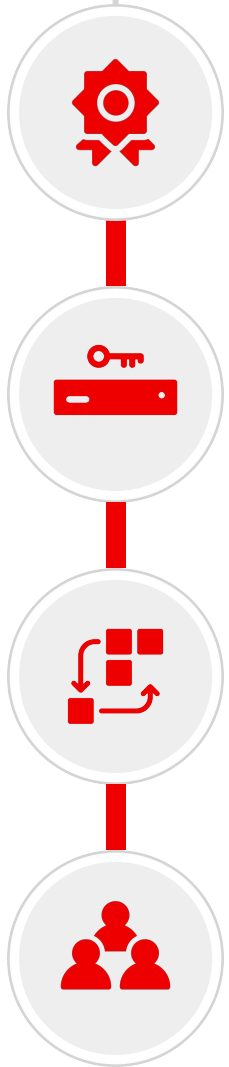
RED HAT QUAY

Red Hat Quay



Industry-leading, **trusted, and open source registry platform** operating at scale since 2014

Built to **efficiently manage content** under governance and security **controls** globally

Runs **everywhere**, easy to **integrate** and **automate** but works best with **OpenShift**

Developed in **collaboration** with a broad open source, customer, and ecosystem **community**

Red Hat Quay Key Features

SCALABILITY

Massive Scale Testing Quay.io
Real Time Garbage Collection
Automated Squashing

BUILD AUTOMATION

Seamless Git Integration
Build Workers
Webhooks

INTEGRATION

Extensible API
Webhooks, OAuth
Robot Accounts

REGISTRY

High Availability
Full Standards / Spec Support
Long-Term Protocol Support
Application Registry
Enterprise Grade Support
Regular Updates

SECURITY

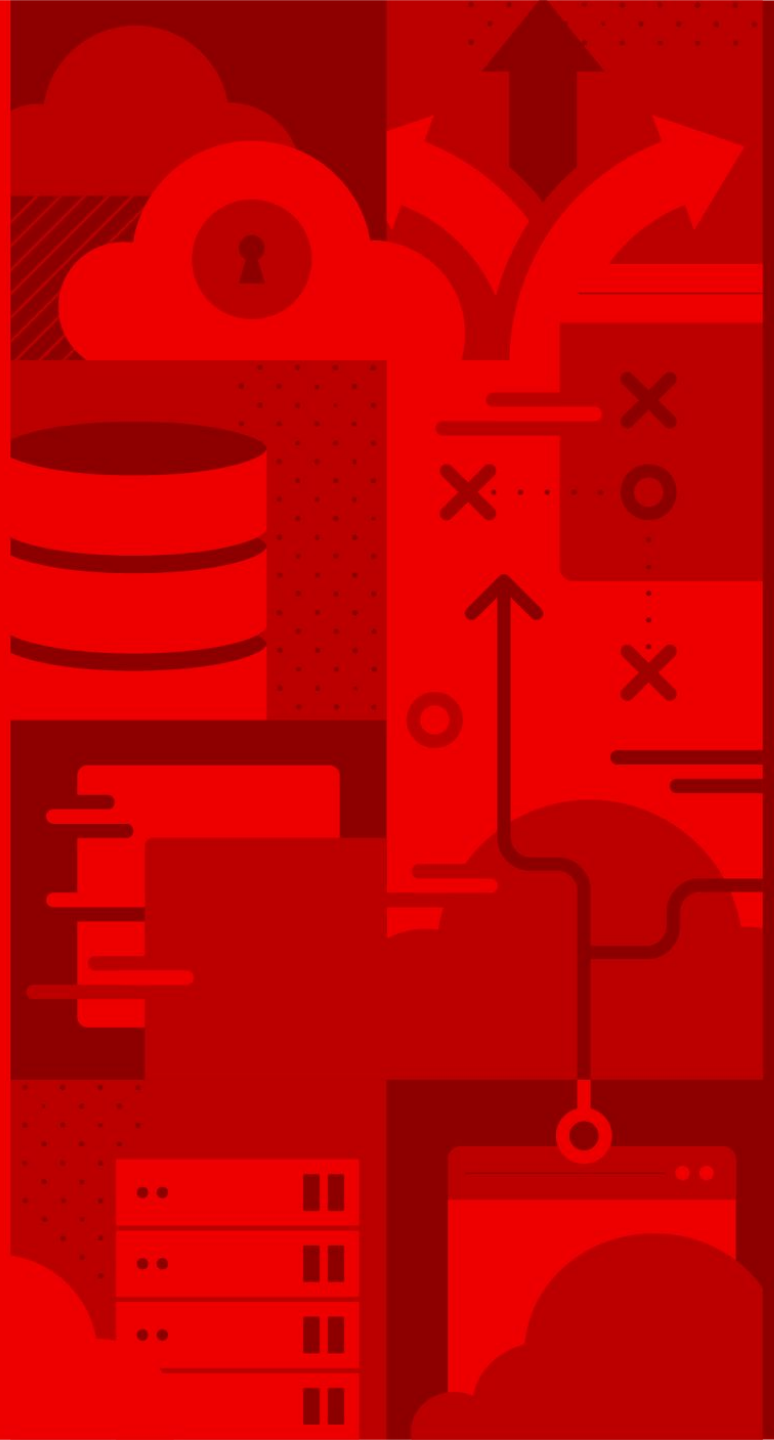
Vulnerability Scanning
Logging & Auditing
Notifications & Alerting

