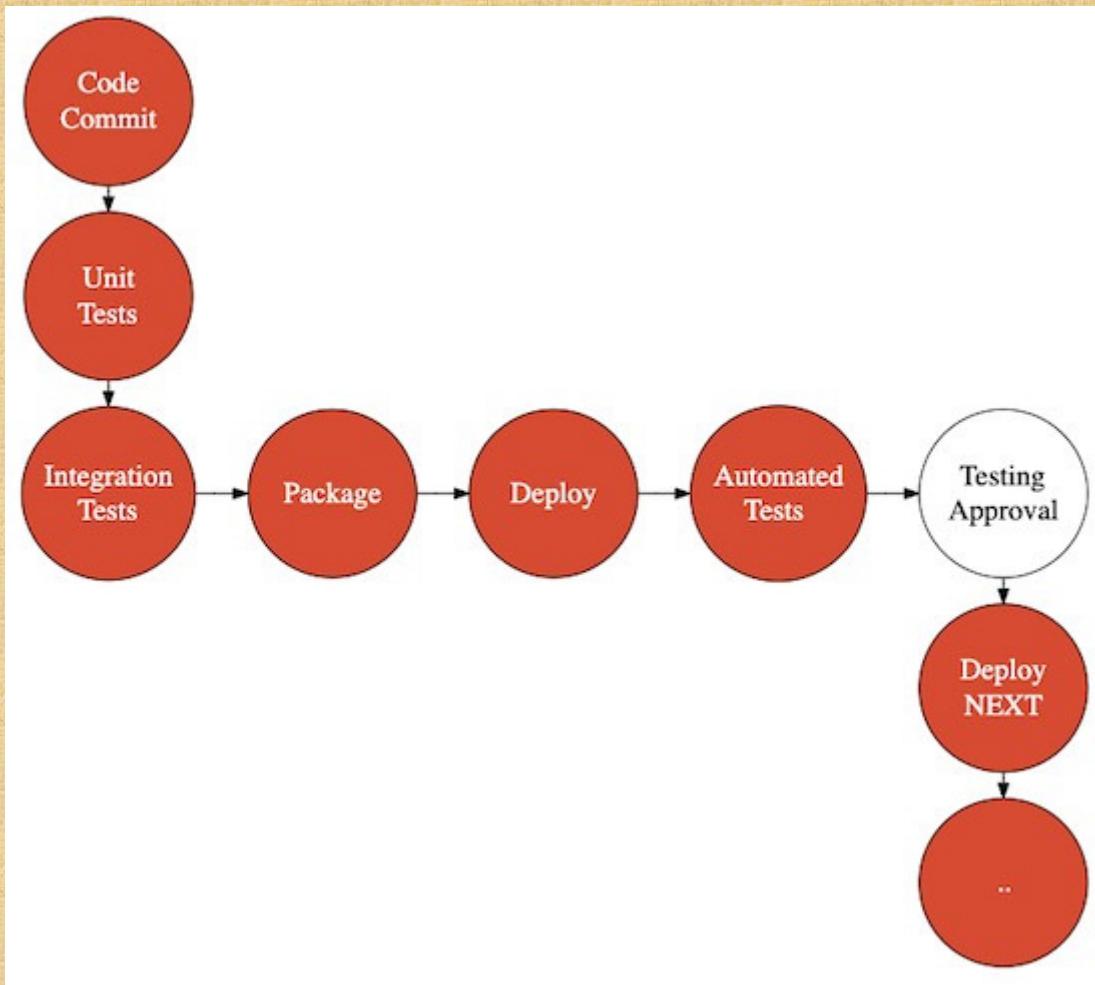


Teams

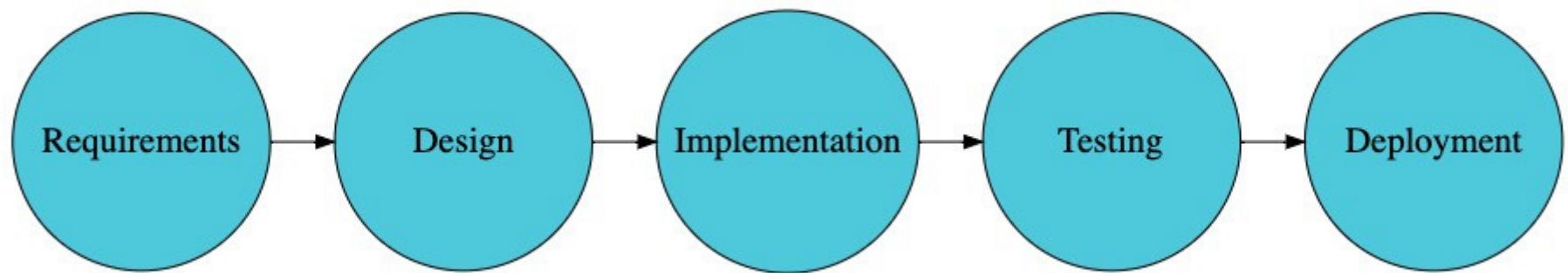


Waterfall

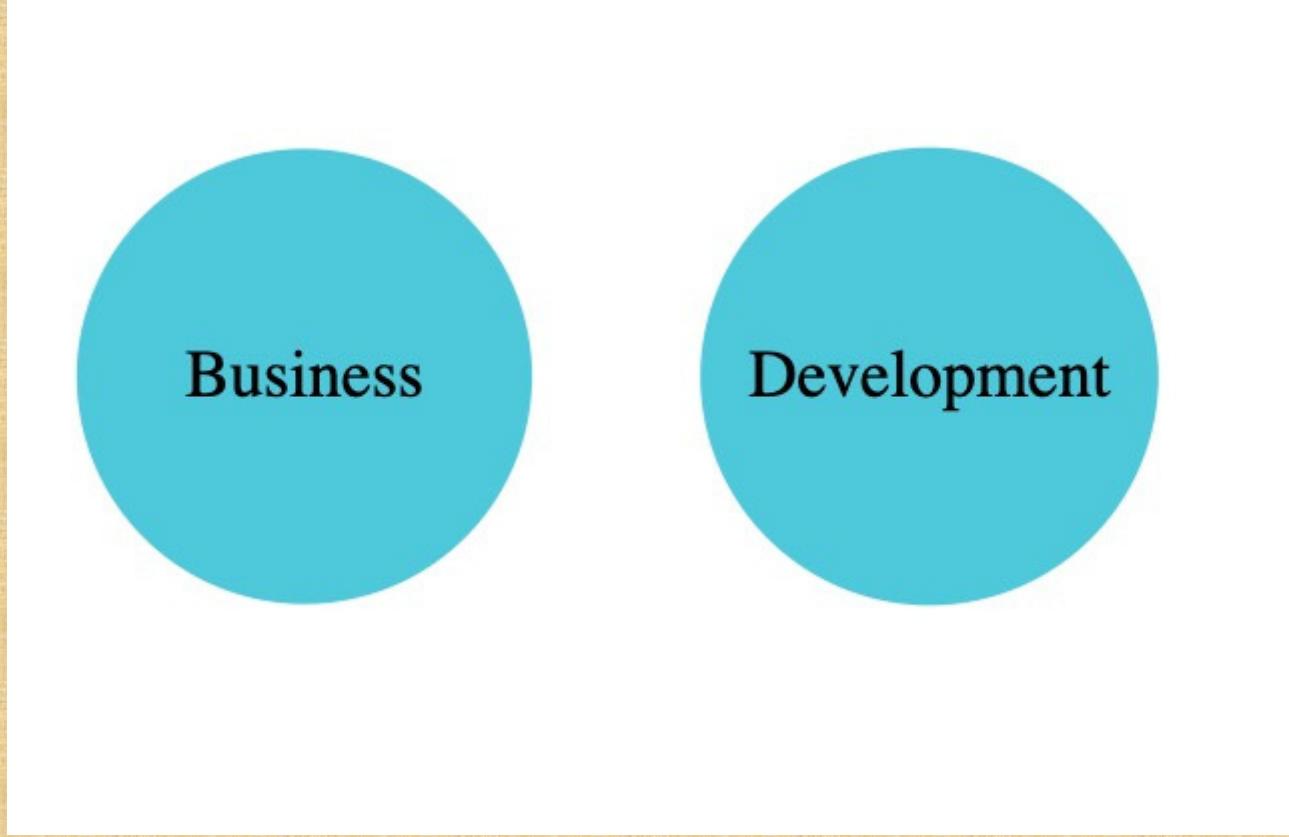
AUTOMATION



QUICK FEEDBACK



AGILE

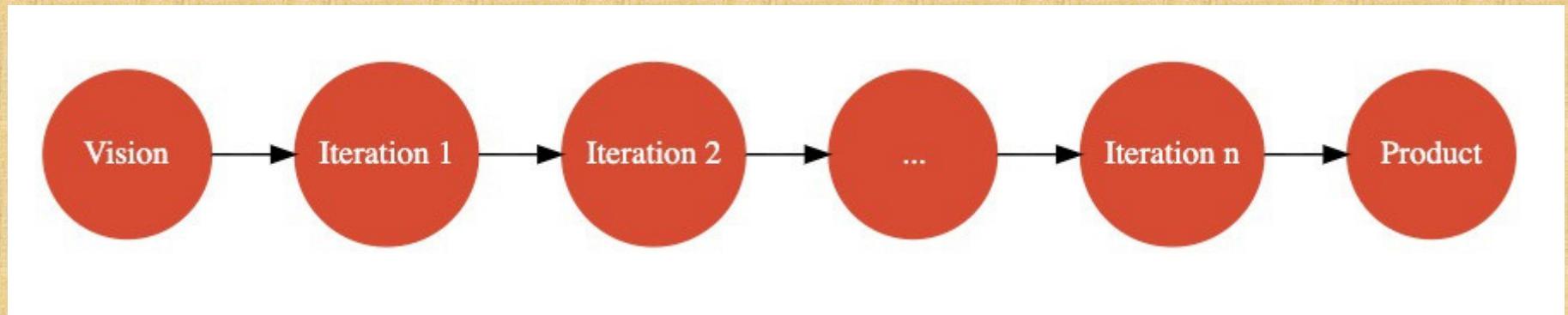


Business

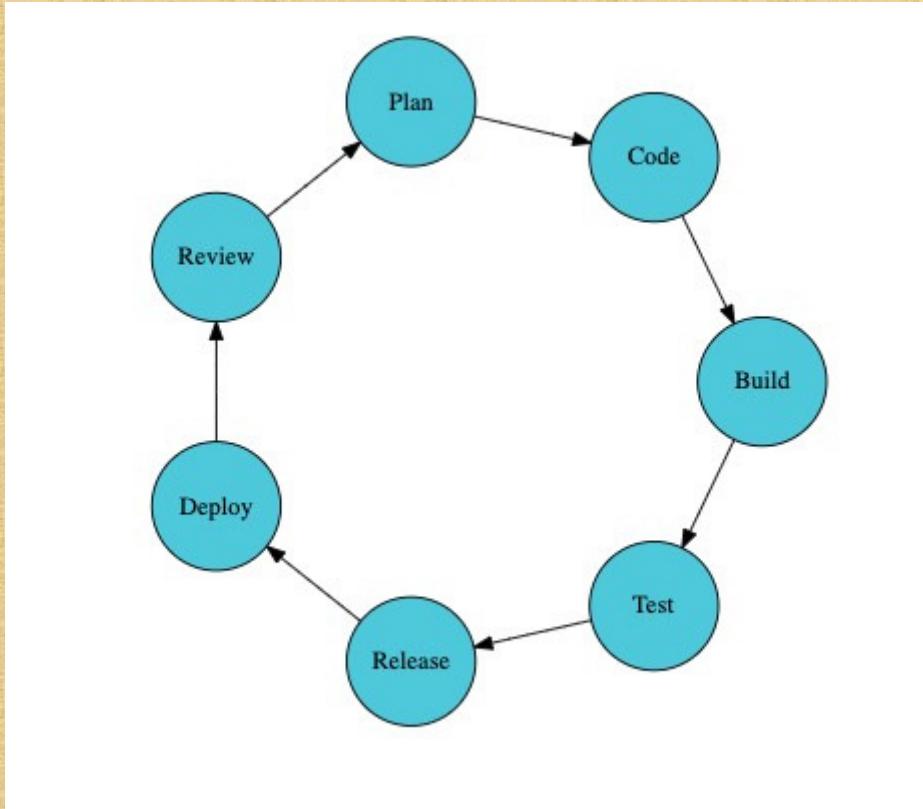
Development



Agile - One Team

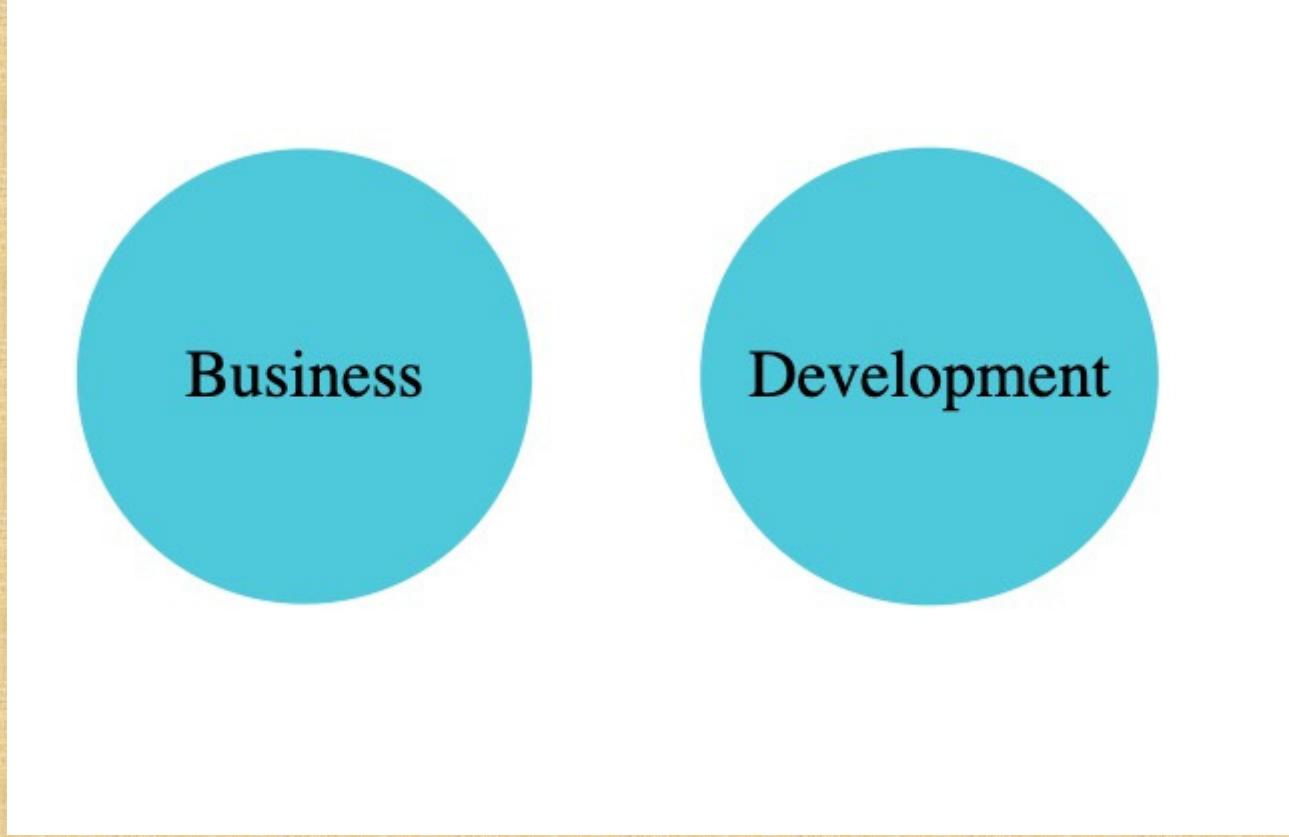


Agile - Short Iterations



Agile - Each Iteration

Enhanced Communication



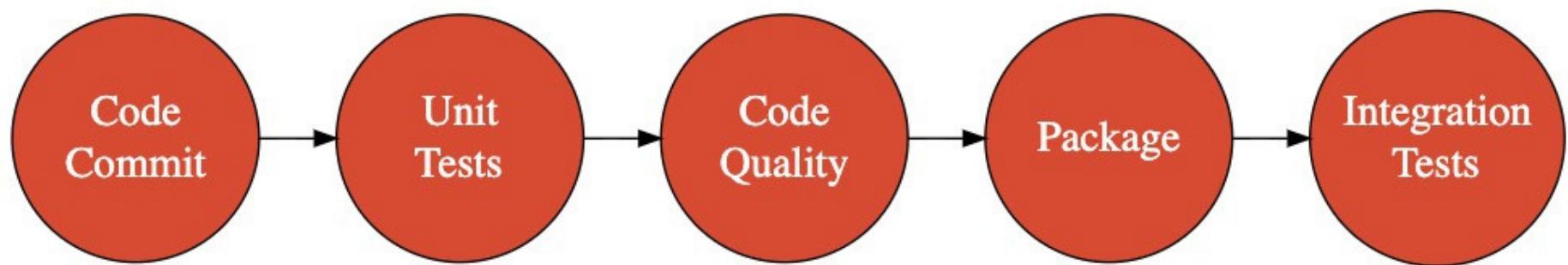
Business

Development



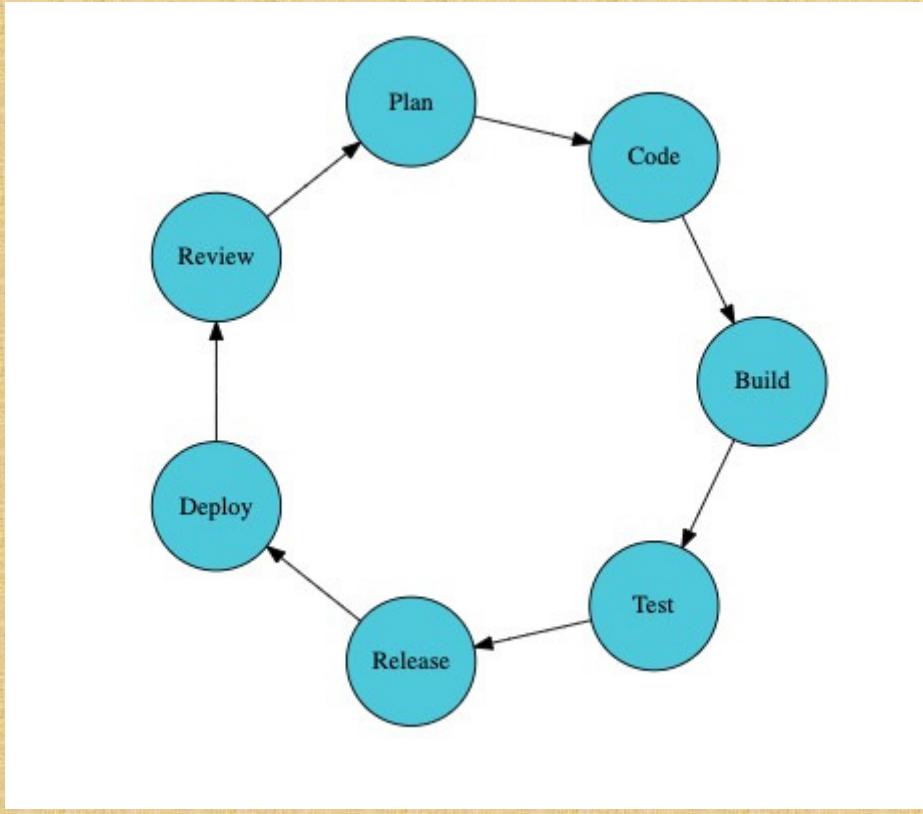
Agile - One Team

Automation

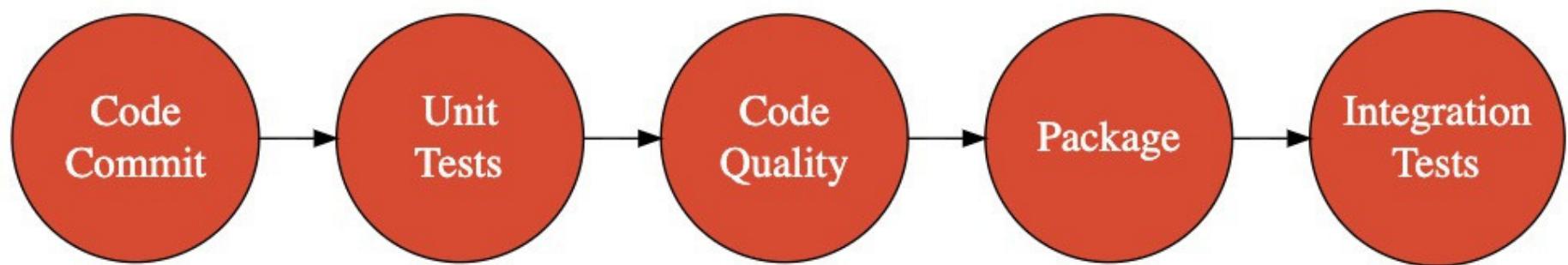


Agile Automation

Quick Feedback

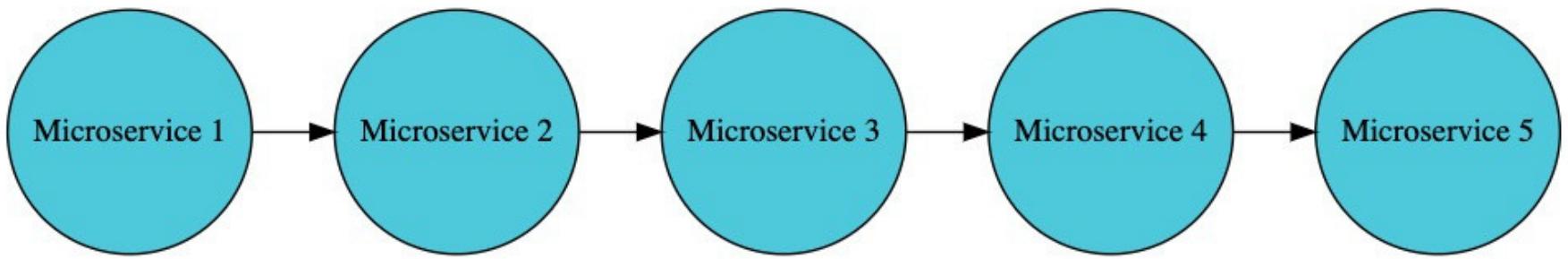


Agile - Retrospectives



Continuous Integration

NEW CHALLENGES

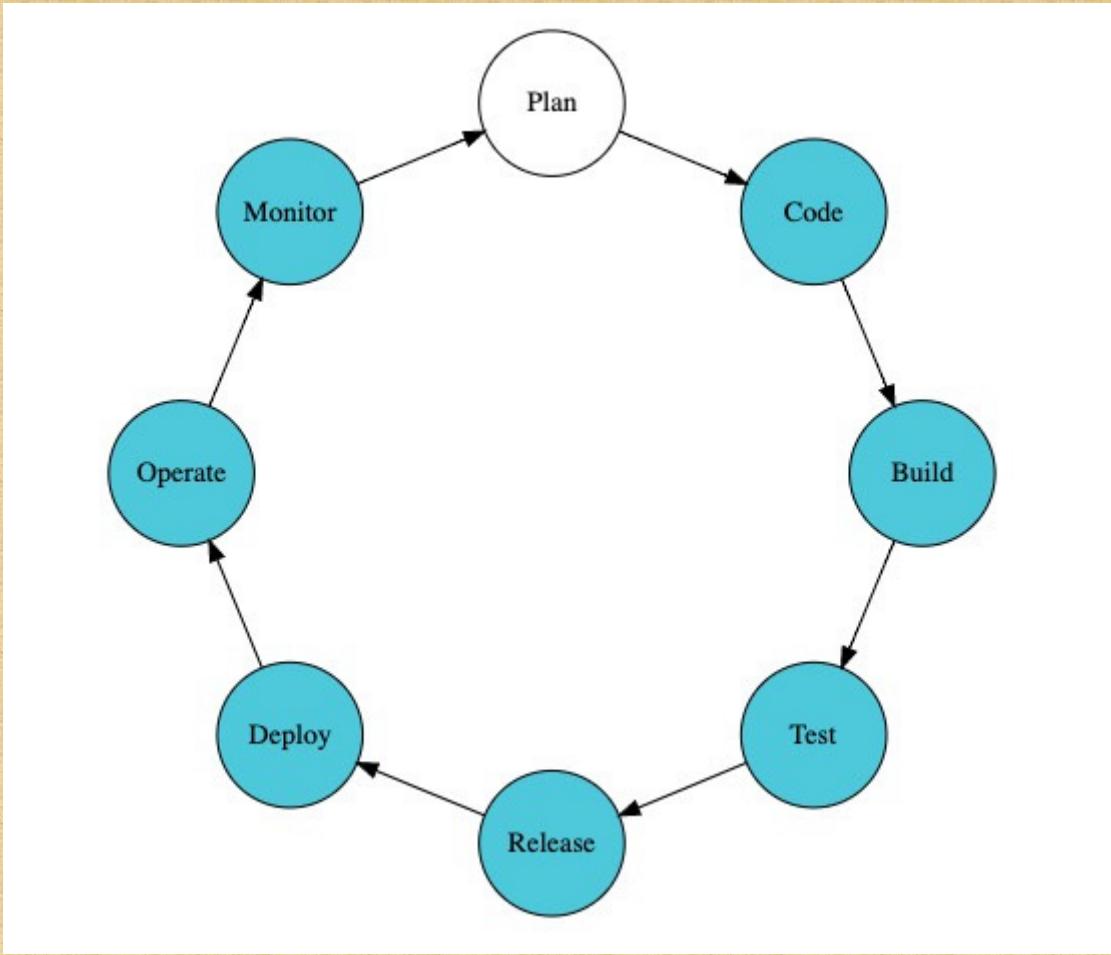


Microservices

DEVOPS

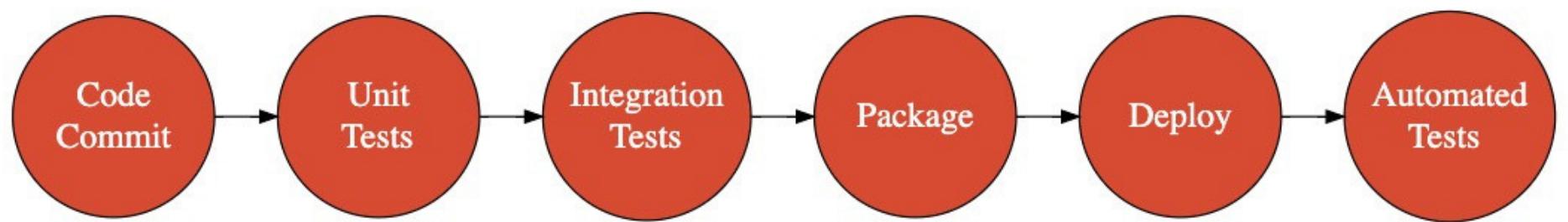


