

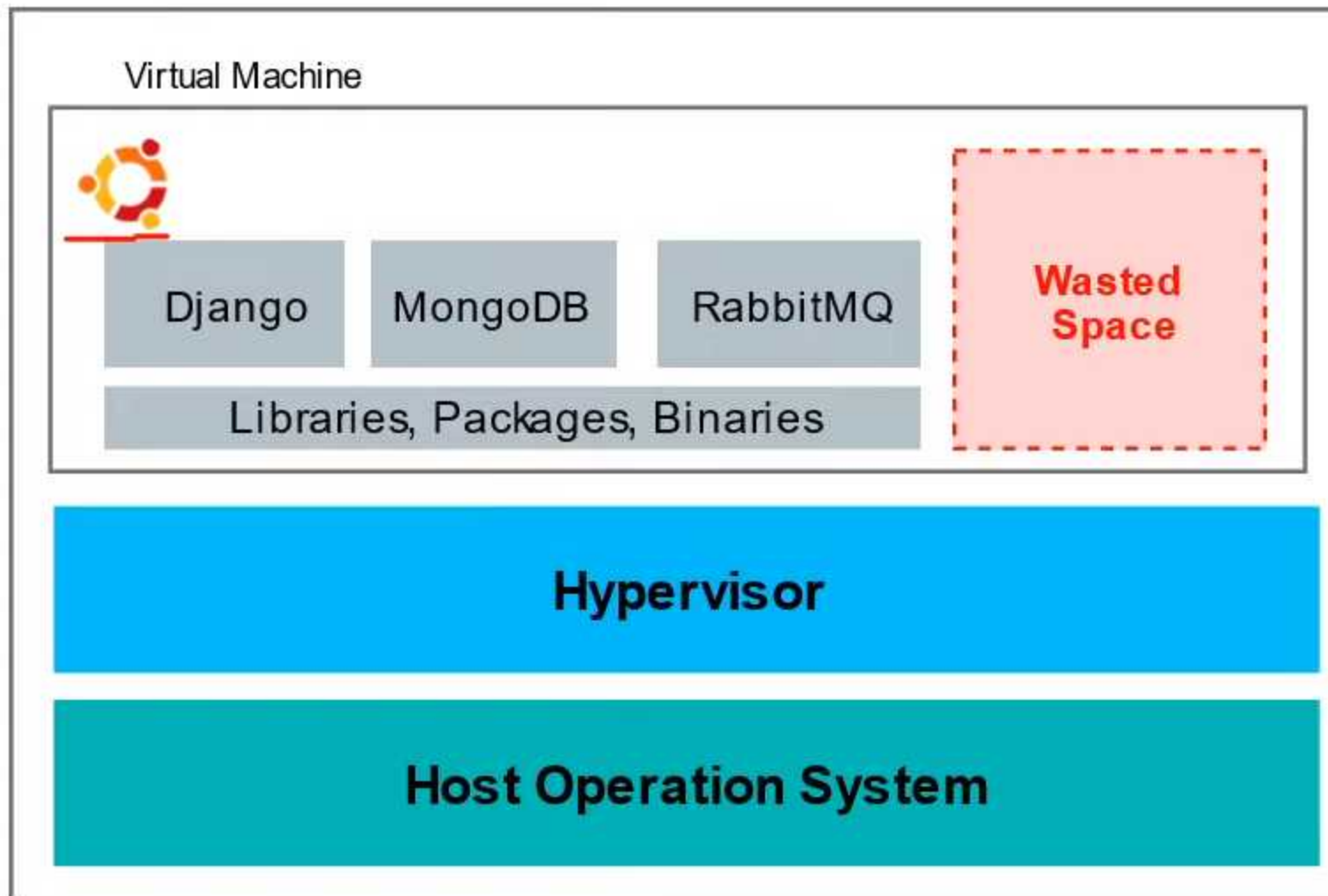
VMs vs Containers

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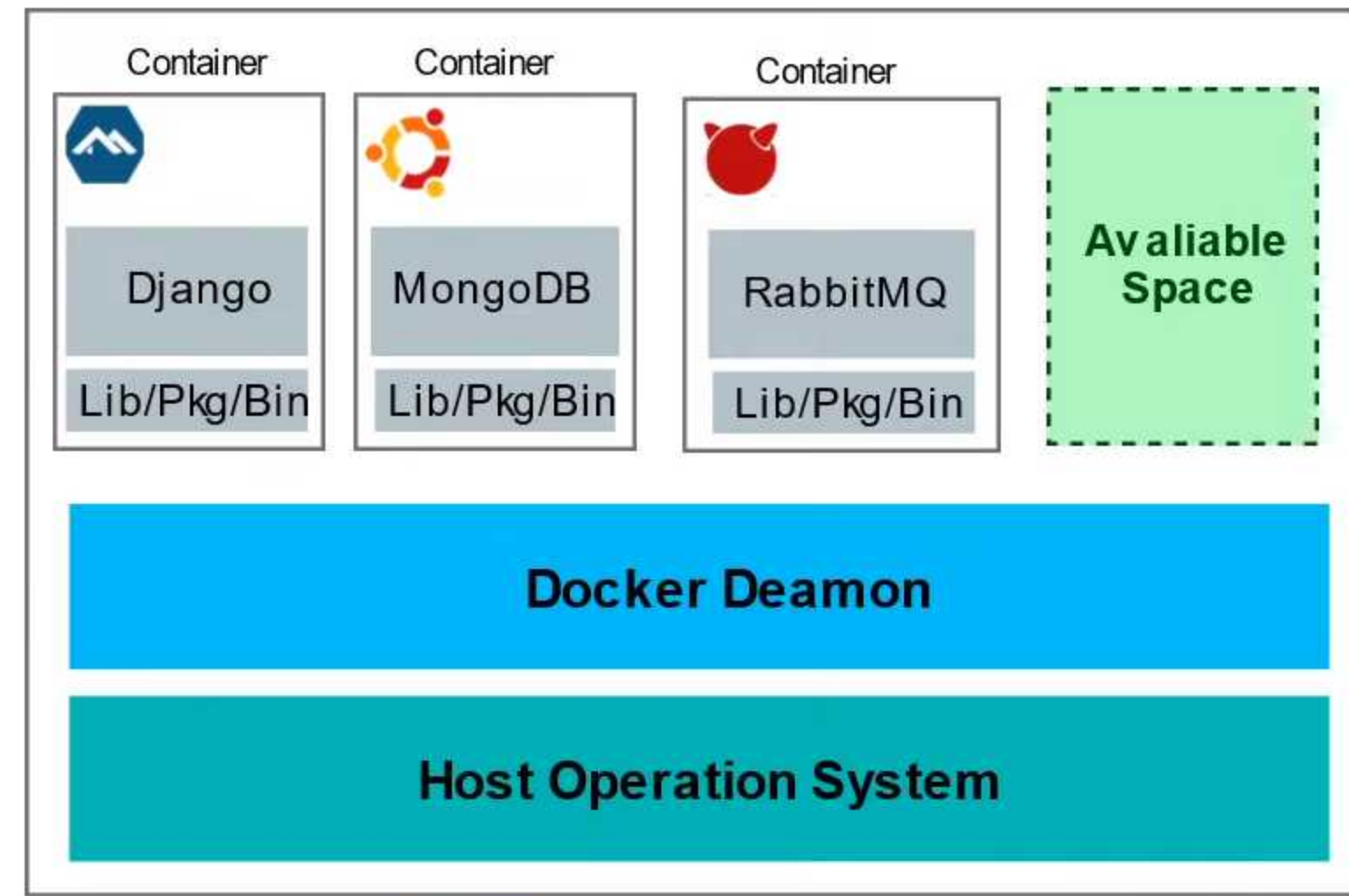
VMs **do not** make best use of space.
Apps are not isolated which. Could cause
config conflicts, security problems
or **resource hogging**.

