redhat.

Linux Containers: Best Practice and Use Cases

30 minutes about Docker, Kubernetes and Atomic

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09/15/2015

AGENDA

A 30 minute look into Containers, RHEL Atomic and our Roadmap

TOPIC 1:
WHAT ARE CONTAINERS?

TOPIC 2:
WHAT IS ATOMIC?

TOPIC 3:
WHAT DO ENTERPRISES NEED?

TOPIC 4:
WHAT ARE YOU DOING?


what are containers?
containerization != virtualization
redhat.

Virtualization

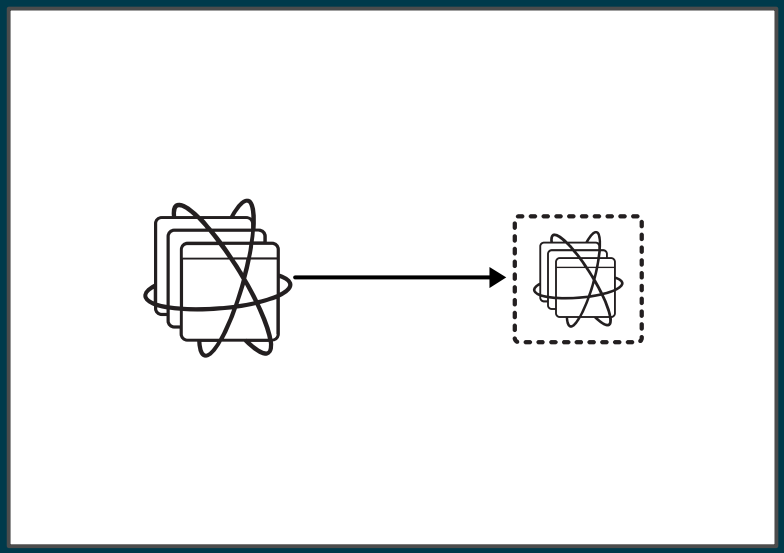
Evolved from a time when every workload had its own physical server.

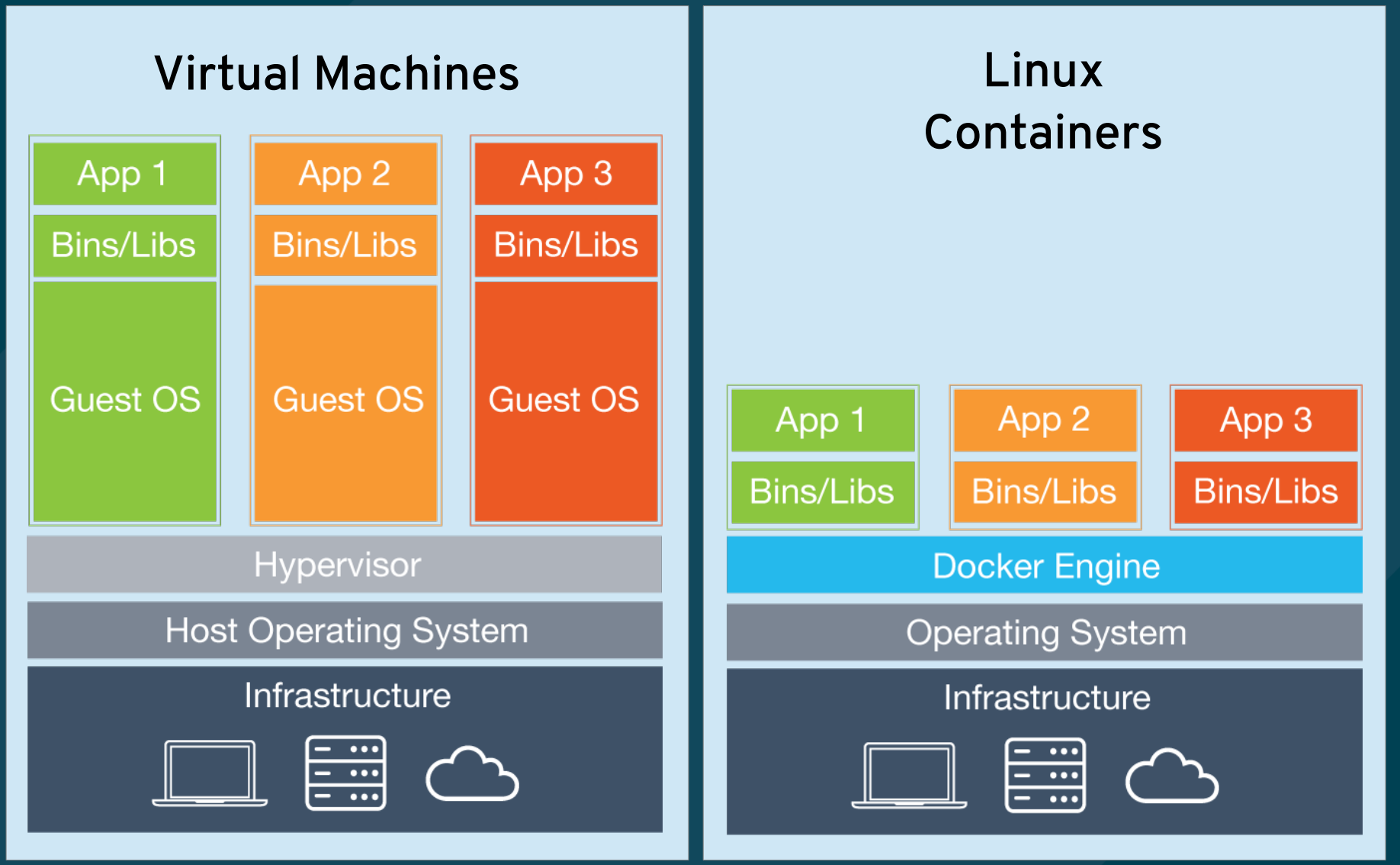
Every virtual machine runs a full copy of the operating system along with the various libraries required to host an application. This duplication leads to a lot of memory, bandwidth and storage being used up unnecessarily.

