Navigating the Container Seas on IBM Power

Linux Day (Rome – October 26, 2024)

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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/

Why Red Hat ?

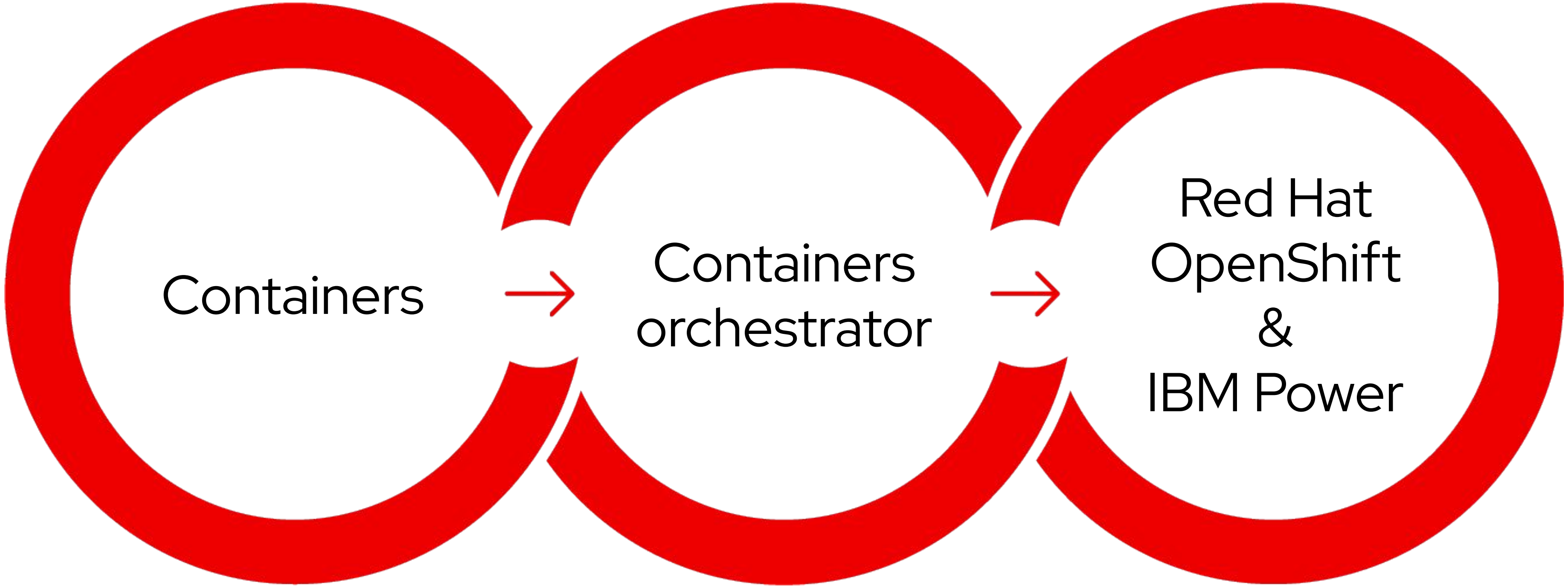
- 2nd largest contributor to Kubernetes
- Part of IBM (6th largest contributor)

Why me ?

