A unique opportunity for you to be mentored by Amazonians

Week 2
25-Sep-2022

BeSA
Become a Solutions Architect

Training Motivation Direction Success Advice Goal Coaching Support

Shipping before containers
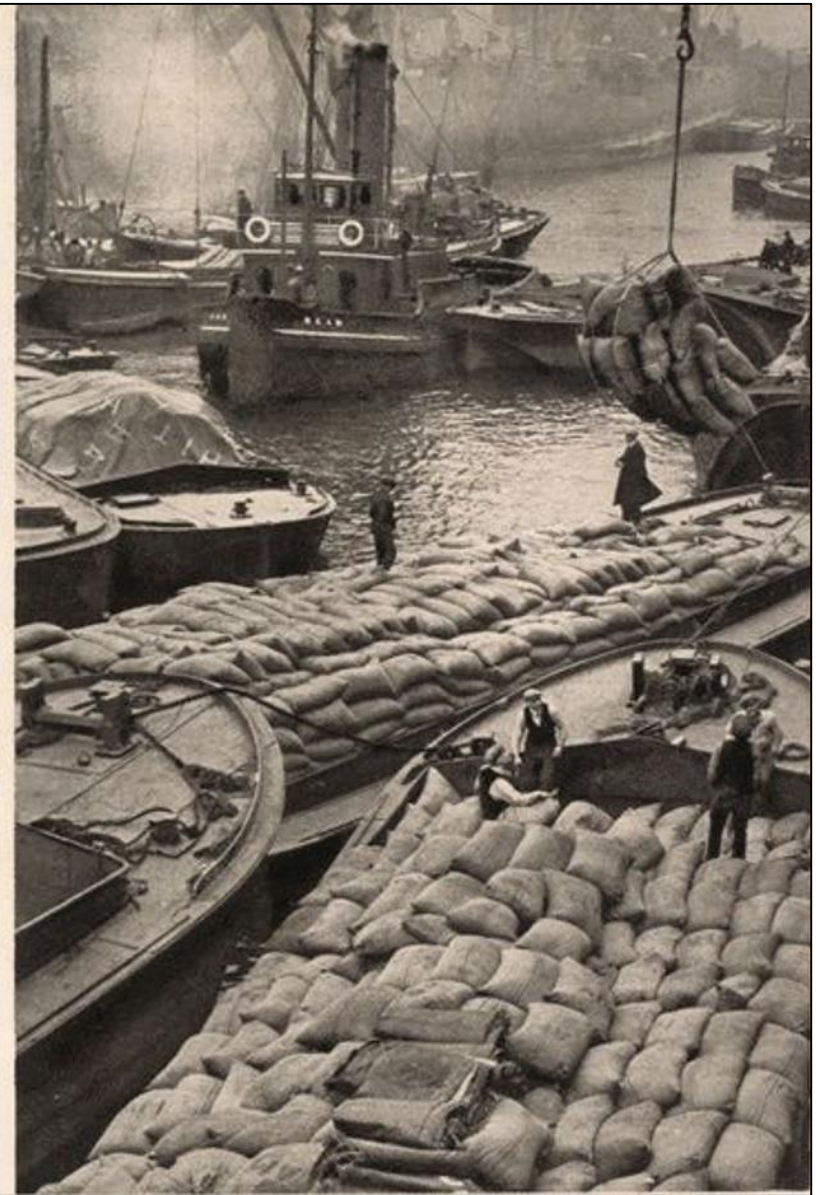
Image source: Internet

Solution – Intermodal shipping container

Multiplicity of Goods

Do I worry about how goods interact (e.g. coffee beans next to spices)

A standard container that is loaded with virtually any goods, and stays sealed until it reaches final delivery.

…in between, can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another

Multiplicity of methods for transporting/storing

Can I transport quickly and smoothly (e.g. from boat to train to truck)