Containerization

Containers made it easy to build, package, and distribute applications

- Great for continuous integration
- Portability within an enterprise
- Increased application density
- Fast, fine grained scaling
- Spin up times in seconds
- 45,000+ images on Docker Hub




Virtual Machines
App 1
Bins/Libs
Guest OS
App 2
Bins/Libs
Guest OS
App 3
Bins/Libs
Guest OS
Hypervisor
Host Operating System
Infrastructure
Linux Containers
App 1
Bins/Libs
App 2
Bins/Libs
App 3
Bins/Libs
Docker Engine
Operating System
Infrastructure

What is Docker?

- User Space Tools
- Linux Containers
- Branch and Commit File System

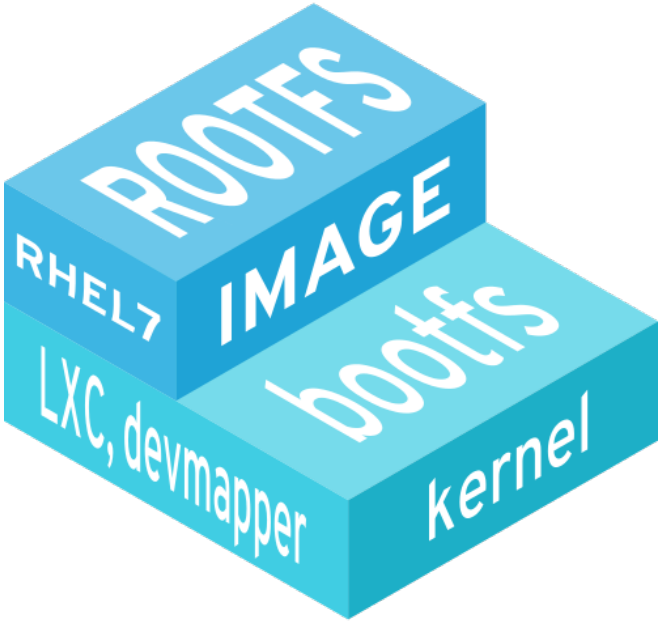
How does Docker work?

- Process Isolation
  - cgroups and namespaces
  - LXC instead of KVM
- Layered Filesystems
  - Device Mapper
  - Base Image
  - Development style commits
- Networking
  - Bridging
  - Network Address Translation (NAT)

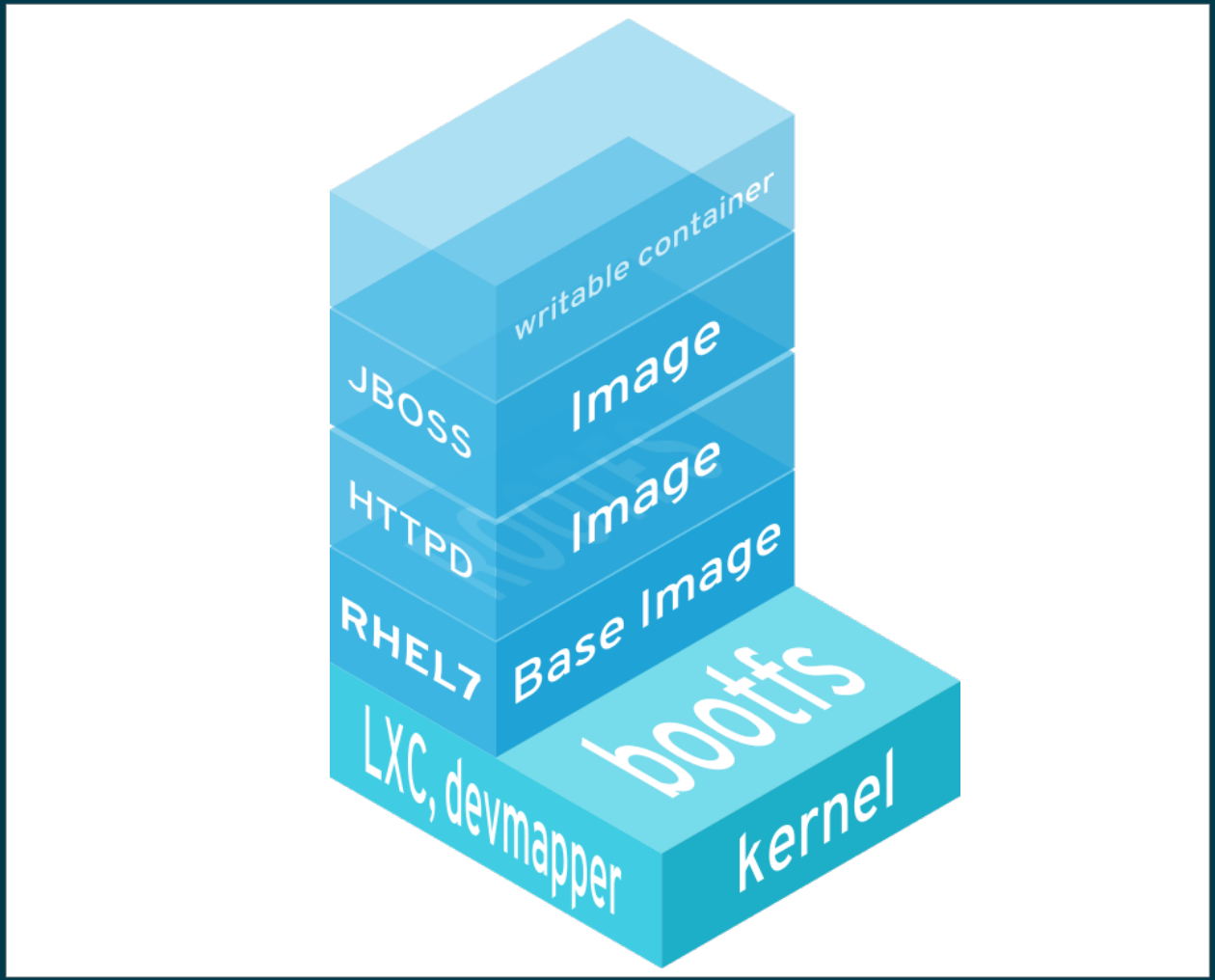
How does Docker work?

