

DEVOPS

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 - Gene Kim ,
Patrick Debois, Et al.*

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.

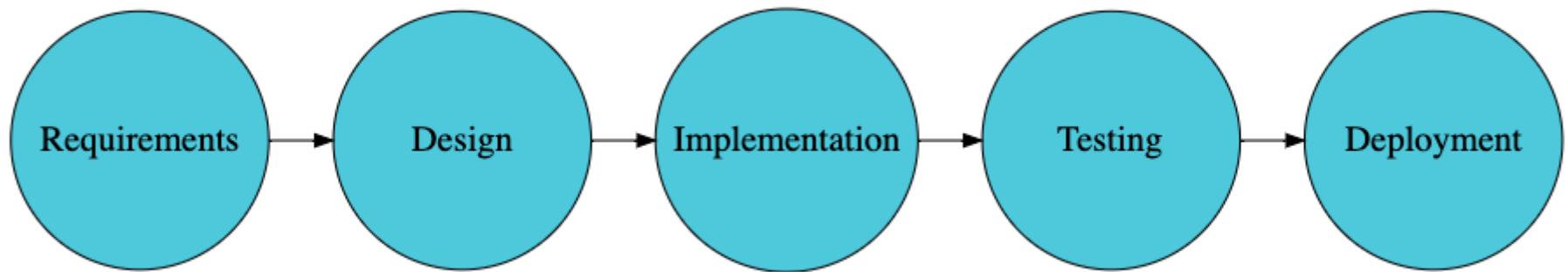
*The DevOps Handbook - Gene Kim ,
Patrick Debois, Et al.*

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 - Gene Kim ,
Patrick Debois, Et al.*