CONTENT DISTRIBUTION

Geo-Replication
Repository Mirroring
Air-Gapped Environments

ACCESS CONTROL

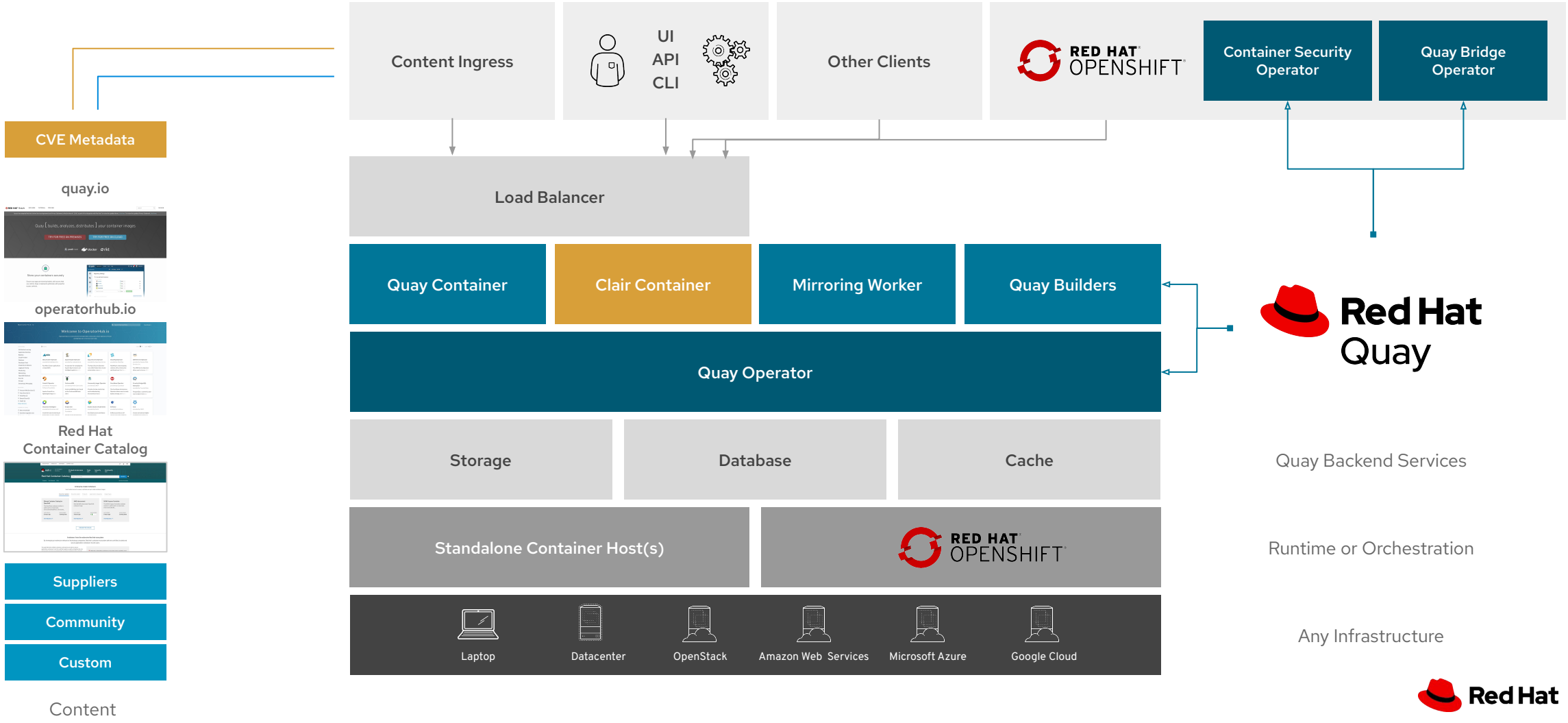
Authentication Providers
Fine-Grained RBAC
Organizations & Teams



