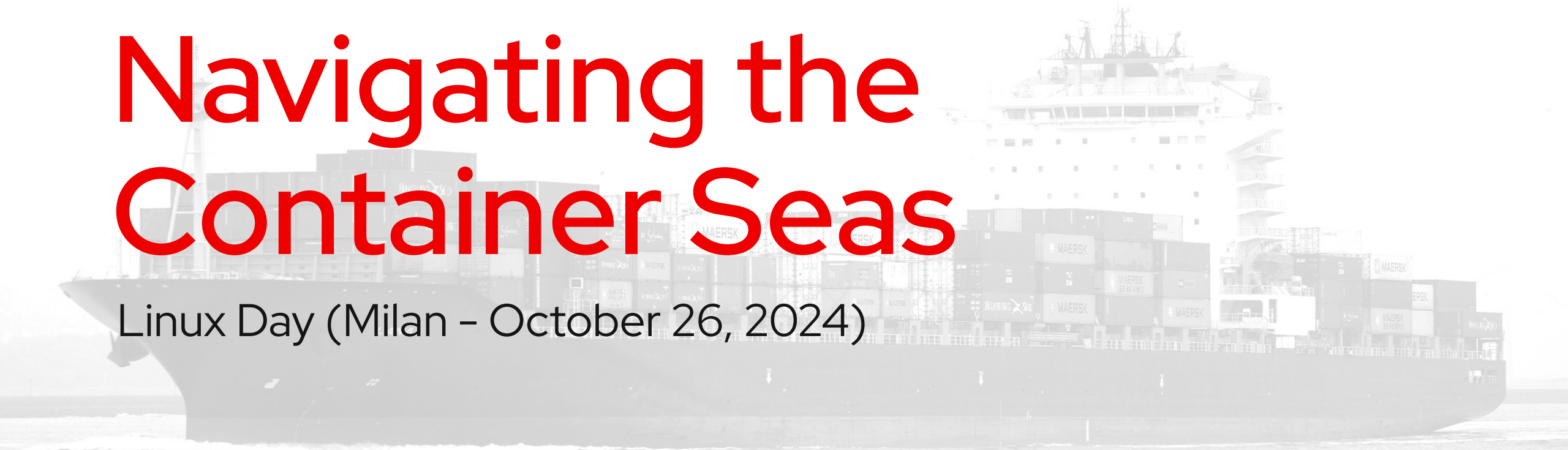
Kubernetes 101: Navigating the Container Seas



Linux Day (Milan - October 26, 2024)

Alfonso Cancellara

Technical Account Manager, OpenShift @ Red Hat

Red Hat

Kubernetes is one of the largest Open Source projects to date

over 88,000 contributors across 44 countries

Source: kubernetes.io/blog/2024/06/06/10-years-of-kubernetes/

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Why Red Hat ?

- 2nd largest contributor to Kubernetes
- Part of IBM (6th largest contributor)

Why me ?