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



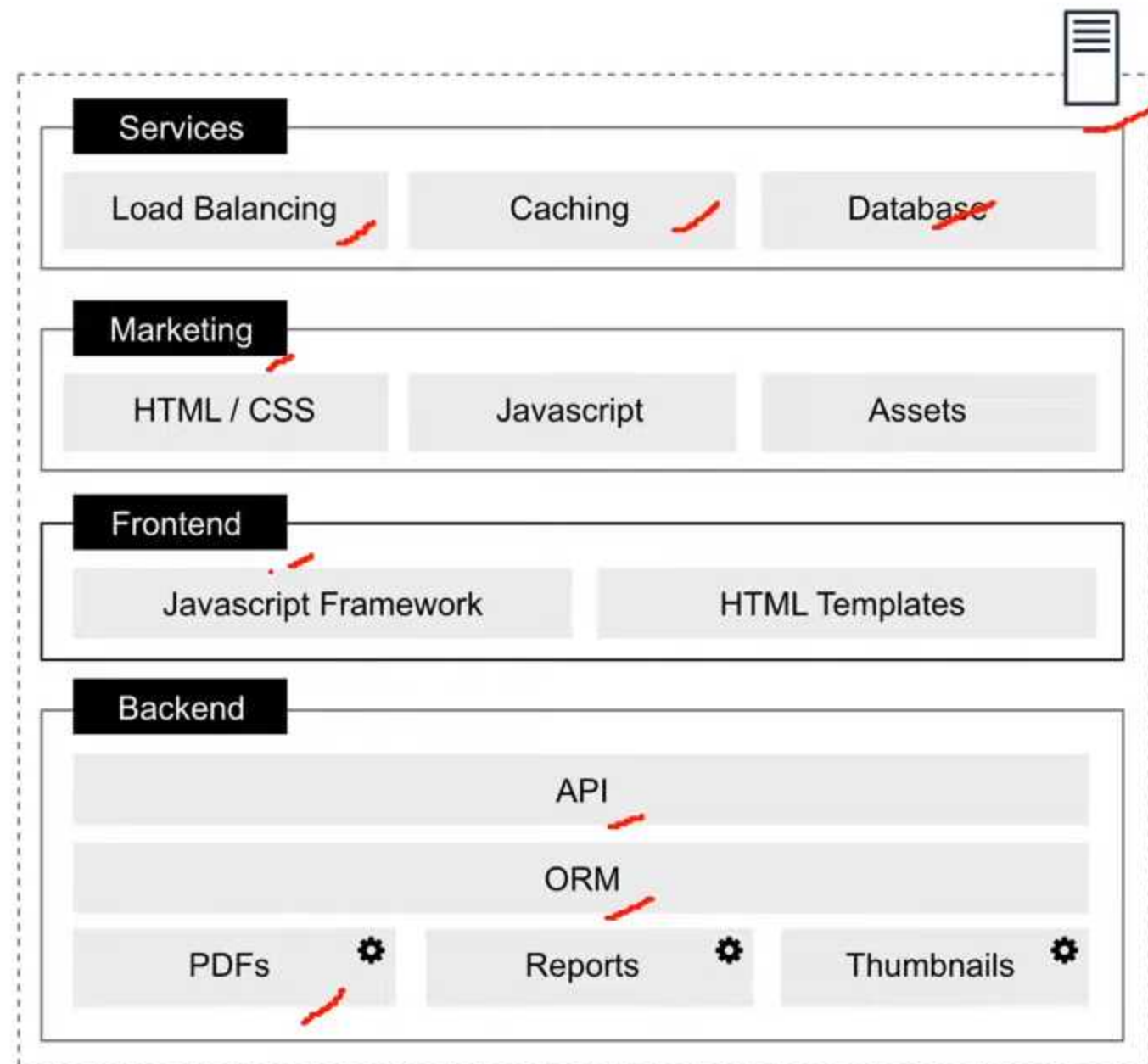
EC2 Instance

What are Microservices