EVOLUTION TO DEVOPS

WATERFALL



Waterfall

3 KEYS
TO
GREAT SOFTWARE

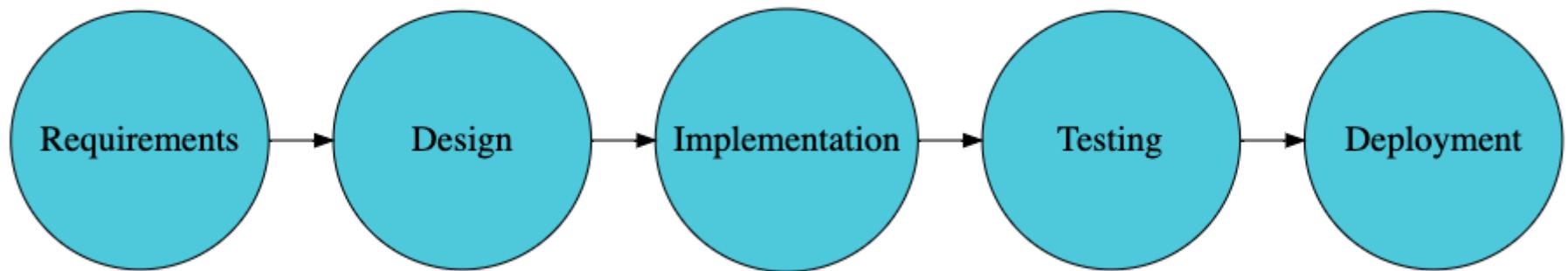
ENHANCED COMMUNICATION

Business

Development

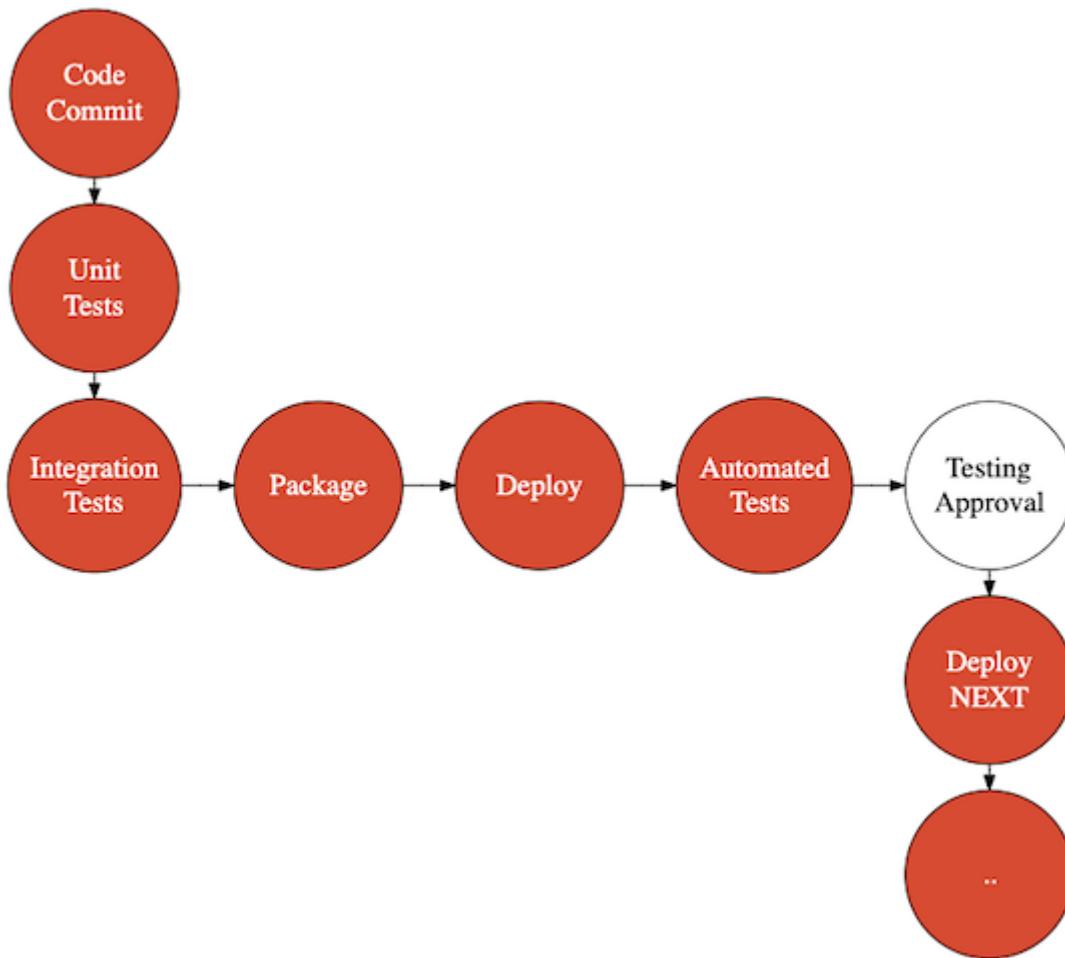
Operations

Teams

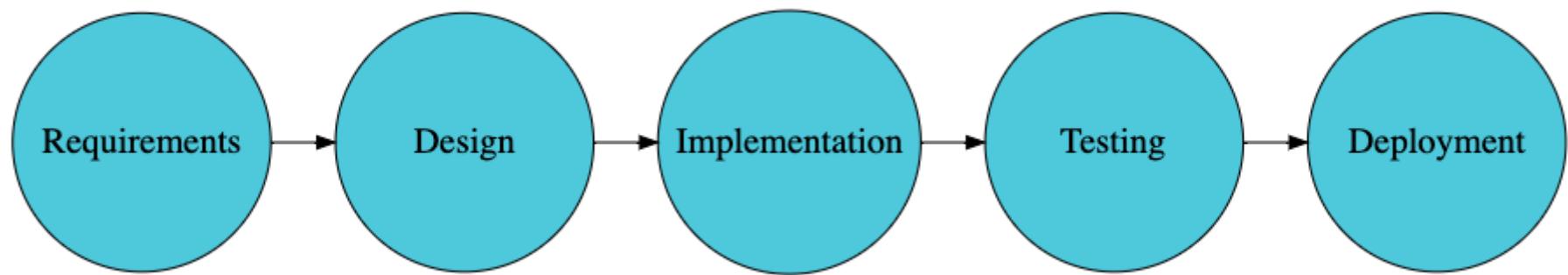


Waterfall

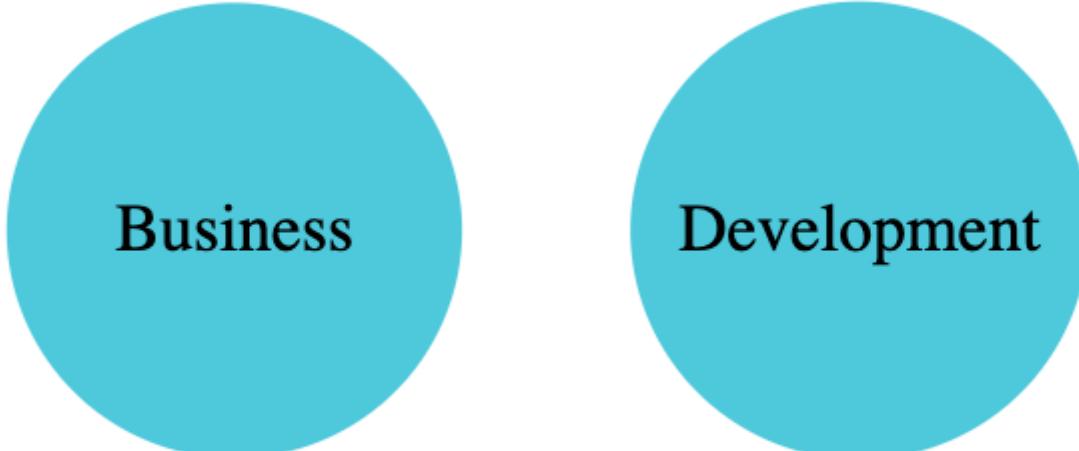
AUTOMATION



QUICK FEEDBACK



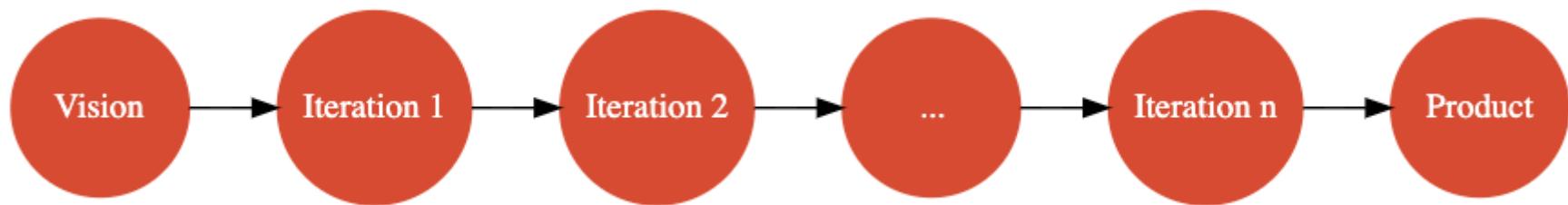
AGILE



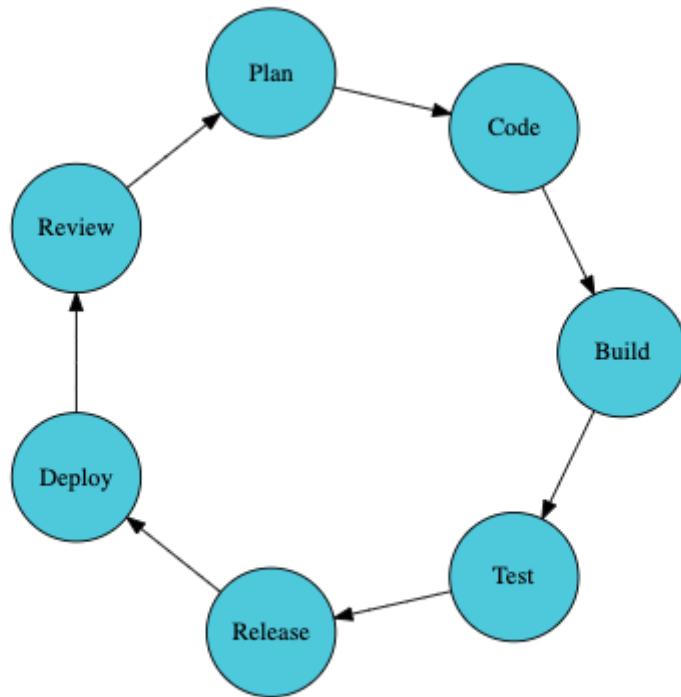
Business

Development

Agile - One Team

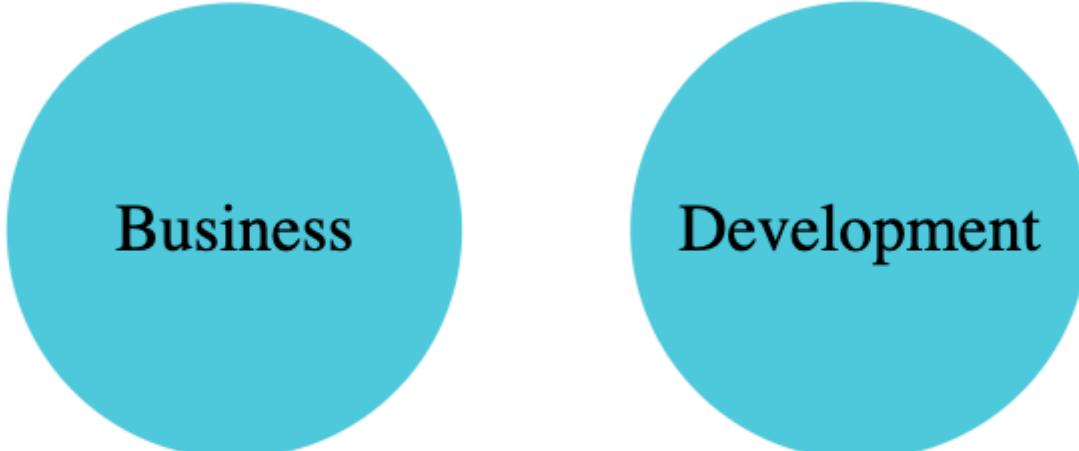


Agile - Short Iterations



Agile - Each Iteration

Enhanced Communication

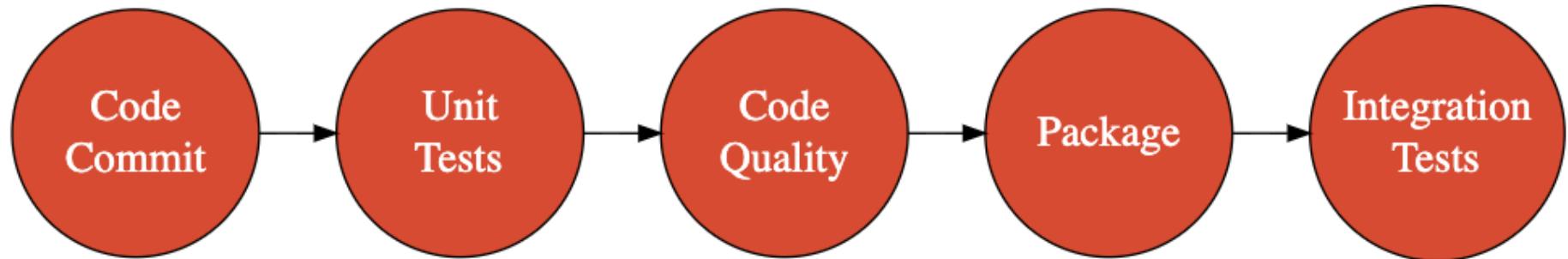


Business

Development

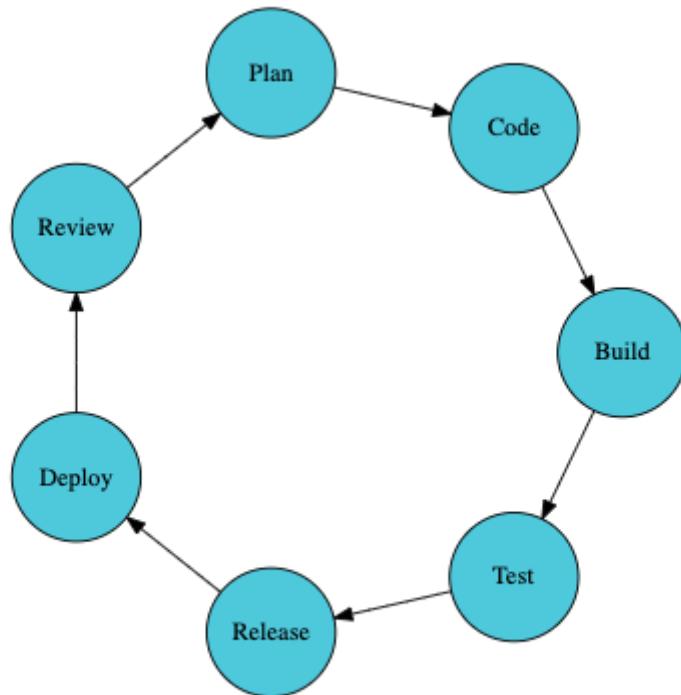
Agile - One Team

Automation

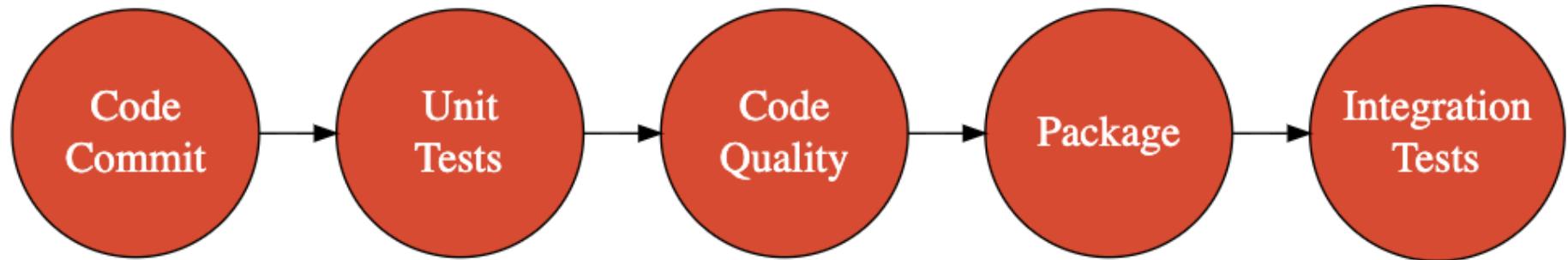


Agile Automation

Quick Feedback

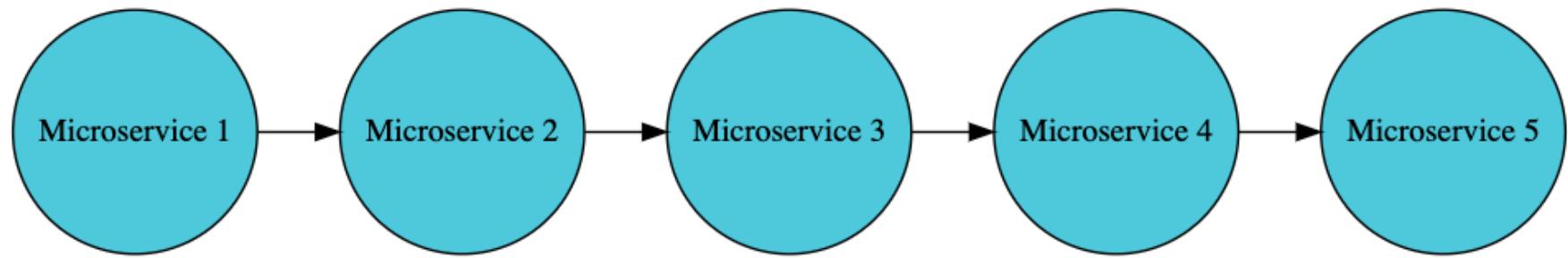


Agile - Retrospectives



Continuous Integration

NEW CHALLENGES



Microservices

DEVOPS

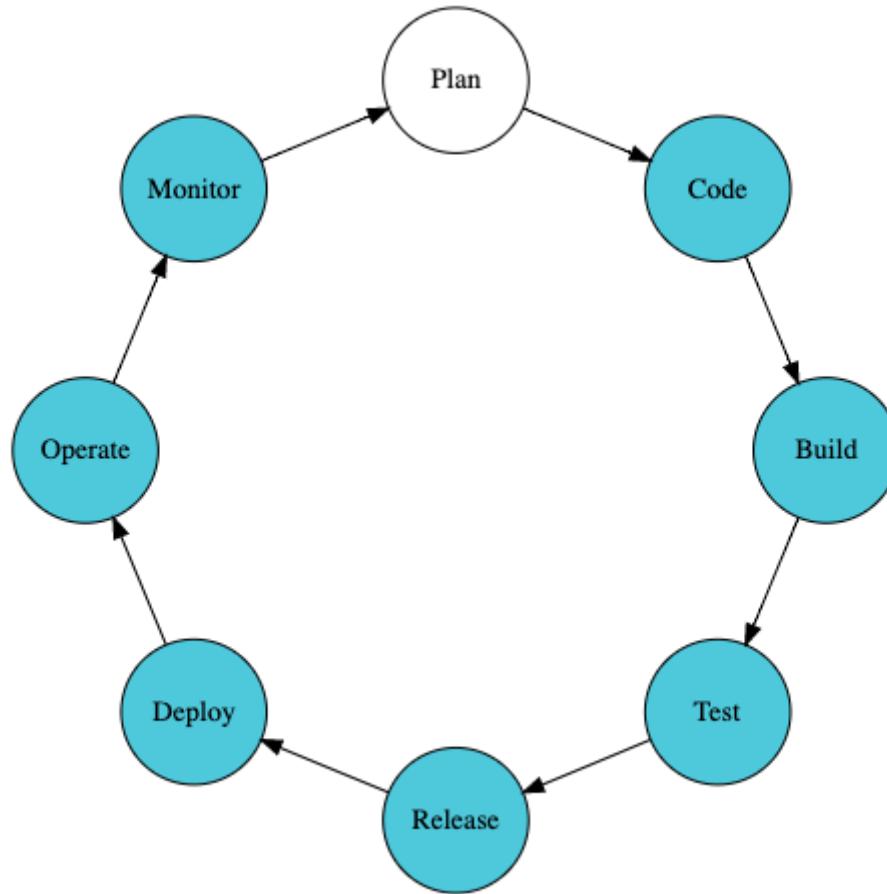