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

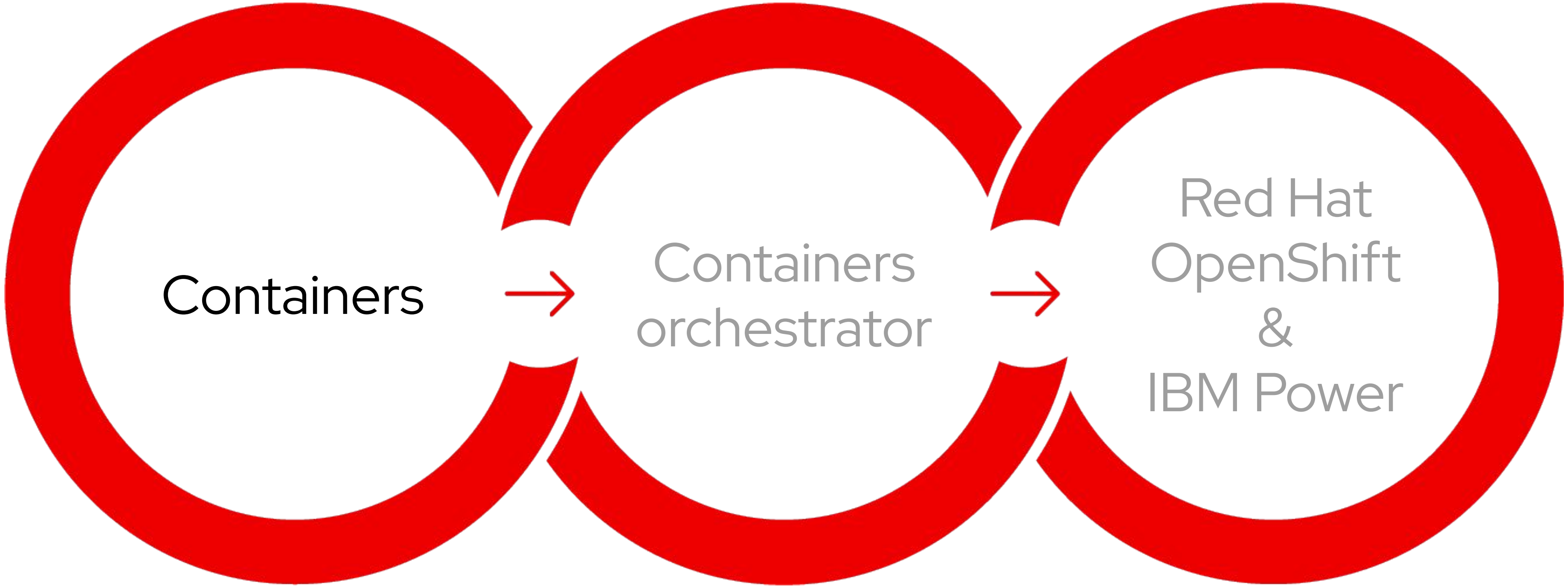
Source: k8s.devstats.cncf.io/d/9/companies-table

What we’ll discuss



Containers → Containers orchestrator → Red Hat OpenShift & IBM Power

