L103118 - LINUX CONTAINER INTERNALS

How they really work

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Lab Gurus
5/4/2017

AGENDA

L103118 - Linux container internals

10:15AM—10:25AM
INTRODUCTION

10:25AM—10:40AM
ARCHITECTURE

10:40AM—11:05AM
CONTAINER IMAGES

11:05AM—11:35PM
CONTAINER HOSTS

11:35AM—12:05PM
CONTAINER ORCHESTRATION

12:05PM—12:15PM
CONCLUSION

Materials

The lab is made up of multiple documents and a GitHub repository

- Presentation (Google Presentation): http://bit.ly/2pYAl9W
- Lab Guide (this document): http://bit.ly/2mIElPG
- Exercises (GitHub): http://bit.ly/2n5NtPl

CONTACT INFORMATION

We All Love Questions

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- Billy Holmes: @gonoph111 biholmes@redhat.com
- Vinny Valdez: @VinnyValdez vvaldez@redhat.com
- Scott McCarty: @fatherlinux smccarty@redhat.com

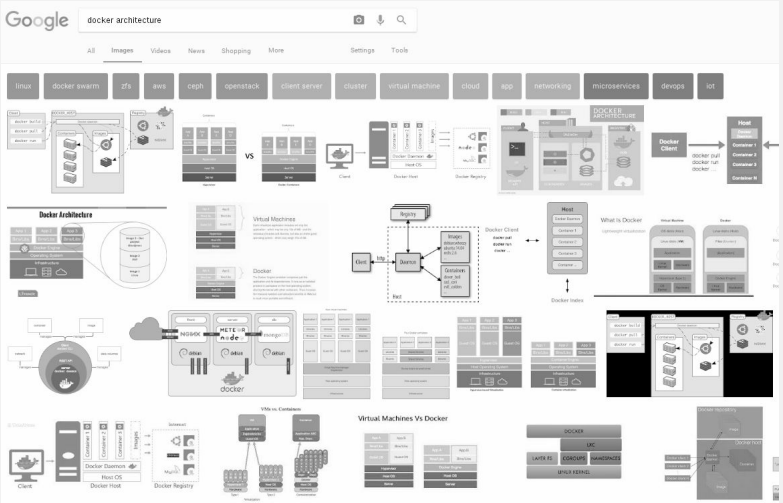

ARCHITECTURE

ARCHITECTURE

Google Images is Wrong :-)

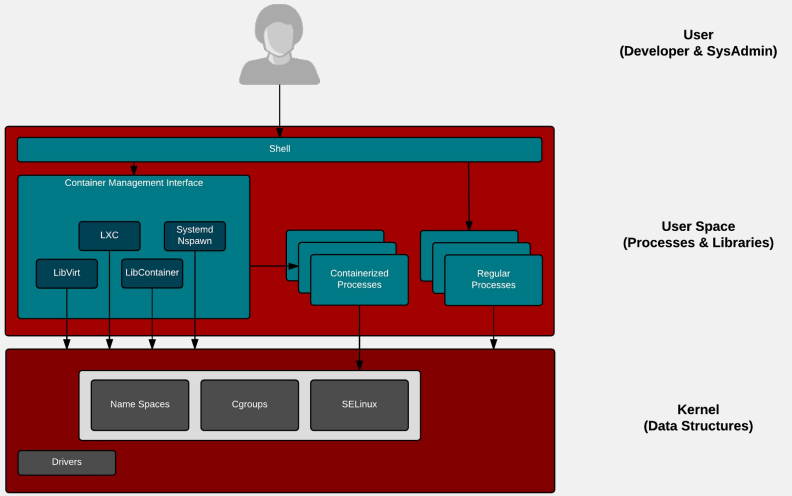
Important corrections

- Containers do not run ON docker. Containers are processes - they run on the Linux kernel. Containers are Linux.
- The docker daemon is one of the many user space tools/libraries that talks to the kernel to set up containers



CONTAINERS ARE LINUX

The Libraries, and Data Structures



Userspace libraries interact with the kernel to isolate processes

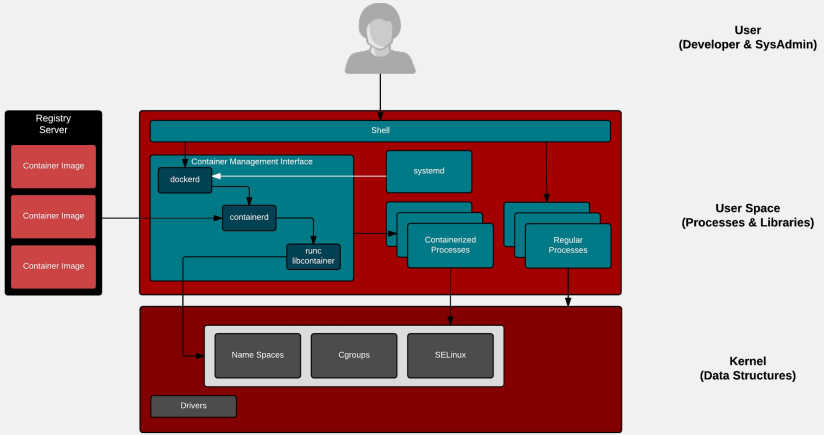
- Libraries
  - LXC, LXD, LibContainer, systemd nspawn, LibVirt
- Kernel Data Structures
  - Name Spaces
  - Cgroups
  - SELinux