Business

Development

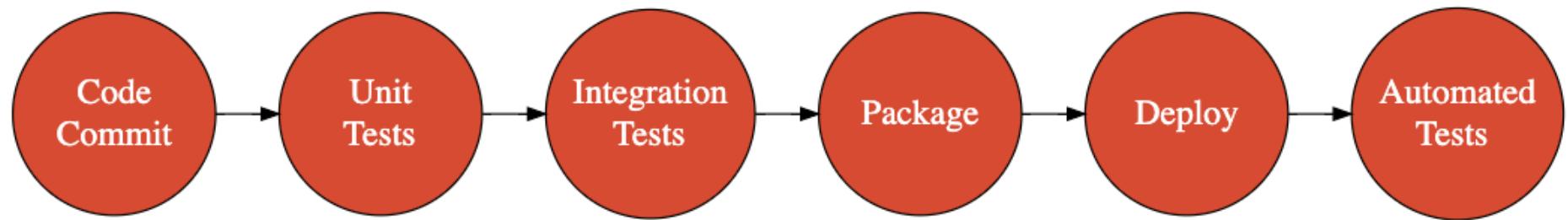
Operations

DevOps - Bring Teams Together

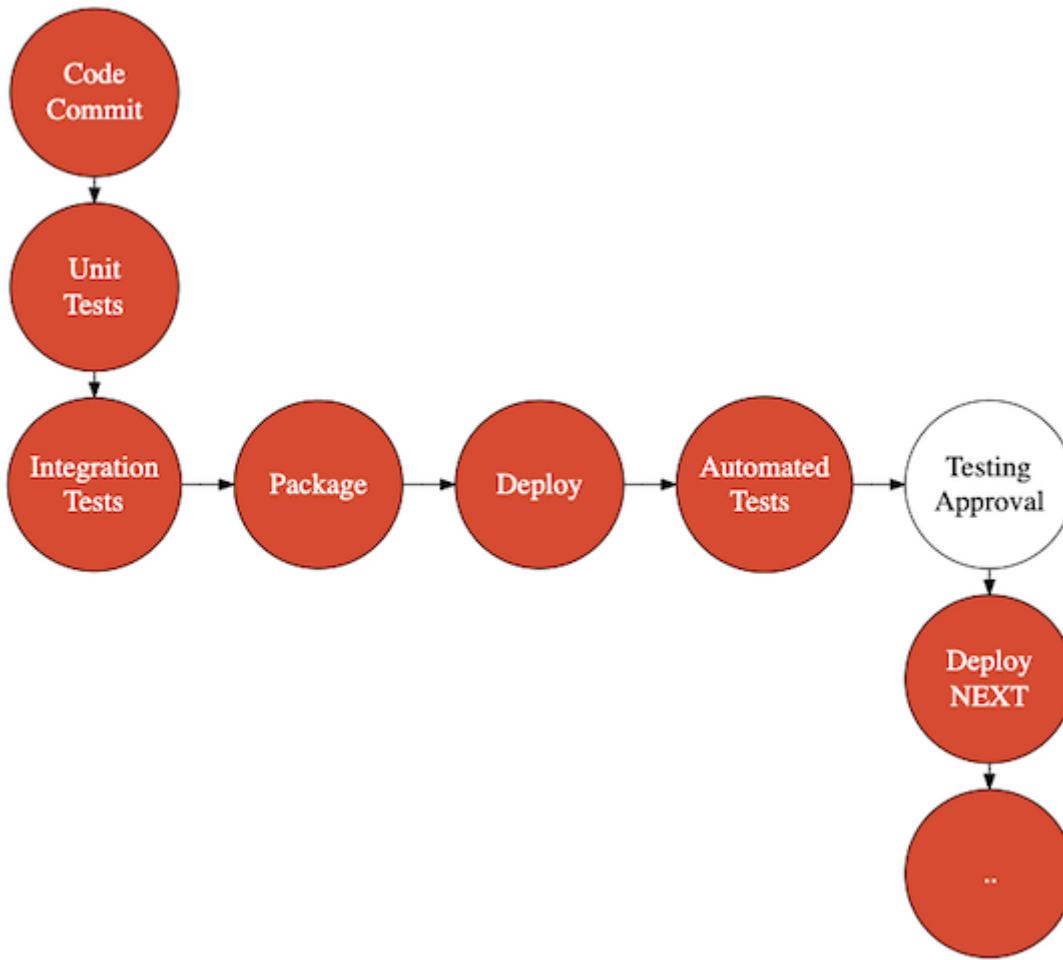


Each Iteration

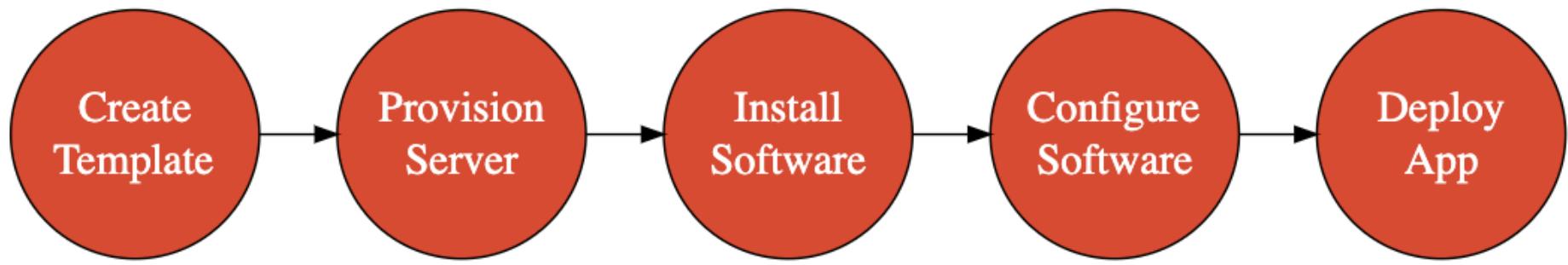
AUTOMATION



Continuous Deployment



Continuous Delivery



IAC - Automate Operations

QUICK FEEDBACK

AGILE AND DEVOPS

DEVOPS

Bring Down the Wall



People

Process

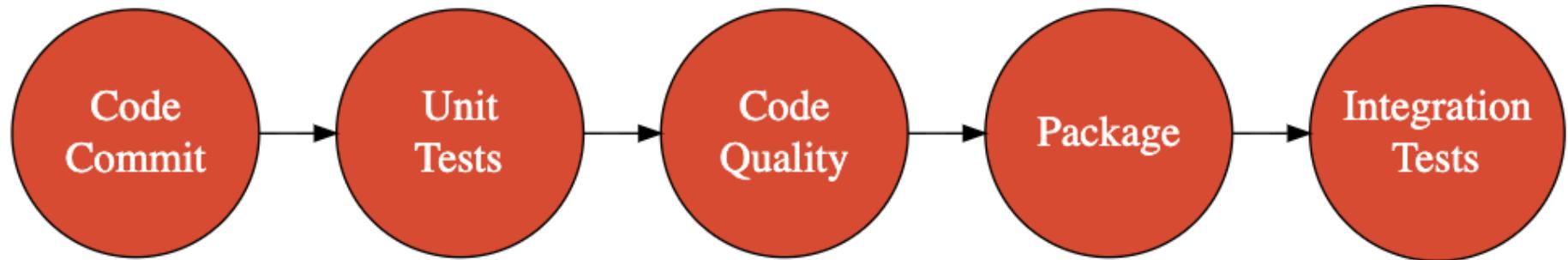
Products

Business

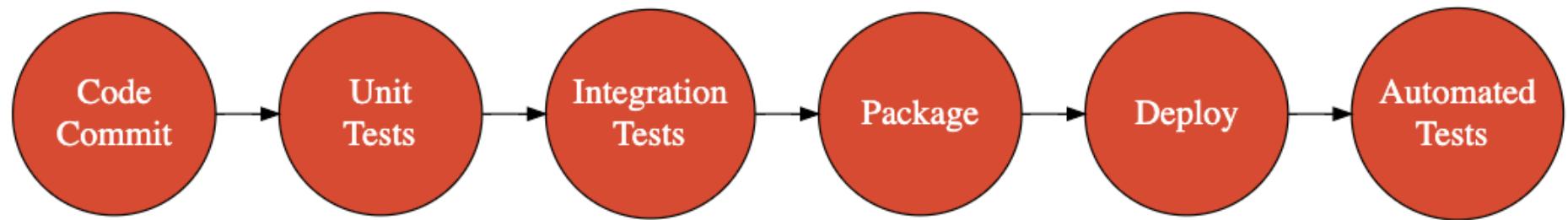
Development

Operations

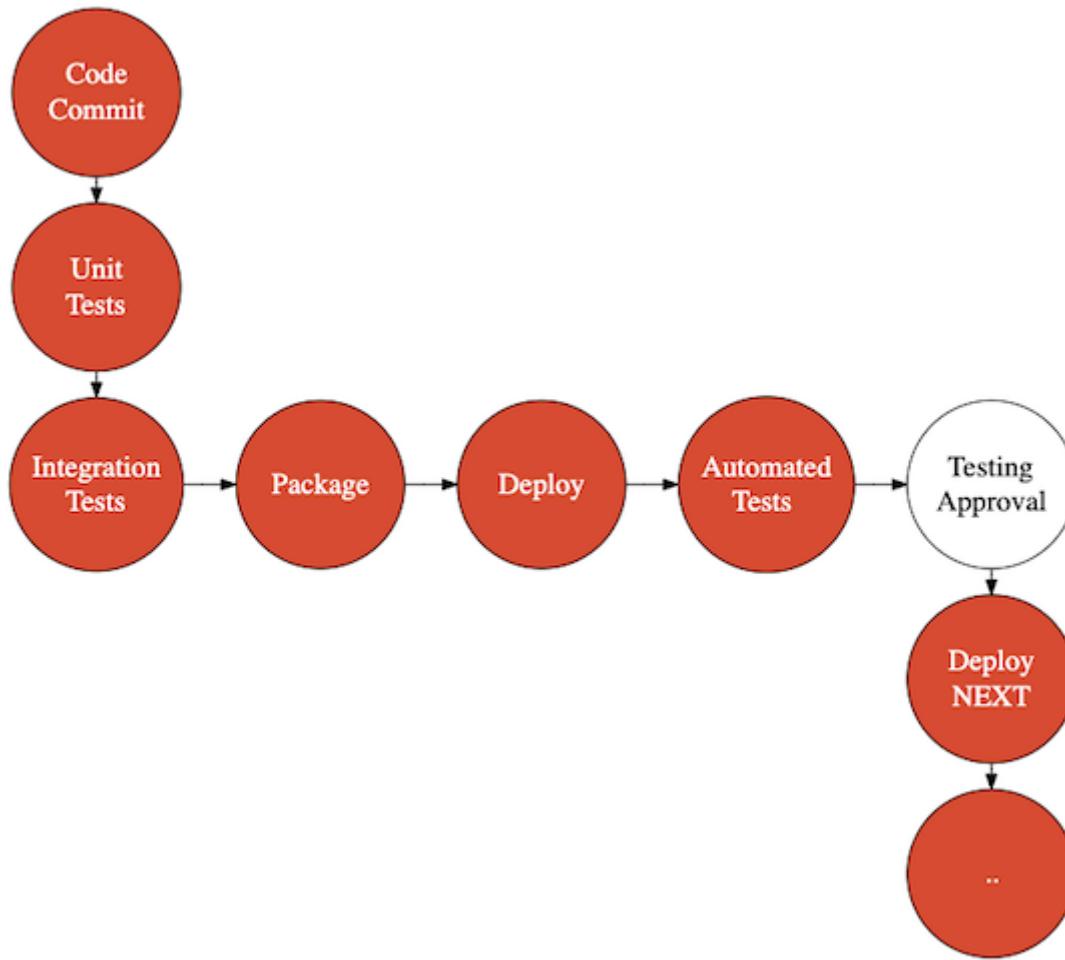
CI CD CD



Continuous Integration

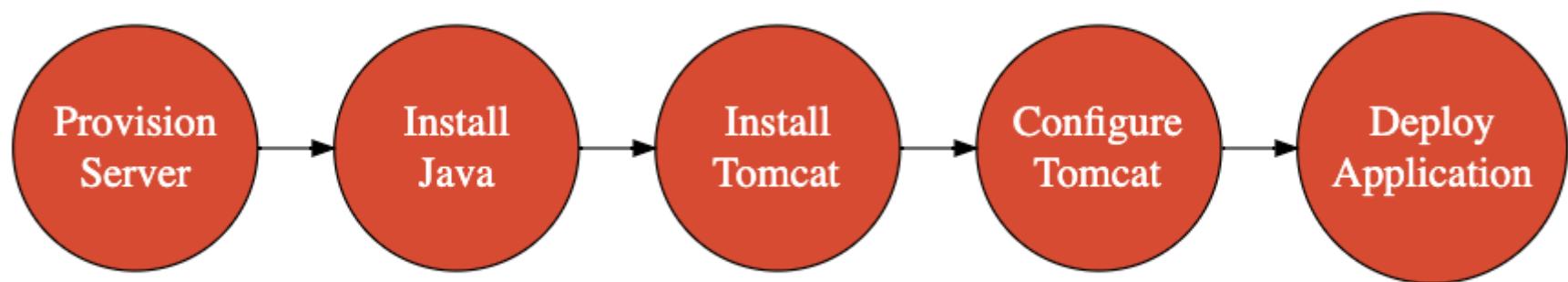


Continuous Deployment

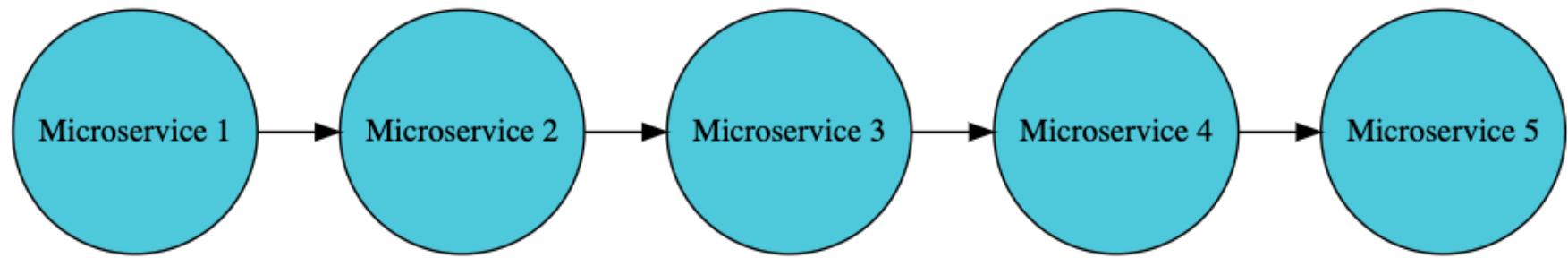


Continuous Delivery

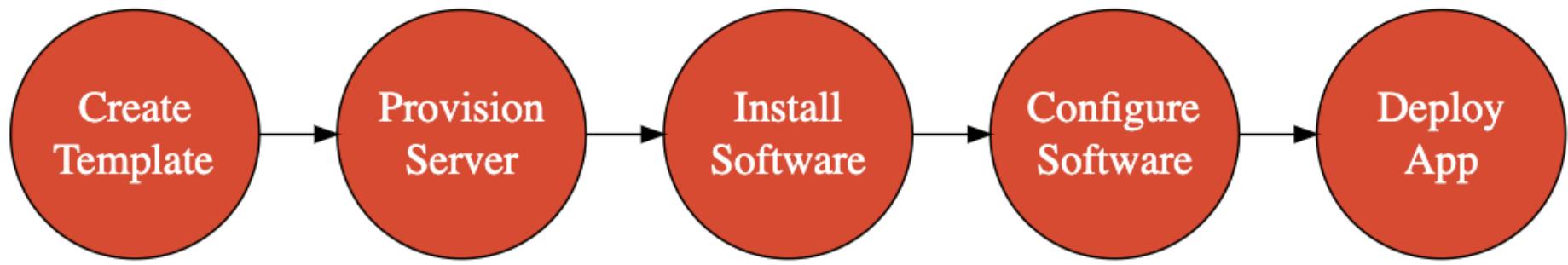
INFRASTRUCTURE AS CODE



Manual Approach



Microservices



Infrastructure as Code

ADVANTAGES

Enable Self Provisioning

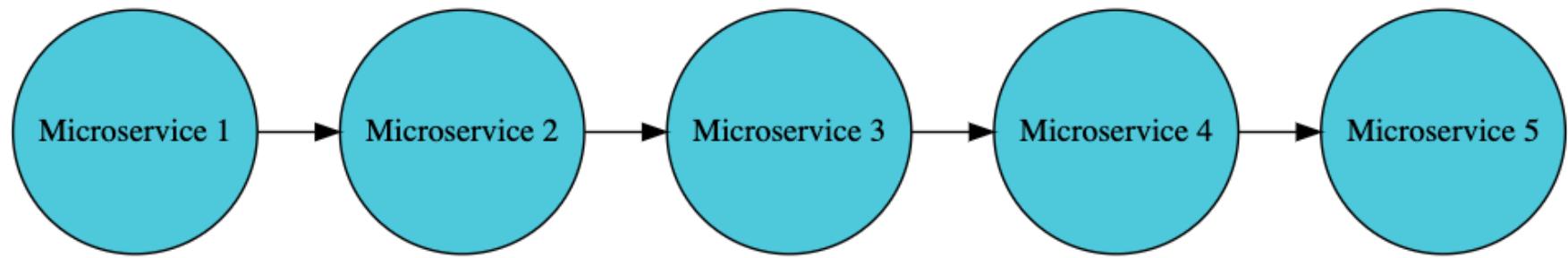
Infra Team can focus on Value Added Work