- Dockerfile Blueprints
  - Quickly identify changes between base images and layers
  - Easily manage core builds
  - Excellent base for testing Puppet modules
- Registry of Reusable Images
  - Public via Docker Hub (mostly wild west)
  - Trusted and Certified via Red Hat
  - Privately hosted on OpenShift 3.0+ and/or Satellite 6.1+

Layered Filesystems: Platform Image



Layered Filesystems: Layered Image



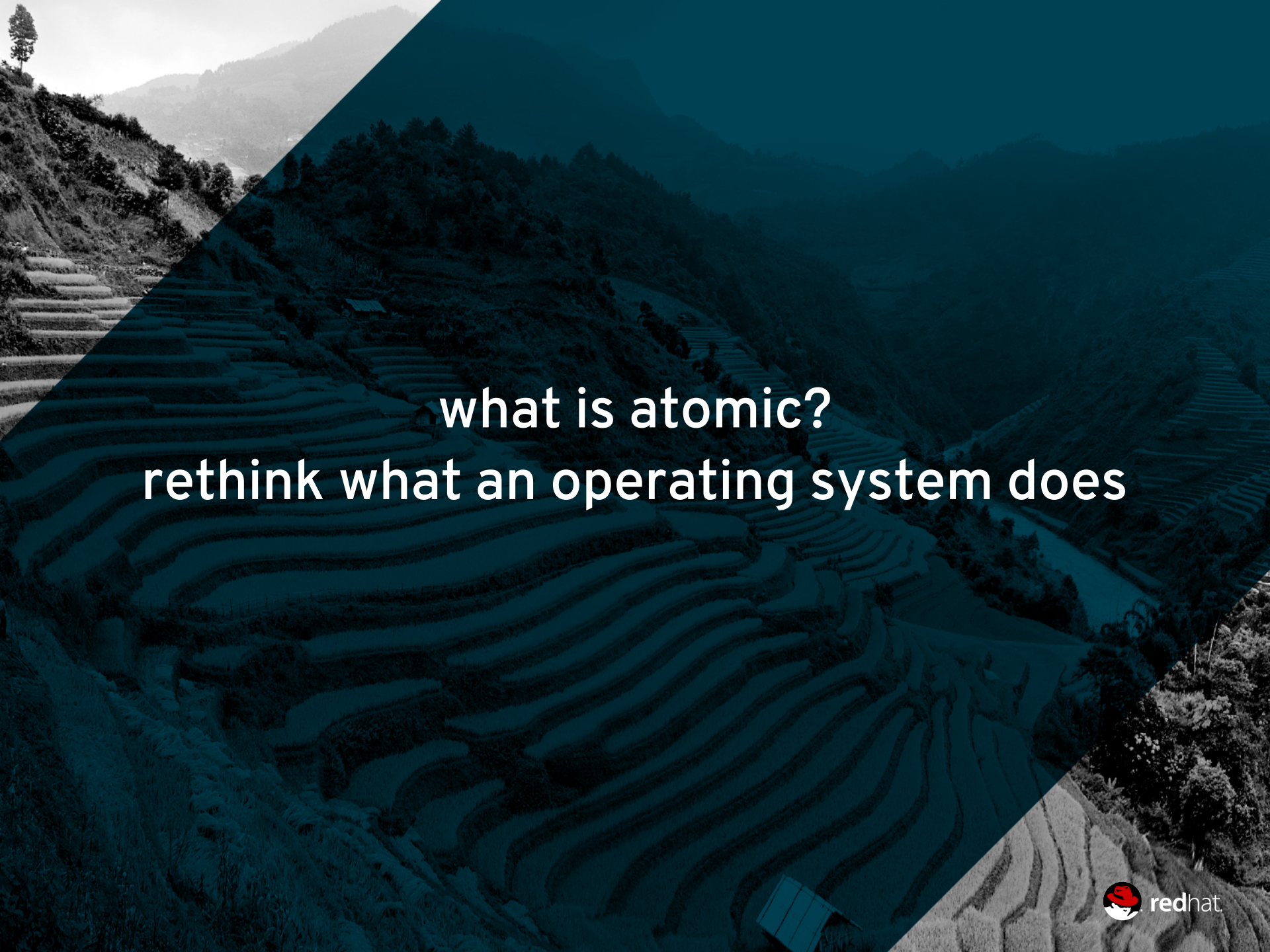
What is Kubernetes?

- Container Orchestration
- Workload Management
- Open Sourced by Google

Why Kubernetes?

Docker is an engine, container and image format
with limited networking between hosts.*

- Kubernetes builds on Docker to make management of many containers like managing containers on a single system
  - describe and launch
  - monitor state and maintain, increase or reduce copies of containers
  - Container oriented networking for non kubernetes native applications


what is atomic?
rethink what an operating system does
redhat.

