Red Hat OpenShift

The Evolution of IT: A Road to Containers

Minnesota Government IT Symposium
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Red Hat

What we'll be discussing today:

- Who am I?
  - … and why should you care?
- The official abstract for this session.
  - … and how we'll diverge from most of it.
- A grand history of software development
  - It's not like history class, I promise.
- Software development methodologies and technologies
  - All the cool flashy stuff that developers use and do
- Containers
  - Buckets, boxes and bins
- Orchestration
  - … and I won't even bring out my son's trombone.
- Putting it all together
  - And, if you're good, a demo

Who the heck am I?

Damien Eversmann

- Developer
- Development Manager
- Systems Engineer
- Enterprise Architect
- Red Hat Solutions Architect

For General Audiences

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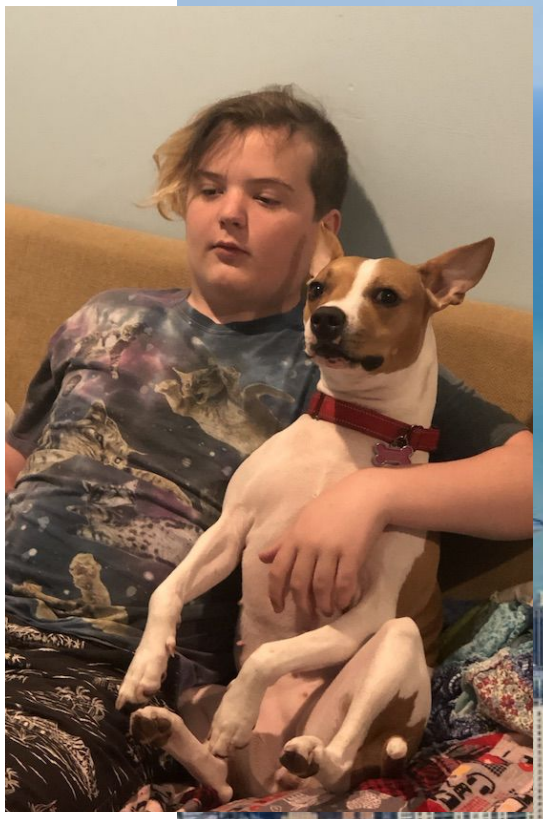
Who Am I Really?



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Why am I here?

What should you be thinking about as you plan for the next 5 years in IT?

Specifically:

- Containers
- DevOps
- Automation
- What else?

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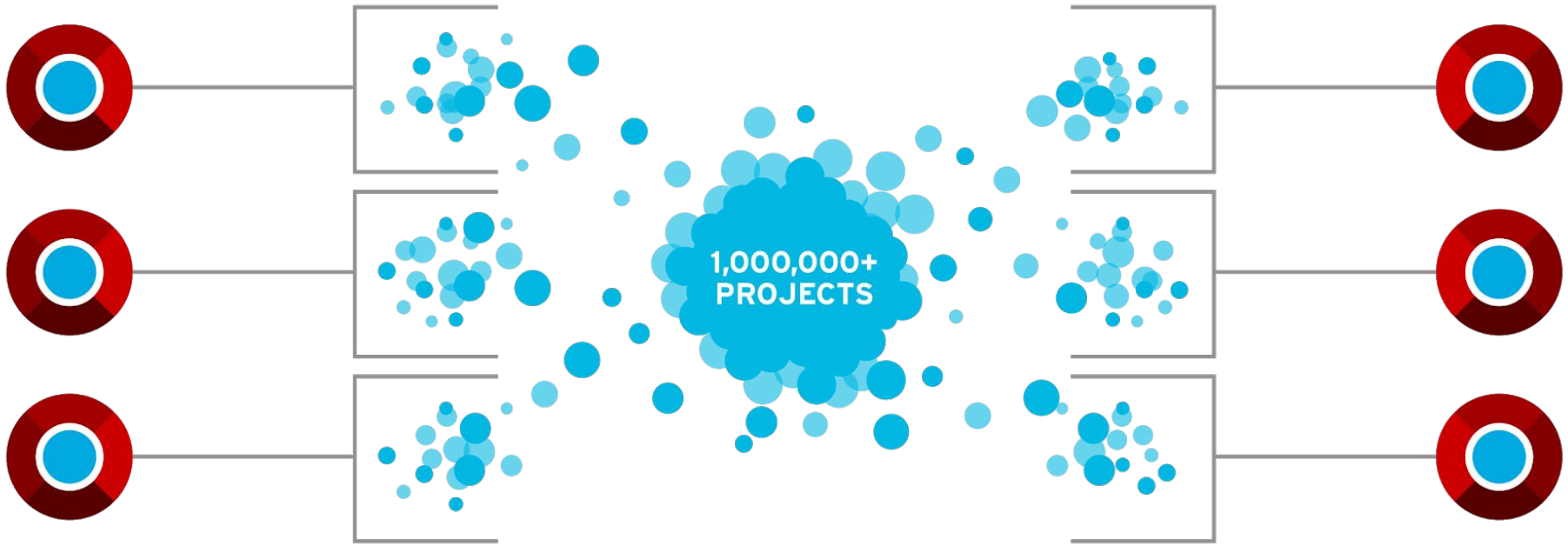
Join us for a brief history of innovation through the lens of IT development and how that history has led to Containerization. Along the journey, we will explore key systems challenges from 20 years ago and the challenges of today: How are these different and what is similar? What is the value of Containerization to Government agencies? Learn why Container adoption is increasing quickly due to the efficiencies it creates and the innovation it enables. Our discussion will conclude with a few examples of why and how organizations are using Containers today.

Brief Diversion:

A quick discussion of open

Red Hat

Product development model



Participate

We participate in and create community-powered upstream projects.

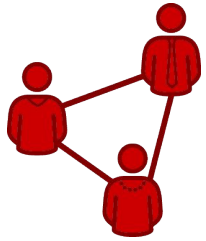
Integrate

We integrate upstream projects, fostering open community platforms.

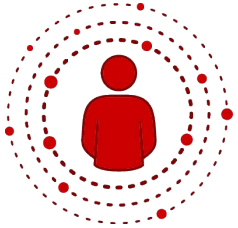
Stabilize

We commercialize these platforms together with a rich ecosystem of services and certifications.

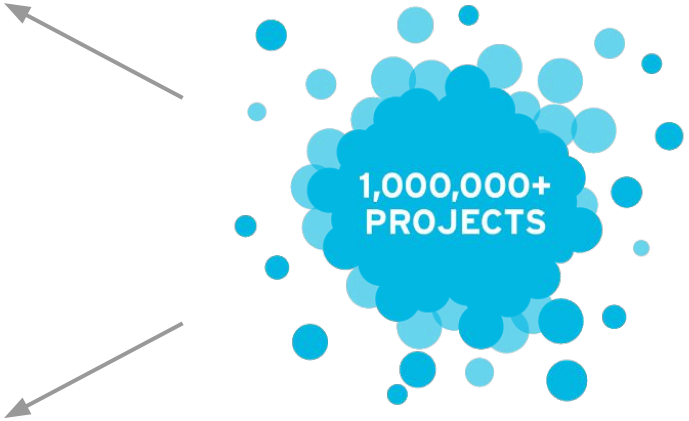
Open source culture

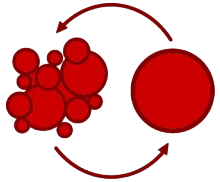


Collaboration

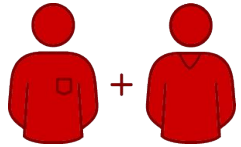


Transparency
(both access and the ability to act)