What we’ll discuss



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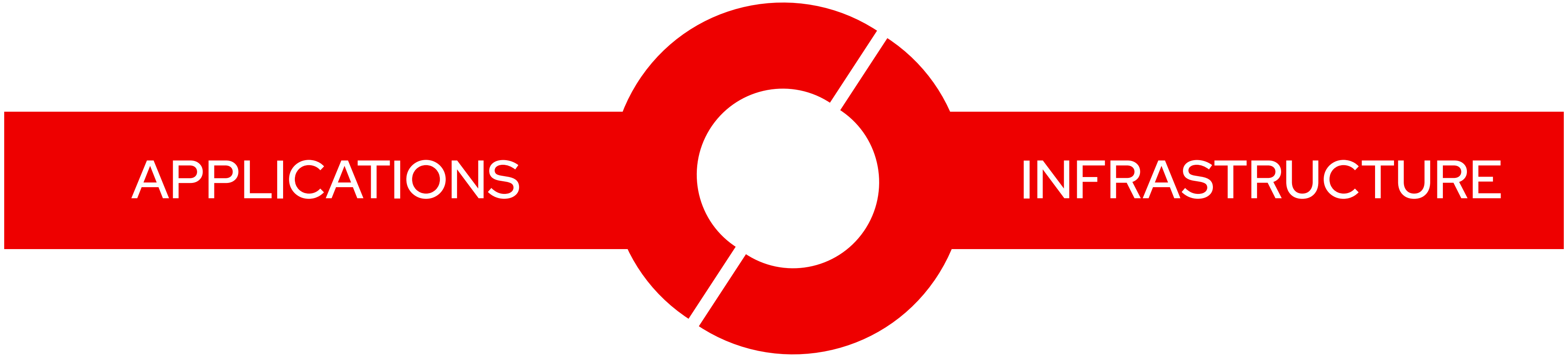
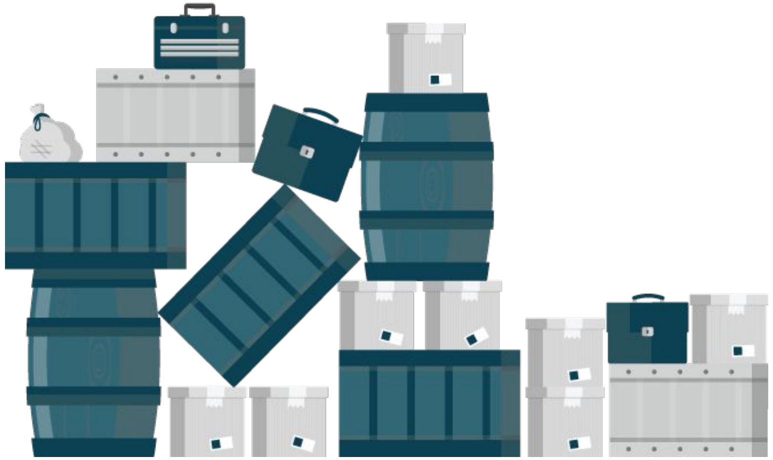
What are containers ?

