

# Head First Containers & Orchestration

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

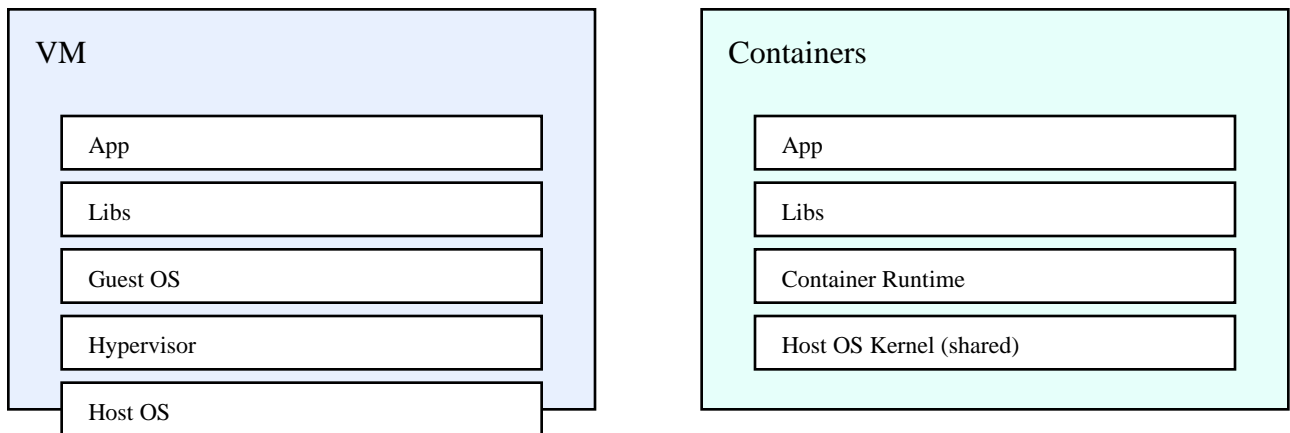
## Before we start...

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



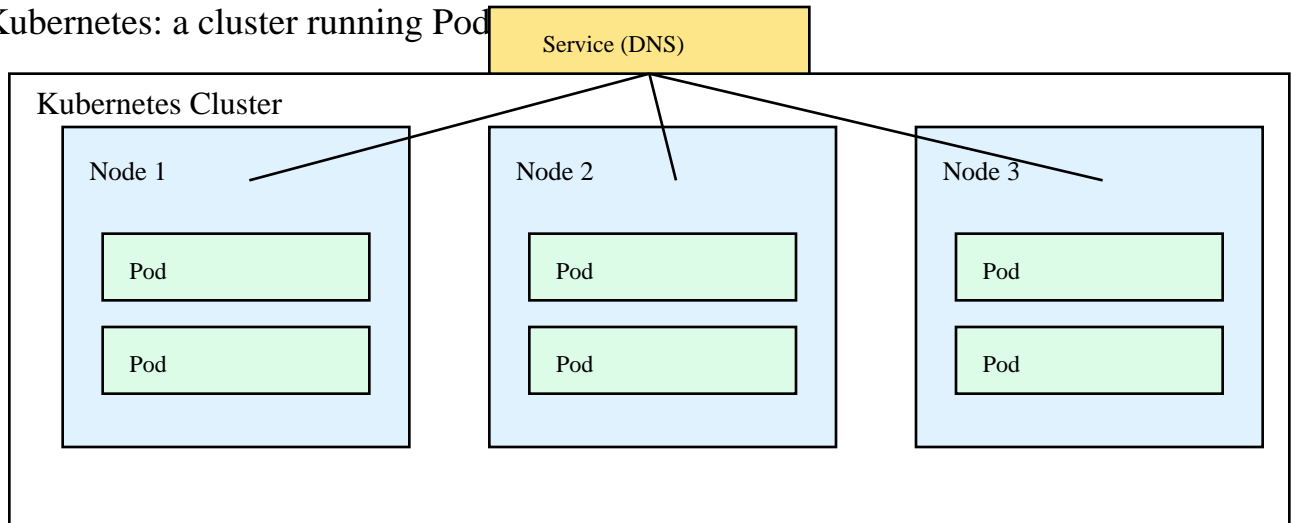
Build once. Run anywhere. (Well... almost ■)

**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 Pods



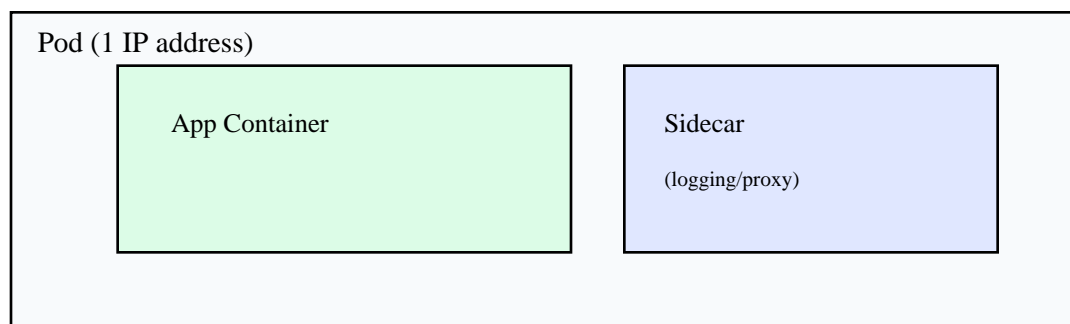
Pods come and go. Service stays stable.

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)

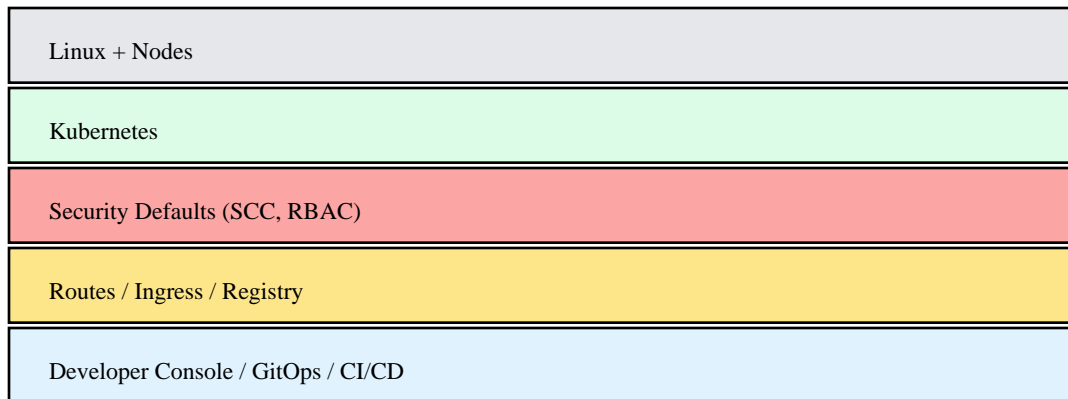


They share network + volumes → behave like one unit.

### 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



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