Consistent Servers

Less Errors

Quick Recovery From Failures

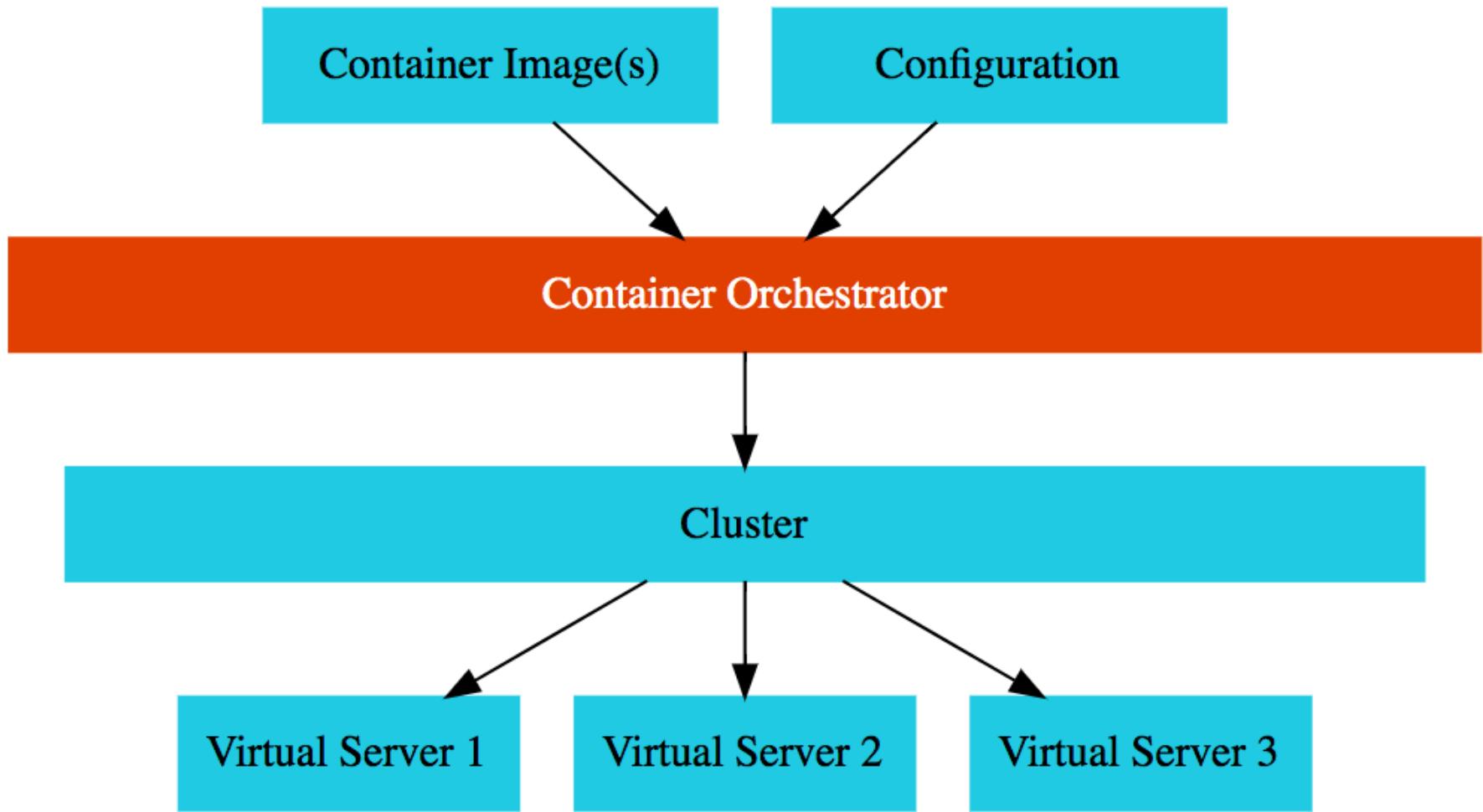
CONTAINERIZATION

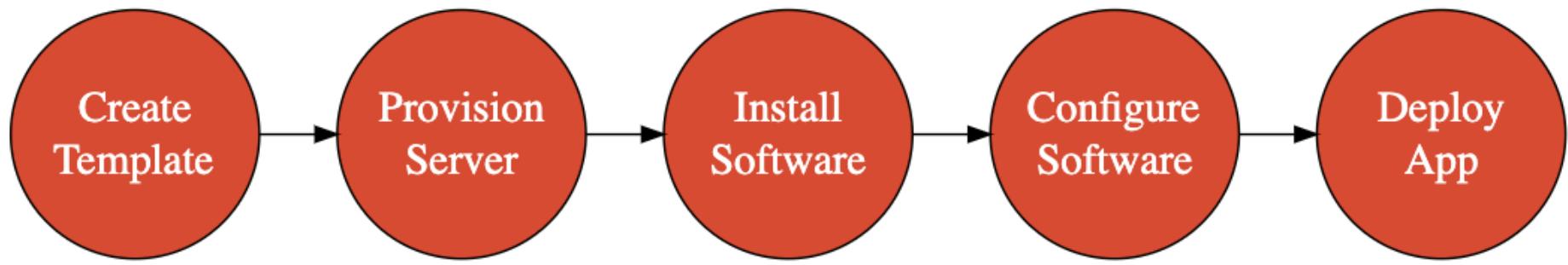


Microservices

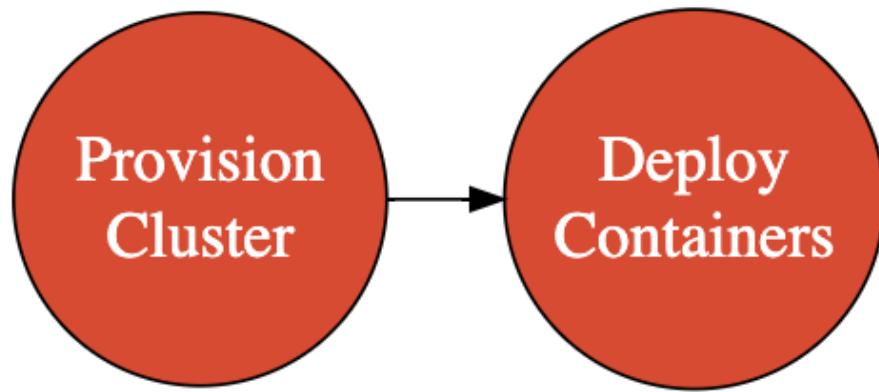


Containers



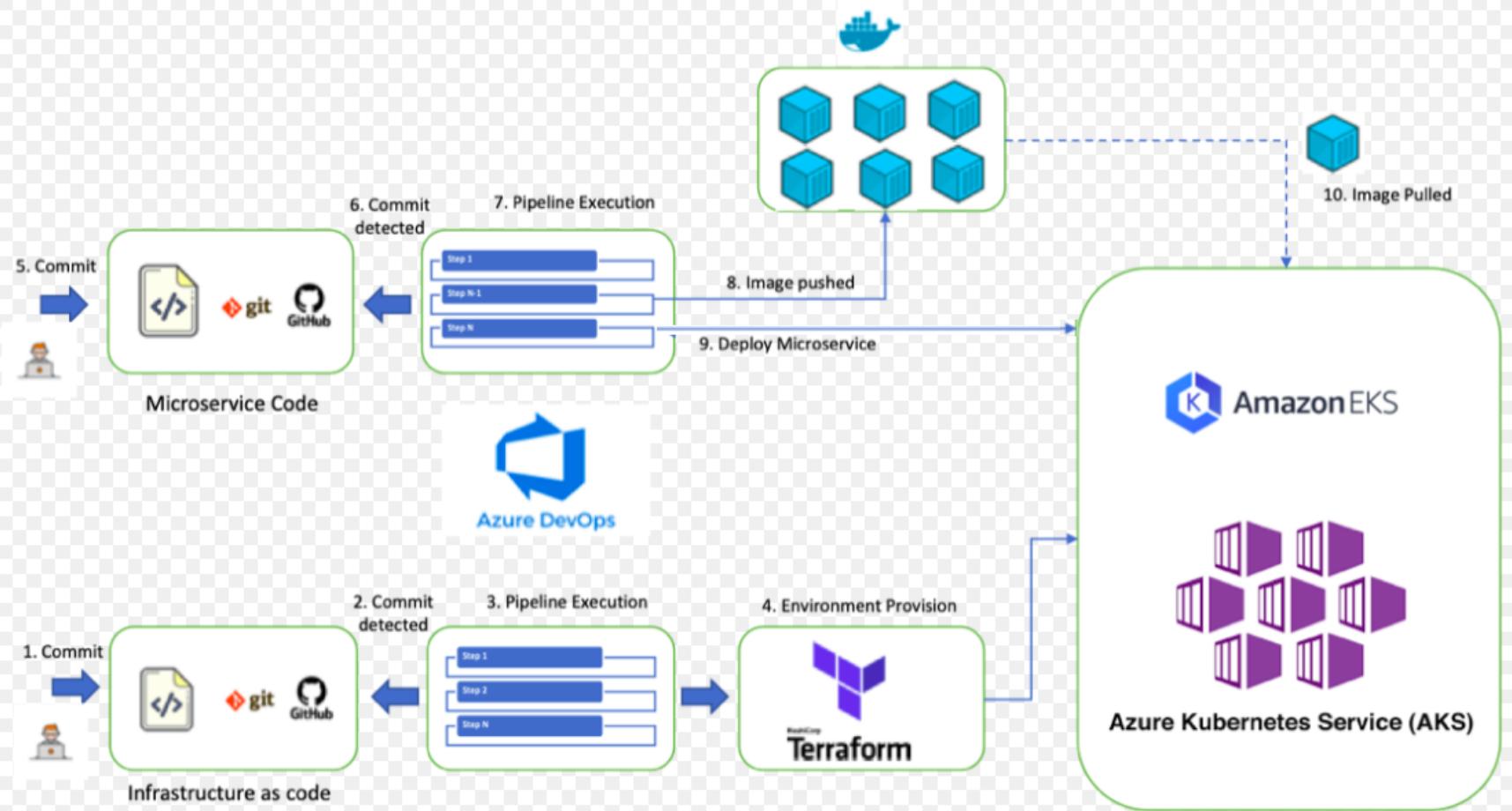


Infrastructure as Code



Infrastructure as Code - Containers

6 DEVOPS TOOLS



2 Example DevOps Use Cases

In28Minutes

DevOps

Master Class

- 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

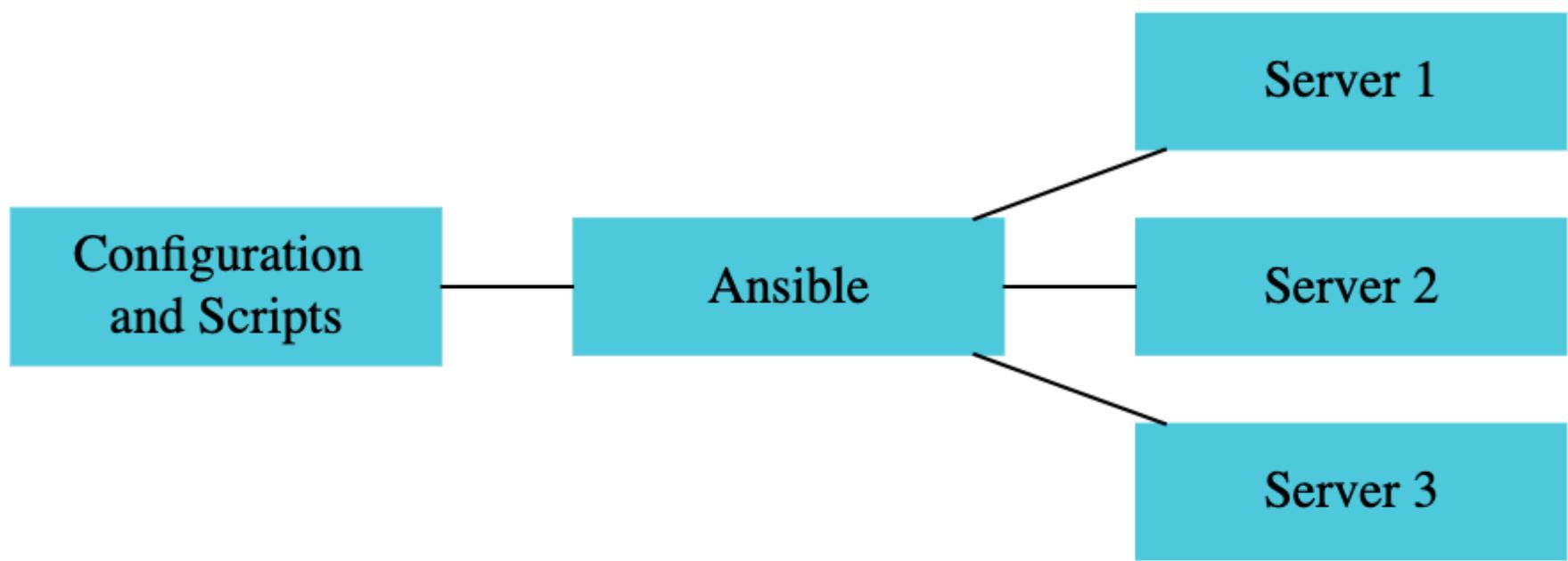
- Multiple DevOps Tools
- 3 Clouds
- Constant Evolution
- No Perfect Tool Set

IAC BEST PRACTICES

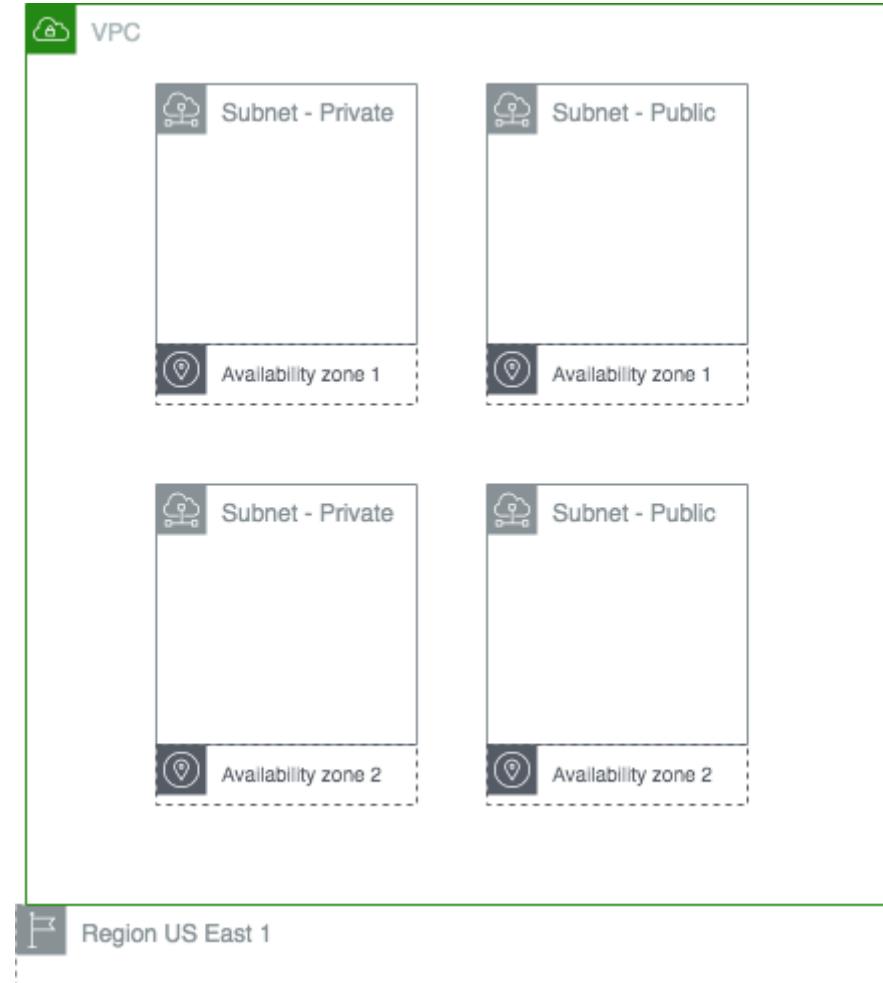
- Self Provisioning
- Treat Servers as Disposable
- Do not do anything manually
- Version Your Infrastructure Code
- Do incremental changes
- Zero Downtime Upgrades