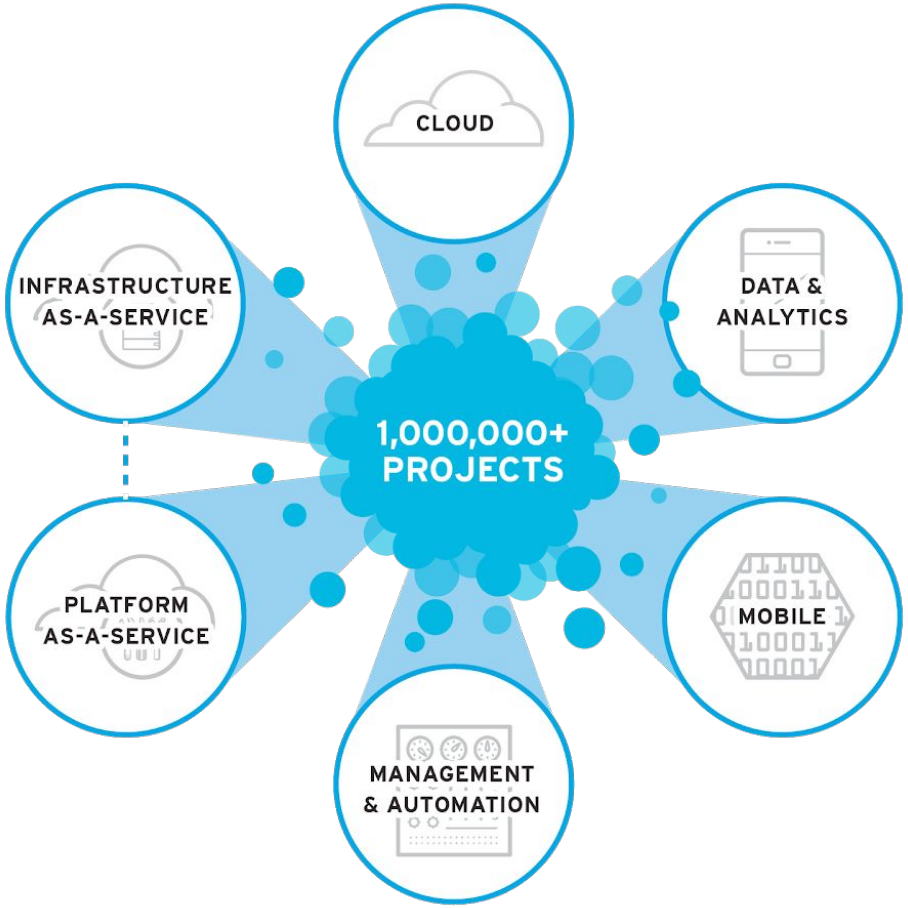


Shared problems are
solved faster

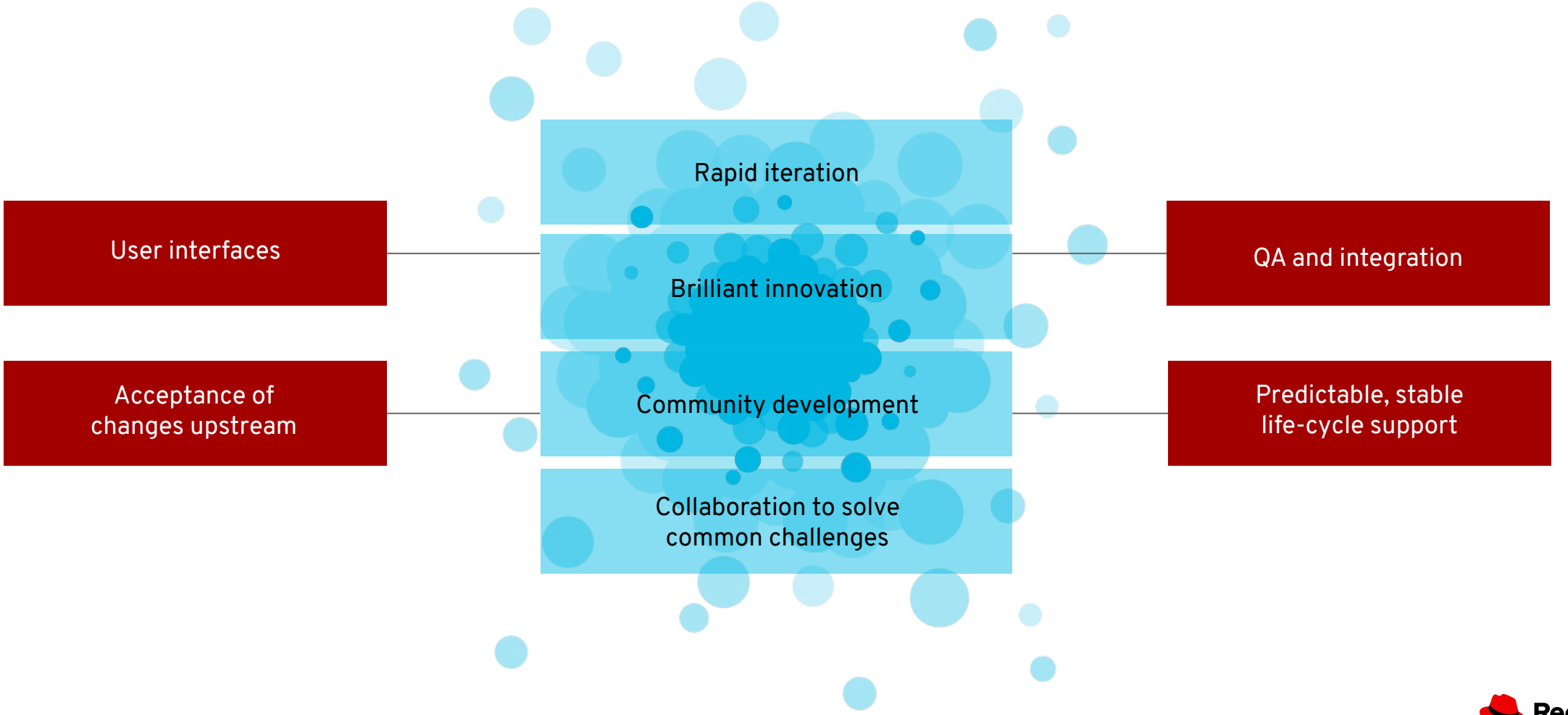


Working together creates
standardization

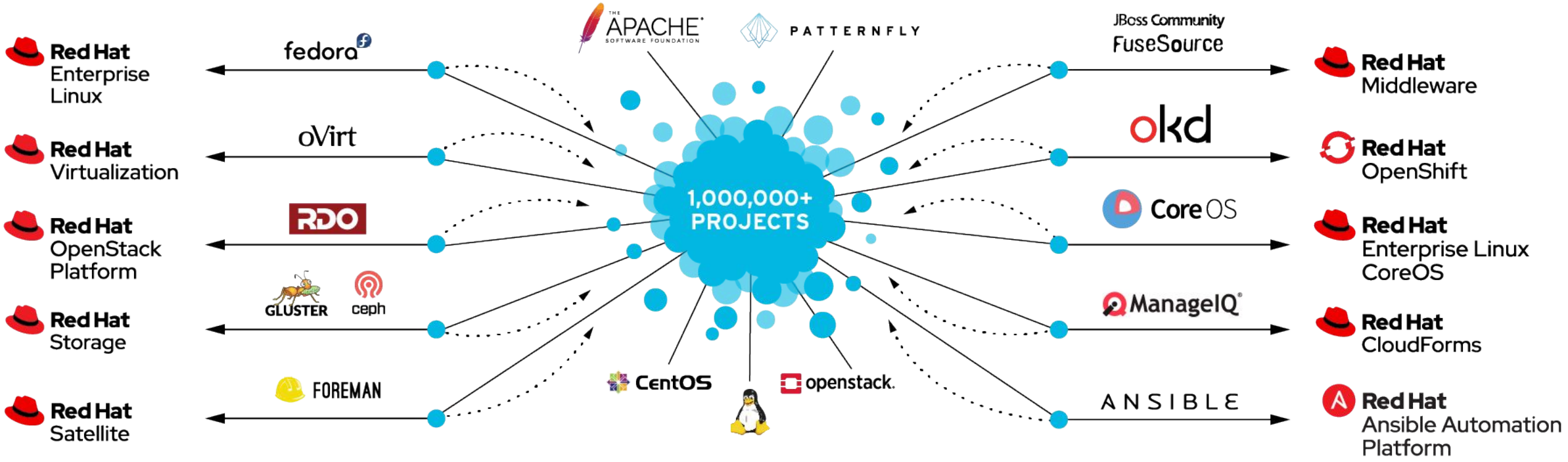
Open source fuels rapid innovation



Open source enterprise solutions



From communities to enterprise



communities-to-enterprise-full-201906rm

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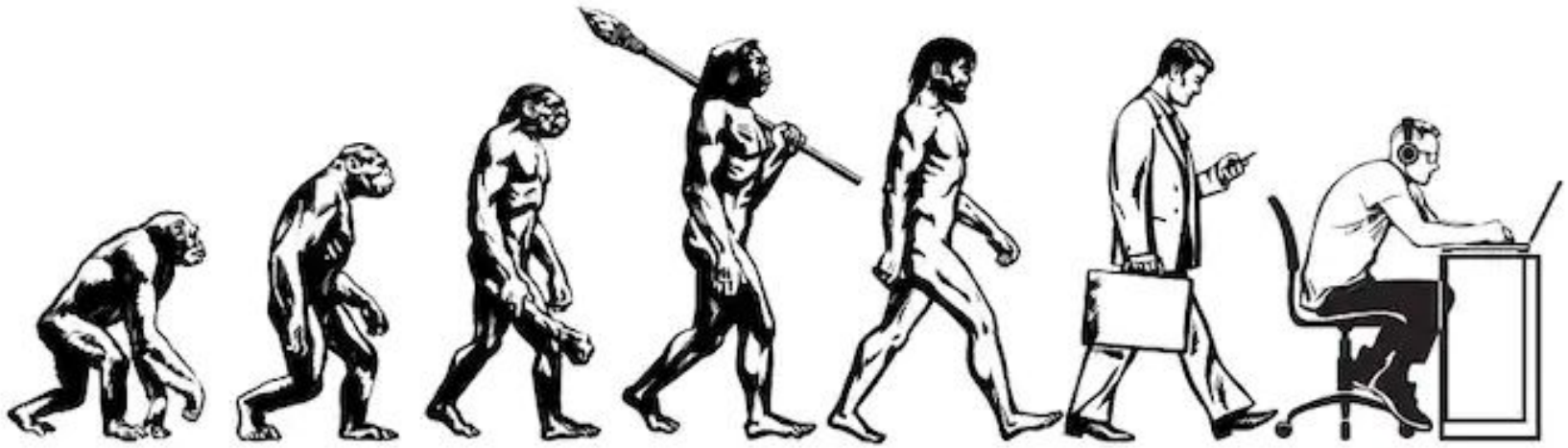

In order to discuss modern solutions, we need to discuss how we got here to begin with.

Stage 1:

The Monolith

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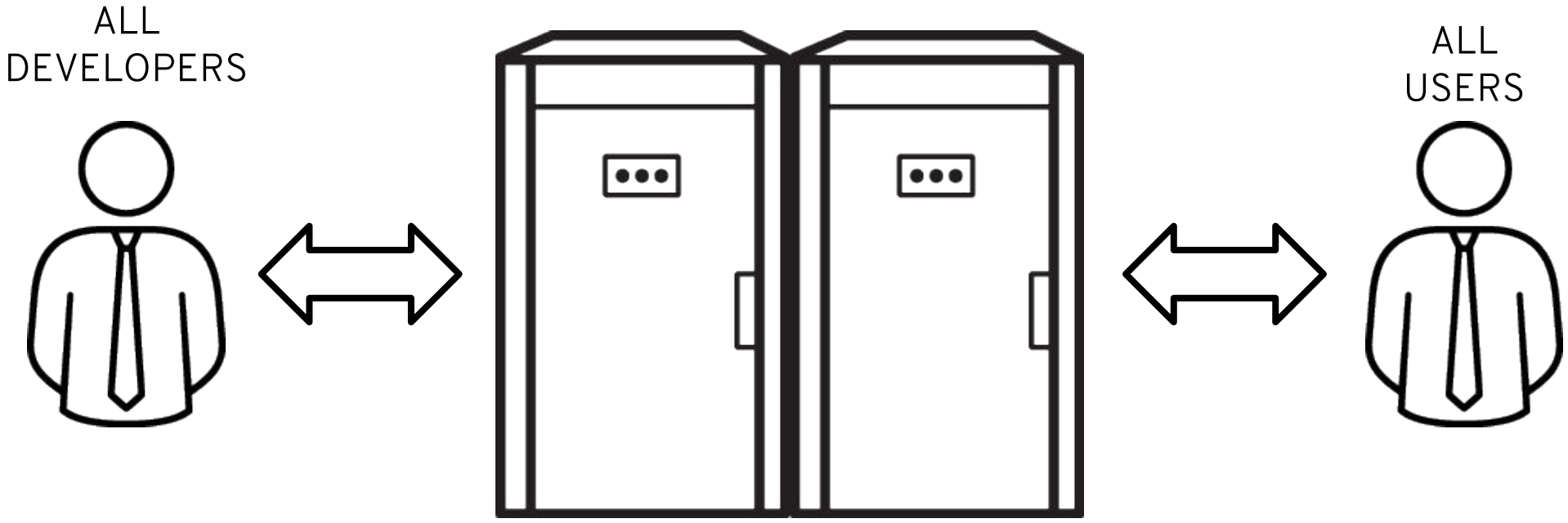
Monolith, the 1st

MAINFRAME



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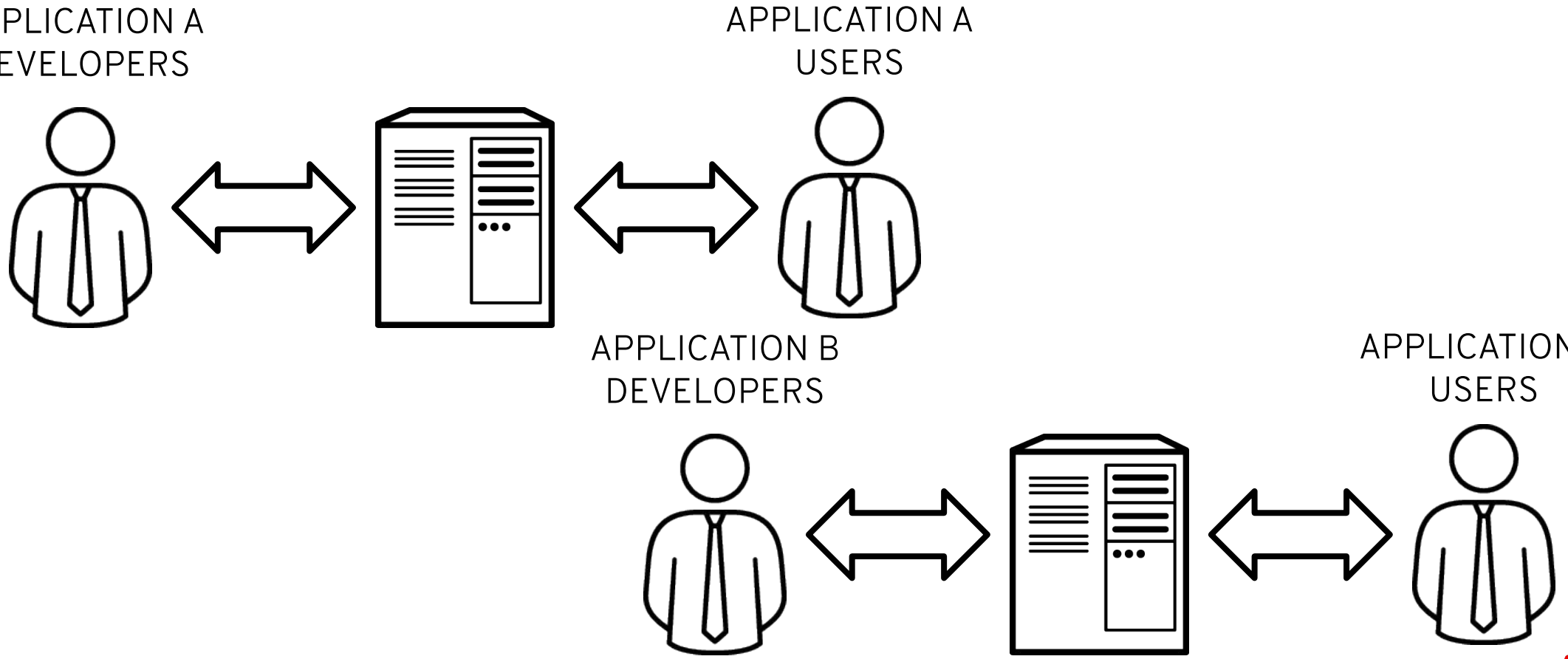
Monolith, the 2nd