Image source: Internet

Shipping after containers

- Containers standardized the shipping industry
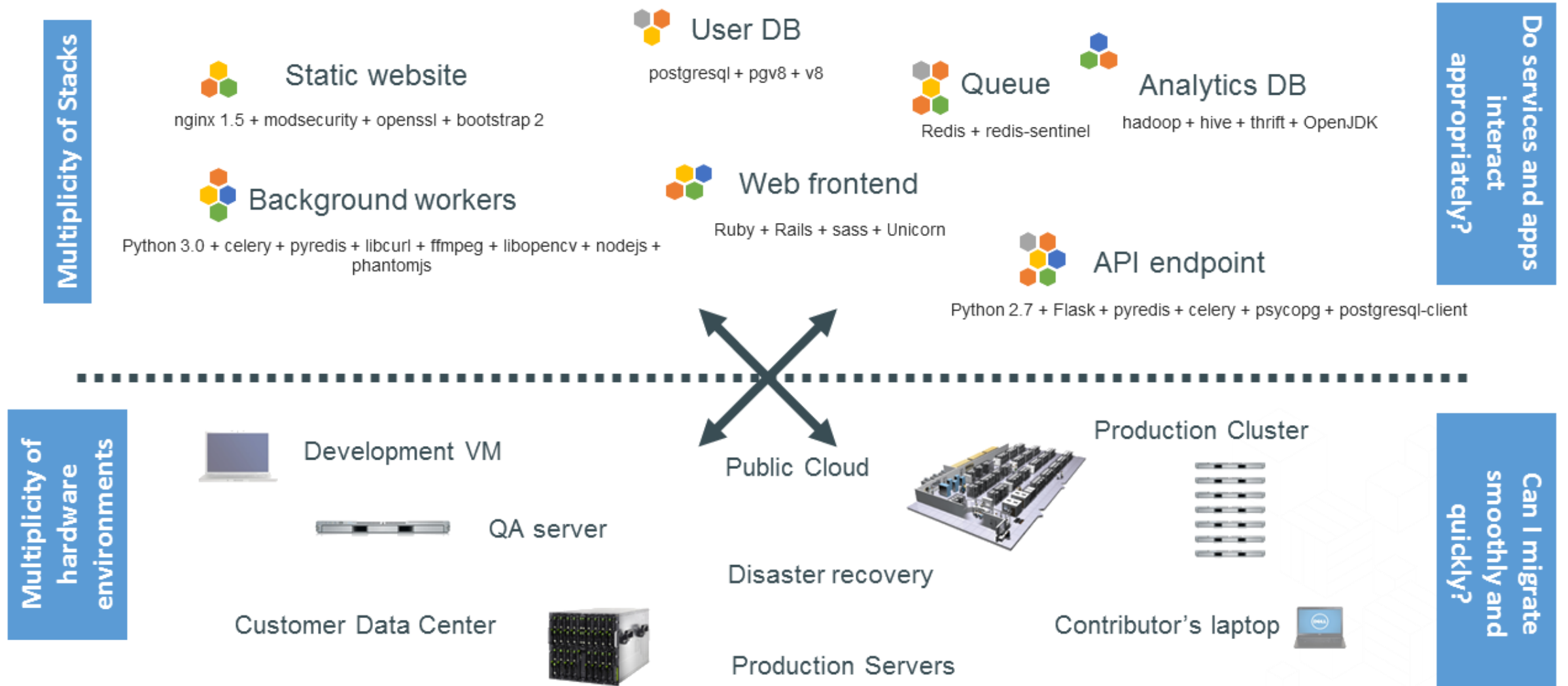

Image source: Internet

Running application without containers

What is the Challenge?

- Maintaining multiple technology stacks across multiple environments is a nightmare


Image source: Internet

Matrix from Hell

- It is the challenge of packaging any application, irrespective of language/ frameworks / dependencies, so that it can run on any environment/cloud, irrespective of the underlying OS/hardware/infrastructure.

|	Development VM	QA Server	Single Prod Server	Production Cluster	Public cloud	Developer's Laptop	Customer Servers
Static Website	?	?	?	?	?	?	?
Web Frontend	?	?	?	?	?	?	?
Background Workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?

Image source: Internet

What is a Container?

- Modeled on the success of shipping containers, an application container is designed to contain a complete deployment unit for an application to allow for automation, version tracking, and rapid deployment.

- Containers provide a standard way to package your application's code, configurations, and dependencies into a single object.
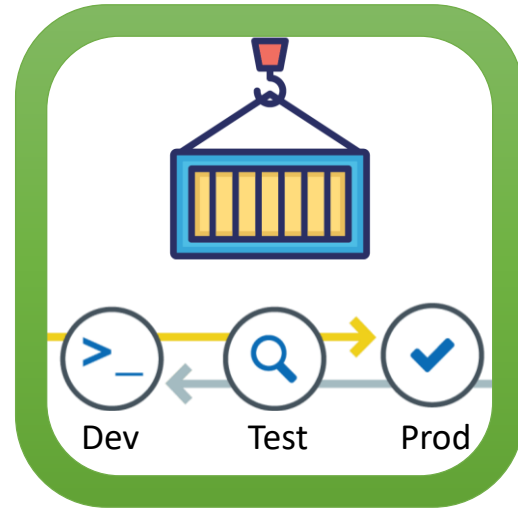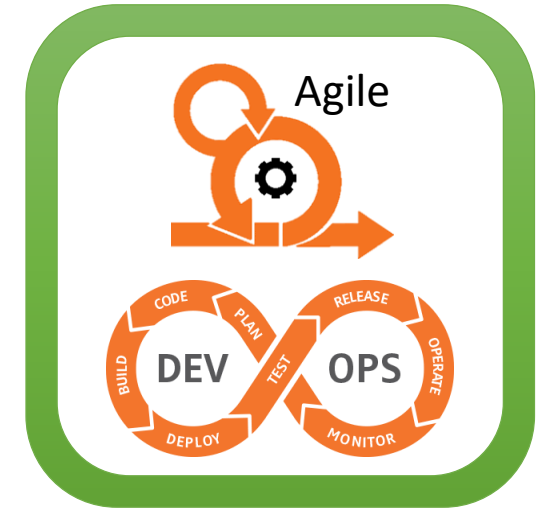