It depends who you ask



The problem

Applications have different requirements: languages, libraries, and tools

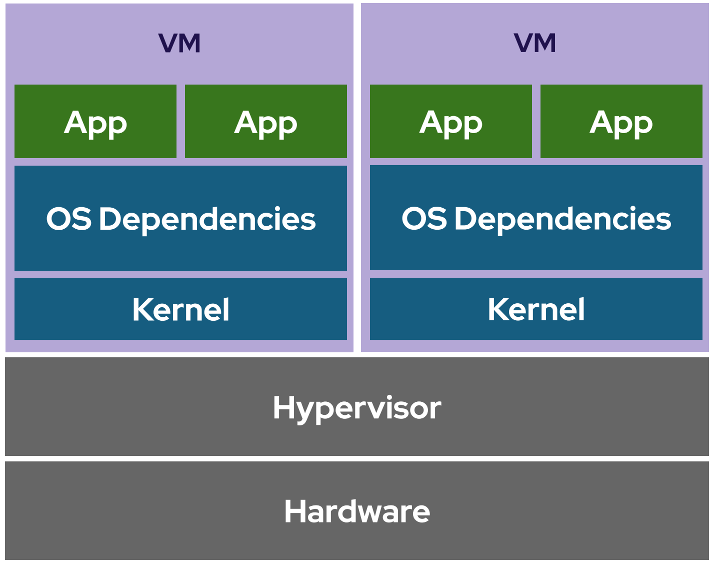


The solution

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

The problem

VMs are "heavy" and usually **not** portable across hypervisors



VM | VM

App | App | App | App

OS Dependencies | OS Dependencies

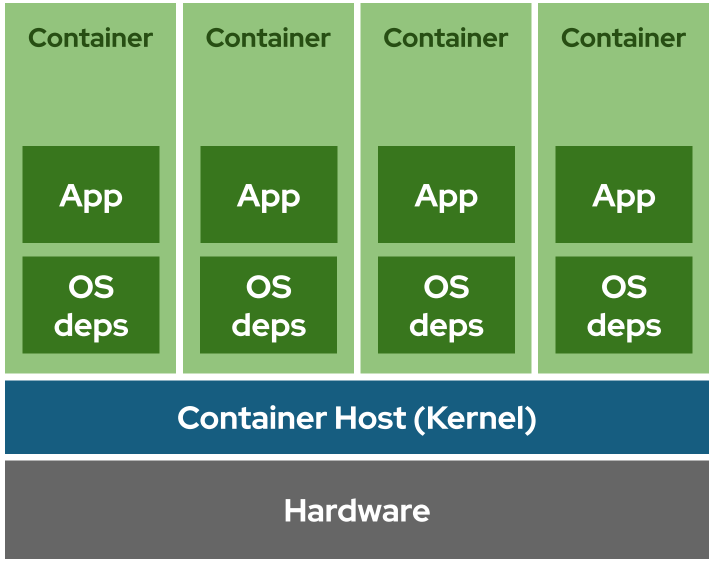
Kernel | Kernel

Hypervisor

Hardware

The solution

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



Container | Container | Container | Container

App | App | App | App

OS deps | OS deps | OS deps | OS deps

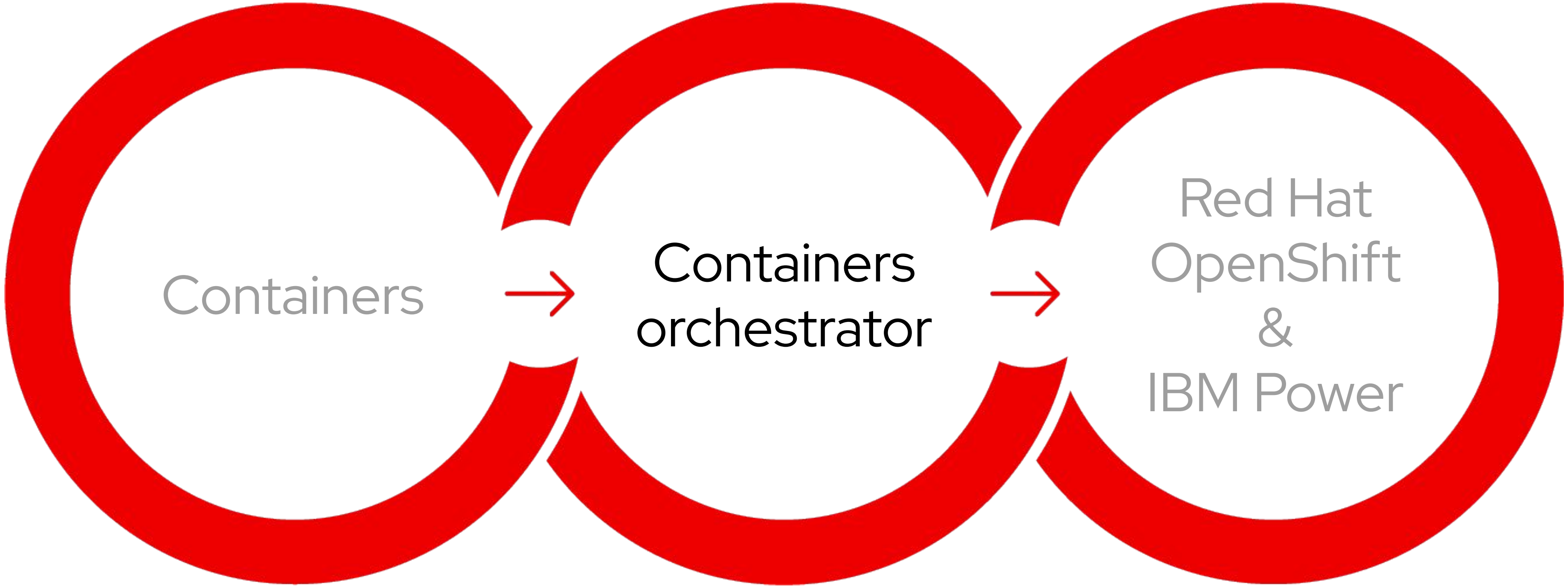
Container Host (Kernel)