MONOLITHIC APPLICATIONS



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Stage 2:

Layered

Applications

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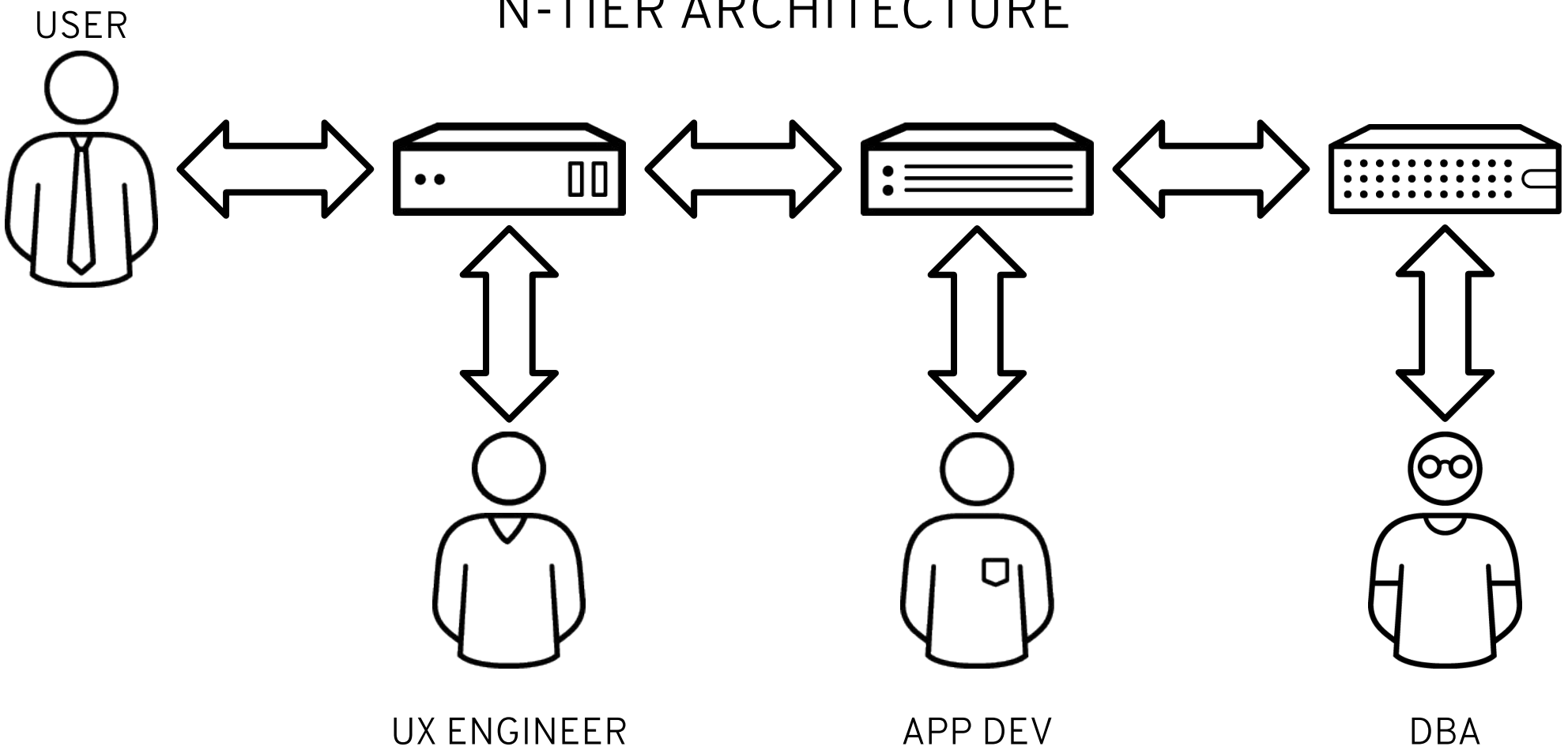
Layered Applications

N-TIER ARCHITECTURE



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Benefits:

- Developer Specialization
- More Efficient Resource Utilization
- Better Security Granularity

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Stage 3:

Services

Based

Architectures

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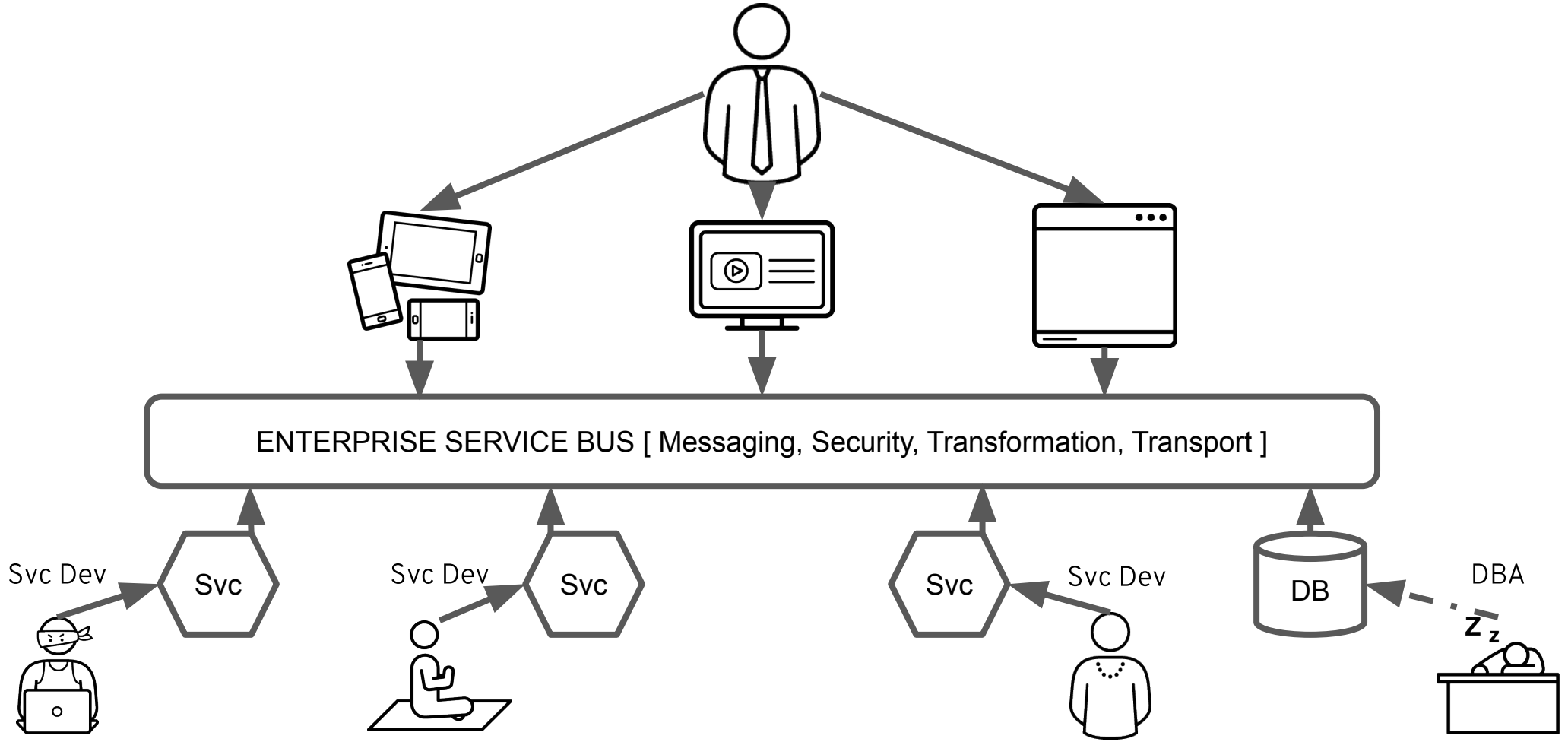
Services-Oriented Architecture (SOA)



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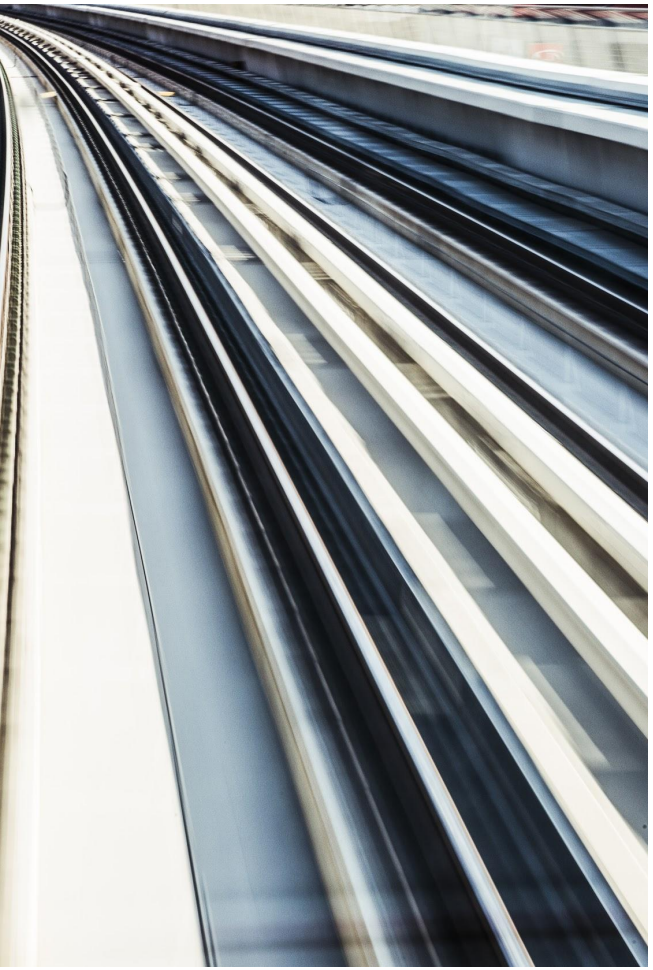
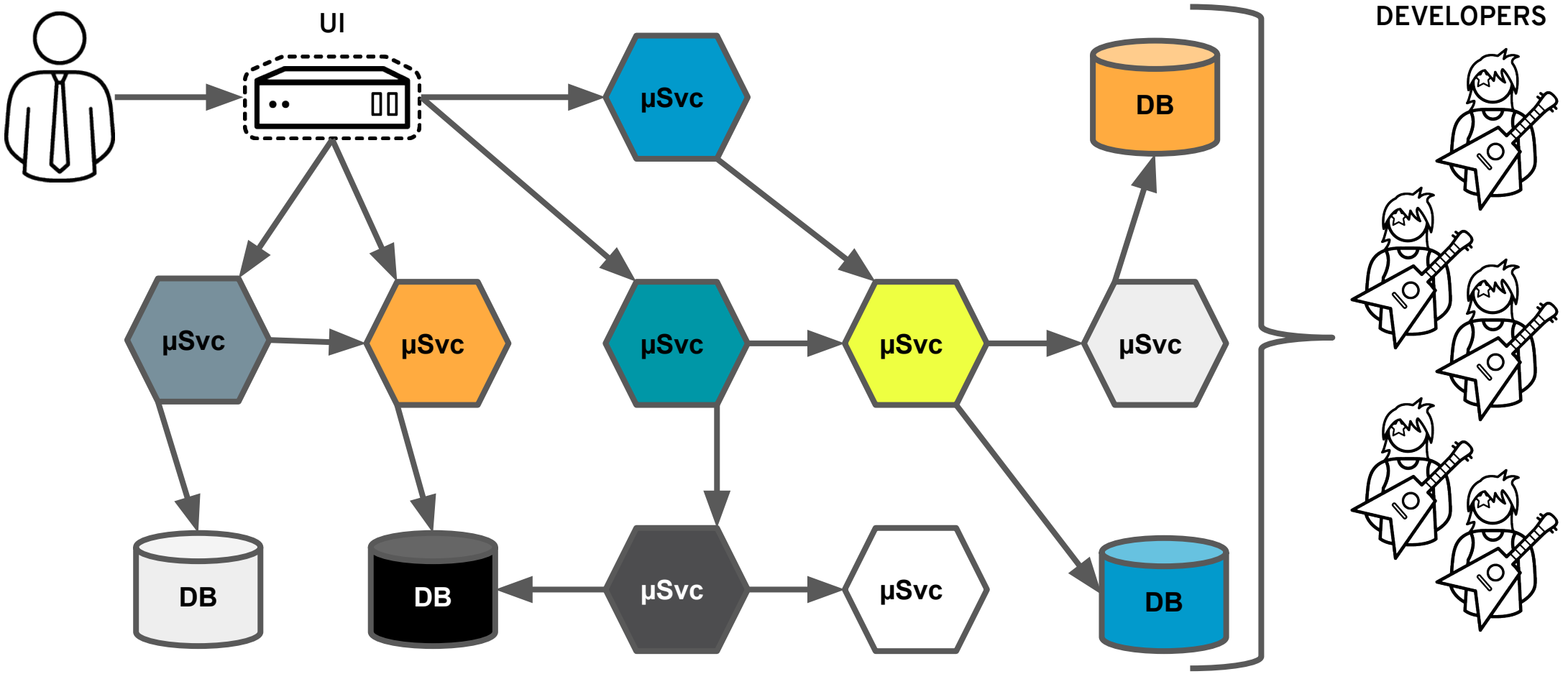