THE USER SPACE TOOL CHAIN

On a Single Host

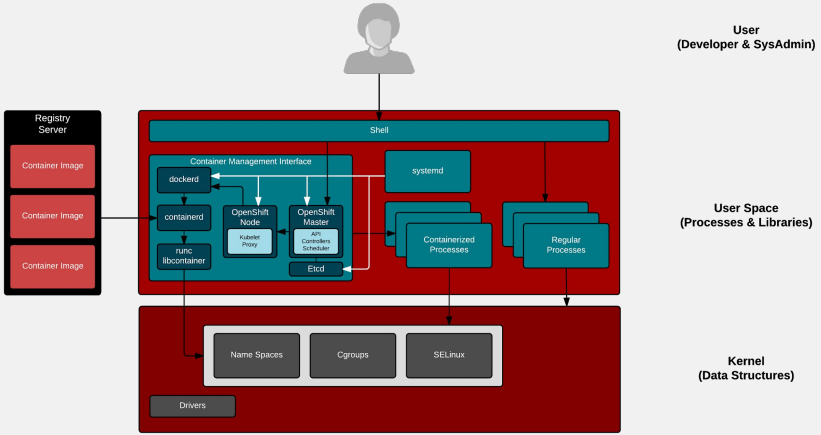
The user space tool chain adds the following:

- A local daemon
- Simple CLI/REST interface
- Support for container images (OCI) and connection to registries



THE ORCHESTRATION TOOLCHAIN

On Multiple Hosts



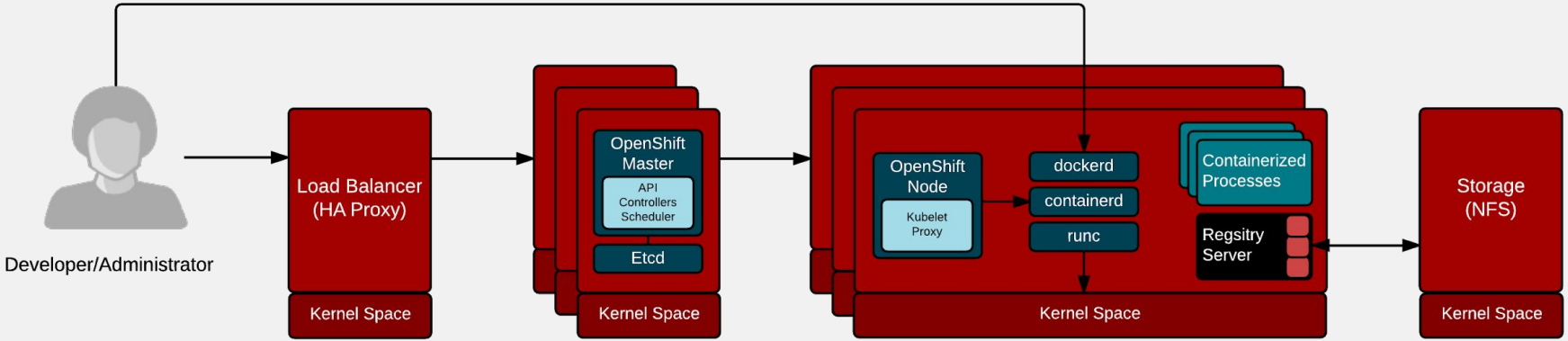
The orchestration toolchain adds the following:

- More daemons (it's a party) :-)
- Scheduling across multiple hosts
- Application Orchestration
- Distributed builds (OpenShift)
- Registry (OpenShift)

TYPICAL ARCHITECTURE

Bringing it All Together

In distributed systems, the user must interact through APIs

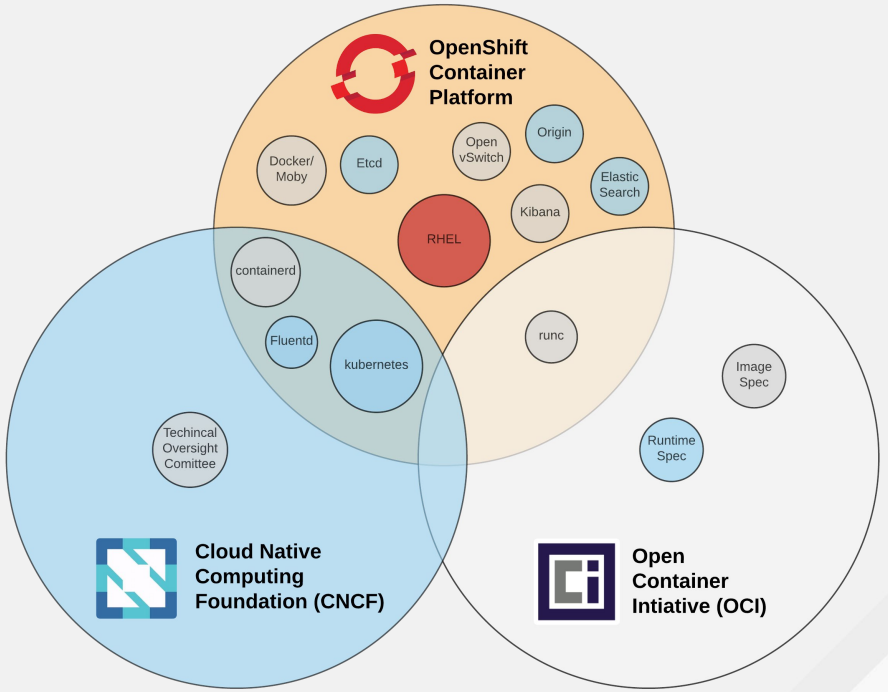


THE COMMUNITY LANDSCAPE

Open Source, Leadership & Standards

The landscape is made up of committees, standards bodies, and open source projects:

- Docker/Moby
- Kubernetes/OpenShift
- OCI Specifications
- Cloud Native Technical Leadership