- Working on Kubernetes since 2019
- Currently working on OpenShift in Red Hat

Source: k8s.devstats.cncf.io/d/9/companies-table

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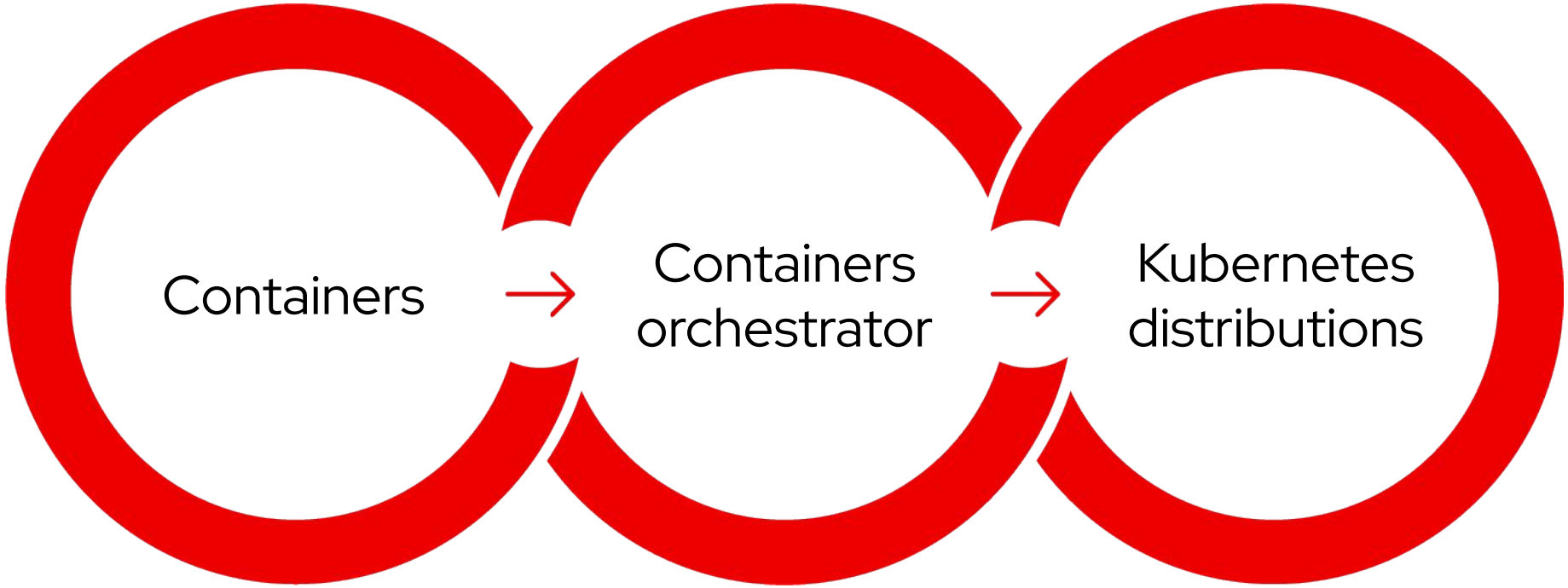
What we'll discuss



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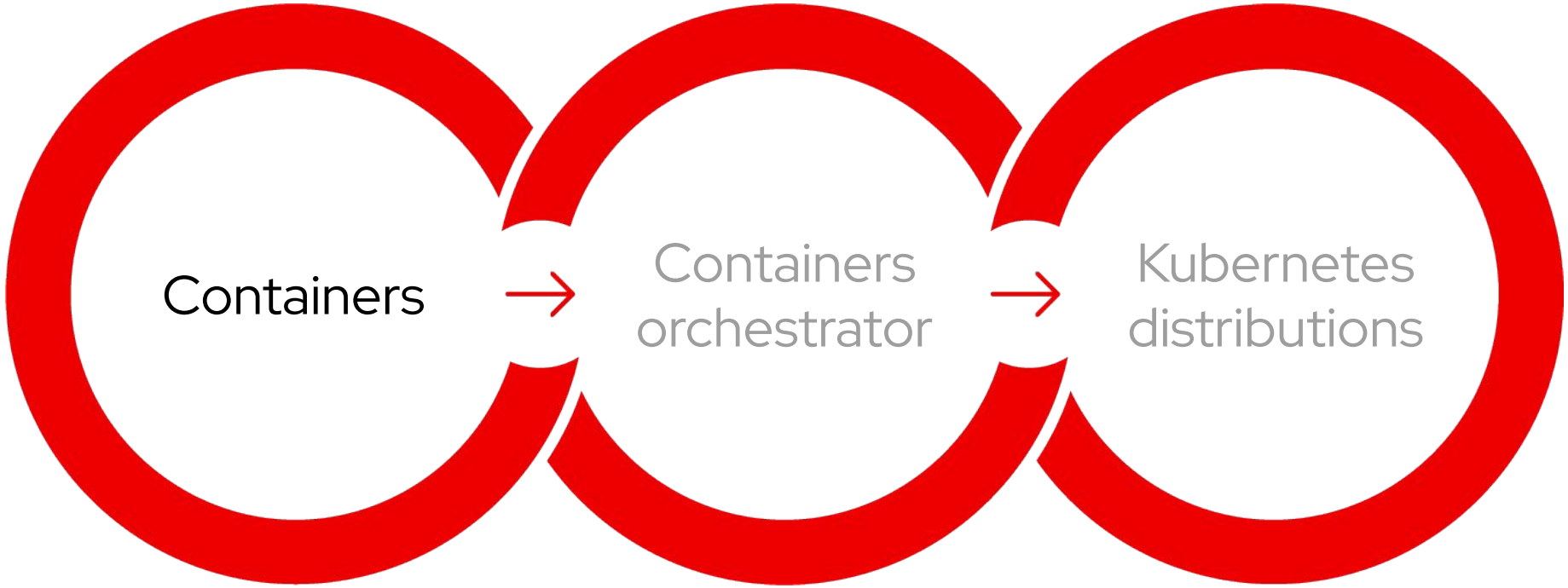
What we'll discuss



