Cloud Devops AWS and CI/CD Concepts

Cloud Computing

On Demand

App Services

Ubiquitous

Easily

Storage

Networking

Network

Quickly

DB Security

Scaling

Shared

Load Balancing

Our Own Cloud

No Capital

Low Maintenance

AWS

AZURE

GCP

Oracle

IBM

Alibaba

Free Tier Limit

30 GB Storage

750 hours per month

Cloud Types

Public	AWS AZURE GCP
Private	Dell,3M,Siemens etc
Hybrid	public+public public+private

Data Center(secure data)

+

AWS(web server, java,load balancing)

(AWS) RDS

+

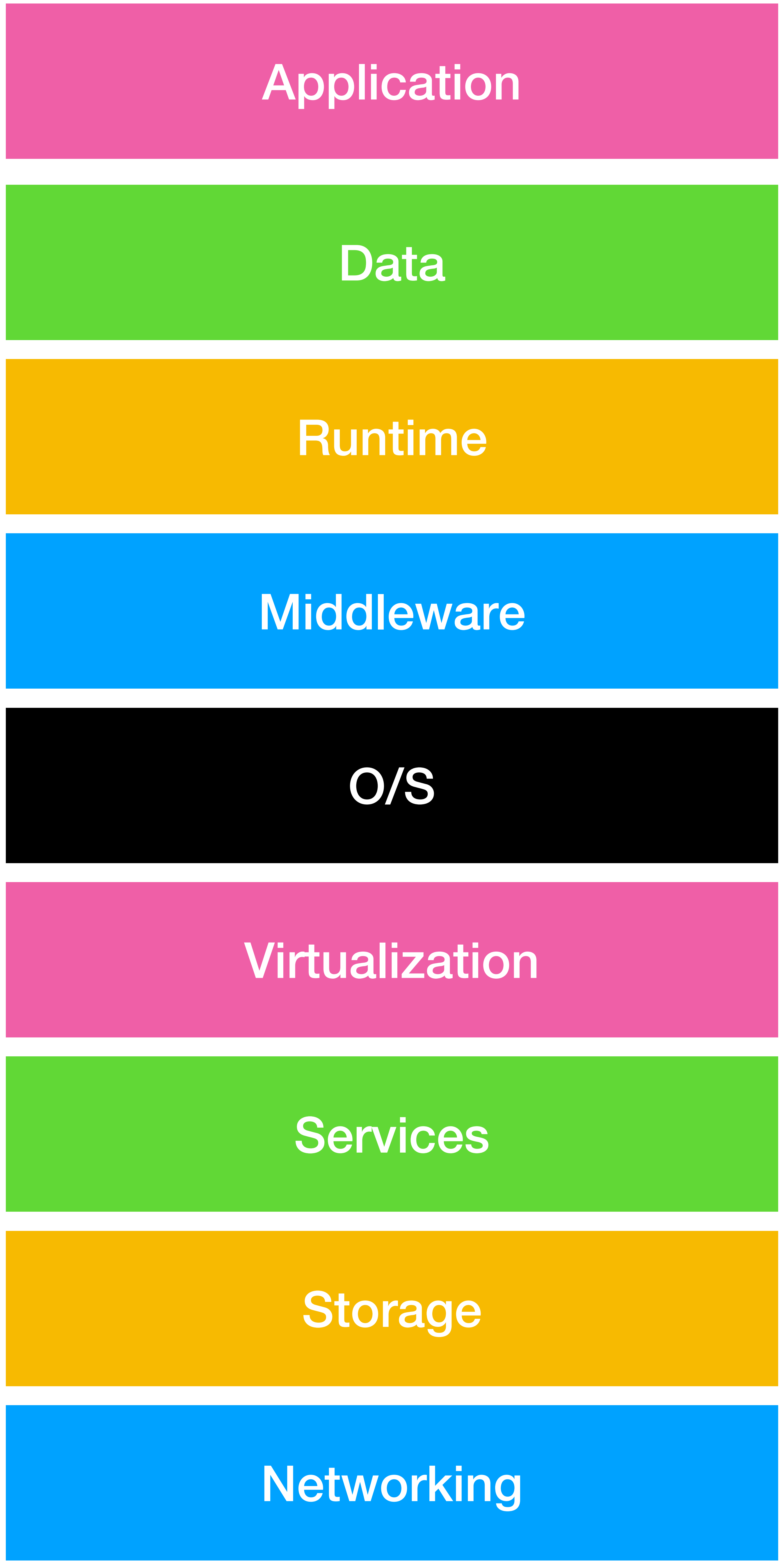
Azure(.Net)

Service Models

PaaS

EBS

SNS



Application

Data

Runtime

Middleware

O/S

Virtualization

Services

Storage

Networking

SaaS

Serverless RDS S3

Lambda

IaaS

CloudFormation

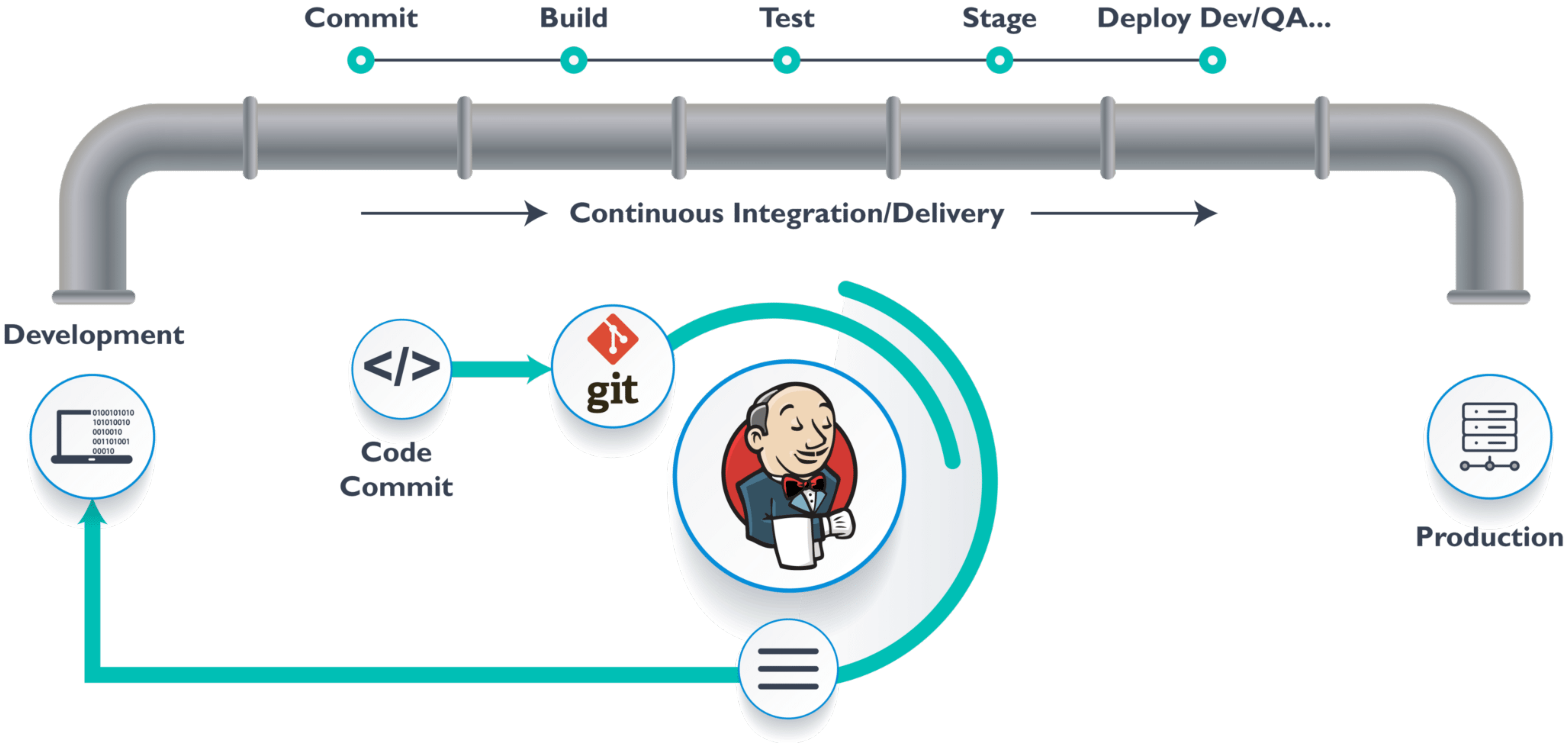
Terraform

EC2

VPC

Security Groups

CI/CD


Commit
Build
Test
Stage
Deploy Dev/QA...
Continuous Integration/Delivery
Development
0100101010
101010010
0010010
001101001
00010
</>
Code
Commit
git
Production

Source

Commit

Code Review

Program

Build

Compile

Unit Test

war/jar/dll

Image

Test

Integration

System

Load

UI

Deploy

Pre-Prod

Prod

Monitor

Health and Unusual Activities

Devops

Source

Git

Docker

Jenkins

Build

Maven

WAR/JAR

Image

Test

WAR/JAR

Container

Deploy

WAR/JAR

Container

Kubernetes

OR

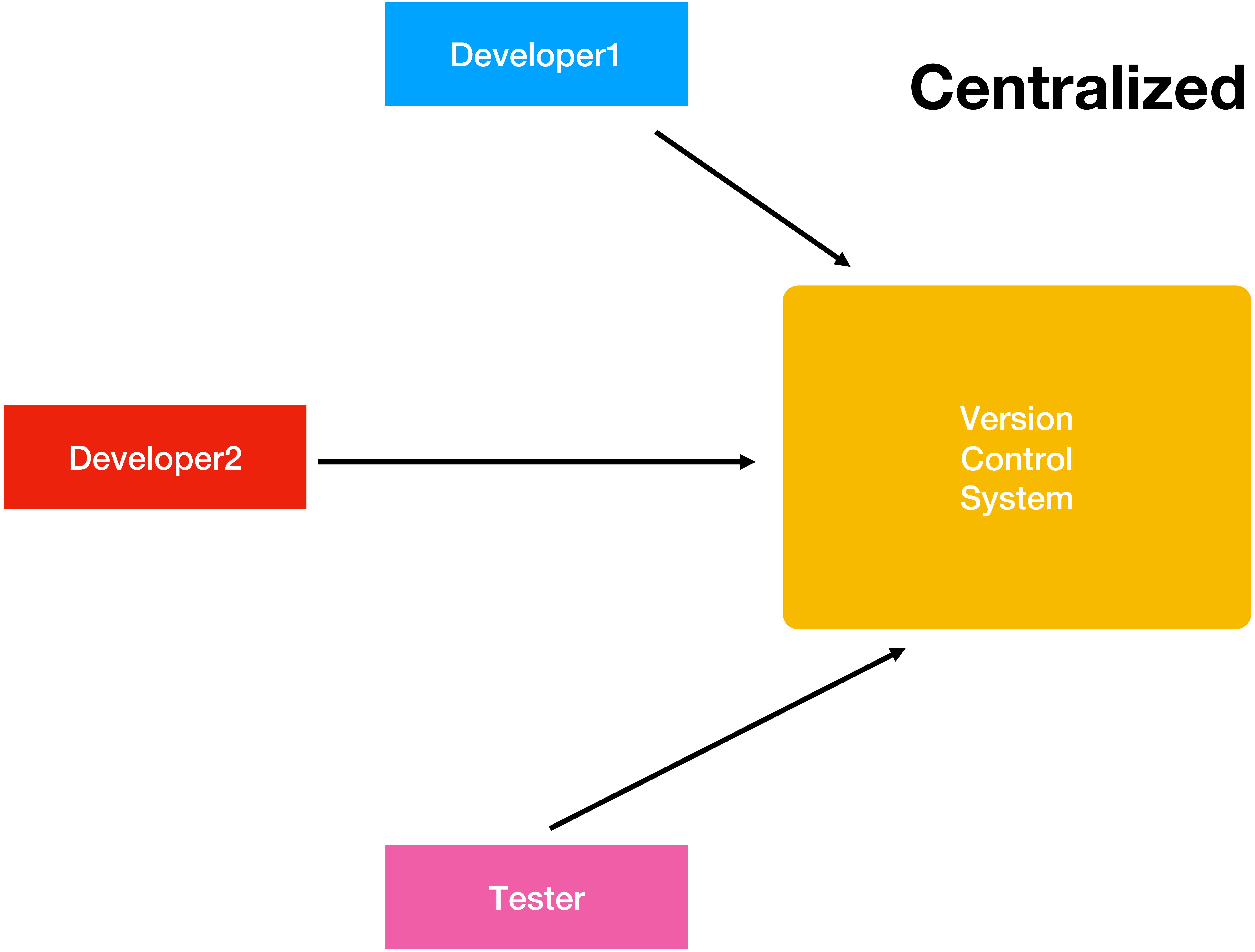
AWS EBS

Monitor

Cloud Watch

Prometheus

GIT



Developer1

Developer2

Tester

Version
Control
System

VCS

Centralized CVS

Clearcase

FligthService.java

1.0

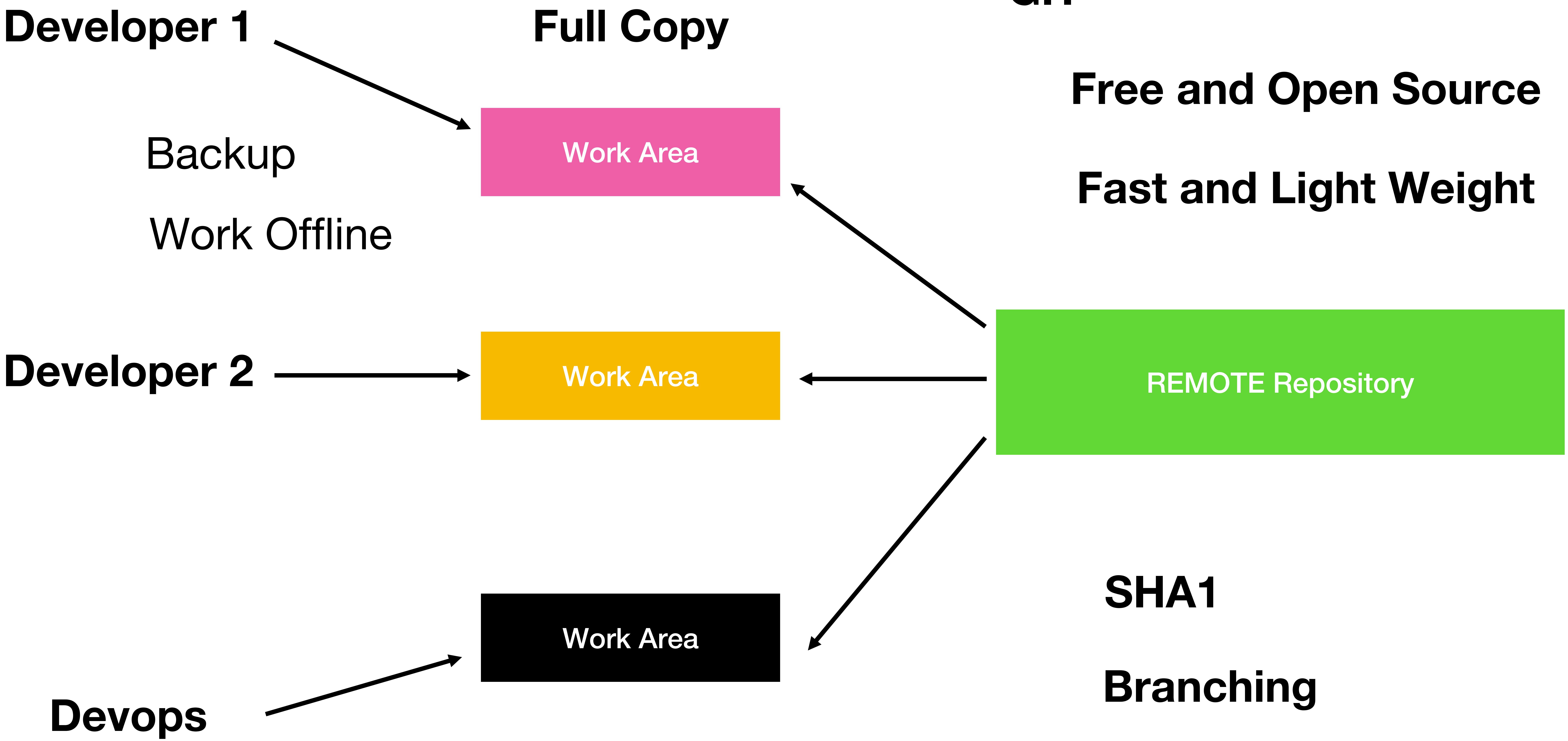
2.0

3.0

GIT

Free and Open Source

Fast and Light Weight



Developer 1

Full Copy

Backup

Work Offline

Work Area

Developer 2

Work Area

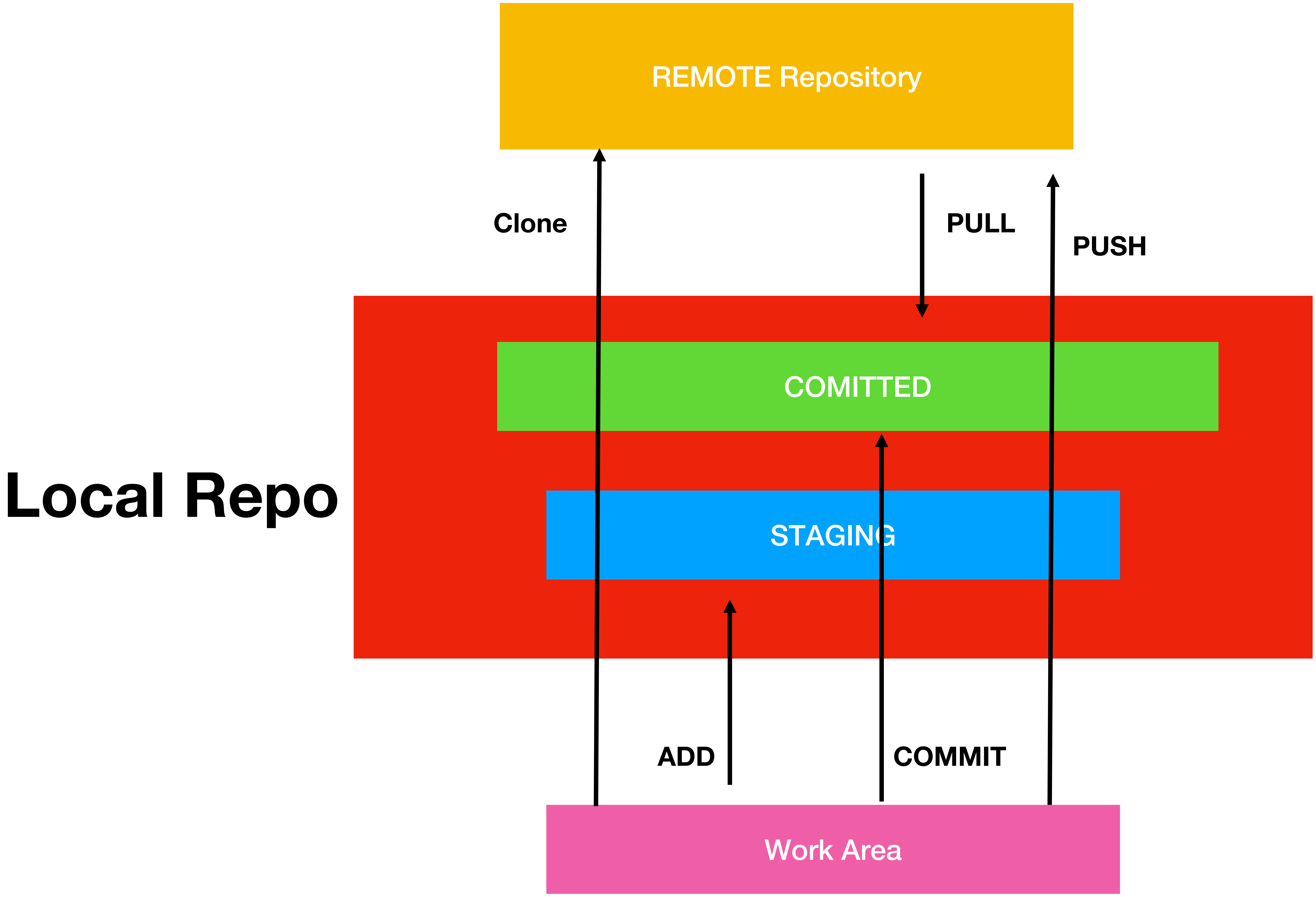
REMOTE Repository

Work Area

Devops

SHA1

Branching



REMOTE Repository

Clone

PULL

PUSH

Local Repo

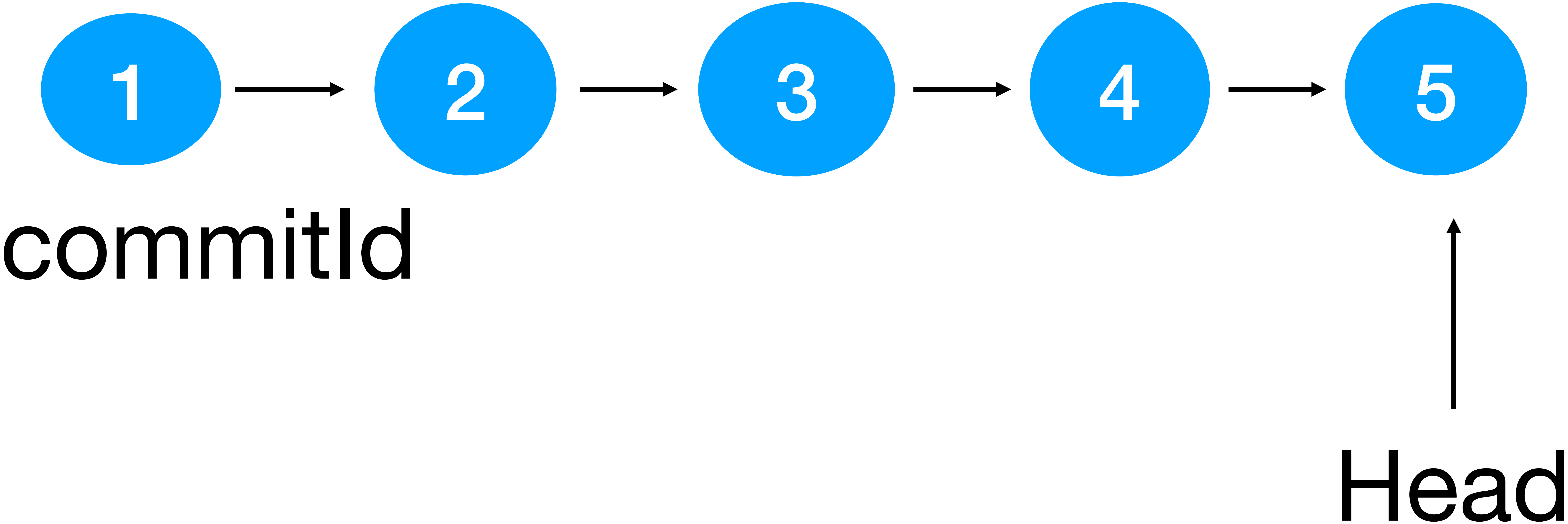
COMITTED

STAGING

ADD

COMMIT

Work Area



commitId

Head

AWS

Clinicals

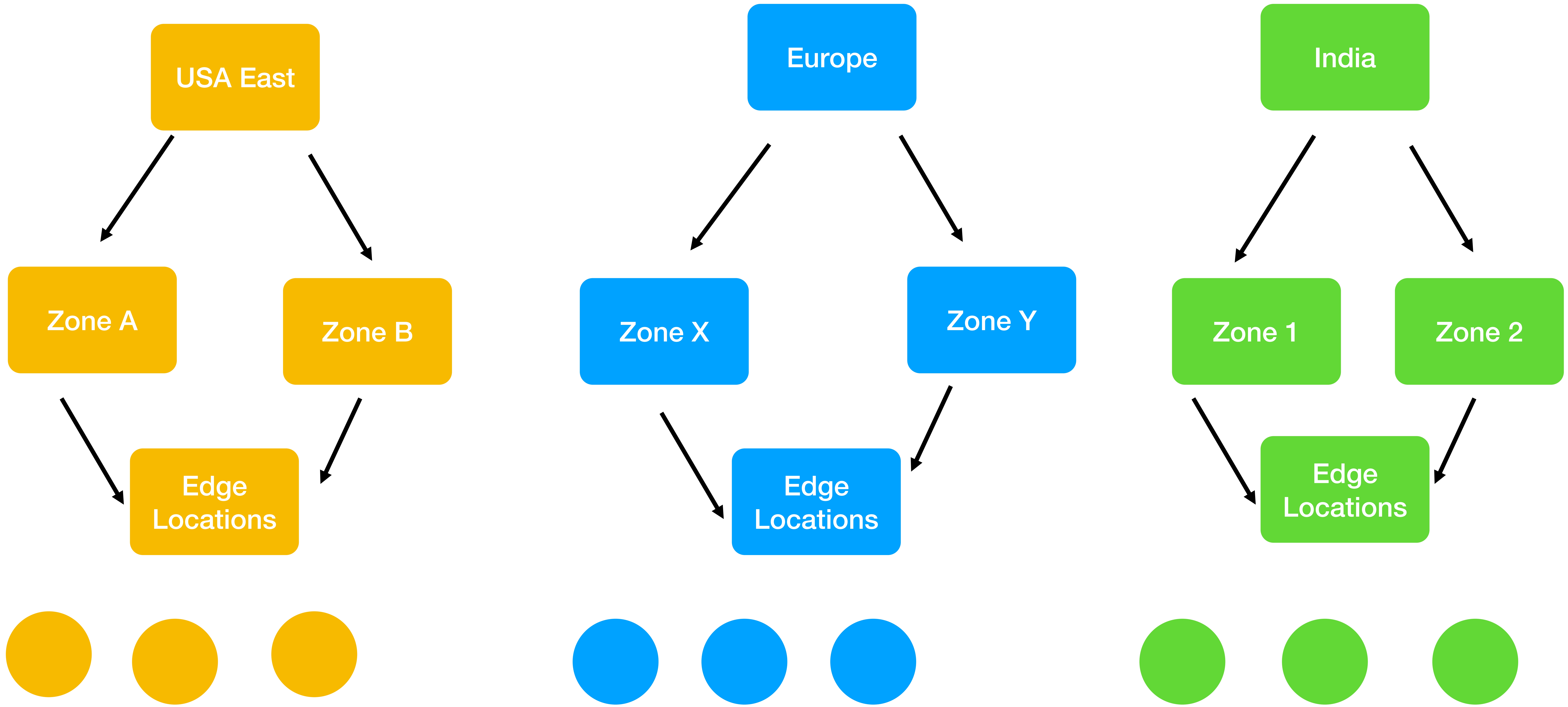
Bed Management

Environment	EBS
Security	IAM/Security Groups
Load Balancing	ELB
Scaling	Auto Scaling
Health Checks and Monitoring	Cloud Watch