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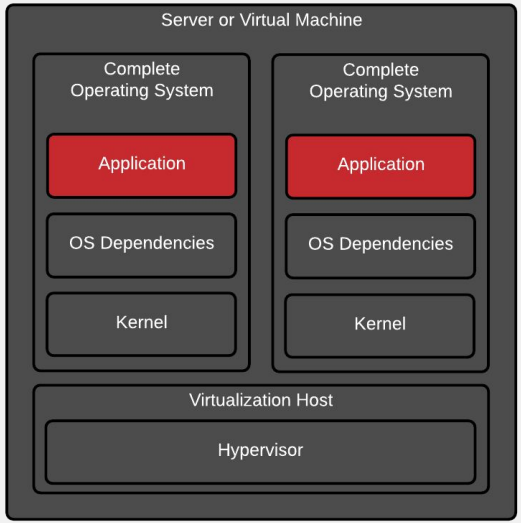
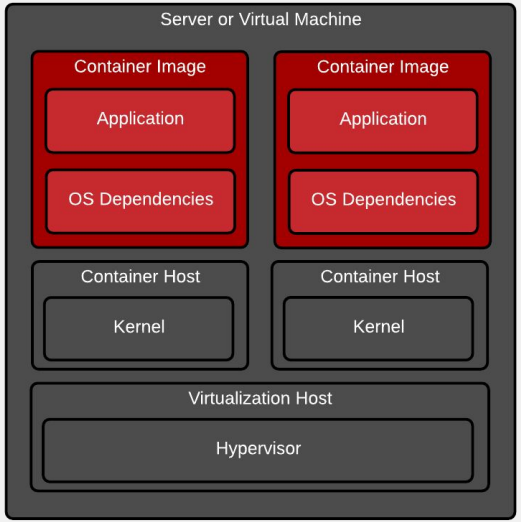
CONTAINER IMAGES

Container Images

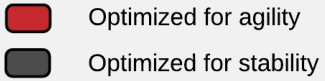
Virtual machines and container environments



Application & Infrastructure
Updates Tightly Coupled

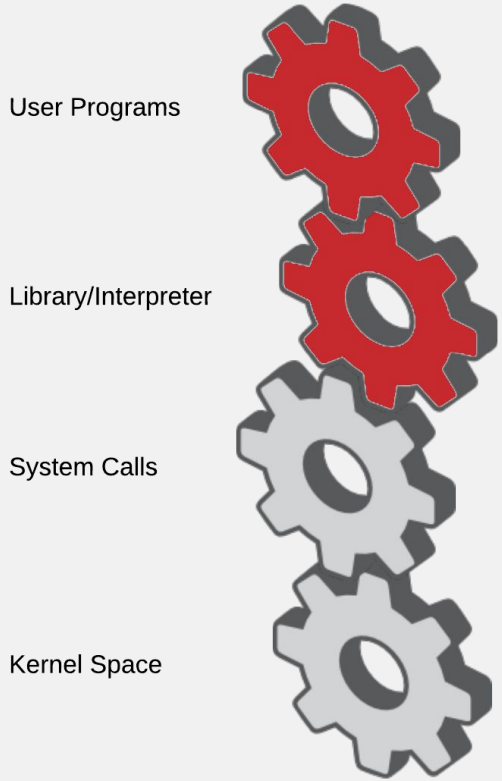


Application & Infrastructure
Updates Loosely Coupled



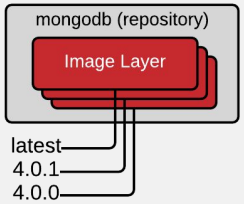
Fancy Files

People forget about Glibc...

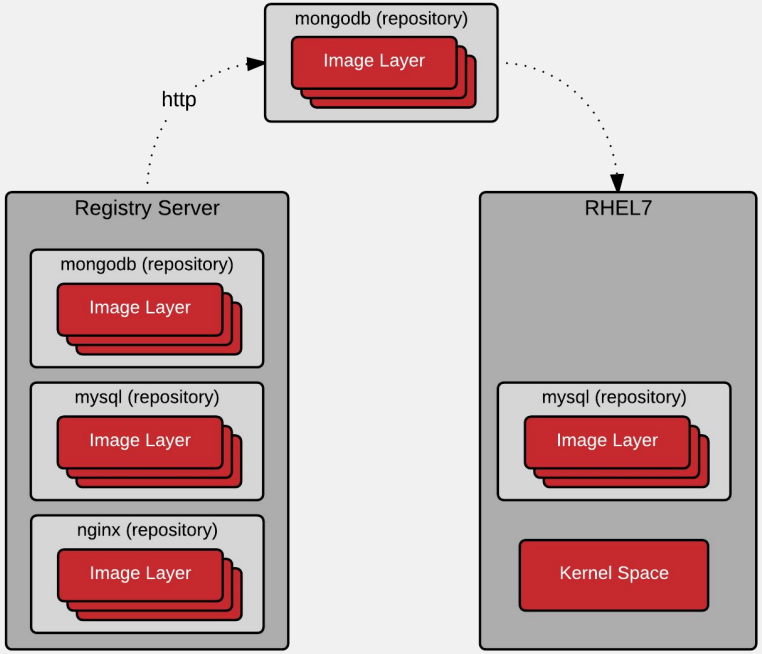


Fancy Files

Actually, they are layers...