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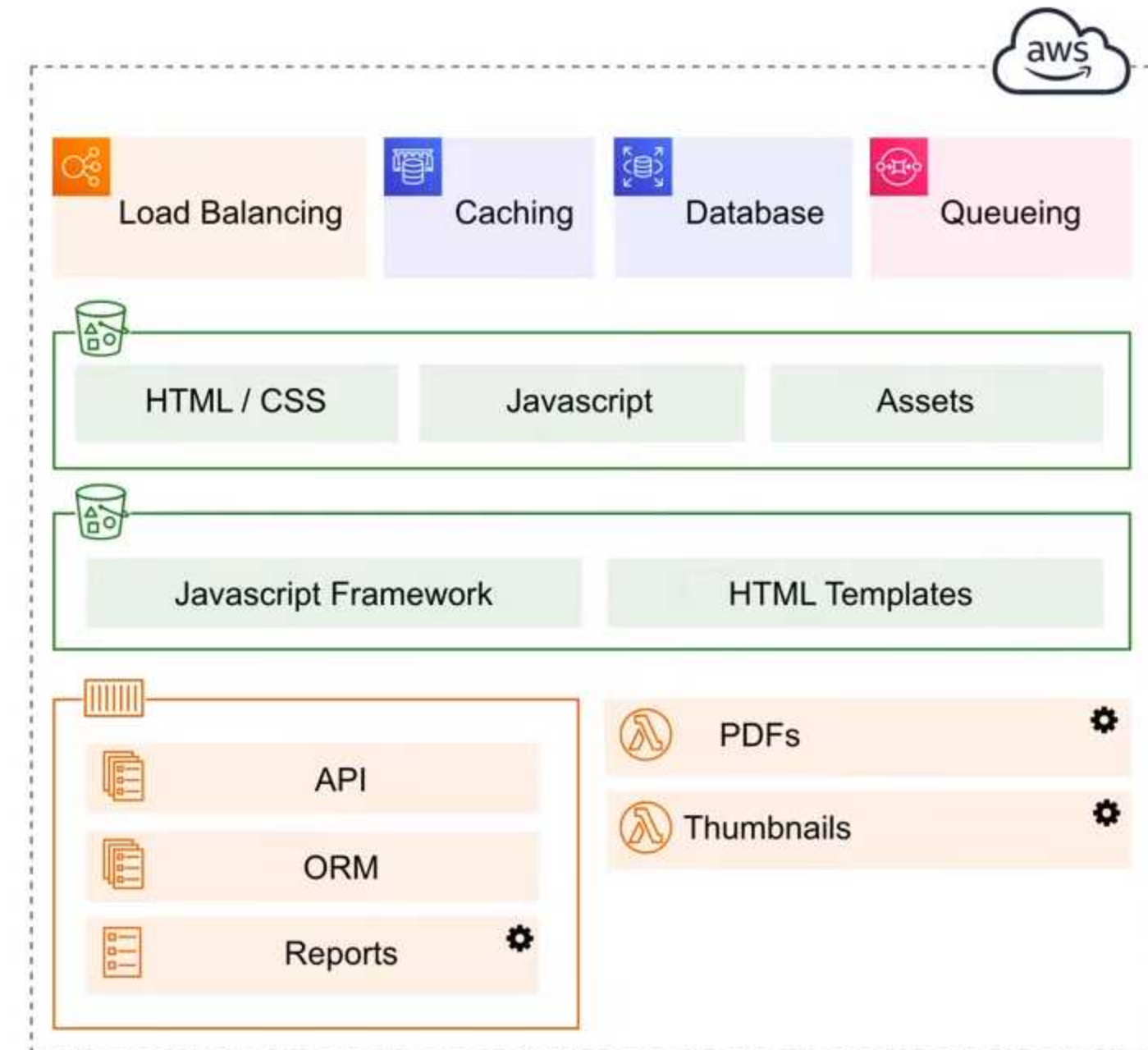
Monolithic Architecture