Patient Registration

Claims

Regions and Zones



EC2

Ubuntu

Windows

Centos

OS

AMI

Software

Java

Python

MySql

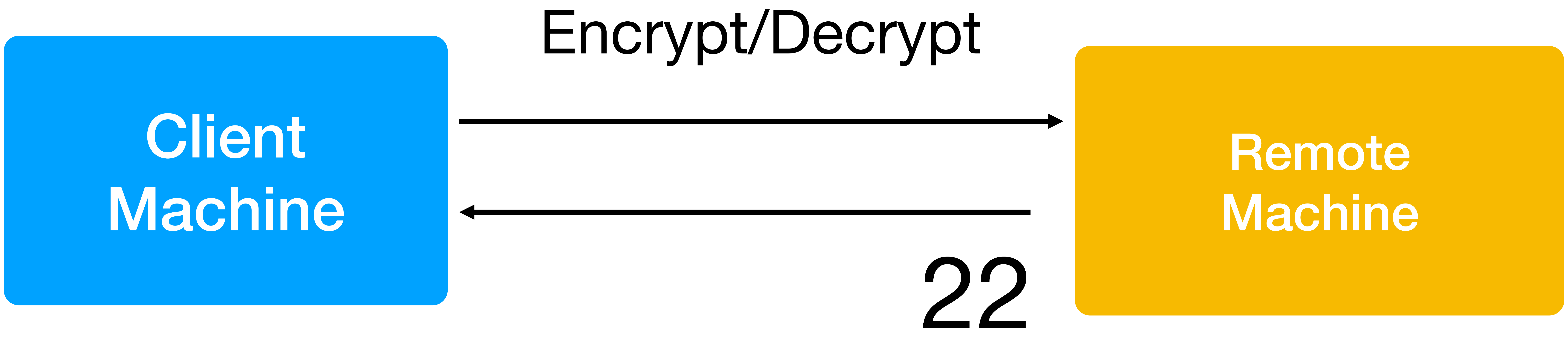
Docker

Putty

Mac Terminal

SSH

Secure Shell



Encrypt/Decrypt

Client Machine

Remote Machine

22

Private

Public

ssh-keygen -t rsa

.ssh/id_rsa

2048-bit SSH-2 RSA keys

5000 per region

S3 Simple Storage Service

Object Based Storage

Buckets

EBS

100 5GB

EC2

20000 GETs

EFS

2000 PUTs

EC2 AND S3

Launch a EC2 instance

Upload jar to S3

Access the jar from ec2 and test

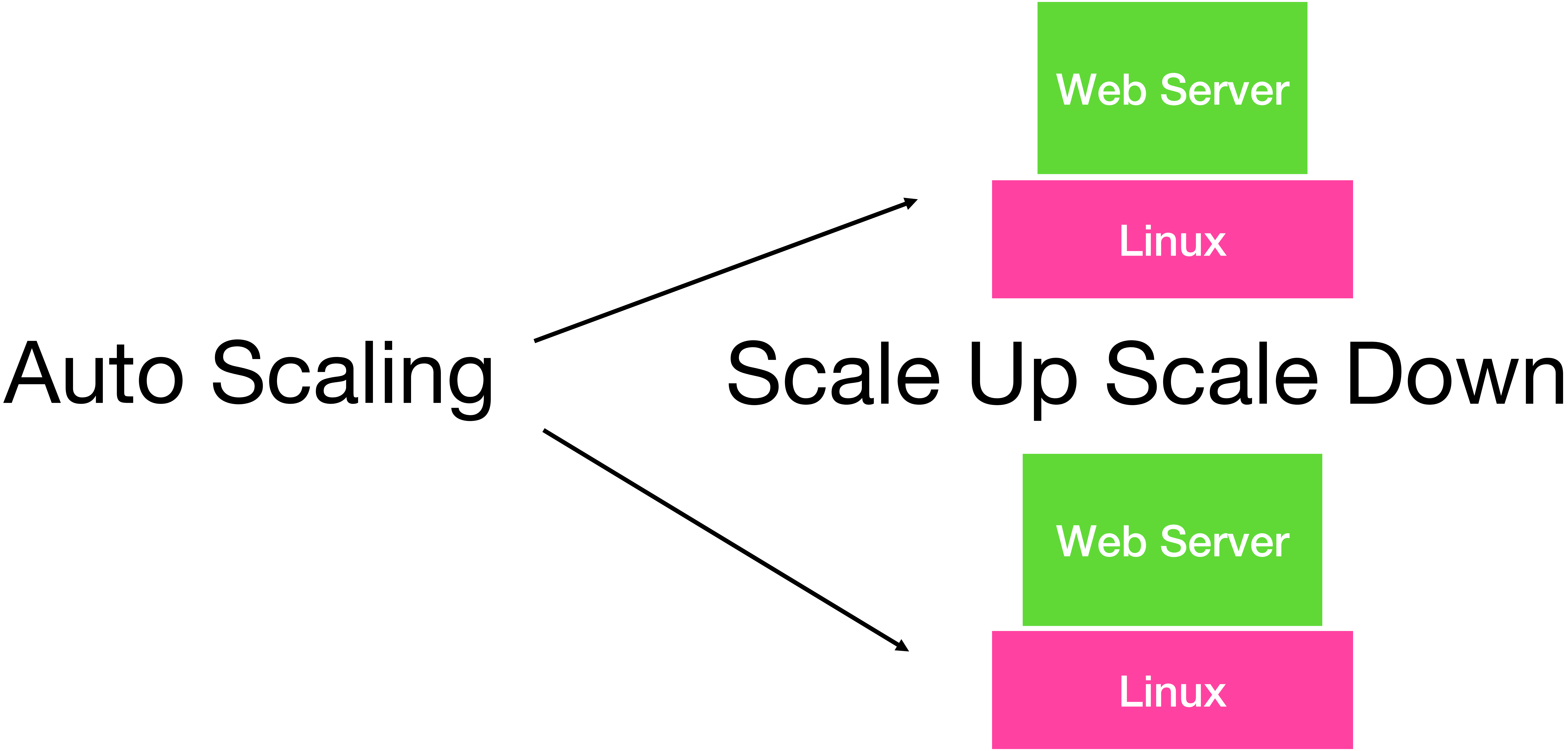
1 - Create Launch Configuration

Instance Creation

Application Image(AMI)

2 - Auto Scaling Group

Scaling Policy



Auto Scaling

Scale Up Scale Down

RDS

DB

MySql

PostgreSQL

MSSQL

MariaDB

Amazon Aurora

Replication

Auto Backups

Auto Recovery

Caching

MongoDb

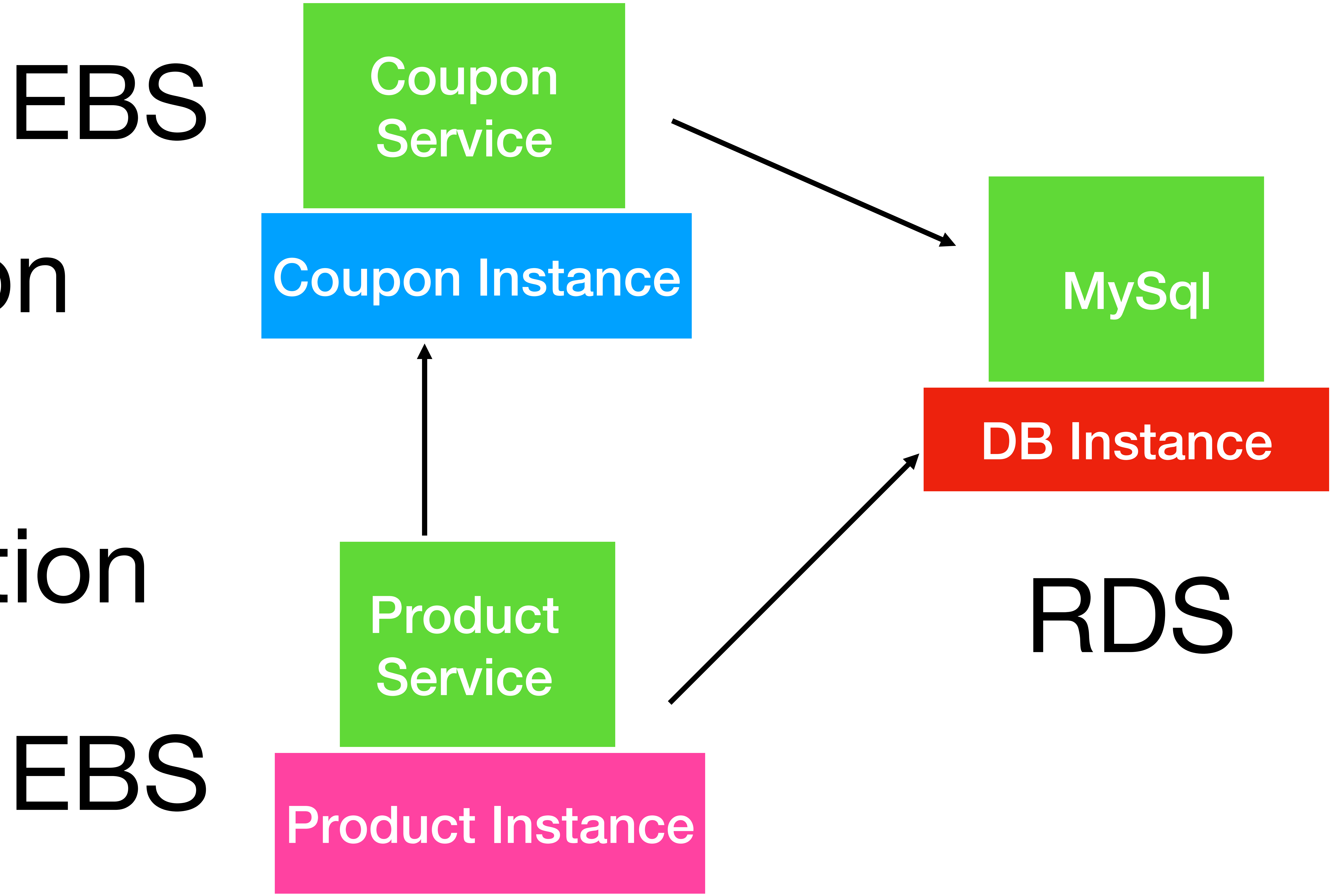
DynamoDB

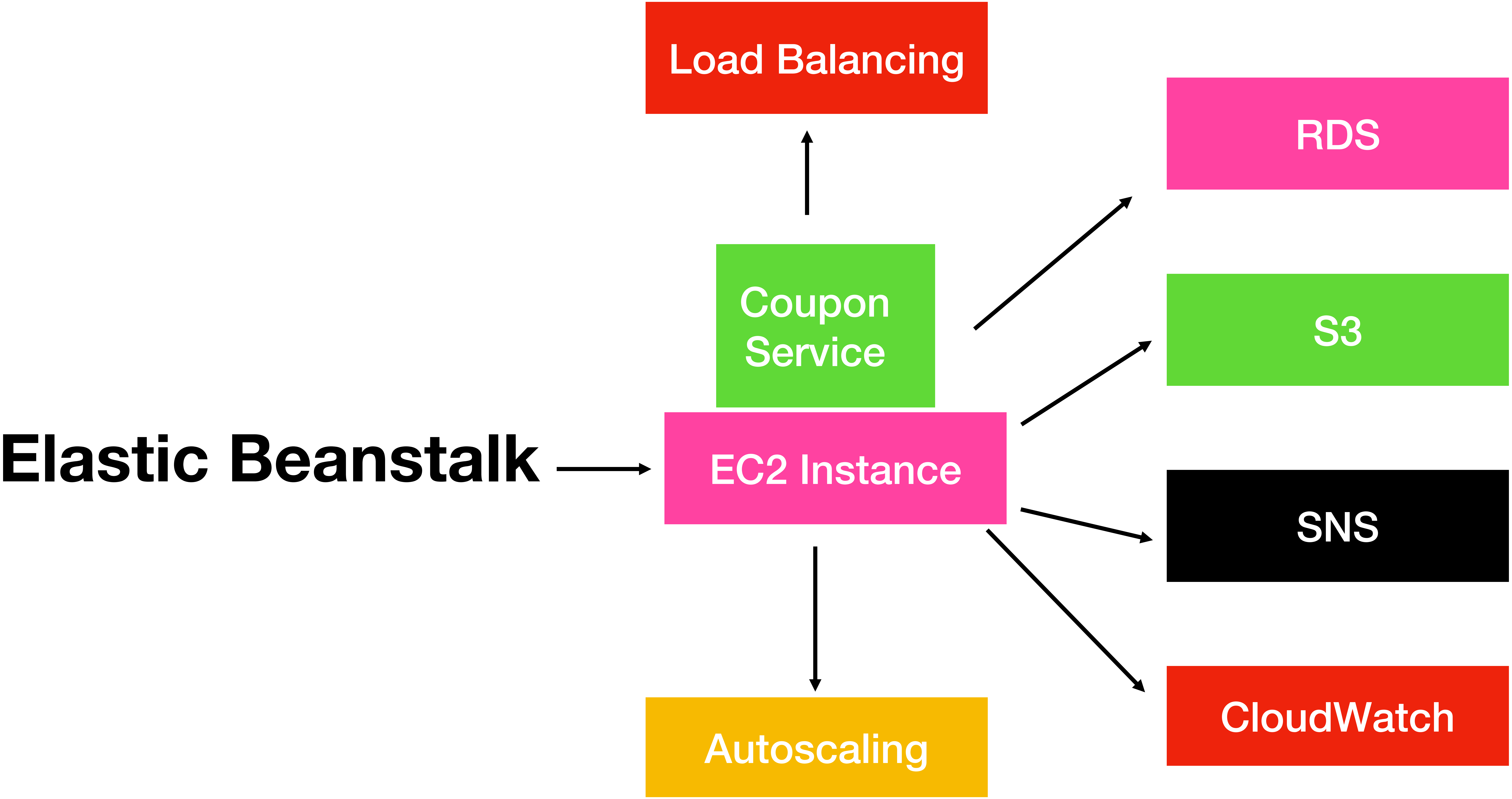
Deploy on EBS using RDS

Application

Version

Configuration




Load Balancing
RDS
Coupon Service
S3
Elastic Beanstalk
EC2 Instance
SNS
CloudWatch
Autoscaling