Hardware

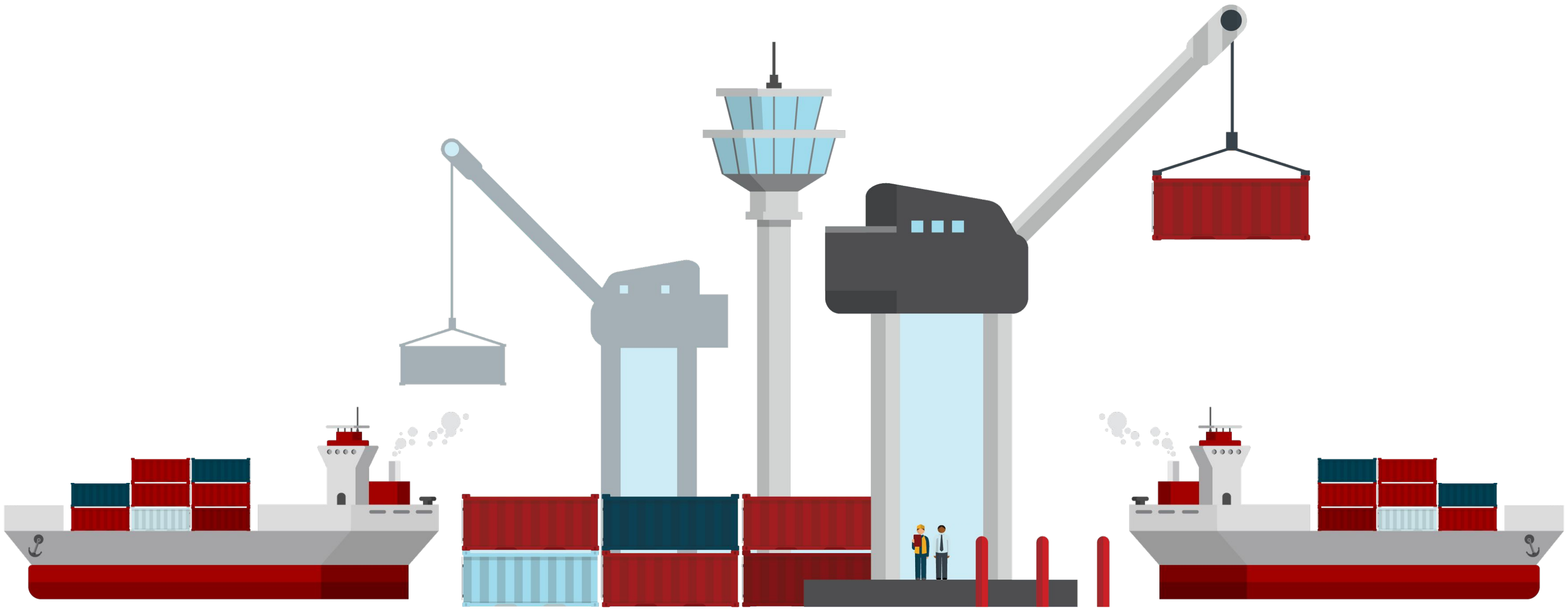
DEMO 1

Create and run a container locally

What we'll discuss



How to manage containers at scale ?



How to manage containers at scale ?

Service discovery

Load balancing

Storage orchestration

Automated rollouts and rollbacks

Self-healing

Secret and configuration management

How to manage containers at scale ?

Use a containers *orchestrator*

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)

Anatomy of a Kubernetes object

Represented as a YAML file

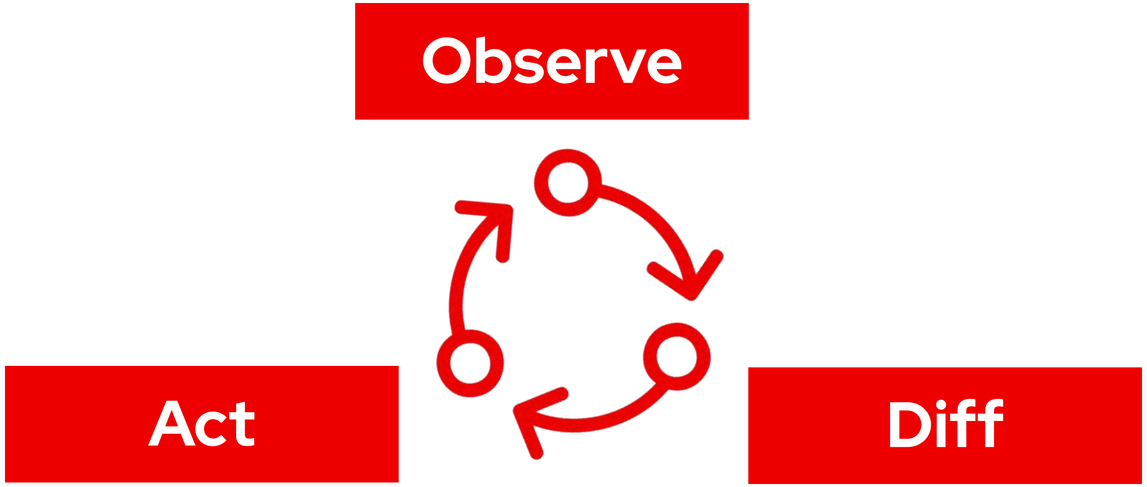
```yaml
apiVersion: v1
kind: Pod
metadata:
  name: demo-pod
  labels:
    app: http-server
spec:
  containers:
    - name: demo-container
      image: quay.io/…/demo-container:latest
      ports:
        - containerPort: 8000
```