DOCKER

Master DevOps







Docker
Software

DevOps
Topic

+ Add comparison

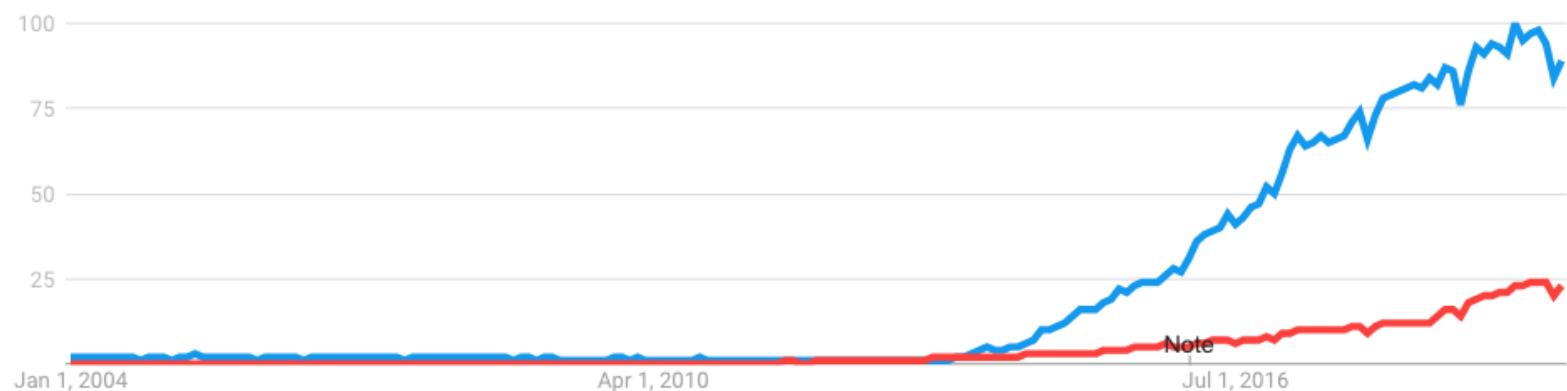
Worldwide ▾

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

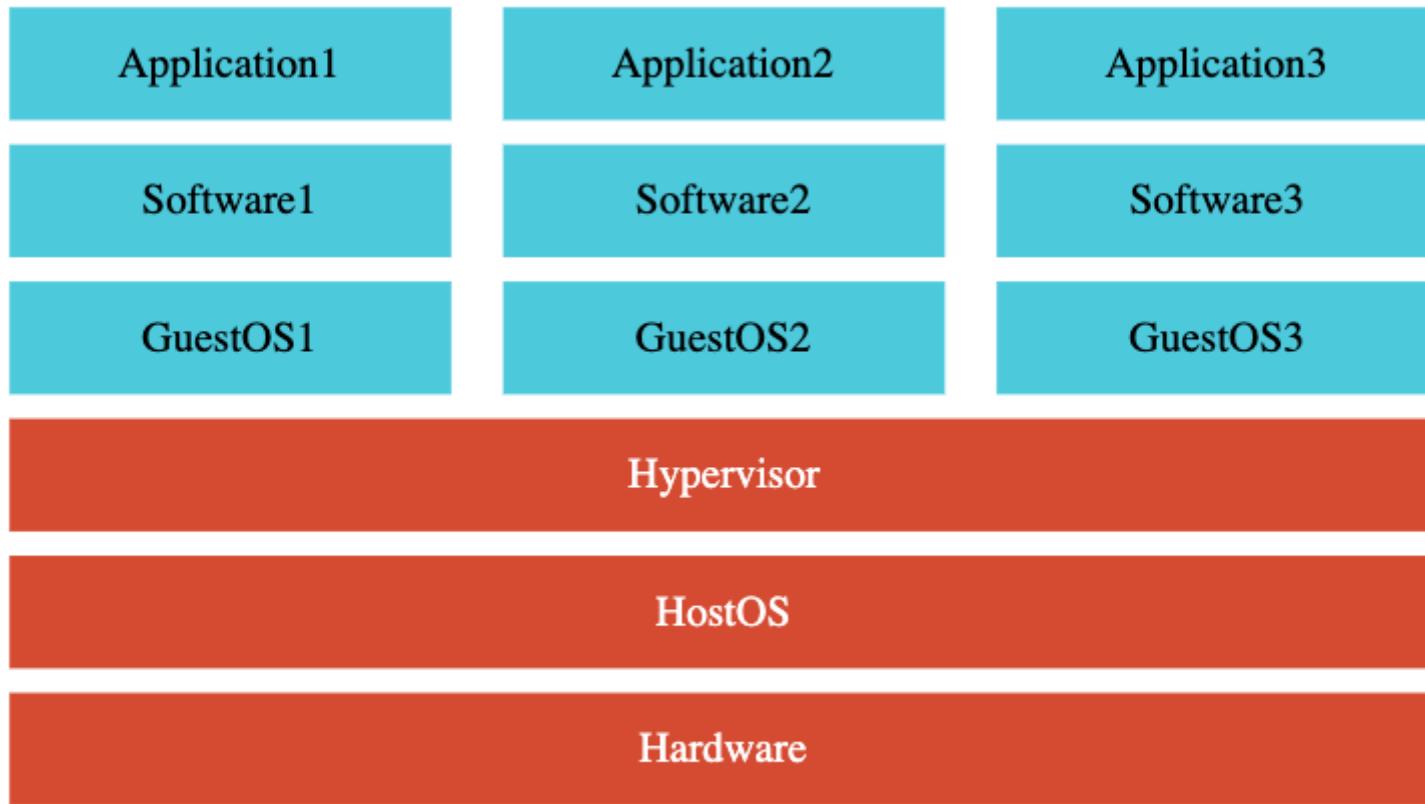
Applications

Software

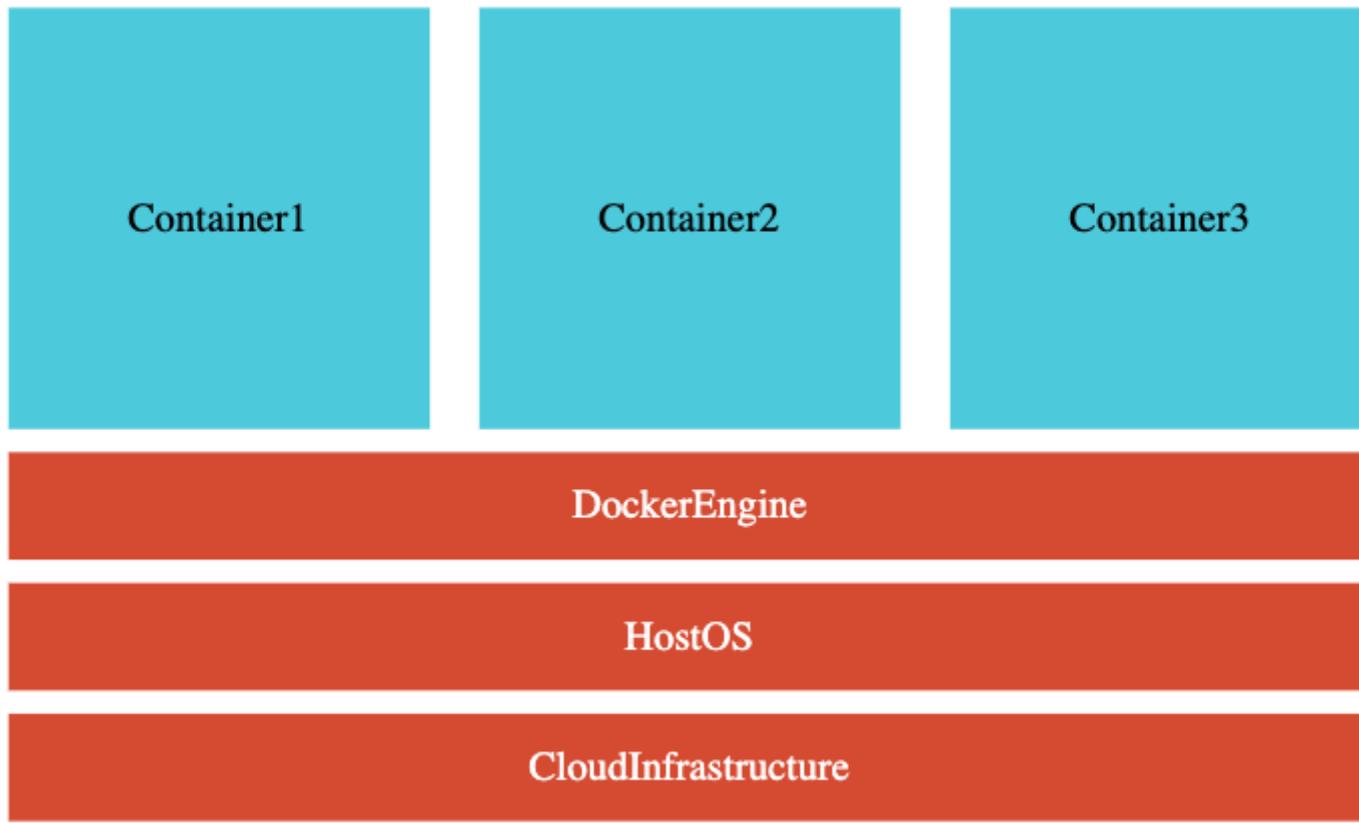
OS

Hardware

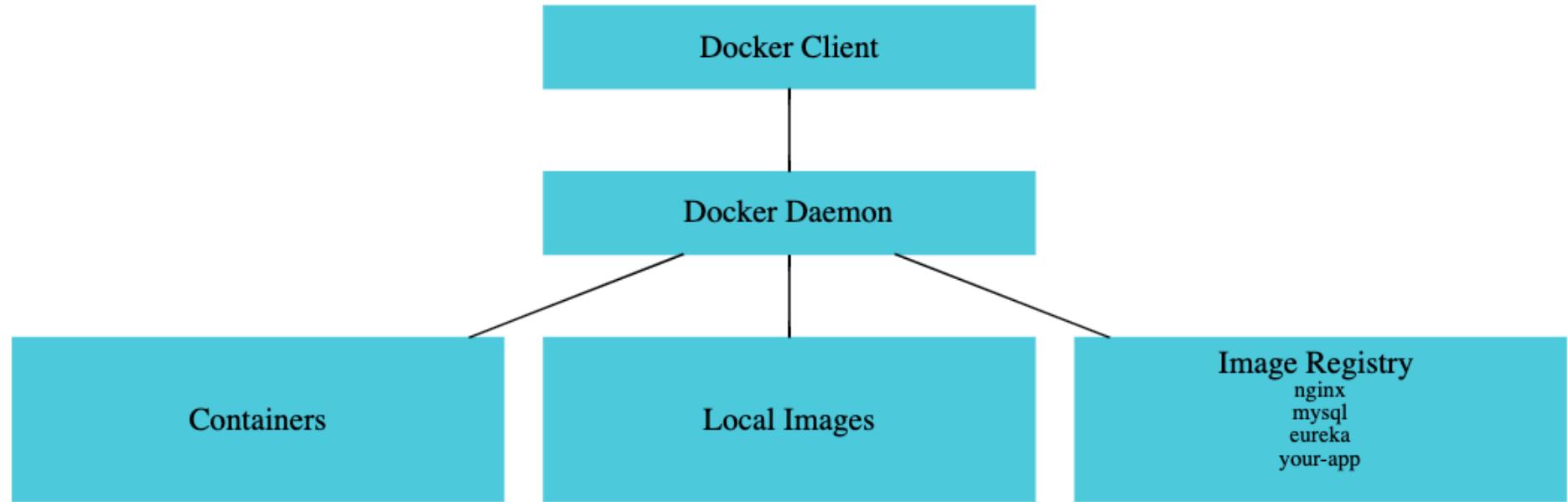
Traditional Deployment



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

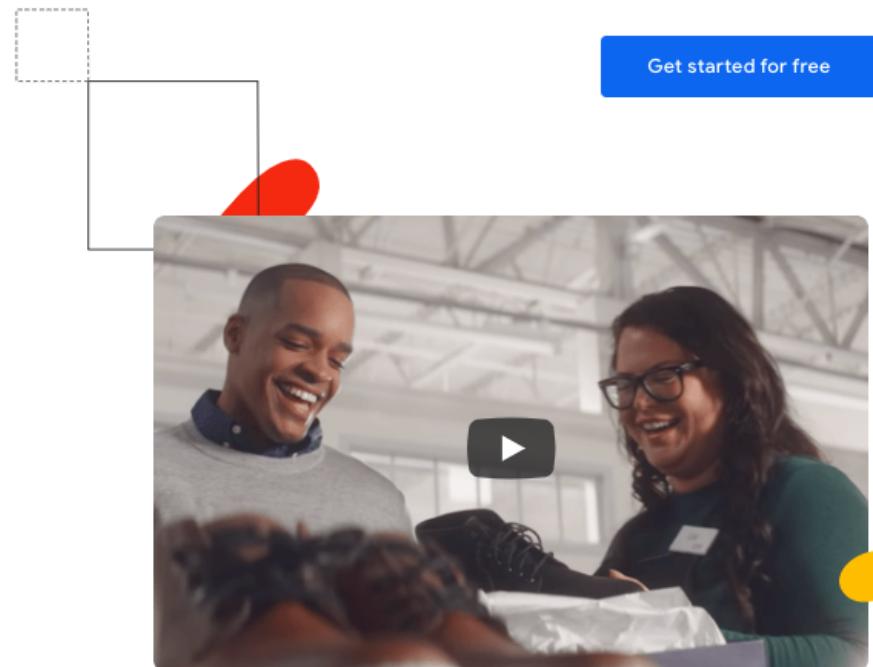
KUBERNETES - FUN FACTS

- K8S
- KOO - BER - NET - EEZ
- Logo - Helmsman
- Kubernetes on Cloud
 - AKS, Amazon EKS and GKE



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CUSTOMER STORIES

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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

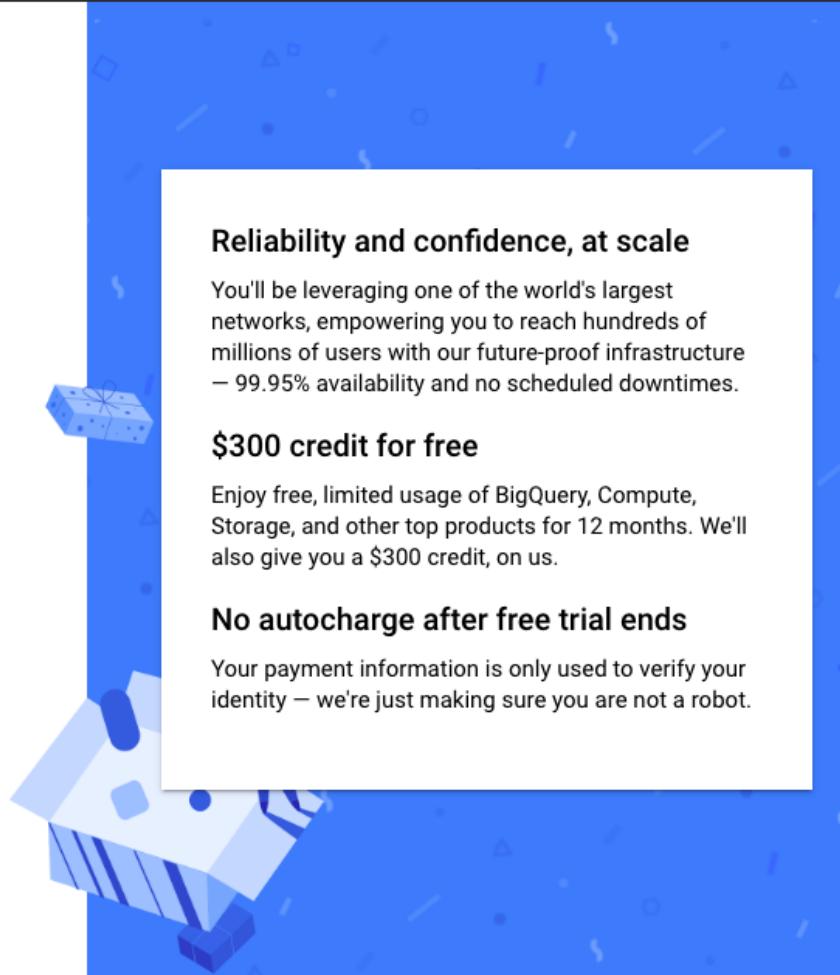
India

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



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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 



Name and address



Ranga Karanam

101, Rac

Hyderabad,

India

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



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



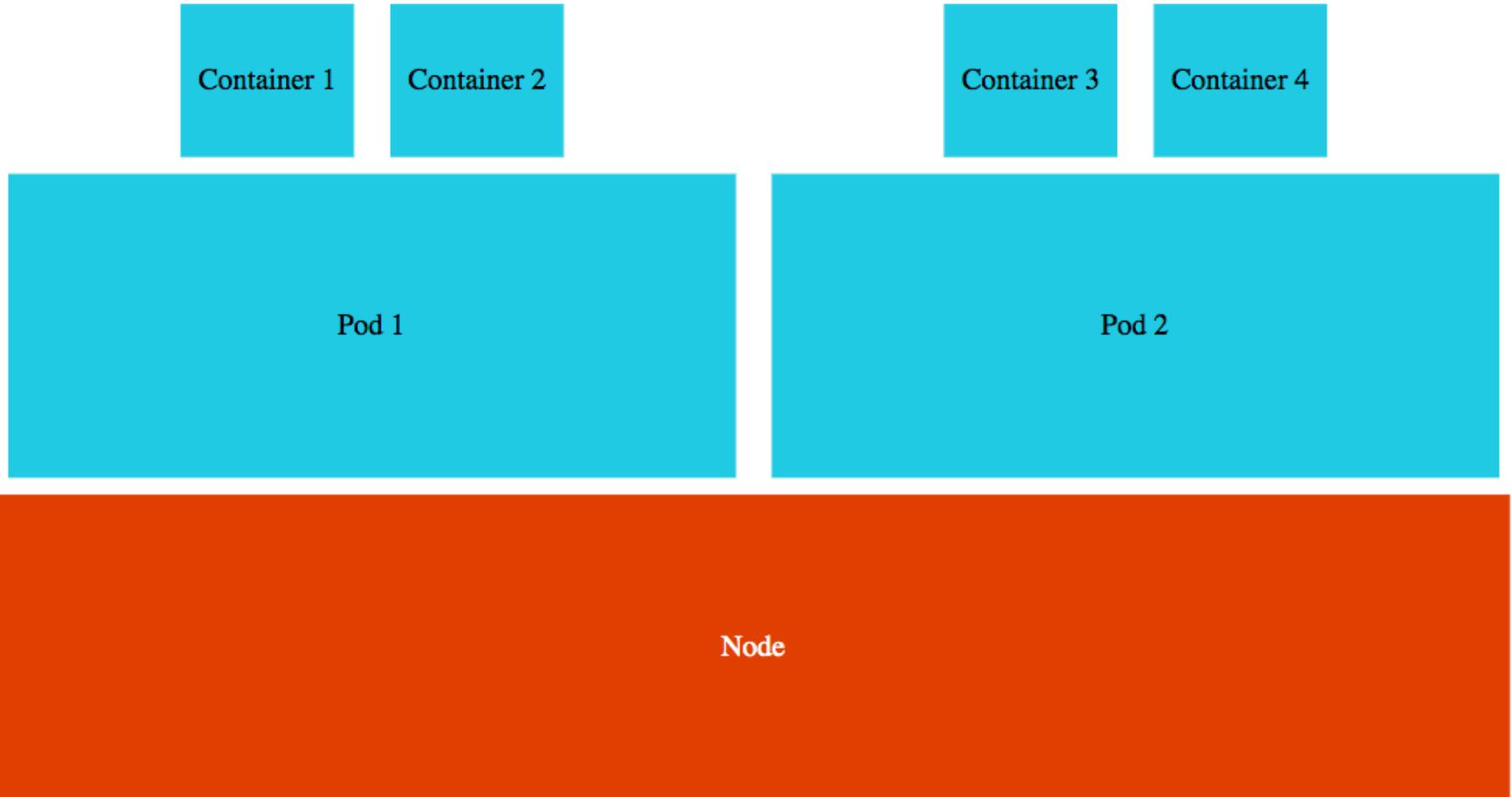
Google Cloud Platform

Welcome Ranga!