DevOps - Bring Teams Together

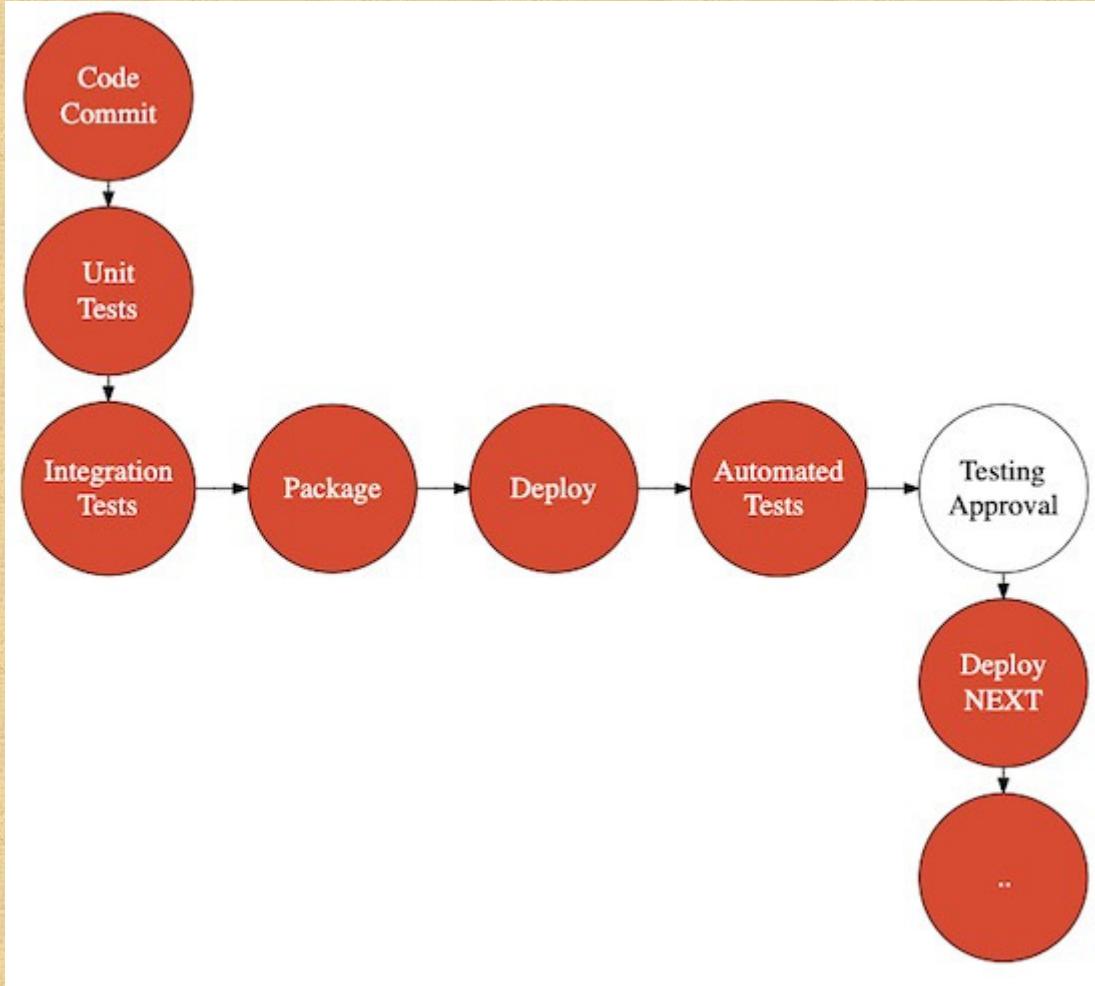


Each Iteration

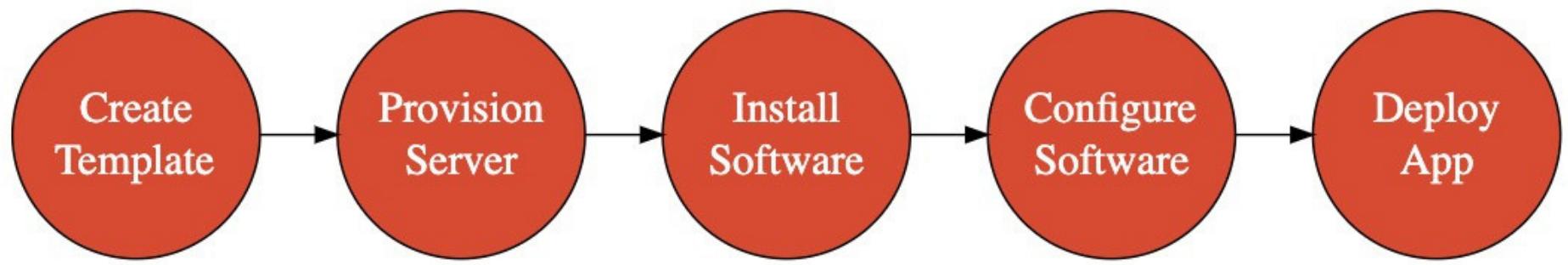
AUTOMATION



Continuous Deployment



Continuous Delivery



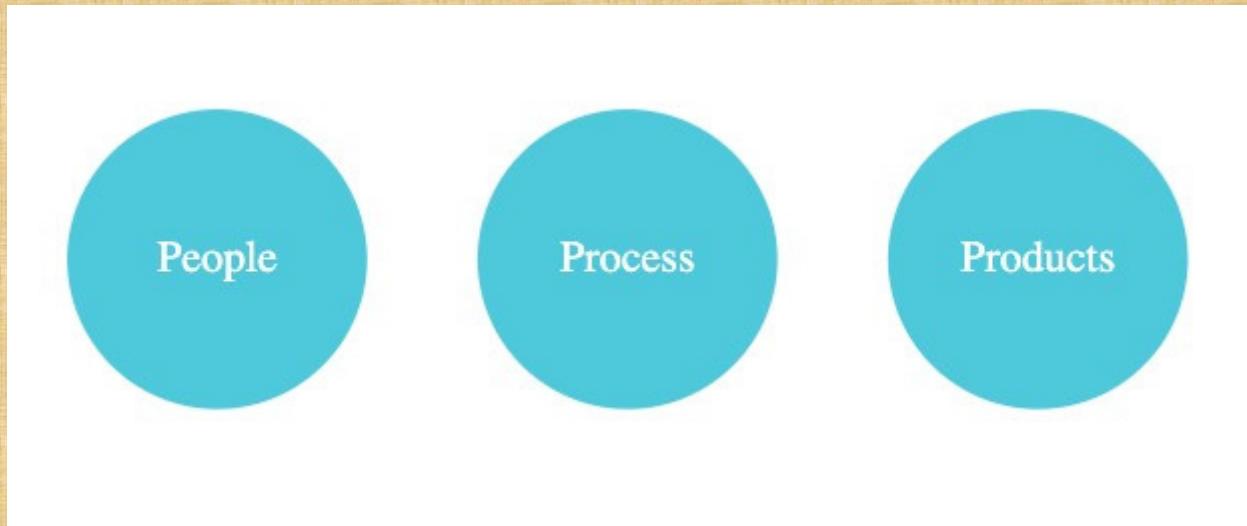
IAC - Automate Operations

QUICK FEEDBACK

AGILE AND DEVOPS

DEVOPS

Bring Down the Wall



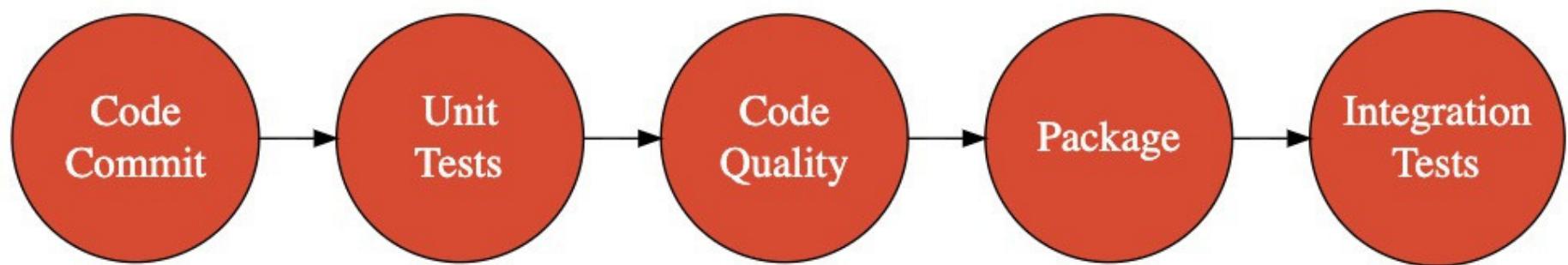


Business

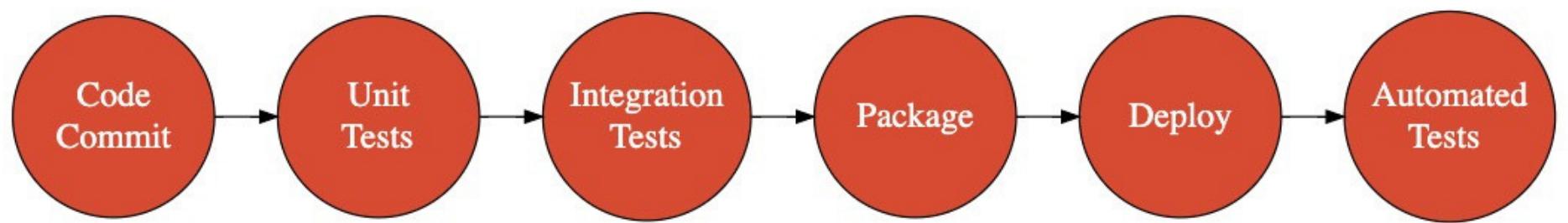
Development

Operations

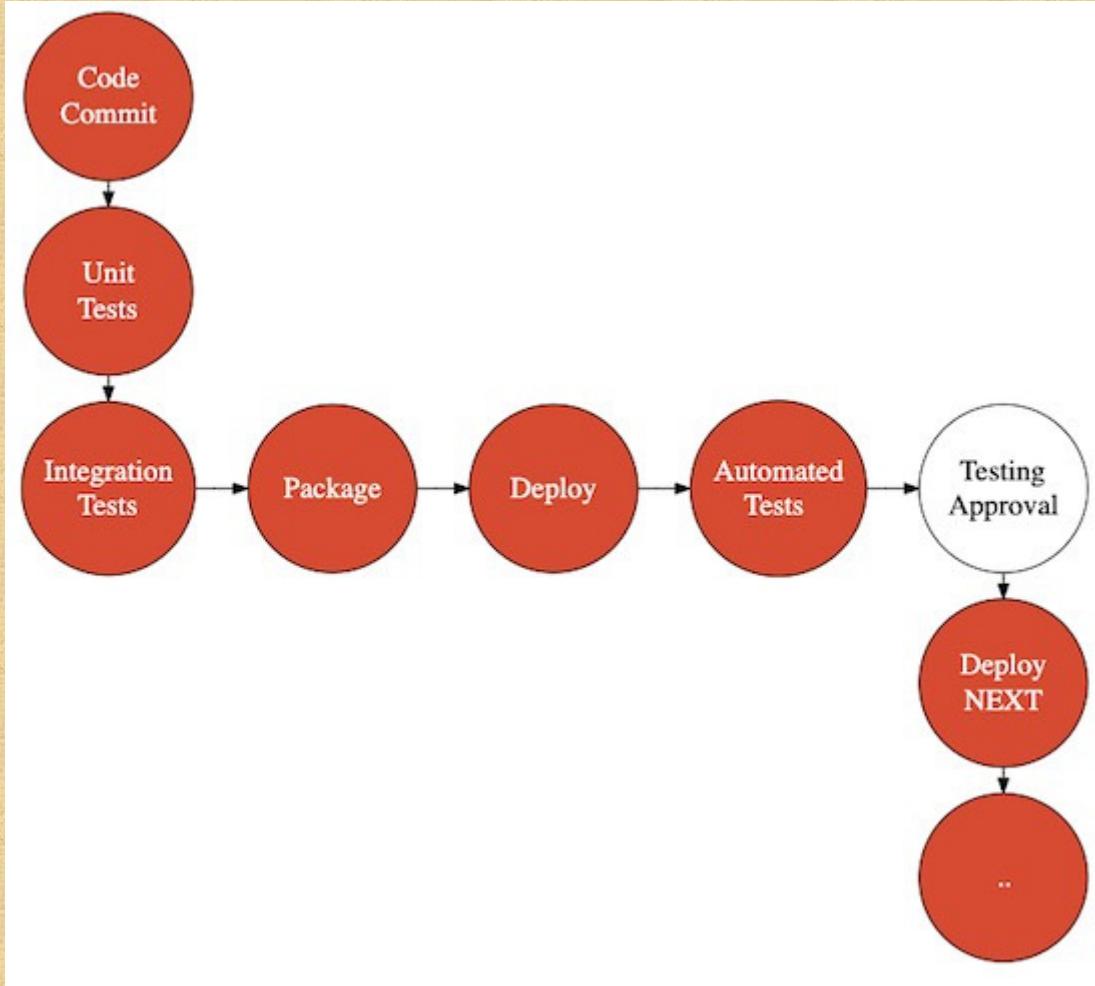
CI CD CD



Continuous Integration

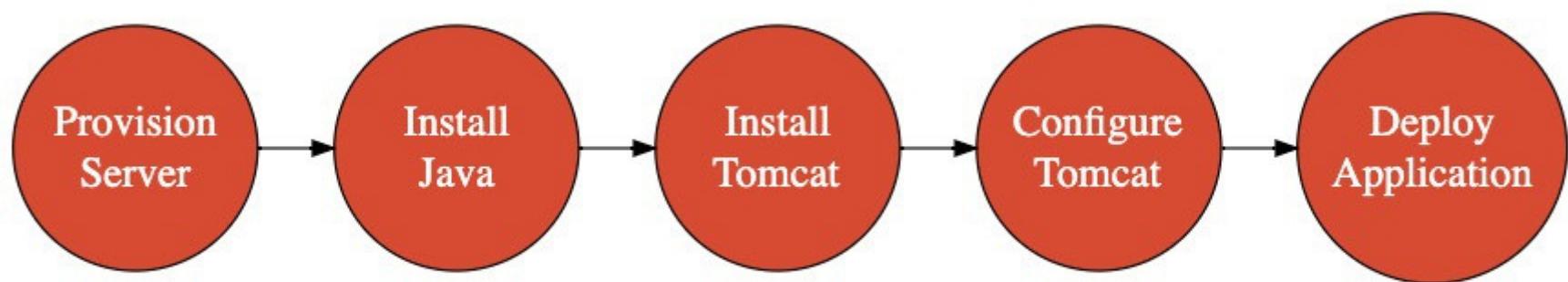


Continuous Deployment

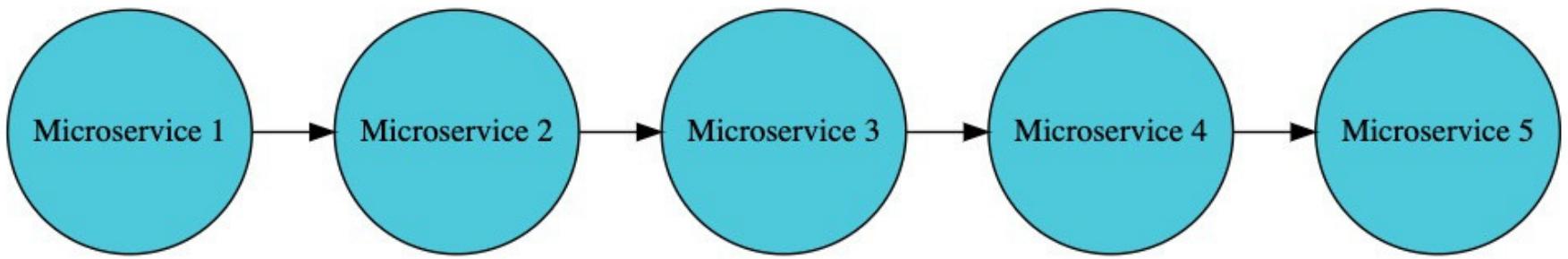


Continuous Delivery

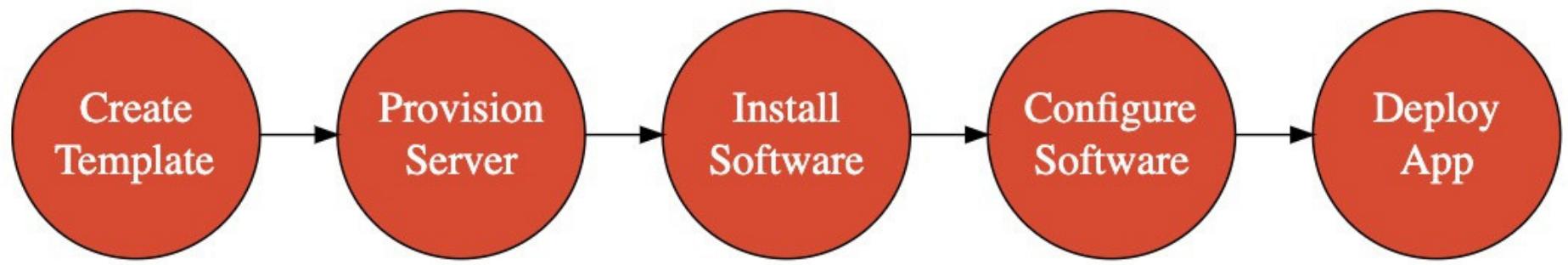
INFRASTRUCTURE AS CODE



Manual Approach



Microservices



Infrastructure as Code

ADVANTAGES

Enable Self Provisioning

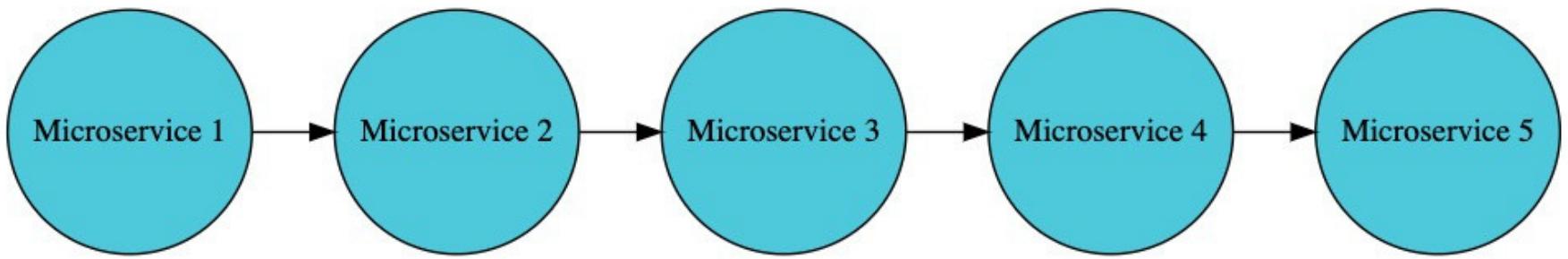