RED HAT® ENTERPRISE LINUX® ATOMIC HOST

Atomic brings the work flow of containers to the operating system

Shrink

Stabilize

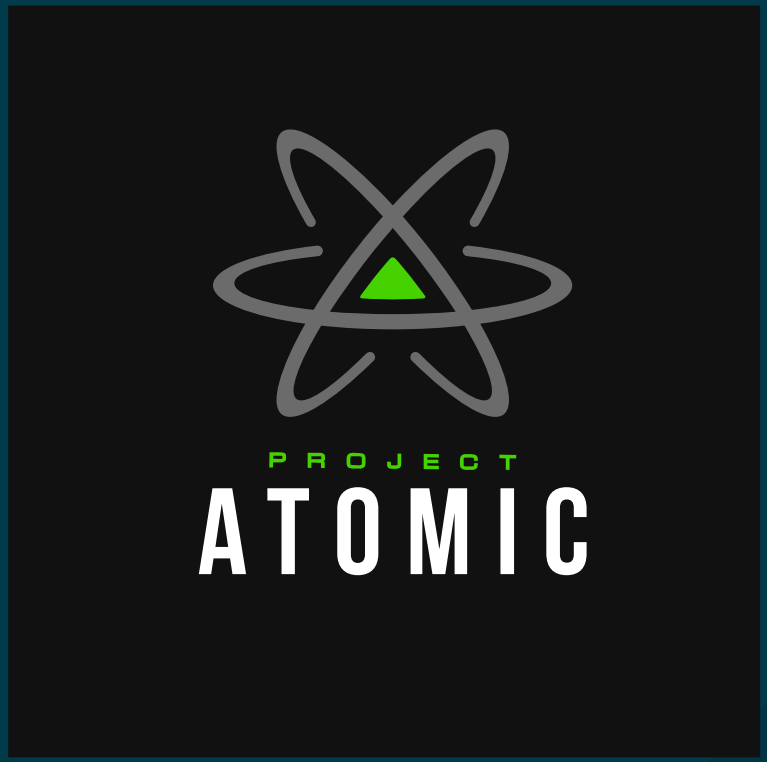
Stack

Community Project

Project Atomic was created to make a better OS for containers

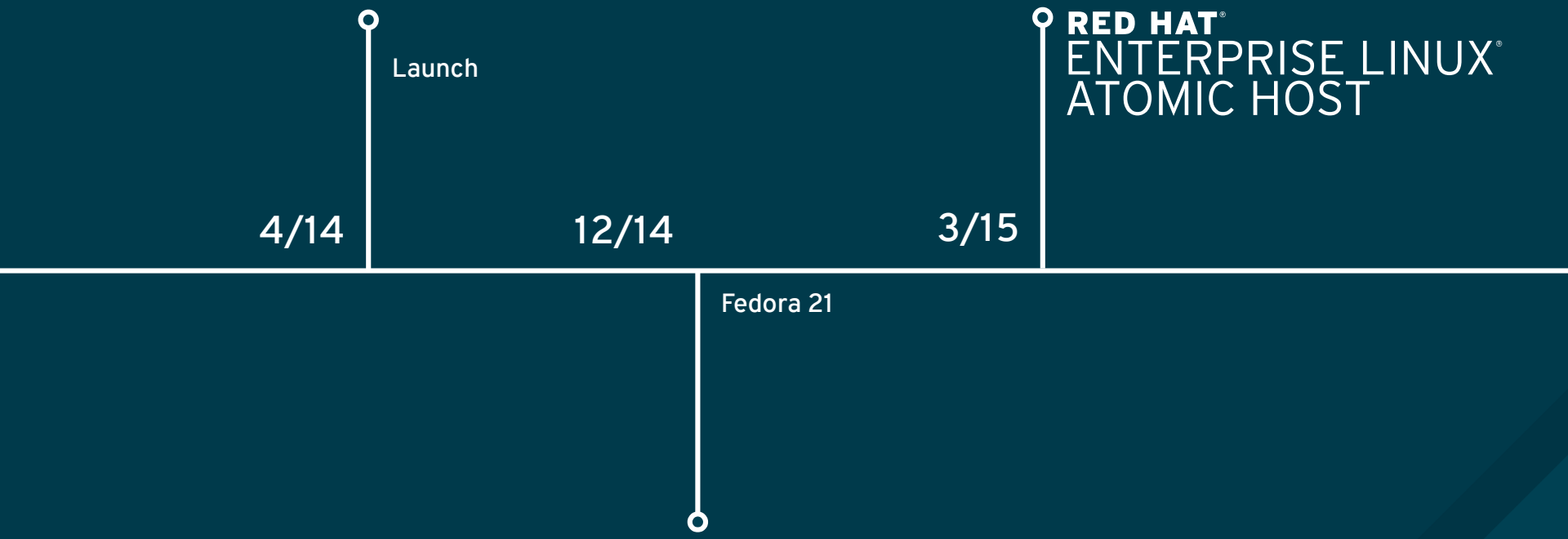
Learn more at:

- http://projectatomic.io/



Timeline

Project Atomic first launched in April 2014 with a supported RHEL Atomic Host launching in March 2015



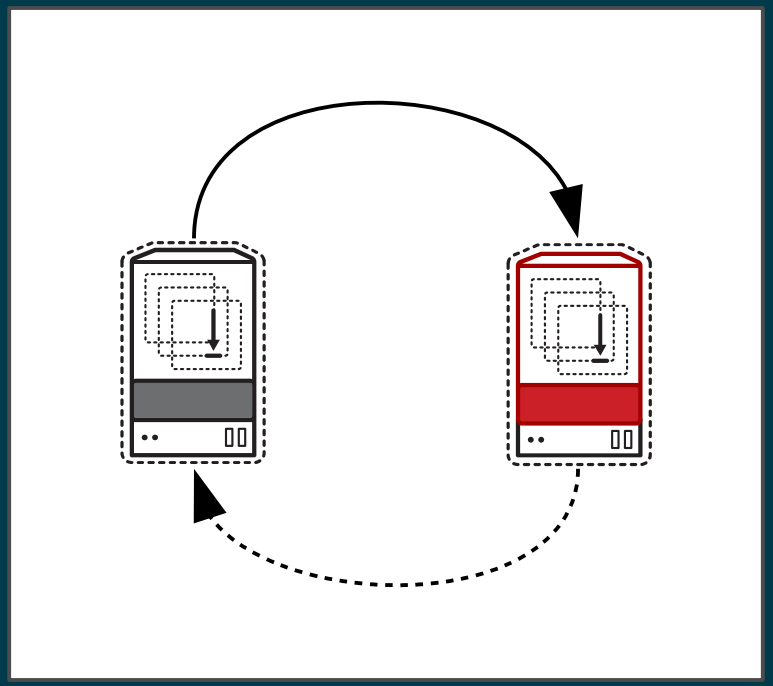
OSTree

"OSTree was born to help implement a continuous delivery model for operating systems. One can be a lot more confident in updating systems if one knows that a reliable rollback system is always available."