Container

Your Application

Dependencies

Configurations

Hooks into OS

Image source: Internet
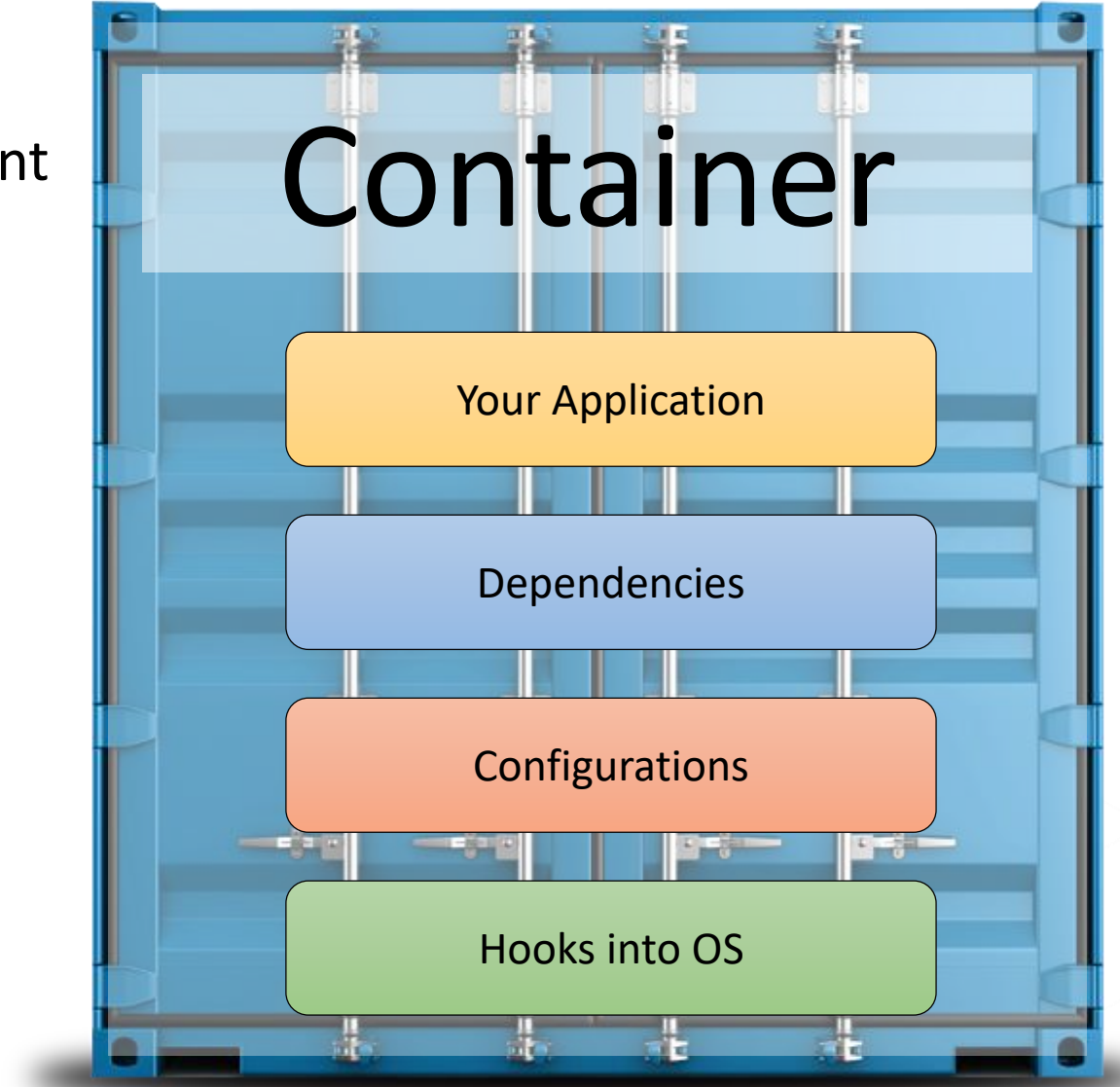
Advantages of using containers