Benefits:

- Even More Developer Specialization
- Better Security Granularity
- Decoupling of Disparate Resources
- Multiple Delivery Mechanisms

Microservices



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Benefits:

- Even More Developer Specialization
- Best Security Granularity
- Efficient Scaling
- Platform Agnostic
- Hybrid-Cloud Friendly

Where do Containers fall into all this already?

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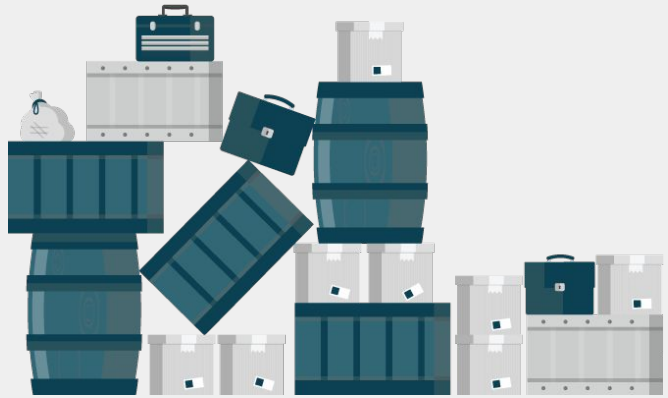
The Problem

Applications require complicated installation and integration every time they are deployed



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The Solution

Adopting a container strategy allows applications to be easily and consistently shared and deployed.

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Containers - An Evolution in Application Deployment

Enable efficiency and automation for microservices, but also supports traditional (even monolithic!) applications

Enable faster and more consistent deployments from Development to Production

Enable application portability across infrastructure footprints

- Physical, Virtual, Private & Public Cloud

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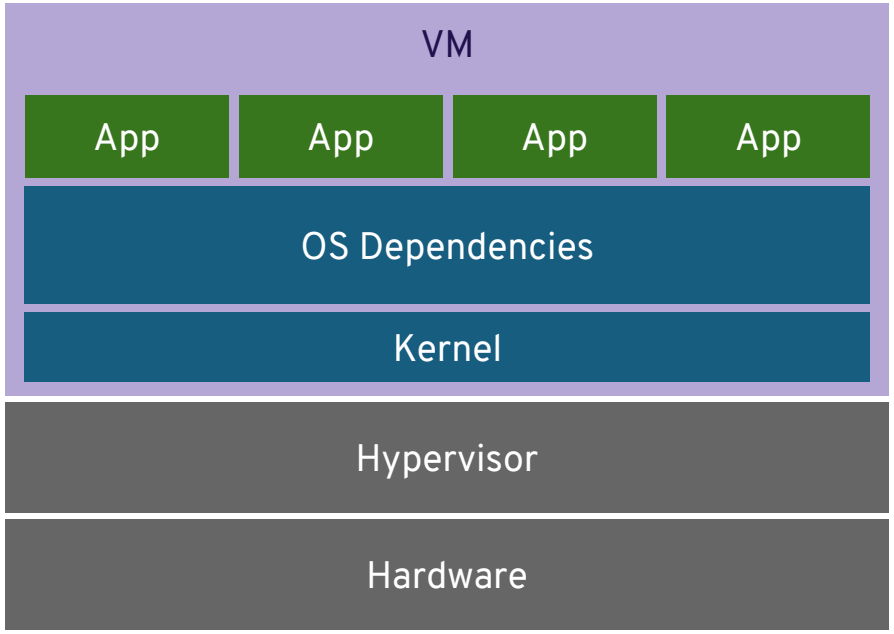
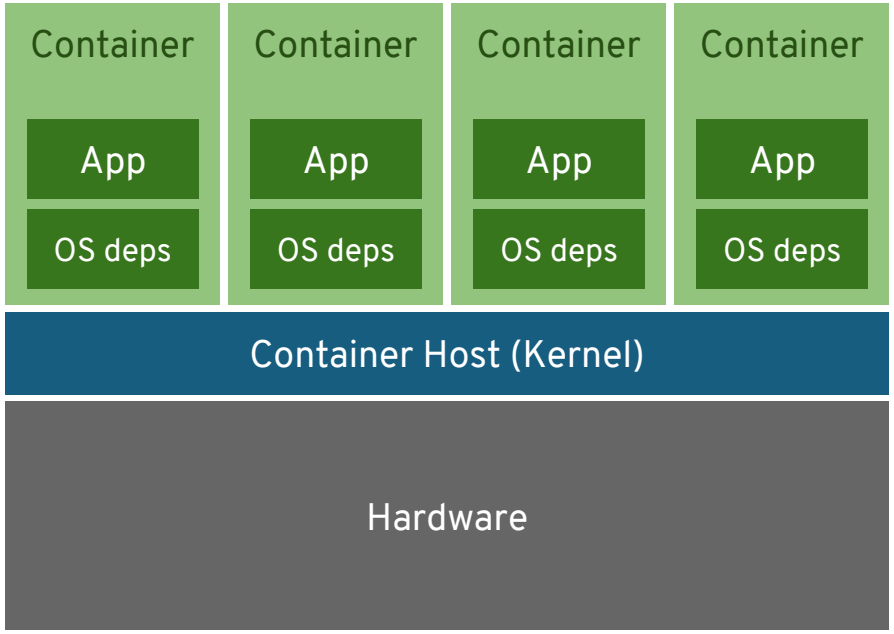
Virtual Machines versus Containers



Virtual machines are isolated,
apps are not isolated

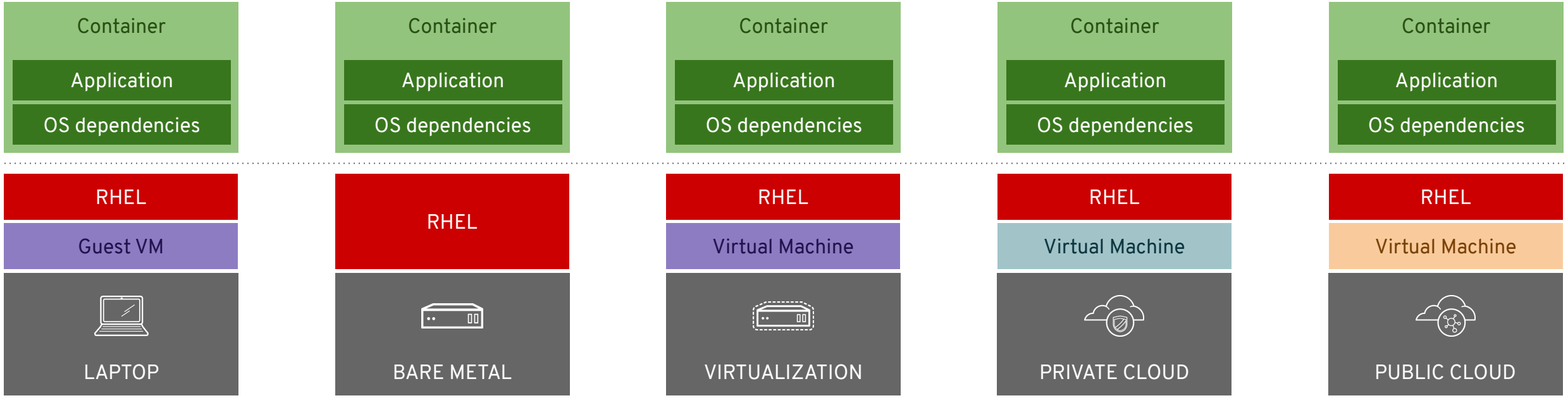


Containers are isolated,
apps are isolated

Red Hat

Application Portability With Containers

RHEL Containers + RHEL Host = Guaranteed Portability
Across Any Infrastructure



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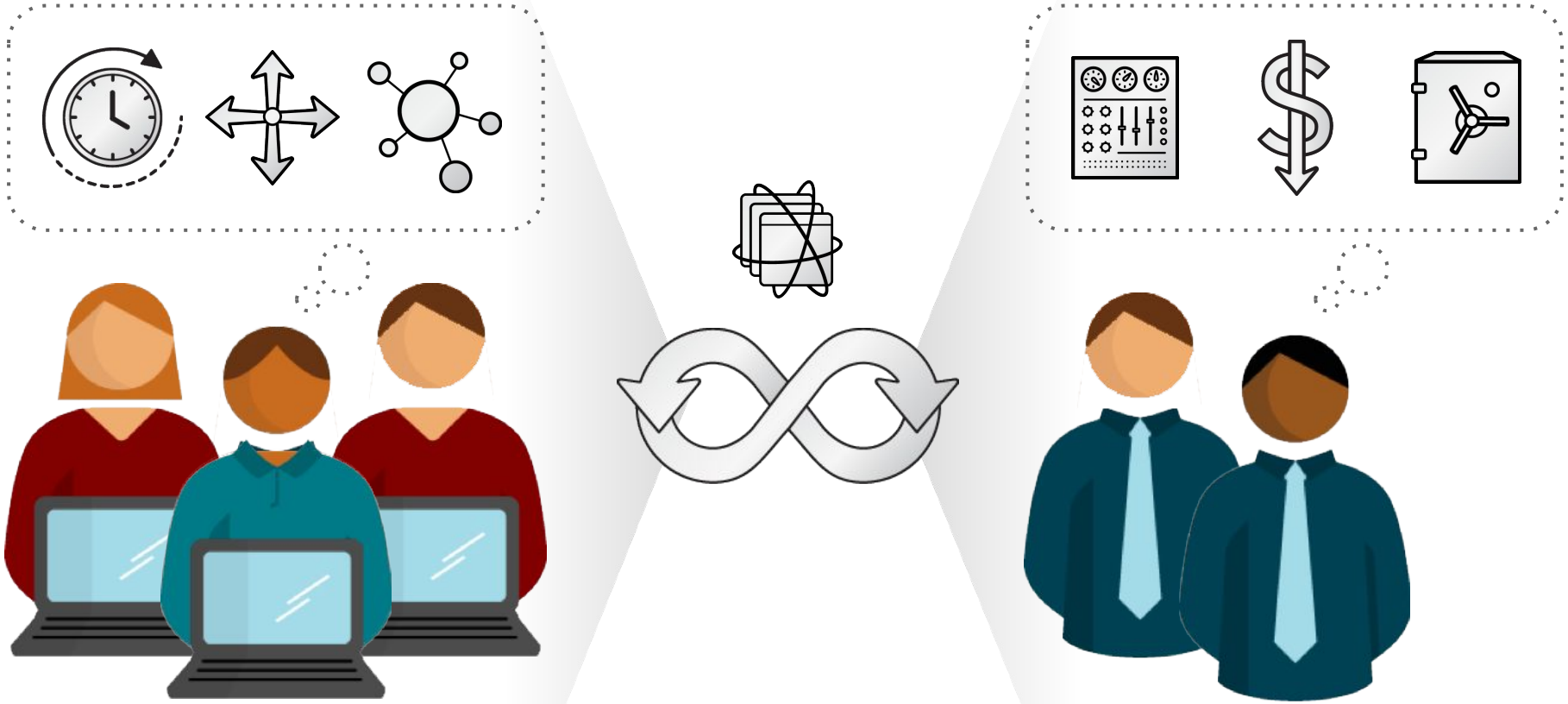
Containers Support DevOps