Quay Architecture

Red Hat

Red Hat Quay Architecture



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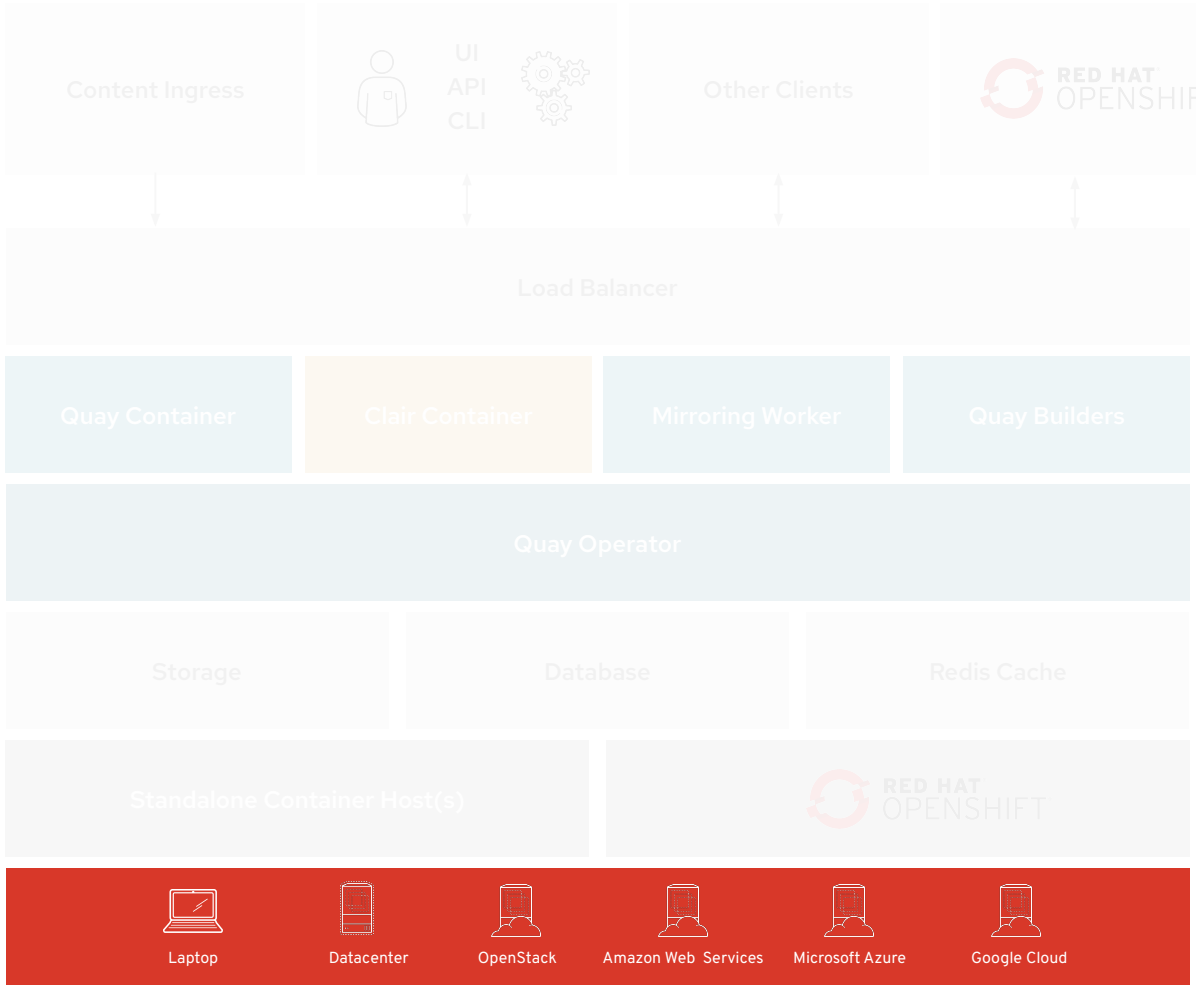
Prerequisite: Infrastructure



Quay runs on any* physical or virtual infrastructure both on-premise or public cloud**

Quay scales from an all-in-one setup on a developer laptop over running highly available on OpenShift up to geographically dispersed setup across multiple availability zones and regions

Recommendation: if Quay runs on public cloud -> use the public cloud services for Quay backend services to ensure proper HA and scalability