Infra Team can focus on Value
Added Work

Consistent Servers

Less Errors

Quick Recovery From Failures

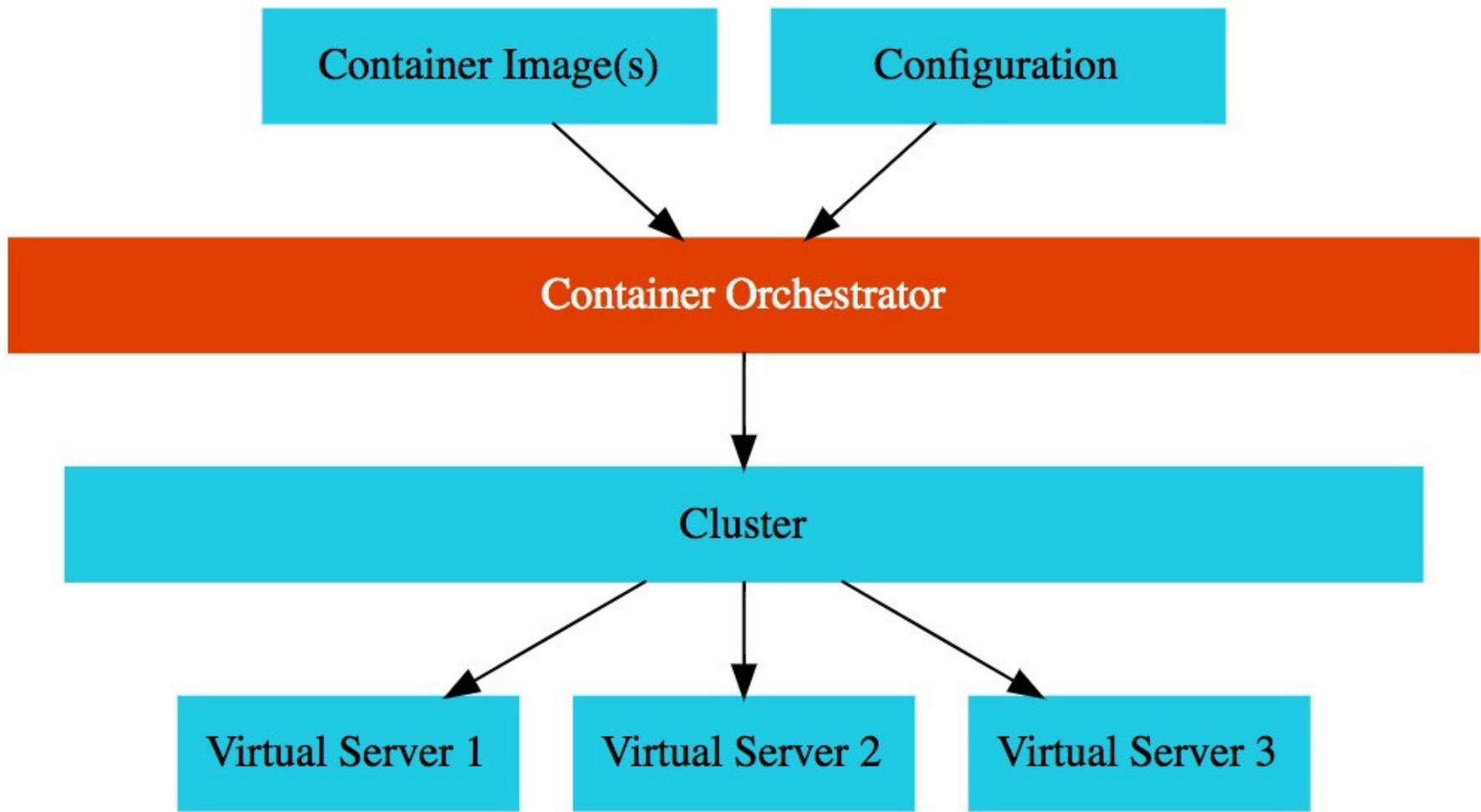
CONTAINERIZATION

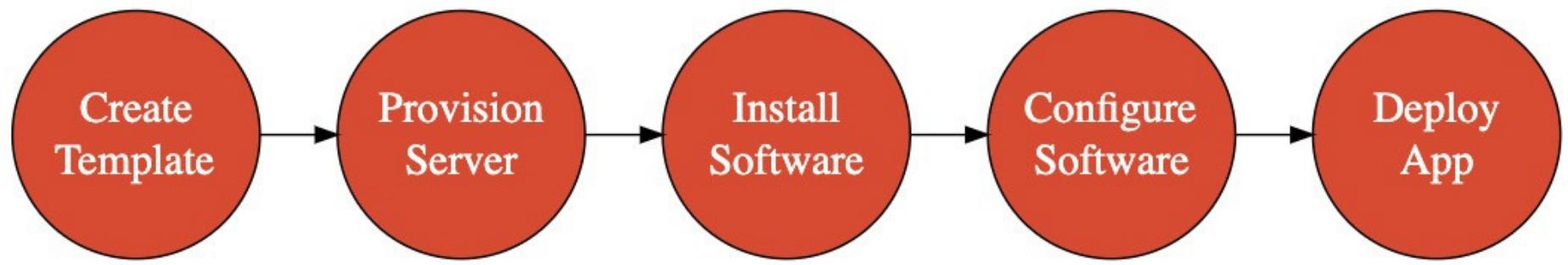


Microservices

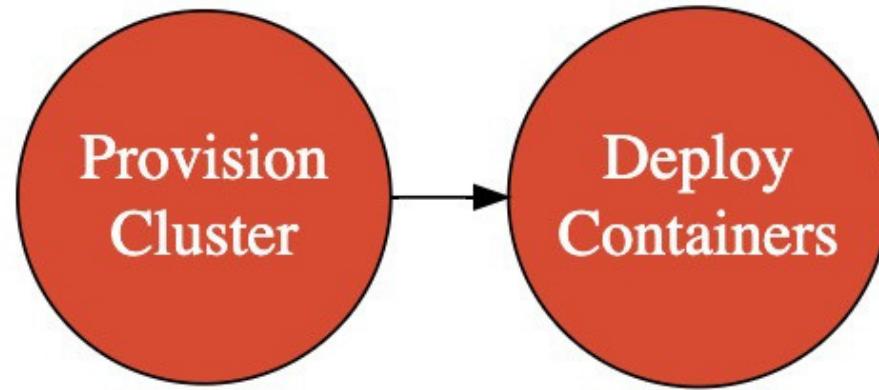


Containers



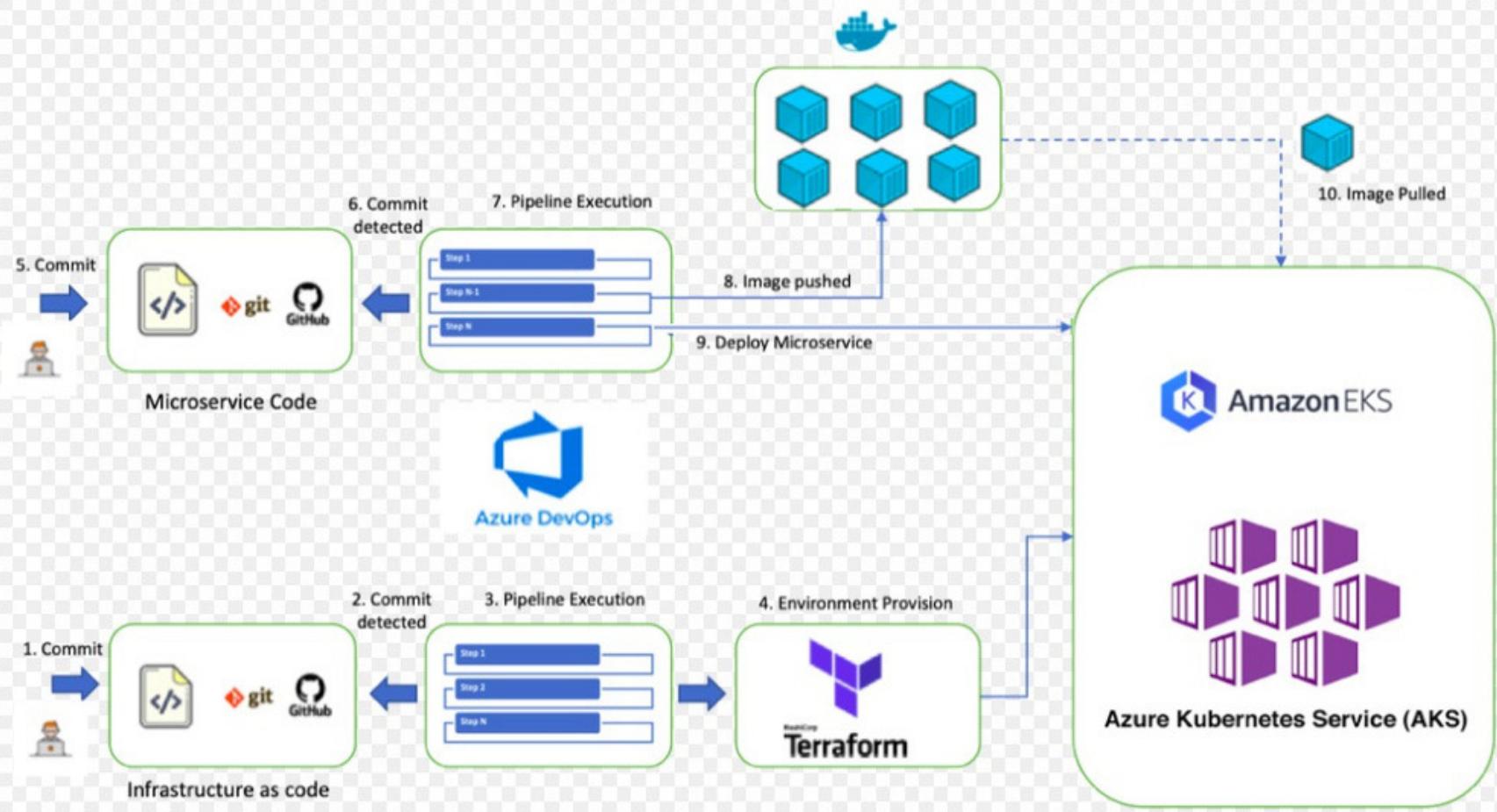


Infrastructure as Code



Infrastructure as Code - Containers

6 DEVOPS TOOLS



2 Example DevOps Use Cases

1

Basics and Best Practices of DevOps

2

Build and Deploy Images with Docker

3

Container Orchestration with Kubernetes

4

Server Provisioning with Terraform

5

Configuration Management with Ansible

6

Azure Dev Ops - CI/CD with Pipelines

7

Jenkins - CI/CD with Pipelines

DEVOPS

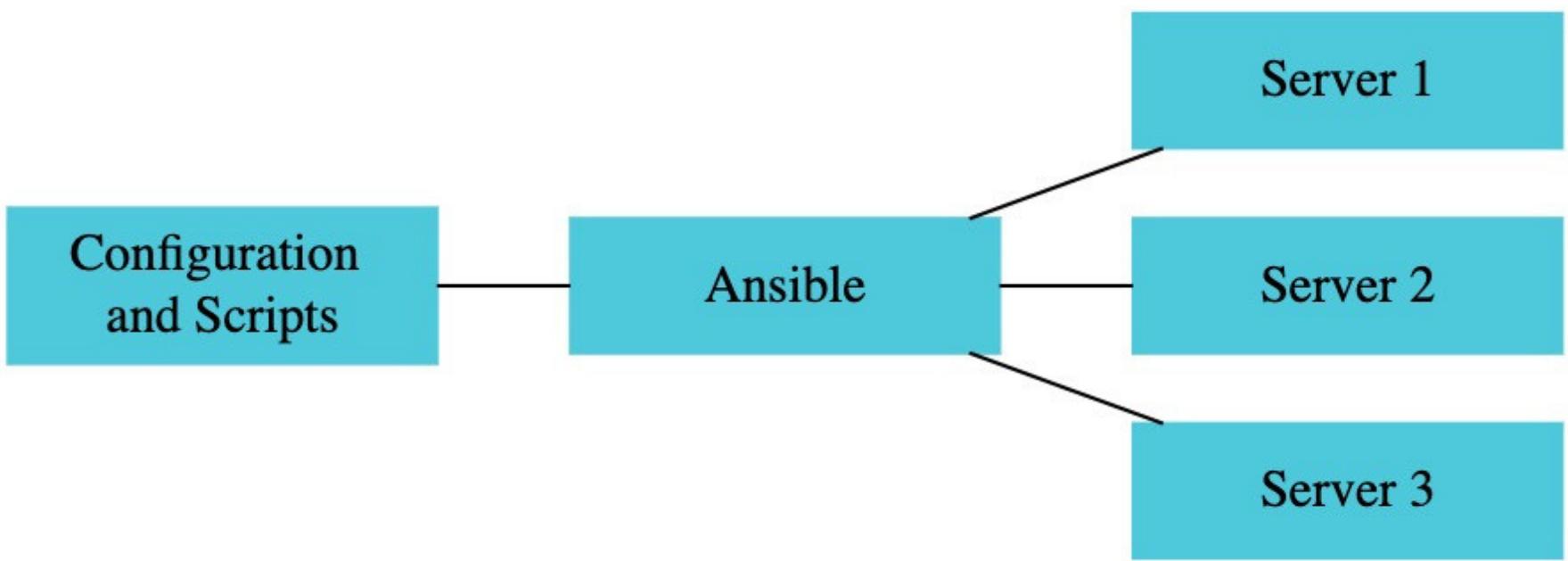
Multiple DevOps Tools
3 Clouds Constant
Evolution No Perfect
Tool Set