Virtual Machine
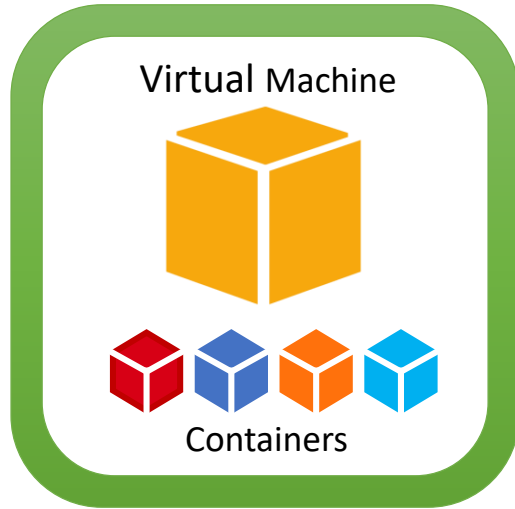
Containers

Smaller Footprint
and Less Overhead

Dev   Test   Prod

Increased
Portability

Greater Efficiency
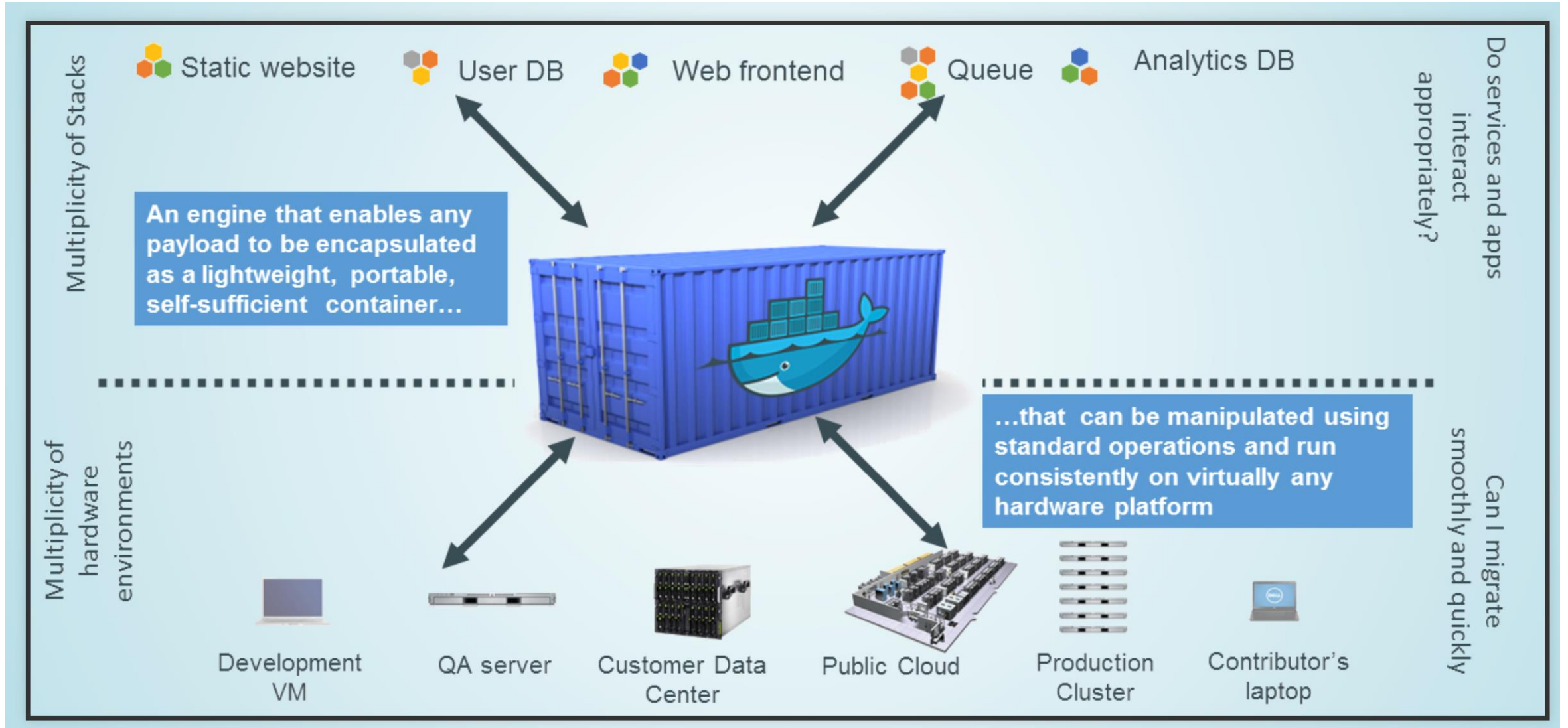and Smooth Scaling

Agile

DEV   OPS

Better Application
Development
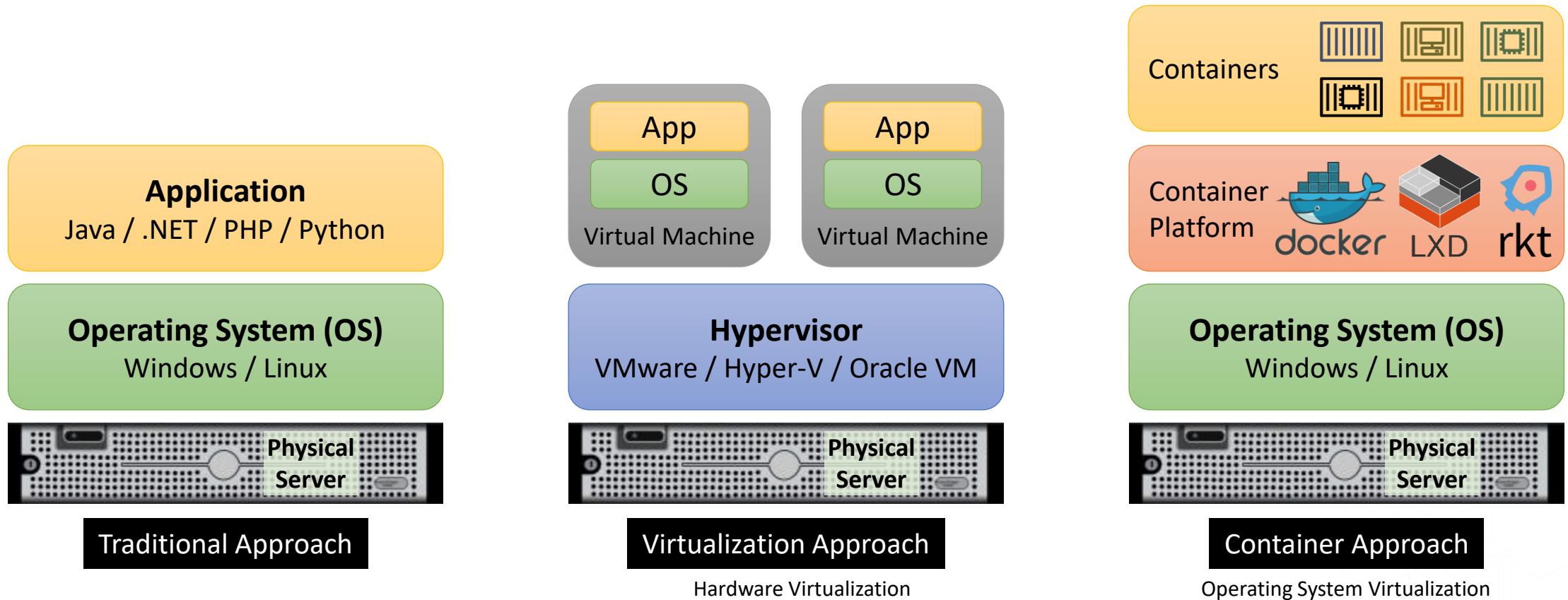
Image source: Internet

What is Docker?

- Docker is an open platform for developing, shipping, and running applications.

How containers run?

- Containers share an operating system installed on the server and run as resource-isolated processes, ensuring quick, reliable, and consistent deployments, regardless of environment.

Application
Java / .NET / PHP / Python

Operating System (OS)
Windows / Linux

Physical Server

Traditional Approach

App

OS

Virtual Machine

App

OS

Virtual Machine

Hypervisor
VMware / Hyper-V / Oracle VM

Physical Server

Virtualization Approach

Hardware Virtualization

Containers

Container Platform

docker   LXD   rkt

Operating System (OS)
Windows / Linux

Physical Server

Container Approach

Operating System Virtualization

Containers on AWS

Running container on AWS

Image Storage

Store, encrypt, and manage container images

Amazon Elastic Container Registry (ECR)
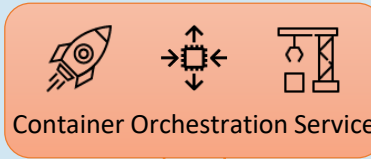
Repository1
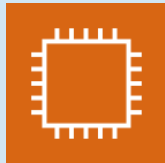
Repository2

Container Images

Container Images

Compute

Container Orchestration Service

Run containers with server level control

Self provisioned Cluster on EC2 Instance

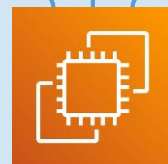Run containers using fully managed container orchestration service

Amazon Elastic Container Service (ECS)
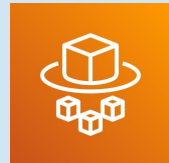
Manage containers with Kubernetes
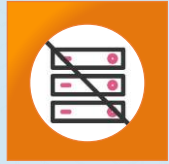
Amazon Elastic Kubernetes Service (EKS)

