VMs vs Containers

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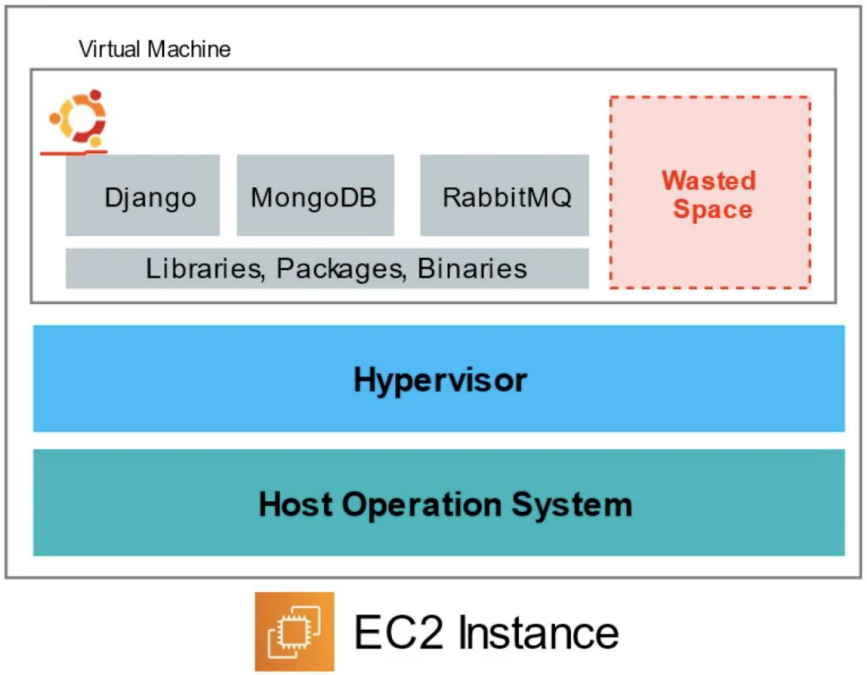
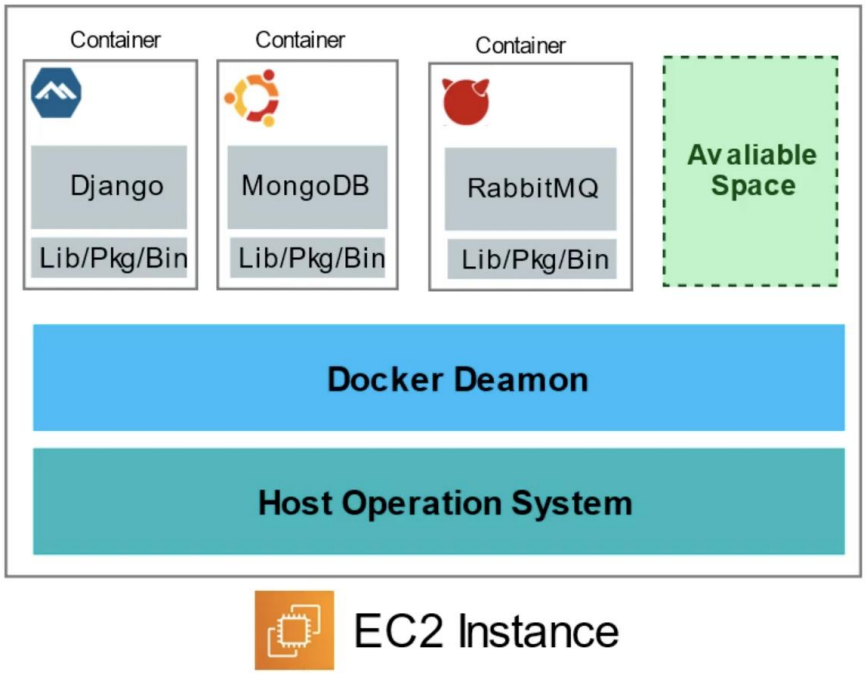
VMs **do not** make best use of space.
Apps are not isolated which. Could cause **config conflicts**, **security problems** or **resource hogging**.