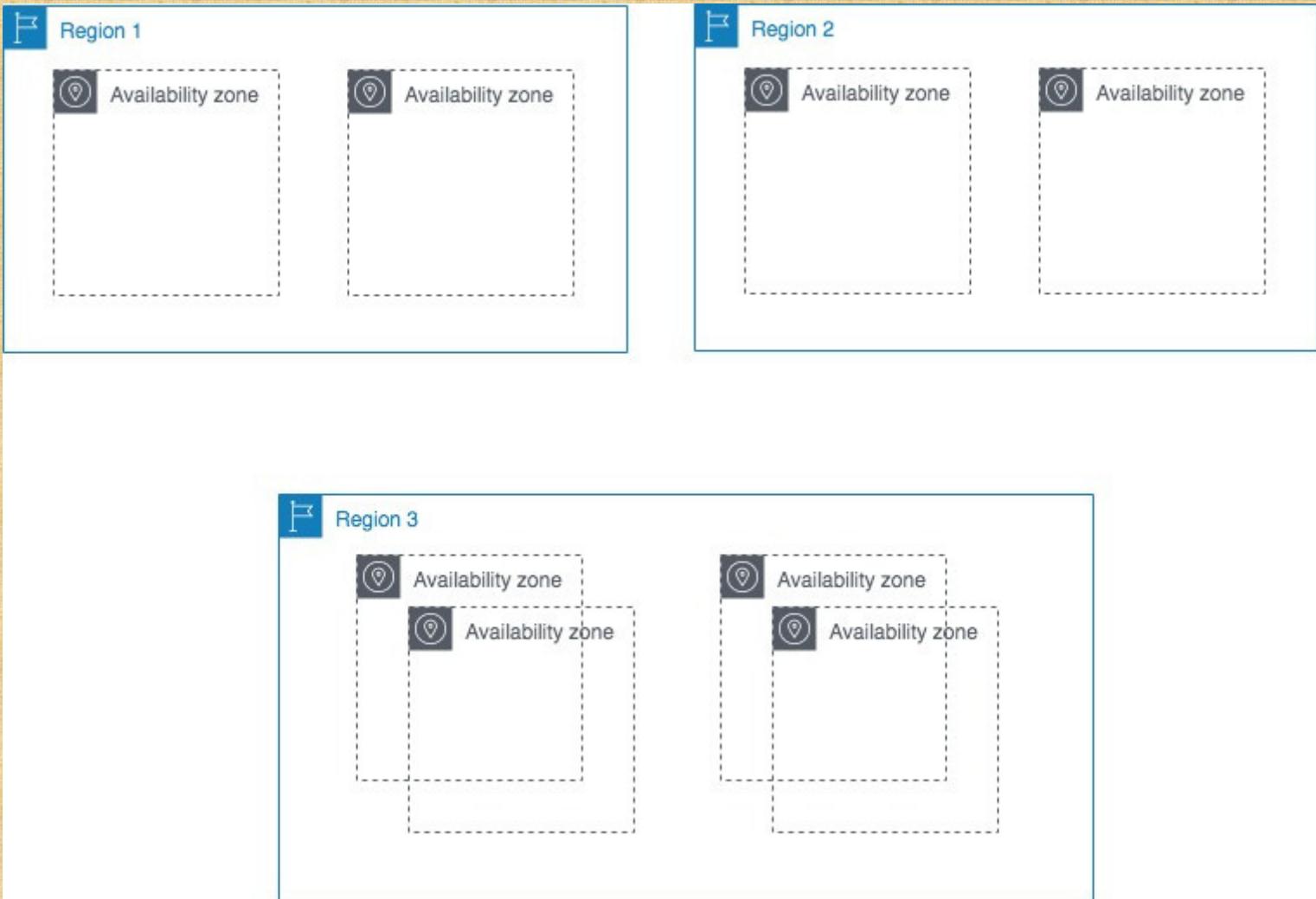
IAC BEST PRACTICES

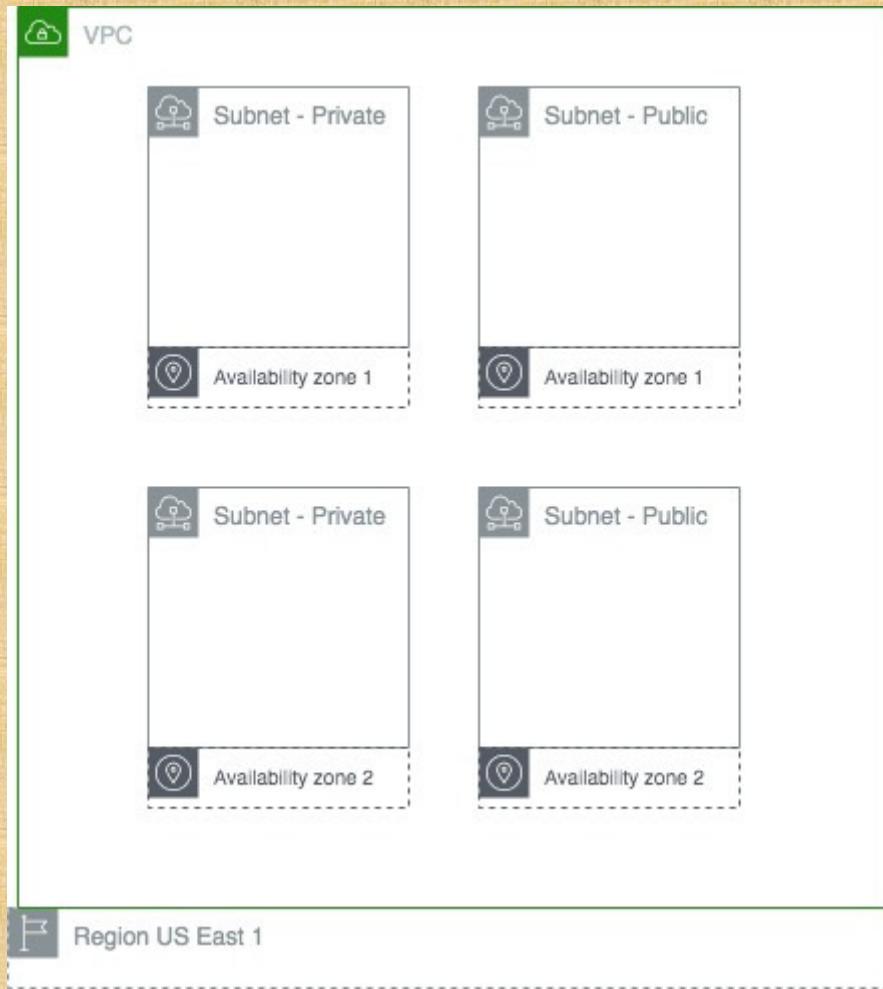
Self Provisioning
Treat Servers
as Disposable
Do not do
anything manually
Version Your
Infrastructure Code
Do
incremental changes
Zero
Downtime Upgrades

DOCKER

Master DevOps







Docker
Software

DevOps
Topic

+ Add comparison

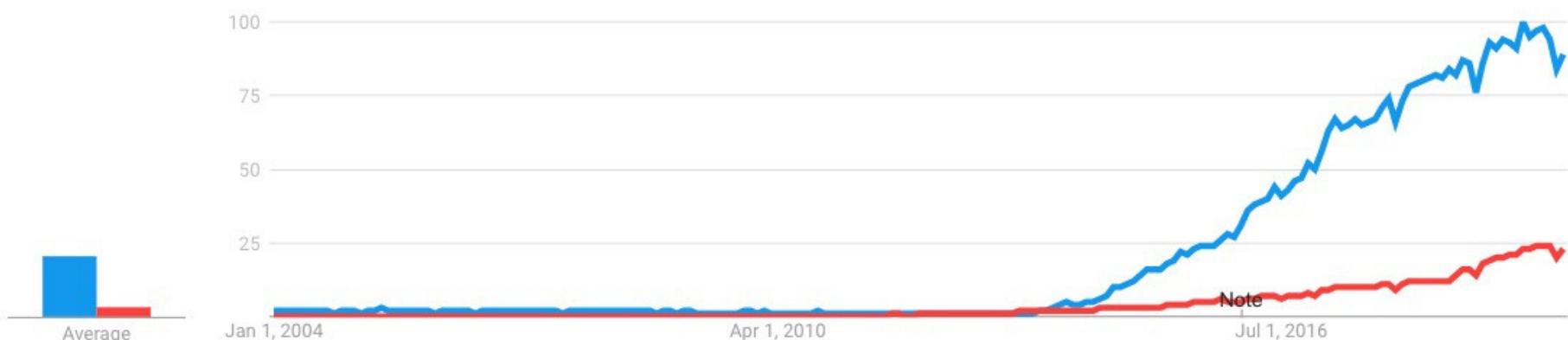
Worldwide ▾

2004 - present ▾

All categories ▾

Web Search ▾

Interest over time



Standardized Application Packaging

Same packaging for all types of applications
- Java, Python or JS

Multi Platform Support

Local Machine
Data Center
Cloud - AWS, Azure and GCP

Light-Weight & Isolation

Containers are Light-weight compared to VM's
Isolated from one another

Docker

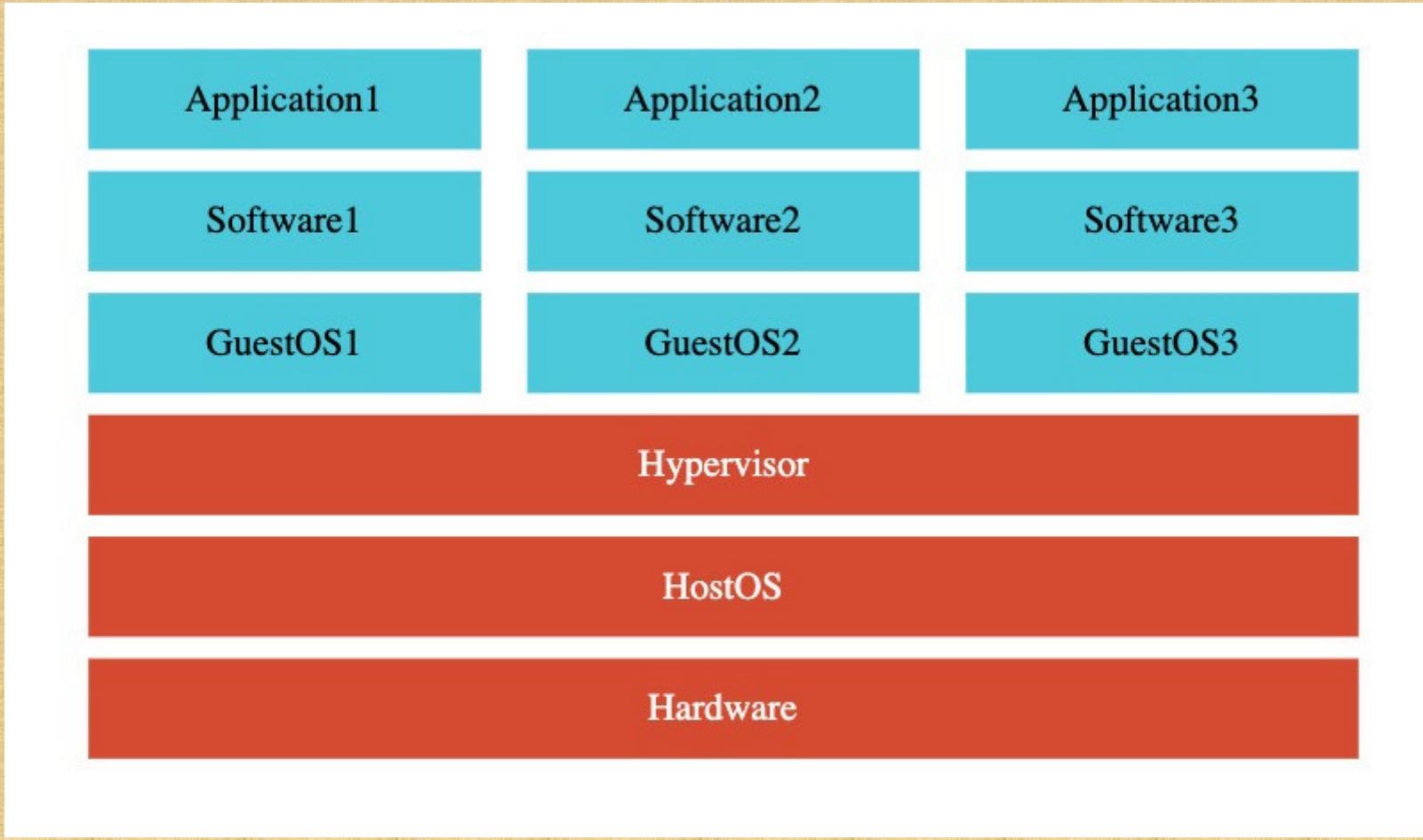
Applications

Software

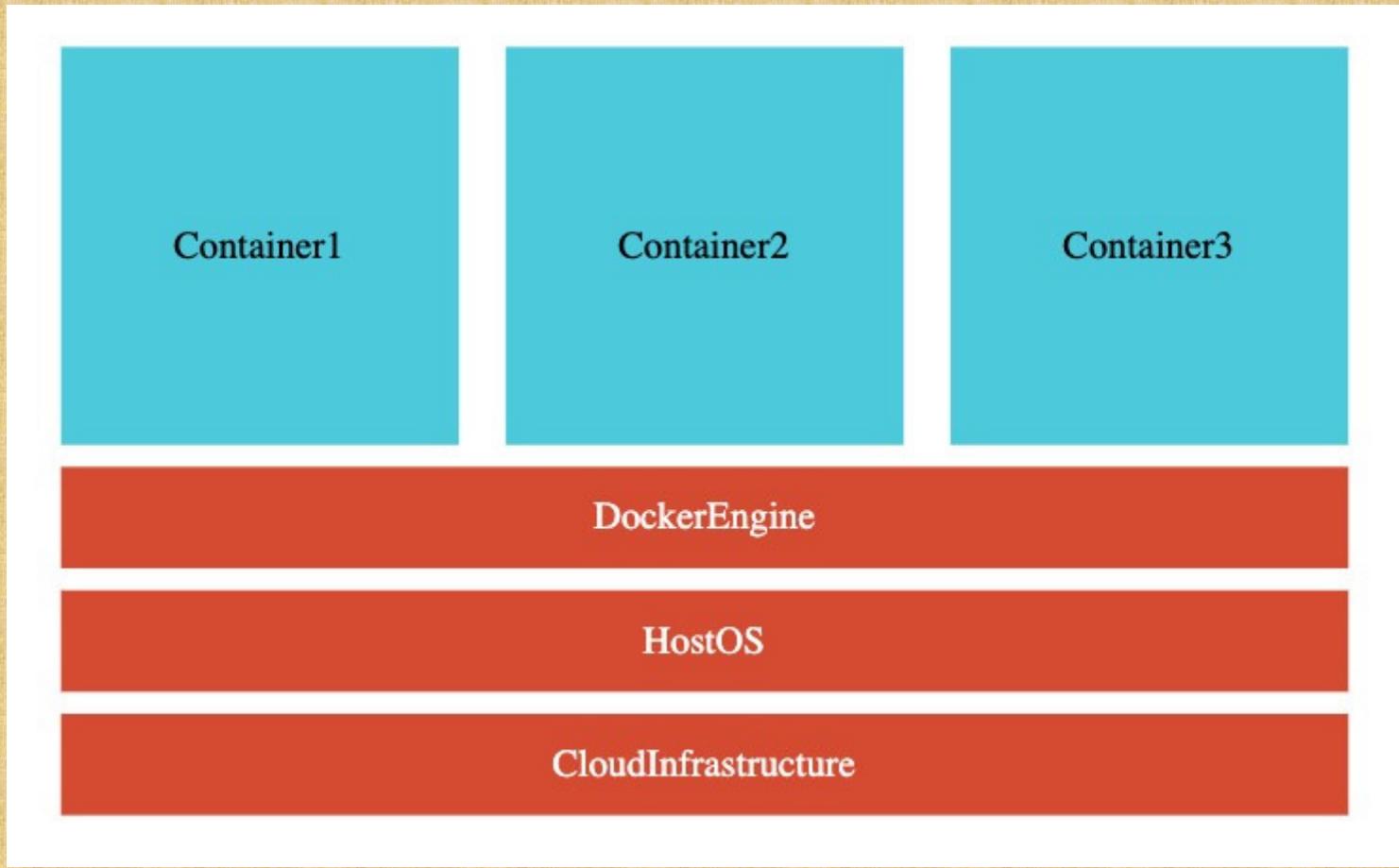
OS

Hardware

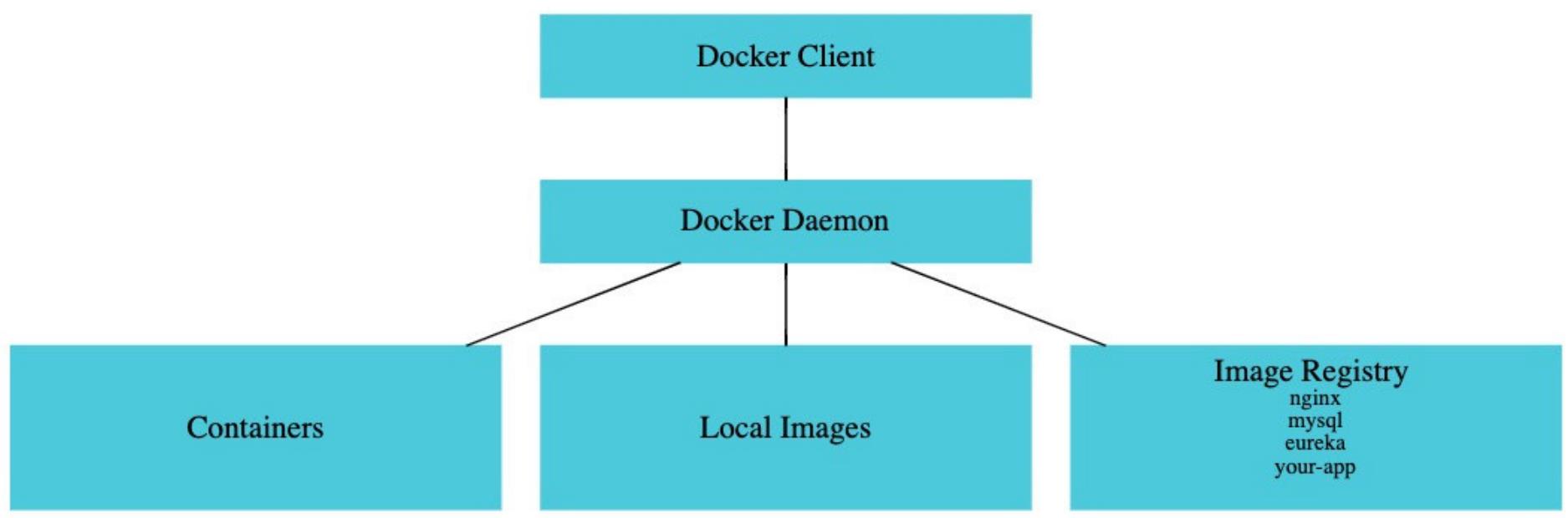
Traditional Deployment



Deployments using Virtual Machines



Deployments using Docker



Docker Architecture

DOCKER AND DEVOPS

Standardized Communication

More Successful Deployments

No More - "It works in my Local!"

