

RED HAT
SUMMIT

Kubernetes Performance-Sensitive Application Platform

Defining patterns and technology to run critical, high
performance line-of-business applications on Kubernetes

Jeremy Eder, Derek Carr and Seth Jennings
OpenShift Engineering
May the Fourth, 2017

What is this?

Bring next generation development processes, agility, procedures and mindset to established industries

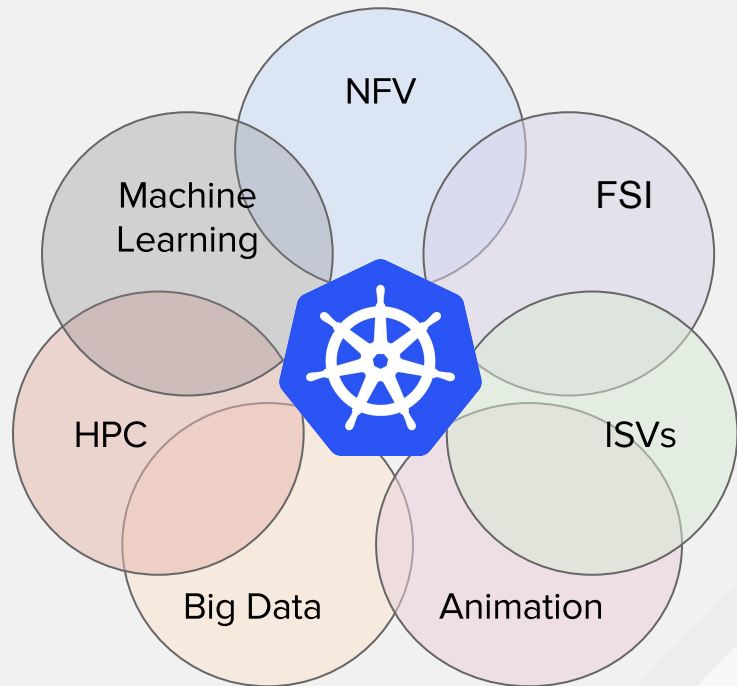
Why do this?

Current capabilities do a good job covering generic web hosting workloads (representing a fraction of workloads).

Why do this?

Kubernetes becomes the **single platform** to run any application:

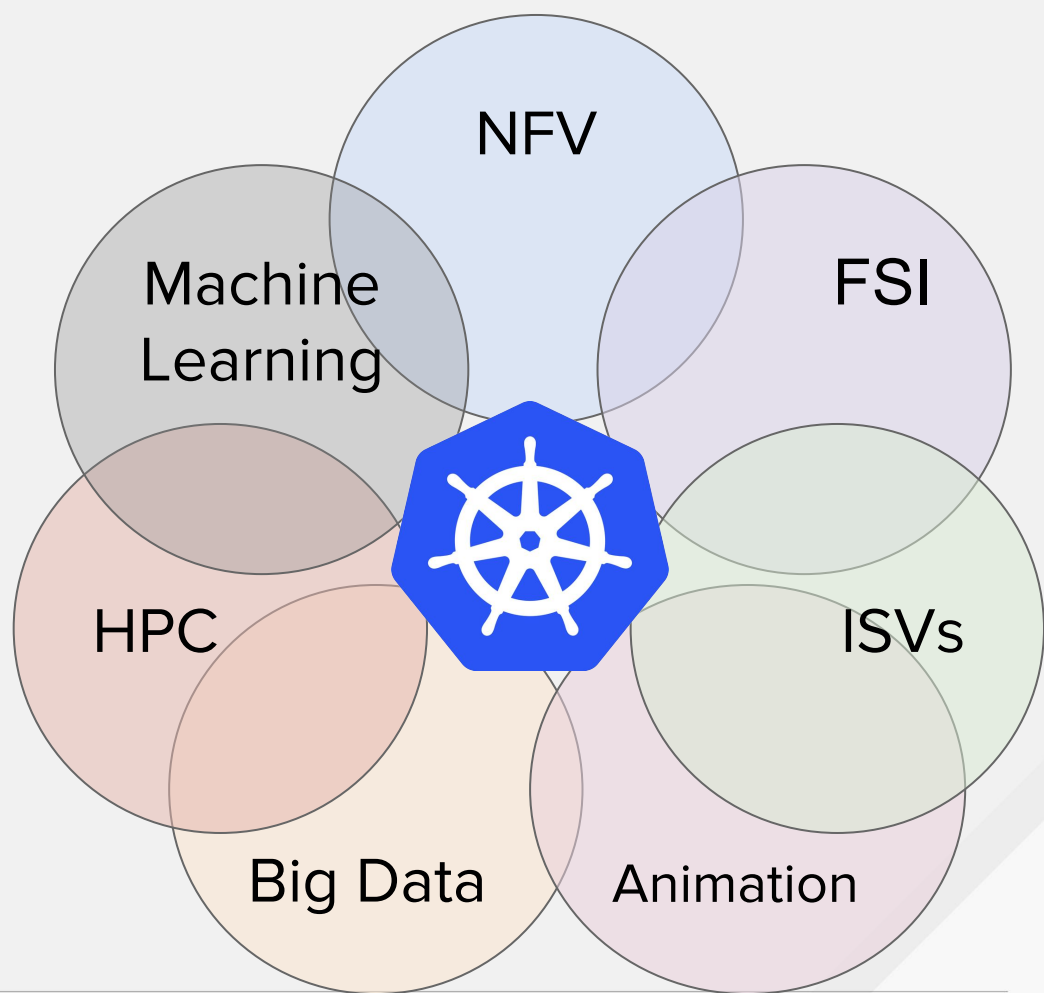
- Old or new
- Monolithic/Microservice



So much overlap...

Coordinate, and plumb
these generically.

Create primitives for
ISV ecosystem to hook
into.



Why do this?

