Head First Containers & Orchestration

Docker • Containers • Pods • Kubernetes • OpenShift (with diagrams)

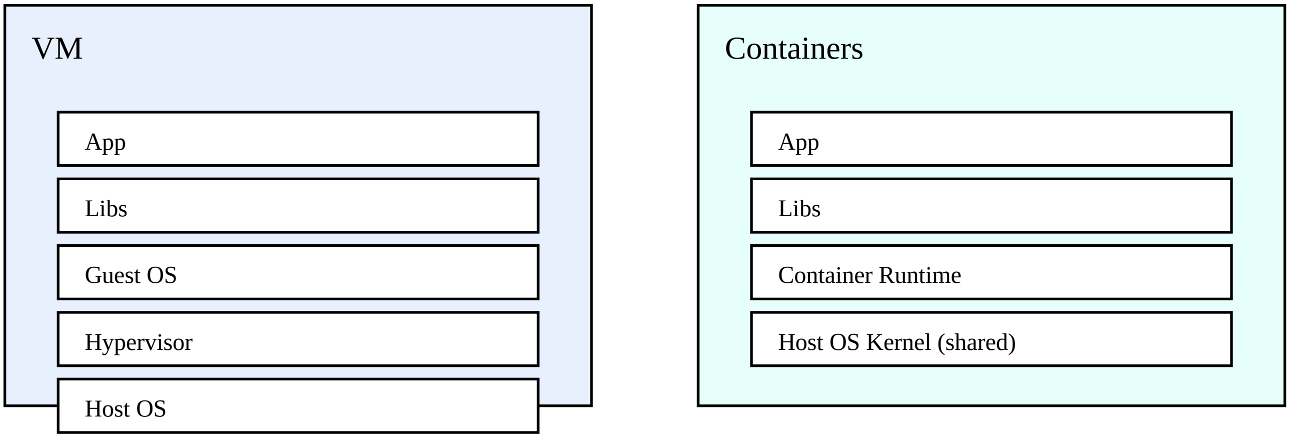
Before we start…

If you’ve ever said: **“It works on my laptop!”** and then production laughed at you… this mini-book is for you. ■

1) Containers are NOT tiny VMs

A container is a lightweight isolated process. A VM is a whole machine. Containers share the host kernel, so they start faster and use fewer resources.

VM vs Containers (why containers feel fast)

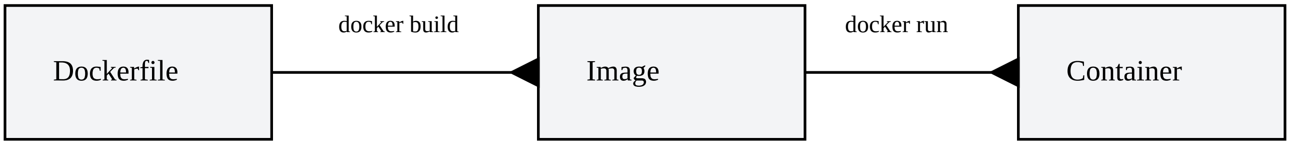


Containers share the host kernel → less overhead than VMs.

2) Docker: the lunchbox for your app

Docker lets you package your app + runtime + dependencies into an **image**. Then you run it as a **container**.

Docker flow: Dockerfile → Image → Container



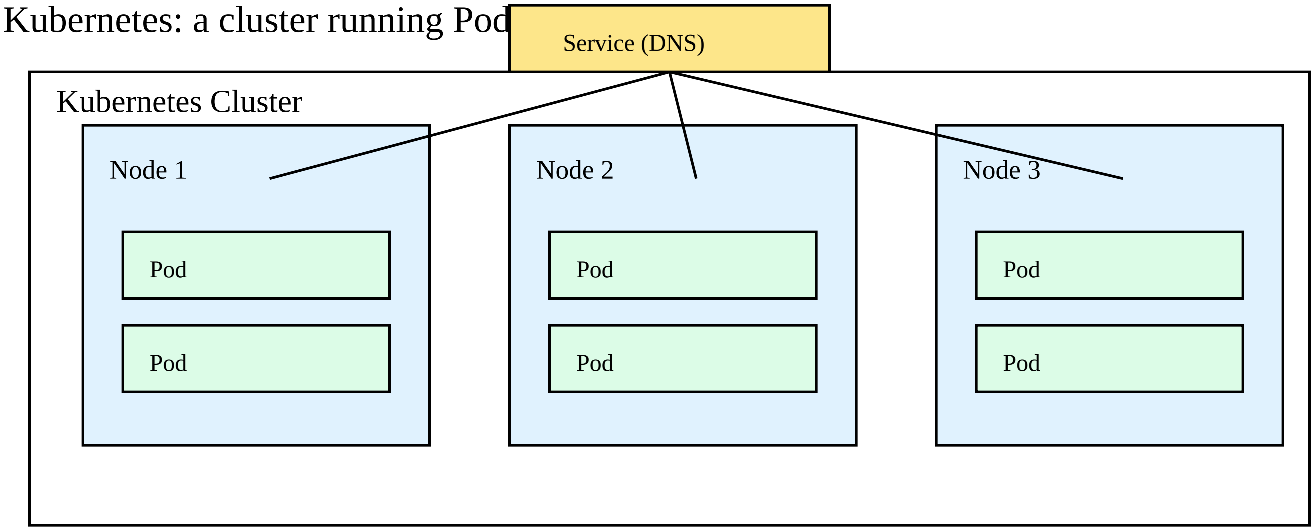
Build once. Run anywhere. (Well… almost ■)

Head First memory trick: Docker builds images. Containers run images.