COLIN WALTERS
Senior Engineer, Inventor of OSTree
Red Hat

Updates and Rollbacks

We've taken the update methods of containers and applied them to operating systems, no more half way upgraded systems



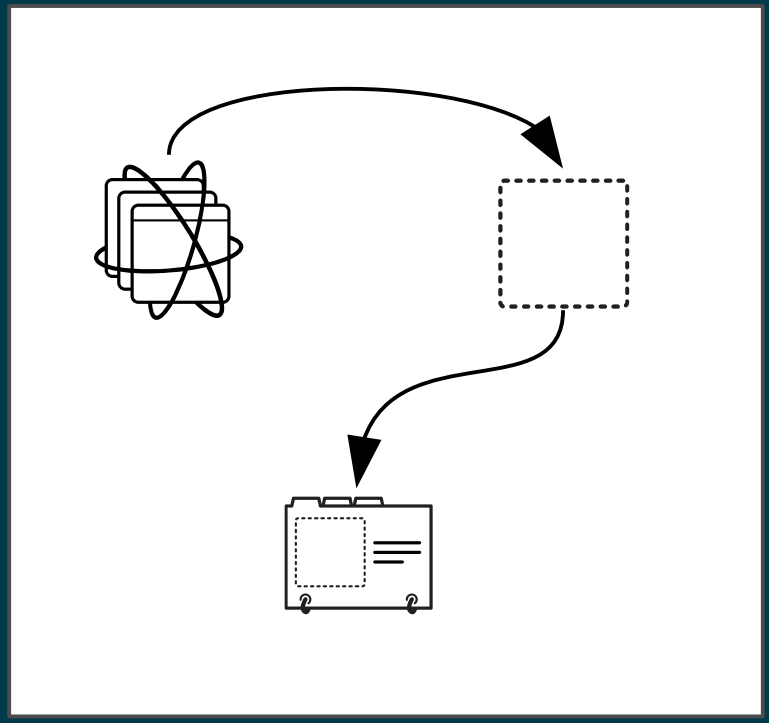
```
# yum update
 bash: yum: command not found

# atomic host upgrade
Upgrade prepared for next boot

# atomic host rollback
Successfully reset deployment
```

Containers

Application containers are built via container management tools like Docker



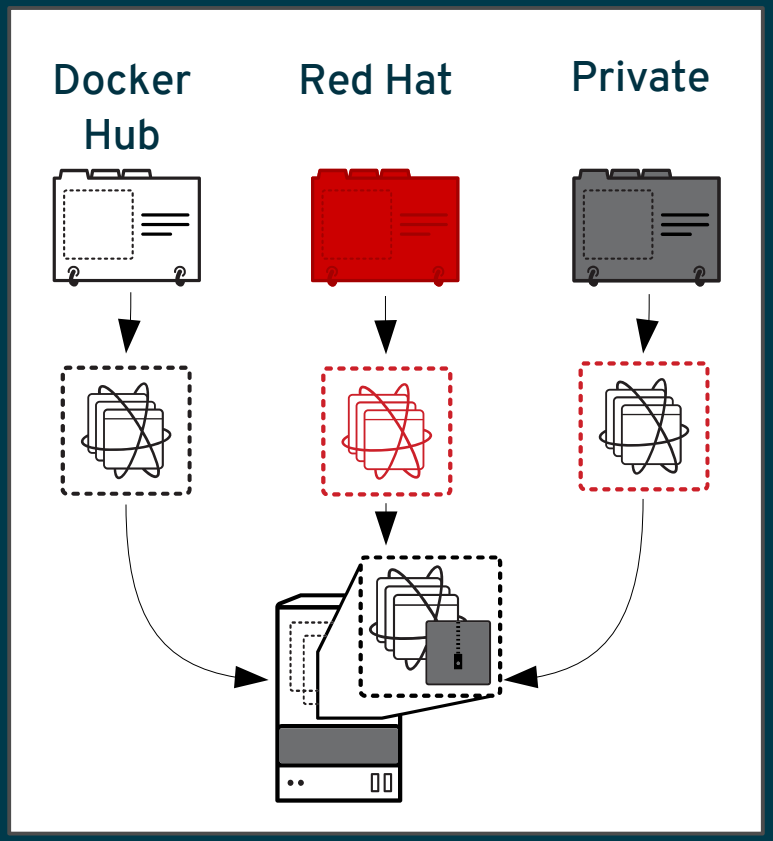
```
# cat Dockerfile
FROM fedora
RUN yum install -y httpd ruby
ADD ./my-ruby-app/ /var/lib/www/
EXPOSE 80

# docker build --rm -t myapp .
Step 0 : FROM fedora
511136ea3c5a: Pull complete
00a0c78eeb6d: Pull complete
834629358fe2: Pull complete

# docker tag bef54b8f8a2f \
  myreg.corp.com:5000/myapp
```