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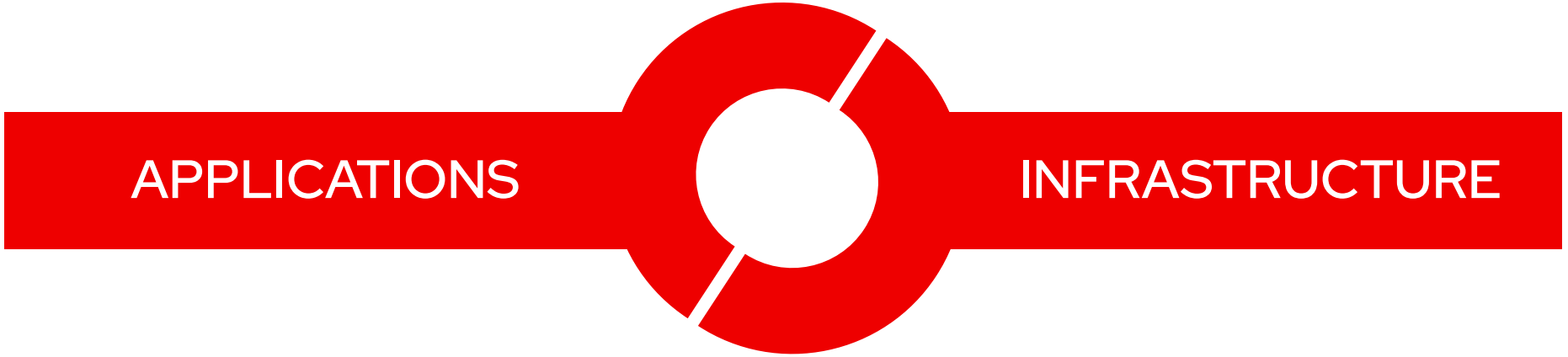
What are containers ?

It depends who you ask



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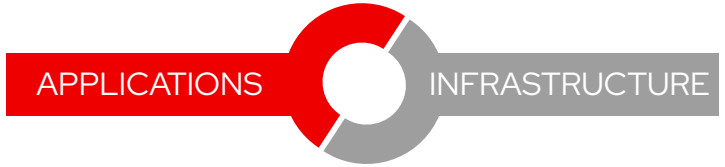

The problem

Applications have different requirements: languages, libraries, and tools

The solution

Package applications as units of software that hold together all the needed components