Java

Python

Tomcat

Elastic Beanstalk

NodeJs

.Net

Ruby

Docker

Go

VPC

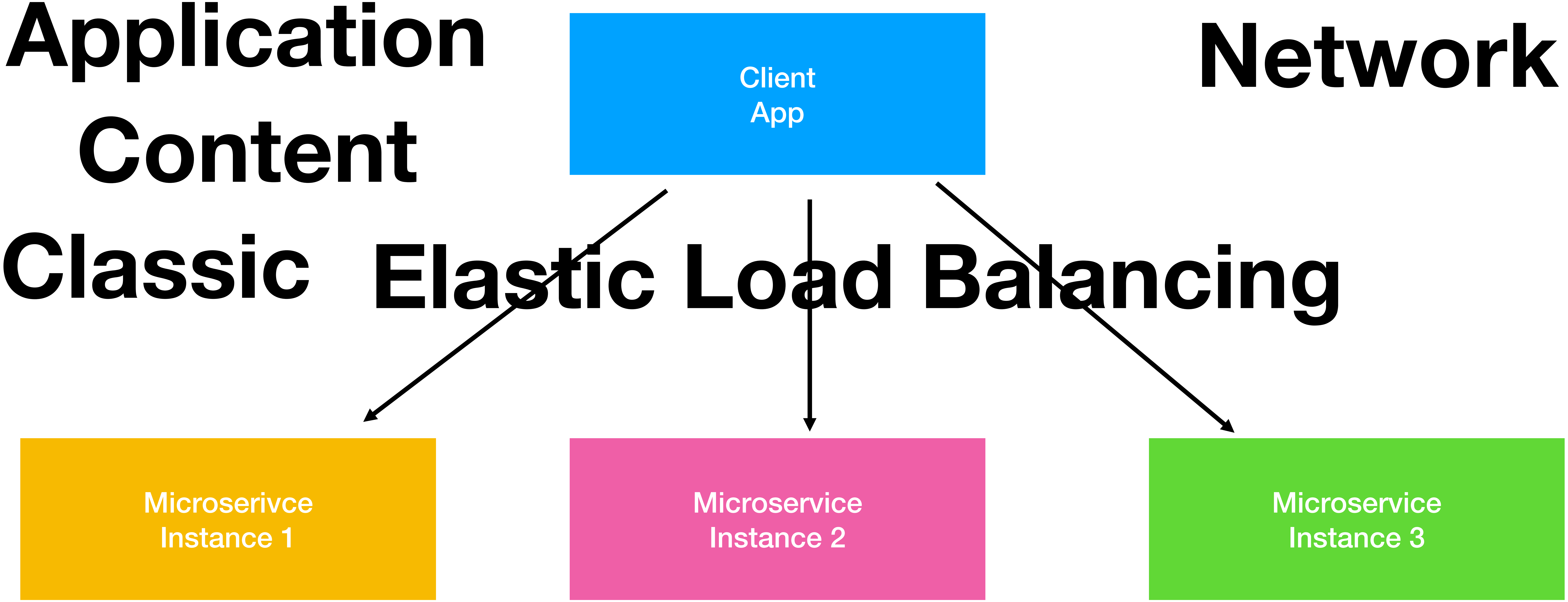
Application

Network

Content

Classic

Elastic Load Balancing



Client
App

Microserivce
Instance 1

Microservice
Instance 2

Microservice
Instance 3

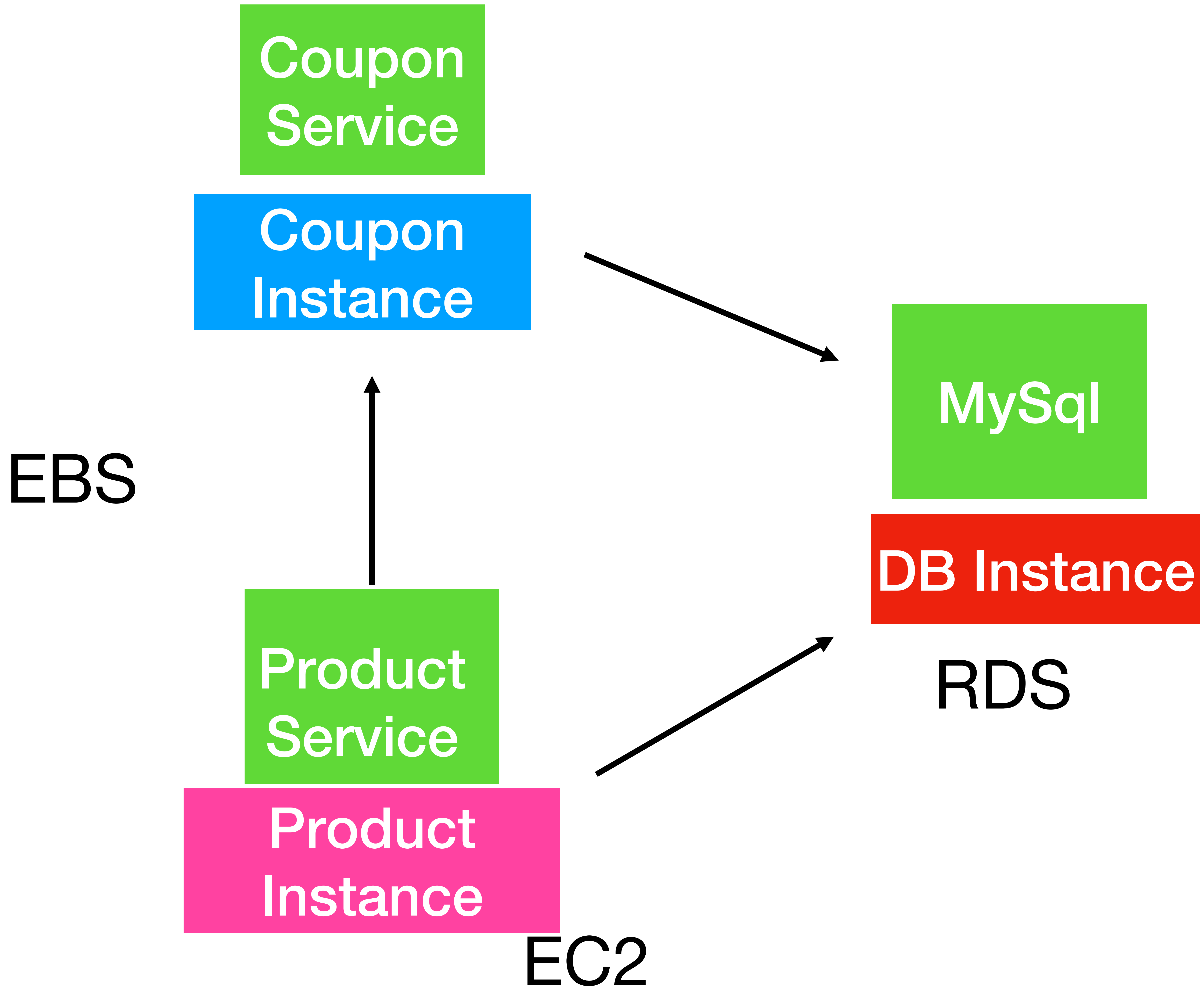
AWS CLI

Create a User

Install AWS CLI

Configure and Use

AWS Cloudwatch

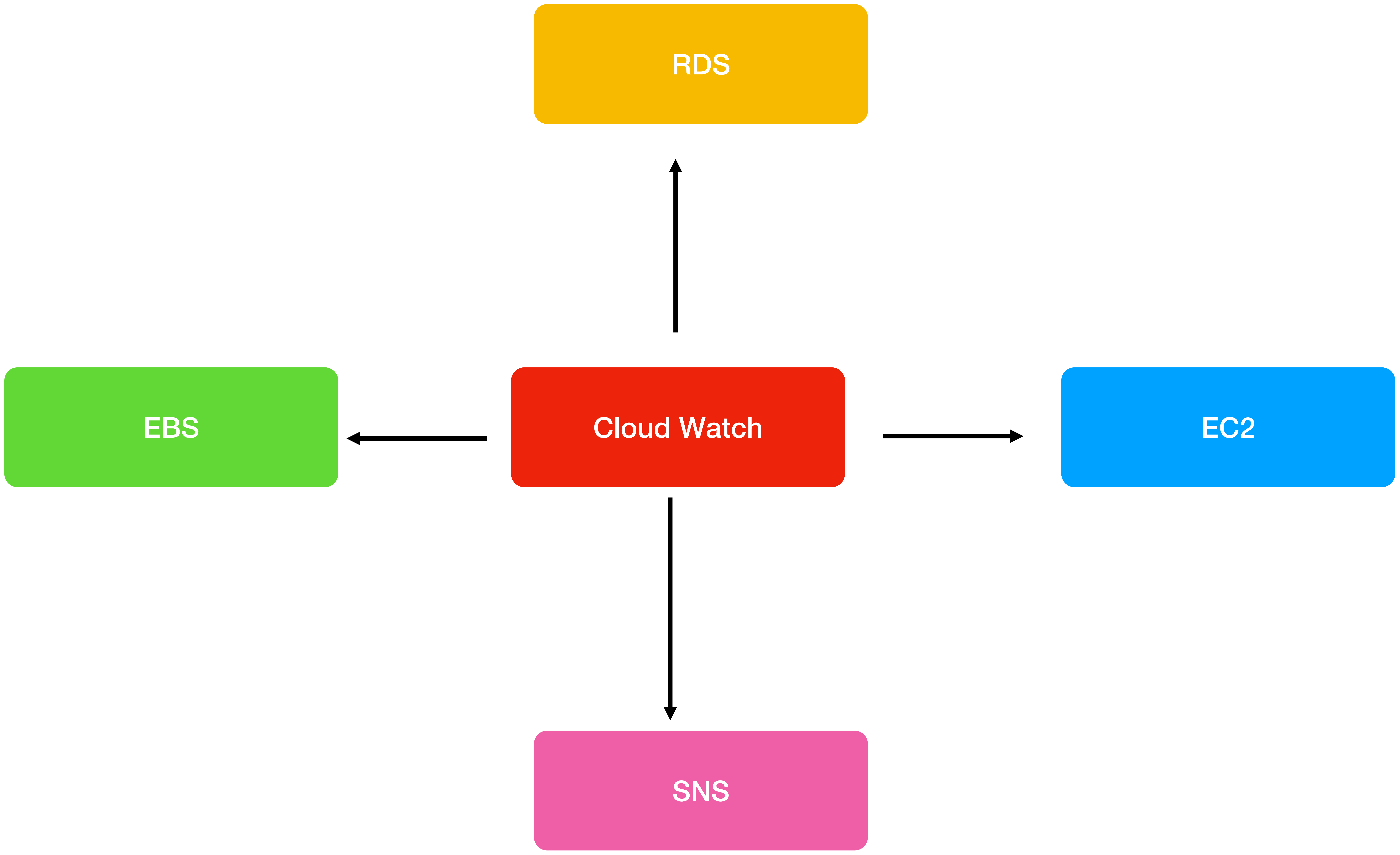


Collect

Monitor

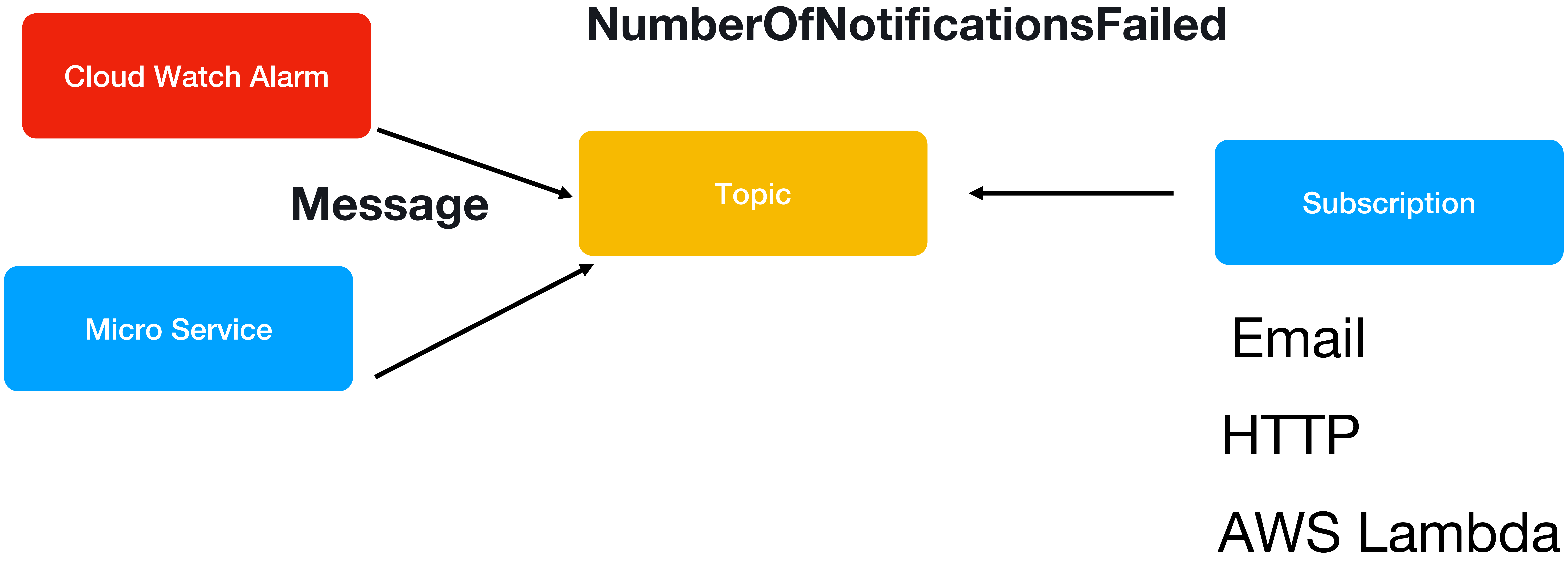
Analyze

Act



RDS
EBS
Cloud Watch
EC2
SNS

Simple Notification Service (SNS)



1- Simple Notification Service

- Topics
- Subscriptions

2- Create Alarm and attach SNS

3-Test

IAM

Access

Console

Programmatic Access

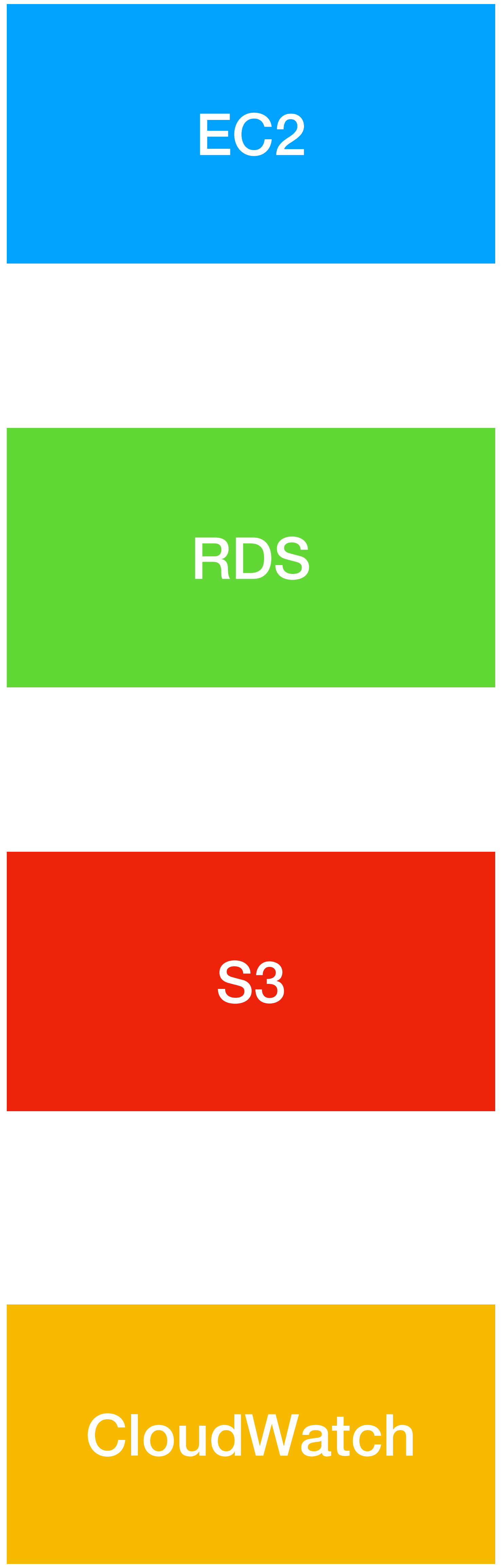
Policy

Permissions

Users

User Groups

Role



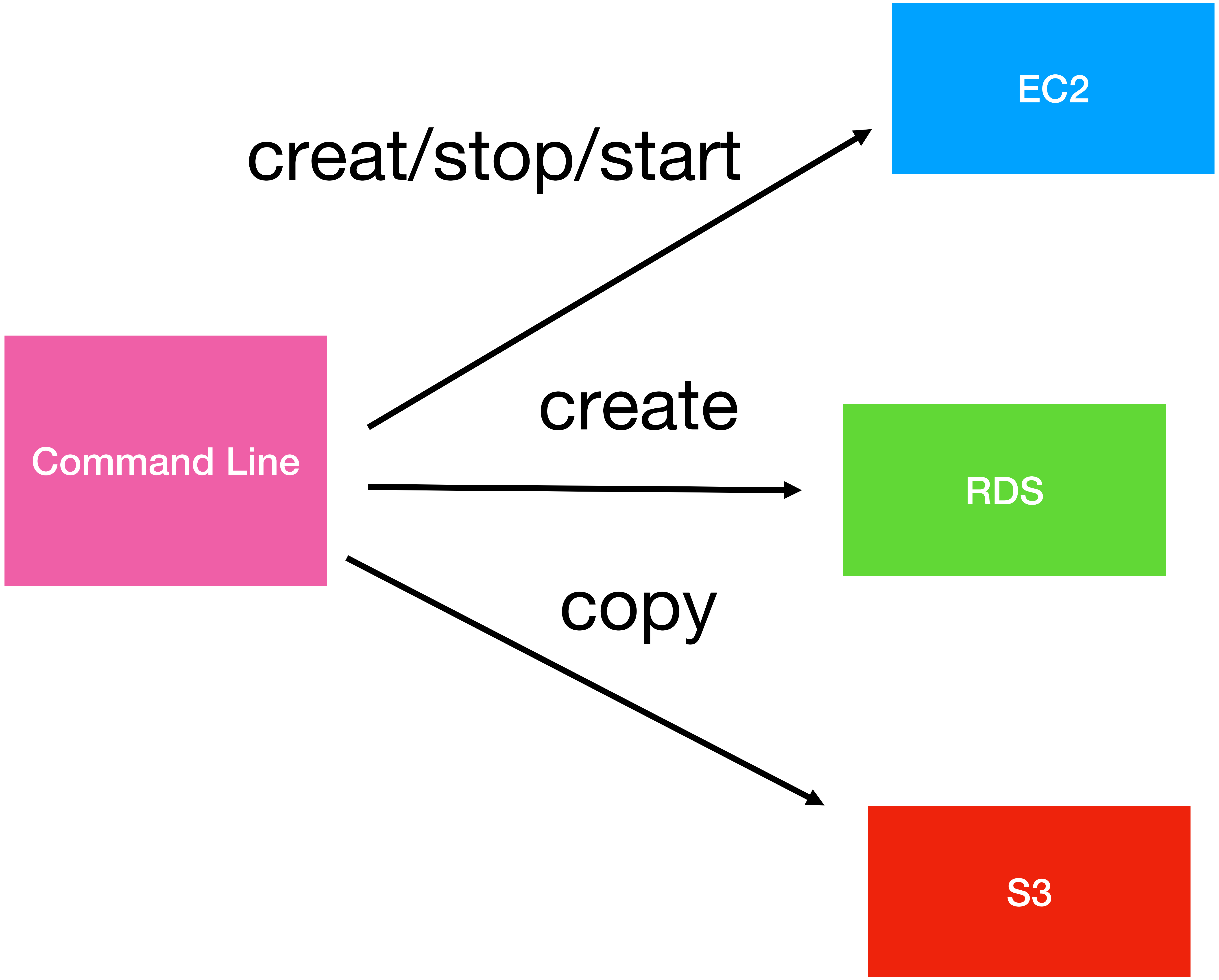
EC2

RDS

S3

CloudWatch

AWS CLI



Policy

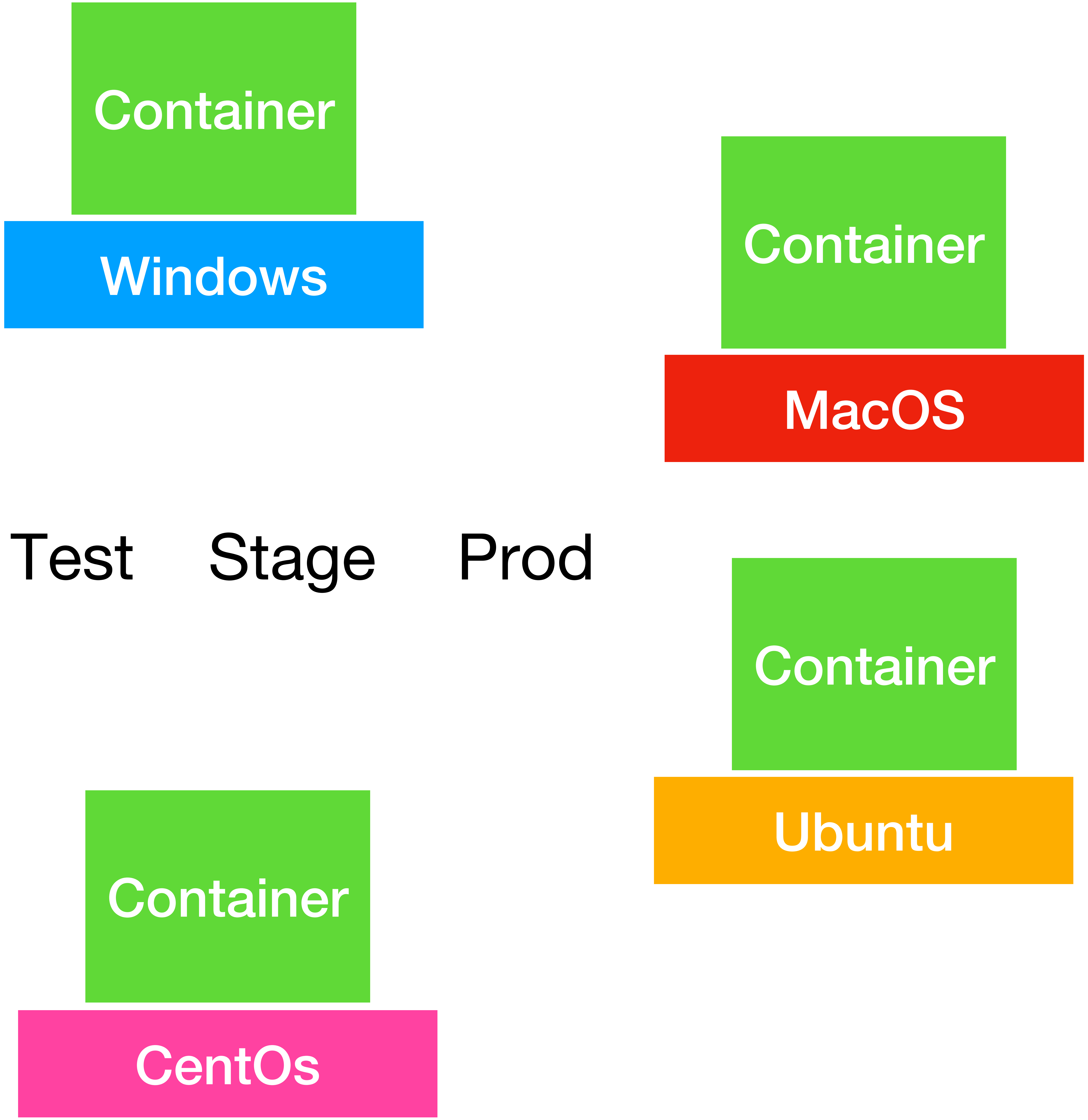
- Identity Based
- Resource Based
- IAM Permission Boundaries
- Service Control Policies
- Access Control Lists
- Session Policies