High performance customers want

- An industry-standard packaging format (OCI)
- A datacenter-wide workload scheduler (K8S)
- To use Open Source

But they will not sacrifice performance to get it

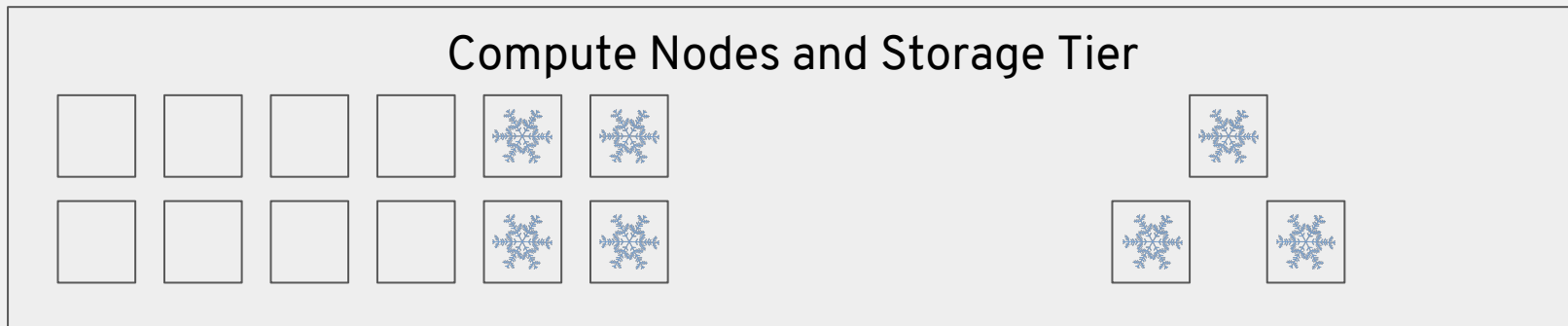
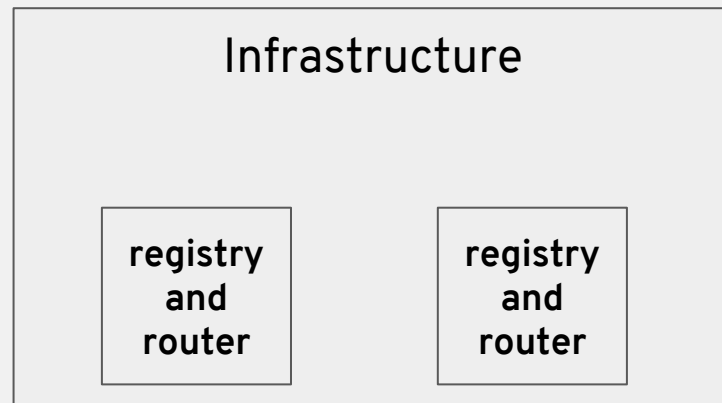
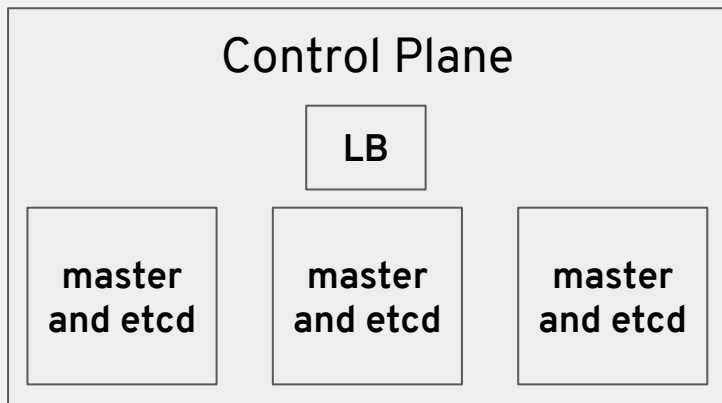
- Not even a little

Why do this?

Enable containerization of Infrastructure Software

- Software-defined Storage and Networking
- Packet switching and routing tiers
- Multi-workloads (very different) within a single cluster
 - Layered schedulers (HPC/grid)
- Many more...

Cluster Topology



Drill-down on overlap

Feature	FSI	NFV	ISV	BD/ML	ANIM	HPC
NUMA (cpuset.cpus and cpuset.mems)	Yes	Yes	Yes	Maybe	Maybe	Yes
Device Passthrough (NIC and Disk, GPU etc...)	Yes	Yes	Yes	Maybe	Maybe	Yes
sysctl Support (non-namespaced too)	Yes	Yes	Yes	Yes	Yes	Yes
Separation of control- and data-plane	Yes	Yes	Yes	Yes	Yes	Yes
Node “fitness” (extended health info)	Yes	Yes	Maybe	Maybe	Maybe	Yes
Multi-homed pods	Yes	Yes	Maybe	Yes	Yes	Yes
Kernel Module loading/verification (DKMS-ish)	Yes	Yes	Maybe	Maybe	Yes	Maybe
Hugepages	Yes	Yes	Yes	Yes	Maybe	Maybe

Kubernetes Resource Management Working Group

Kicked off in January

- Define requirements for high performance workloads
- Design solutions to meet those needs
- First face to face this week, very productive!

RED HAT
SUMMIT

Red Hat Container Catalog

Consuming Container Images from
Red Hat and its Ecosystem

Dirk Herrmann
Product Owner Container Catalog
May 2nd 2017

The Value & New Challenges

It's quick and easy to pull a Linux container image from a public registry and get started.

In fact, too easy. There can be an explosion of different distributions, architectures, performance and security characteristics in different images.



Red Hat Registry Stats

- 227 repositories
- 2,169 images
- 1+ TB storage



Red Hat Security Statistics 2016

- 97 critical RHSA
- 286 important RHSA
- 100% fixed in <1d *



Red Hat Customer Portal Stats 2016

- 13,100,00 visitors
- 2,400,000 searches
- 108,300,00 views



- Cross-team effort of 10 teams across 4 organizations
- Design driven approach focusing on end customer user experience

RED HAT® CONTAINER CATALOG

- Container Health Index
- Extensive Image Metadata
- Image Documentation
- Image Advisories



Vision

Our vision is to help developers, architects, and IT operations realize the full potential of containers by transforming the way container-based applications are built, delivered, and consumed

1 Explore &
Search

2 Evaluate &
Select

3 Consume &
Distribute

4 Use &
Maintain

Mission

Our mission is to provide customers and partners with the best experience when delivering and consuming container-based applications. This includes the right information and guidance to make intelligent decisions about which container images to consume



Joe

Architect

I want to explore what's inside the Red Hat Container Catalog
I want to search for a product and see all images belonging to it

1 Explore & Search

2 Evaluate & Select

3 Consume & Distribute

4 Use & Maintain

I'm searching for a database container image
I'm searching for Red Hat Enterprise Linux base image

Jane

Developer





Explore the Catalog:

Repository Activity in the Last 30 Days

<p>New (17) Brand new repositories which have recently been added to the catalog.</p>	<p>Updated (148) Active repositories with a recent image update.</p>	<p>Most Popular (50) Top 50 most pulled repositories over the last month.</p>
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Popular Products [View all products](#)

Red Hat Enterprise Linux (53)	Red Hat OpenShift Container Platform (44)	JBoss Enterprise Application Platform (3)
JBoss Fuse (2)	Red Hat Gluster Storage (2)	

Popular Application Categories

Container Platform / Management (33)	Operating System (22)	Mobile Application Development Platform (MADP) (20)
Programming Languages & Runtimes (16)	Logging & Monitoring (15)	Virtualization Platform (12)

Image Architectures

Application Image (46)	Builder Image (13)	Base Image (10)
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use our explore page to browse most relevant products and image categories

app categories such as database, programming language, logging

popular Red Hat and Ecosystem products

Base, Builder and Application Images



Jane
Developer

I'm looking for a base image, what are my options?