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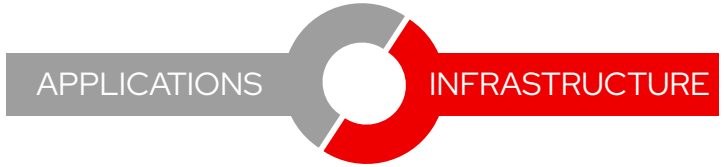
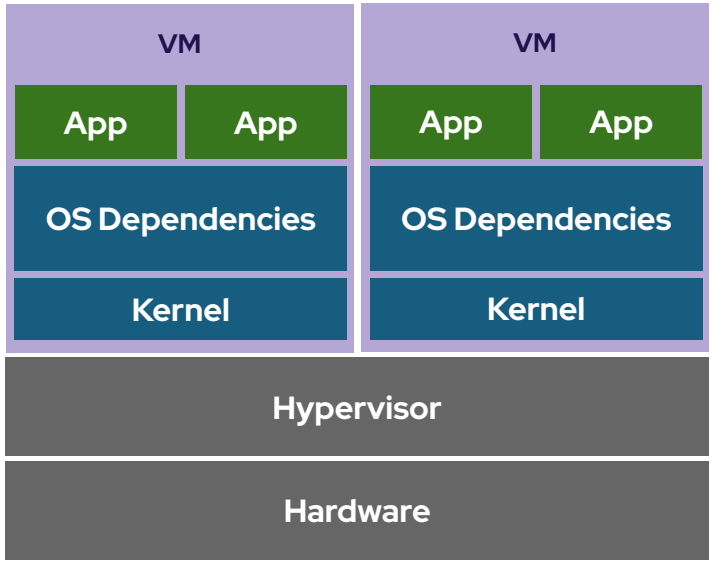


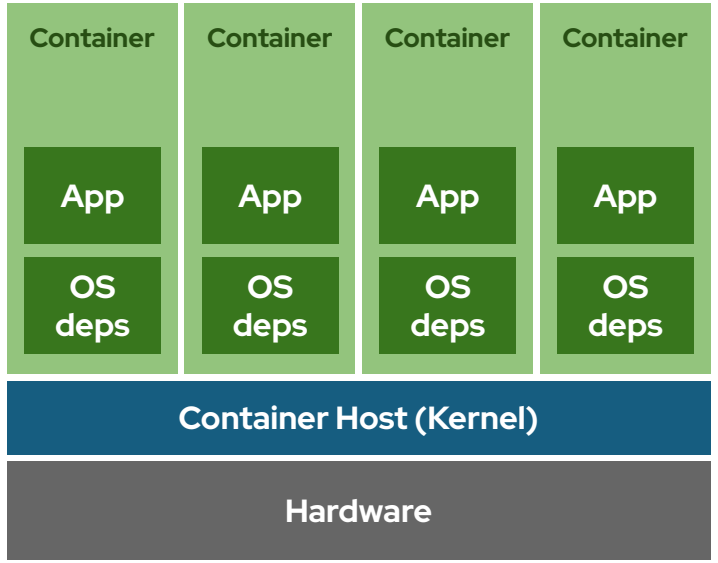
The problem

VMs are “heavy” and usually **not** portable across hypervisors



The solution

Isolated **processes** on a shared kernel (using Linux technologies)