Layers and Tags

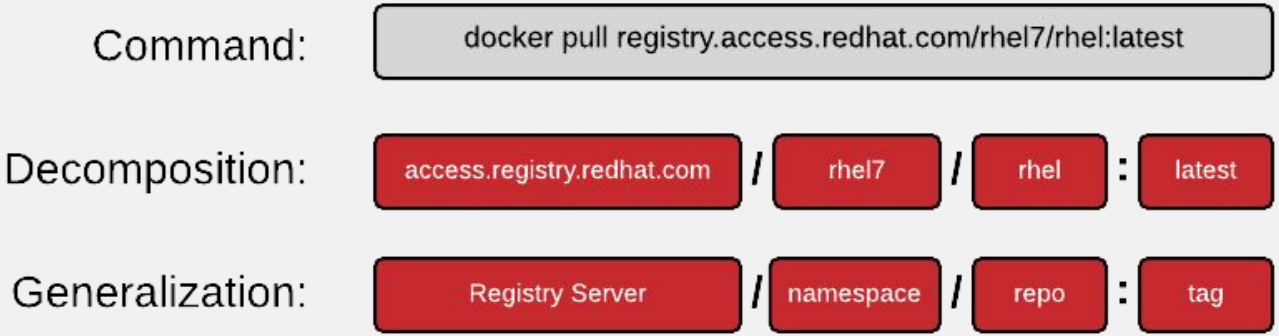


Registry

Cache

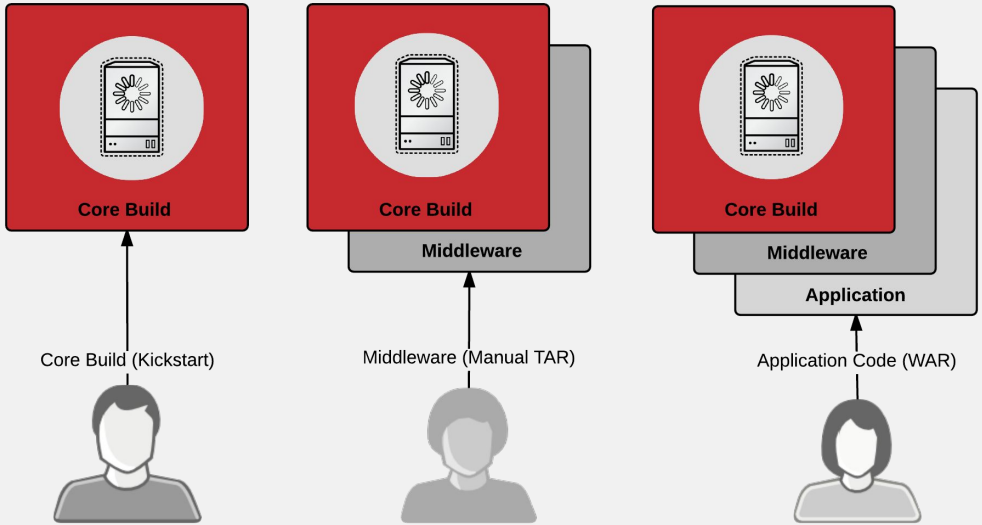
Fancy File Servers

Actually, they are repositories



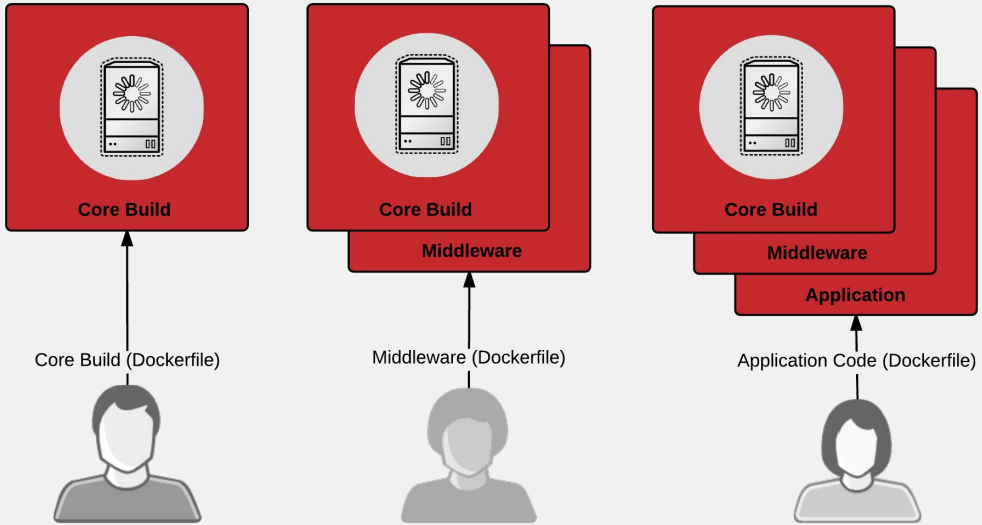
Fancy Files

How do we currently collaborate in the user space?



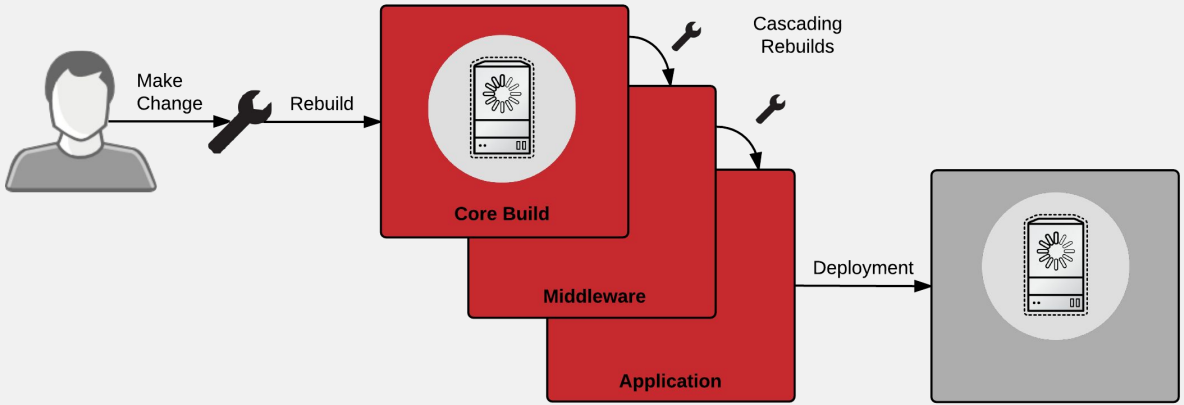
Fancy Files

The future of collaboration in the user space....



Fancy Files

The future of collaboration in the user space....