Image Repositories Products

APPLICATION CATEGORY

- Operating System (0)

PRODUCT

- Red Hat Enterprise Linux (0)

RELEASE CATEGORIES

- Generally Available (0)

IMAGE ARCHITECTURES

- Base Image (0)

10 of 10 Results

Repository Name	Health Index	Push
<p>rhel7/ubi</p> <p>Red Hat Enterprise Linux by Red Hat, Inc.</p> <p>This platform image provides a minimal runtime to build, run and deploy Red Hat Enterprise Linux 7 applications as a container on a Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 7 Atomic host.</p> <p>4 days ago 7.3-82 Health A B C D E</p>	<p>4 days ago 7.3-82 Health A B C D E</p>	<p>↓ 75k</p>
<p>rhel6/ubi</p> <p>Red Hat Enterprise Linux 6.8 by Red Hat, Inc.</p> <p>This platform image provides a minimal runtime to build, run and deploy Red Hat Enterprise Linux 6 applications as a container on a Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 7 Atomic host.</p> <p>4 days ago 6.8-85 Health A B C D E</p>	<p>4 days ago 6.8-85 Health A B C D E</p>	<p>↓ 2k</p>
<p>rhel7.3</p> <p>Red Hat Enterprise Linux by Red Hat, Inc.</p> <p>This platform image provides a minimal runtime to build, run and deploy Red Hat Enterprise Linux 7.3 applications as a container on a Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 7 Atomic host.</p> <p>4 days ago 7.3-82 Health A B C D E</p>	<p>4 days ago 7.3-82 Health A B C D E</p>	<p>↓ 15k</p>

Popular Application Categories

Container Platform / Management (33)	Operating System (22)	Mobile Application Development Platform (MADP) (20)
Programming Languages & Runtimes (16)	Logging & Monitoring (15)	Virtualization Platform (12)
Application Image (46)	Builder Image (13)	Base Image (10)

use the Base Images filter on search page

or use Base Images tile on explore page

Base Image

Category Overview

Simply put, a base image is an image that has no parent layer. Typically, a base image contains a fresh copy of an operating system. Base images normally include the tools (yum, rpm, apt-get, etc.) needed necessary to install packages / make updates to the image over time. While base images can be "hard crafted" in practice they are typically provisioned and published by open source projects (like Debian, Fedora or CentOS) and vendors like Red Hat. The provenance of base images is critical for security. In short, the sole purpose of a base image is to provide a starting place for creating your derivative images. When using a Dockerfile, the choice of which base image you are using is explicit. FROM registry.access.redhat.com/ubi7

Red Hat currently provides two main base images supported to be used for different use cases:

<p>RHEL Image</p> <ul style="list-style-type: none"> Defines the RHEL "platform" tier All standard RHEL packages Less than 200M Standard RHEL lifecycle Major & minor releases are preserved in the registry (similar to ISO) YUM package manager Standard RHEL binaries <p>GO TO RHEL IMAGE</p>	<p>Atomic Image</p> <ul style="list-style-type: none"> Minimal footprint 250M compressed TSMack disk Only latest minor release Removal of non-essential components (python, systemd, etc) Microdist package manager No SUID binaries <p>GO TO ATOMIC IMAGE</p>
--	--

The Red Hat Container Catalog provides namespaces, repositories, and tags to make it easy to consume images with the desired lifecycle. Here are some examples:

- Latest version of the current release: `rhel:latest`
- Latest version of a major release: `rhel:latest_rhel7`
- Latest version of a specific minor release: `rhel:latest_rhel7.3`

When a new Red Hat Enterprise Linux minor release is shipped we deprecate the older minor release version and mark it in the Red Hat Container Catalog accordingly including a pointer to the repository supported to be used instead. Minor release repositories are useful for standardizing at a point in time and are analogous to ISO images for RHEL.

All Red Hat Enterprise Linux Base Image variants listed below:

10 of 10 repositories belong to this category

Repository Name	Health Index	Push
<p>rhel6/ubi</p> <p>Red Hat Enterprise Linux by Red Hat, Inc.</p> <p>This platform image provides a minimal runtime to build, run and deploy Red Hat Enterprise Linux 7 applications as a container on a Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 7 Atomic host.</p> <p>4 days ago 7.3-82 Health A B C D E</p>	<p>4 days ago 7.3-82 Health A B C D E</p>	<p>↓ 75k</p>
<p>rhel6/ubi</p> <p>Red Hat Enterprise Linux 6.8 by Red Hat, Inc.</p> <p>This platform image provides a minimal runtime to build, run and deploy Red Hat Enterprise Linux 6 applications as a container on a Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 7 Atomic host.</p> <p>4 days ago 6.8-85 Health A B C D E</p>	<p>4 days ago 6.8-85 Health A B C D E</p>	<p>↓ 2k</p>

to find our Red Hat base images





RED HAT CONTAINER CATALOG

base | SEARCH

- Products - See all 4 Product results >
- Red Hat Container Development Kit
- Red Hat OpenShift Container Platform
- JBoss A-MQ
- Red Hat Virtualization
- Image Repositories - See all 85 Image Repository results >
- Base image with essential libraries and tools used as a base for builder images like perl, python, ruby, etc. - rhsci/s2r-base-rhel7
- Red Hat Enterprise Linux 7 - rhel7-atomic
- Red Hat Enterprise Linux 6 - rhel6/rhel
- RHMAP 4.3 Ngui - rhmap43/th-ngui
- Database & Data Management - Application Category
- Base Image / OS - Application Category