- Actions
- Resouces
- Effect
- Conditions

DOCKER

Containers

Dev Test Stage Prod



Container

Windows

Container

MacOS

Container

Ubuntu

Container

CentOs

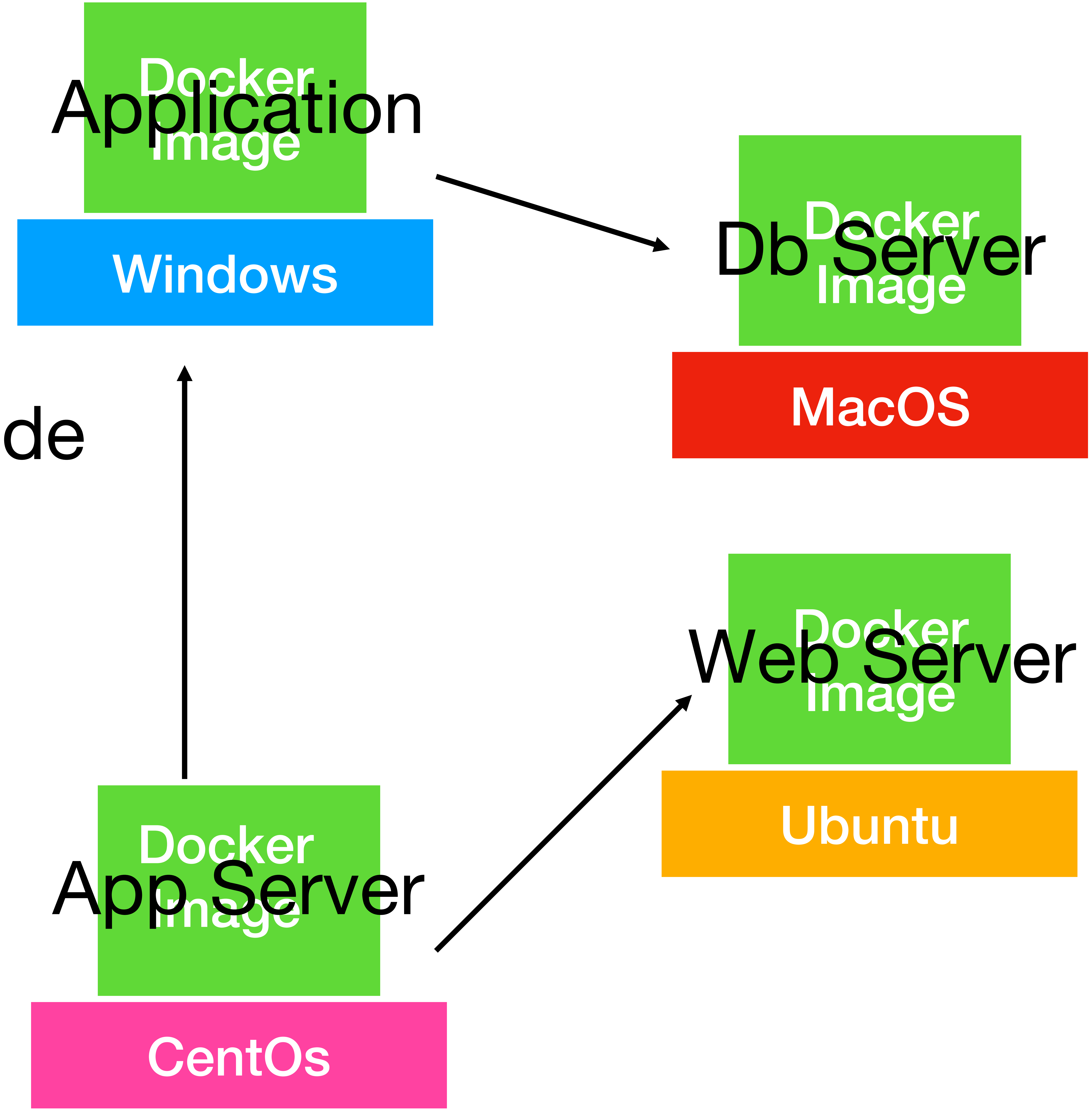
Docker

OCI

war/dll/django code

Image

Container



Docker Image

Application

Windows

Docker Image

Db Server

MacOS

Docker Image

Web Server

Ubuntu

Docker Image

App Server

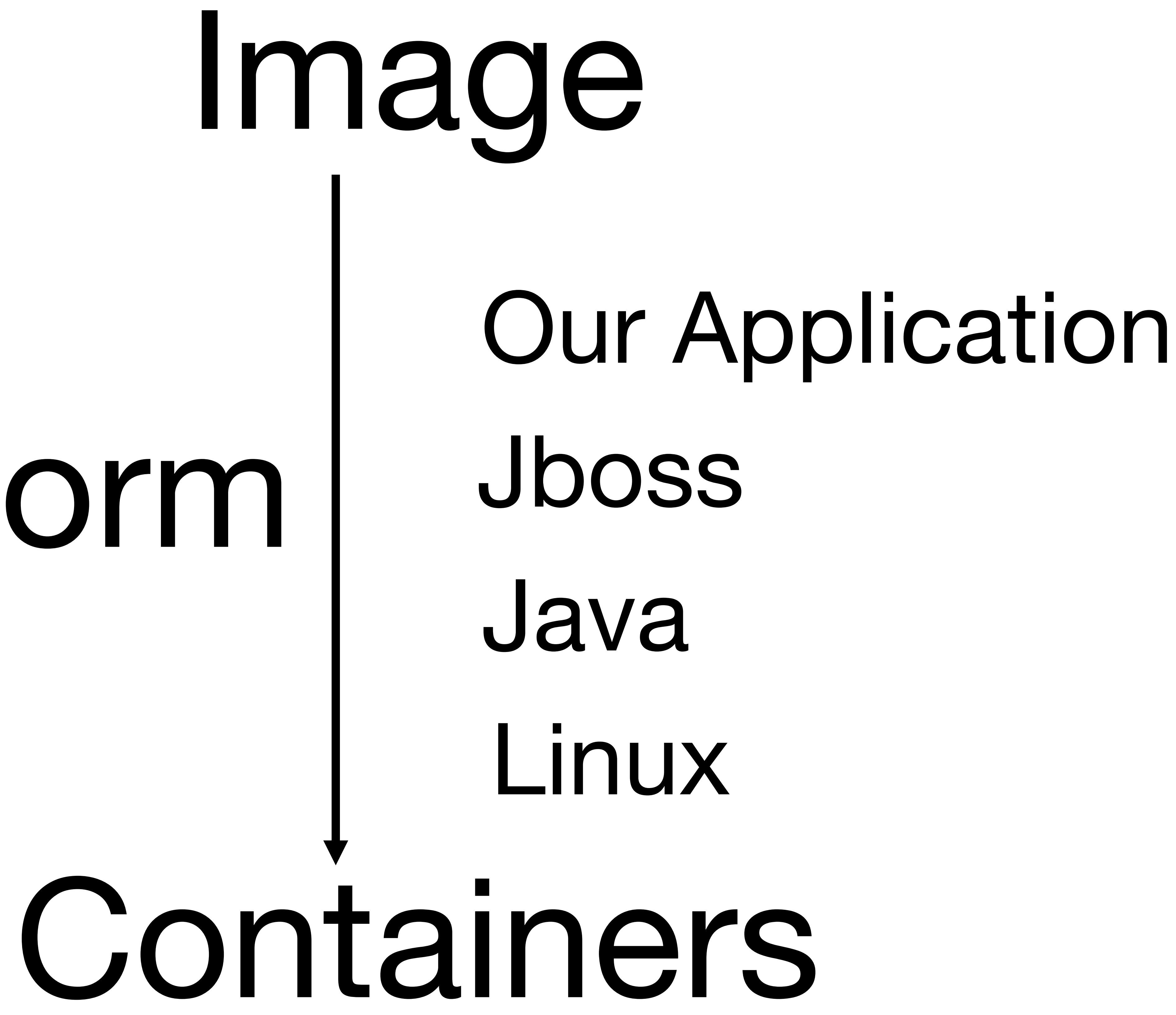
CentOs

Simple

Virtualization Platform

Fast

PODA



Image

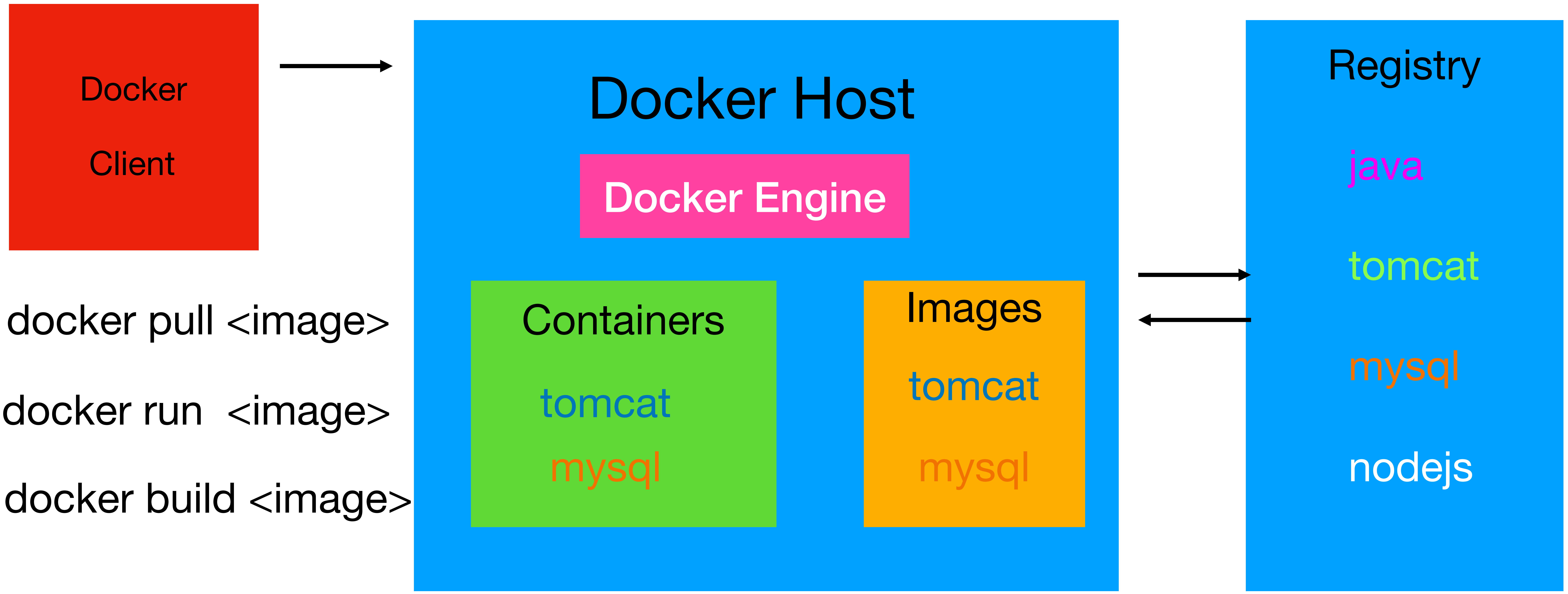
Our Application

Jboss

Java

Linux

Containers



Docker

Client

docker pull <image>

docker run <image>

docker build <image>

Docker Host

Docker Engine

Containers

tomcat

mysql

Images

tomcat

mysql

Registry

java

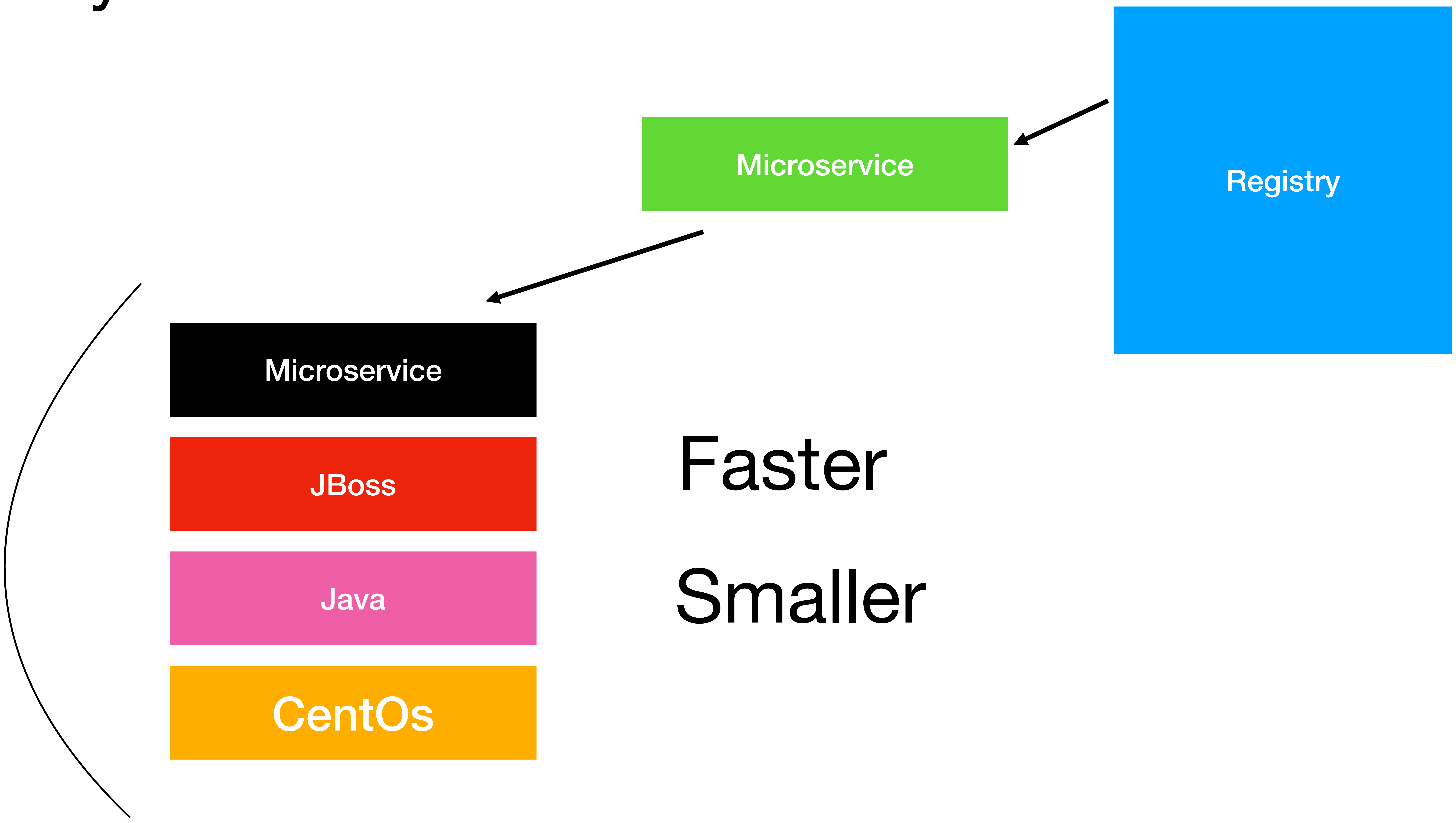
tomcat

mysql

nodejs

Docker Components and Workflow

Docker Layers



UFS

Faster

Smaller

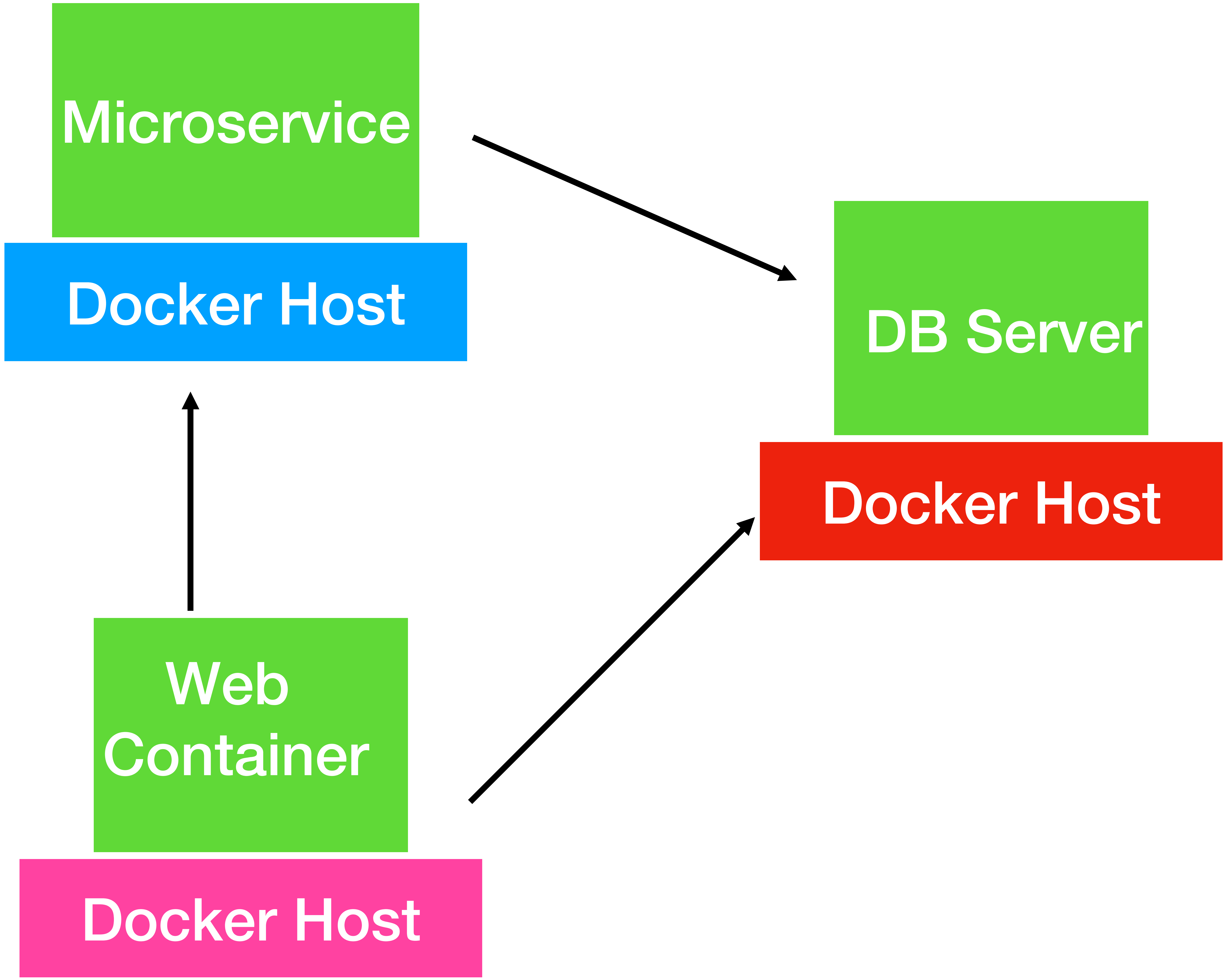
Dockerization

Launch a MySql Container

Create a Dockerfile

Launch the App Container and Test

Docker Compose



Microservice

Docker Host

DB Server

Docker Host

Web Container

Docker Host

up

restart

build

scale

stop

kill

logs

ps

Web Dashboard

CLI

REST APIs

Master/Control node

Managed Nodes

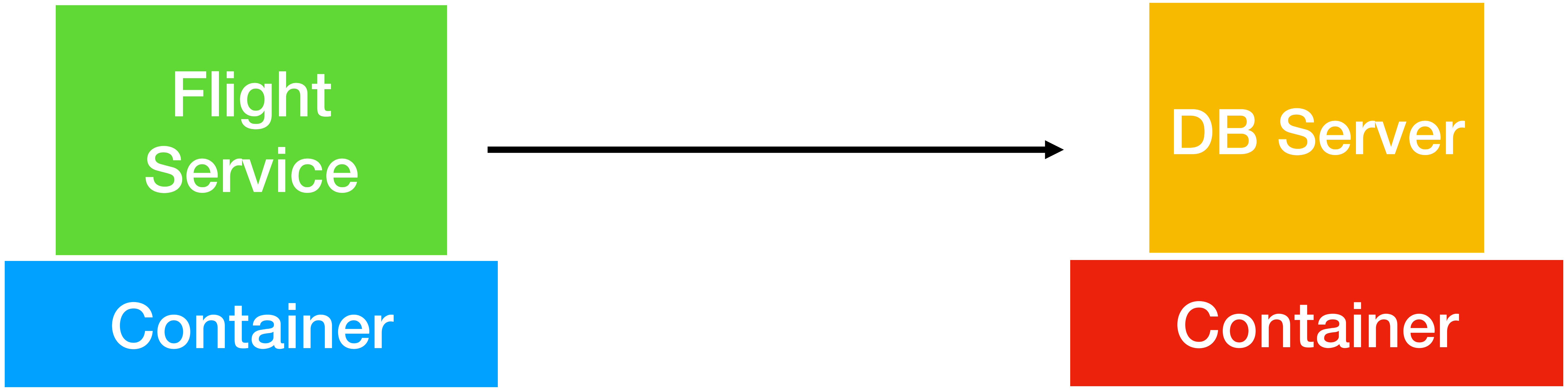
Inventory

Copy Files

Modules

Install Software

Assignment



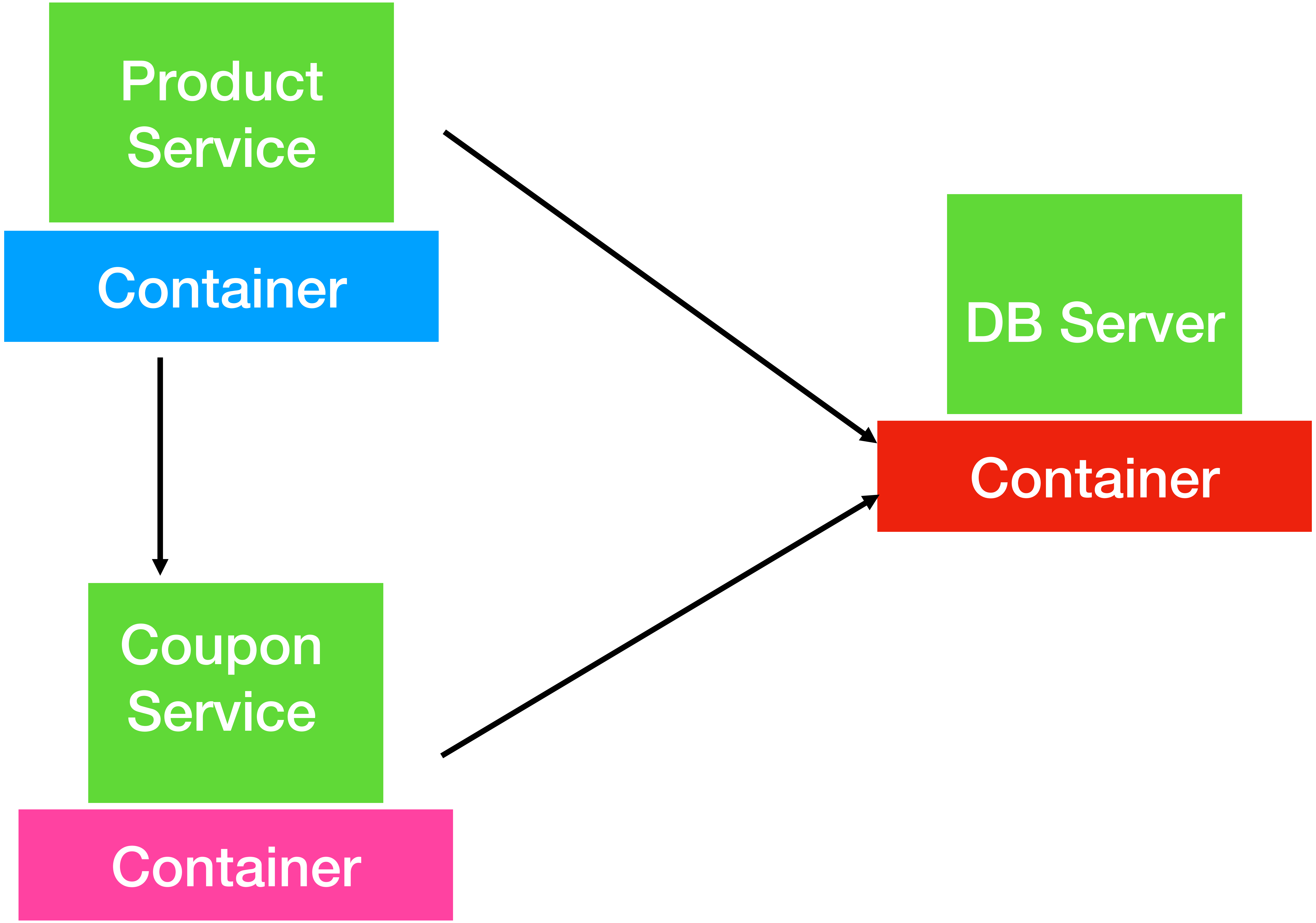
Flight Service

Container

DB Server

Container

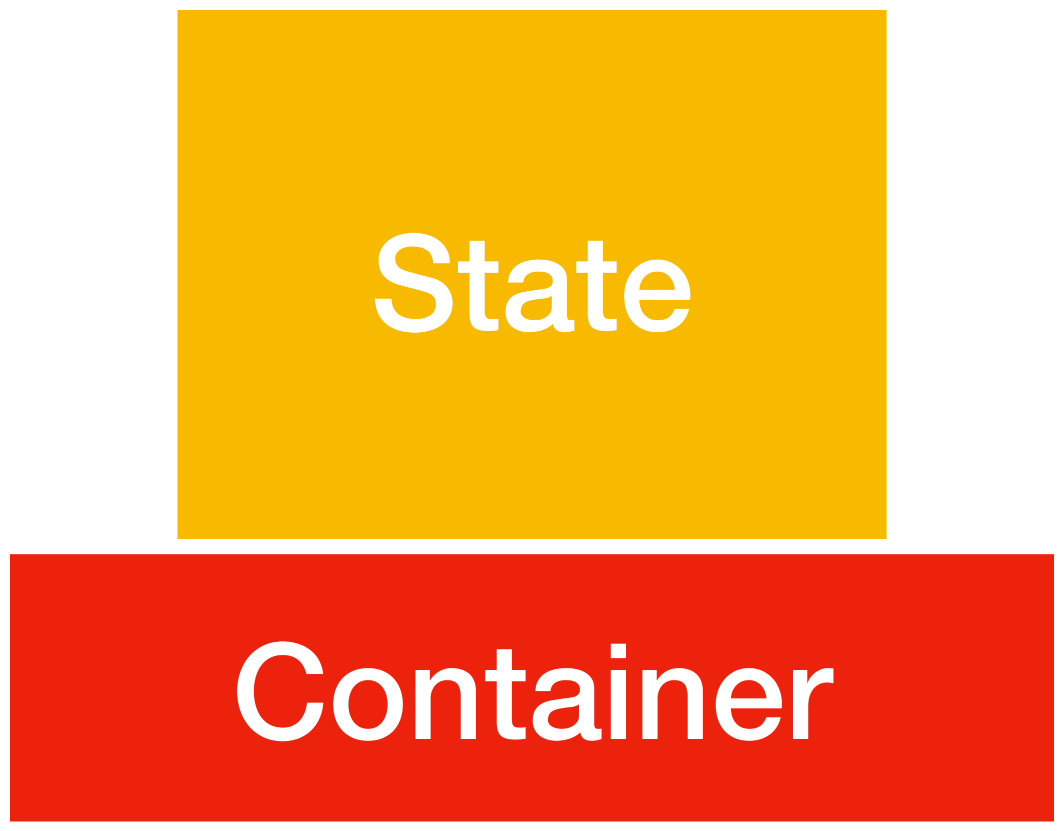
Dockerization



docker commit <container-id> image

Apache2

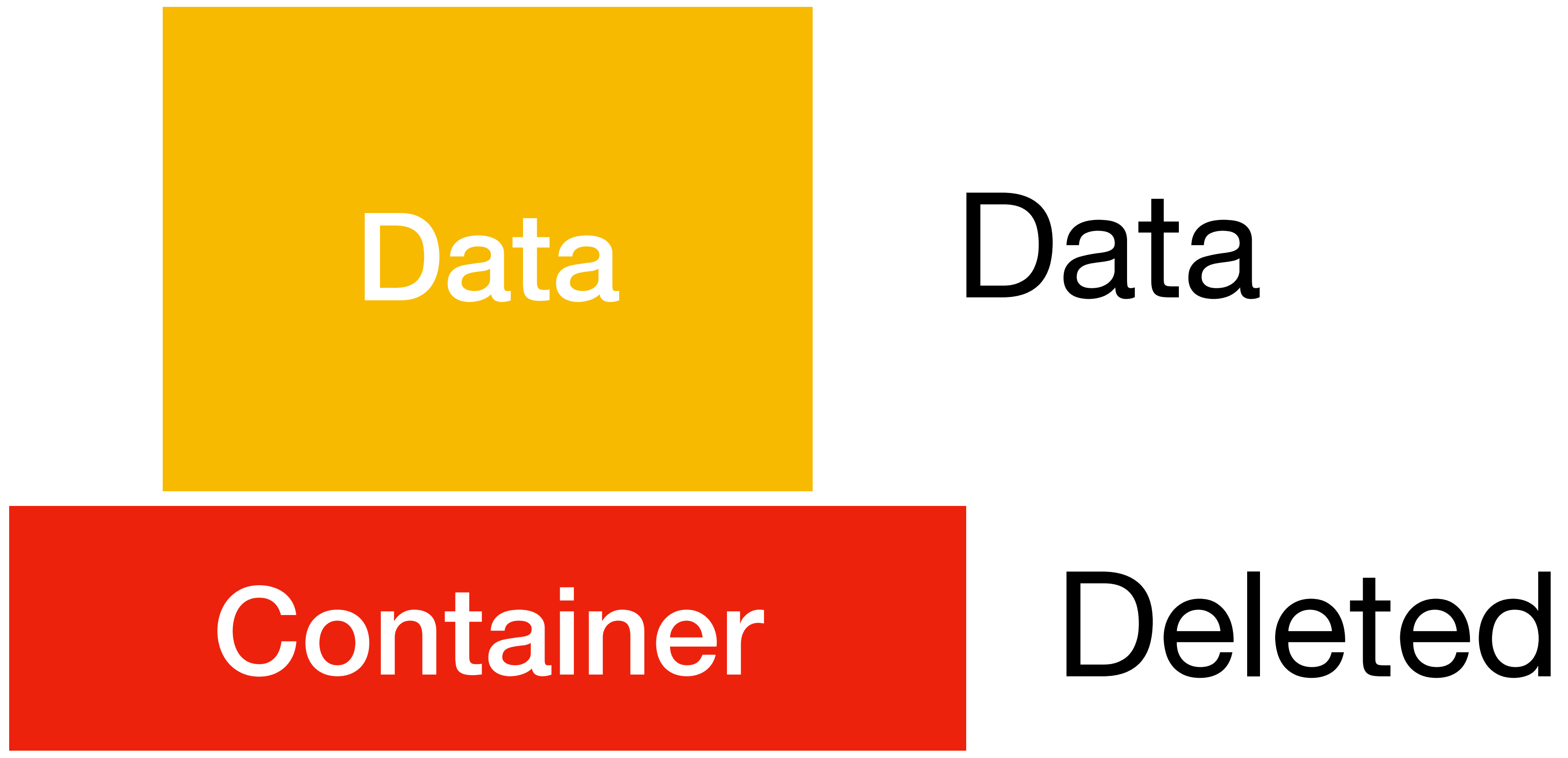
Ubuntu



State

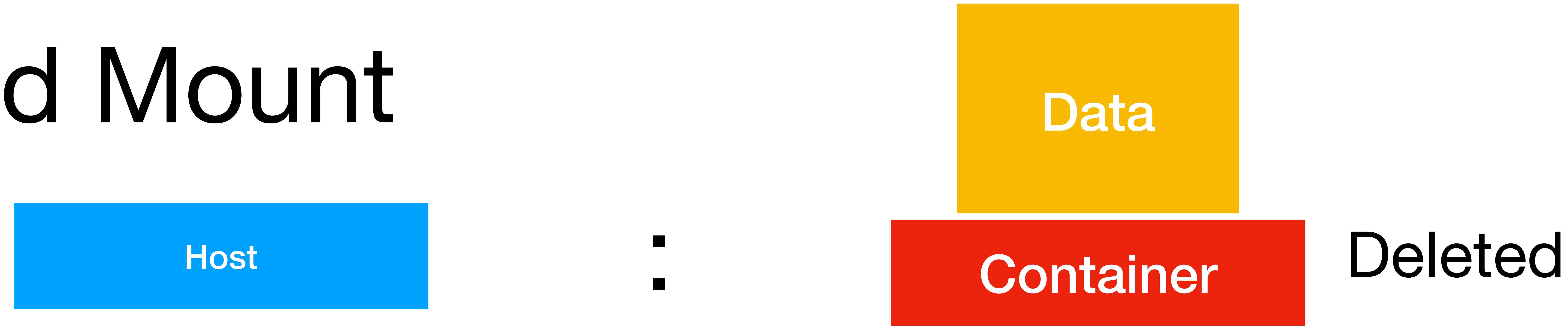
Container

Volumes and Bind Mounts



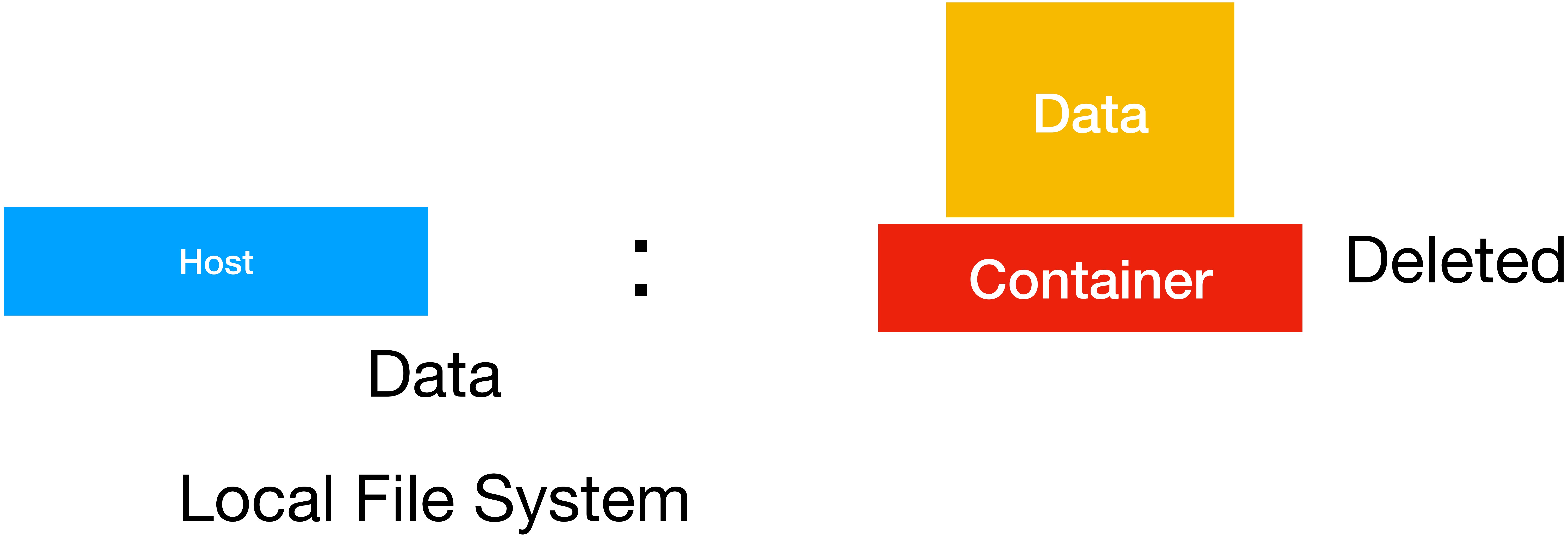
Persist Data

Bind Mount



Volume

Bind Mounts



Host

:

Data

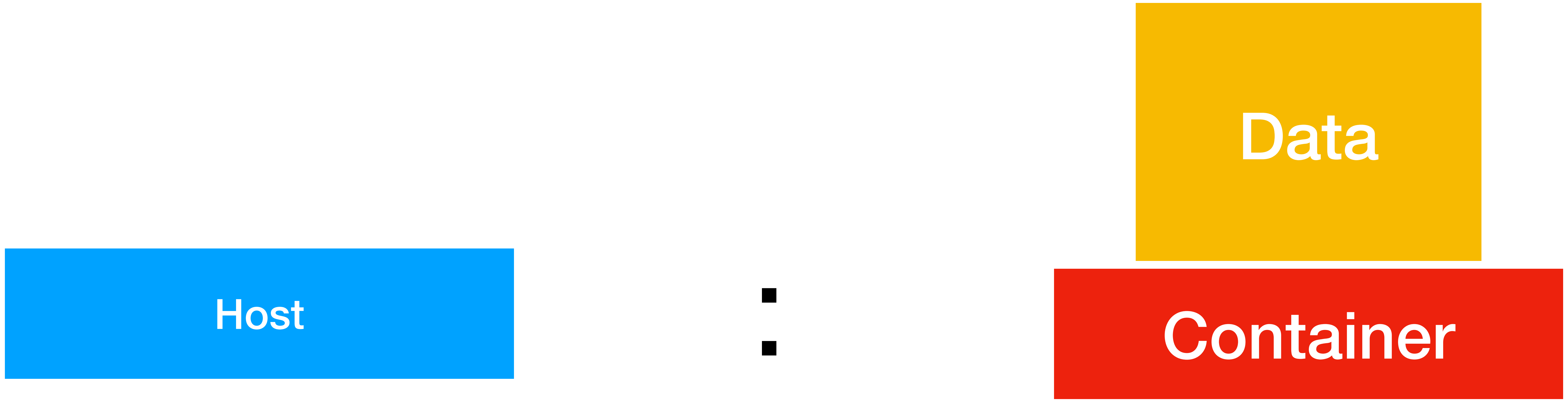
Container

Deleted

Data

Local File System

Volume



Host

:

Data

Container

Deleted

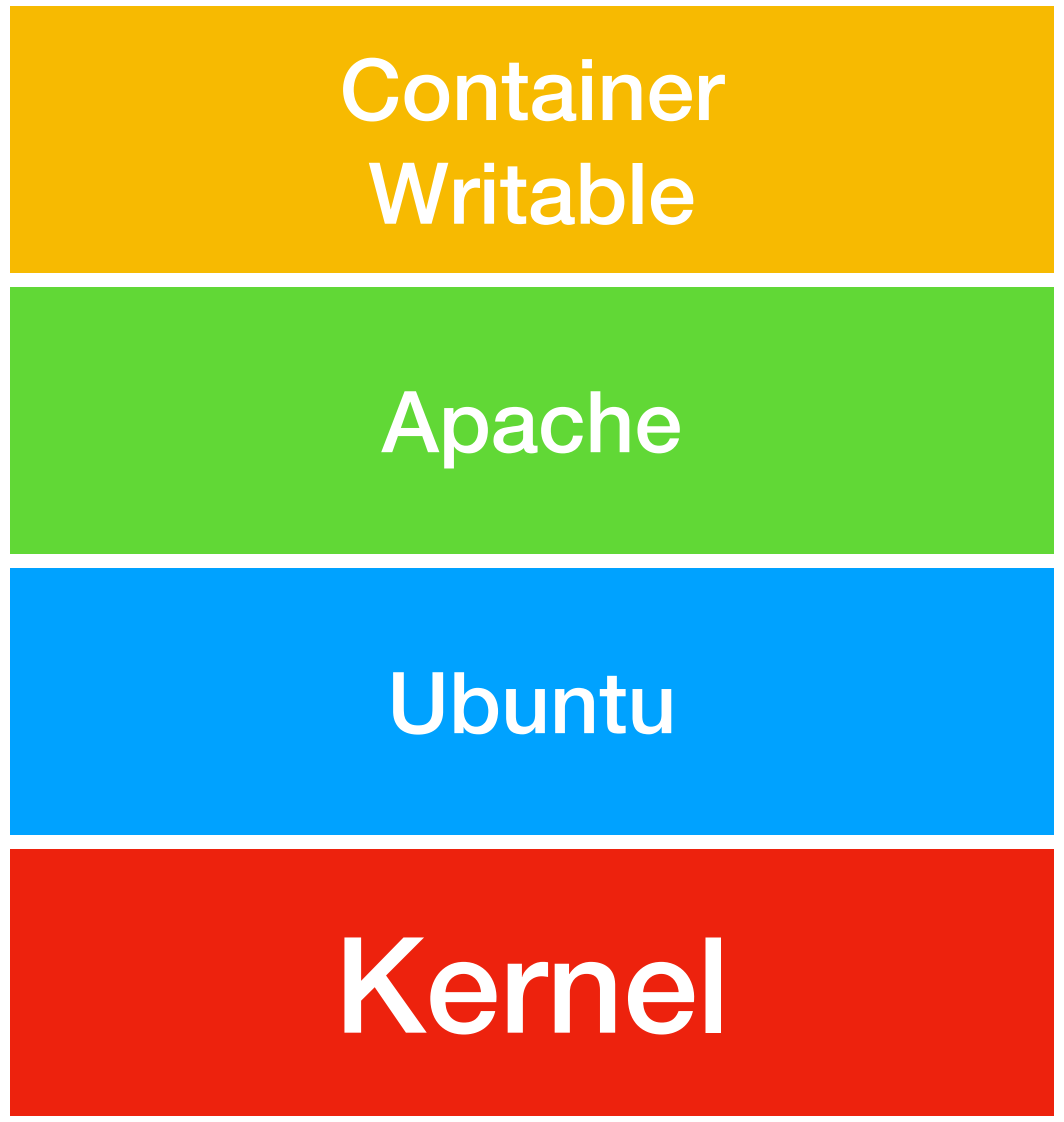
Data

Docker

/var/lib/docker/volumes

Image Layers and Overlay

Union File System



Container Writable

Apache

Ubuntu

Kernel

Kubernetes

Container Orchestration

Fault-tolerance

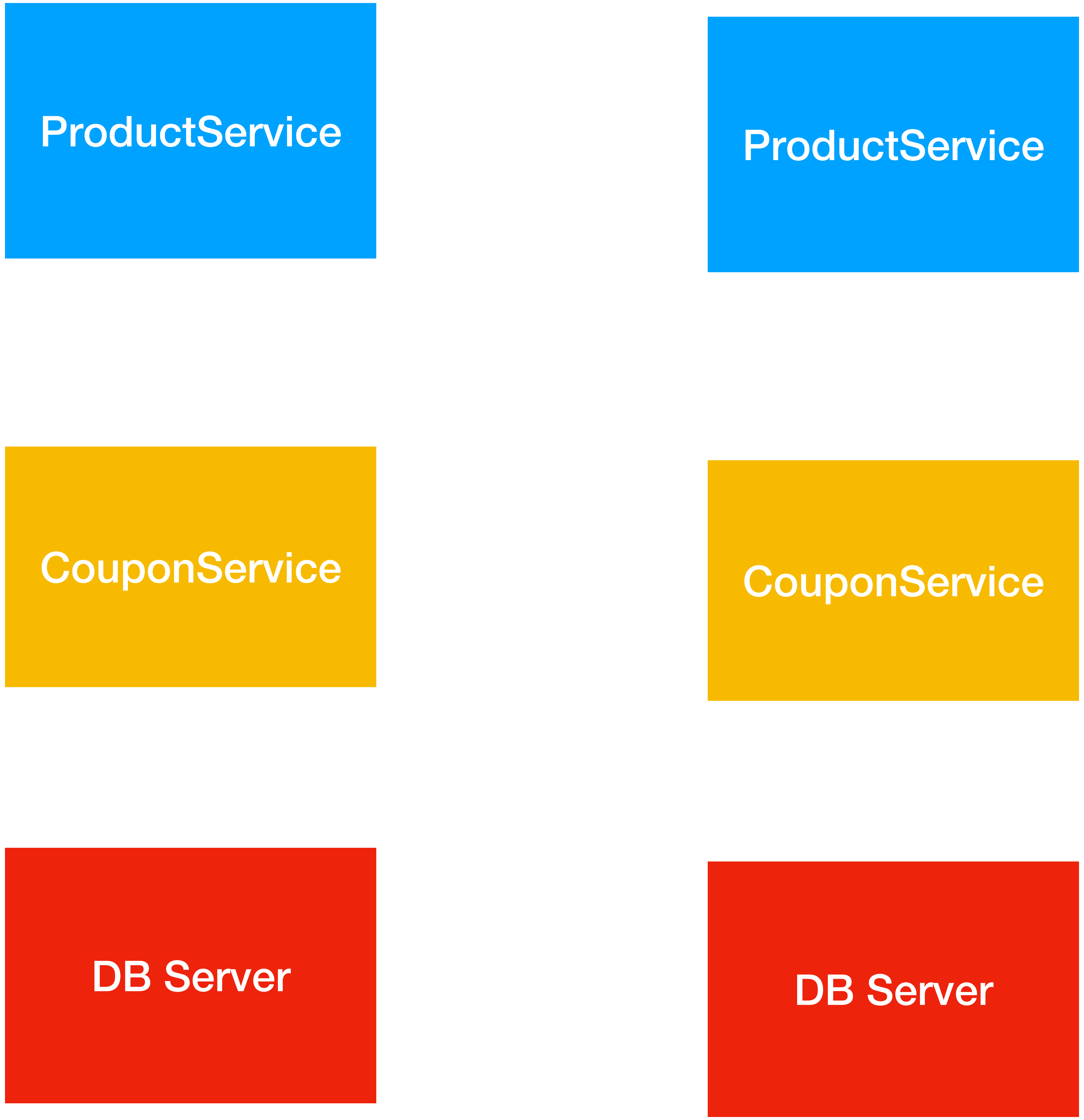
On-demand scalability

Performance

Auto Discovery

Public Access

Auto Update and RollBack



ProductService

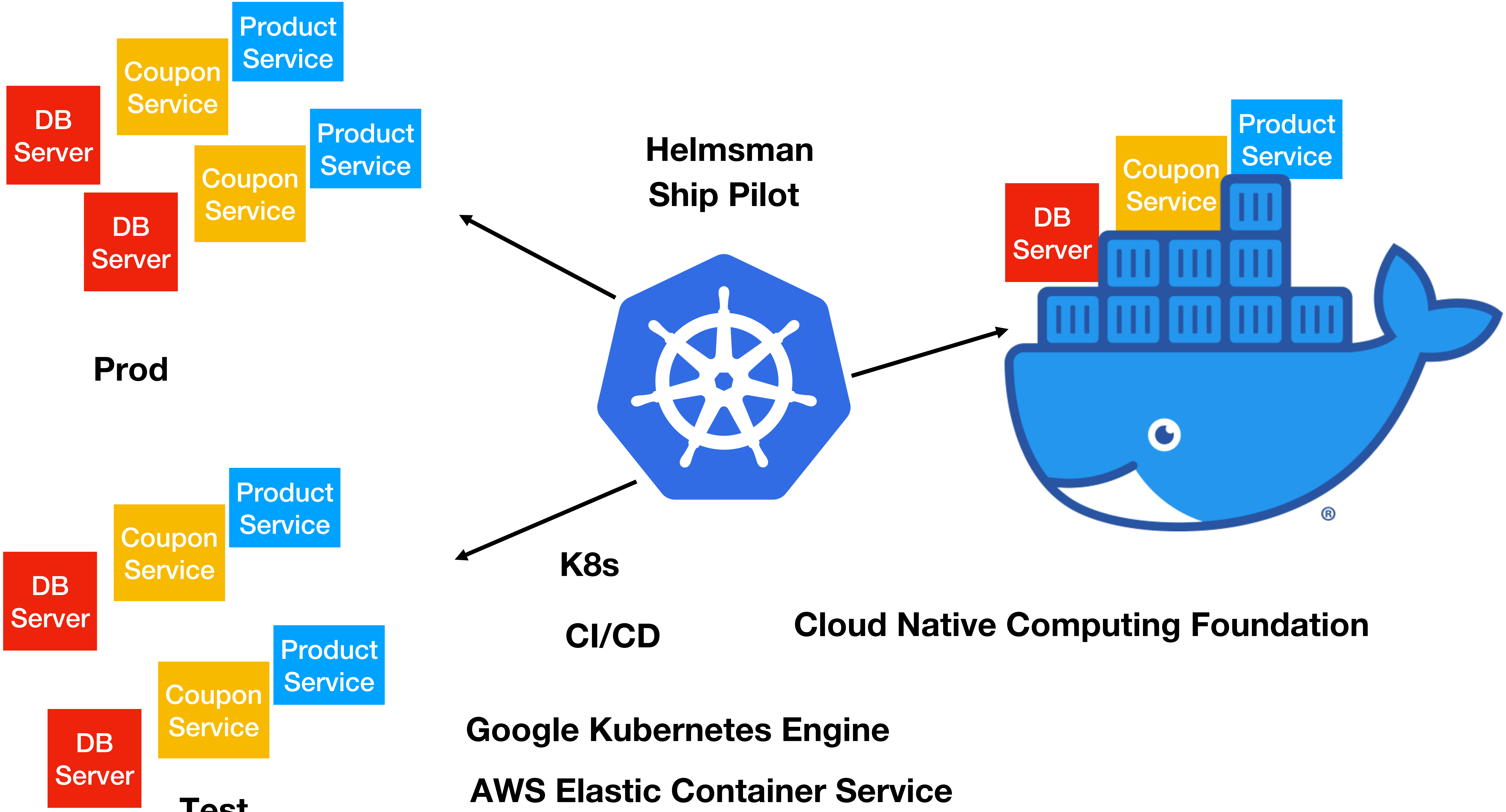
ProductService

CouponService

CouponService

DB Server

DB Server



Product Service

Coupon Service

DB Server

Product Service

Coupon Service

DB Server

Prod

Helmsman

Ship Pilot

DB Server

Coupon Service

Product Service

Product Service

Coupon Service

DB Server

Product Service

Coupon Service

DB Server

Test

K8s

CI/CD

Cloud Native Computing Foundation

Google Kubernetes Engine

AWS Elastic Container Service

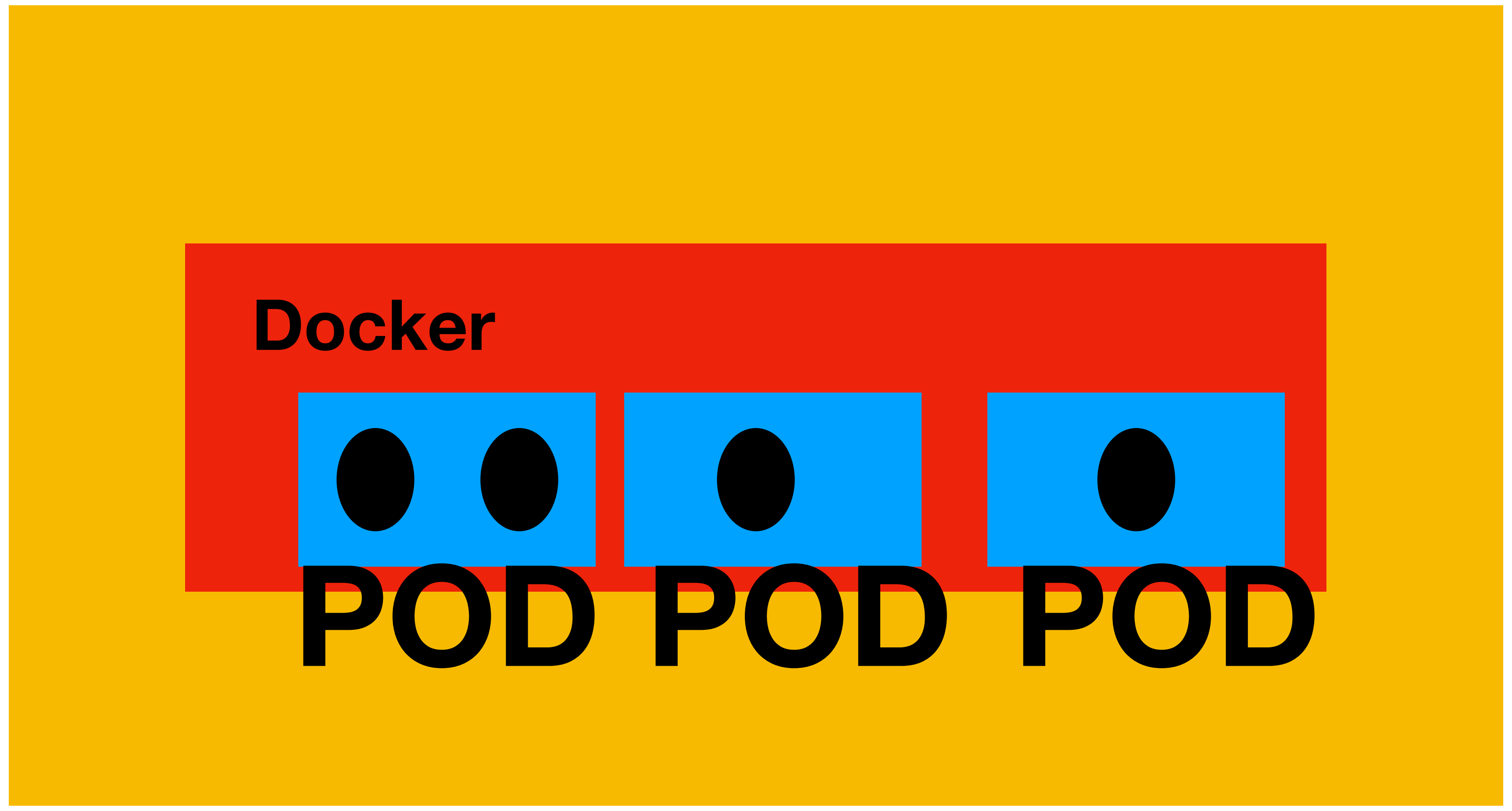
Azure Kubernetes Service

Namespace

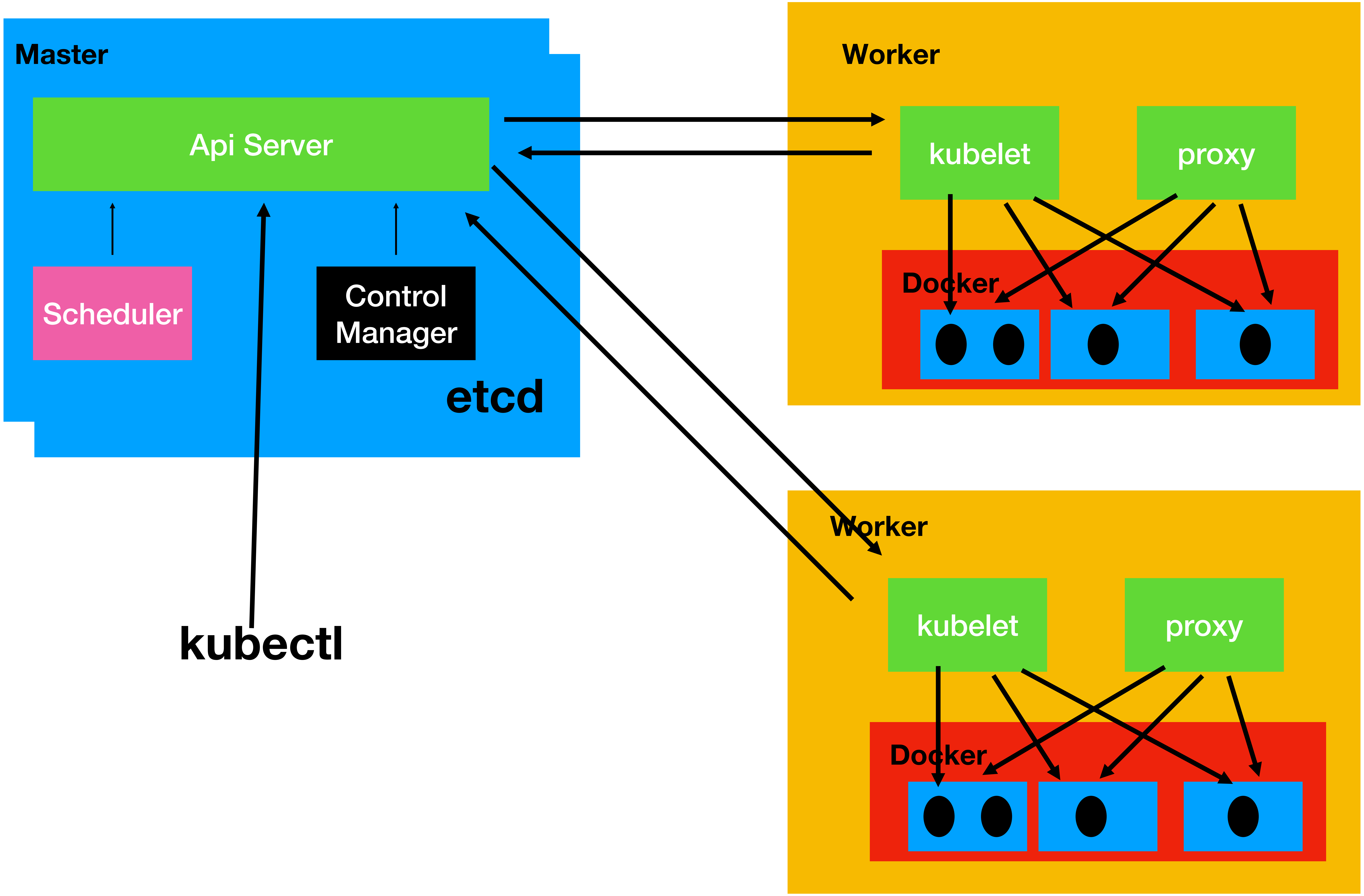
Deployment

ReplicaSet

Pod

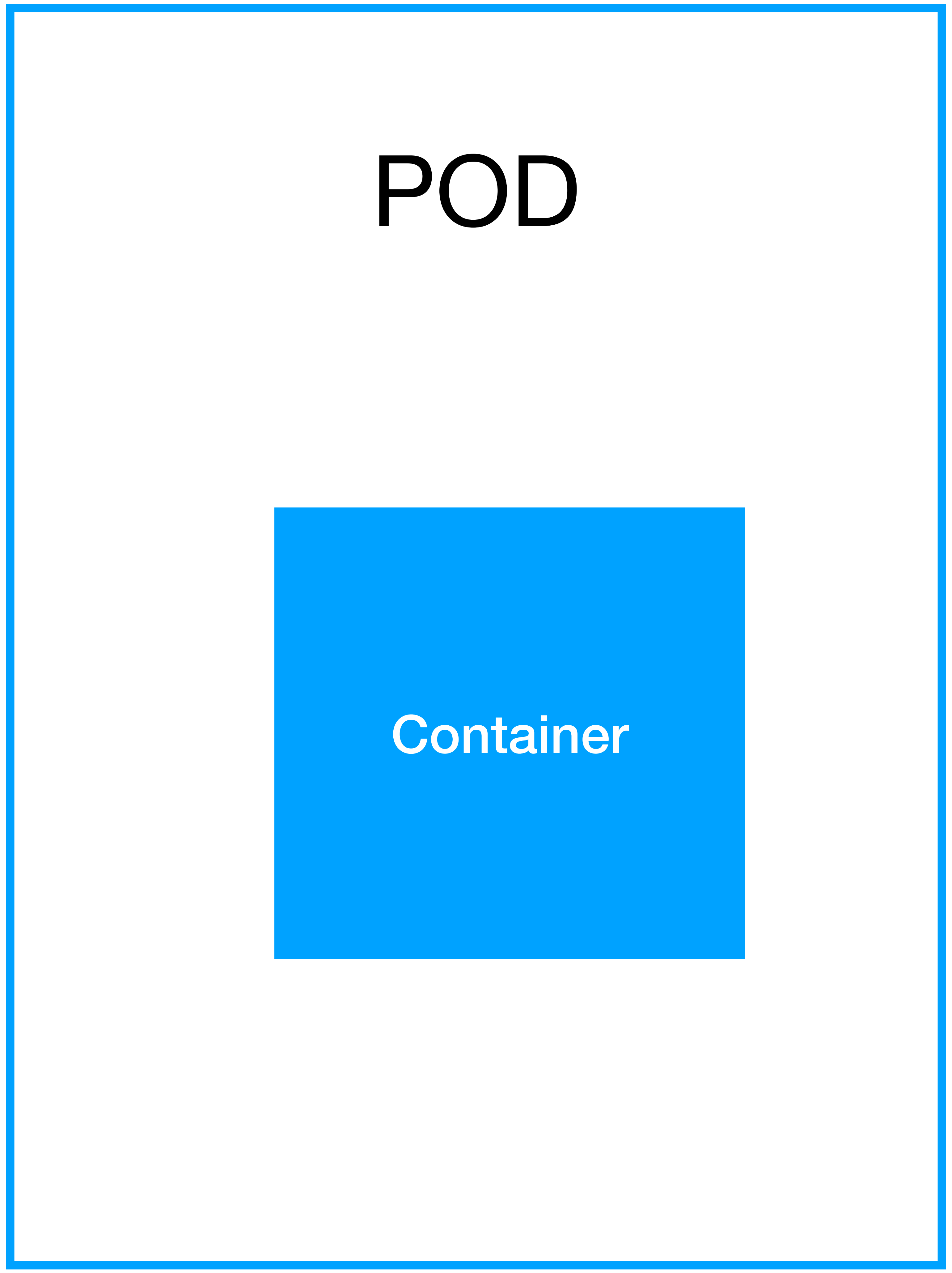


Service


Master
Api Server
Scheduler
Control Manager
etcd
kubectl
Worker
kubelet
proxy
Docker
Worker
kubelet
proxy
Docker