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**



Observe

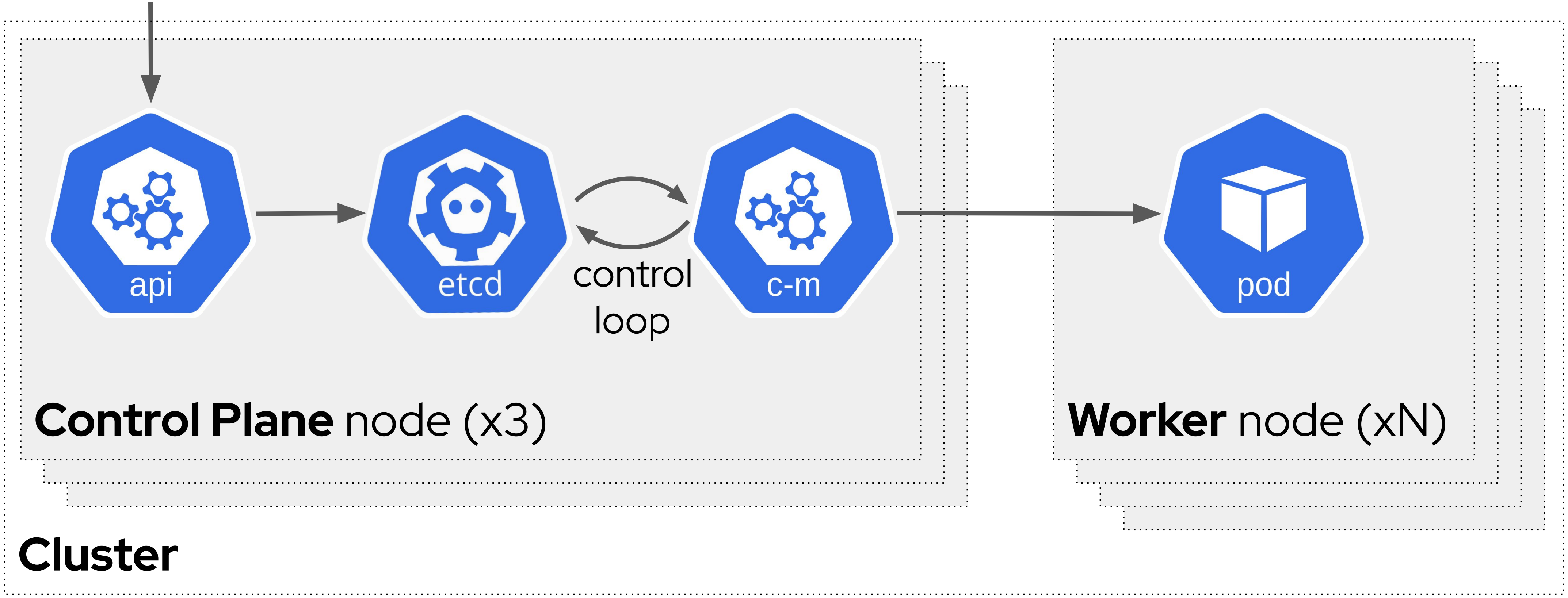
Diff

Act

Kubernetes architecture

Simplified view

```
> kubectl apply -f pod.yaml
```



api

etcd

control loop

c-m

pod

Control Plane node (x3)