Image Repositories

Products

APPLICATION CATEGORY

- Container Platform / Management (3)
- Operating System (2)
- Mobile Application Development Platform (MADP) (20)
- Logging & Monitoring (15)
- Programming Languages & Runtimes (13)

PRODUCT

- Red Hat Enterprise Linux (52)
- Red Hat OpenShift Container Platform (42)
- Red Hat Mobile Application Platform (20)
- Red Hat OpenStack Platform (1)
- Other (8)

RELEASE CATEGORIES

- Generally Available (131)
- Tech Preview (18)

IMAGE ARCHITECTURES

- Containerized Product Component (73)
- Standalone Image (42)
- Builder Image (1)
- Base Image (9)

10 of 165 Res

Repository

rhel7/rhel
Red Hat E
This platfor
Red Hat Ent
Enterprise L

rhel7/kubernetes-controller-mgr Kubernetes Controller Manager by Red Hat, Inc.	10 days ago 1.5.2-4 Grade A	↓ 65k
rhceph/rhceph-13-rhel7 rhceph/rhceph-1.3-rhel7 by Red Hat, Inc.	5 months ago 1.3.3-3 Grade A	↓ 351
Red Hat Ceph Storage 1.3 (selectable daemon single image)		
jboss-datagrid-6/datagrid65-openshift JBoss Data Grid 6.5 by Red Hat, Inc.	2 months ago 1.2-29 Grade B	↓ 155k
JBoss DataGrid OpenShift		
jboss-webserver-3/webserver30-tomcat8-openshift JBoss Web Server 3.0 by Red Hat, Inc.	a month ago 1.2-22 Grade A	↓ 166k
Platform for building and running web applications on JBoss Web Server 3.0 - Tomcat v8		
rhsci/nodejs-4-rhel7 Node.js 4 by Red Hat, Inc.	9 days ago 4-11.15 Grade A	↓ 198k

You can search for:

- Images / Repos
- Products
- Image ID
- Advisory ID
- Categories
- Keywords
- etc.

Filter facets for multiple characteristics

Type-ahead contains products, repositories and app categories

Search results with key data





Joe

Architect

I want to see the key characteristics of an image.
Is there documentation available around an image?

1 Explore & Search

2 Evaluate & Select

3 Consume & Distribute

4 Use & Maintain

What are the environment variables defined inside the image?
I would like to learn how this images has been built.

Jane

Developer





RHEL Atomic Base Image

by [Red Hat, Inc.](#) | in Product [Red Hat Enterprise Linux](#)

[registry.access.redhat.com/rhel-atomic](#) Updated 5 days ago 7.3-19 : Health Index ▲

[Overview](#)[Get this image](#)[Tech Details](#)[Documentation](#)[Tags](#)

Description

The Red Hat Enterprise Linux 7 Atomic Base Image is designed to be a fully supported foundation for your custom developed applications which are built and updated rapidly, and don't require the extensive libraries or services in the operating system. This image is maintained by Red Hat and updated regularly, following the latest minor release cadence of Red Hat Enterprise Linux. It is designed for containerized applications that don't rely on a full, traditional Linux userspace, but wish to maintain complete runtime compatibility with RHEL. When used as the source for your containers, only one copy will ever be downloaded and cached in your production environment. Use this image just like you would a regular Red Hat Enterprise Linux distribution. Only a minimal set of tools are provided - components such as python, systemd, and yum are not included by default. Extra packages can be installed and updated with a simplified package manager called microdnf.

Application Categories: [Operating System](#)

Keywords: [base](#) [rhel7](#) [atomic](#)

▼ Hide Repository Specifications

Registry	registry.access.redhat.com
Namespace/Repository	rhel-atomic
Release Category	Generally Available
Repository Size	112.5 MB
Image Versions	4
Subscription Required	No

Most recent tag

[View All Tags](#)

Updated 5 days ago

7.3-19

Health Index

▲

Image Advisory

[RHBA-2017:1123](#)

▶ Show Image Specifications

overview page
shows most
relevant repository
and latest image
version data

additional tabs for
consumption
guidance, further
technical details,
surrounding
documentation
and tag index



Joe
Architect

I want to learn more how to consume and use this image.
Do I need a subscription or license to pull it?

1 Explore & Search

2 Evaluate & Select

3 Consume & Distribute

4 Use & Maintain

I want to pull this image, what do I need to do?
I'm using Red Hat Satellite 6, how can I sync the repository?

Jane
Developer





RHEL Atomic Base Image

by [Red Hat, Inc.](#) in Product [Red Hat Enterprise Linux](#)

[registry.access.redhat.com/rhel-atomic](#) Updated 11 days ago 🔍 7.3-15 : Freshness ▲

- Overview
- Get this image**
- Tech Details
- Documentation
- Tags

Choose your platform:

Red Hat Satellite

See [Acquiring Red Hat Container Images](#) for general information on acquiring images listed in the Red Hat Container Catalog. Select "Choose your platform" for specific acquire paths.

Satellite 6 supports two different ways to distribute container images to its managed hosts:

- A. **External Registries:** You can [configure external registries](#) by navigating to **Containers > Registries** in the Web UI of Satellite 6. Note that in this scenario Satellite 6 only triggers commands executed on the corresponding container host. This is a **pass-by** scenario because the image is neither pulled through Satellite 6 nor cached or stored inside Satellite 6. This also applies for the predefined external registry Docker Hub while [creating a new container](#).
- B. **Local Content:** Red Hat Satellite allows you to [import / synchronize images from local and external registries](#). Satellite itself can act as an image registry for hosts. However, hosts cannot push changes back to the registry.

In this document we describe how to use Satellite 6 to synchronize external image repositories (**local content, scenario B**).