LAB 2: PAGE 8


CONTAINER RUNTIME
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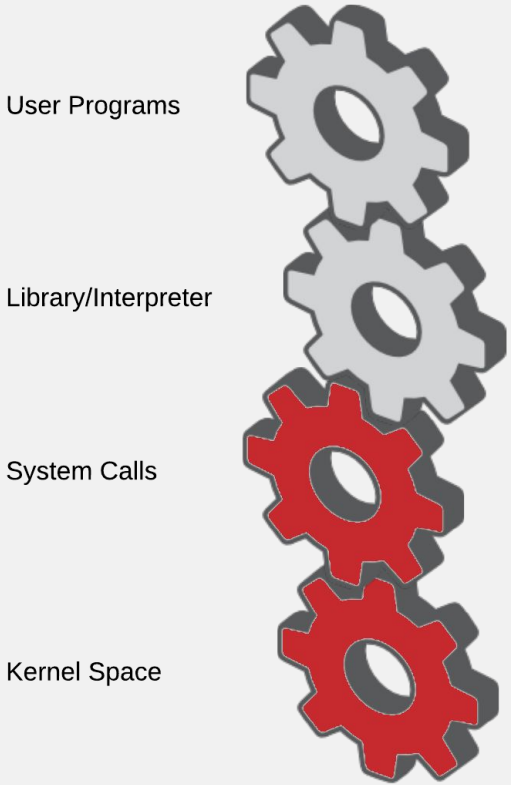
Fancy Processes

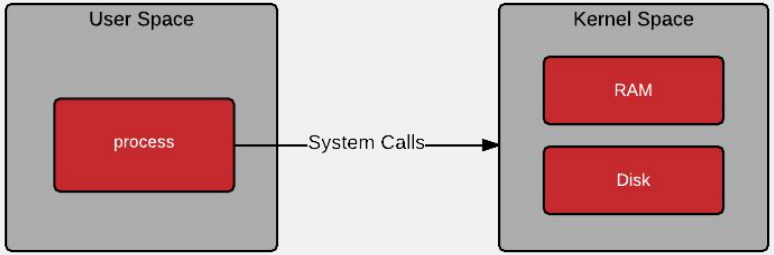
People forget about Glibc...