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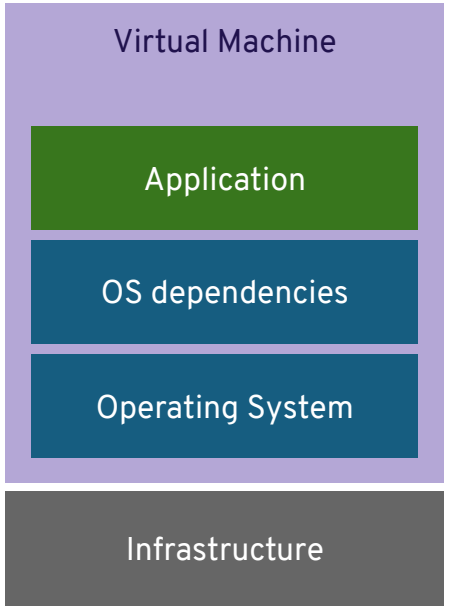
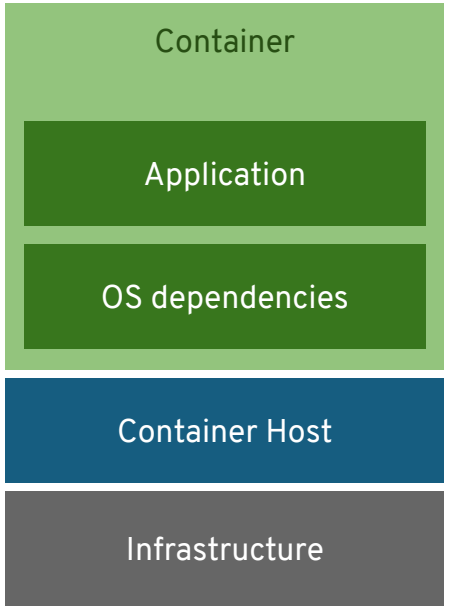
Virtual Machines and Containers

Ops and Dev (sort of)



Clear ownership boundary between Dev and IT Ops drives DevOps adoption and fosters agility



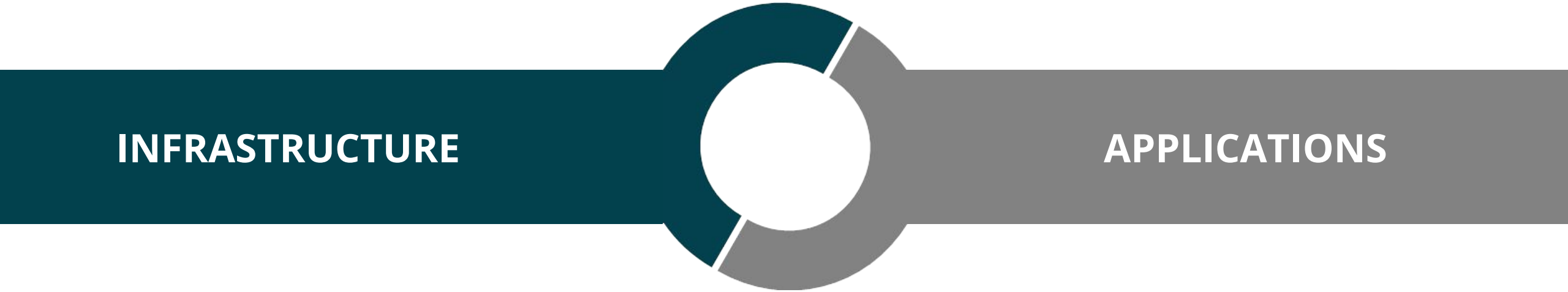
Dev

Ops

Optimized for stability
Optimized for agility

Red Hat

Containers Are Everything to Everyone



- Sandboxed application processes on a shared Linux OS kernel
- Simpler, lighter, and denser than virtual machines
- Portable across different environments

- Package my application and all of its dependencies
- Deploy to any environment in seconds and enable CI/CD
- Easily access and share containerized components

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Containers Transform

Applications

Monolith

N-Tier

Microservices

Infrastructures

Datacenter

Hosted

Hybrid

Processes

Waterfall

Agile

DevOps

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The Business Benefits of Containers

5 year ROI

531%

Average Annual Benefits per 100 Developers

$1.29M

Payback Period

8 Months

Source: https://www.openshift.com/sites/default/files/idc-business-value-of-openshift.pdf

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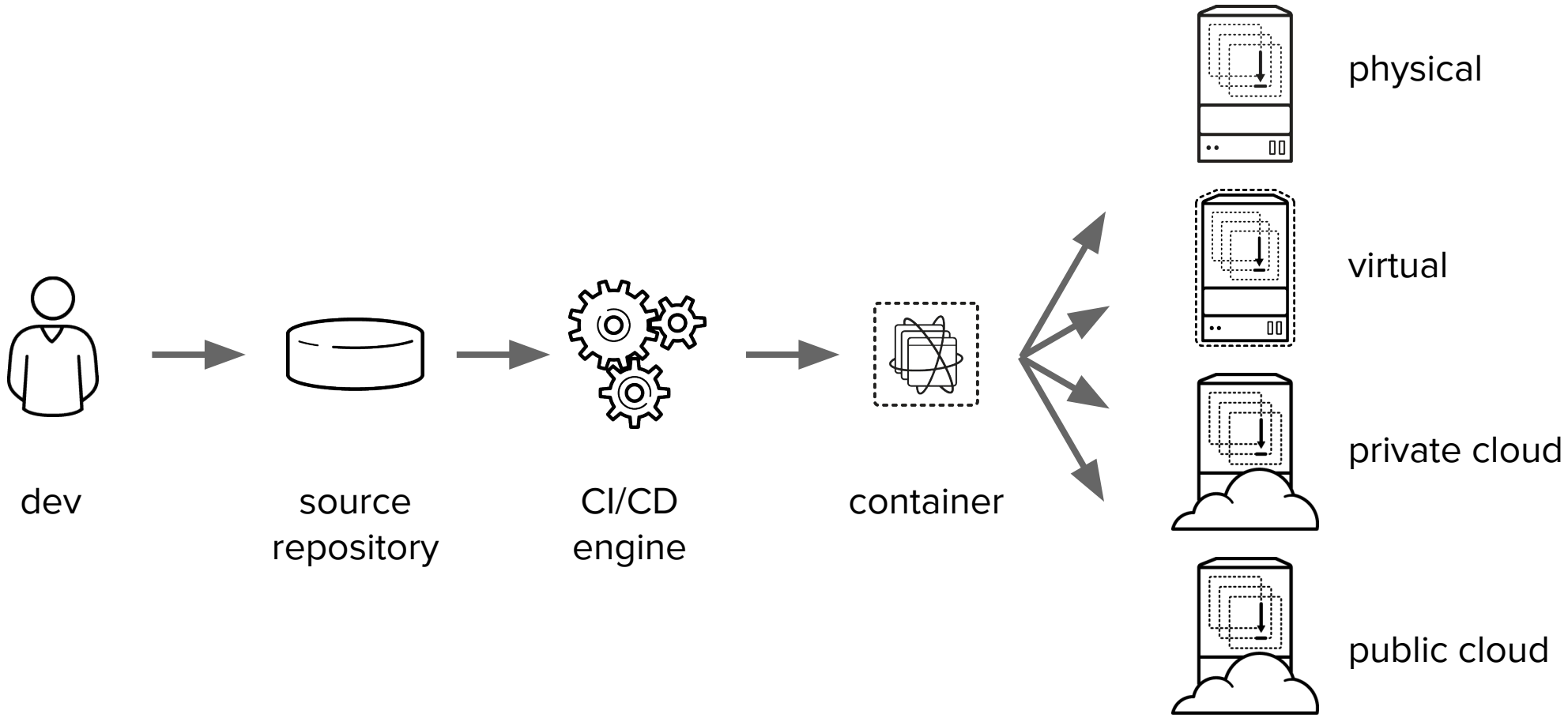
Containers Save the Day



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Great! We will use containers! Thxcya!

… But wait, there’s more.

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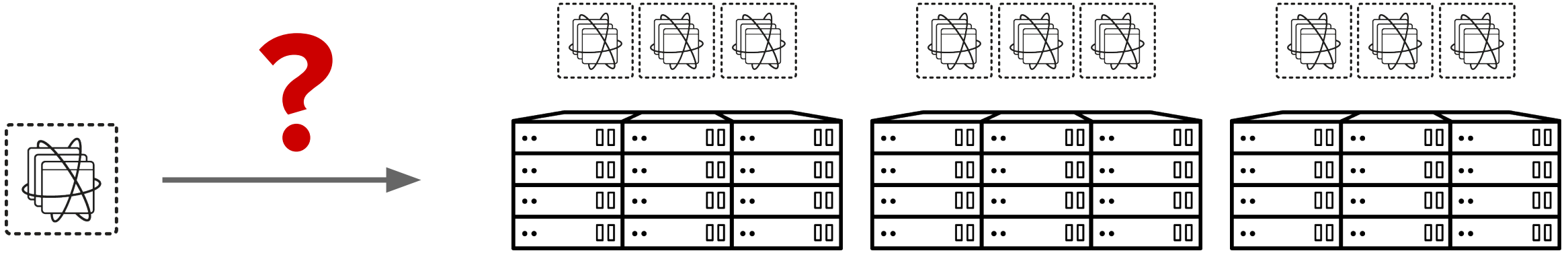
What about a container running at scale?