1 Prerequisites

- Before container images can be synchronized into Satellite 6 the following prerequisites have to be met:
- Red Hat Satellite 6 has been installed following the [Satellite 6 Install Guide](#)
 - [Subscription Manifest](#) created and uploaded to Satellite 6 to access content
 - For CLI Users only: [hammer CLI installed and configured](#)

2 Creating a Custom Product

consumption guidance for different container runtime env's and registries

consumption details including copyable command lines





Carl
Security

I want to see which updates are applicable to an image used by us
I want to see an actionable result for applicable security updates

1 Explore & Search

2 Evaluate & Select

3 Consume & Distribute

4 Use & Maintain

I want to get a list of all images associated with an advisory ID
I want to see an aggregated and simple freshness description

Jane
Developer



**Jane**
Developer

How can I get more details around an image I'm using?

```
[root@dherrman ~]# docker images | grep nodejs
registry.access.redhat.com/rhscsl/nodejs-4-rhel7 4-11.14
bf9f9320b3d2 9 weeks ago 444 MB
[root@dherrman ~]#
```

Red Hat Container Catalog

Image Repositories - See all Image Repository results

Platform for building and running Node.js 4 applications - rhscsl/nodejs-4-rhel7

Tag Name	Date Pushed	Image Advisory	Health Index	Docker Image ID
4-11.16	4 days ago	RHBA-2017:1127	A	9e8704e70637
4-11.15	16 days ago	RHBA-2017:0975	C	79b2e9f6829e0
4-11.14	2 months ago	RHBA-2017:0404	C	bf9f9320b3d2
4-11.13	3 months ago	RHBA-2017:0174	C	6a532adb1abf

1

Get the image ID using CLI or registry UI

2

Use the container catalog search to find the image

3

Select the right image version and explore details

[Technologies](#)[Services & support](#)[Success stories](#)[About Red Hat](#)

INVESTOR RELATIONS

Press releases

Red Hat Sets New Standard for Trusted, Enterprise-Grade Containers with Industry's First Container Health Index

MAY 02, 2017

Red Hat extends container inspection and tooling to ISV partner ecosystem; provides customers with enhanced security, reliability and support for deploying Linux containers at scale

BOSTON--(BUSINESS WIRE)-- Red Hat, Inc. (NYSE:RHT), the world's leading provider of open source solutions, today introduced the industry's first Container Health Index, setting a new standard for enterprise-grade Linux containers. Based upon Red Hat's track record of delivering enterprise-grade open source technologies, including the world's leading enterprise Linux platform, the Container Health Index provides the most comprehensive image detail of any enterprise container service. The index grades all of Red Hat's containerized products as well as the Red Hat base layer of containers from certified independent software vendor (ISV) partners, with Red Hat planning to certify containerized products from 20 ISVs within the next 90 days.

While container-based applications have begun moving into production, not all containers are created or maintained equally. Every container starts with a Linux base layer, which means that every ISV building container images is distributing Linux content. For these containers to be used in production environments, this content needs to be free from known

Red Hat Registry Stats

- 227 repositories
- 2,169 images
- 542,525 RPMs



images are static content bundles

but

security issues emerge frequently

Red Hat Security Statistics 2016

- 3134 advisories
- 5075 unique CVEs
- 2016: 97 crit RHSA



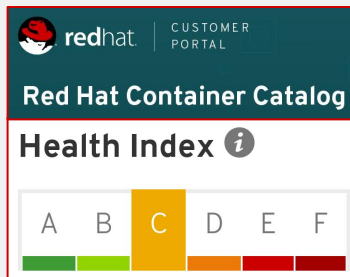
health index indicators

age of the image

unapplied updates

Developed as a **cross-team effort** leveraging Red Hat's Security expertise

Single item status (grade A-F) as an aggregated indicator of container health



Leveraging **Red Hat security data** (advisories) for RPMs and images

Actionable scan results (RPM, Image)



Red Hat Container Catalog

bf9f9320b3d2

SEARCH

Explore Get Started FAQ

Platform for building and running Node.js 4 applications

by Red Hat, Inc. | in Product Red Hat Enterprise Linux

registry.access.redhat.com/rhscsl/nodejs-4-rhel7 Updated 4 days ago 4-11.16 :Health Index A

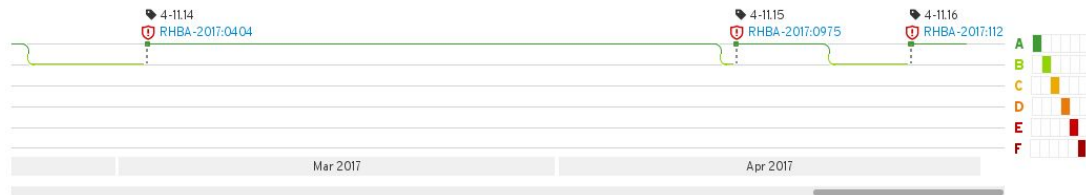
Overview

Get this image

Tech Details

Documentation

Tags



Container Health Index history

list of all image versions inside this repository

Tag Name	Date Pushed	Image Advisory	Health Index	Docker Image ID
4-11.16 4 latest	4 days ago	RHBA-2017:1127	A	9e8704e70637
4-11.15	16 days ago	RHBA-2017:0975	C	79b2e96829e0
4-11.14	2 months ago	RHBA-2017:0404	C	bf9f9320b3d2
4-11.13	3 months ago	RHBA-2017:0174	C	6a532adb1abf

key version attributes



Carl
Security

What is the associated risk with the content inside the image?

warning if
non-current
image version

Security Package List Dockerfile

Updated image available. Red Hat strongly recommends updating to the newest image version [4-11.16](#) unless otherwise defined by the [support policy](#) of Platform for building and running Node.js 4 applications.

Health Index ⓘ

This image is affected by Critical (no older than 30 days) or Important (no older than 90 days) security updates.

6 security vulnerabilities affecting 7 packages

Critical	1	█
Important	1	█
Moderate	4	█████
Low	0	

Unprivileged Image ⓘ
This image does not require elevated capabilities.

Container Health
Index based on
applicable security
updates and its age

vulnerabilities by
advisory severity

privilege
requirements



Carl
Security

How can I get rid of those vulnerabilities ?

Affected Packages

7 of 528 packages have security-related updates

Search affected packages

Impact	CVE ID	Affected Package	RPM Advisory	Fixed in Image
Critical	CVE-2017-5461	nss-util-3.21.3-1.el7_3.x86_64	RHSA-2017:1100	4-11.16
Critical	CVE-2017-5461	nss-sysinit-3.21.3-2.el7_3.x86_64 nss-tools-3.21.3-2.el7_3.x86_64 nss-3.21.3-2.el7_3.x86_64	RHSA-2017:1100	4-11.16
Important	CVE-2017-2636	kernel-headers-3.10.0-514.10.2.el7.x86_64	RHSA-2017:0933	4-11.16

Red Hat
advisory severity

CVE ID

content advisory
which contains fix

newer image version
which contains fix

What's next?