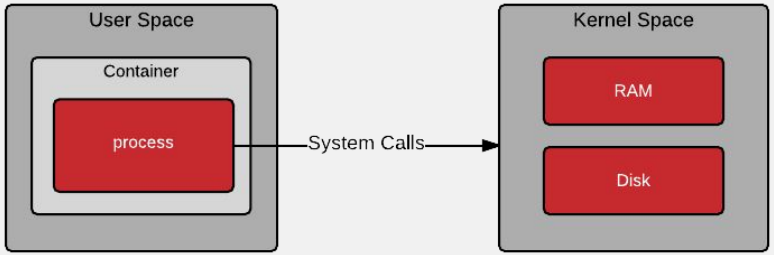
Linux Containers

Fancy Processes

Regular Linux Process

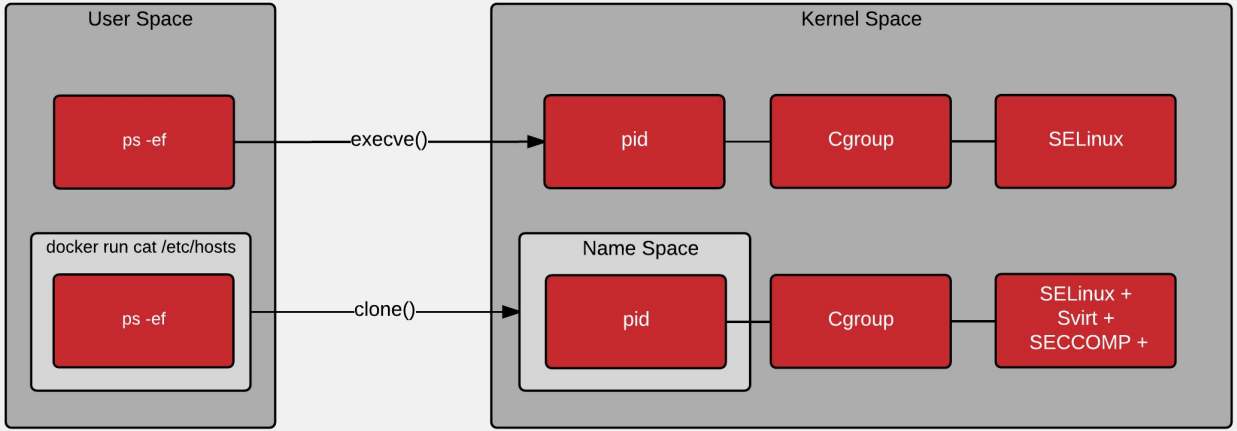


Containerized Process



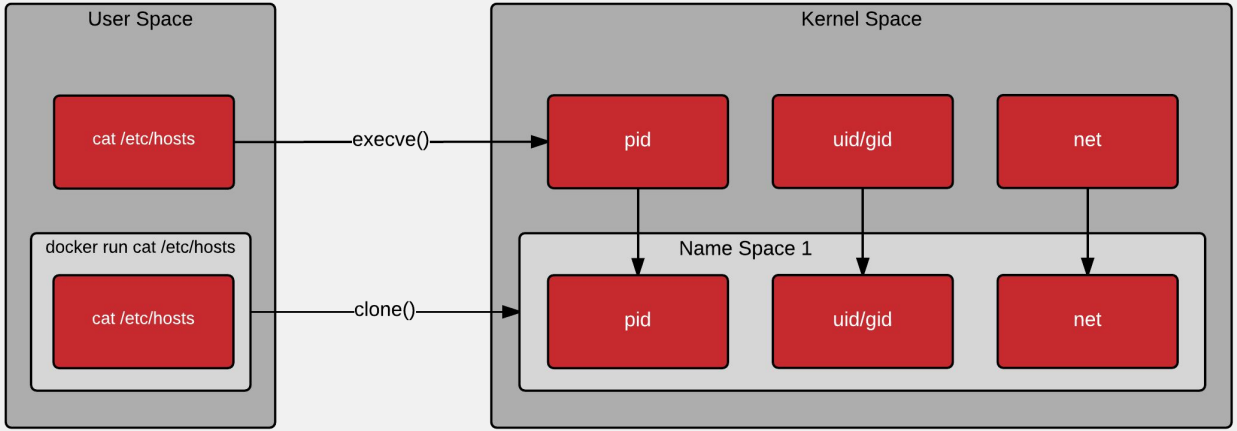
Containerized Processes

Starting the process with namespaces, cgroups, and security controls



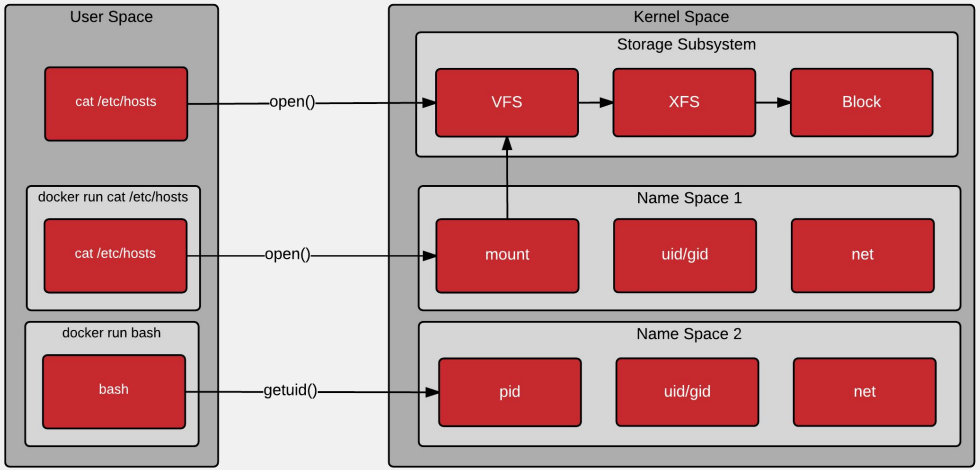
Containerized Processes

Starting the process in a namespace



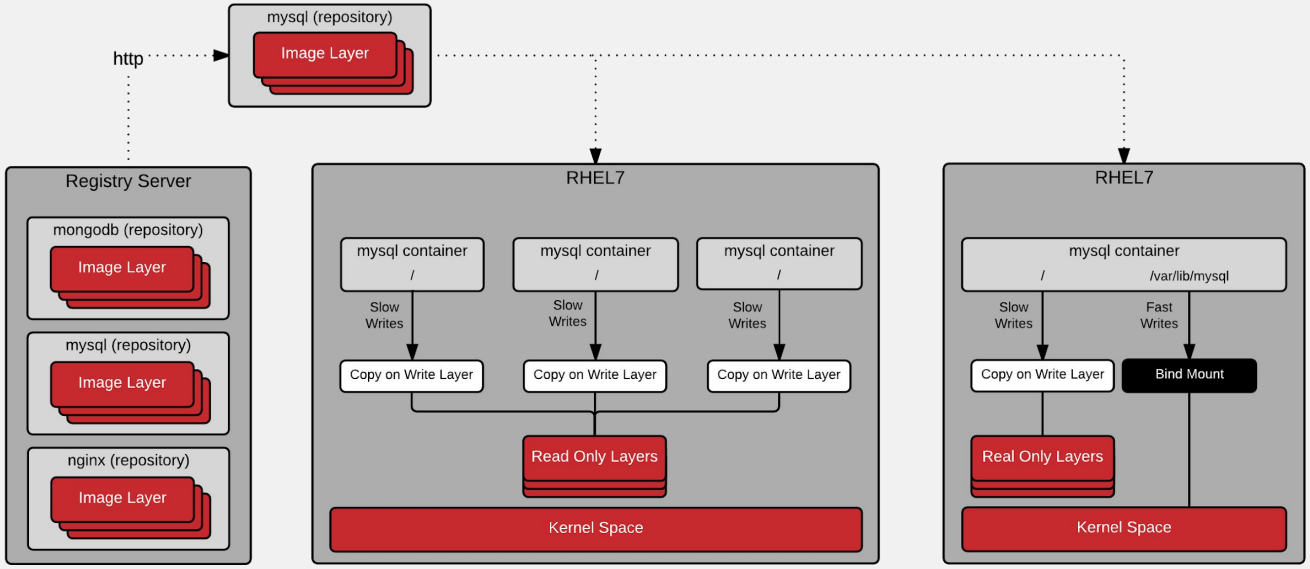
Containerized Processes

The containerized process still use the underlying kernel abstractions...