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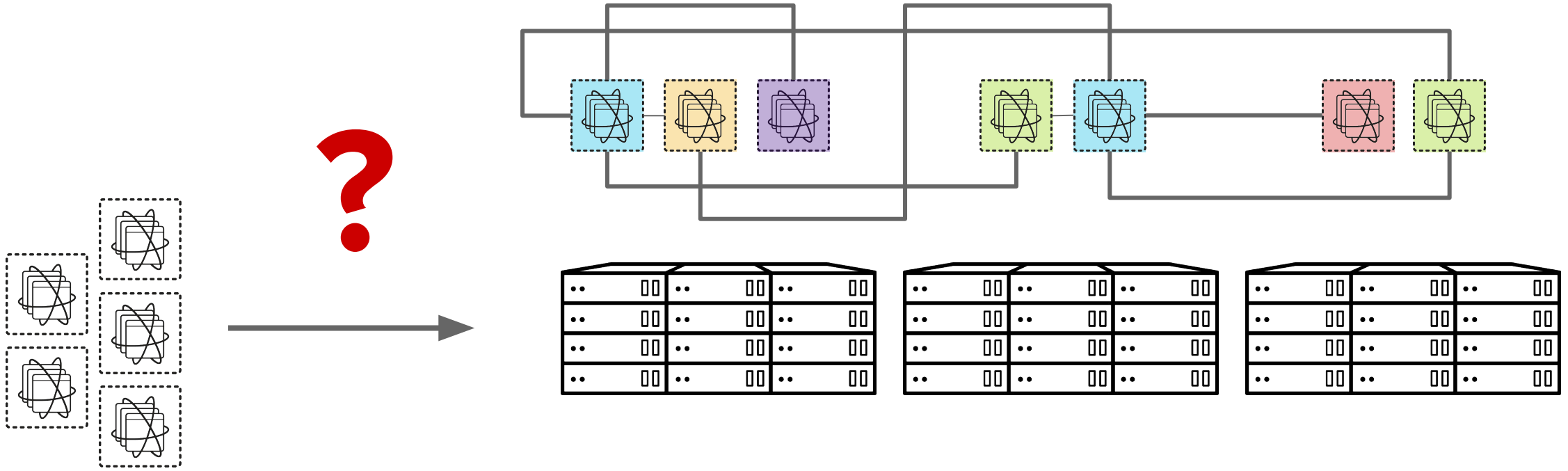
What about multiple coupled containers running at scale?



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Containers Alone Aren't Enough

Scheduling
Decide where to deploy containers

Lifecycle and health
Keep containers running despite failures

Discovery
Find other containers on the network

Monitoring
Visibility into running containers

Security
Control who can do what

Scaling
Scale containers up and down

Persistence
Survive data beyond container lifecycle

Aggregation
Compose apps from multiple containers

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Kubernetes to the Rescue

Kubernetes is an open-source system for automating deployment, operations, and scaling of containerized applications across multiple hosts.

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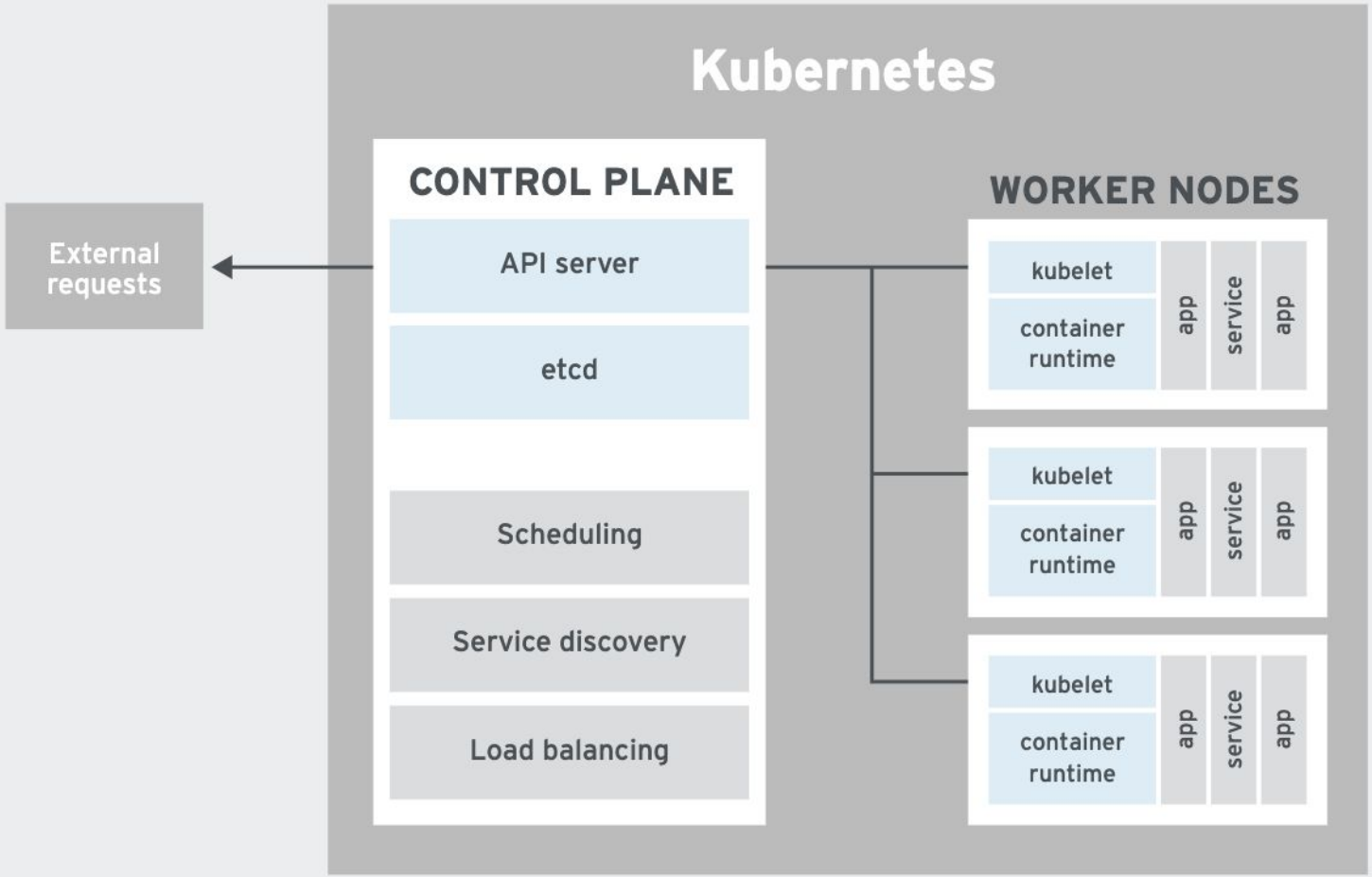

Kubernetes is a cluster of simple worker nodes running containers and managed by one-or-more control nodes.

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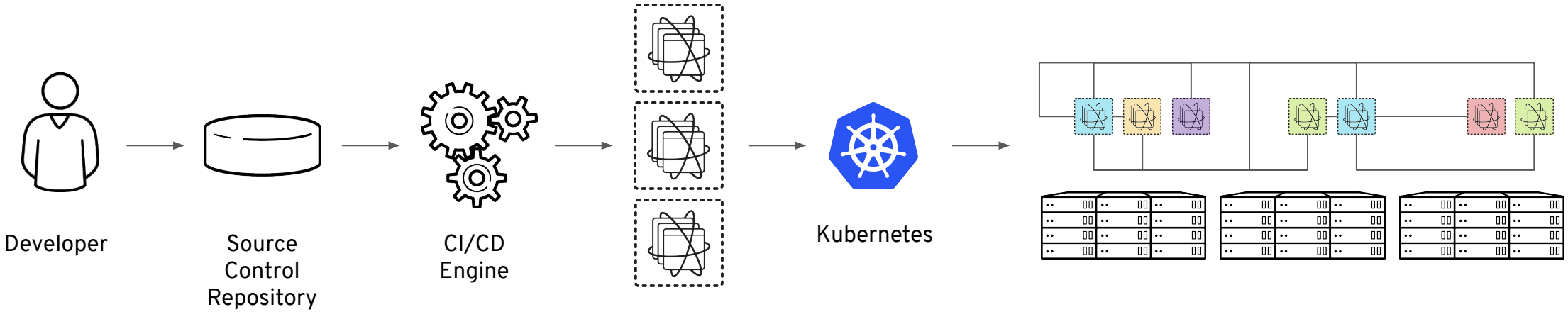
Container Orchestration With Kubernetes



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Enterprise Demands More

- Standard operating environment
- Application services
- Metrics and logging
- Infrastructure management
- Self service portal
- Persistent storage
- Etc.

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OpenShift is a platform that enables enterprise-grade, container-based application development

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What is OpenShift Really?

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Trusted Container OS

Trusted by Fortune Global 500 companies

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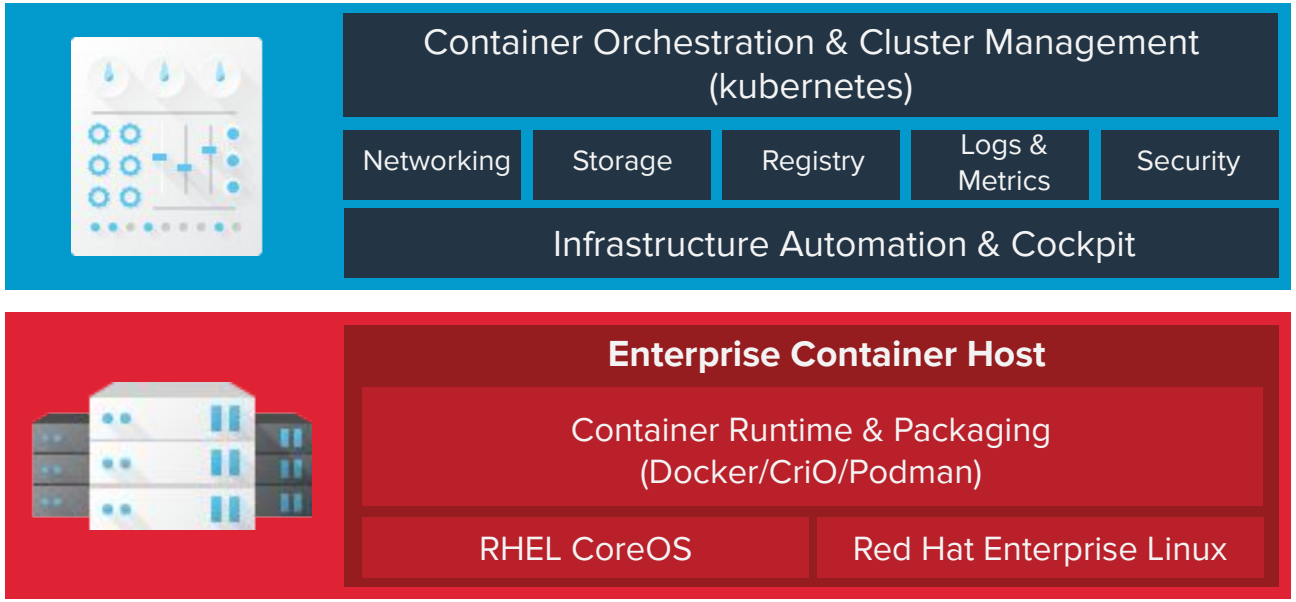
Container Orchestration



Kubernetes
Prometheus
Red Hat Storage

Red Hat

FEATURE	KUBERNETES	OPENSHIFT CONTAINER PLATFORM
Multi-host container scheduling	✔	✔
Self-service provisioning	✔	✔
Service-discovery	✔	✔
Persistent storage	✔	✔
Multi-tenancy	✖	✔
Collaboration	✖	✔
Networking	✖	✔
Image registry	✖	✔
Monitoring	✖	✔
Log aggregation	✖	✔
CI/CD and DevOps	✖	✔
Certified application services (databases, runtimes, ...)	✖	✔
Certified middleware services	✖	✔
Built-in operational management	✖	✔