Phases

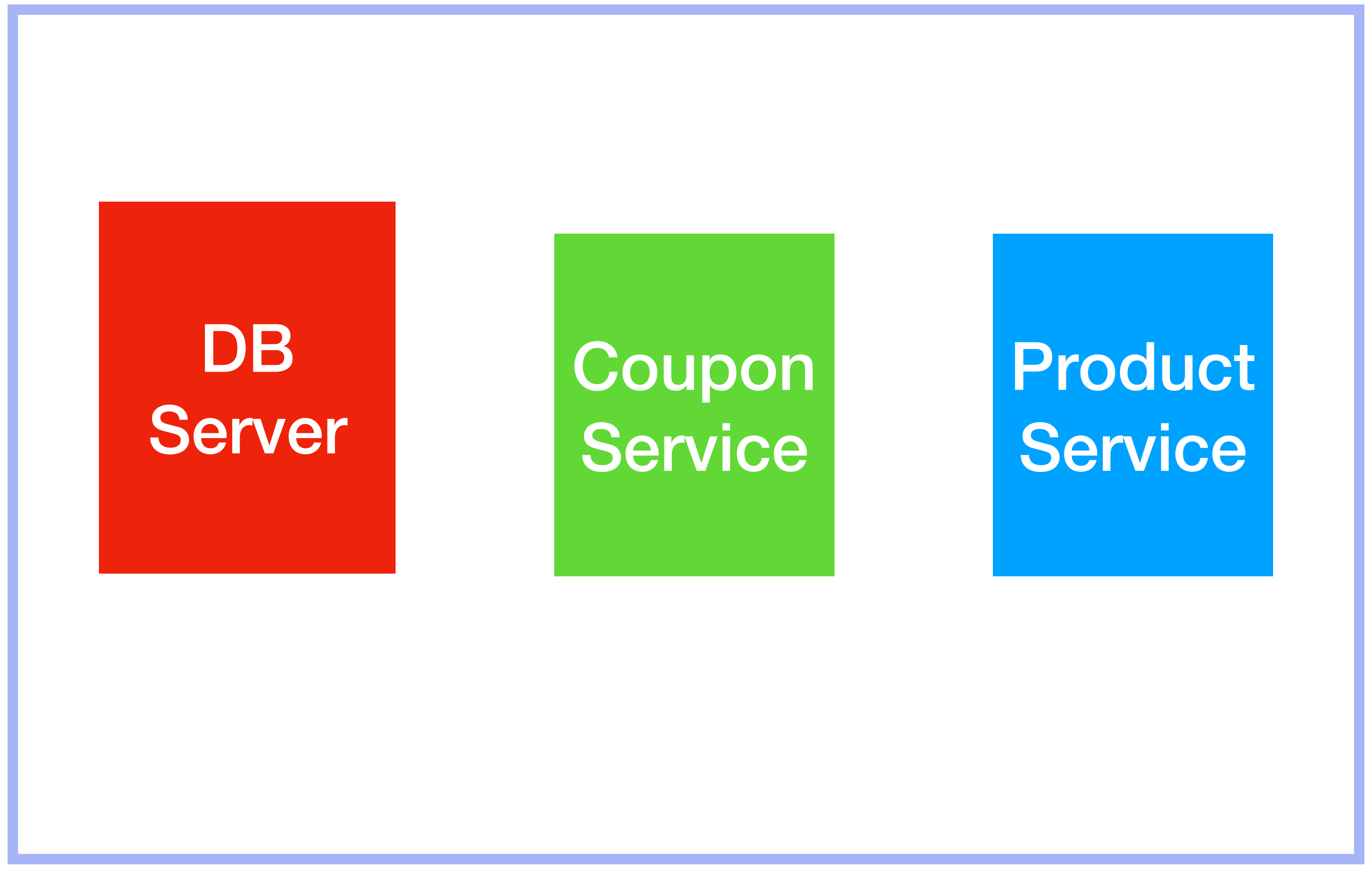
- Pending
- Running
- Succeeded
- Failed
- Unknown



POD

Network

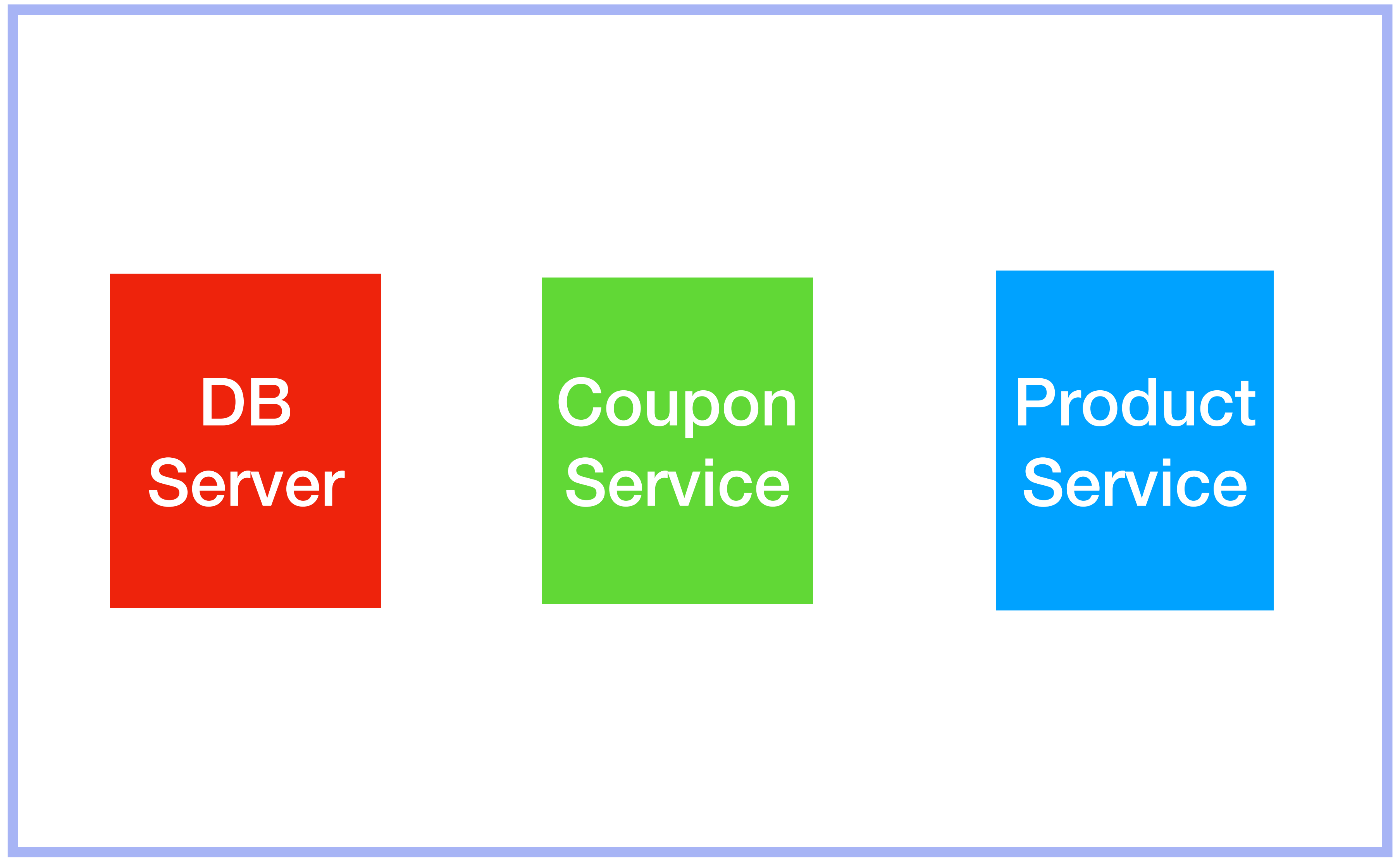
Security



DB Server

Coupon Service

Product Service



DB Server

Coupon Service

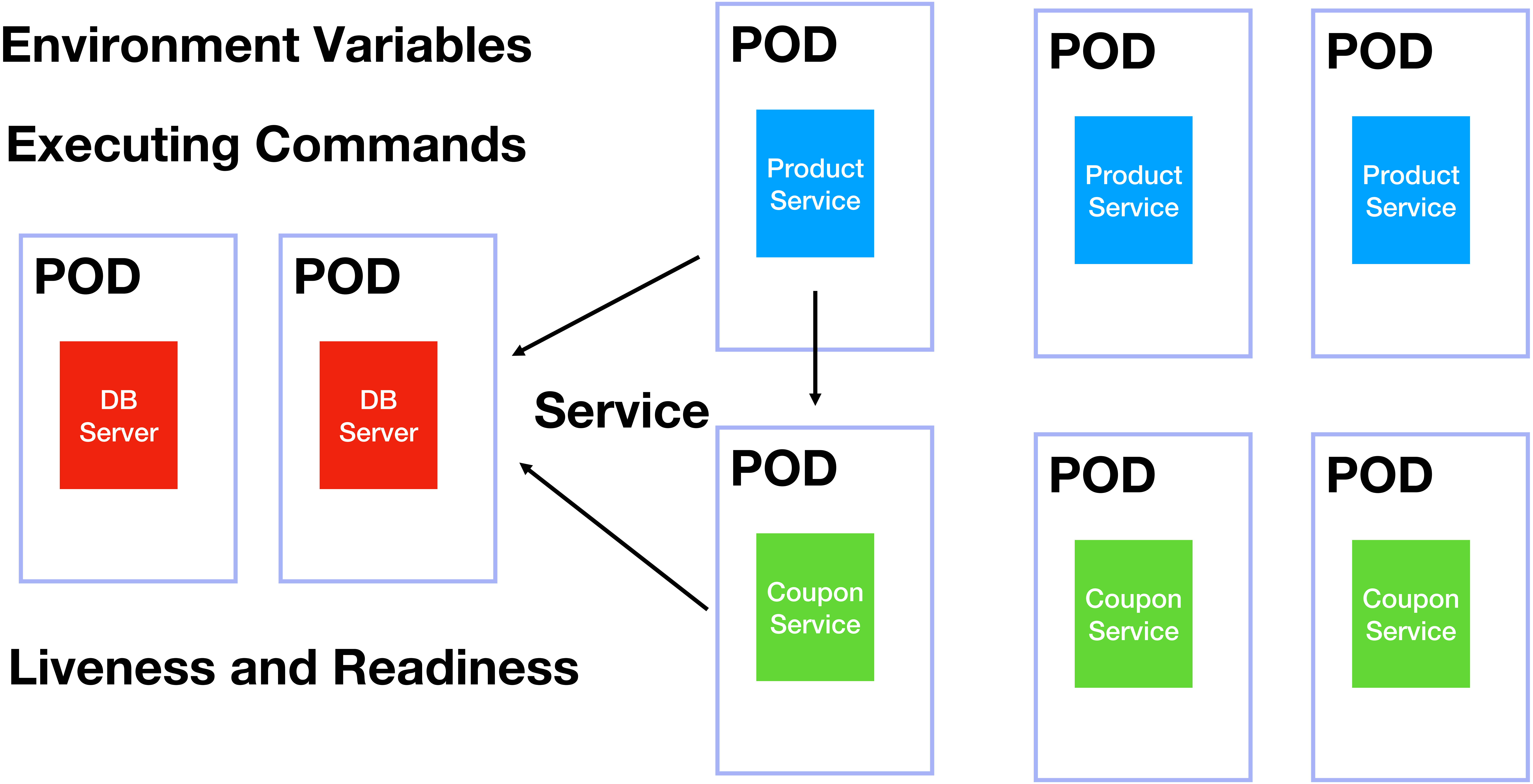
Product Service

Configuration

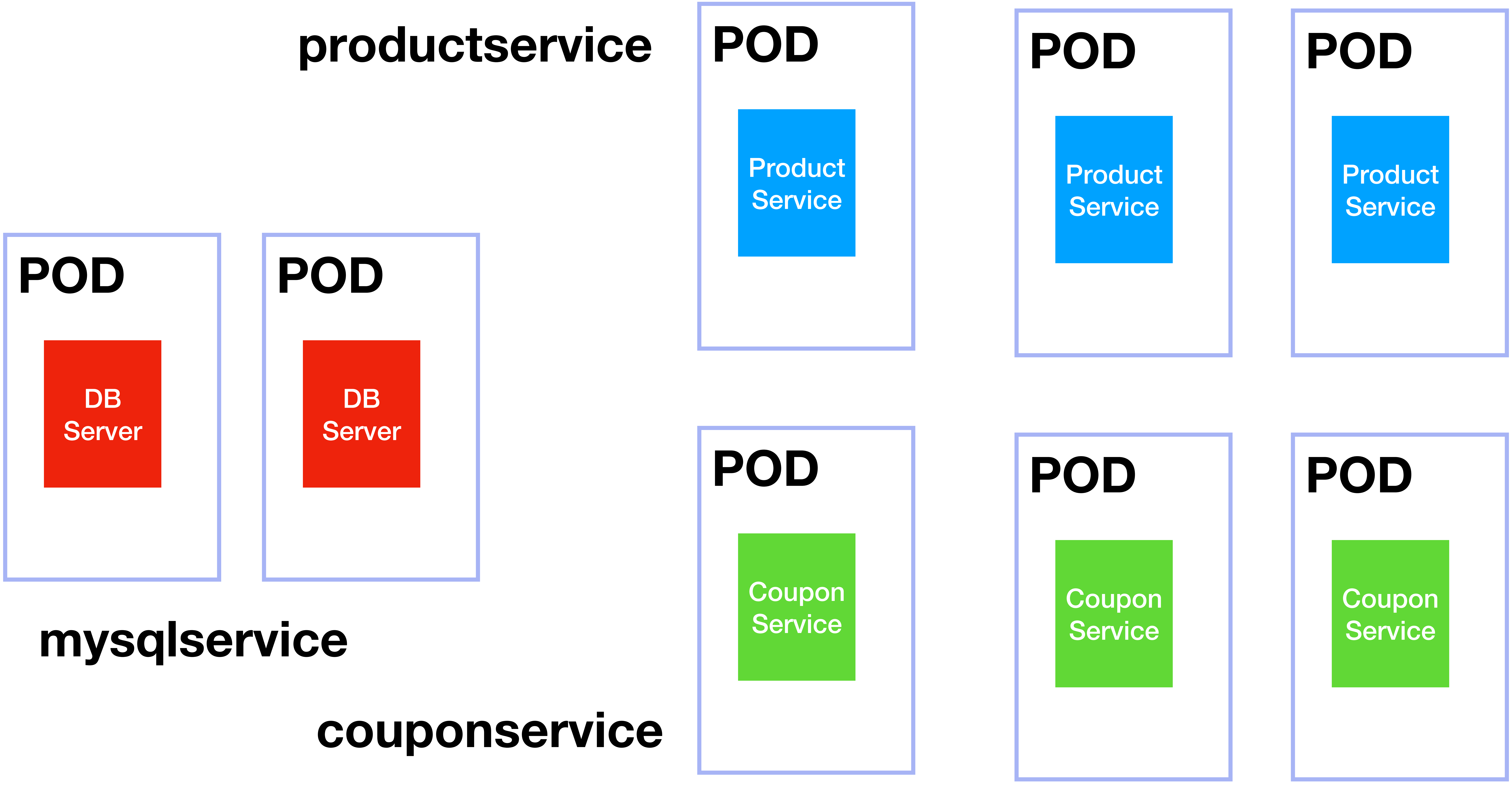
Volumes

Environment Variables

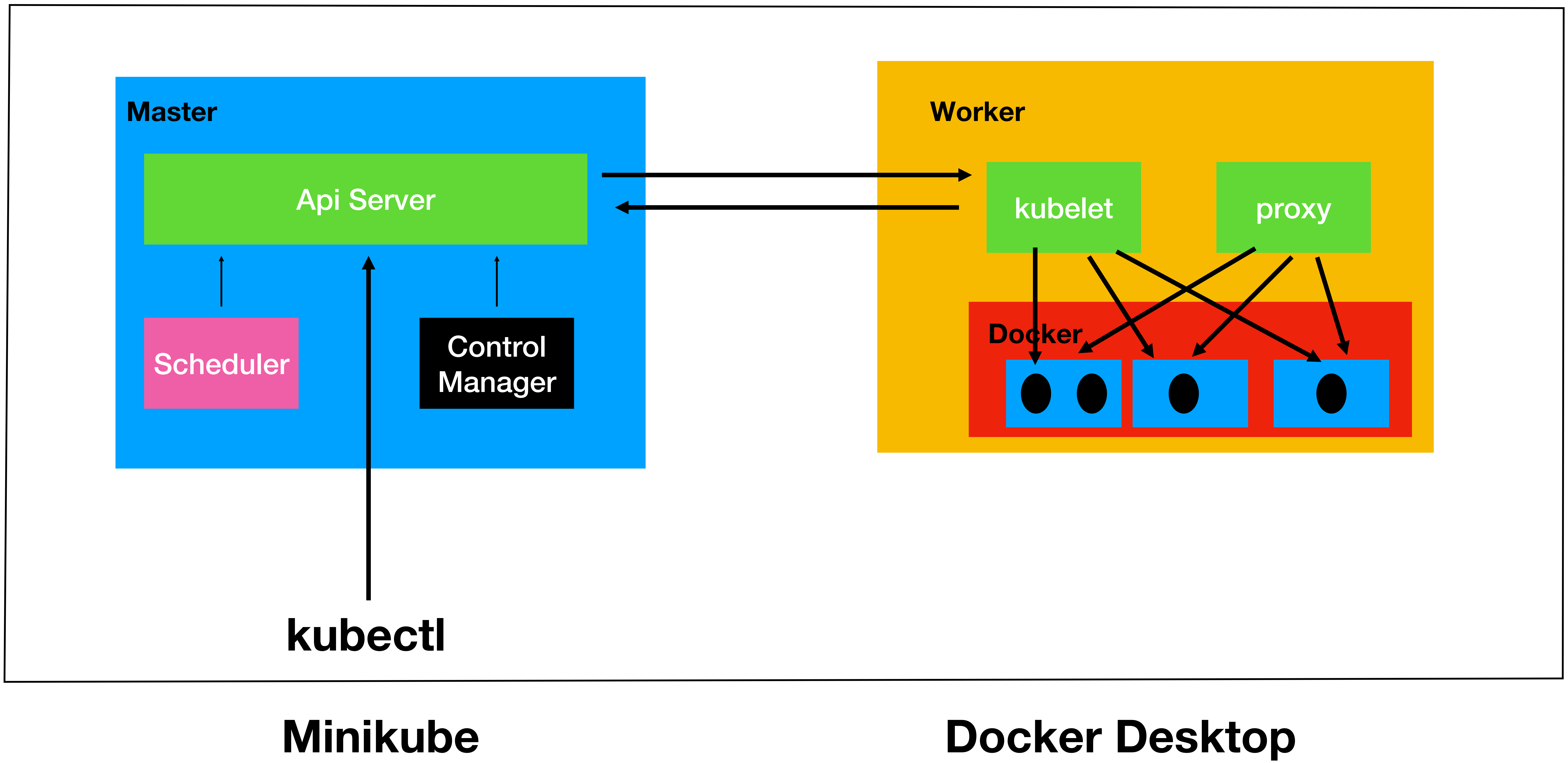
Executing Commands



Liveness and Readiness


productservice
POD
Product Service
POD
Product Service
POD
Product Service
POD
DB Server
POD
DB Server
mysqlservice
POD
Coupon Service
POD
Coupon Service
POD
Coupon Service
couponservice

Single-Node Installation



On-Premise Bare Metal or VMs

Cloud Installation

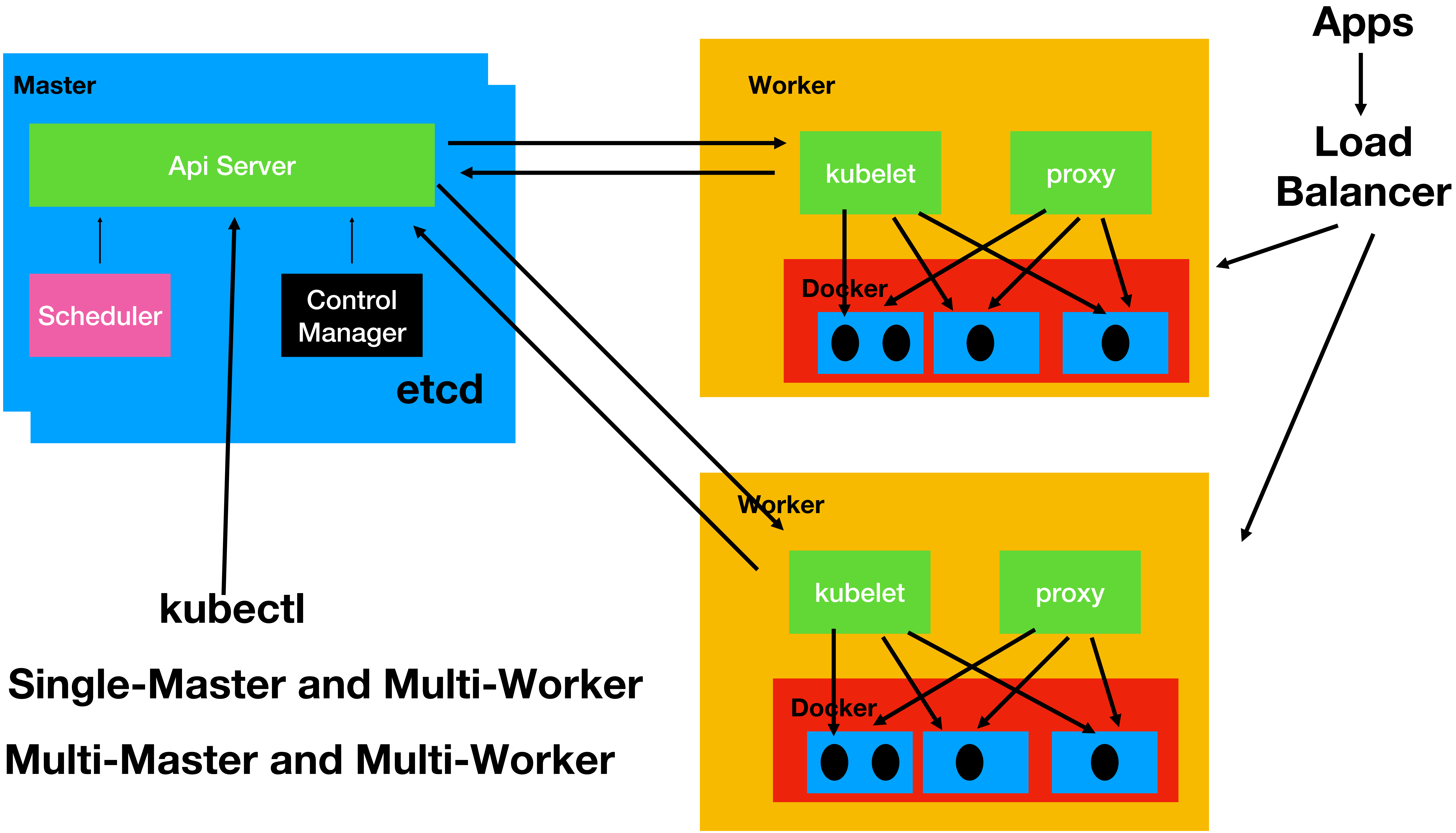
Hosted Solutions on Cloud

Google Kubernetes Engine (GKE)

Azure Kubernetes Service (AKS)