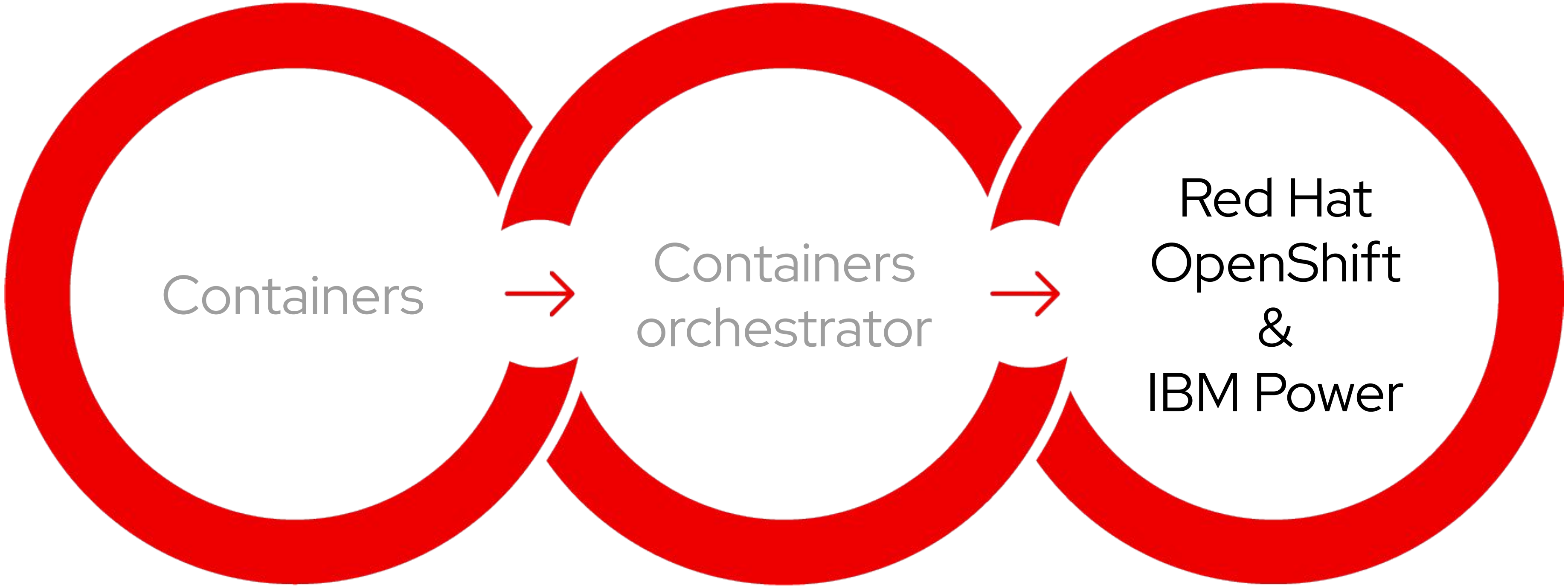
Worker node (xN)