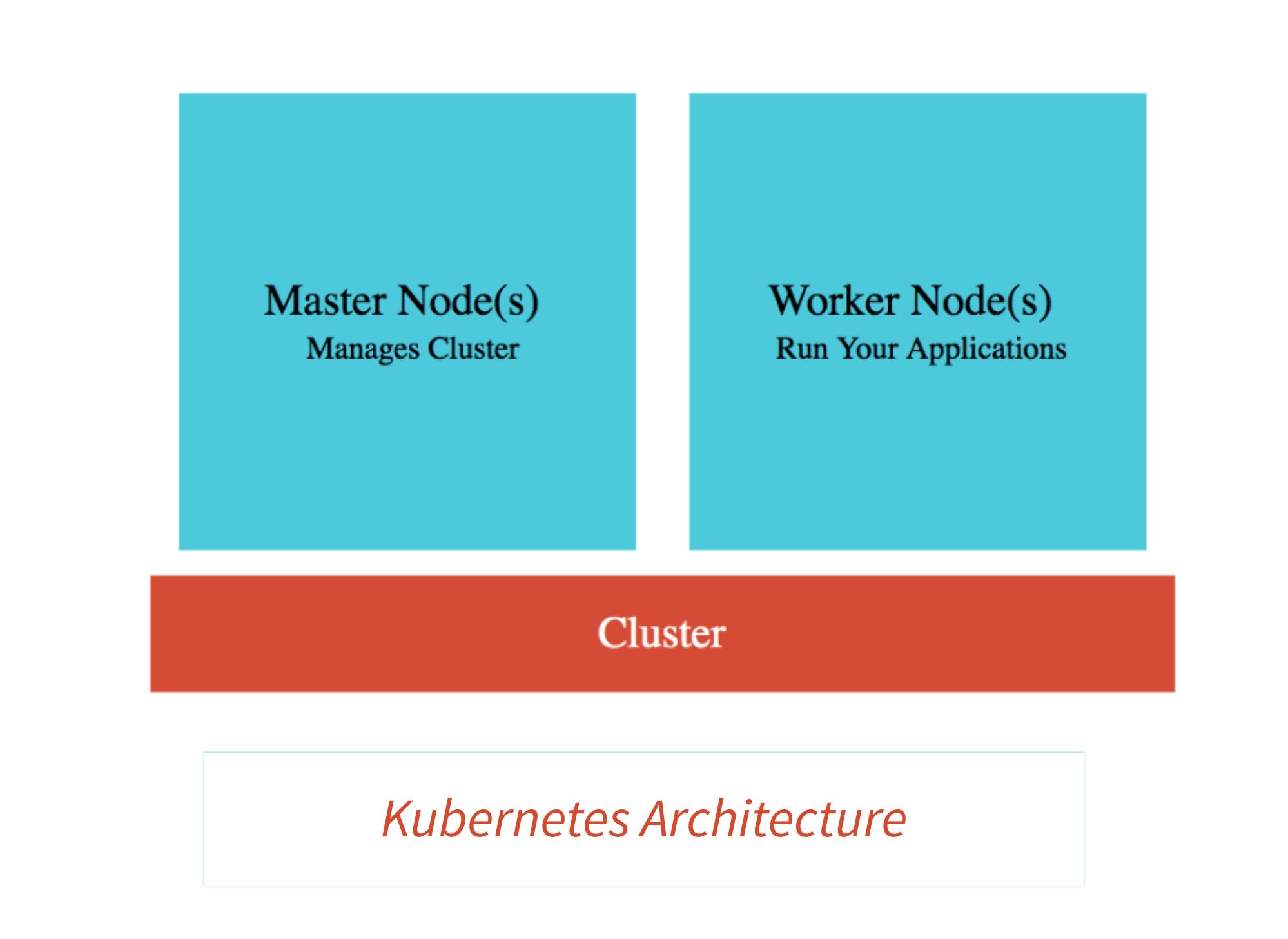
Thanks for signing up for the 12-month free trial.

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

API Server
(kube-apiserver)

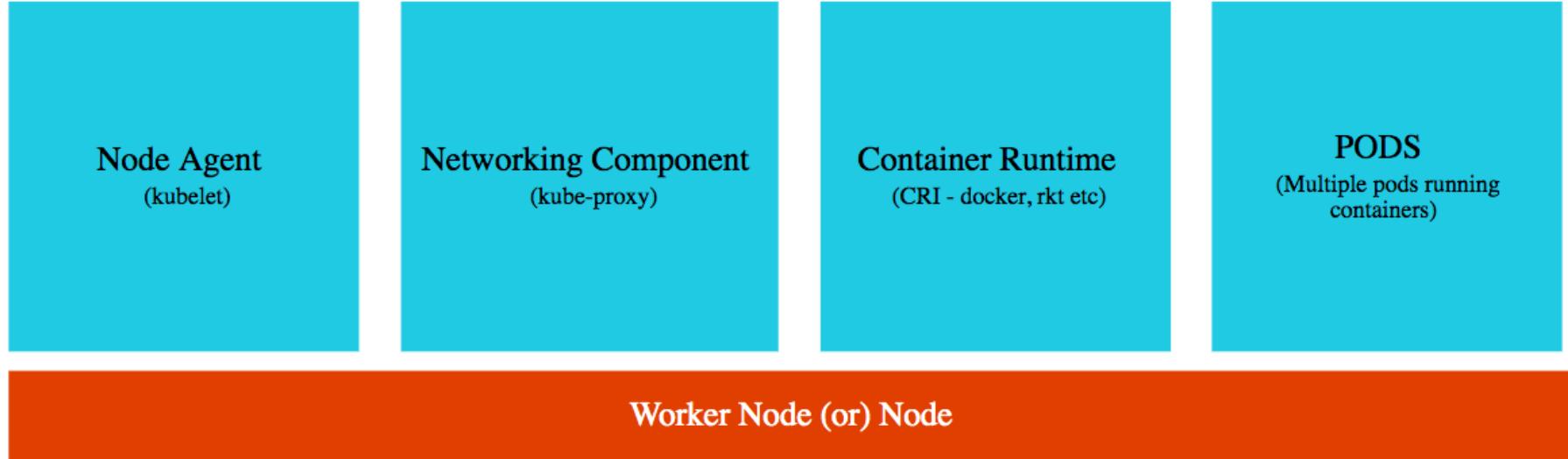
Distribute Database
(etcd)

Scheduler
(kube-scheduler)

Controller Manager
(kube-controller-manager)

Master Node

Kubernetes Architecture



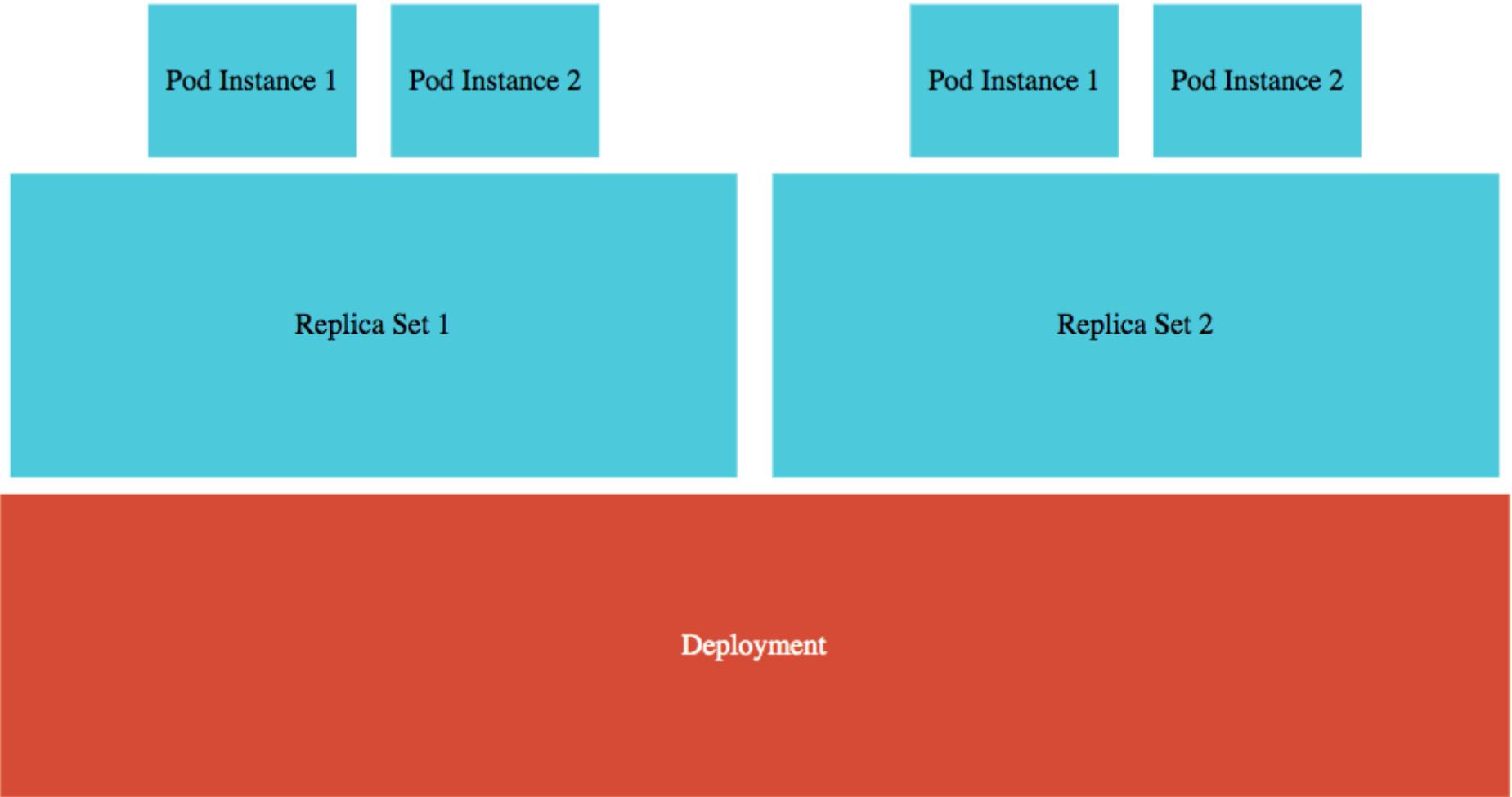
Kubernetes Architecture



Kubernetes Deployments



Kubernetes Deployments



Kubernetes Deployments



Kubernetes Service

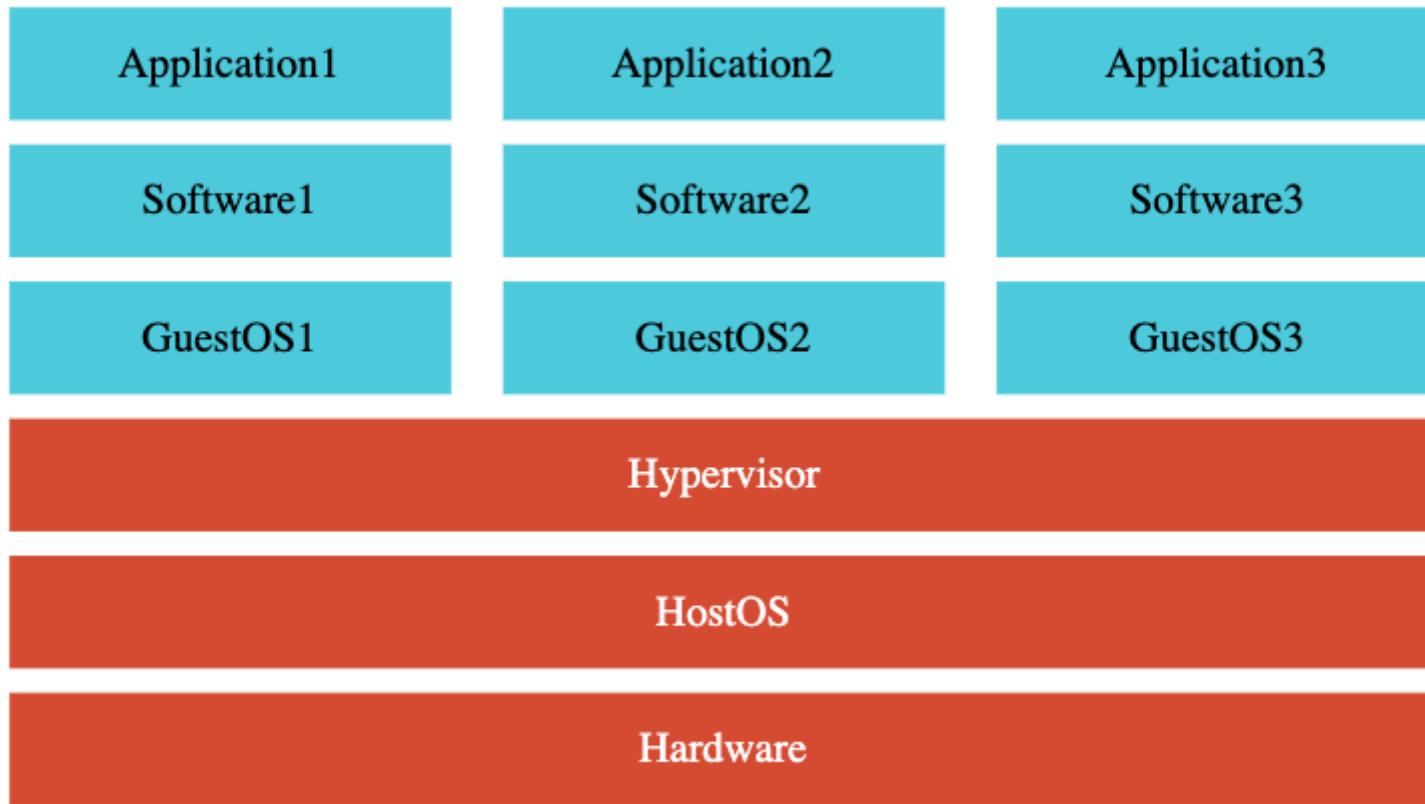
Applications

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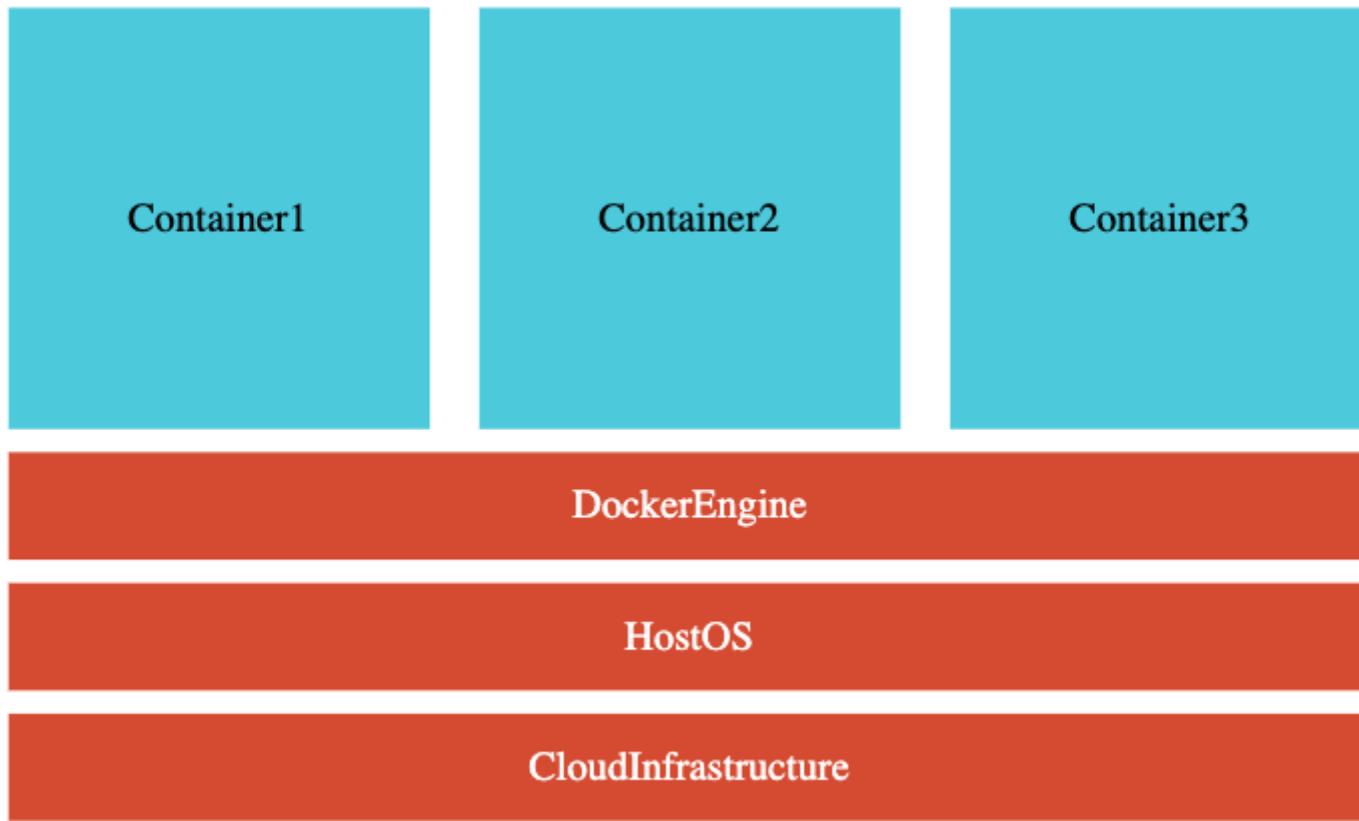
OS