Upcoming features of future Red Hat Container Catalog releases

- Ecosystem content incl. Red Hat Certified and OpenShift Primed
- Additional acquire paths, image usage documentation
- OpenShift on-premise / Online enhancements
- Subscribe to notifications for products, images and categories for new images, image versions, advisories, freshness grade changes
- Subscriptions / licenses, support policies, FOSS license compliance

Try it out: <https://access.redhat.com/containers>

You have feedback?
An idea or feature request?

Let's meet at our **User Experience Design** booth.



Partner Pavilion
Exhibit Hall A

RED HAT
SUMMIT

ATOMIC STATE OF THE UNION

Lightning Talk: The latest and greatest in Red Hat's
container initiative

Mike McGrath
Platform Engineering
May 4th, 2017

WAT?

What is Atomic (for the uninitiated)

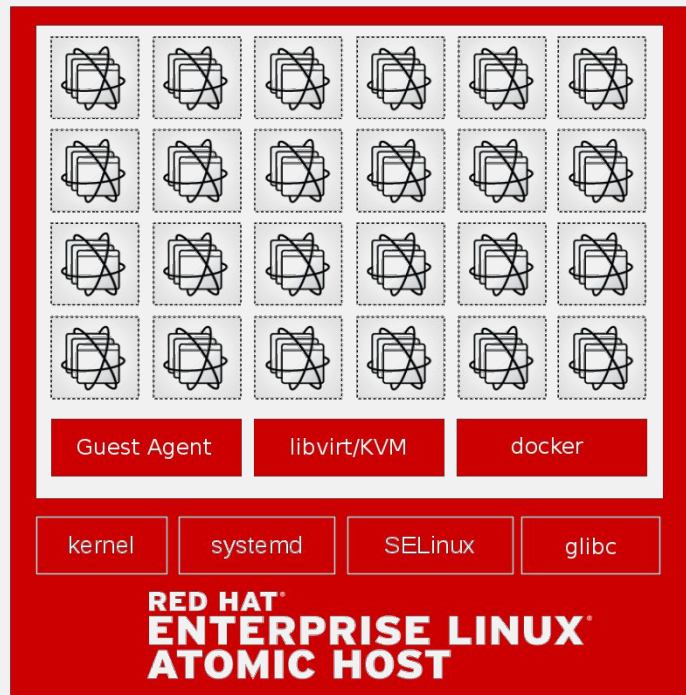


Atomic Host

A faster moving, purpose built host

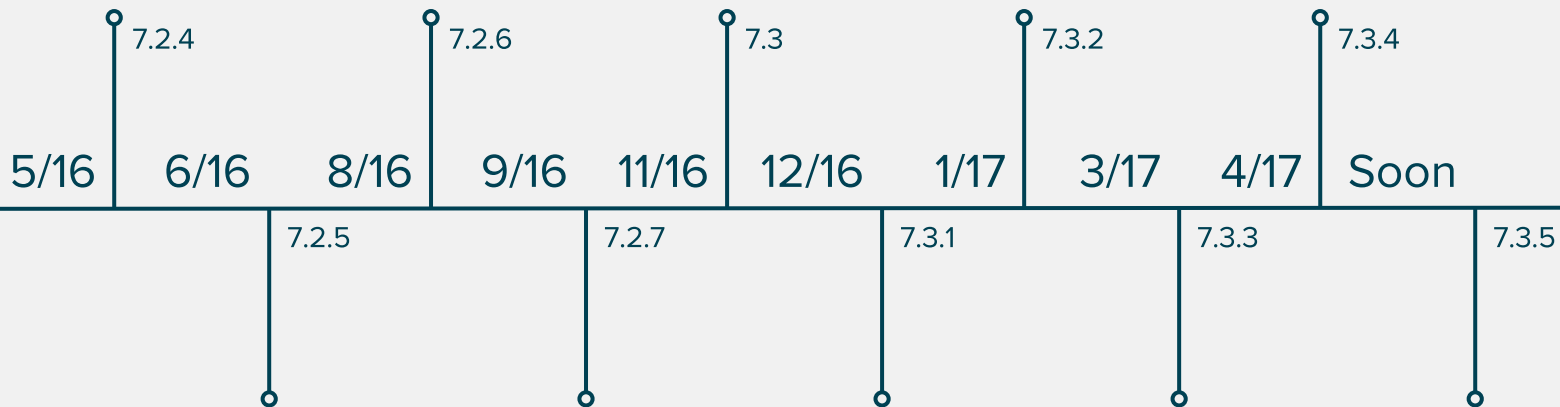
Making Atomic Host modular and further isolating software stacks from OS Updates

- Built for containers, hypervisors, embedded systems, storage & network appliances, etc
- rpm-ostree only
 - Highly secure read-only OS (/usr)
 - Reliable upgrade & rollback
 - Flexibility via host extension model



Releases

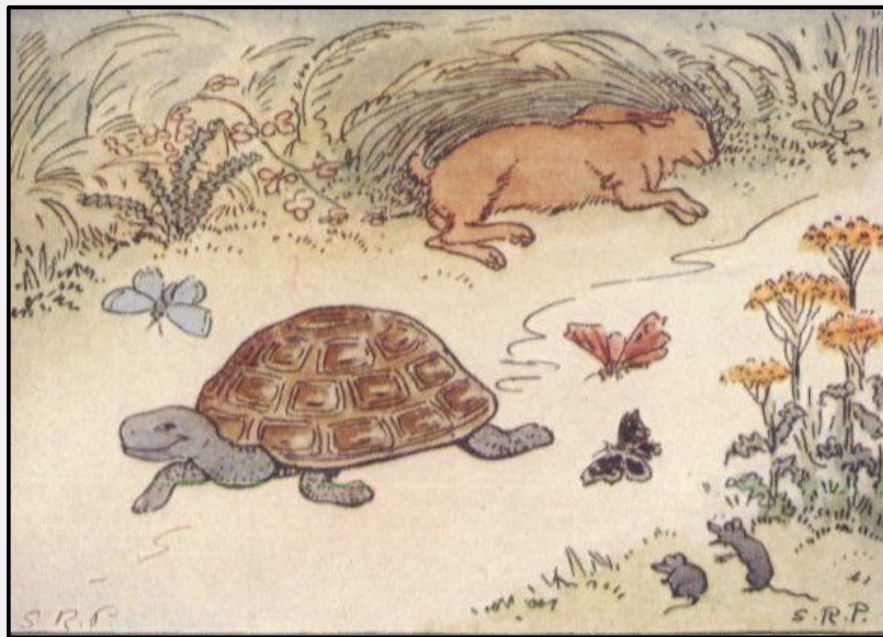
We've been averaging one release about every 5-6 weeks