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DEMO 1

Create and run a container locally

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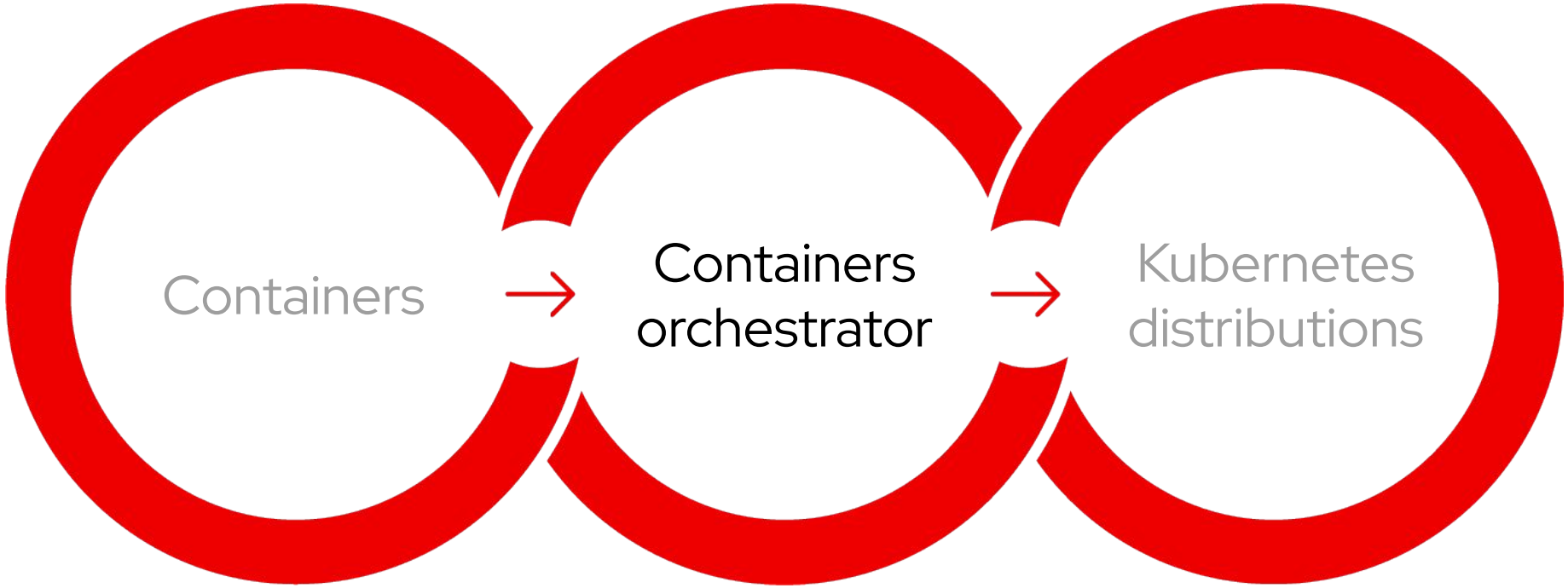
What we'll discuss



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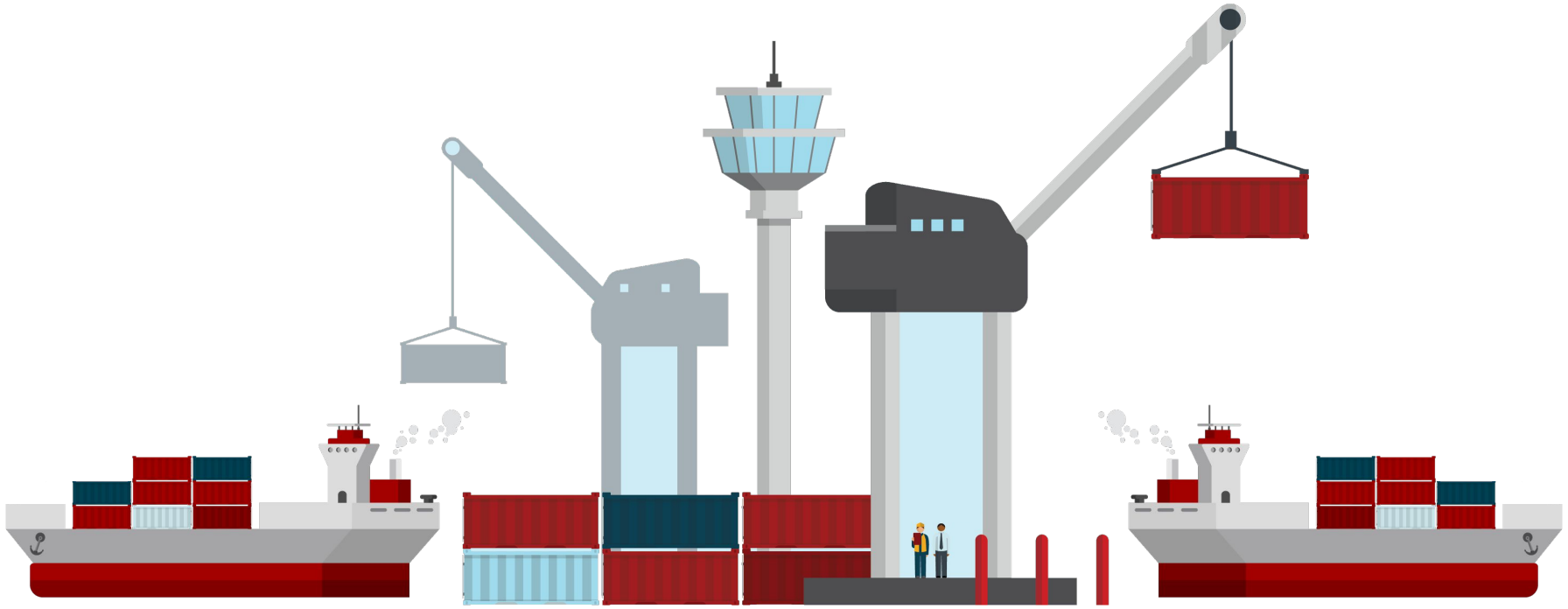
How to manage containers at scale ?