OpenShift Dedicated

On Premise Private Cloud



Master

Api Server

Scheduler

Control Manager

etcd

kubectl

Worker

kubelet

proxy

Docker

Worker

kubelet

proxy

Docker

Apps

Load Balancer

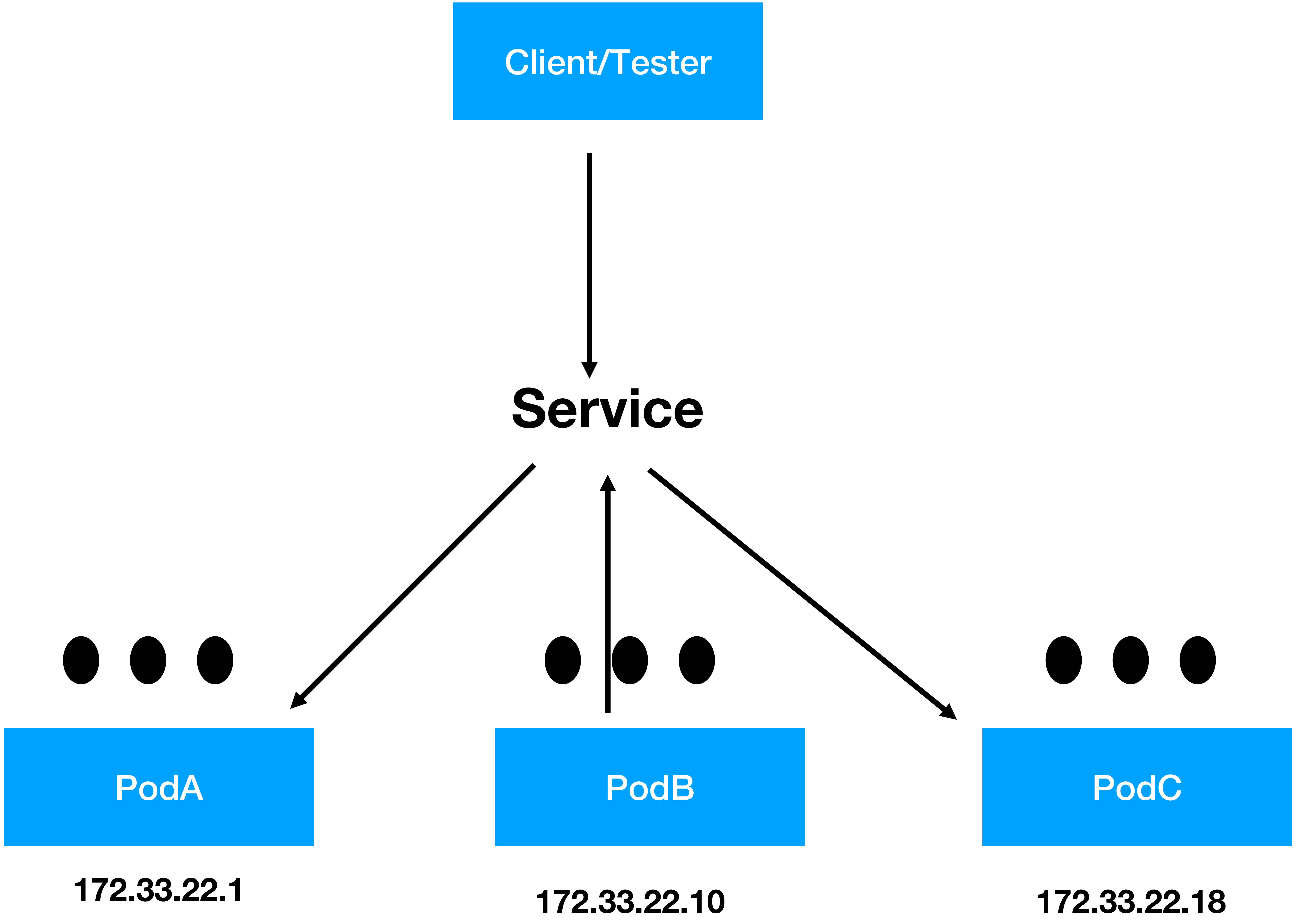
Single-Master and Multi-Worker

Multi-Master and Multi-Worker

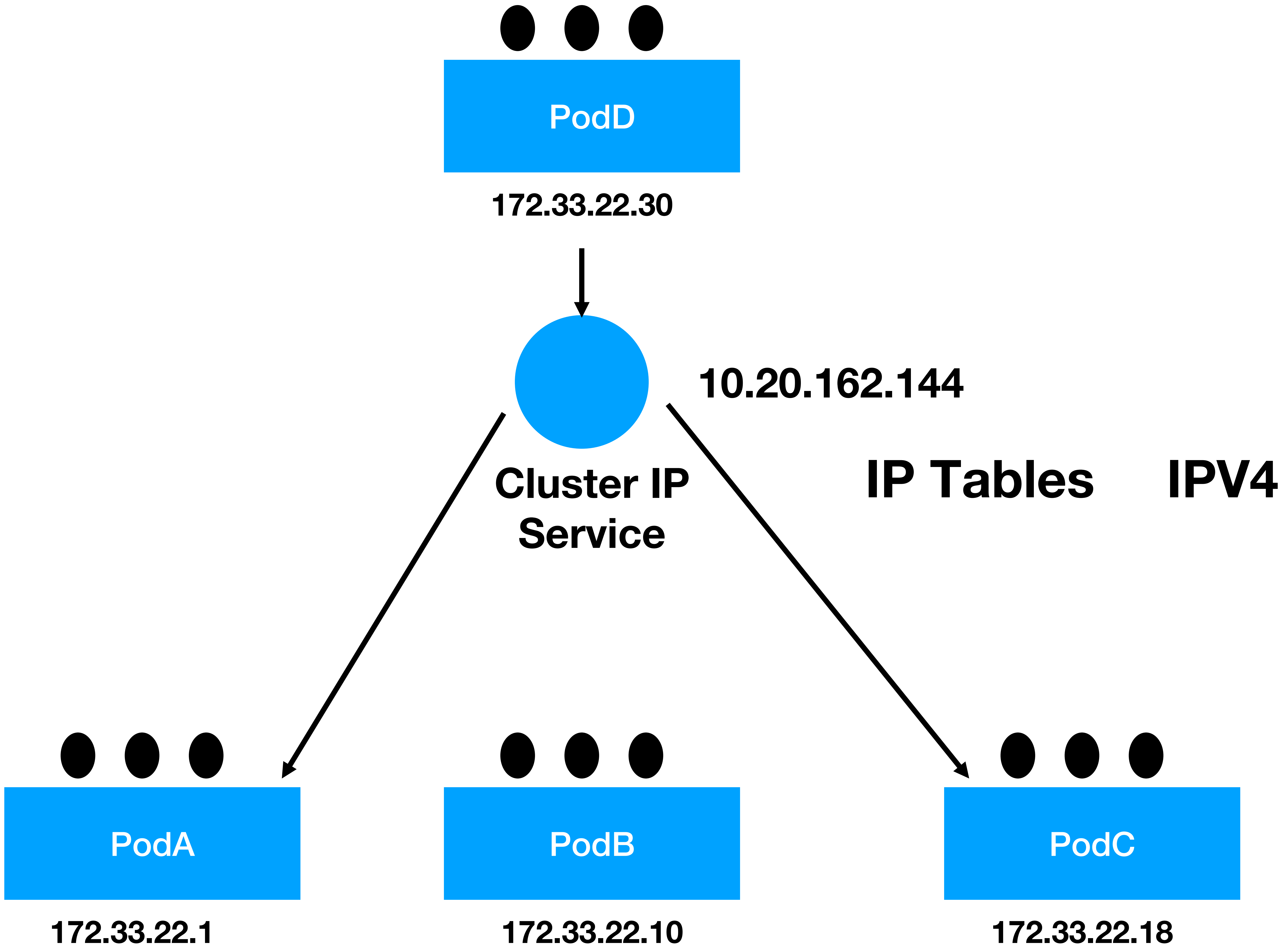
Only Cluster

Outside

Maps to a entity

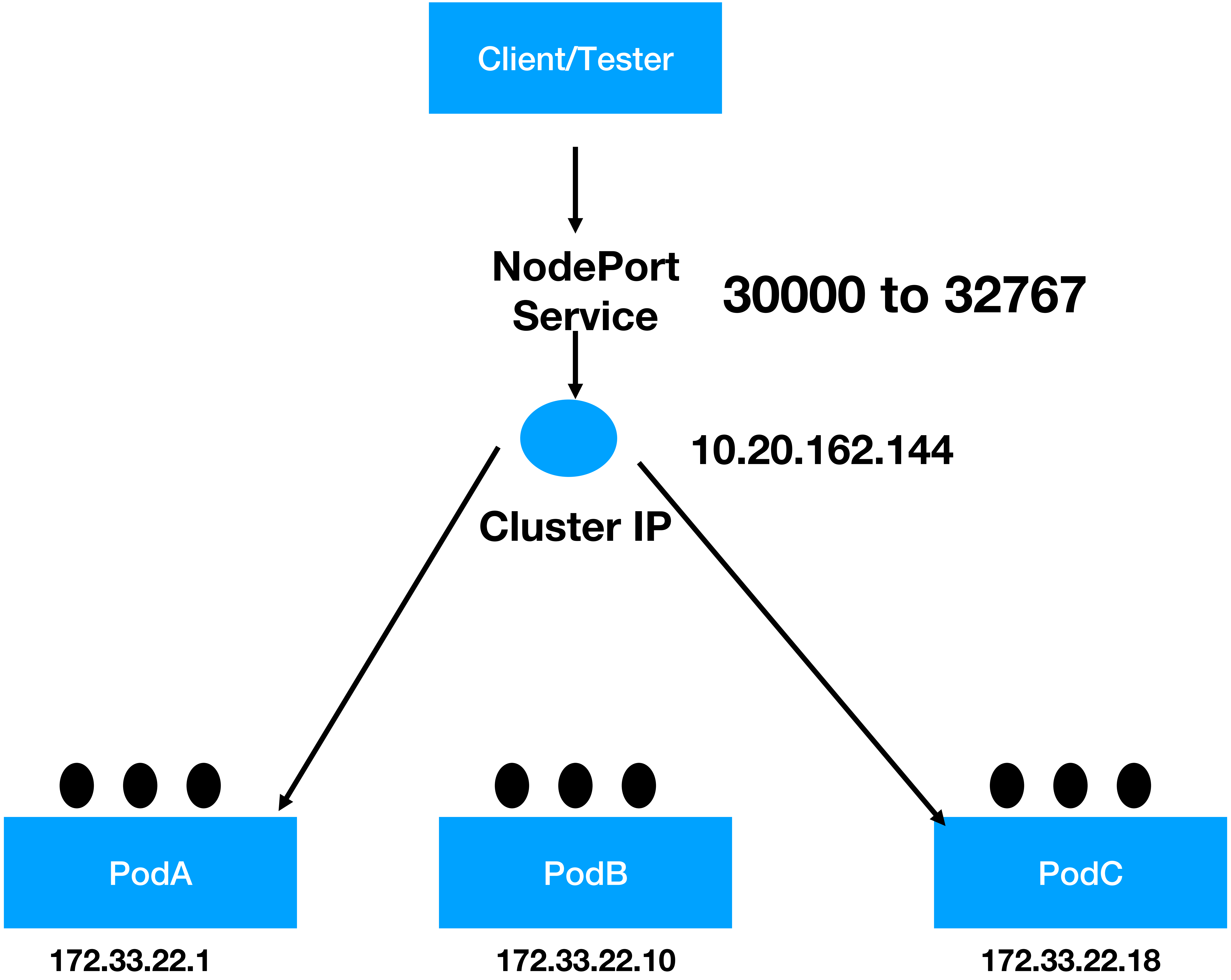


ClusterIP

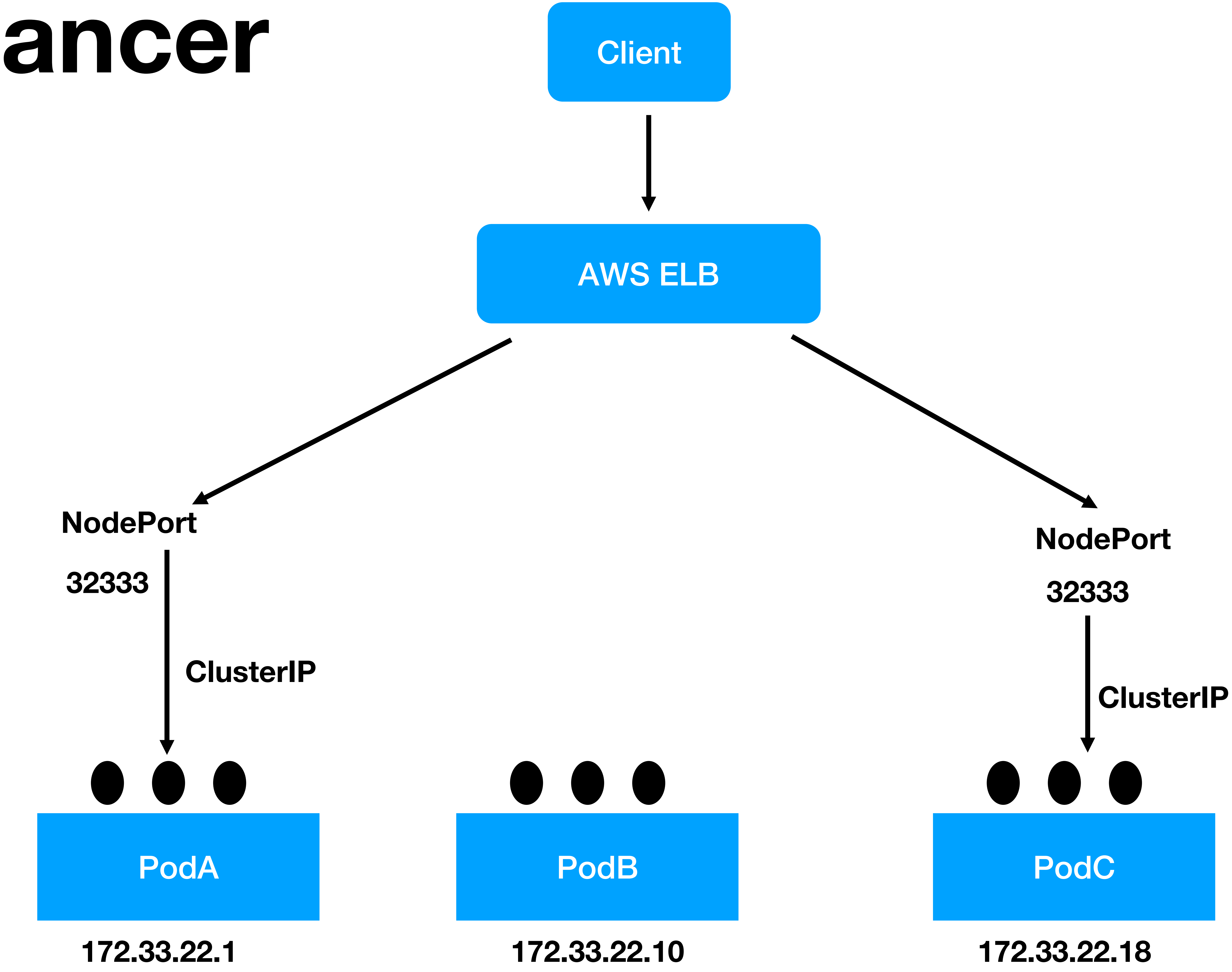


PodD
172.33.22.30
10.20.162.144
Cluster IP Service
IP Tables
IPV4
PodA
172.33.22.1
PodB
172.33.22.10
PodC
172.33.22.18

NodePort


Client/Tester
NodePort
Service
30000 to 32767
10.20.162.144
Cluster IP
PodA
PodB
PodC
172.33.22.1
172.33.22.10
172.33.22.18