3) Kubernetes: the container daycare ■

Kubernetes is the system that takes care of your containers when you have many of them. It schedules them, restarts them, scales them, and keeps traffic flowing.

Kubernetes: a cluster running Pod



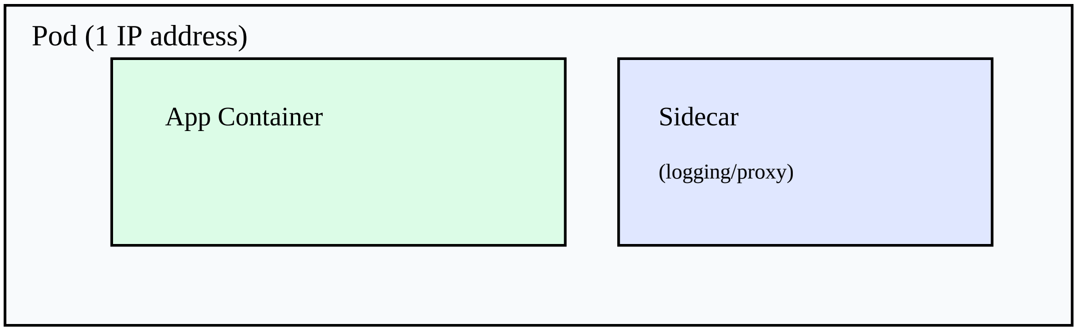
Pods come and go. Service stays stable.

If a Pod dies, Kubernetes creates a new one. If traffic increases, it adds more Pods. You declare what you want. Kubernetes makes it happen.

4) Pods: the smallest deployable unit

A Pod is Kubernetes’ smallest unit. It often contains 1 container. Sometimes it contains multiple containers that must live together.

Pod with Sidecar (roommates pattern)

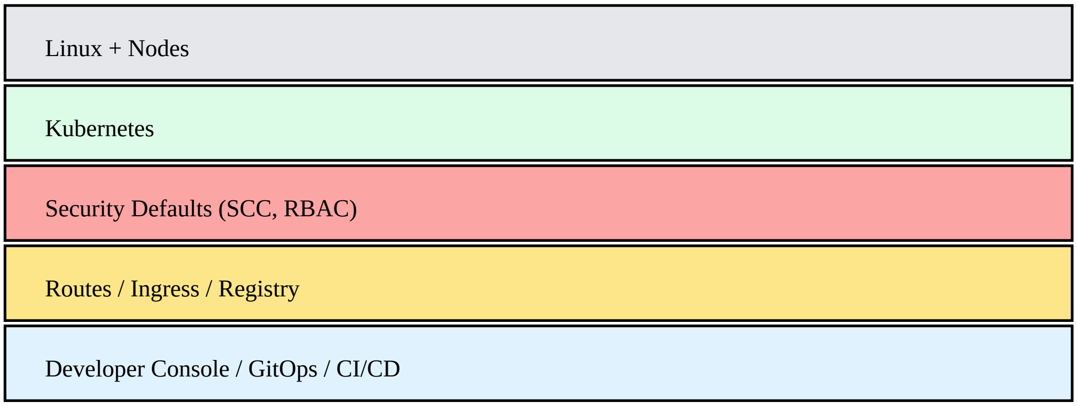


They share network + volumes → behave like one unit.

5) OpenShift: Kubernetes with enterprise superpowers

OpenShift is Red Hat’s enterprise Kubernetes platform. It includes Kubernetes plus security defaults, a developer console, integrated tools, and support.

OpenShift: Kubernetes + enterprise platform



Linux + Nodes

Kubernetes

Security Defaults (SCC, RBAC)

Routes / Ingress / Registry

Developer Console / GitOps / CI/CD

Think: ‘Kubernetes, but easier + safer for enterprises’.

In one line: OpenShift is Kubernetes + secure-by-default + platform features.

6) The ‘etc etc’ page (fast explainers)

Helm — Kubernetes package manager (install apps as charts).

Ingress — Rules for routing HTTP traffic into services.

Ingress Controller — The actual engine that implements Ingress rules.

ConfigMap — External config (non-secret).

Secret — Passwords/tokens/certs (handled carefully).

StatefulSet — For databases & stateful apps (stable IDs + storage).

DaemonSet — Runs one Pod per node (monitoring agents).

HPA — Auto-scales Pods based on CPU/memory/custom metrics.

Service Mesh — Manages service-to-service traffic (mTLS, retries, tracing).

Operator — A controller that manages complex apps like DBs.

Namespace — A logical partition in a cluster (teams/environments).

7) Cheat Sheet (print this)

Docker = build images
Container = running image
Kubernetes = runs Pods across nodes
Pod = smallest deployable unit
Deployment = replicas + rolling updates
Service = stable DNS + load balancing
Ingress = HTTP entry point
OpenShift = enterprise Kubernetes