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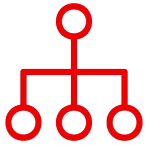
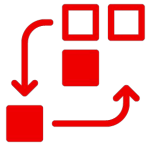
How to manage containers at scale ?

Service discovery



Load balancing

Storage orchestration



Automated rollouts and rollbacks

Self-healing

Secret and configuration management

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How to manage containers at scale ?

Use a containers *orchestrator*

kubernetes

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Kubernetes objects

Entities representing the state of the orchestrator


Pod : unit of computing (group of one or more containers)


Deployment : set of identical Pods (replicas of the same app)


Service : way to expose Pods over the network


PersistentVolume : unit of storage (“disk” that is usable by a Pod)


ConfigMap : way to set configurations in Pods


Secret : way to store confidential data (ex. connection strings)

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Anatomy of a Kubernetes object

Represented as a YAML file

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: demo-pod
  labels:
    app: http-server
spec:
  containers:
    - name: demo-container
      image: quay.io/…/demo-container:latest
       ports:
         - containerPort: 8000
```


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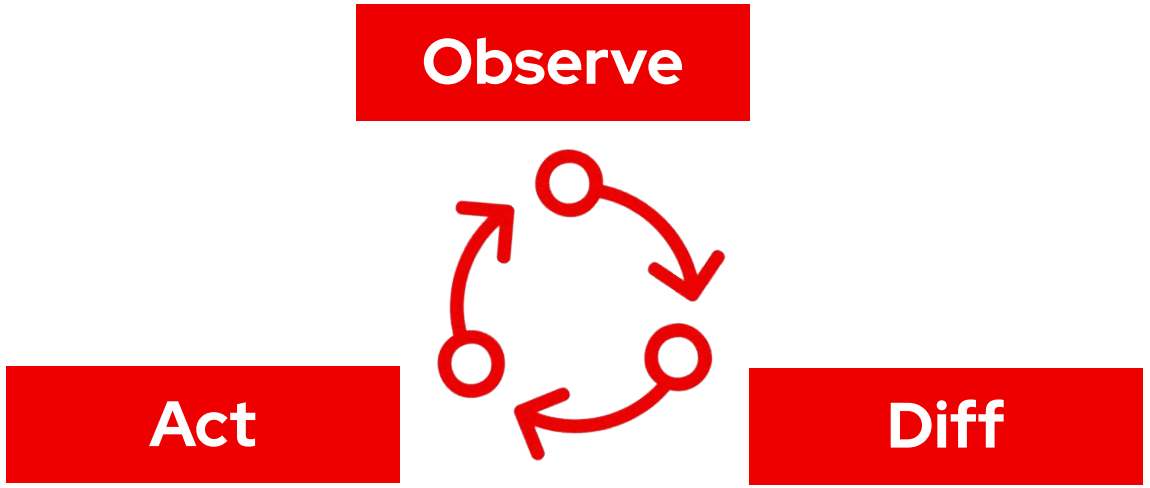
Reconciliation / Control loop

A core Kubernetes concept

Kubernetes is based on the concept of a **declarative specification of the desired state**

and the **use of reconciliation loops** to **drive the actual state toward the desired state**



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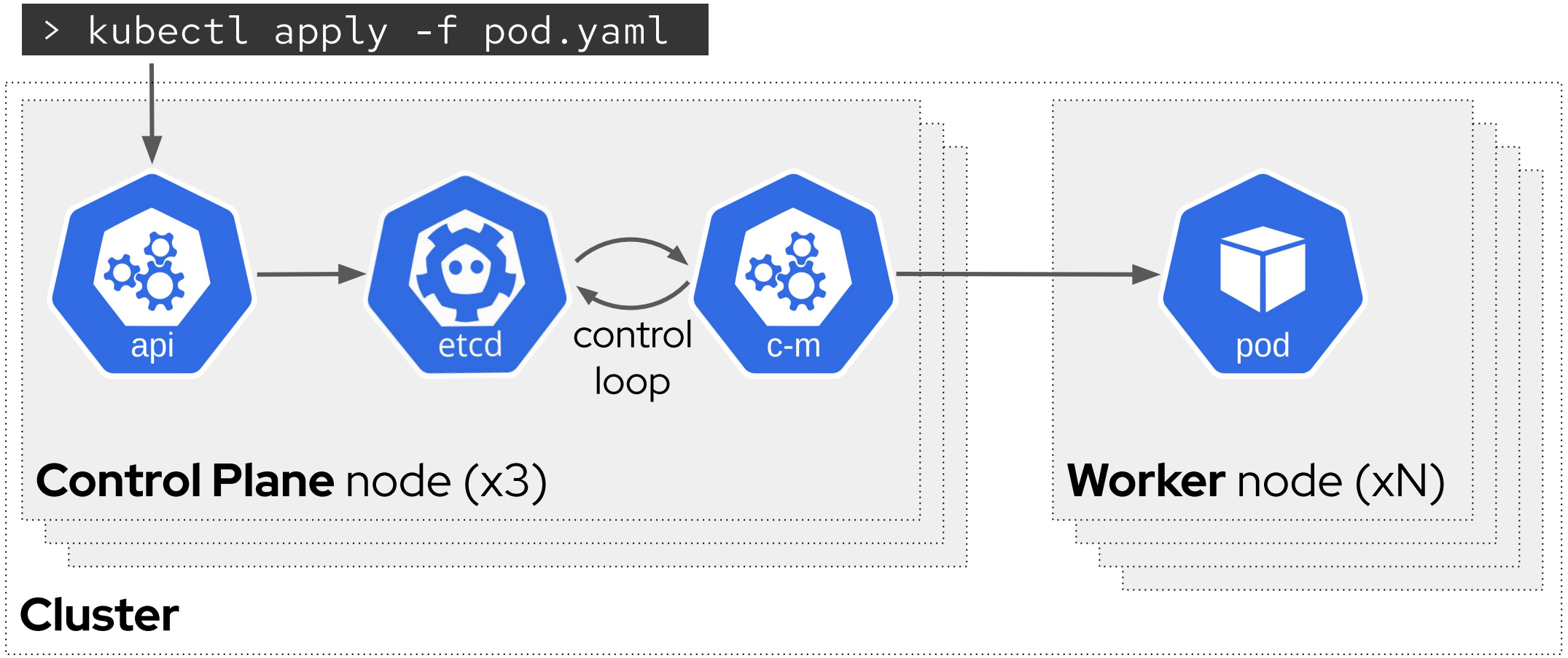
Kubernetes architecture

Simplified view



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DEMO 2

Create and run a pod on K8s

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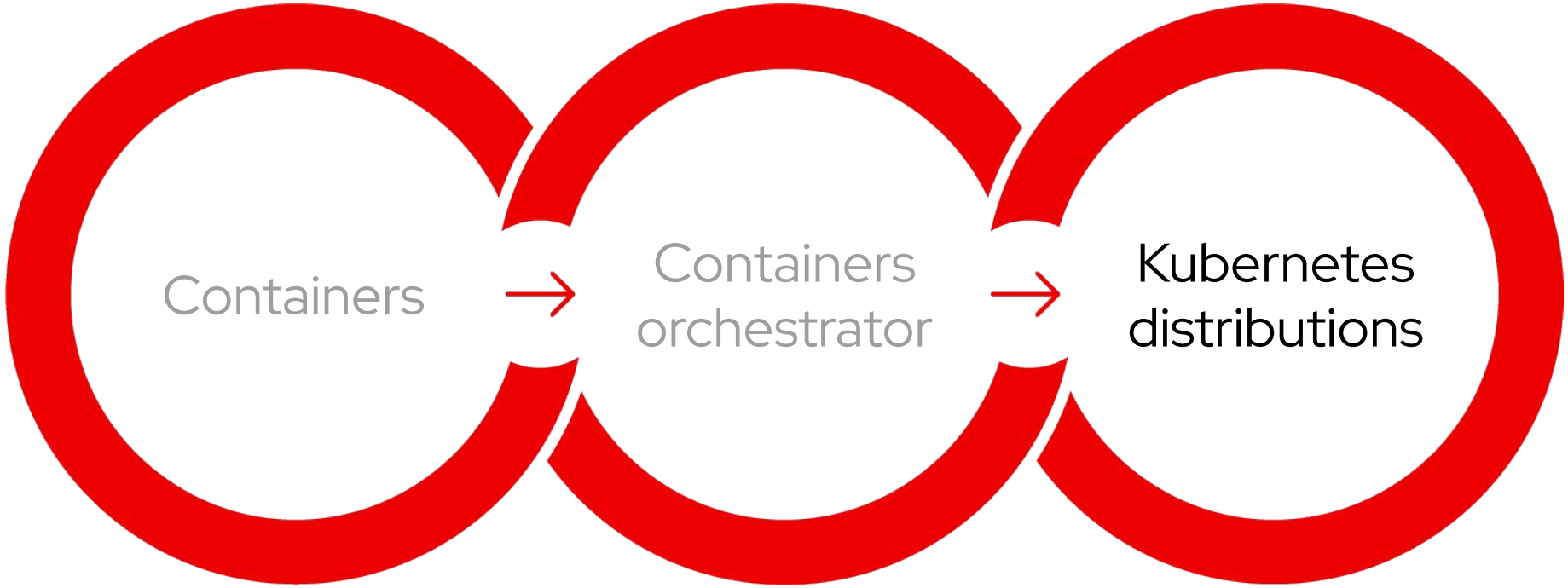