EC2 Instance

Containers allow you to run multiple apps which are virtually isolated from each other.

Launch new containers and configure OS Dependencies per container.



EC2 Instance

What are Microservices

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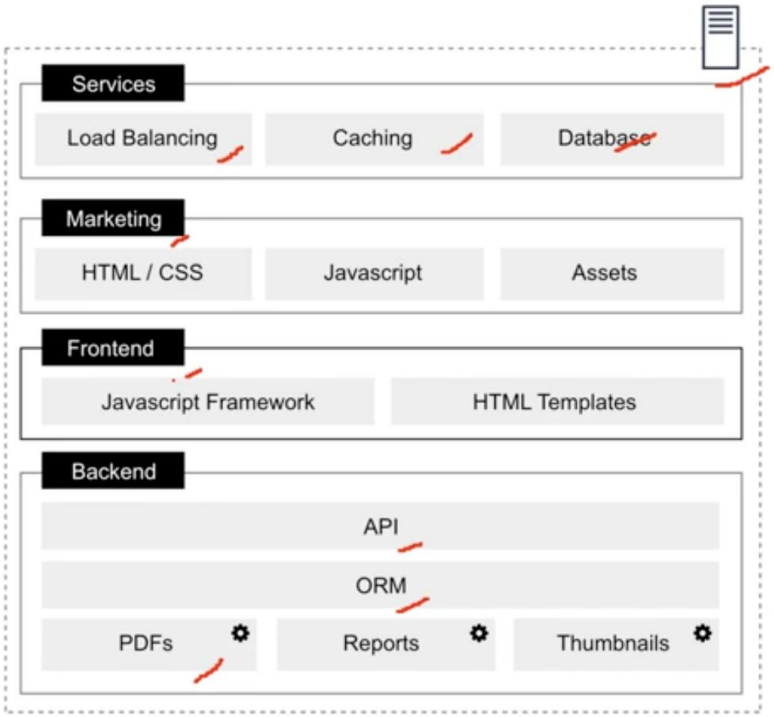
Monolithic Architecture

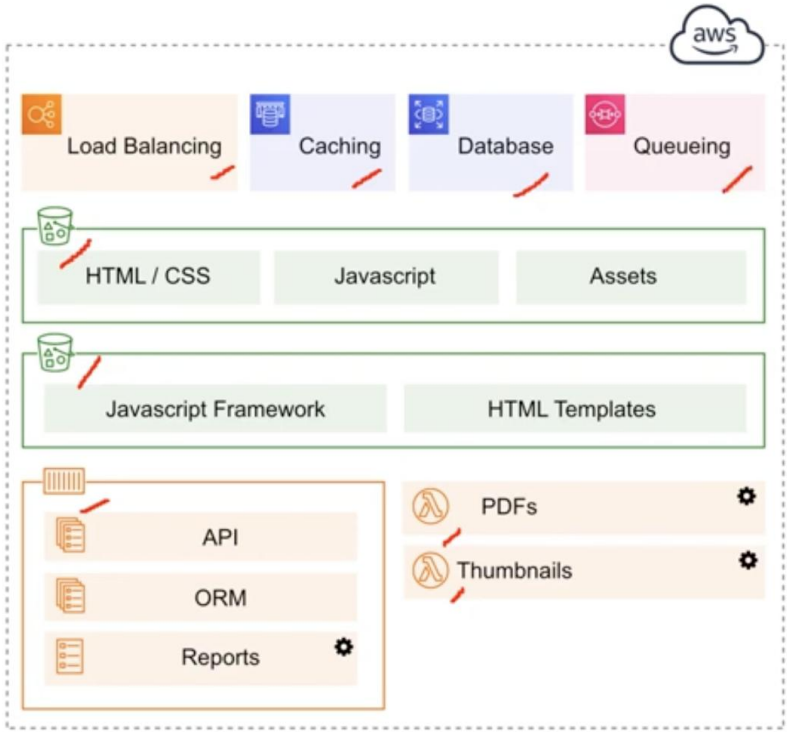
One app which is responsible for everything
Functionality is tightly coupled



VS

Microservices Architecture

Multiple apps which are each responsible for one thing
Functionality is isolate and stateless



Kubernetes

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Kubernetes is an **open-source container orchestration system** for automating **deployment, scaling and management** of containers.