Mounts

Copy on write vs. bind mounts




CONTAINER ORCHESTRATION
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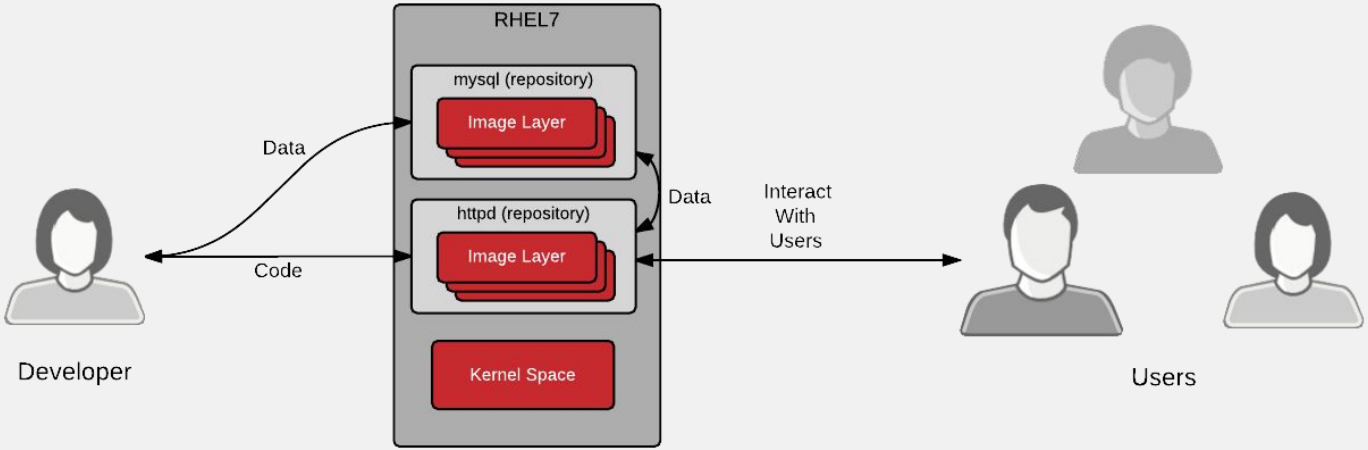
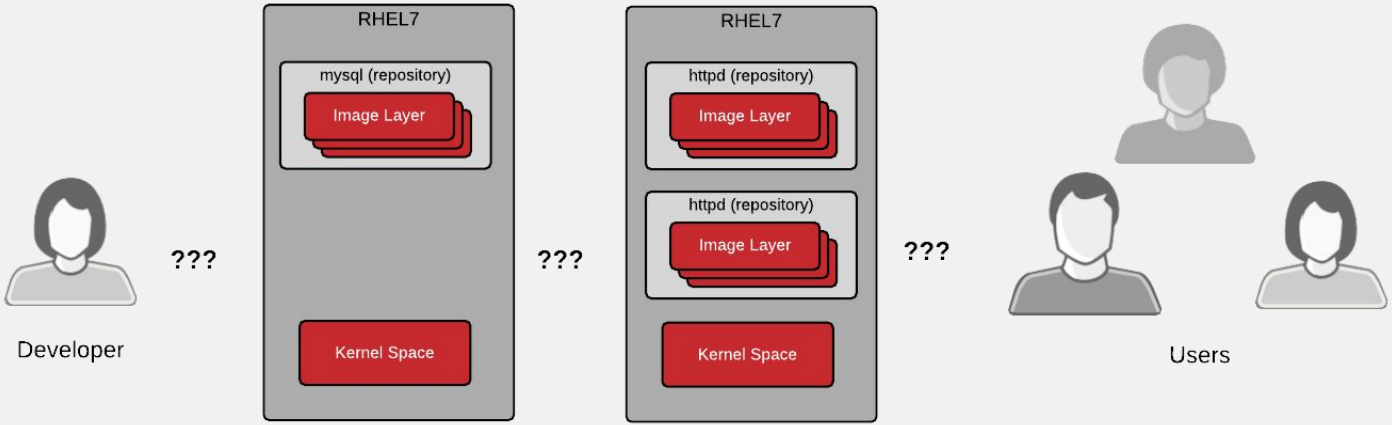
Application Containers