Cluster

DEMO 2

Create and run a pod on K8s

What we'll discuss



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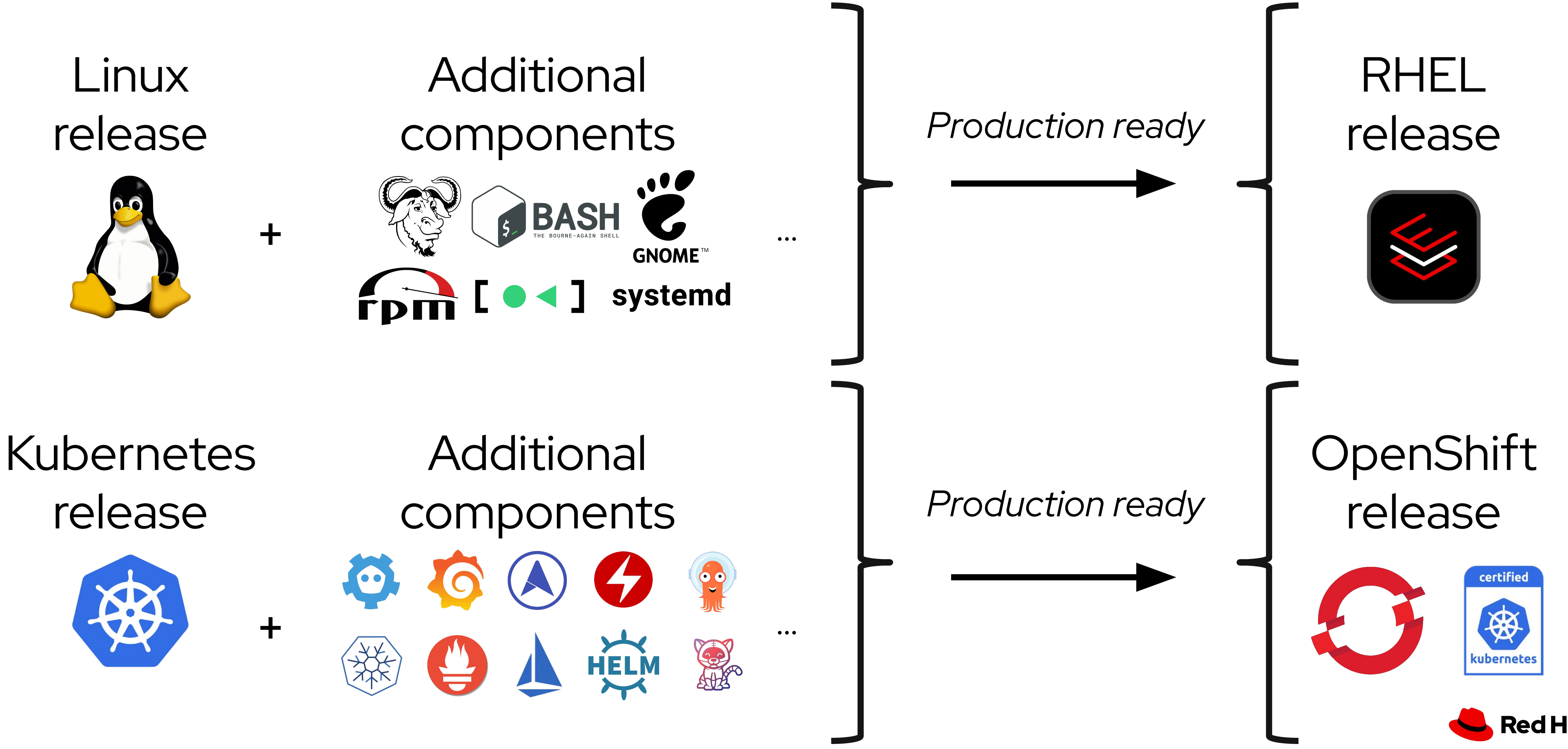
OpenShift Container Platform

Kubernetes-based platform that includes additional tools, features, and services



Linux release + Additional components ... → *Production ready* → RHEL release

Kubernetes release + Additional components ... → *Production ready* → OpenShift release

Red Hat Enterprise Linux CoreOS

The default operating system for all OpenShift cluster nodes

Based on **RHEL**

Controlled **immutability**

Container-centric

OpenShift on IBM Power

Securely build new OpenShift apps adjacent to data on AIX, IBM i

- **Incremental modernization**: value delivered as you go
- **Performance and scalability**: leveraging the POWER processors
- **Enhanced security**: hardware-based encryption, secure boot, and memory isolation capabilities
- **Reliability and availability**: redundant components, error correction and dynamic resource allocation
- **AI capabilities**: integrated accelerators

DEMO 3

Microservices app on OCP

Thank you

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