Infrastructure Standardization

Container Orchestration - Kubernetes or AWS ECS

Fargate

NEXT STEPS

Explore Docker from Operations Perspective
Pre Built Images
REST API Web Application talking
with MySQL
Docker Compose
Separate Section for Building Docker Images

Container Orchestration

Manage 1000's of instances
1000's of microservices
Declaratively

Features

Auto Scaling
Service Discovery
Load Balancing
Self Healing
Zero Downtime Deployments

Cloud Neutral

Standardized Platform
on any infrastructure

Kubernetes

YOUTUBE, GOOGLE MAPS AND GOOGLE SEARCH

Google Kubernetes Engine (GKE) on
Google Cloud Platform (GCP)!

Go Declarative - Go YAML
Use Helm Stay Cloud
Neutral

Kubernetes
Best Practices

Naming Server Load Balancing Distributed Tracing

Spring Cloud - A Couple Of Years Ago

spring-cloud-starter-kubernetes
spring-cloud-gcp-starter-trace
spring-cloud-gcp-starter-logging

Spring Cloud - In the Cloud World

Update the step referring to Docker to refer to
Appendix Section on Docker.

Google Console Keyboard Shortcuts

Debugging Problems in K8s

Billing

NodePort Example

[https://cloud.google.com/kubernetes-engine/docs/how-to/exposing-apps#access your service](https://cloud.google.com/kubernetes-engine/docs/how-to/exposing-apps#access_your_service)

KUBERNETES - FUN FACTS

K8S KOO - BER - NET -
EEZ Logo - Helmsman
Kubernetes on Cloud

AKS, Amazon EKS and GKE

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[cloud.google.com](#)

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console.cloud.google.com/freetrial/signup/tos?_ga=2.175787298.-1489585026.1572932391&pli=1

Try Google Cloud Platform for free

Step 1 of 2

Country

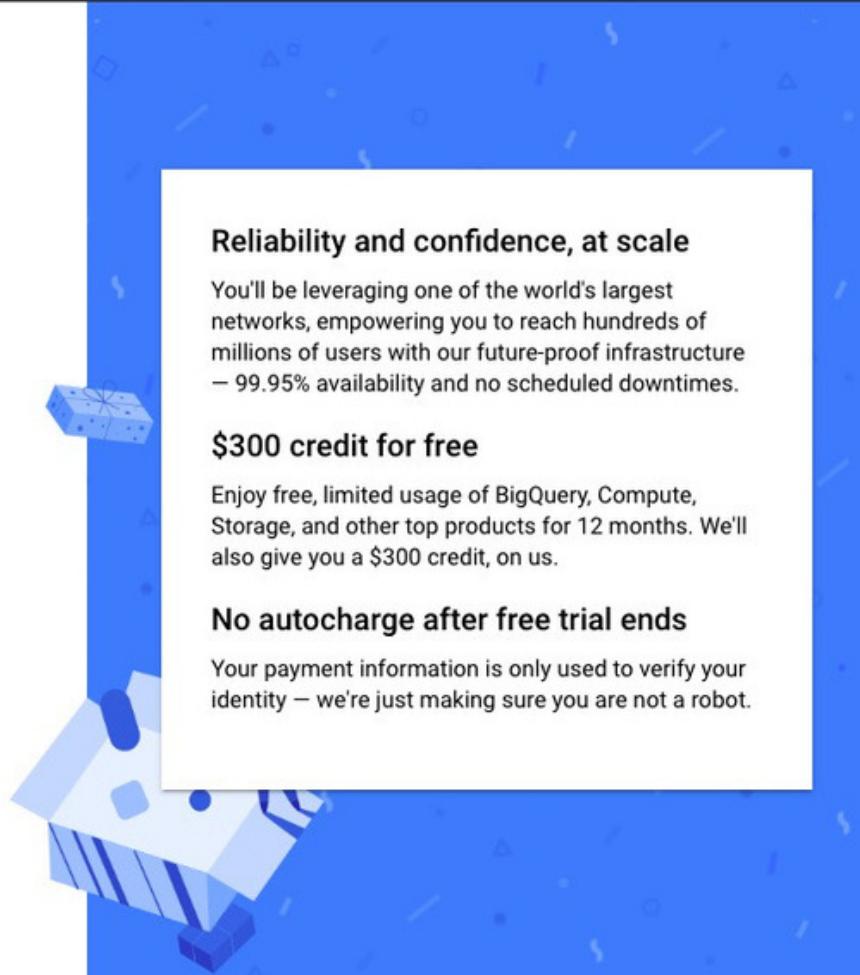
India

Terms of Service

I agree to the [Google Cloud Platform Terms of Service](#), and the terms of service of [any applicable services and APIs](#). I have also read and agree to the [Google Cloud Platform Free Trial Terms of Service](#).

Required to continue

CONTINUE



Reliability and confidence, at scale

You'll be leveraging one of the world's largest networks, empowering you to reach hundreds of millions of users with our future-proof infrastructure – 99.95% availability and no scheduled downtimes.

\$300 credit for free

Enjoy free, limited usage of BigQuery, Compute, Storage, and other top products for 12 months. We'll also give you a \$300 credit, on us.

No autocharge after free trial ends

Your payment information is only used to verify your identity – we're just making sure you are not a robot.



Account type 

Individual



Tax information

Tax status

Unregistered individual 

PAN (optional)

Permanent account number example: ABCDE1234A

TAN (optional)

Tax deduction and collection account number example:
DELA02603G

How you pay



Monthly automatic payments

You pay for this service on a regular **monthly** basis, via an automatic charge when your payment is due.

Payment method ⓘ

Card details

The personal information you provide here will be added to your payments profile. It will be stored securely and treated in accordance with the [Google Privacy Policy](#).

START MY FREE TRIAL

X Verify Mastercard 6000



Mastercard 6000

Enter the 3-digit security code on your card

Security code



CONTINUE

Complete this transaction

When you click Continue, a new browser window will appear where you'll verify your info.

After you're done, you may see a small charge to your credit card. This is temporary and will be refunded.

CONTINUE

×

Uh oh, something went wrong

Your card does not support automatic
recurring payments. [OR-CC3ST-02]

OK



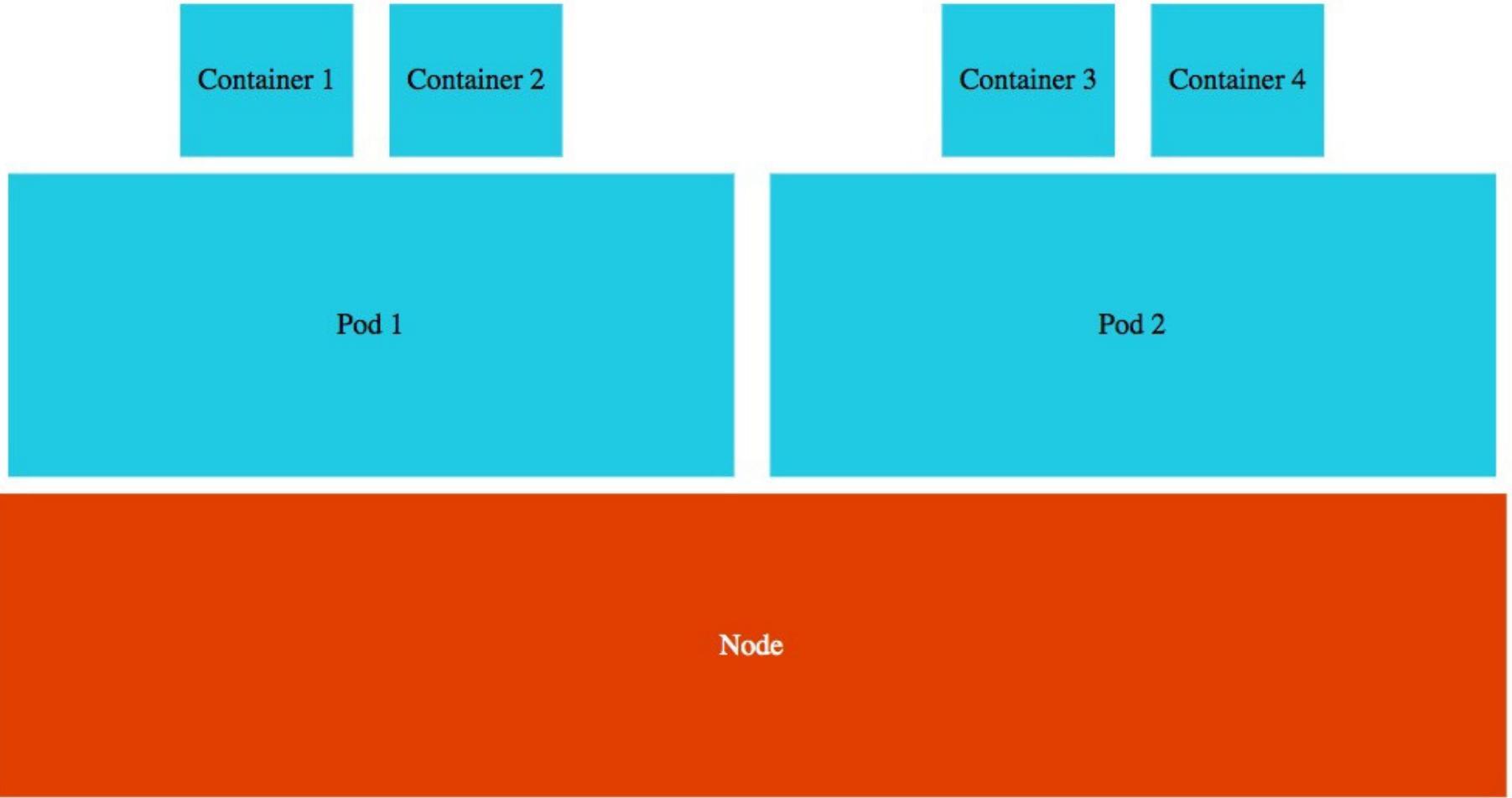
Google Cloud Platform

Welcome Ranga!

Thanks for signing up for the 12-month free trial.

Thanks for signing up. Your free trial includes \$300 in credit to spend over the next 12 months. If you run out of credit, don't worry — you won't be billed without your permission.

GOT IT



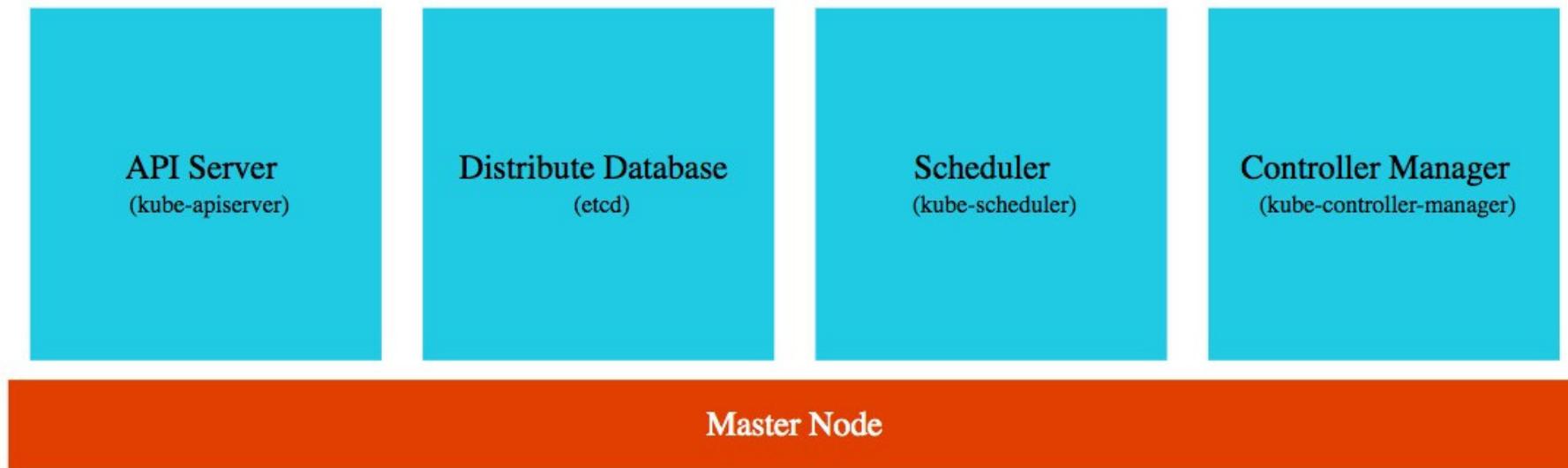
Kubernetes Architecture

Master Node(s)
Manages Cluster

Worker Node(s)
Run Your Applications

Cluster

Kubernetes Architecture



Kubernetes Architecture

Node Agent
(kubelet)

Networking Component
(kube-proxy)

Container Runtime
(CRI - docker, rkt etc)

PODS
(Multiple pods running
containers)