LoadBalancer



External Name

Ingress

8080   80

kubectl command resource <options>

create

get

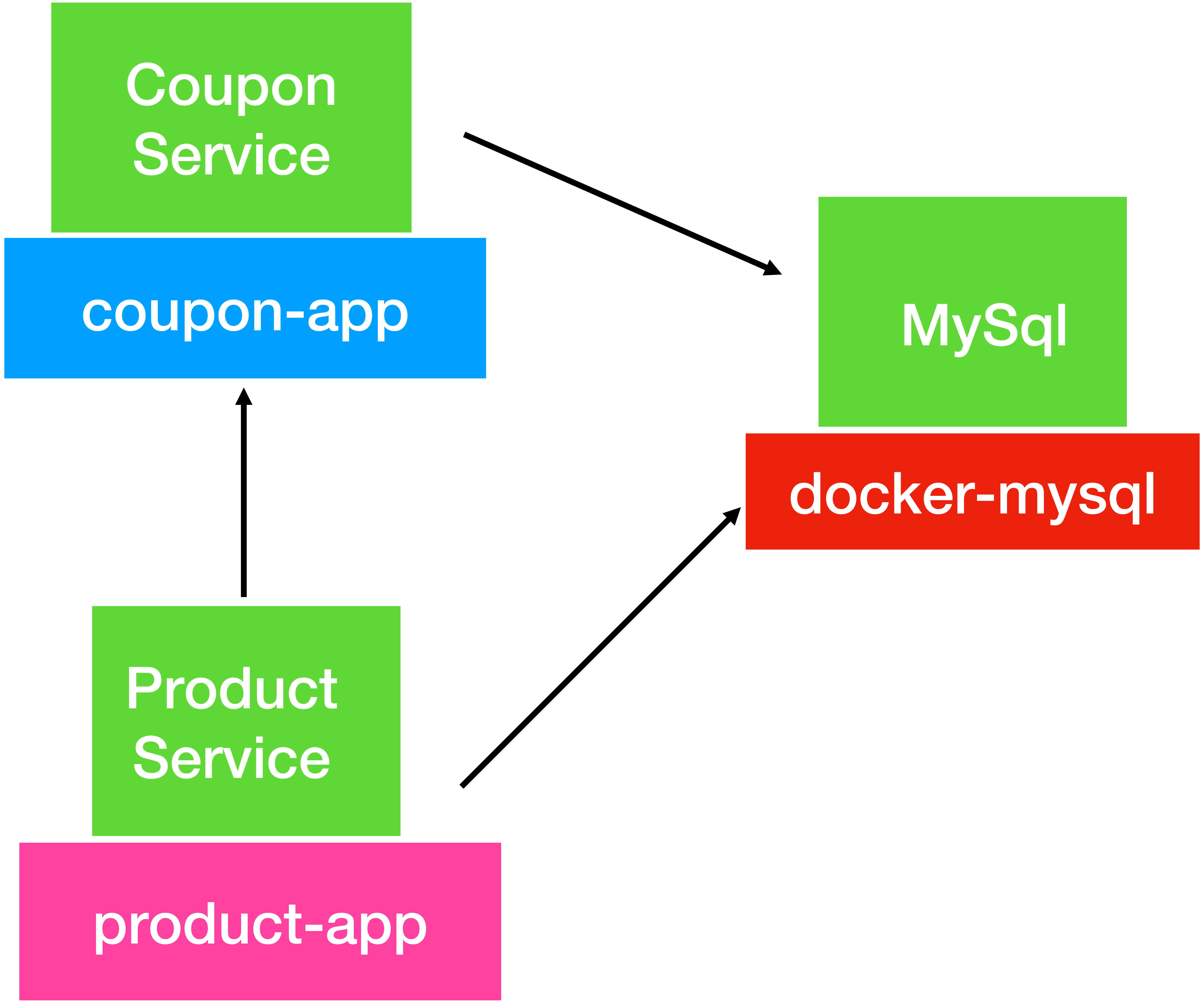
describe

delete

pod

replicaset

service


Coupon Service
coupon-app
MySql
docker-mysql
Product Service
product-app

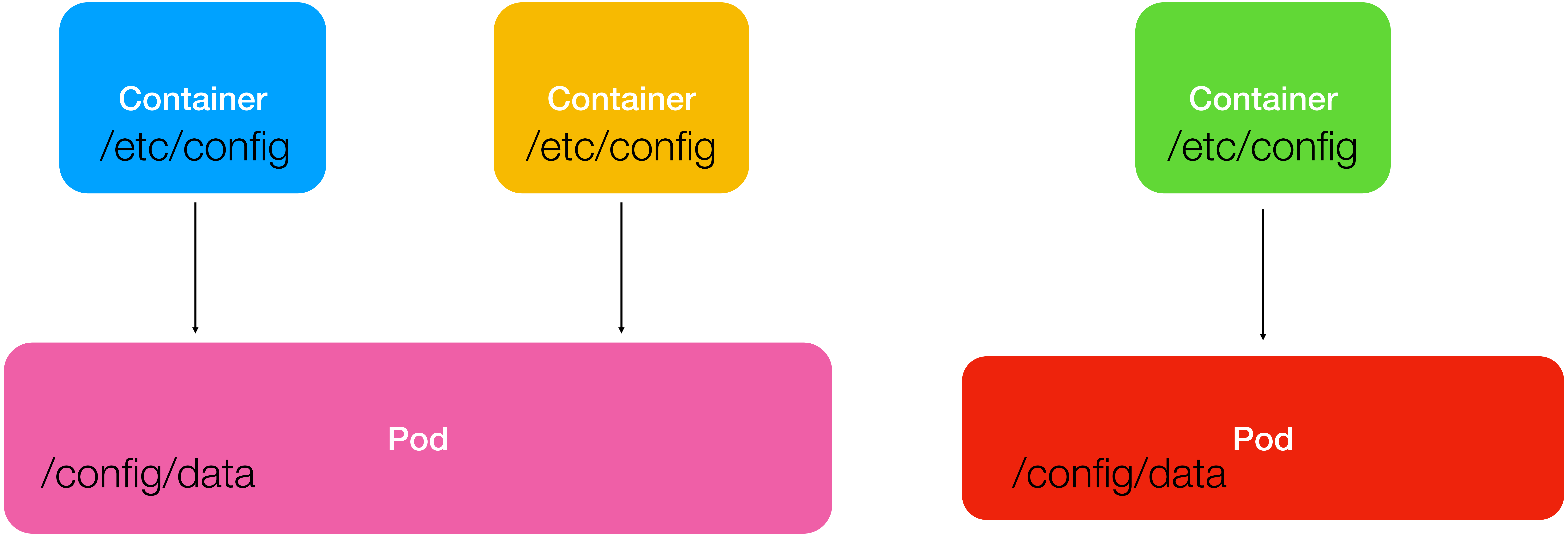
DB Deployment

Create Deployment

Create ConfigMap

Mount Volume

Volumes



Container
/etc/config

Container
/etc/config

Container
/etc/config

Pod
/config/data

Pod
/config/data

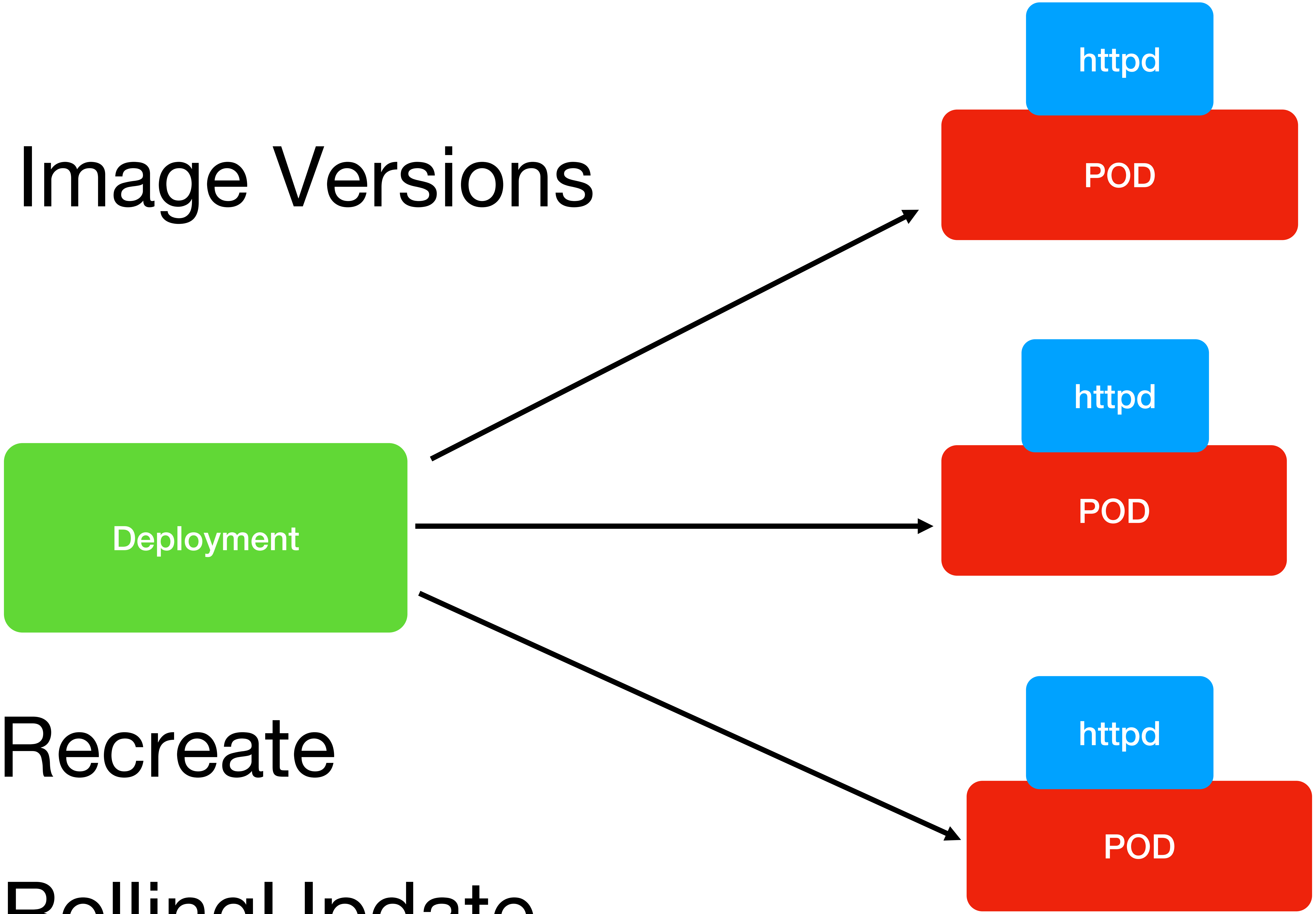
emptyDir

nfs

hostPath

Config Map and secret

Image Versions



Recreate

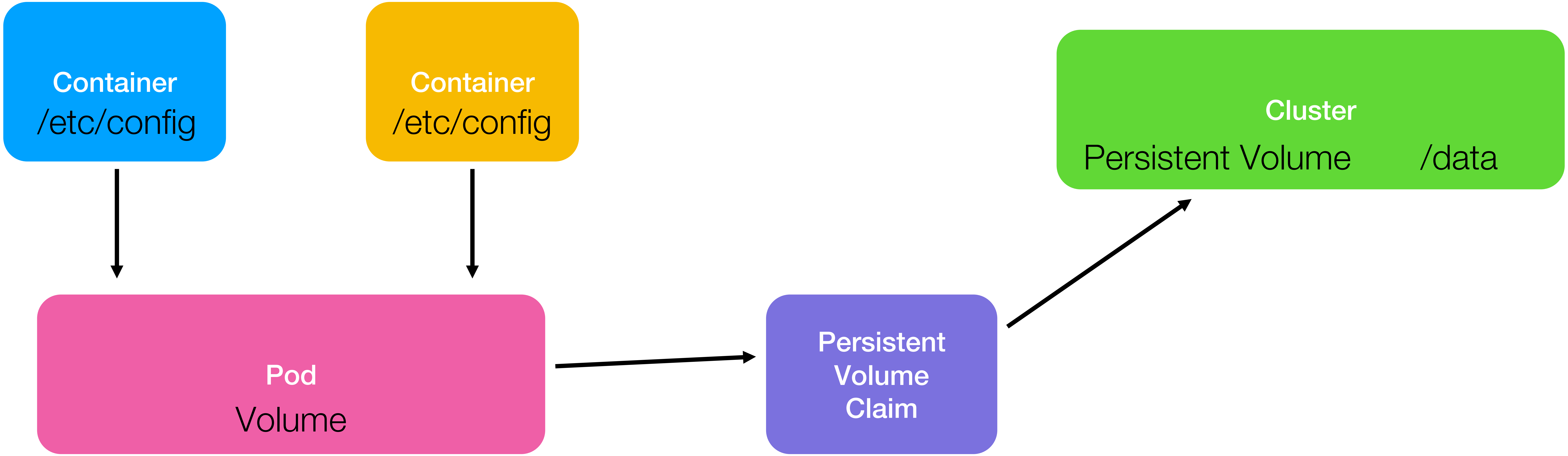
RollingUpdate

maxUnavailable

maxSurge

PersistentVolume

PersistentVolumeClaim



Container
/etc/config

Container
/etc/config

Pod
Volume

Persistent
Volume
Claim

Cluster
Persistent Volume /data

Access Modes

ReadWriteOnce

ReadOnlyMany

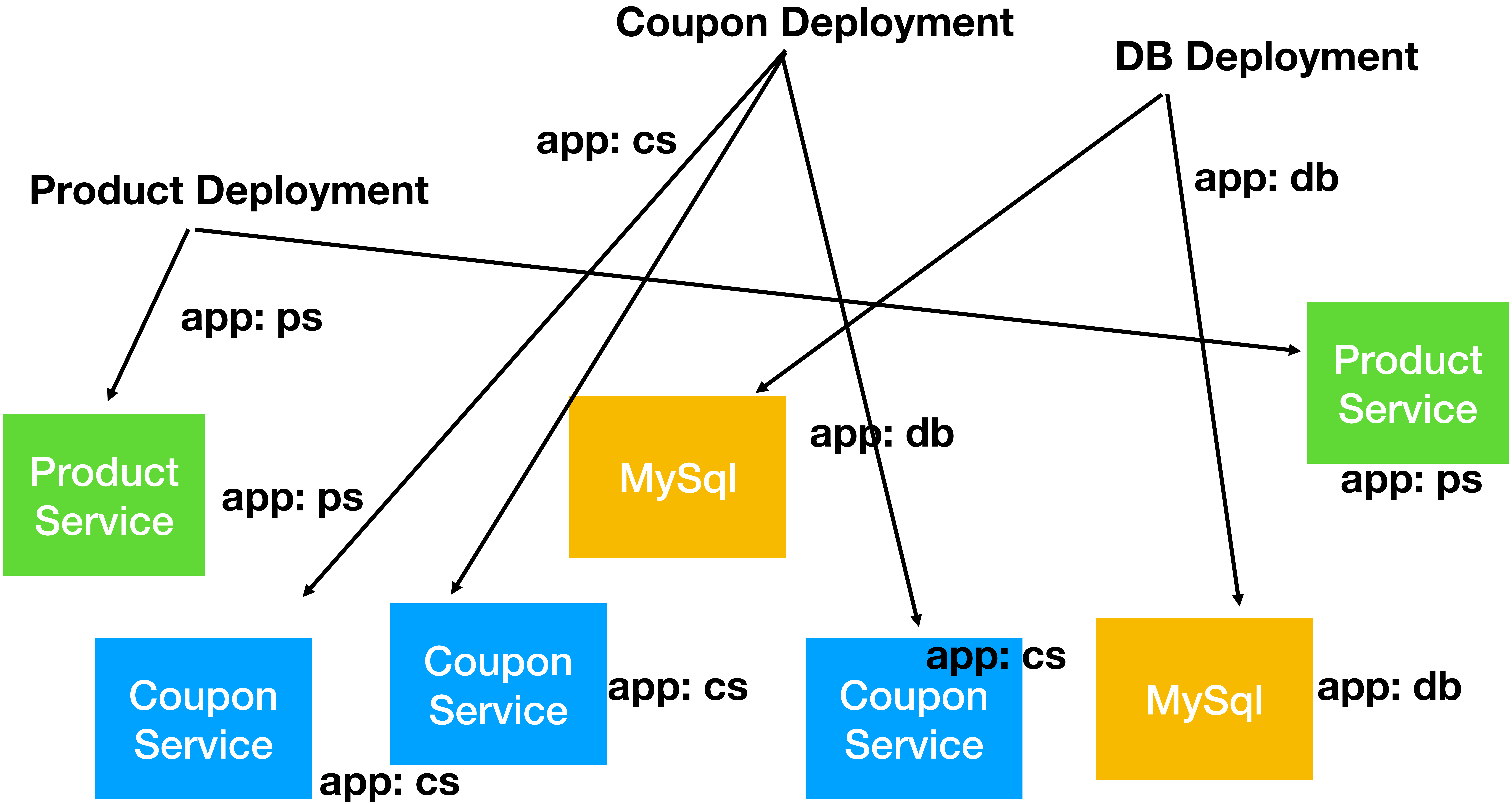
ReadWriteMany

Create Persistent Volume

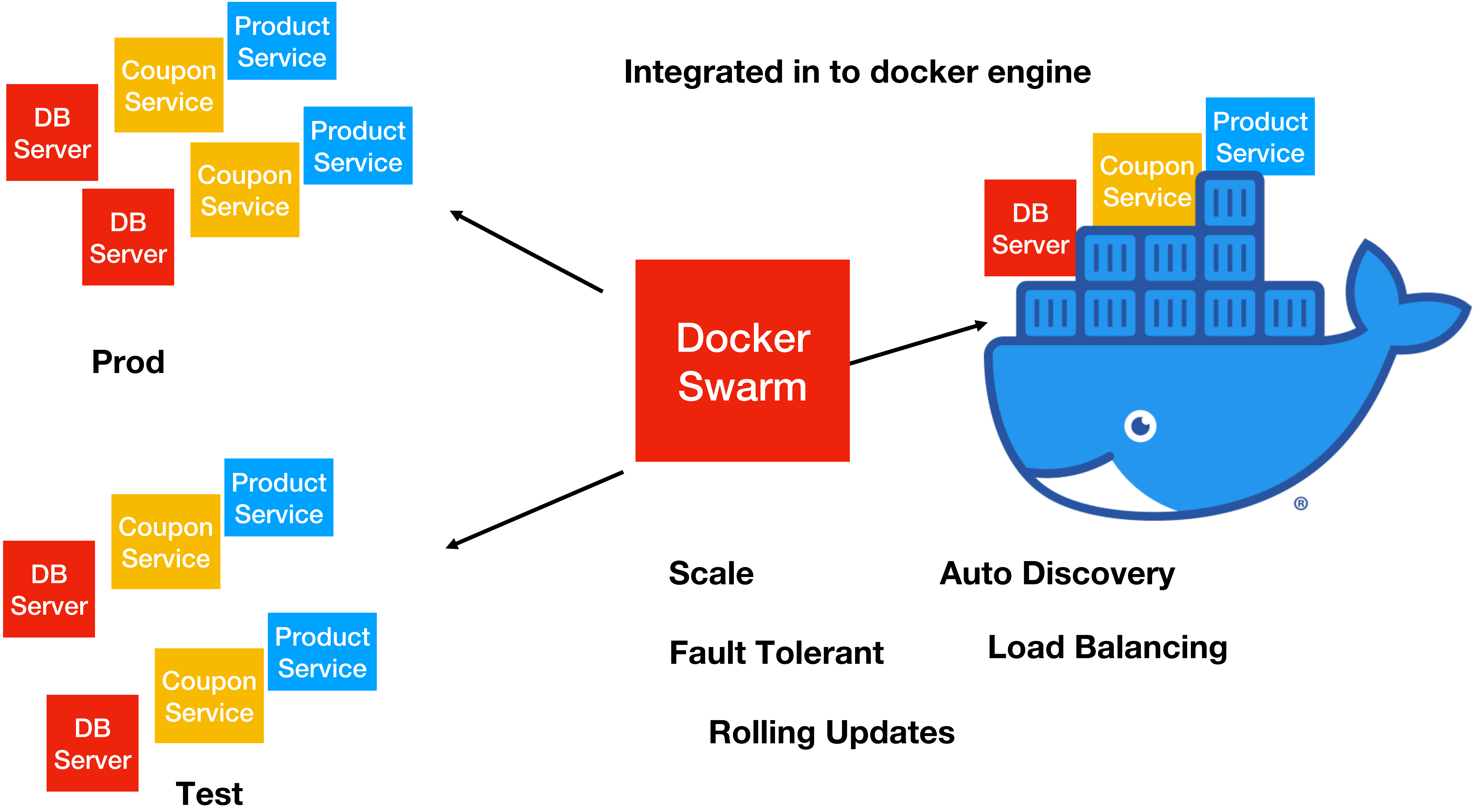
Create Persistent Volume Claim

Mount the Volume Claim

Labels and Selectors


Coupon Deployment
DB Deployment
app: cs
app: db
Product Deployment
app: ps
Product Service
MySql
app: db
Product Service
app: ps
app: ps
Coupon Service
Coupon Service
app: cs
app: cs
Coupon Service
MySql
app: db
app: cs

=　　!=　　in　　notin　　exists



Integrated in to docker engine

Product Service

Coupon Service

DB Server

Product Service

Coupon Service

DB Server

Prod

Docker Swarm

Product Service

Coupon Service

DB Server

Product Service

Coupon Service

DB Server

Test

DB Server

Coupon Service

Product Service

Scale

Auto Discovery

Fault Tolerant

Load Balancing

Rolling Updates

Docker Swarm vs Kubernetes

How they work

Setup

Components

First

Evolved from google

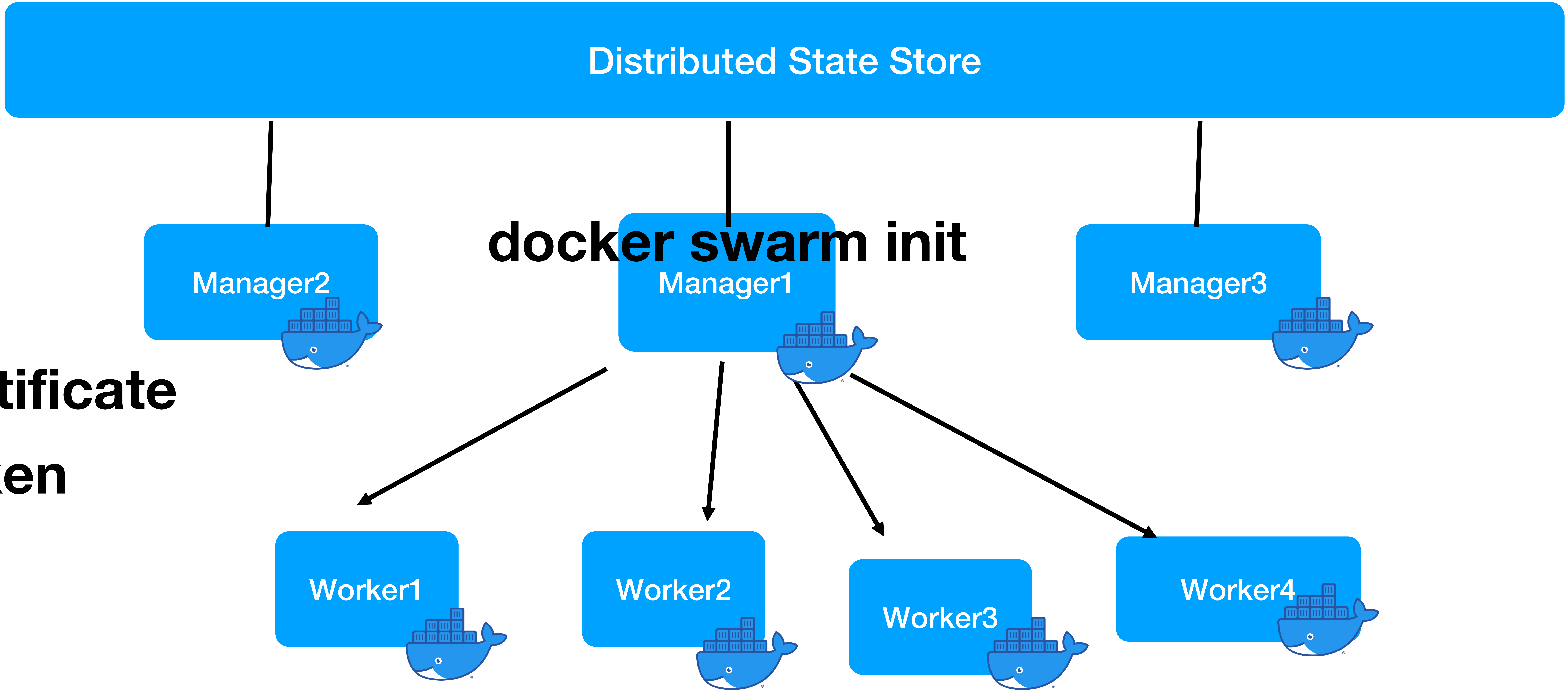
Community Backing

Lots of commits

Pods

Huge Clusters

Raft Consensus Group

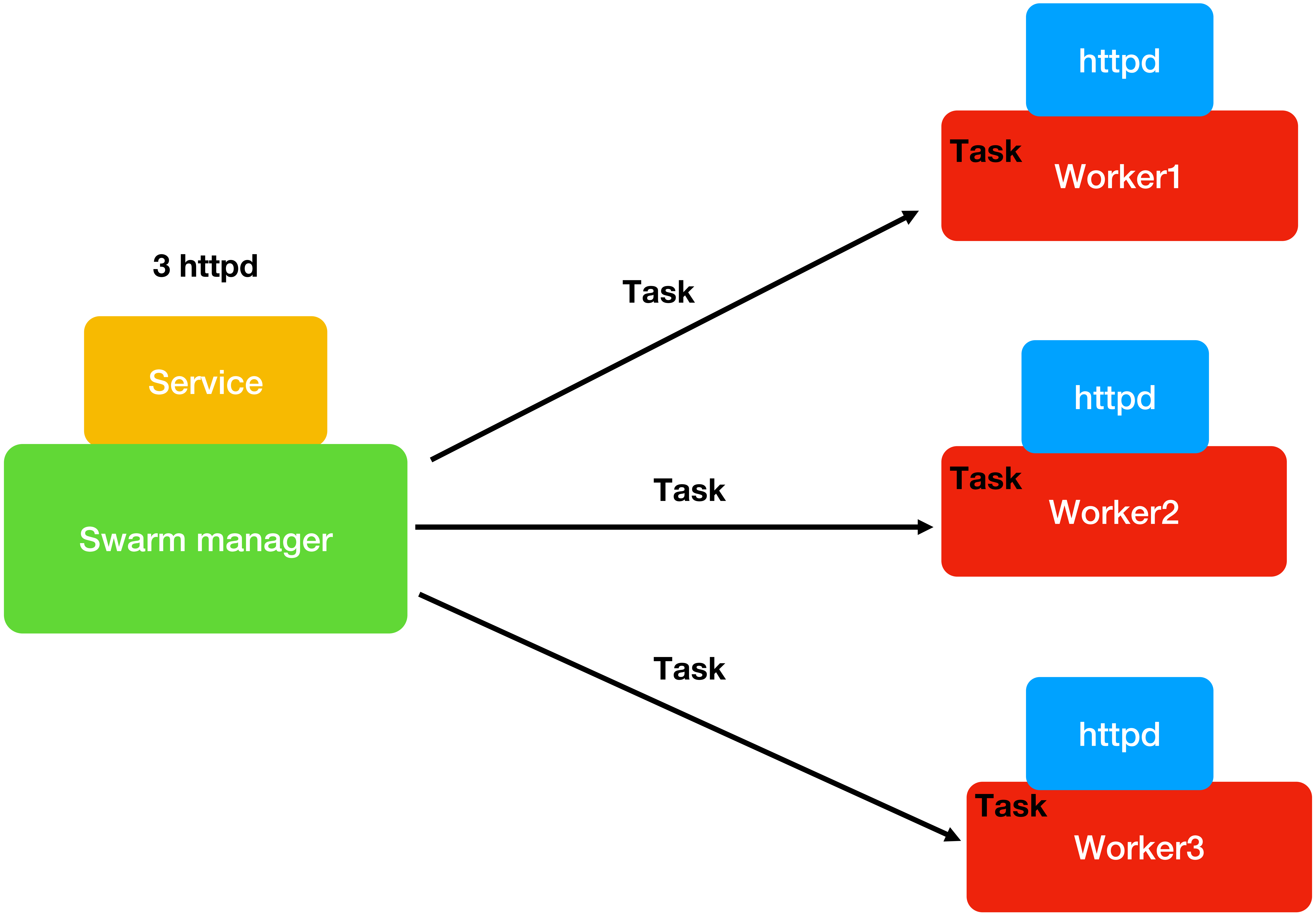


docker swarm init

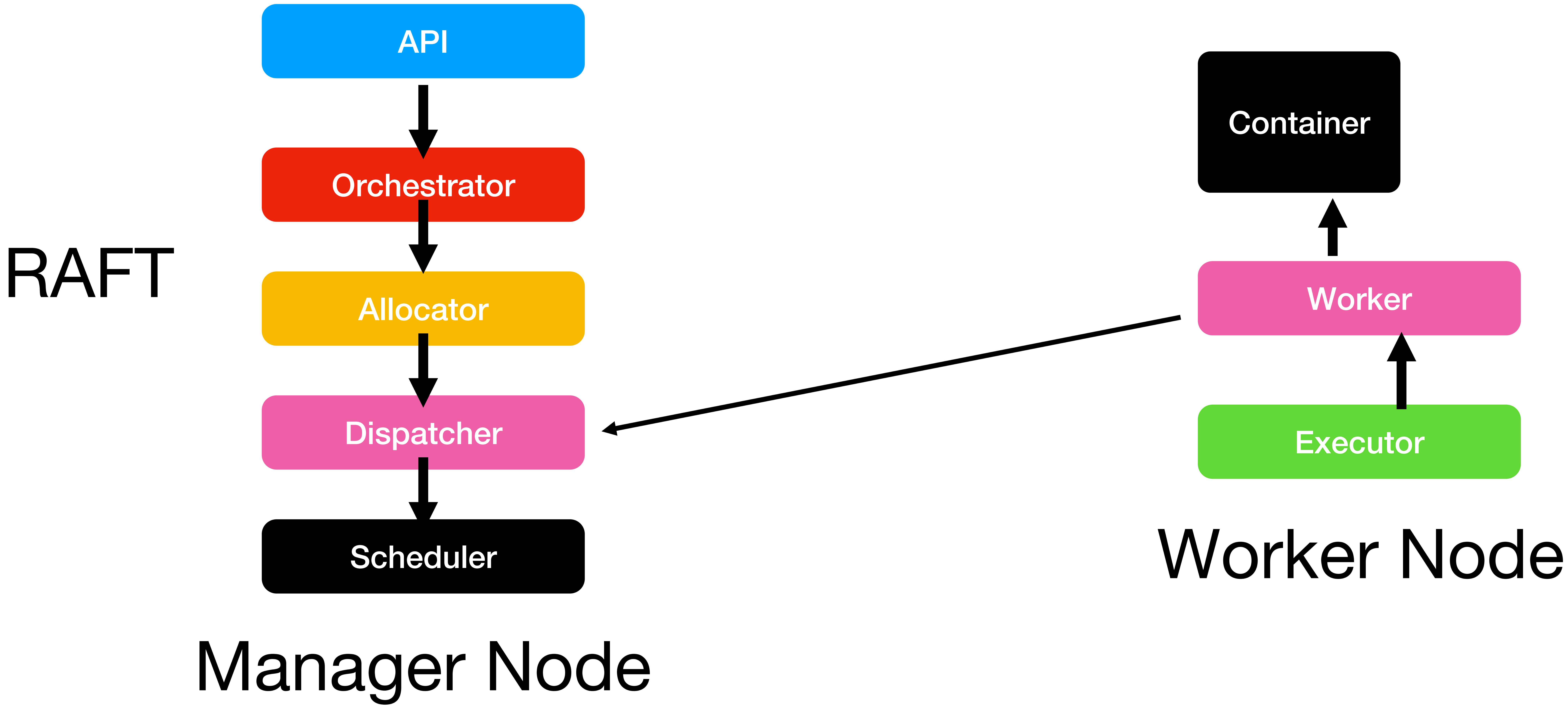
TLS

Certificate

Token


3 httpd
Service
Swarm manager
Task
Task
Task
httpd
Task
Worker1
httpd
Task
Worker2
httpd
Task
Worker3

Swarm Architecture



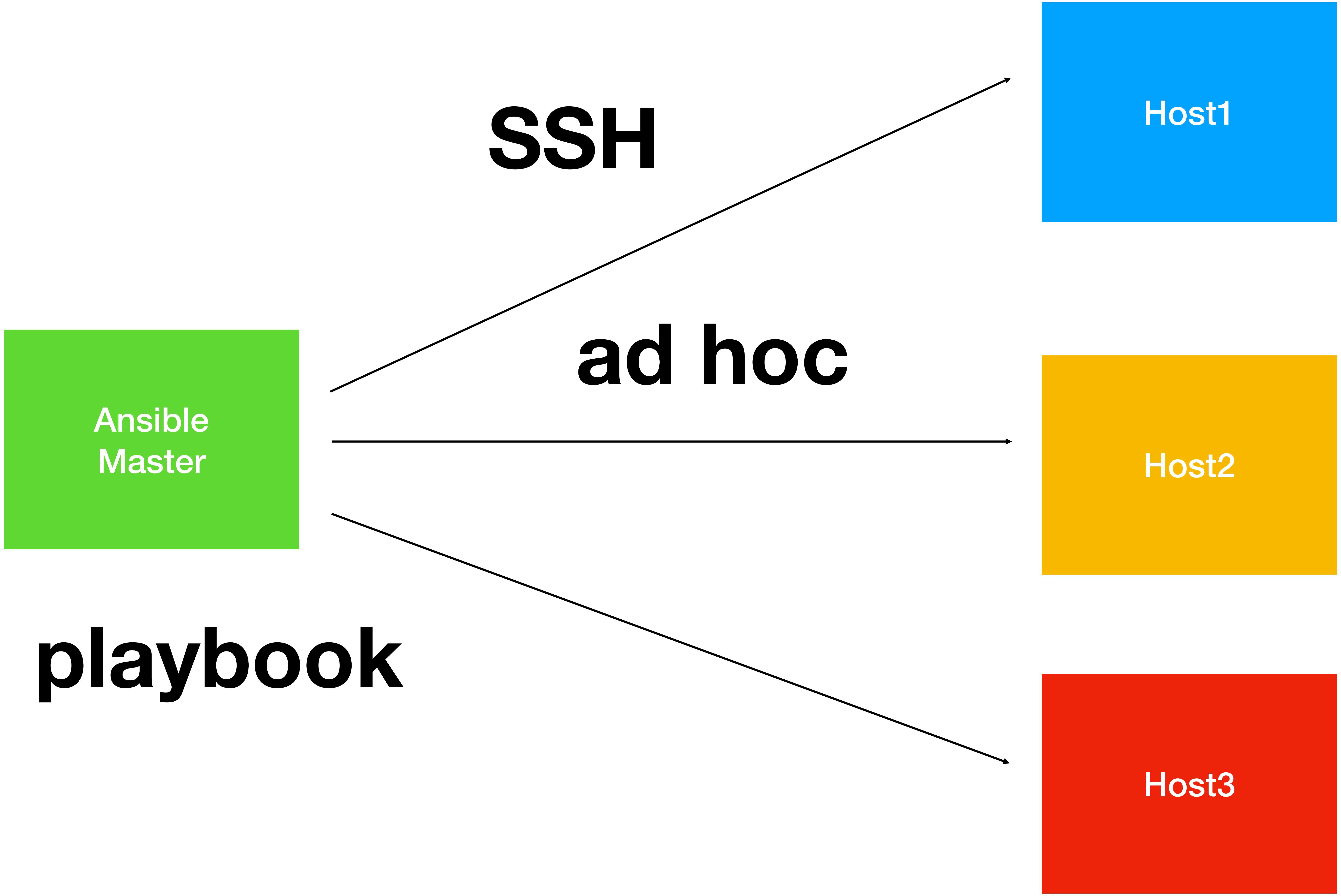
Service

	Redis	Older Version
	3	
	8	
	5	

docker stack deploy   docker-compose.yml

Ansible

Provisioning/CM



SSH

ad hoc

playbook