Originally created by Google and now maintained by the **Cloud Native Computing Foundation (CNCF)**

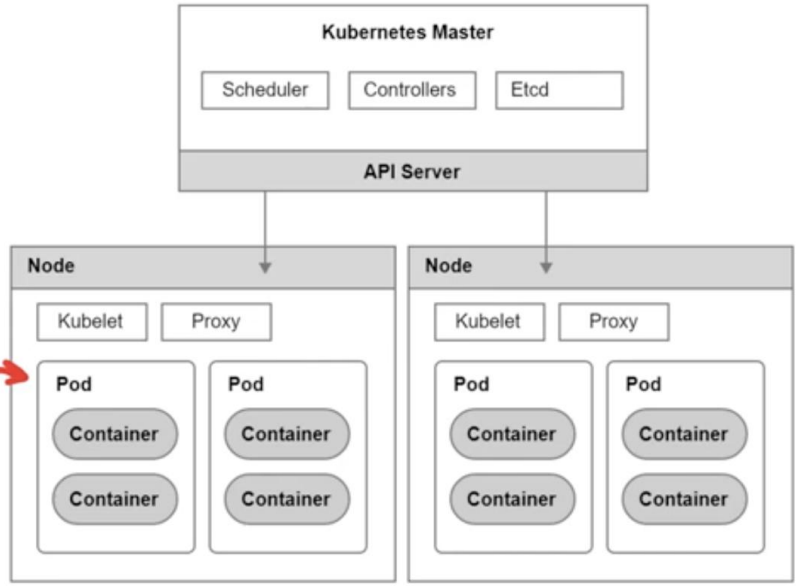
Kubernetes is commonly called **K8**

- The 8 represent the remaining letters “ubernete”

The advantage of Kubernetes over Docker is the ability to run containers distributed across multiple VMs

A unique component of Kubernetes are **Pods**.
A pod is a group of one more containers with shared storage, network resources and other shared settings.

Kubernetes is ideally for micro-service architectures where a company has tens to hundreds of services they need to manage



Docker

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Docker is a set of Platform as a Service (PaaS) products that use OS-level virtualization to deliver software in packages called containers.

Docker was the earliest popularized open-source container platform.
When people think of containers, they think of Docker.

```
FROM python:3.8-alpine3.12
COPY . /app
WORKDIR /app
RUN pip install -r requirements.txt
CMD ["python3", "app.py"]
```

Docker CLI – CLI commands to download, upload, build run and debug containers

Dockerfile – a configuration file on how to provision a container

Docker Compose – is a tool and configuration file when working with multiple containers

Docker Swarm – An orchestration tool for managing deployed multi-containers architectures

Dockerhub – a public online repository for containers published by the community for download

The Open Container Initiative (OCI) is an open governance structure for creating open industry standards around container formats and runtime.
Docker established the OCI and it is now maintained by the Linux Foundation.

Docker has been losing favor with developers due to their handling of introducing a paid open-source model and alternative like Podman are growing.

Container Services

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Primary Services

Elastic Container Service (ECS)
No Cold Starts
Self-Managed EC2

AWS Fargate
More Robust Than Lambda
Scale to Zero Cost
AWS-Managed EC2

Elastic Kubernetes Services (EKS)
Open Source
Avoid Vendor Lock-In

AWS Lambda
Only think about code
Short running tasks
Can deploy custom containers

Provisioning and Deployment

Elastic Beanstalk (EB)
ECS on training wheels
Platform as a Service

App Runner
Platform as a Service
specifically for containers

AWS Copilot CLI
build, release and operate production ready containerized applications on AWS App Runner, Amazon ECS, and AWS Fargate

Supporting Services

Elastic Container Registry (ECR)
Repos for your Docker Images

X-Ray
Analyze and debug between microservices

Step Functions
Stitch together Lambdas and ECS tasks