This is what most people think of with Docker



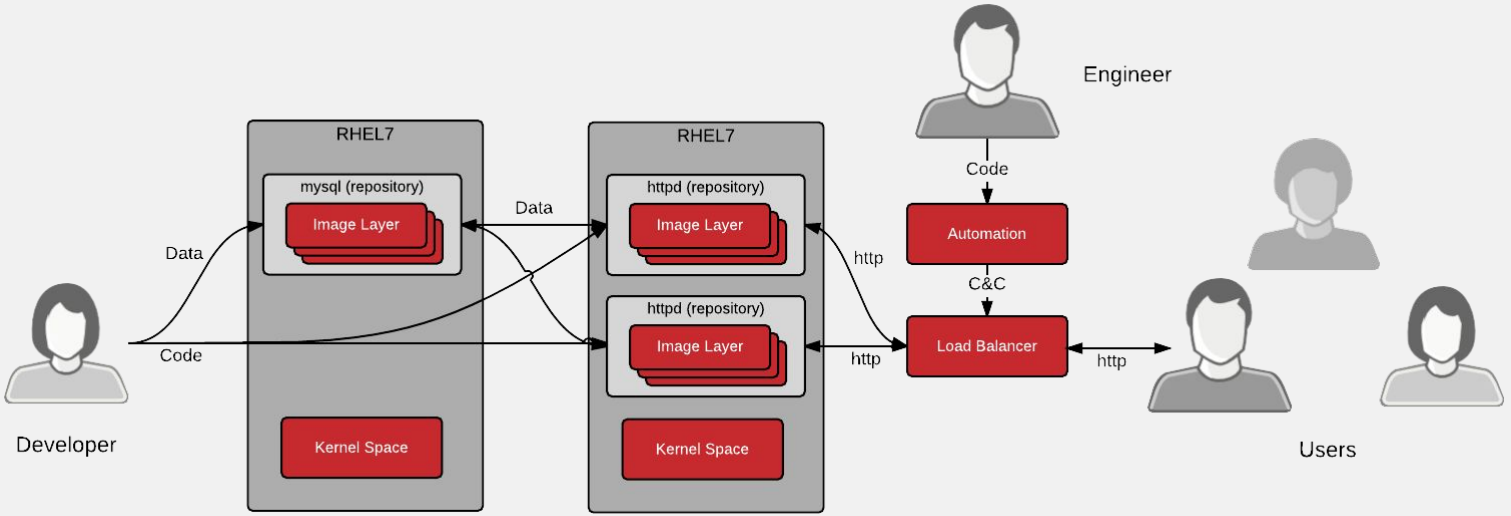
Container Orchestration

Multiple nodes changes everything



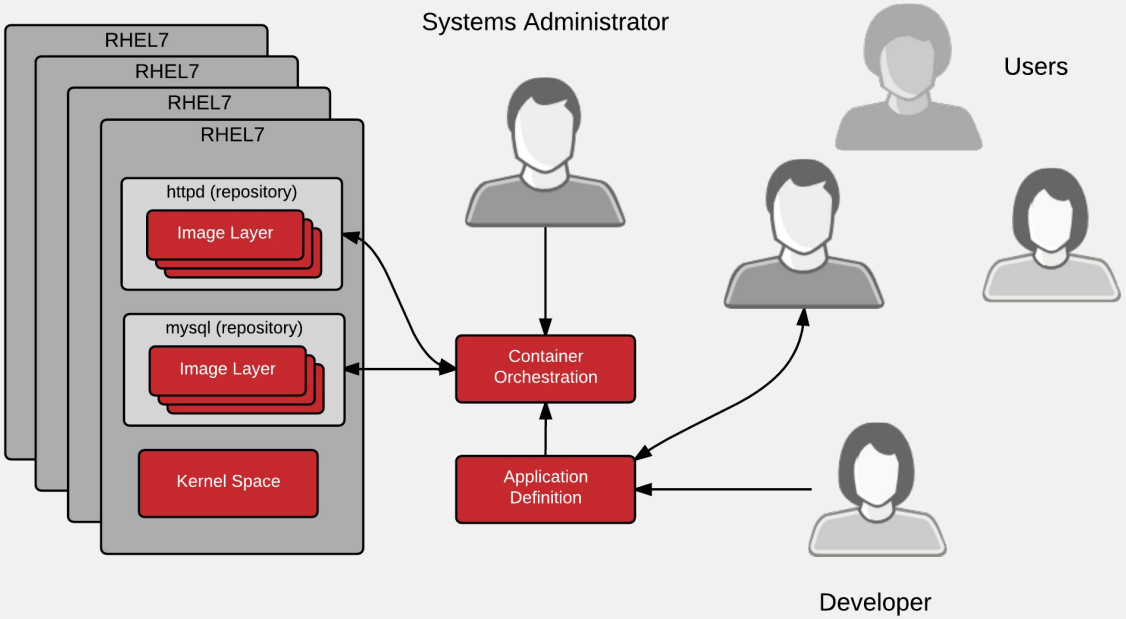
Container Orchestration

You can hack a solution together yourself, but it's ugly...



Kubernetes/OpenShift

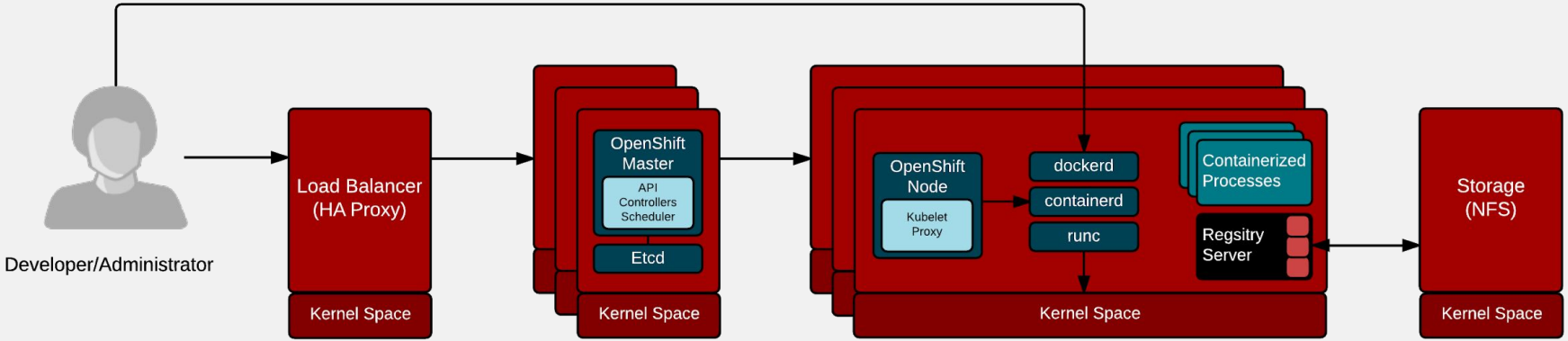
This Standardizes Everything



The Daemons

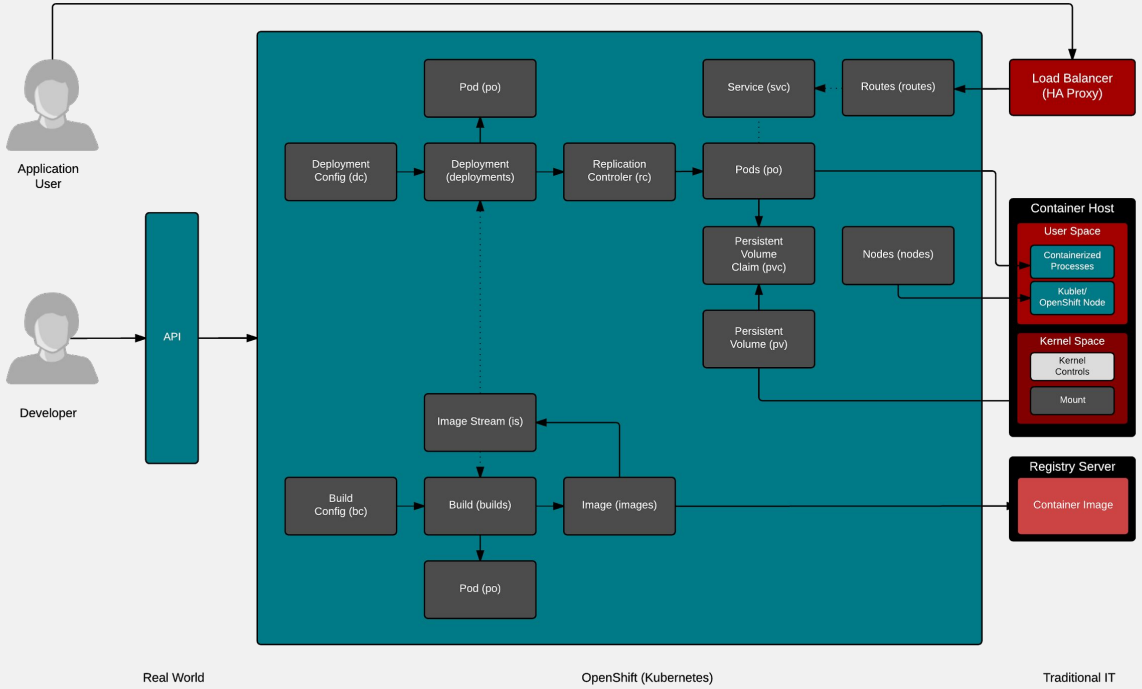
Bringing it All Together

User -> OpenShift -> Docker -> Kernel



THE LOGIC

Bringing it All Together



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