* Excludes asynchronous security updates

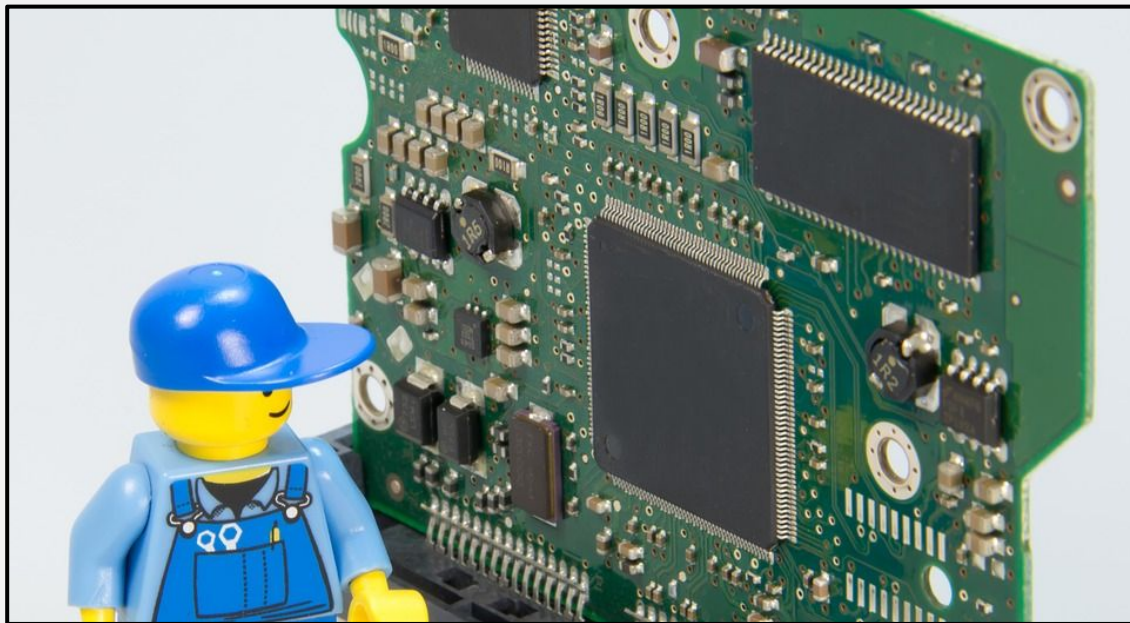
Multi-Docker

Some thought we were going too fast, others thought to slow!



OSTree Unlock

Others wanted easier ways to troubleshoot Atomic Hosts



Devmode

Developers asked for an easier way to use Atomic on their workstation

```
Fedora 23 (Twenty Three) 23 (ostree)
Fedora 23 (Twenty Three) Developer Mode
```

The screenshot shows a 'SERVER' storage management interface. At the top, there are tabs for 'Hosts', 'jabba', and 'Storage'. Below the tabs are two graphs: 'Reading' at 431.4 KB/s and 'Writing' at 20.3 MB/s. A 'Filesystems' table is displayed below the graphs. To the right, there are sections for 'RAID Devices', 'Volume Groups', and 'Drives'.

Name	Mount Point	Size
/dev/fedora-server/root	/var/lib/docker/devicemapper/	4.8 / 13.3 GB
raid5	/export	0.6 / 7.9 TB
/dev/sdf2	/boot	108.8 / 499.4 MB

RAID Devices

md0	7.3 TB
-----	--------

Volume Groups

fedora-server	14.2 GB
---------------	---------

Drives

WDC WD2003FYY5-02W0B0 (WD-WMAY02840973)
1.8 TB Hard Disk
R: 32.0 KB/s W: 4.0 MB/s

Features

In fact, we've had more than 85 significant features introduced in the last year

- Multiple Docker Versions
- OSTree Unlock
- Package Layering
- Runc
- Skopeo
- Devmode
- System Containers
- MicroDNF
- Containerized Kubernetes

RED HAT[®]
ENTERPRISE LINUX[®]
ATOMIC HOST

Fedora Atomic Host

At the start of the year we started targeting a release every two weeks (compared to Fedora's 2 times per year cadence)

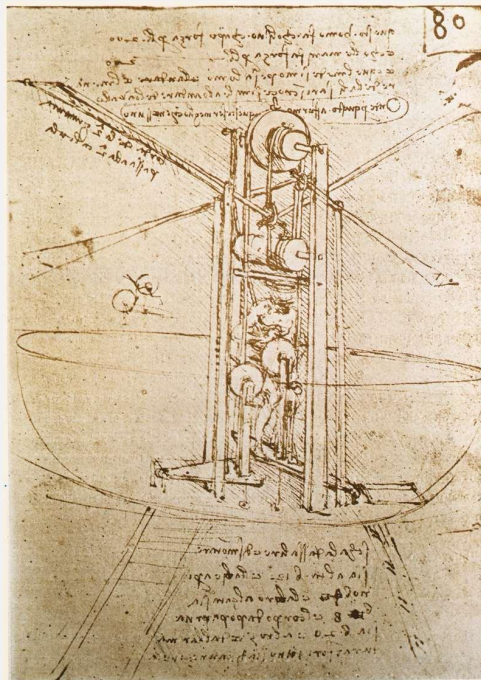
See things first in Fedora!

- 18 releases in the last year
- That's almost one release every three weeks!



Upstream Efforts

- SELinux support with OverlayFS
- POSIX compliance for OverlayFS
- user namespaces
- Shiftfs
- Container live migration
- OpenShift Origin on CentOS and Fedora Atomic Host
- Ongoing containerization



Credits

- Tortoise and hare - https://commons.wikimedia.org/wiki/File:The_Tortoise_and_the_Hare_-_Project_Gutenberg_etext_19993.jpg
- Lego Man - https://pixabay.com/p-499799/?no_redirect
- Confused - <https://www.flickr.com/photos/83633410@N07/7658298768>

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GPL IN THE WORLD OF CONTAINERS