Hardware

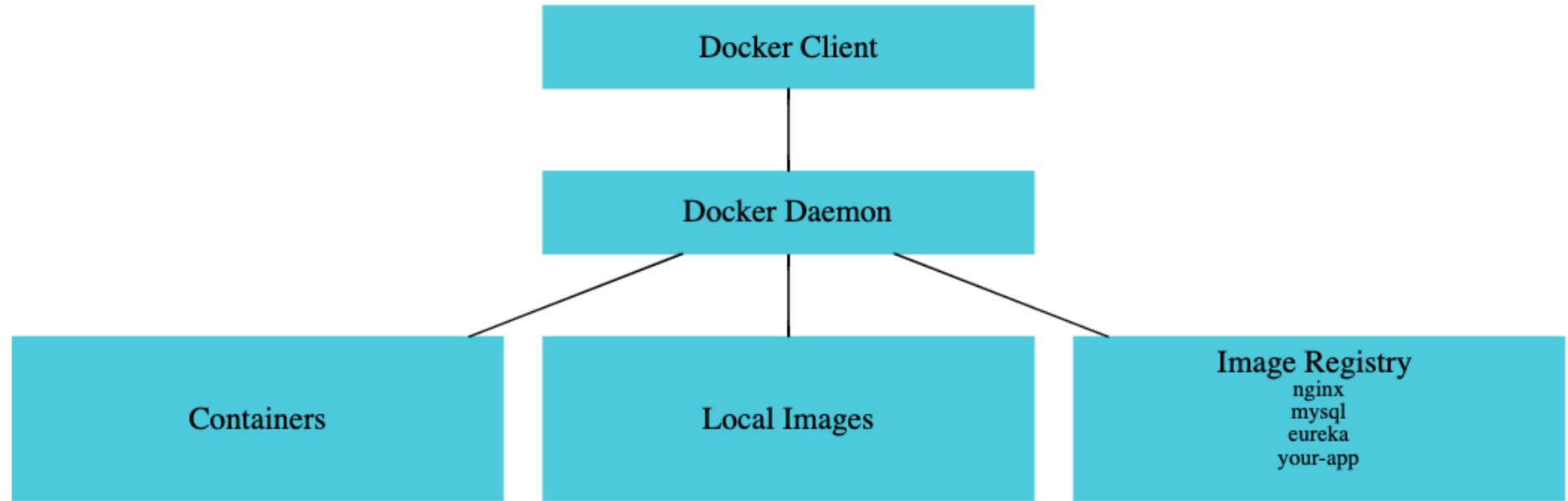
Traditional Deployment



Deployments using Virtual Machines

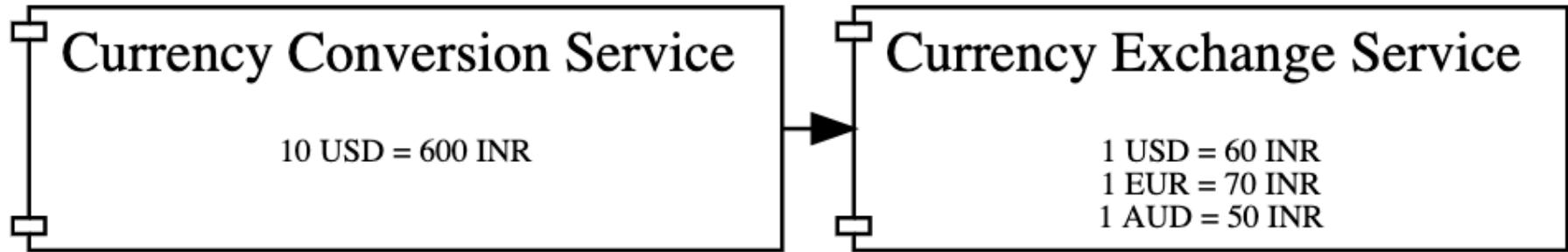


Deployments using Docker



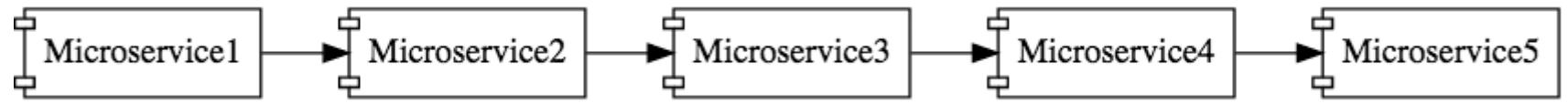
Docker Architecture

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*

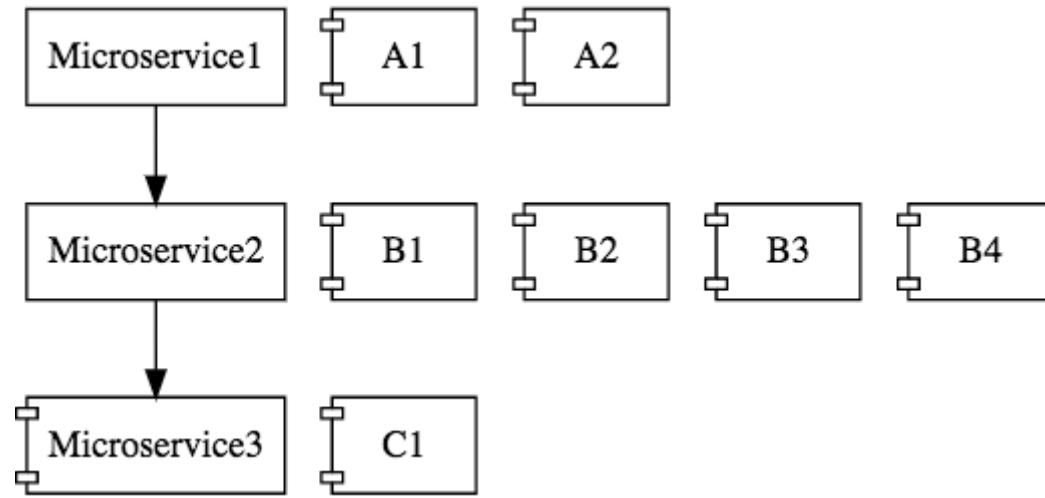
KUBERNETES AND MICROSERVICES

EASIER DEVELOPMENT

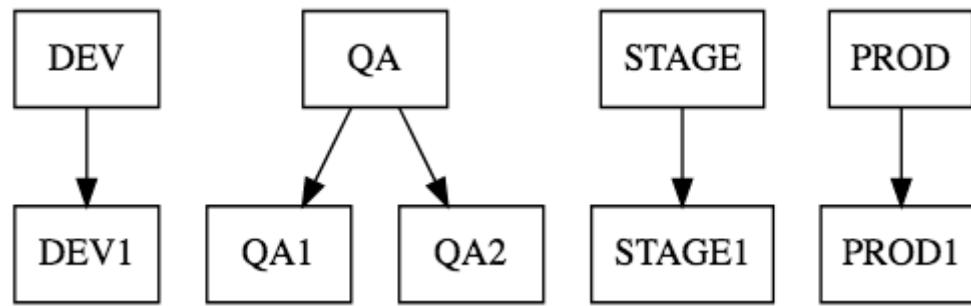
- Adopt New Technology Faster
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EASIER OPERATIONS

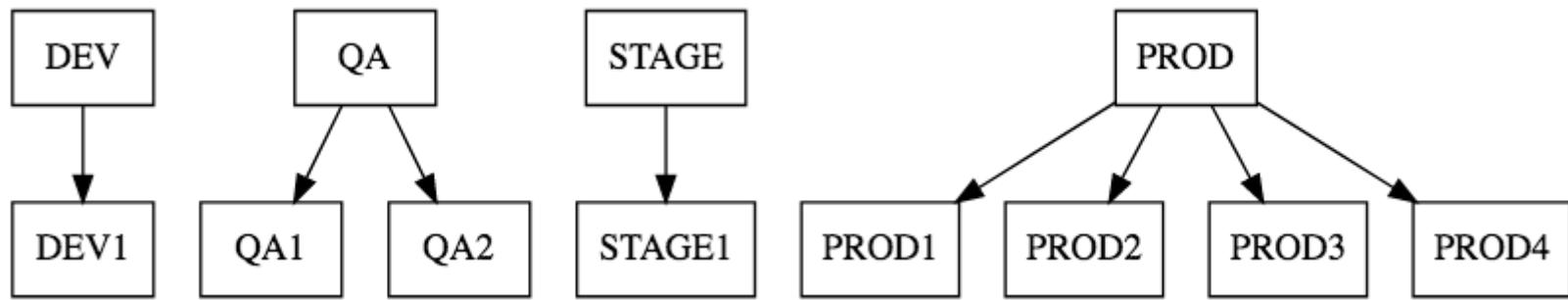
*Consistent Deployment Automation
Across Different Environments and
Different Technologies*



Microservices Multiple Instances

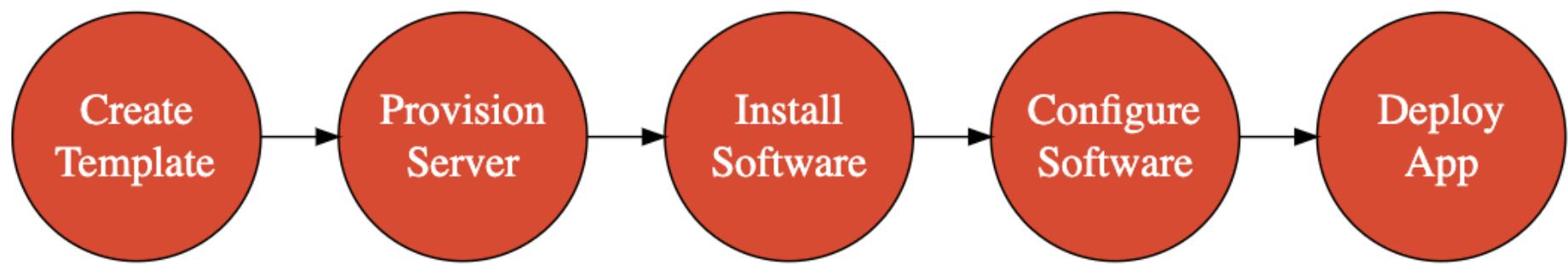


Currency Conversion Service



Currency Exchange Service

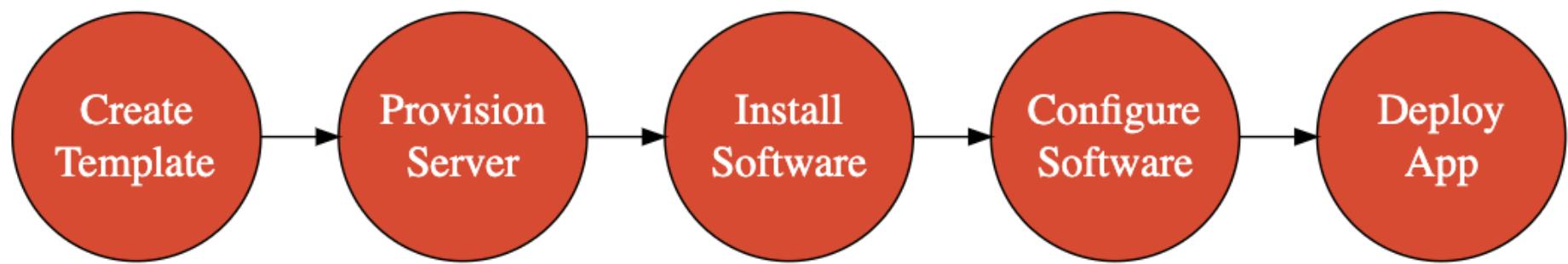
TERRAFORM



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-100320007ccaa
```

```
Initializing your account for Cloud Shell...\nRequesting a Cloud Shell.Succeeded.\nConnecting terminal...
```

```
ranga@Azure:~$ git clone https://github.com/in28minutes/devops-master-class.git
Cloning into 'devops-master-class'...
remote: Enumerating objects: 453, done.
remote: Counting objects: 100% (453/453), done.
remote: Compressing objects: 100% (291/291), done.
remote: Total 453 (delta 105), reused 423 (delta 75), pack-reused 0
Receiving objects: 100% (453/453), 110.96 KiB | 0 bytes/s, done.
Resolving deltas: 100% (105/105), done.
Checking connectivity... done.
```

← → C 🔒 portal.azure.com/#home

Microsoft Azure Search resources, services, and docs (G+/)

ranga@in28minutes.com DEFAULT DIRECTORY

Bash

Untitled

FILES

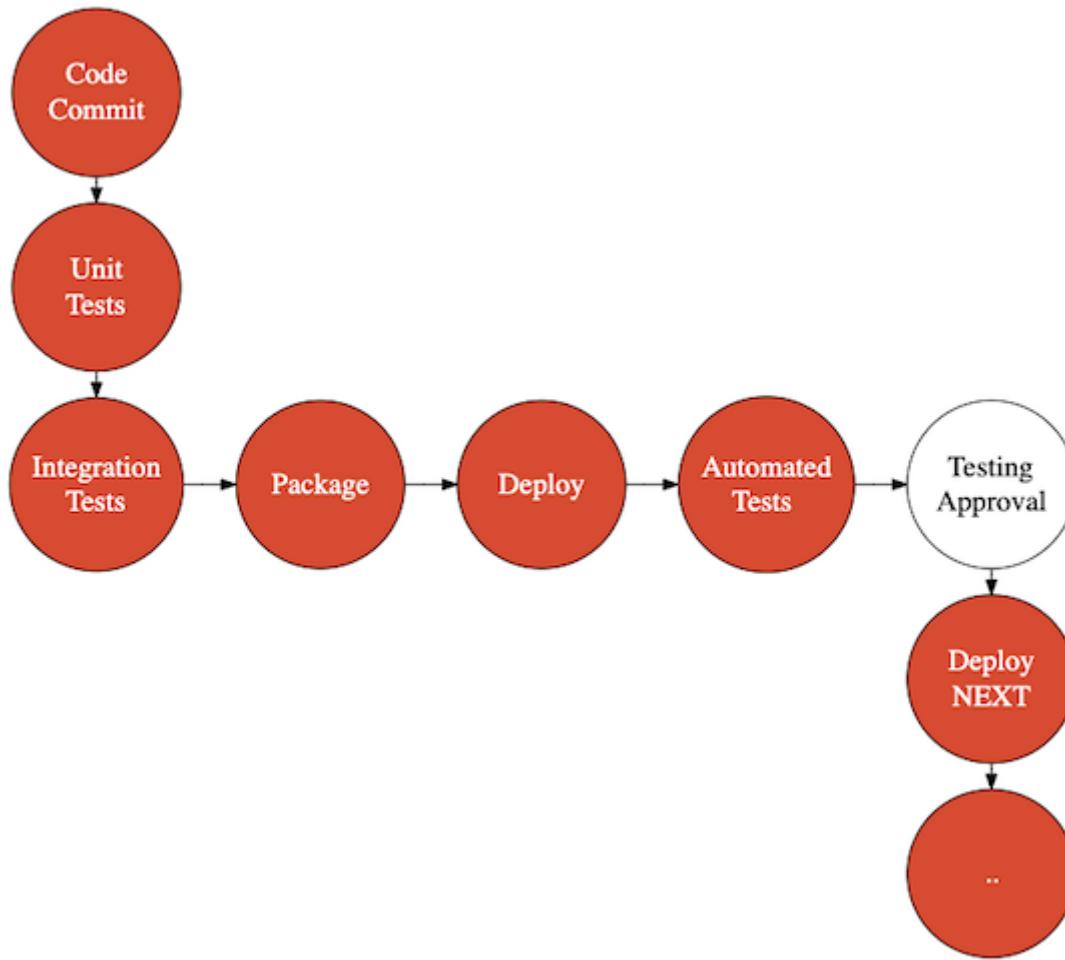
- ↳ .ssh
- ↳ clouddrive
- ↳ devops-master-class
 - ↳ .git
 - ↳ ansible
 - ↳ backup
 - ↳ inventory
 - ↳ playbooks
 - ansible_hosts
 - ansible.cfg
 - readme.md