What we'll discuss



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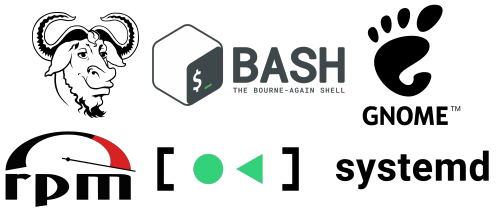
Kubernetes distributions

Are a packaged form of Kubernetes that includes additional tools, features, or services

Linux release

\+

Additional components



...

Production ready

RHEL release

Kubernetes release

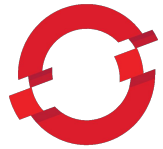
\+

Additional components

...

Production ready

OpenShift release



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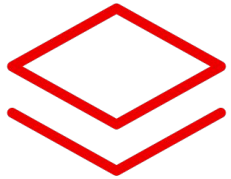
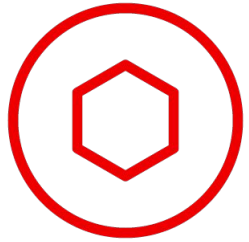
Red Hat Enterprise Linux CoreOS

The default operating system for all OpenShift cluster nodes



Based on **RHEL**

Controlled **immutability**



Container-centric

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DEMO 3

Microservices app on OCP

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Thank you

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