Registry

Containers are distributed via a public, private, or licensed registry



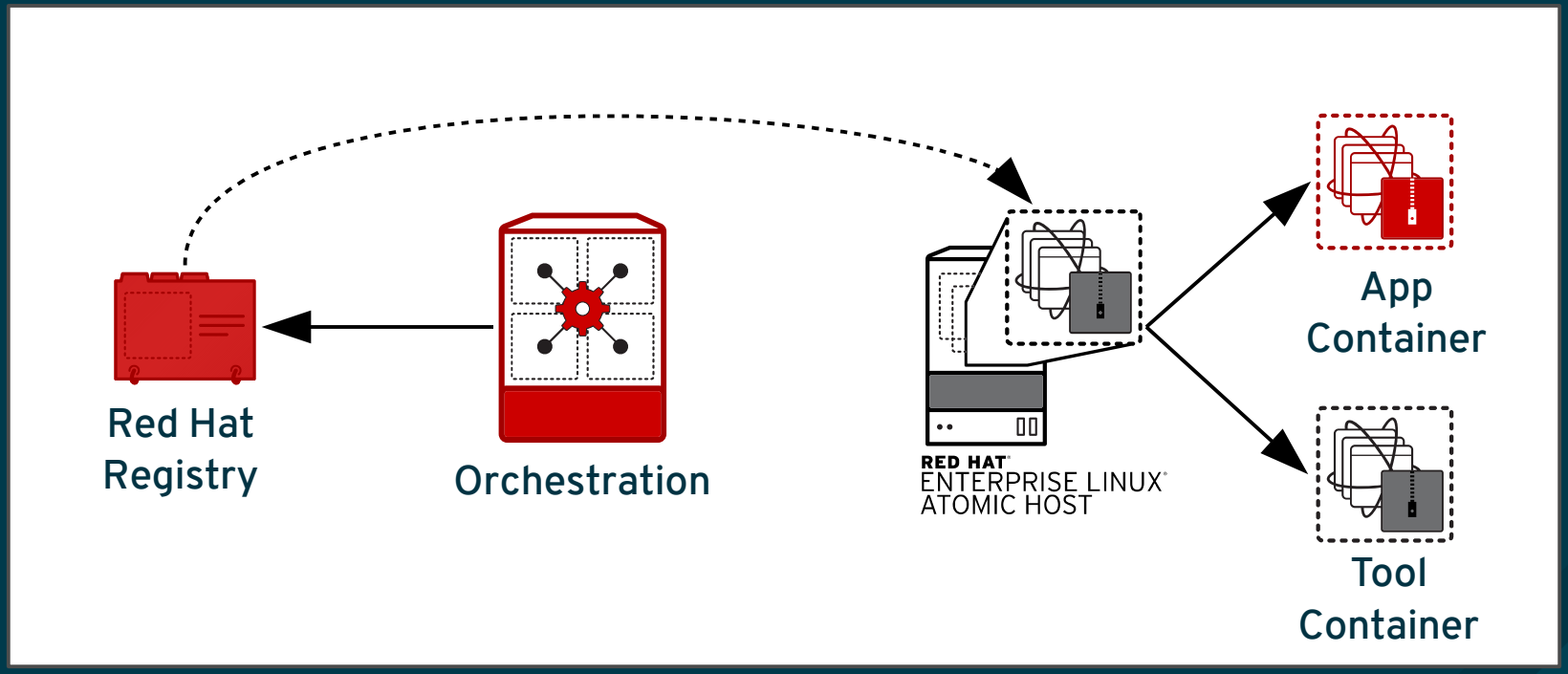

```
# docker run -P fedora/apache
2e11d8fd18b3: Download complete
511136ea3c5a: Download complete
ff75b0852d47: Download complete
0dae8c30a0b2: Download complete
84f33df93401: Download complete
24b116bb2956: Download complete
a7f290a6f21d: Download complete

# docker ps
```


what do enterprises need?
redhat.

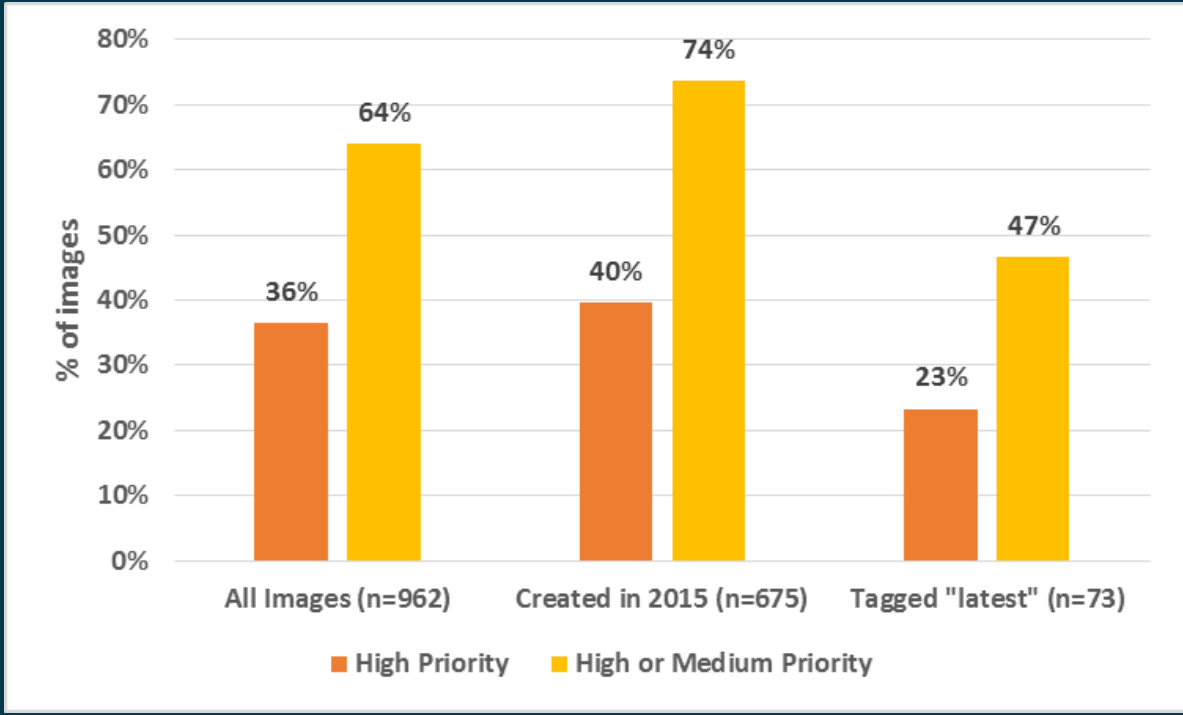
Supported Containers

Red Hat provides support through the entire stack from orchestration, to the operating system, to the containers themselves