EC2 Hosted

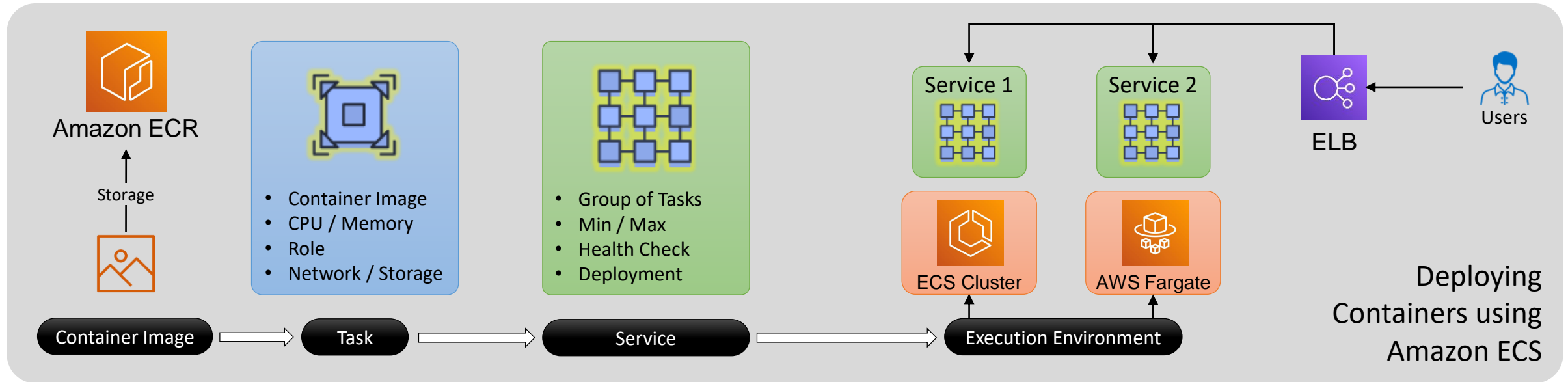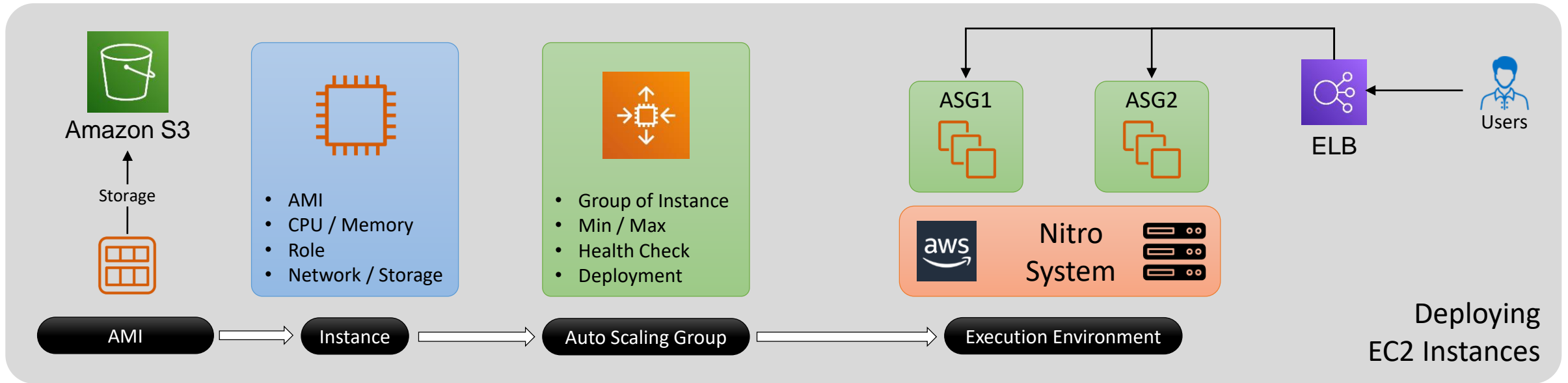Run containers without managing servers

AWS Fargate

Serverless

EC2 Instance vs Containers

Deploying EC2 Instances

Amazon S3

Storage

- AMI
- CPU / Memory
- Role
- Network / Storage

- Group of Instance
- Min / Max
- Health Check
- Deployment

ASG1 ASG2 ELB Users

aws Nitro System

AMI → Instance → Auto Scaling Group → Execution Environment

Deploying Containers using Amazon ECS

Amazon ECR

Storage

- Container Image
- CPU / Memory
- Role
- Network / Storage

- Group of Tasks
- Min / Max
- Health Check
- Deployment

Service 1 Service 2 ELB Users

ECS Cluster AWS Fargate

Container Image → Task → Service → Execution Environment

Amazon EKS

Amazon ECR

Storage

- Container Image
- CPU / Memory
- Role
- Network / Storage

- Group of Tasks
- Min / Max
- Health Check
- Deployment

Service

Deployment

Deployment

ELB

Users

EKS Cluster

AWS Fargate

Container Image → POD → Deployment → Execution Environment

Deploying Containers using Amazon EKS

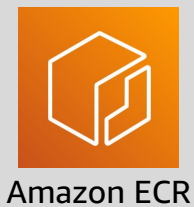**Amazon ECR**

What?
- Amazon Elastic Container Registry (ECR) is a fully managed container registry that makes it easy to store, manage, share and deploy your container images and artifacts.
- You can easily access Amazon ECR from any Docker environment, whether in the cloud, on-premises, or on your local machine.