David Levine
Vice President and Assistant General Counsel

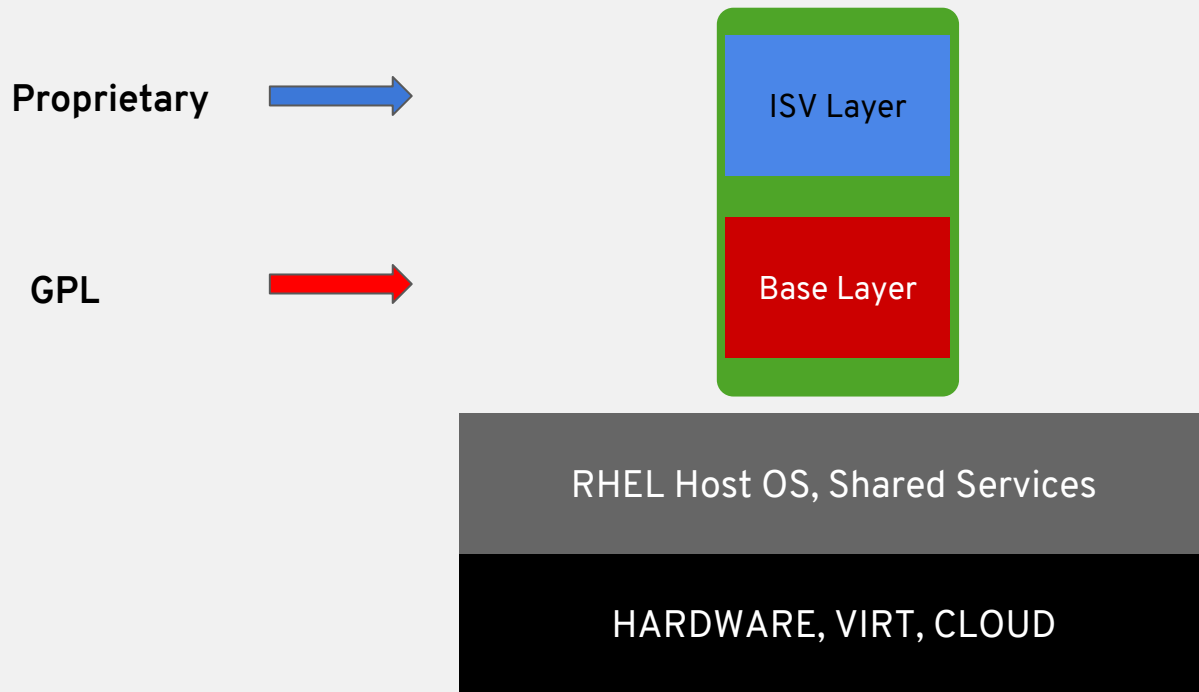
Richard Fontana
Senior Commercial Counsel
May 4, 2017

GPL and Copyleft Basics

Copyleft Scope: Single Container Image

Does the combination of GPL and non-GPL software in a single container image create a single program or a derivative work and, therefore, implicate GPL copyleft?

Copyright Scope: Single Container Image



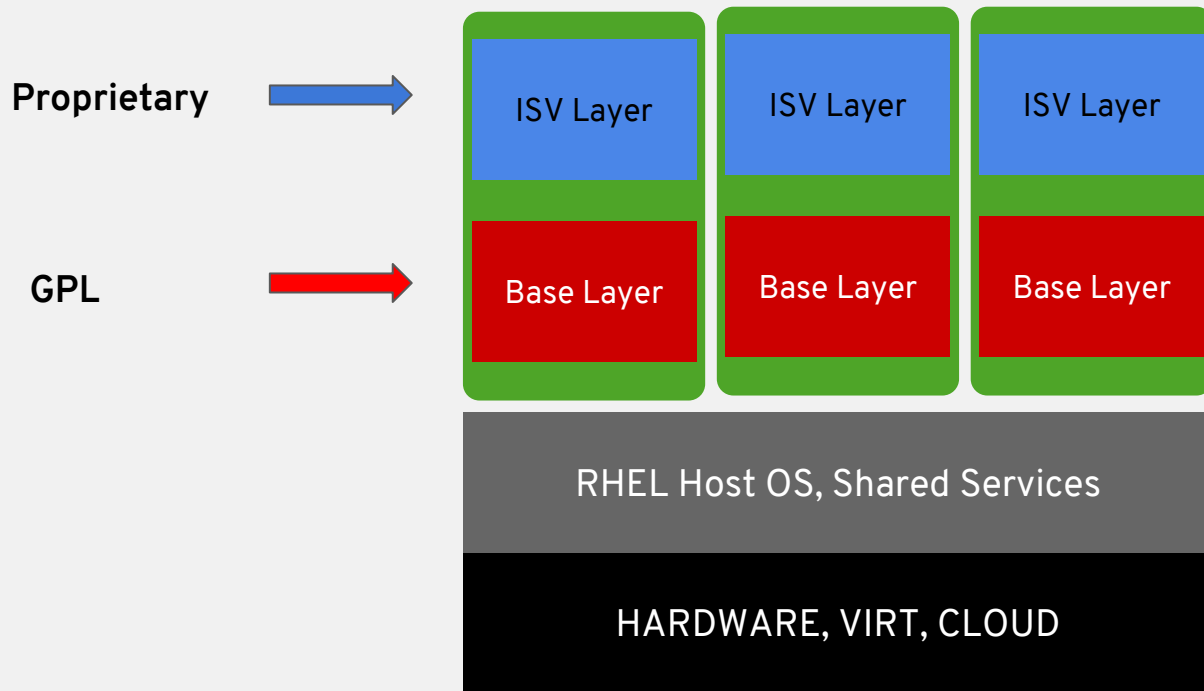
Copyleft Scope: Single Container Image

- Base layers of images contain GPL-licensed code
- Upper layers contain proprietary ISV app
- GPLv2: mere aggregation clause; GPLv3 "Aggregate"
- Assembly of software into container images does not raise any special GPL copyleft scope issue
 - Container image format uses established packaging (tar format)
 - Share characteristics with RPMs, VM images
 - No basis for analyzing container images differently from past Linux stack distribution media for purposes of GPL copyleft scope

Copyleft Scope: Multiple Containers

Can software in one container fall within GPL copyleft scope of software in another container?

Copyleft Scope: Multiple Containers



Copyleft Scope: Multiple Containers

- While decomposition into multiple containers is not itself a guarantee, containerization makes technical boundaries between components more apparent and provides a strong indication of 'separateness'.
 - Software in separate containers runs in separate processes, and a process boundary is an indicator of GPL copyleft scope.
 - FSF contrasts:
 - software linked and running in a shared address space (in same copyleft scope)
 - communicating over Unix pipes (separate from a copyleft perspective)
 - Multi-container applications: more like pipes - separate



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