Trusted Containers

Someone said that 30% of the images on the Docker Registry contain vulnerabilities



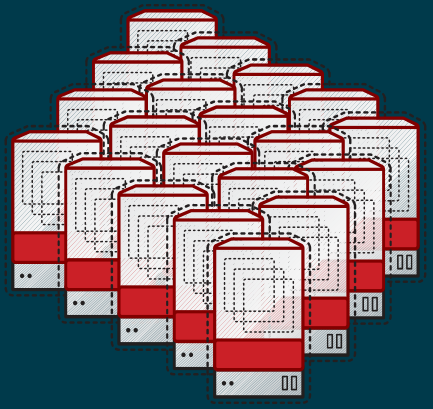
https://jpetazzo.github.io/2015/05/27/docker-images-vulnerabilities/

http://www.infoq.com/news/2015/05/Docker-Image-Vulnerabilities

http://www.banyanops.com/blog/analyzing-docker-hub/

Scale

Running hundreds or thousands of containers on RHEL Atomic Host requires an orchestration agent, for this we're using Kubernetes by Google



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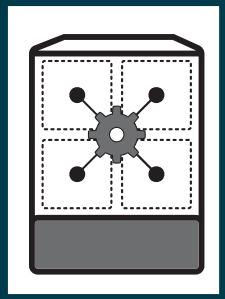
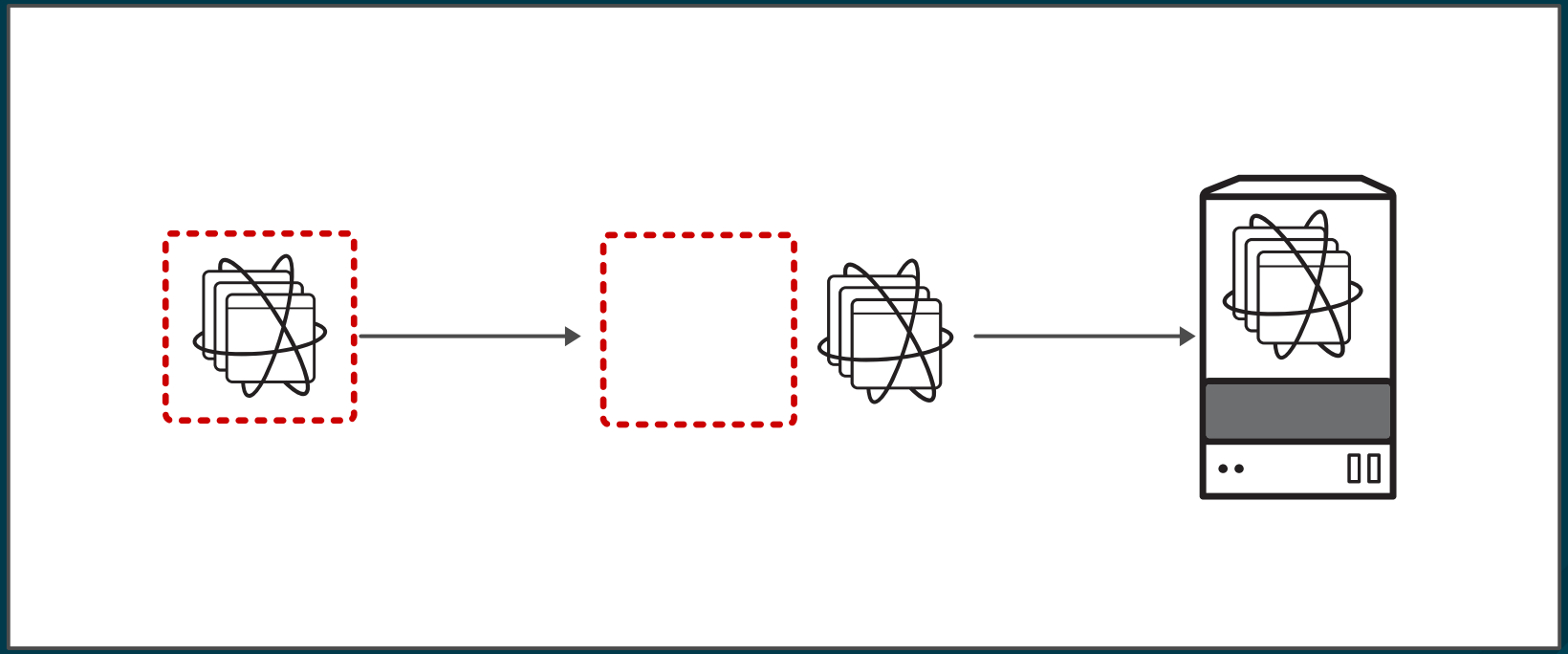
ENTERPRISE LINUX®
ATOMIC HOST