Why?
- Amazon ECR eliminates the need to operate and scale the infrastructure required to power your container registry.
- You can configure policies to manage permissions for each repository and restrict access to IAM users, roles, or other AWS accounts. Amazon ECR is integrated with third-party developer tools.

When?
- You want to use the familiar Docker CLI, or your preferred client, to push, pull, and manage images.
- You want to use lifecycle policies to manage your images, for example expiring images based on age or count.
- You want to scan software vulnerabilities in your container images on push using Amazon Inspector.

Where?
- Amazon ECR is a Regional service. Amazon ECR stores your container images and artifacts in Amazon S3.
- It also supports cross-Region and cross-account replication.

Who?
- You can easily push your container images to Amazon ECR using the Docker CLI from your development machine.
- You can set up AWS PrivateLink endpoints to pull images from your private repositories without traversing internet.

How?
- After you create a repository, you can use your preferred CLI to push, pull, and manage Docker images, Open Container Initiative (OCI) images, and OCI compatible artifacts. Amazon ECR transfers your container images over HTTPS and automatically encrypts your images at rest. You can configure resource-based permissions using IAM.

How much?
- You pay only for the amount of data you store in your public or private repositories, and data transferred to the internet.
- Data transferred between Amazon Elastic Container Registry and Amazon EC2 within a single region is free of charge.
- Data transferred between Amazon ECR and Amazon EC2 in different regions is charged at Internet Data Transfer rates.

Category:

Containers

What?
- Amazon ECS is a fully managed container orchestration service that makes it easy for you to deploy, manage, and scale containerized applications.

Why?
- Amazon ECS eliminates the need for you to install, operate, and scale your own cluster management infrastructure.
- You can use Amazon ECS to schedule container placement across your cluster based on your resource needs and availability requirements.

When?
- You want to schedule long-running applications, services, and batch processes using Docker containers.
- You want to maintains application availability and ability to scale your containers up or down to meet your application's capacity requirements.

Where?
- Amazon ECS is a regional service which can run and scale your container workloads across availability zones
- On your infrastructure with *Amazon ECS Anywhere*.

Who?
- Amazon ECS is a fully-managed container orchestration service, with AWS configuration and operational best practices built-in, and no control plane, nodes, or add-ons for you to manage.
- Customers define Tasks, Service, Capacity Providers and deployment process.

How?
- Amazon ECS allows you to easily run applications on a managed cluster of Amazon EC2 instances.
- Your containers are defined in a task definition that you use to run an individual tasks or task within a service.
- Amazon ECS is integrated with familiar features like Elastic Load Balancing, EBS volumes, Amazon VPC and IAM.

How much?
- There is no additional charge for Amazon ECS. You pay for AWS resources (e.g. Amazon EC2 instances or EBS volumes) you create to store and run your application.
- You only pay for what you use, as you use it; there are no minimum fees and no upfront commitments.

Amazon Elastic Container Service (Amazon ECS)

Category:

Containers

What?
- Amazon EKS is a managed service that makes it easy for you to run Kubernetes on AWS without installing and operating your own Kubernetes control plane or worker nodes.

Why?
- Amazon EKS provisions and scales the Kubernetes control plane, including the API servers and backend persistence layer, across multiple AWS Availability Zones (AZs) for high availability and fault tolerance.
- Amazon EKS automatically detects and replaces unhealthy control plane nodes and patches the control plane.

When?
- You don't want operational burden of managing the Kubernetes control plane.
- You want to maintain existing applications that run on upstream Kubernetes and want to use plugins and tooling from the Kubernetes community.

Where?
- Amazon EKS is a regional service.
- It runs and scales the Kubernetes control plane across multiple AWS Availability Zones to ensure high availability.

Who?
- Amazon EKS handles provisioning, scaling, and managing the Kubernetes control plane. It also automatically detects and replaces unhealthy masters, and it provides automated version upgrades and patching for the masters.
- Customers provision an EKS cluster, Deploy Compute nodes, connect to EKS and run Kubernetes applications.

How?
- Amazon EKS runs a single tenant Kubernetes control plane for each cluster. It integrates with many AWS services to provide scalability and security for your applications
- It uses Amazon VPC network policies to restrict traffic between control plane components to a single cluster.

How much?
- You pay $0.10 per hour for each Amazon EKS cluster you create and for the AWS resources you create to run your Kubernetes worker nodes. You only pay for what you use, as you use it; there are no minimum fees and no upfront commitments.
- If you are using AWS Fargate, pricing is calculated based on the vCPU and memory resources used.