Worker Node (or) Node

Kubernetes Architecture



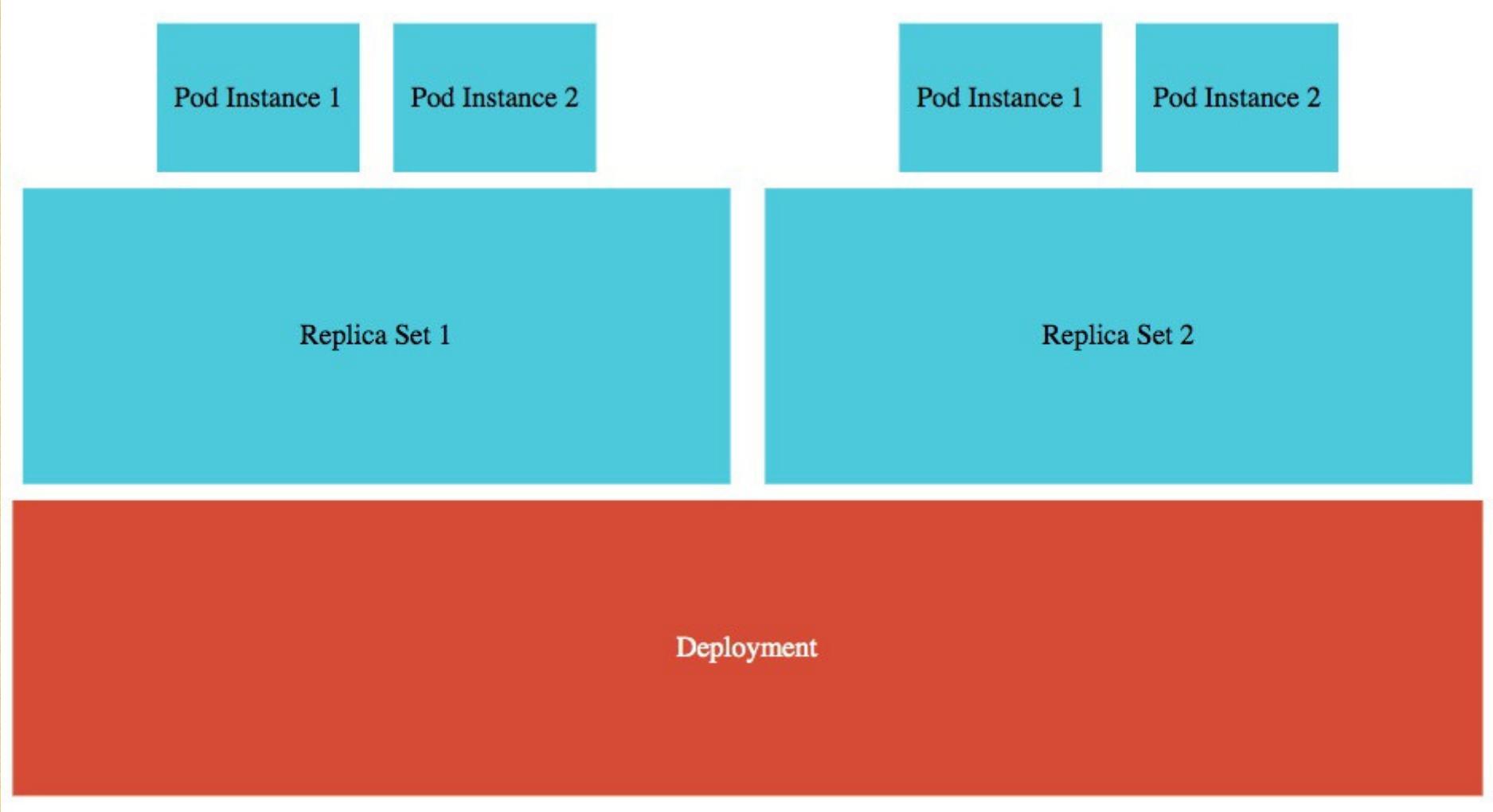
Kubernetes Deployments

Create Cluster

Create Deployment

Docker Repository

Kubernetes Deployments



Kubernetes Deployments



Kubernetes Service

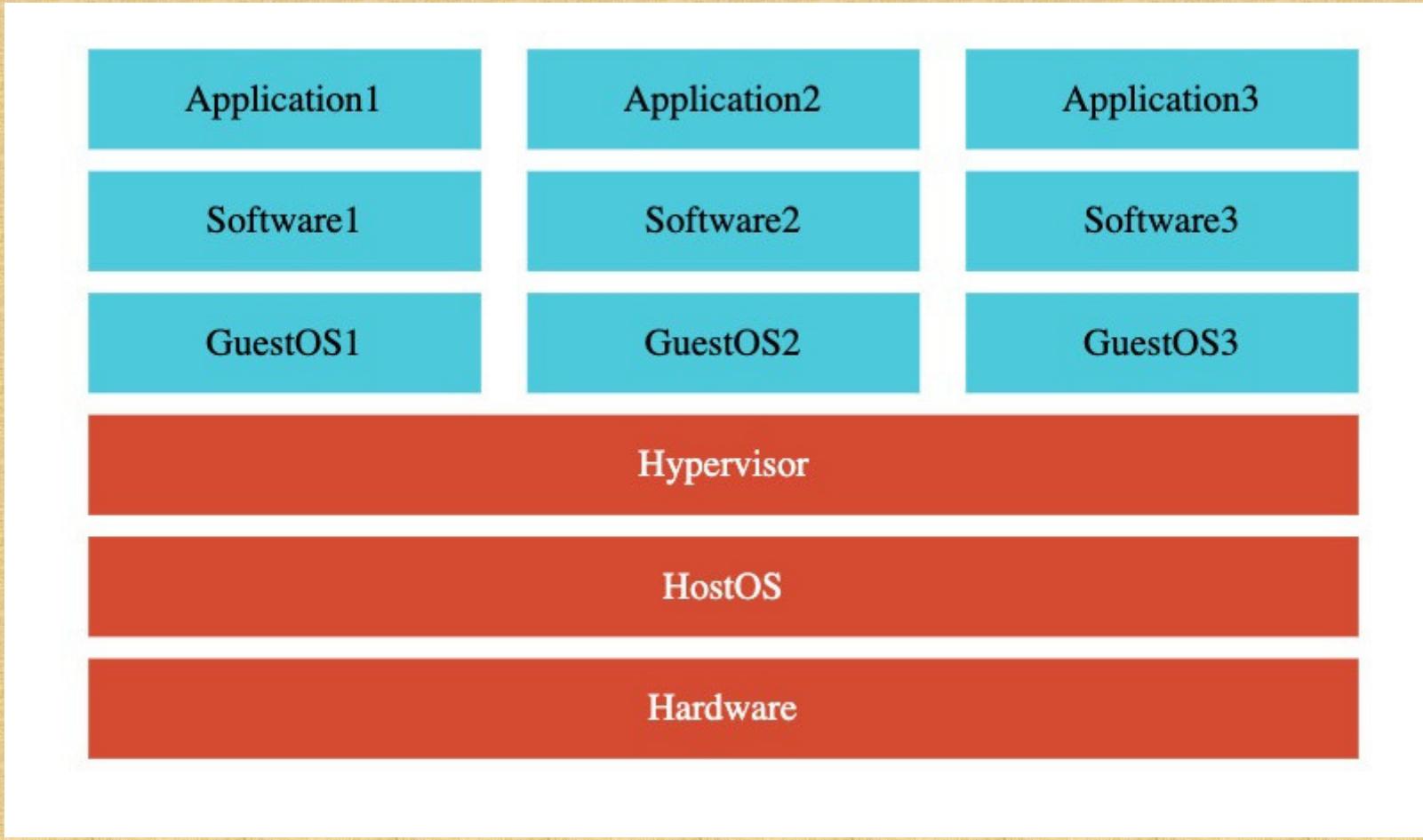
Applications

Software

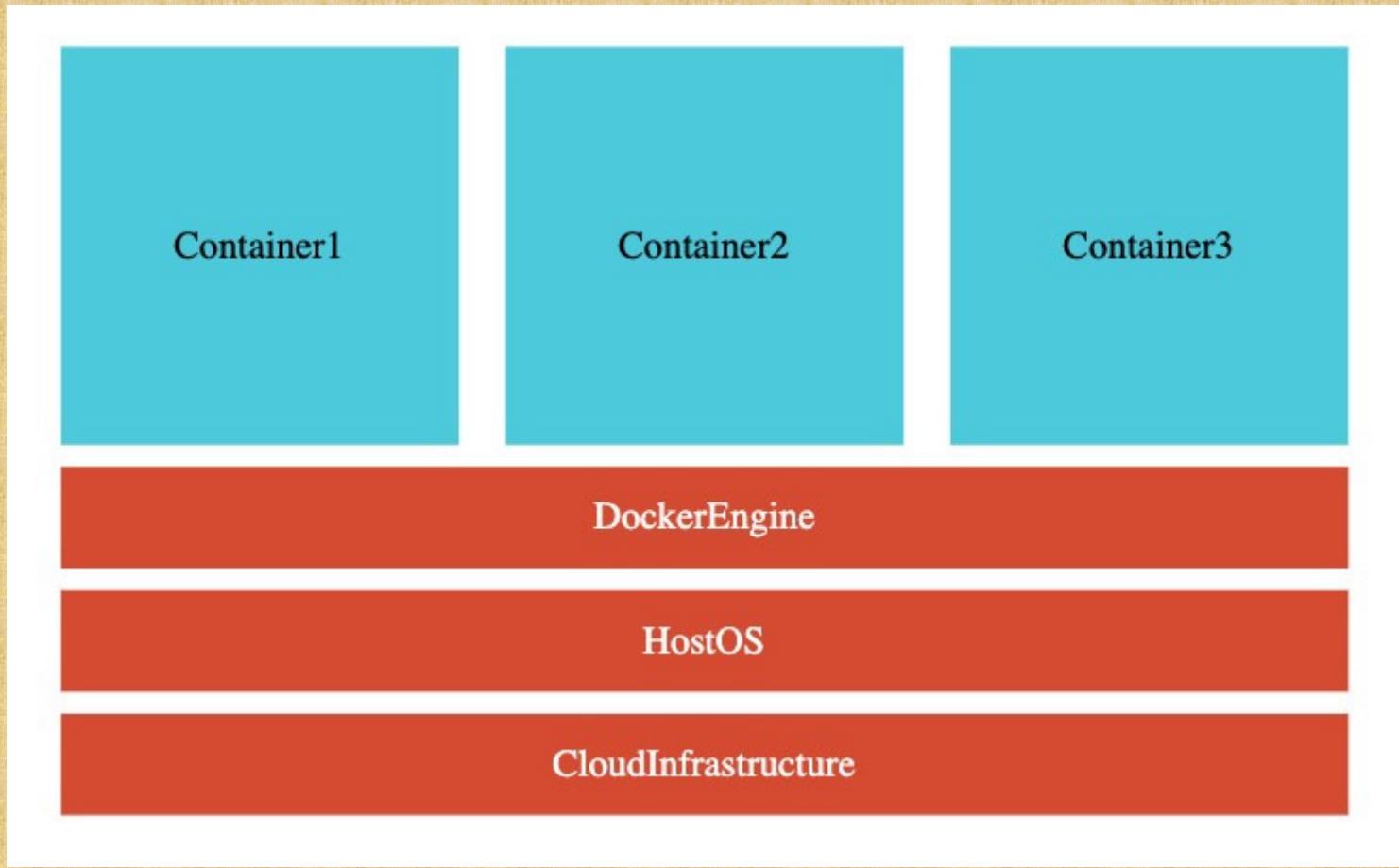
OS

Hardware

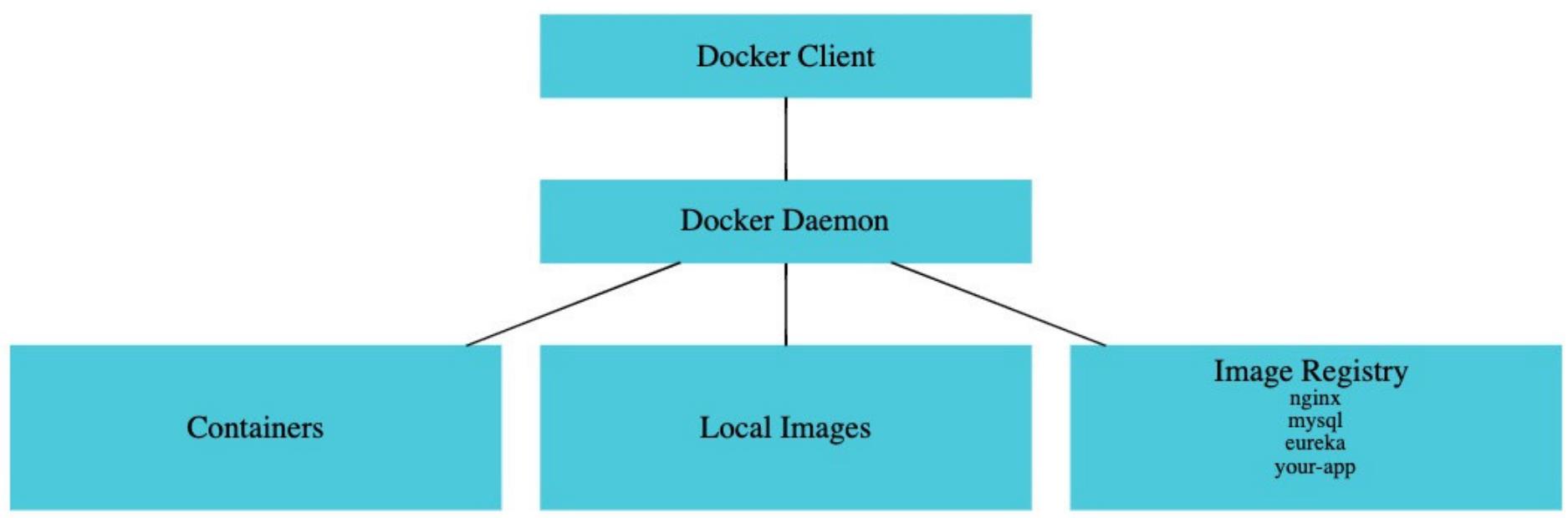
Traditional Deployment



Deployments using Virtual Machines

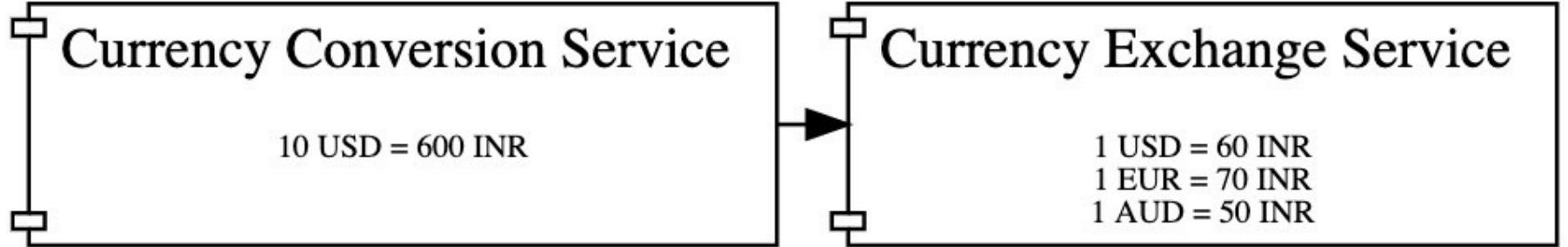


Deployments using Docker



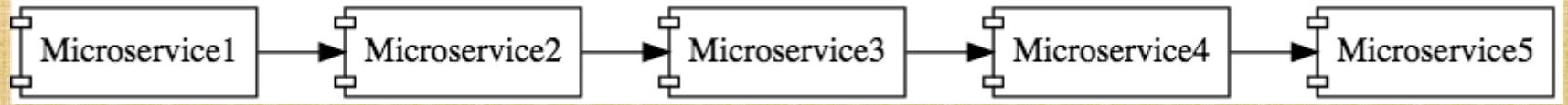
Docker Architecture

MICROSERVICES



Microservices Overview

DOCKER AND MICROSERVICES



Microservices Chain

EASIER DEVELOPMENT

Adopt New Technology Faster

Zero worry about deployment procedures

Fewer Environment Issues

No more - "It works in my Local"

EASIER OPERATIONS

Consistent Deployment
Automation Across Different
Environments and Different
Technologies

KUBERNETES AND MICROSERVICES

EASIER DEVELOPMENT

Adopt New Technology Faster

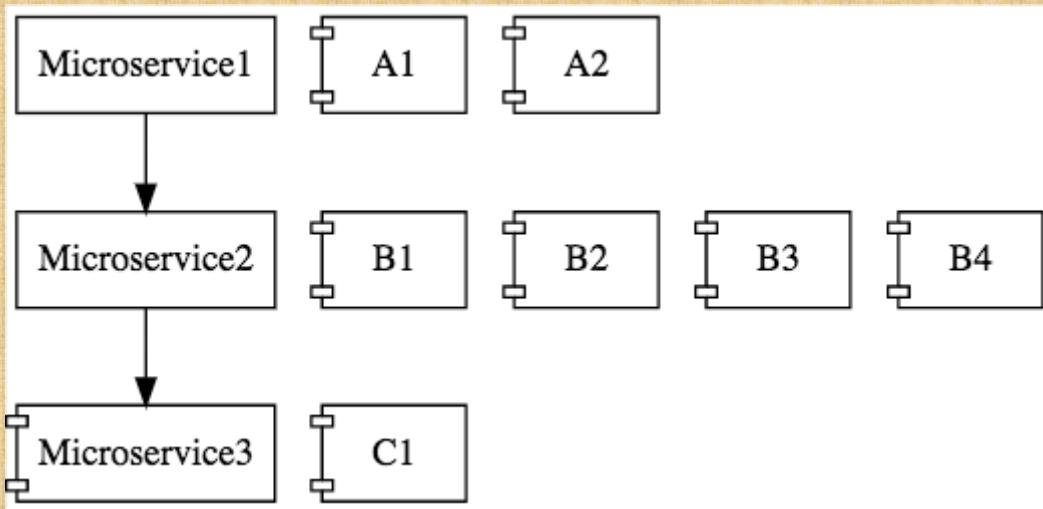
Zero worry about deployment procedures

Fewer Environment Issues

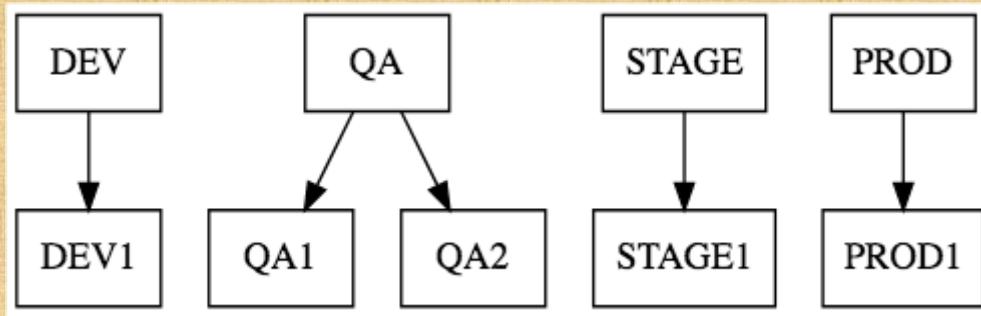
No more - "It works in my Local"

EASIER OPERATIONS

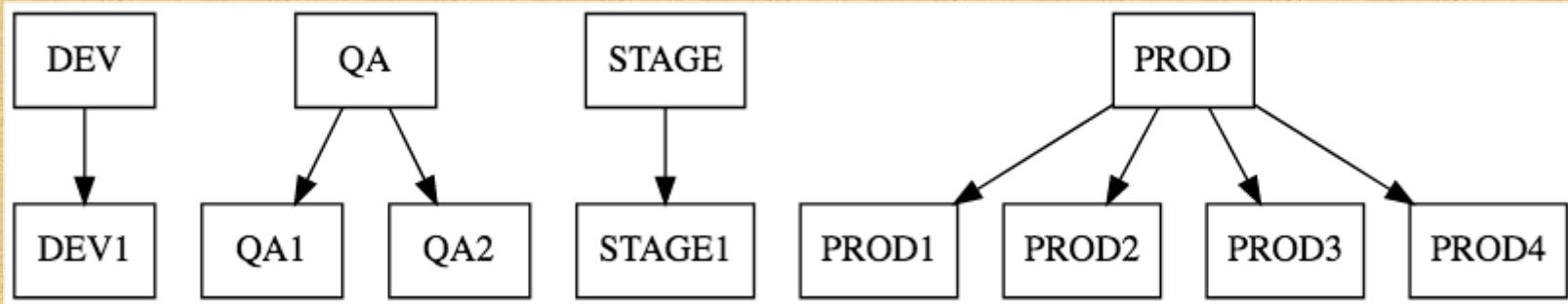
Consistent Deployment
Automation Across Different
Environments and Different
Technologies