One app which is responsible for everything
Functionality is tightly coupled



Microservices Architecture

VS 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)**

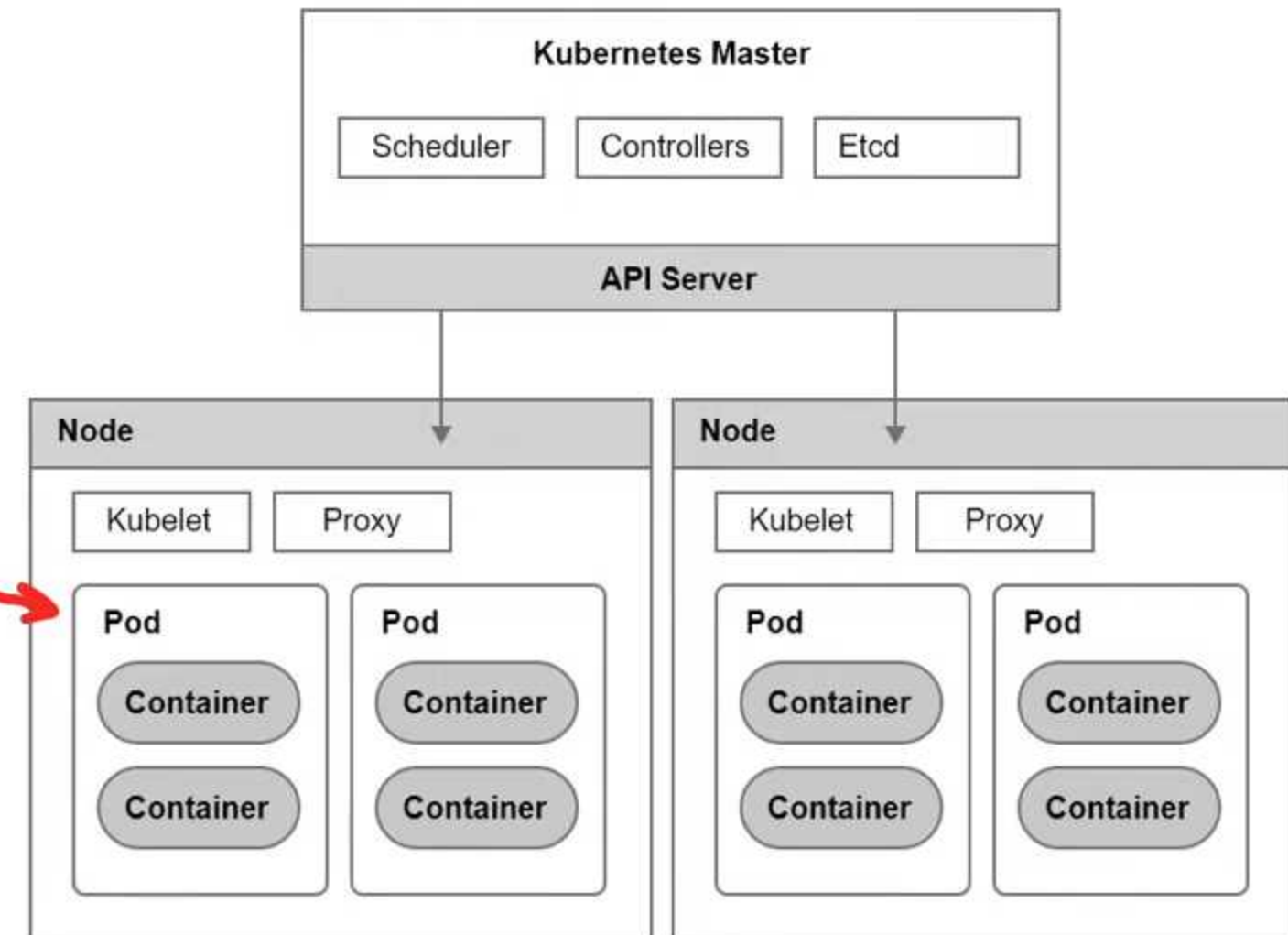
Kubernetes is commonly called **K8**

- 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.

Podman, Buildah and Skopeo

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Podman is a container engine that is OCI-compliant and is a drop-in replacement for Docker.

- Podman is daemon-less where Docker uses a containerd daemon
- Podman allows you to create pods like K8, Docker does not have pods
- Podman only replaces one part of Docker. Podman is to be used alongside Buildah and Skopeo



Buildah is a tool used to build OCI Images



Skopeo a tool for moving container images between different types of container storages

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