Red Hat OpenShift

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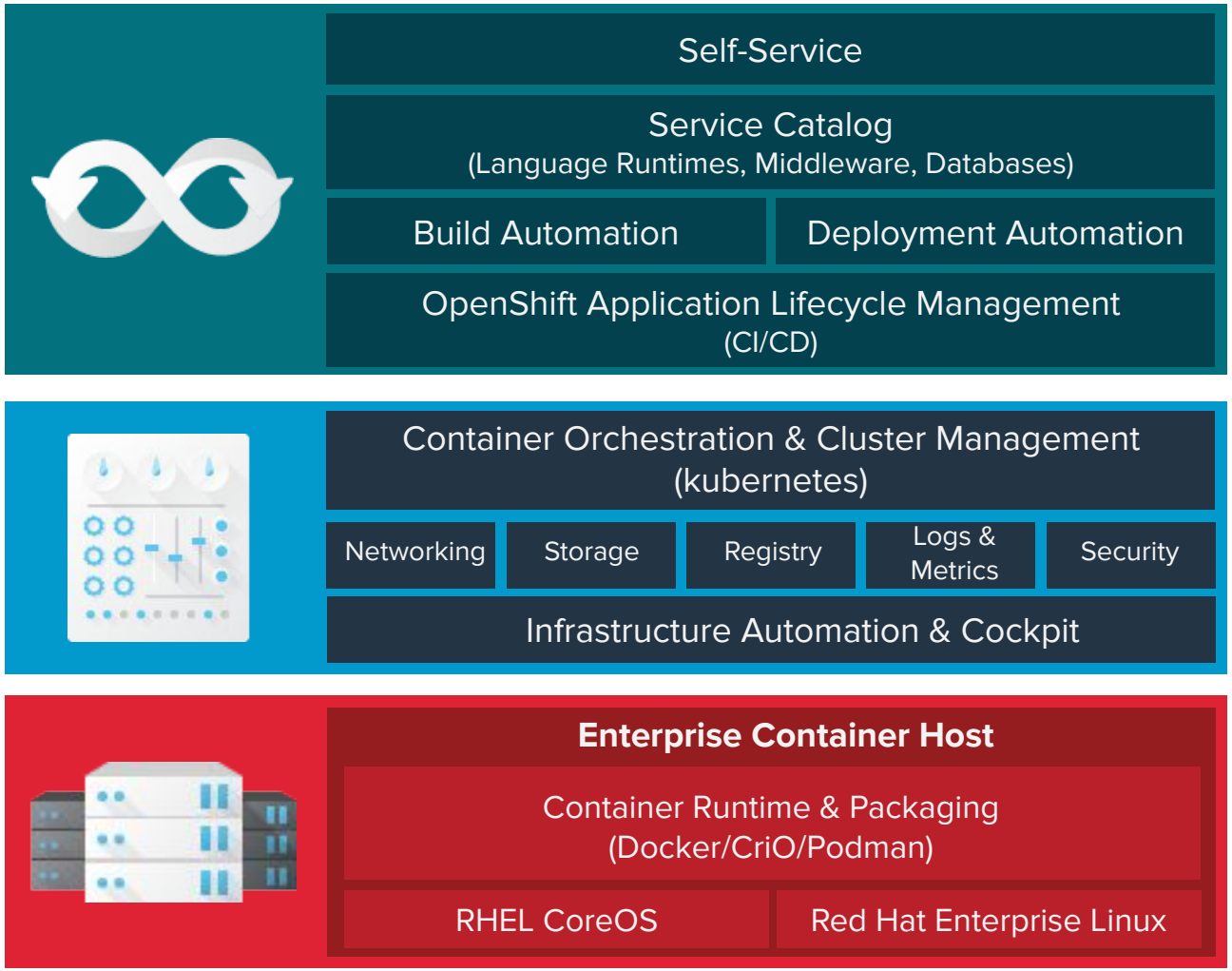
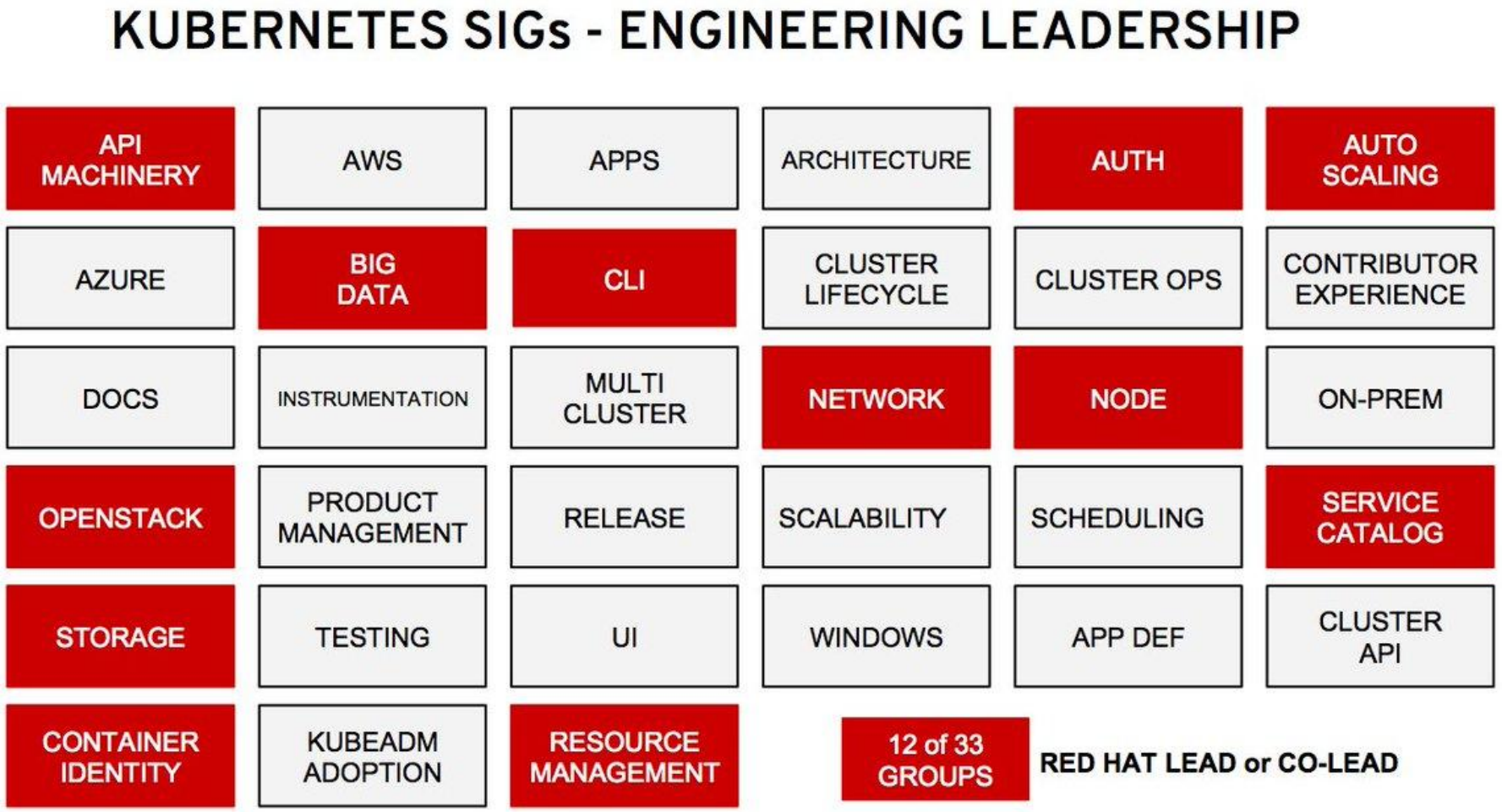
Application Services



Source-2-Image
CI/CD Pipelines
Dev Tools

Red Hat

Red Hat Kubernetes Participation



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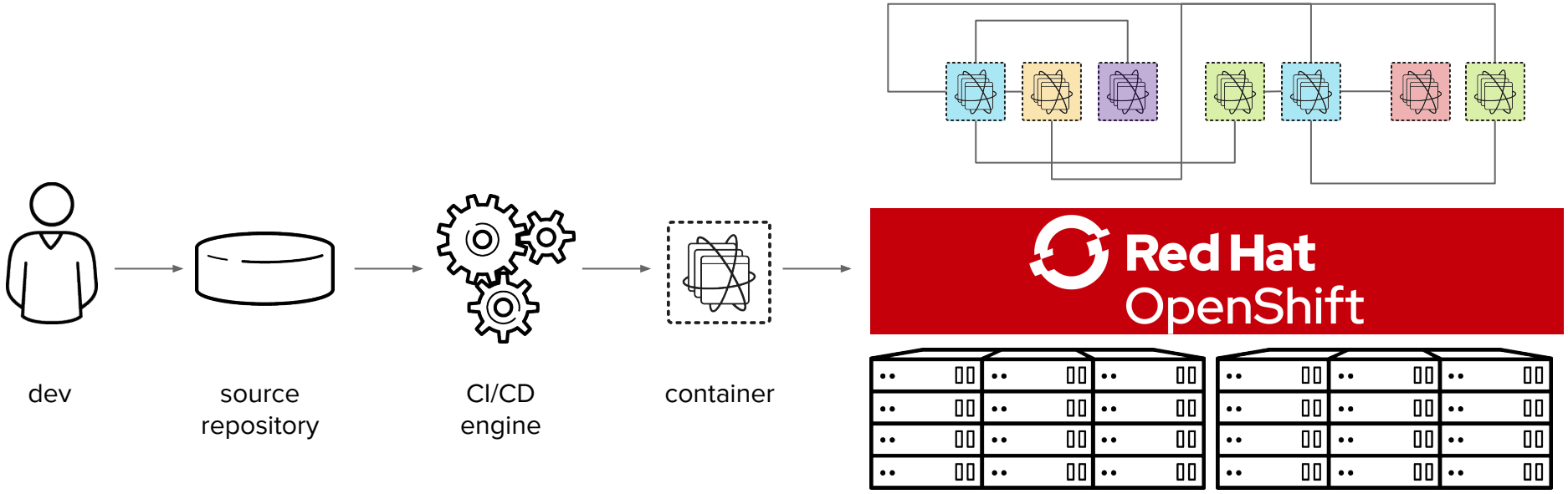
Container Development, Deployment and Management with OpenShift



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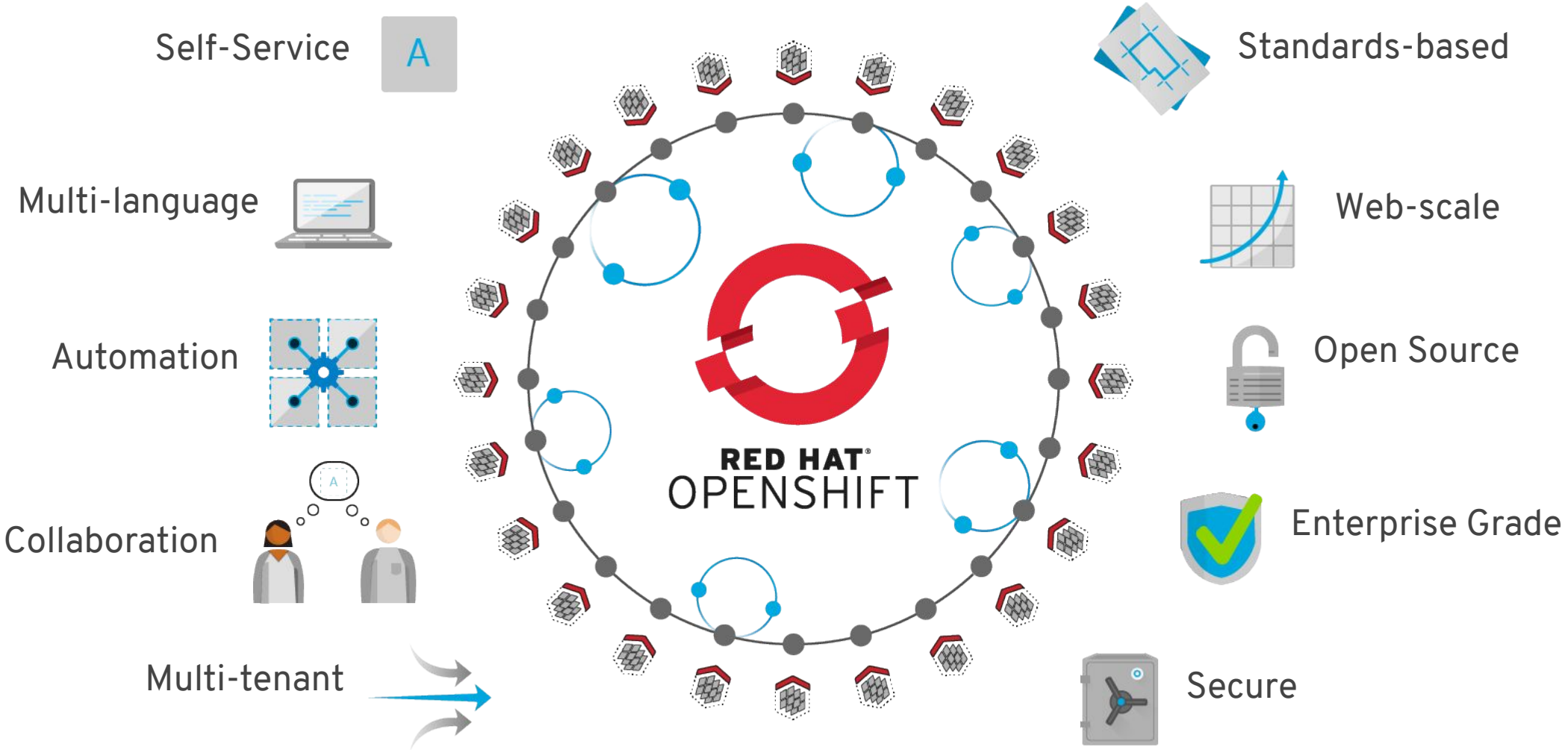