Amazon Elastic
Kubernetes Service
(Amazon EKS)

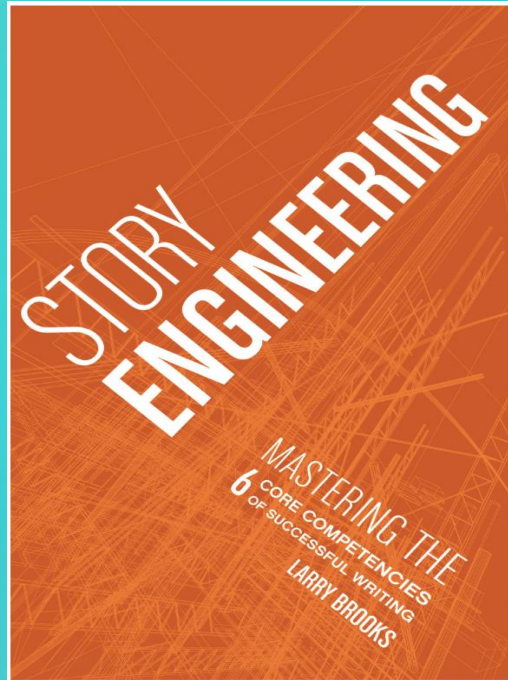**Category:**

Containers

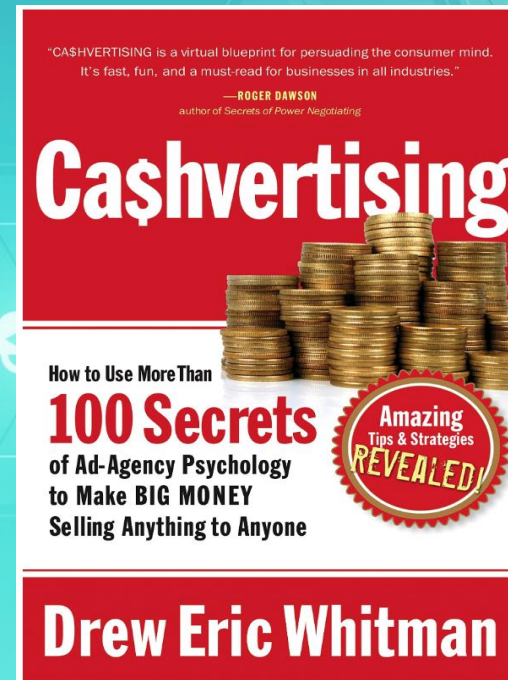Let's read some superb books

- Jamila Jamilova

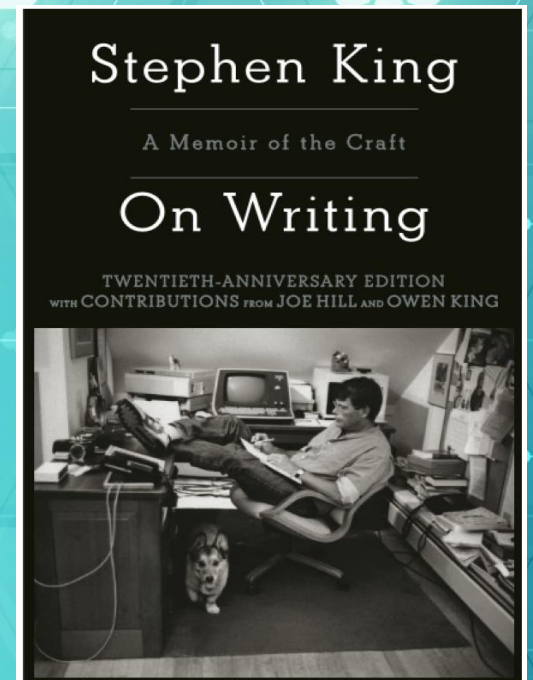# Essential books on structure and frame of mind
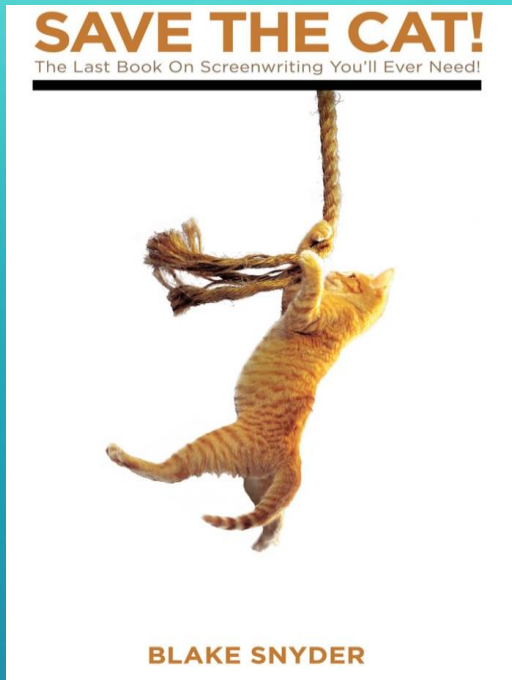
Categories: Primarily structure and formula

Categories: Heavy on structure

Categories: Structure and using the mechanics of language

Categories: Primarily writing life with a frame of mind and structure insight

Serverless Track

- James Eastham

BeSA

Thank you.

See you next week.