Kubernetes

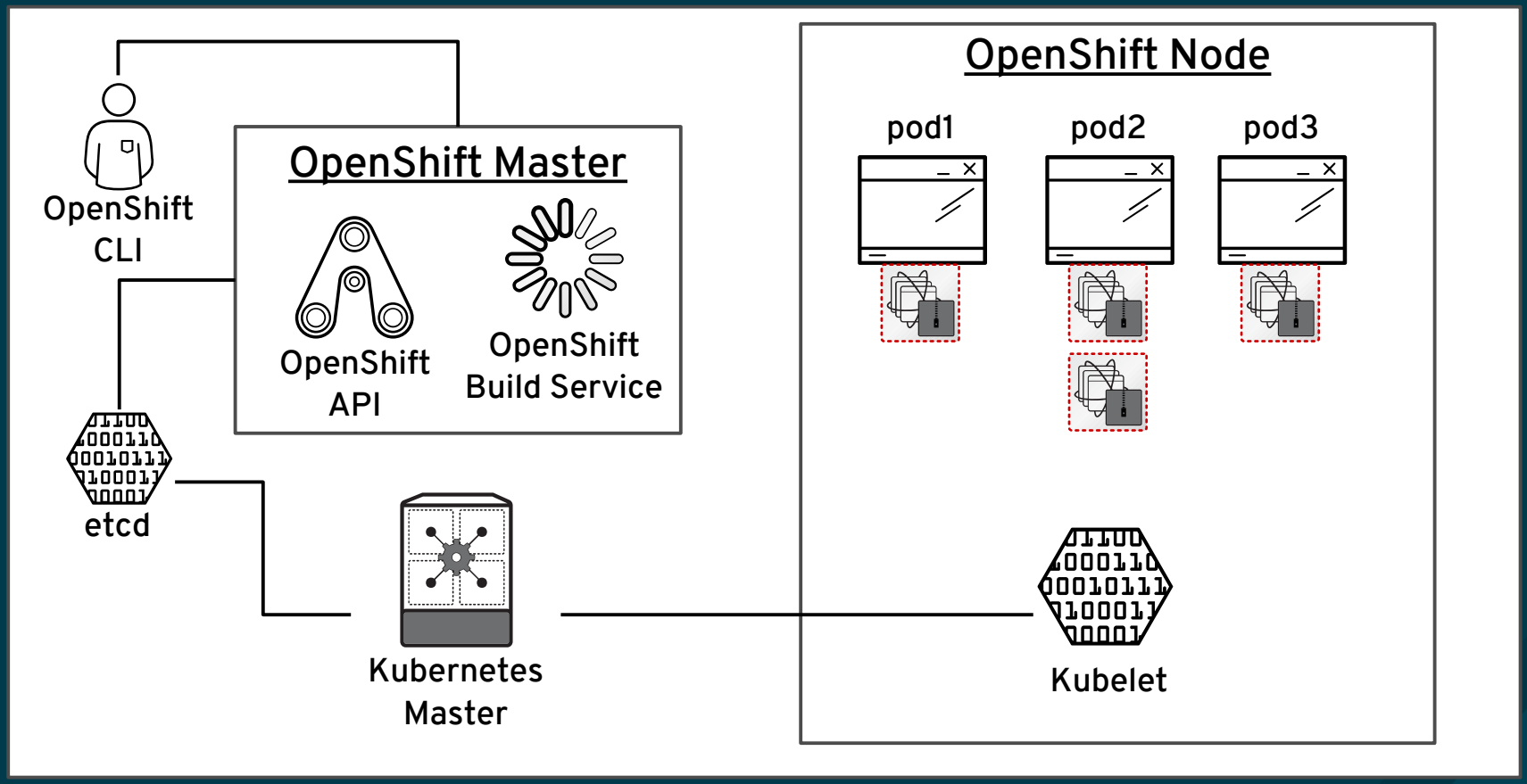
SPC

Super Privileged Containers (SPC) allows applications inside of containers to interact with or control the host, very useful for system and monitoring tools



OPENSHIFT®
by Red Hat®

OpenShift is a fully implemented PaaS solution built with Atomic components but also includes build, user management, and enhanced developer experience



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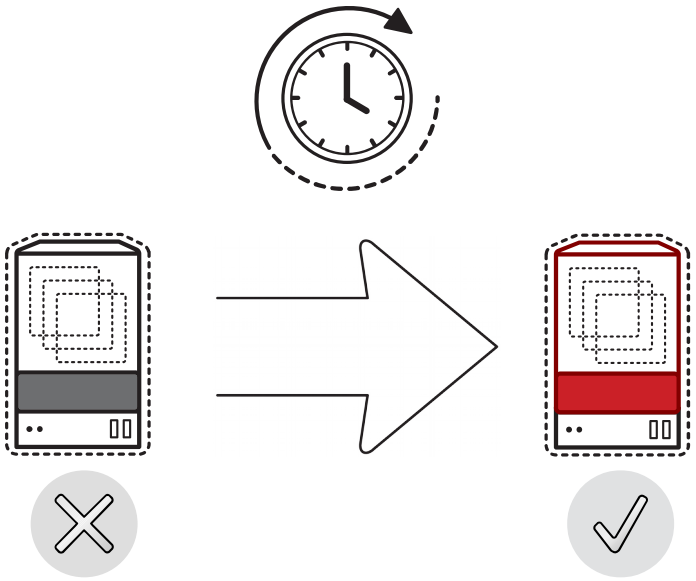
UNIFIED RECOVERY + DEPLOYMENT

Atomic lets users treat their systems like cattle instead of pets,
just like they do with containers



- Don't fix, rebuild
- Scale up and down
- Infinite Testing and CI


speaking of use cases

Container Use Case 1

- Mode 2 Applications
  - aka “Cloud Ready”
  - aka “12 Factor”
- Software as a Service
- Short lived service calls
- Need to quickly scale out
  - Flash sales
  - Burst traffic

- Generally stateless
- Single service per container
- Containers are rebuilt and deployed for fixes and features

Container Use Case 2

- Mode 1 Applications
  - aka “Enterprise”
  - aka “Traditional”
- Long lived service calls
- Typically only scale up

- Generally stateful
- Multiple services per container
- Containers are long lived and only rebuilt and deployed for fixes

Container Use Case 3

- Test Risky Things in a Sandbox
  - Security Tests
  - Unverified Packages
  - Vendor Installations
- Scan and Audit Images
  - Export for analysis
  - Scan in centralized in registry


what are you doing?
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TELL US MORE

Containers and Atomic are very new and they're undergoing a lot of innovation, tell us what your plans are so you can be part of that creation

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THANK YOU

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