Microservices Multiple Instances

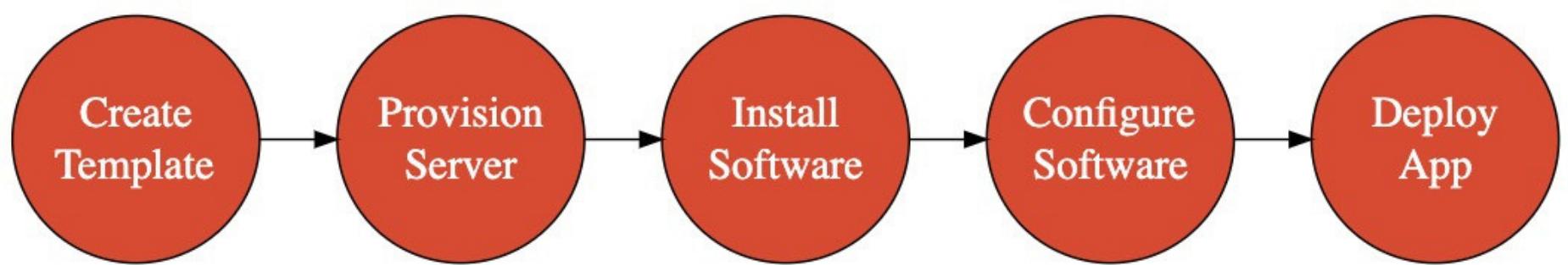


Currency Conversion Service



Currency Exchange Service

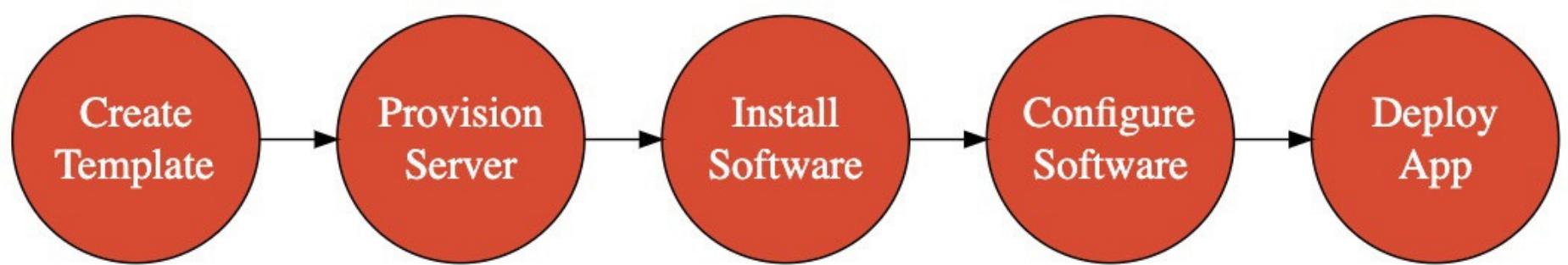
TERRAFORM



PREREQUISITES

AWS Account
Visual Studio Code
Terraform Installation

ANSIBLE



PREREQUISITES

AWS Account Visual
Studio Code
Ansible Installation
Python 2.7 or 3.4 Installed

ANSIBLE FOR WINDOWS

Azure services

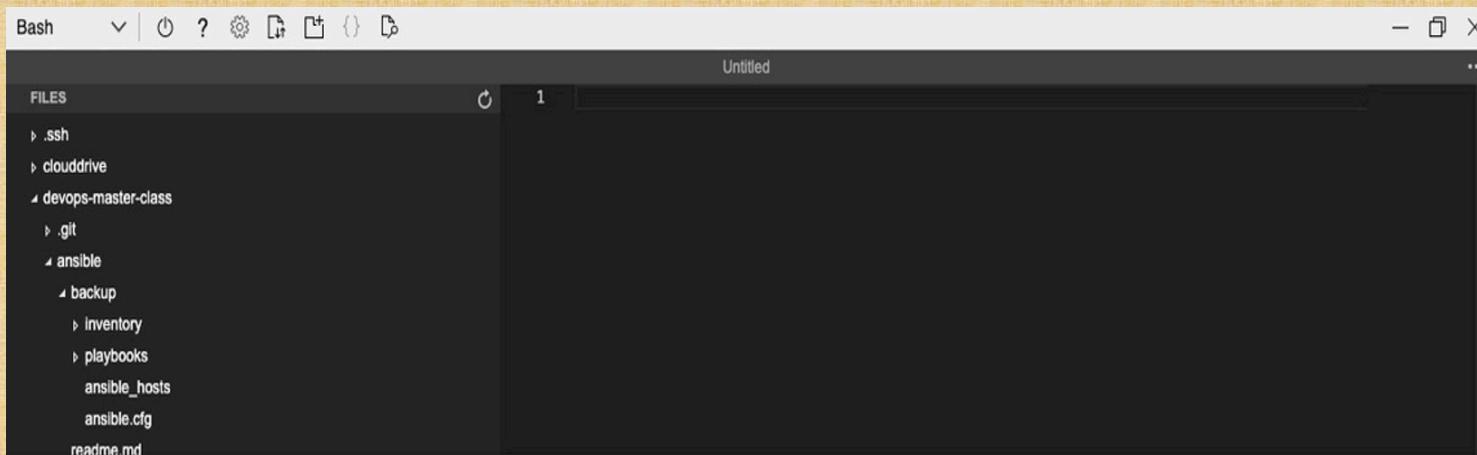
Create a resource Kubernetes services Resource groups Subscriptions All resources Management groups Application Insights SQL databases Azure Database for MySQL... More services

Recent resources

Bash

```
Your cloud drive has been created in:  
Subscription Id: a4ea5466-b88b-4000-923a-4a7823757774  
Resource group: cloud-shell-storage-centralindia  
Storage account: csga4ea5466b88bx4000x923  
File share: cs-ranga-in28minutes-com-100320007cca03da  
  
Initializing your account for Cloud Shell...\nRequesting a Cloud Shell.Succeeded.  
Connecting terminal...
```

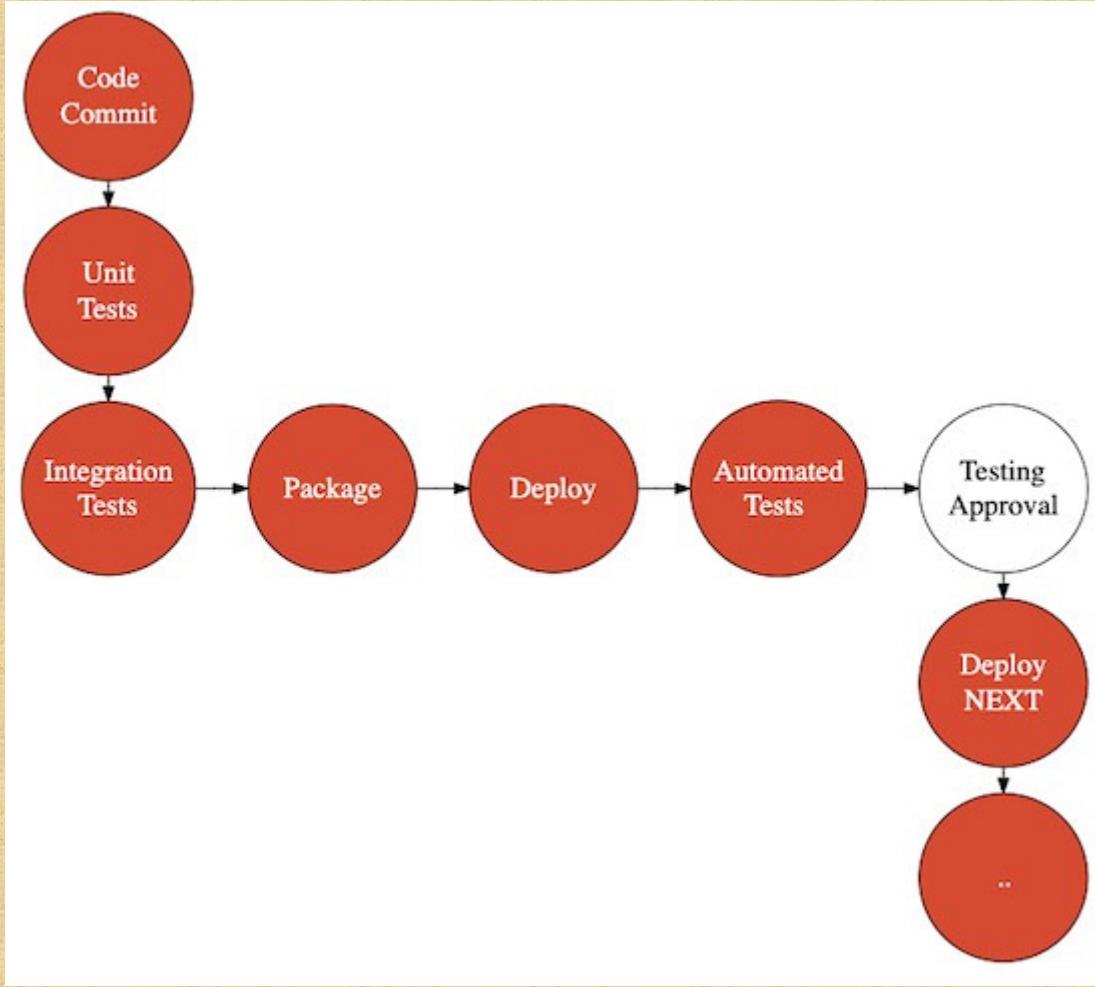
```
nholu@nholuongs-MacBook-Pro Github % git clone git@github.com:nholuongut/devops-for-beginners.git
Cloning into 'devops-for-beginners'...
cd devops-for-beginners
warning: You appear to have cloned an empty repository.
```



ANSIBLE DYNAMIC INVENTORY

Install boto3 and botocore

AZURE DEVOPS

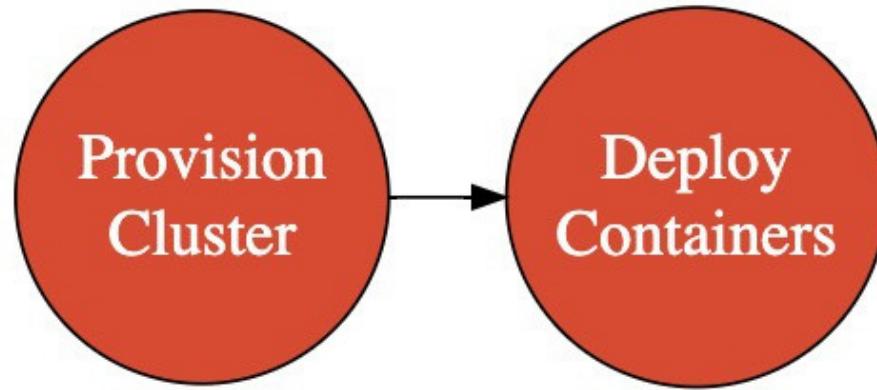


Continuous Delivery

PREREQUISITES

Azure Account
Visual Studio Code
Section : Docker

AZURE DEVOPS AZURE AKS WITH TERRAFORM

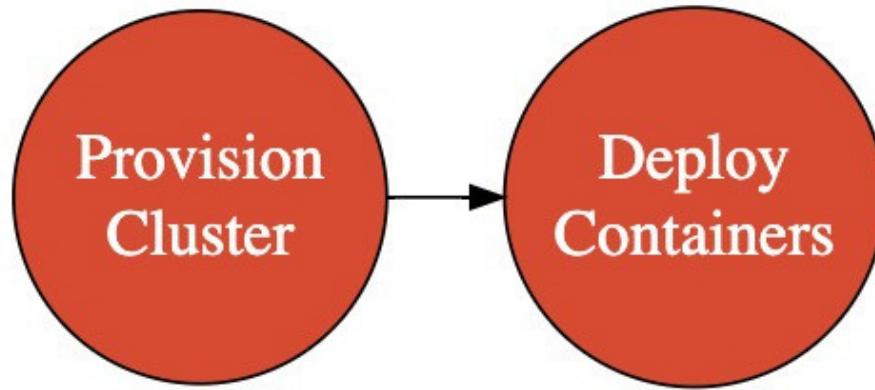


Azure K8S with Terraform

PREREQUISITES

Azure Account Visual
Studio Code Section :
Azure DevOps Section :
Docker Section :
Kubernetes Section :
Terraform

AZURE DEVOPS AWS EKS WITH TERRAFORM



AWS EKS (Kubernetes) with Terraform

PREREQUISITES

WARNING! NOT AWS FREE TIER!

Azure Account AWS Account

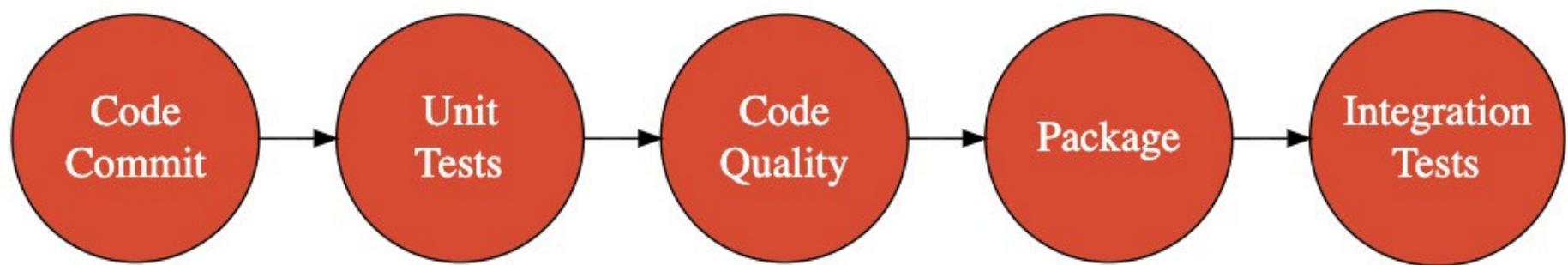
Visual Studio Code Section :

Azure DevOps Section : Docker

Section : Kubernetes Section :

Terraform

JENKINS

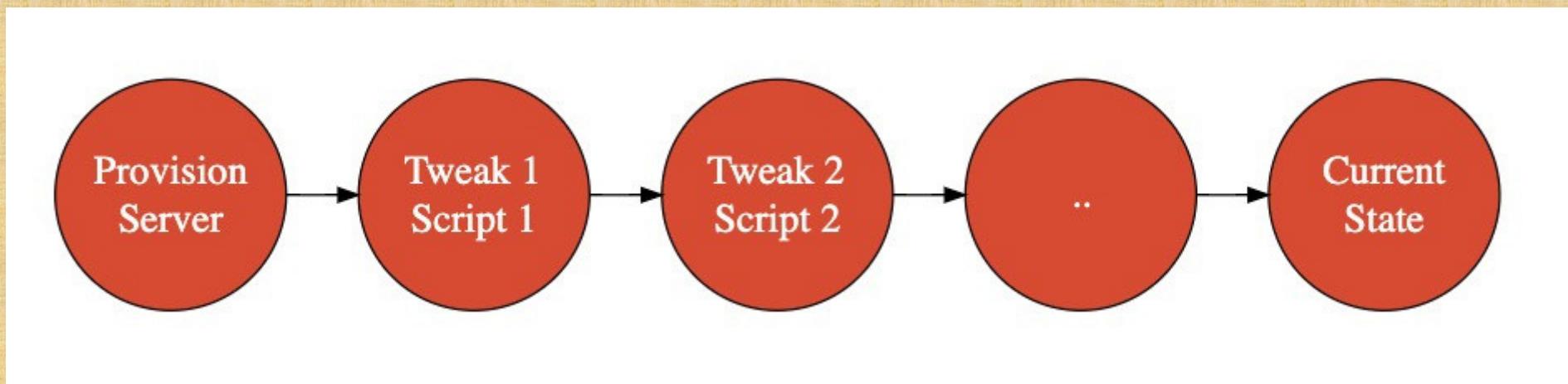


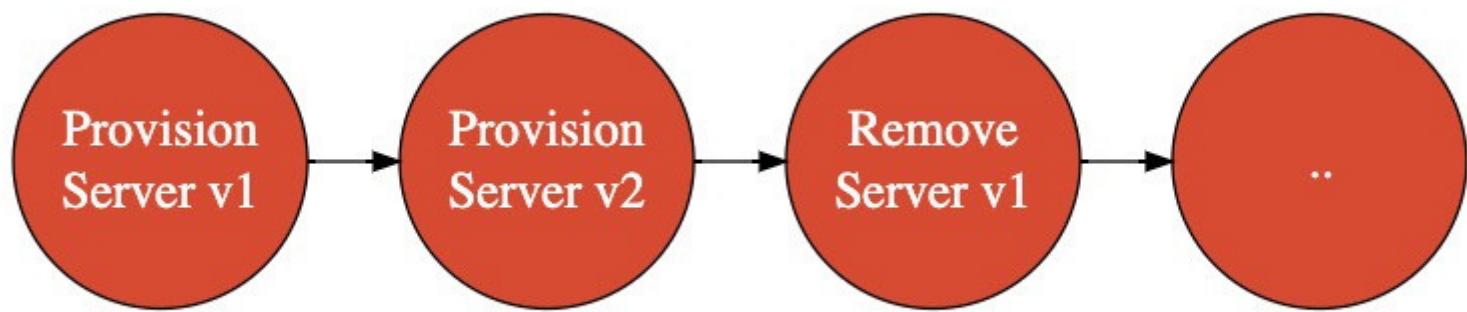
Continuous Integration

PREREQUISITES

Visual Studio Code
Section : Docker
Docker Compose

IMMUTABLE SERVERS



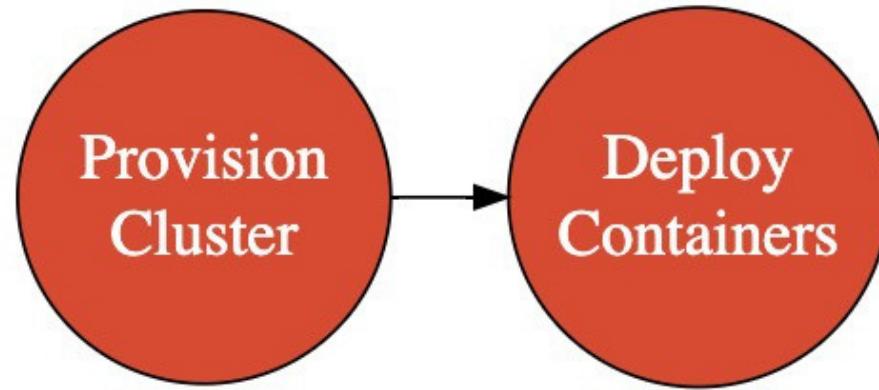


AZURE DEVOPS PIPELINES

01-first-azure-pipeline 02-understanding-stages 03-playing-with-environment-deployment 04-build-and-push-docker-image 05-azure-kubernetes-cluster-iaac-pipeline 06-azure-kubernetes-code-ci-cd-pipeline 07-aws-kubernetes-cluster-iaac-pipeline 08-aws-kubernetes-code-ci-cd-pipeline

AZURE DEVOPS PIPELINES

07-aws-kubernetes-cluster-iaac-pipeline
08-aws-kubernetes-code-ci-cd-pipeline



Kubernetes Clusters with Terraform

DEVOPS - CAMS

Culture
Automation
Measurement
Sharing

DEVOPS METRICS

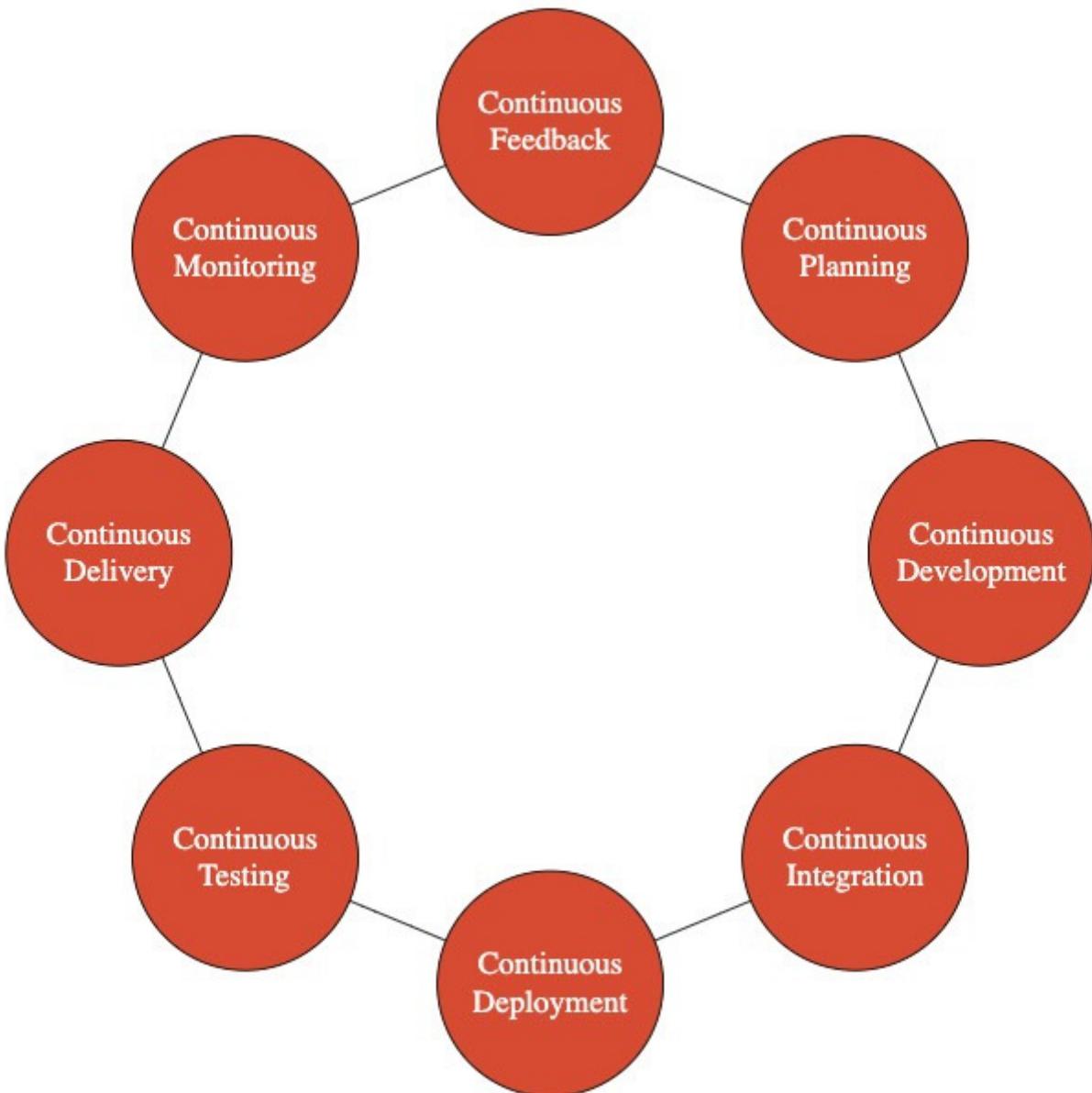
Deployment Frequency Time
To Market Failure Rate of
New Releases Lead Time to
Fixes Mean Time to Recovery

DEVOPS BEST PRACTICES

Standardization Teams with
Cross Function Skills Focus on
Culture Automate, Automate and
.. Immutable Infrastructure Dev
Prod Parity Version Control
Everything Self Provisioning

DEVOPS CULTURE

What would you do if something is difficult?
Focus on the End Goal
Continuous Improvements Culture of Learning and Sharing
Local Discoveries > Global Improvements



DEVOPS - 7Cs

DEVOPS Maturity Assessments

DEVOPS MATURITY SIGNALS

Development

Does every commit trigger automated tests and automated code quality checks?