```
ranga@Azure:~$ cd devops-master-class/ansible/backup/
ranga@Azure:~/devops-master-class/ansible/backup$ tree
bash: tree: command not found
ranga@Azure:~/devops-master-class/ansible/backup$ pwd
/home/ranga/devops-master-class/ansible/backup
ranga@Azure:~/devops-master-class/ansible/backup$ ls
ansible.cfg  ansible_hosts  inventory  playbooks
ranga@Azure:~/devops-master-class/ansible/backup$ ansible --version
ansible 2.9.4
  config file = /home/ranga/devops-master-class/ansible/backup/ansible.cfg
  configured module search path = [u'/home/ranga/.ansible/plugins/modules', u'/usr/share/ansible/plugins/modules']
  ansible python module location = /opt/ansible/local/lib/python2.7/site-packages/ansible
  executable location = /opt/ansible/bin/ansible
  python version = 2.7.12 (default, Oct  8 2019, 14:14:10) [GCC 5.4.0 20160609]
ranga@Azure:~/devops-master-class/ansible/backup$
```

ANSIBLE DYNAMIC INVENTORY

- Install boto3 and botocore

AZURE DEVOPS



Continuous Delivery

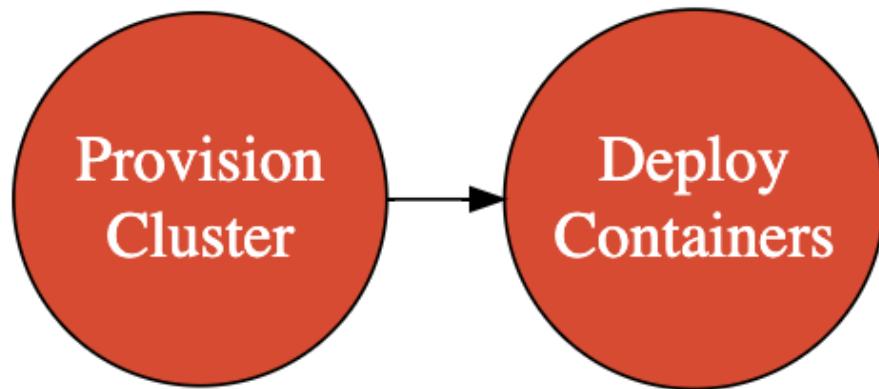
PREREQUISITES

- Azure Account
- Visual Studio Code
- Section : Docker

AZURE DEVOPS

AZURE AKS

WITH TERRAFORM



Azure K8S with Terraform

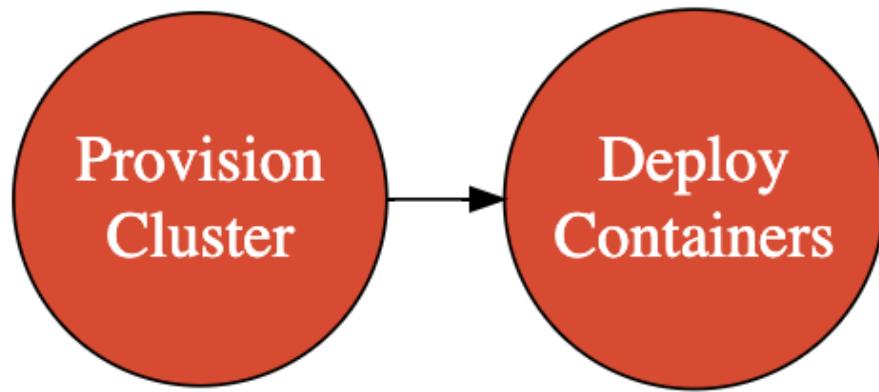
PREREQUISITES

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

AZURE DEVOPS

AWS EKS

WITH TERRAFORM

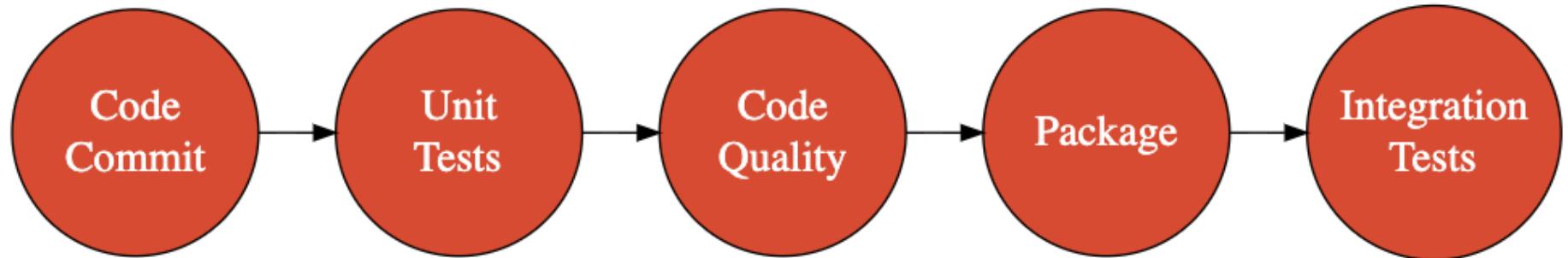


AWS EKS (Kubernetes) with Terraform

PREREQUISITES

- WARNING! NOT AWS FREE TIER!
- Azure Account
- AWS Account
- Visual Studio Code
- Section : Azure DevOps
- Section : Docker
- Section : Kubernetes
- Section : Terraform

JENKINS

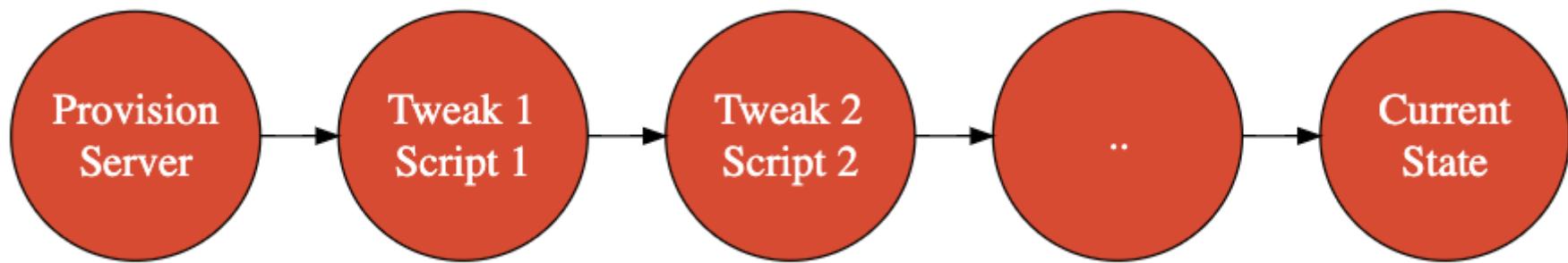


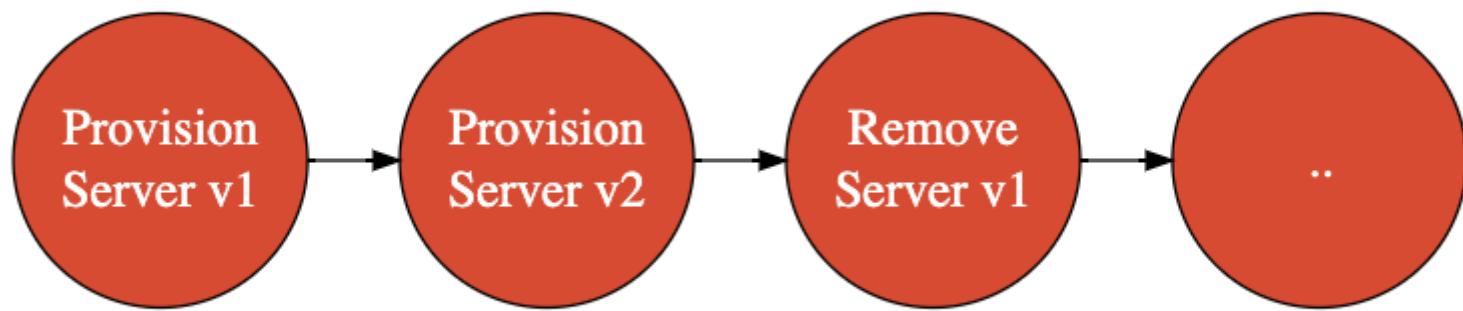
Continuous Integration

PREREQUISITES

- Visual Studio Code
- Section : Docker
- Docker Compose

IMMUTABLE SERVERS





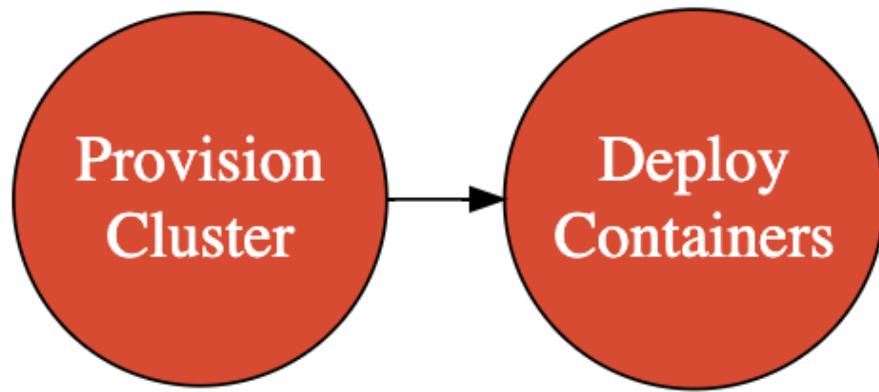
AZURE DEVOPS

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

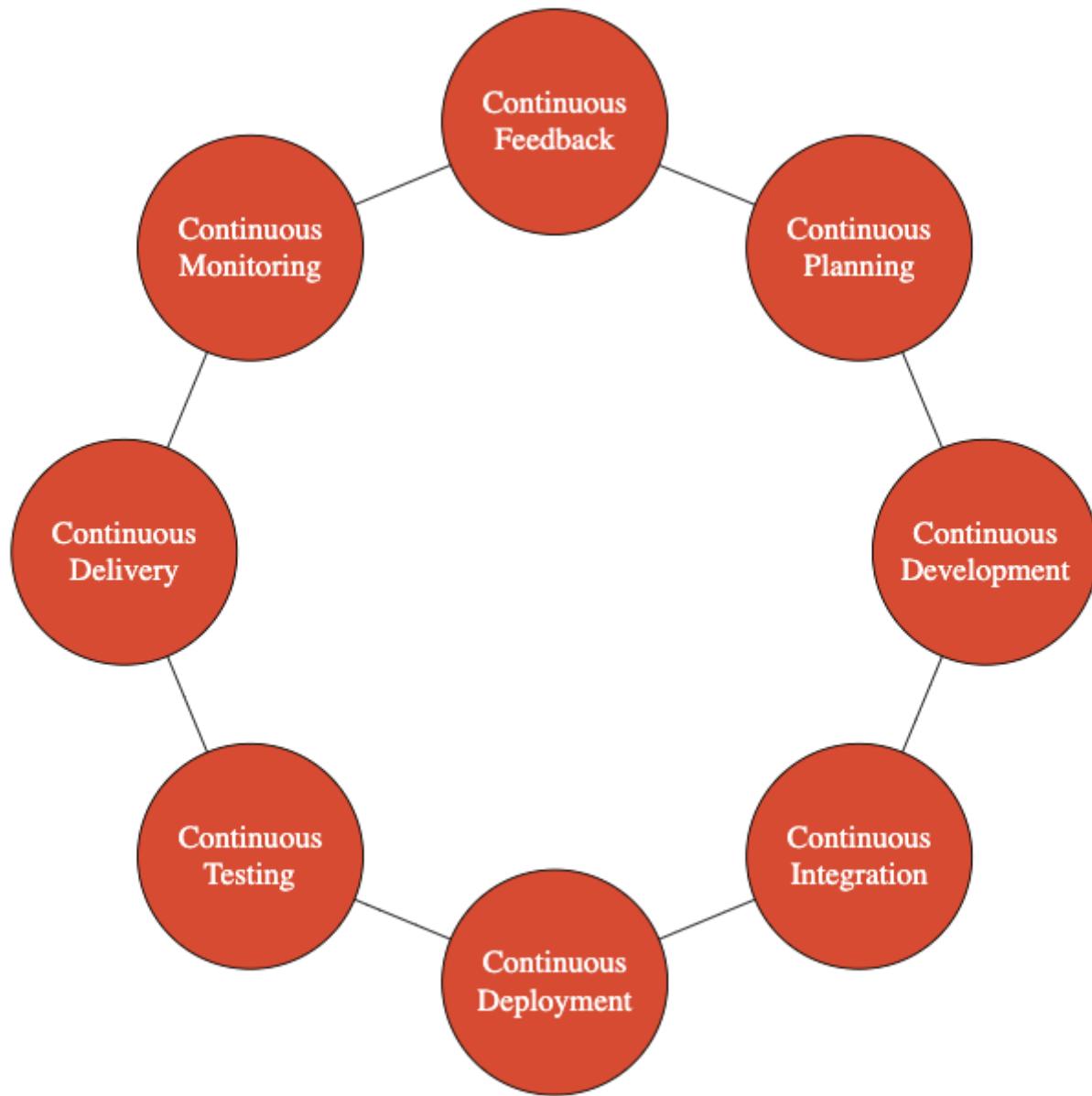
- Deployment Frequency
- Time To Market
- Failure Rate of New Releases
- Lead Time to Fixes
- Mean Time to Recovery

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 Learings (Newsletters, Communication, COEs)
- Encourage People with Exploration and Automation Mindset
- Recognize DevOps Teams

QUESTIONS

In28Minutes

DevOps

Master Class

- 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