Self-Service
A
Multi-language
Automation
Collaboration
A
Multi-tenant
RED HAT®
OPENSHIFT
Standards-based
Web-scale
Open Source
Enterprise Grade
Secure

Red Hat

How do we deliver OpenShift

okd

- Community Distribution of Kubernetes
- 100+ Integrations
- Align time with OSS trunk
- Integrate OSS projects
- Partner integration platform
- No-cost validations for innovation

OPENSHIFT
CONTAINER PLATFORM

OPENSHIFT
DEDICATED

OPENSHIFT
ONLINE

Over 1000 Customers Around the Globe

MODERNIZE APPS

WEB APPS

CLOUD NATIVE DEV

MULTI-CLOUD

MOBILE

BIG DATA | ANALYTICS

AI | ML

IOT

Red Hat

“”

We got the idea to have all these tests we do with hardware on virtual test environments, and that’s why we’ve come to OpenShift and containers.

—

Michael Denecke
Head of Test Technology
Volkswagen AG

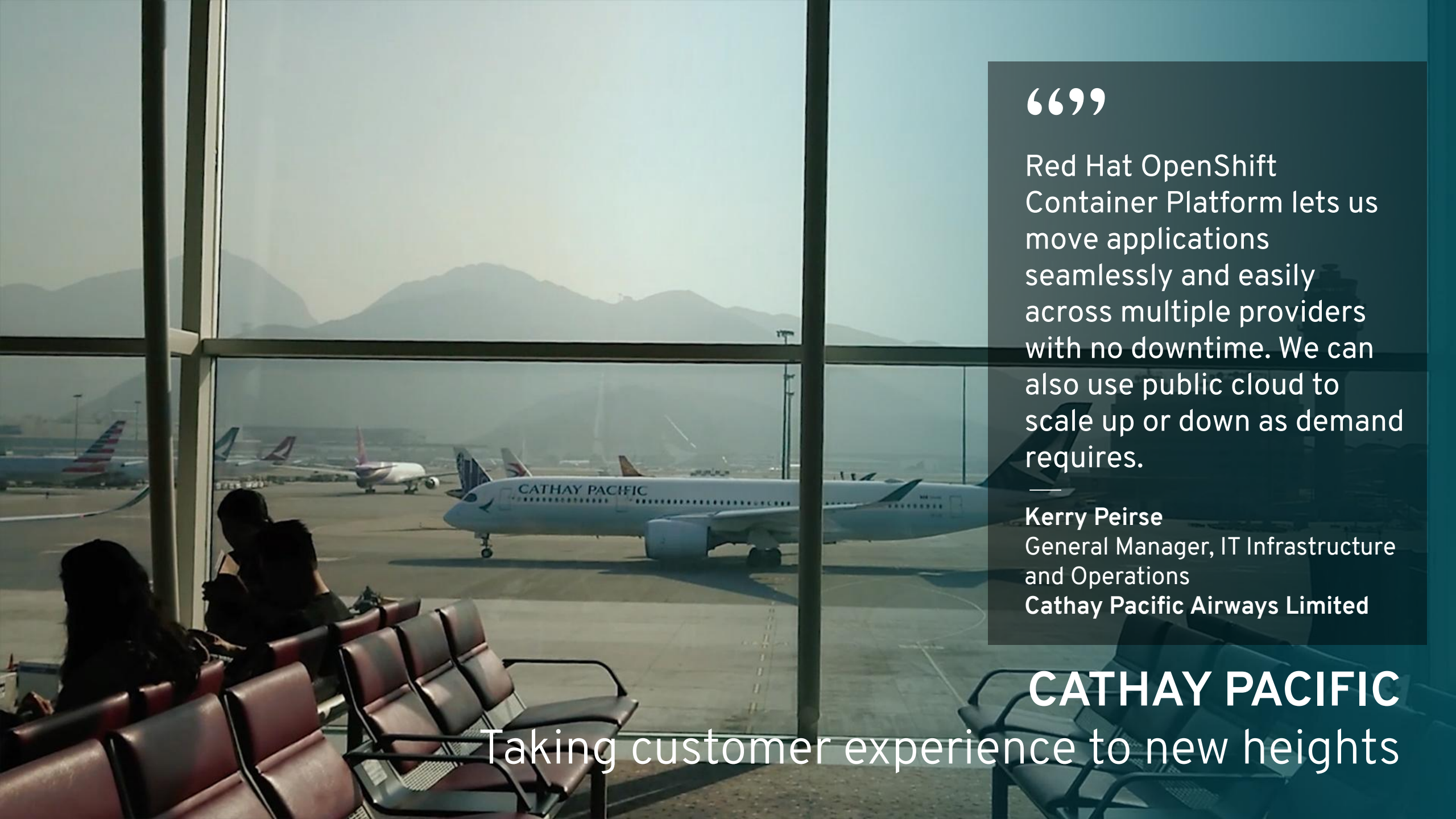
VOLKSWAGEN
Autonomous Vehicle Testing

“”

We can localize clusters in different markets if we need to and therefore serve our customers on a worldwide scale.

Dr. Alexander Lenk
Lead Architect Connected Vehicle, Digital Backend, Big Data, Blockchain
BMW Group

BMW
Connected Drive



“”

Red Hat OpenShift Container Platform lets us move applications seamlessly and easily across multiple providers with no downtime. We can also use public cloud to scale up or down as demand requires.

—

Kerry Peirse
General Manager, IT Infrastructure and Operations
Cathay Pacific Airways Limited

CATHAY PACIFIC

Taking customer experience to new heights

The Kubernetes platform for your business

"The moment we have an idea, we can start building the product."

Tobias Mohr, Head of Technology and Infrastructure, Lufthansa Technik

Source: Red Hat success story page, Lufthansa Technik builds a digital foundation with Red Hat, May 2018.

> By working with the Red Hat Open Innovation Labs team, we changed everything—our toolchain, our process, and most importantly, our culture.
>
> —
>
> **Michael Cawood**
> Vice President, F-16/F-22 Product Development
> **Lockheed Martin**

FAST FACTS

Industry: Technology
Business Challenge: Cloud-native application development
Region: North America
Location: Bethesda, MD
Company size: Approximately 105,000 employees in the United States and internationally

LOCKHEED MARTIN

F-16/F-22 Product Development

Thank You

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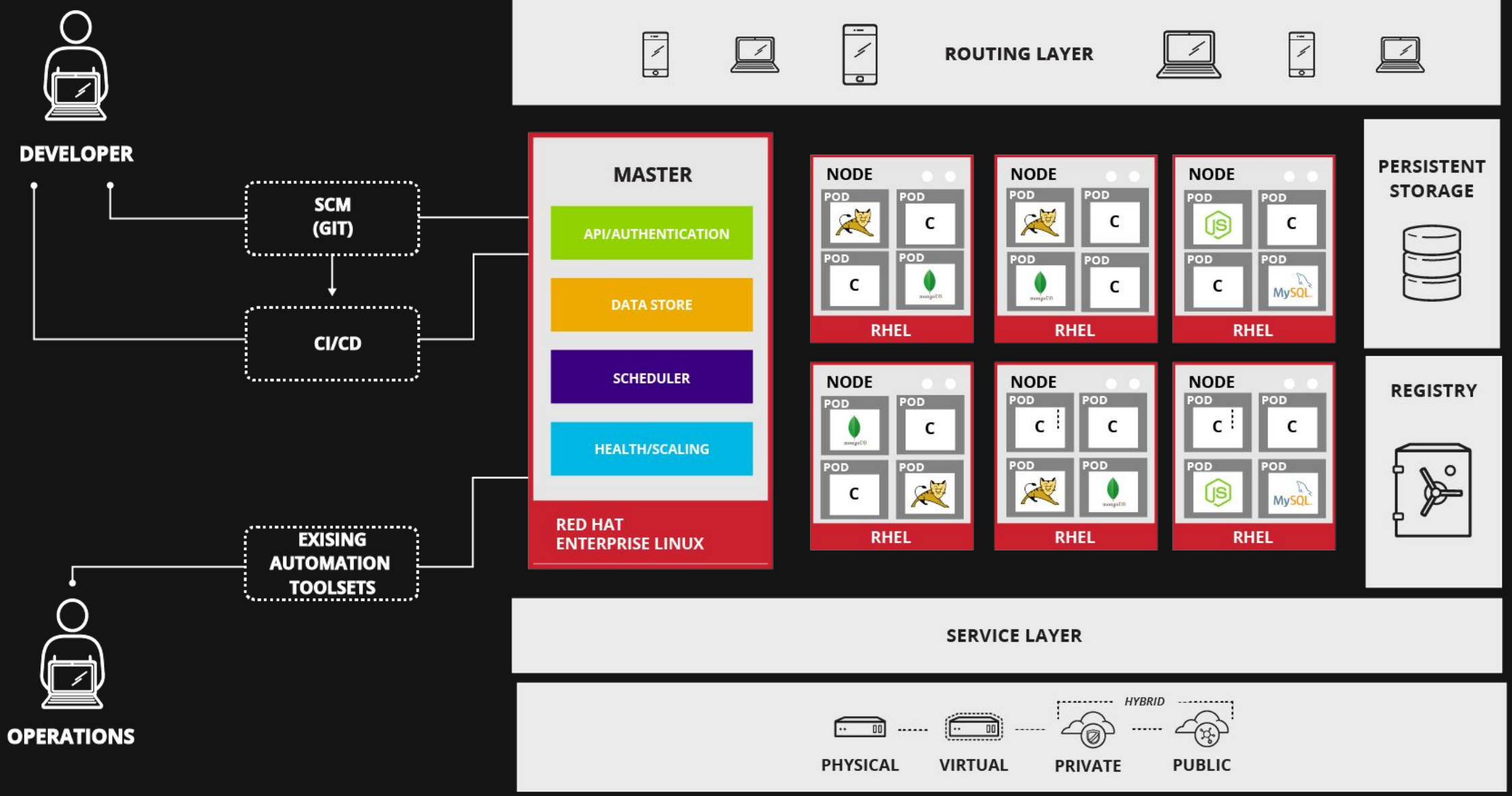
DEVELOPER
SCM (GIT)
CI/CD
EXISING AUTOMATION TOOLSETS
OPERATIONS
ROUTING LAYER
MASTER
API/AUTHENTICATION
DATA STORE
SCHEDULER
HEALTH/SCALING
RED HAT ENTERPRISE LINUX
NODE
POD
C
RHEL
PERSISTENT STORAGE
REGISTRY
SERVICE LAYER
HYBRID
PHYSICAL
VIRTUAL
PRIVATE
PUBLIC