Is your code continuously delivered to production?

Do you use pair programming?

Do you use TDD and BDD?

Do you have a lot of re-usable modules?

Can development teams self provision environments?

How long does it take to deliver a quick fix to production?

DEVOPS MATURITY SIGNALS

Test

Are your tests full automated with high quality production like test data?

Does your builds fail when your automated tests fail?

Are your testing cycles small?

Do you have automated NFR tests?

DEVOPS MATURITY SIGNALS

Deployment

Do you have Dev Prod Parity?

Do you use A/B Testing?

Do you use canary deployments?

Can you deploy at the click of a button?

Can you rollback at the click of a button?

Can you provision and release infrastructure at the click of a button?

Do you use IAC and version control your infrastructure?

DEVOPS MATURITY SIGNALS

Monitoring

Does the team use a centralized monitoring system?

Can development team get access to logs at the click of a button?

Does the team get an automated alert if something goes wrong in production?

DEVOPS MATURITY SIGNALS

Teams and Processes

Is the team looking to continuously improve?

Does the team have all the skills it needs from Business,
Development and Operations?

Does the team track the key DevOps metrics and improve on
them?

Do you have the culture of take Local Discoveries and using
them to make Global Improvements?

DEVOPS TRANSFORMATIONS

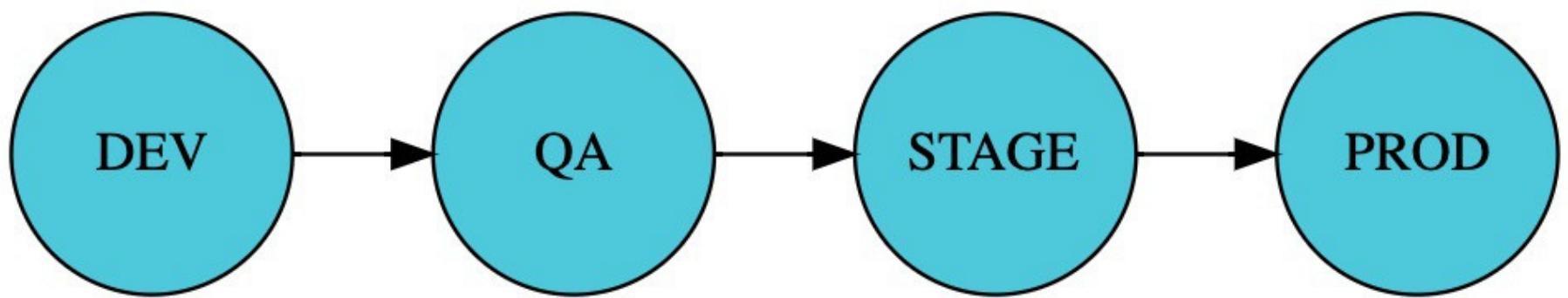
Leadership Buy-in is Critical
Involves Upfront Costs
Setup COEs to help teams Choose the right
application and team

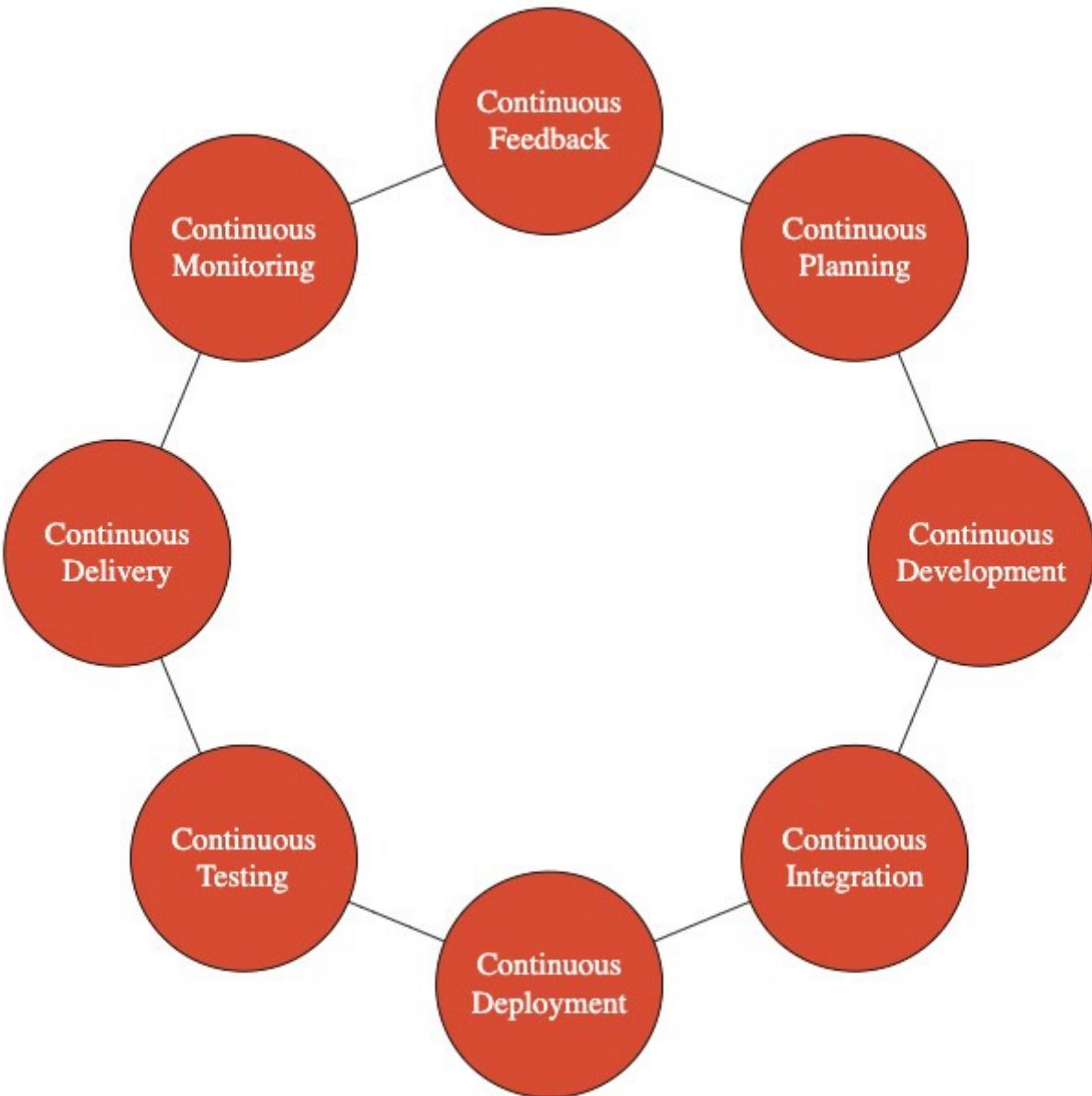
DEVOPS TRANSFORMATIONS

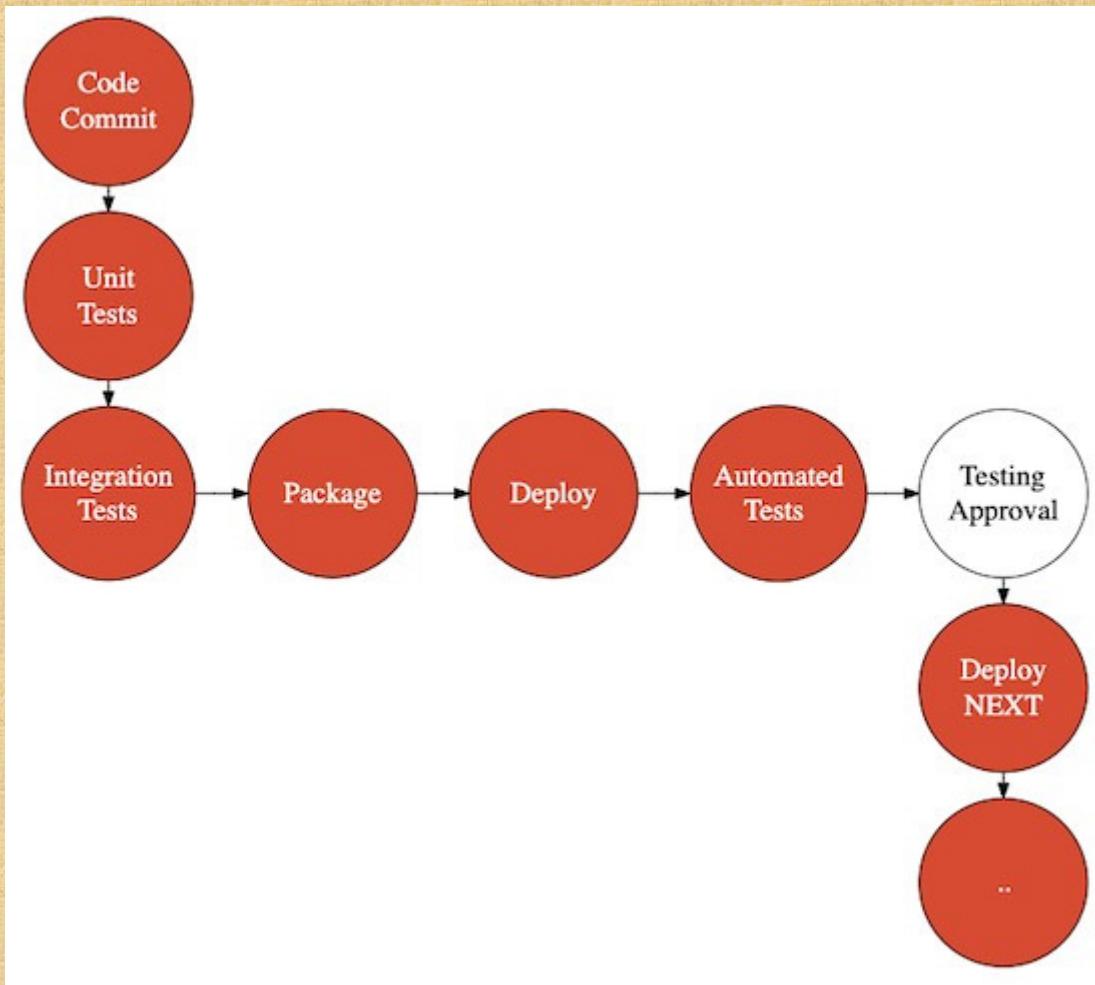
Start Small Sharing Learnings (Newsletters, Communication, COEs)

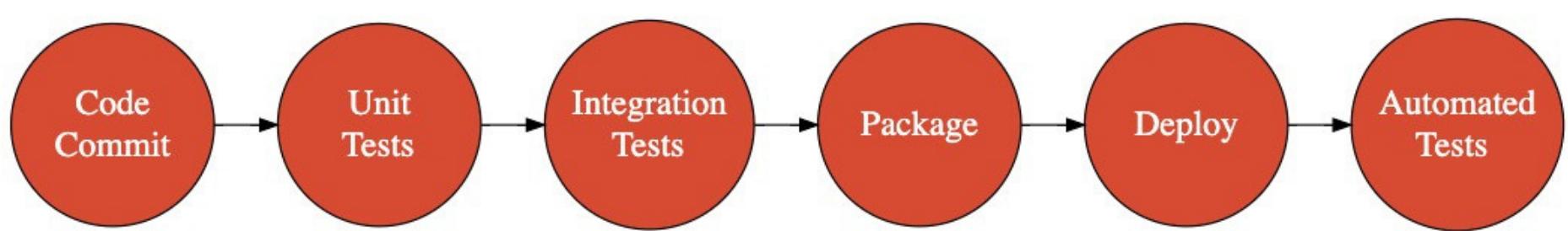
Encourage People with Exploration and Automation Mindset
Recognize DevOps Teams

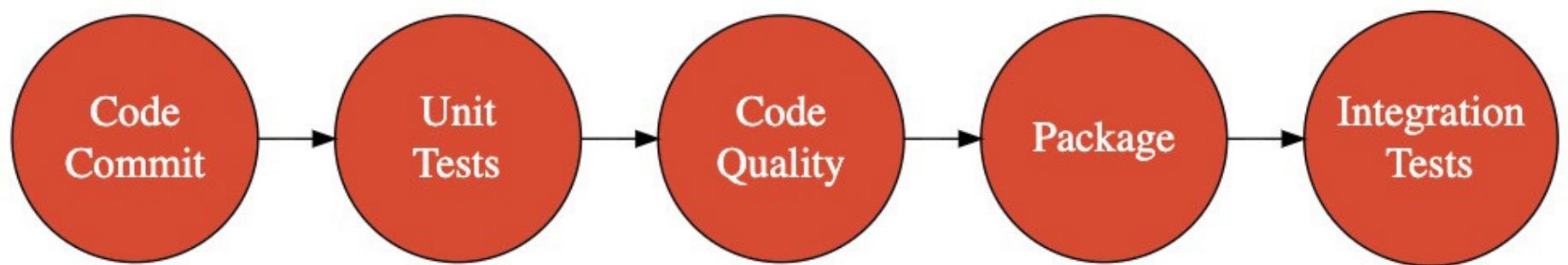
- 1 Basics and Best Practices of DevOps**
- 2 Build and Deploy Images with Docker**
- 3 Container Orchestration with Kubernetes**
- 4 Server Provisioning with Terraform**
- 5 Configuration Management with Ansible**
- 6 Azure Dev Ops - CI/CD with Pipelines**
- 7 Jenkins - CI/CD with Pipelines**

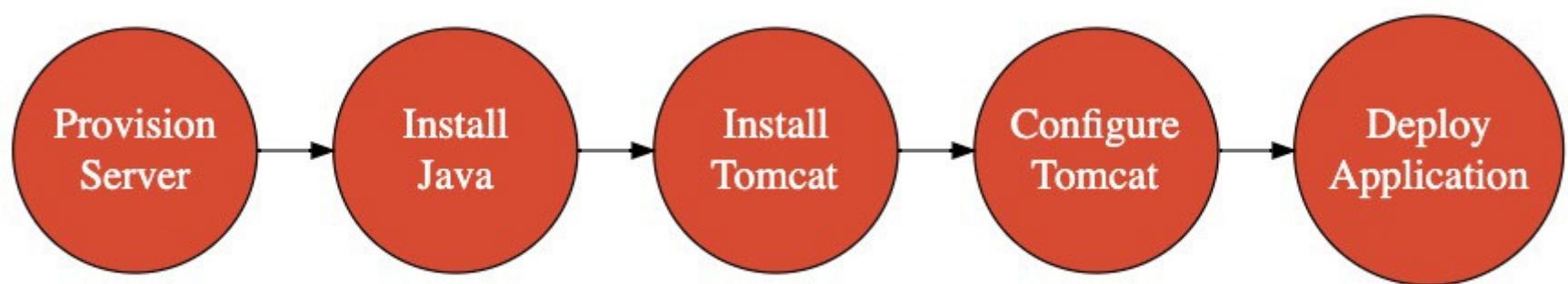


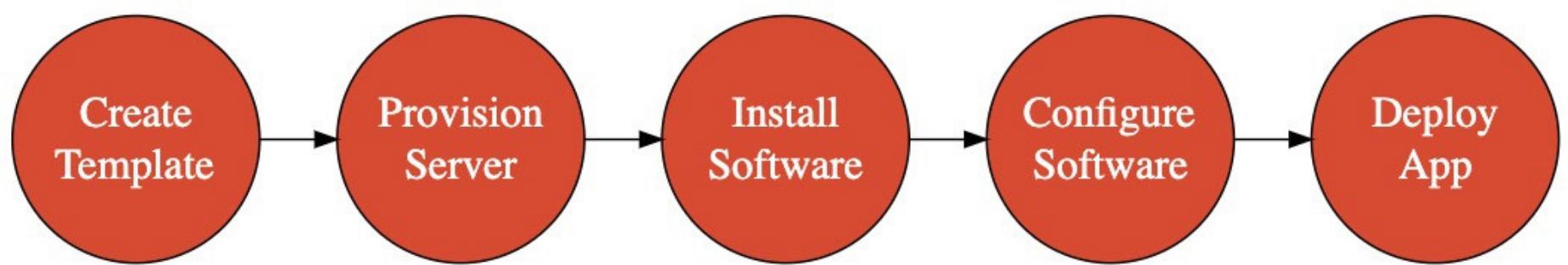


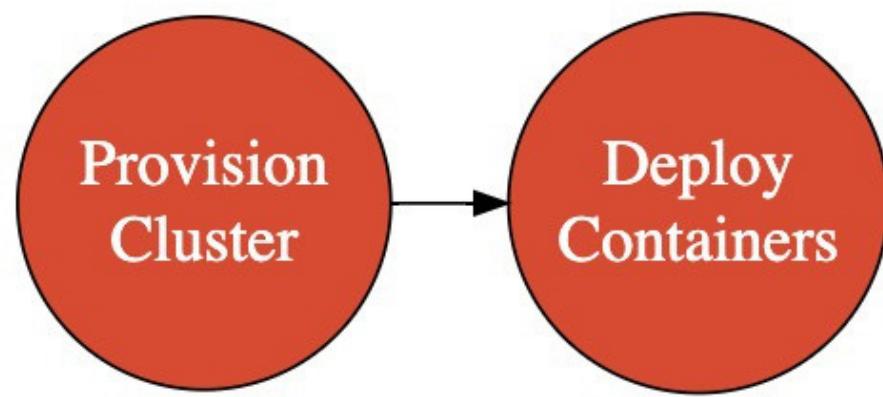














Thank You