* Further details can be found in the Quay 3.x tested configuration matrix: https://access.redhat.com/articles/4067991

** Further details can be found in the Quay Support Policy: https://access.redhat.com/support/policy/updates/rhquay/policies

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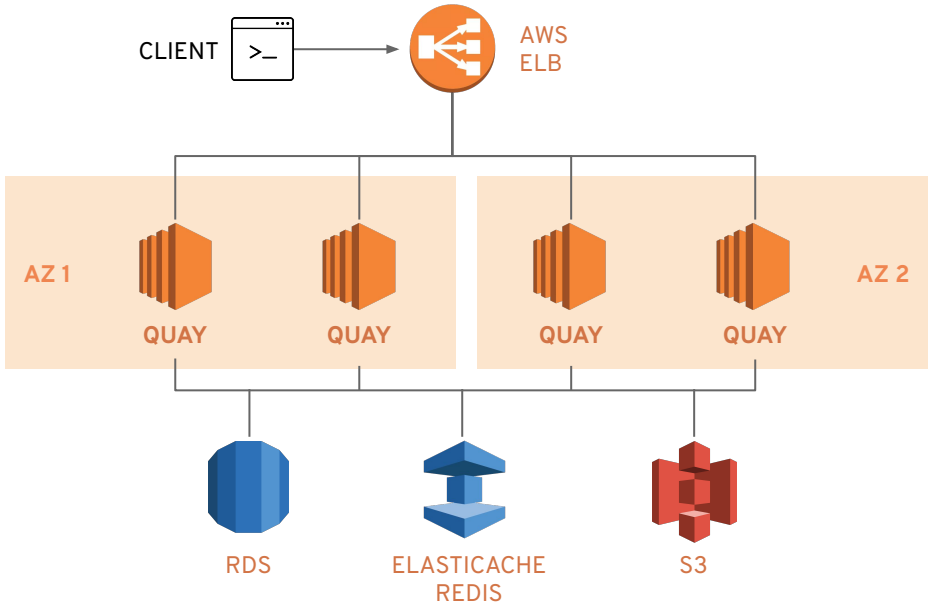
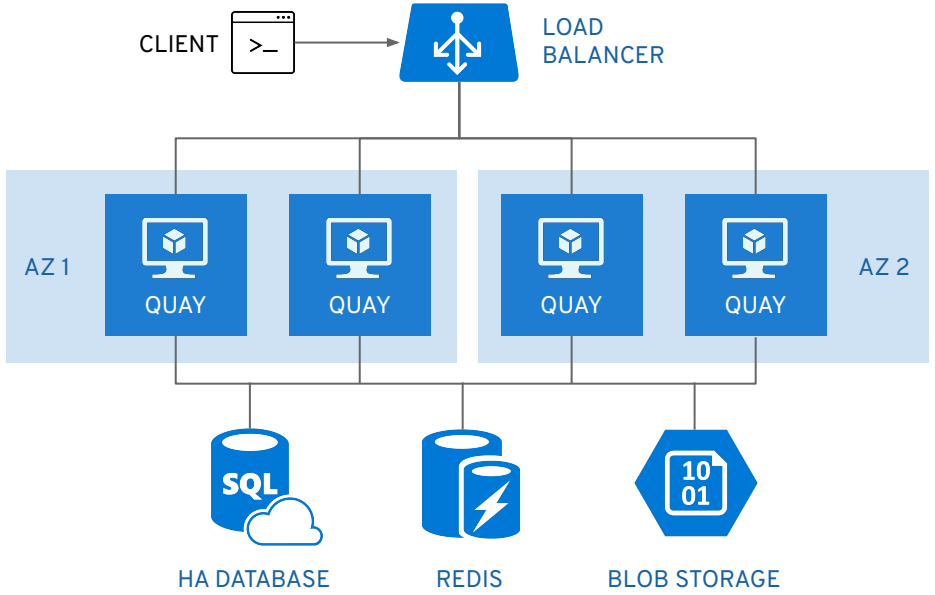
Running Red Hat Quay on Public Cloud

Full list of tested and supported configurations can be found inside the Red Hat Quay Tested Integrations Matrix: https://access.redhat.com/articles/4067991



If Quay runs on AWS you can use:

- AWS Elastic Load Balancer
- AWS S3 (hot) blob storage
- AWS RDS database
- AWS ElastiCache Redis
- EC2 VMs recommendation: M3.Large or M4.XLarge



If Quay runs on MS Azure you can use:

- Azure managed services such as HA PostgreSQL
- Azure Blob Storage must be hot storage (not Azure Cool Blob Storage)
- Azure Cache for Redis

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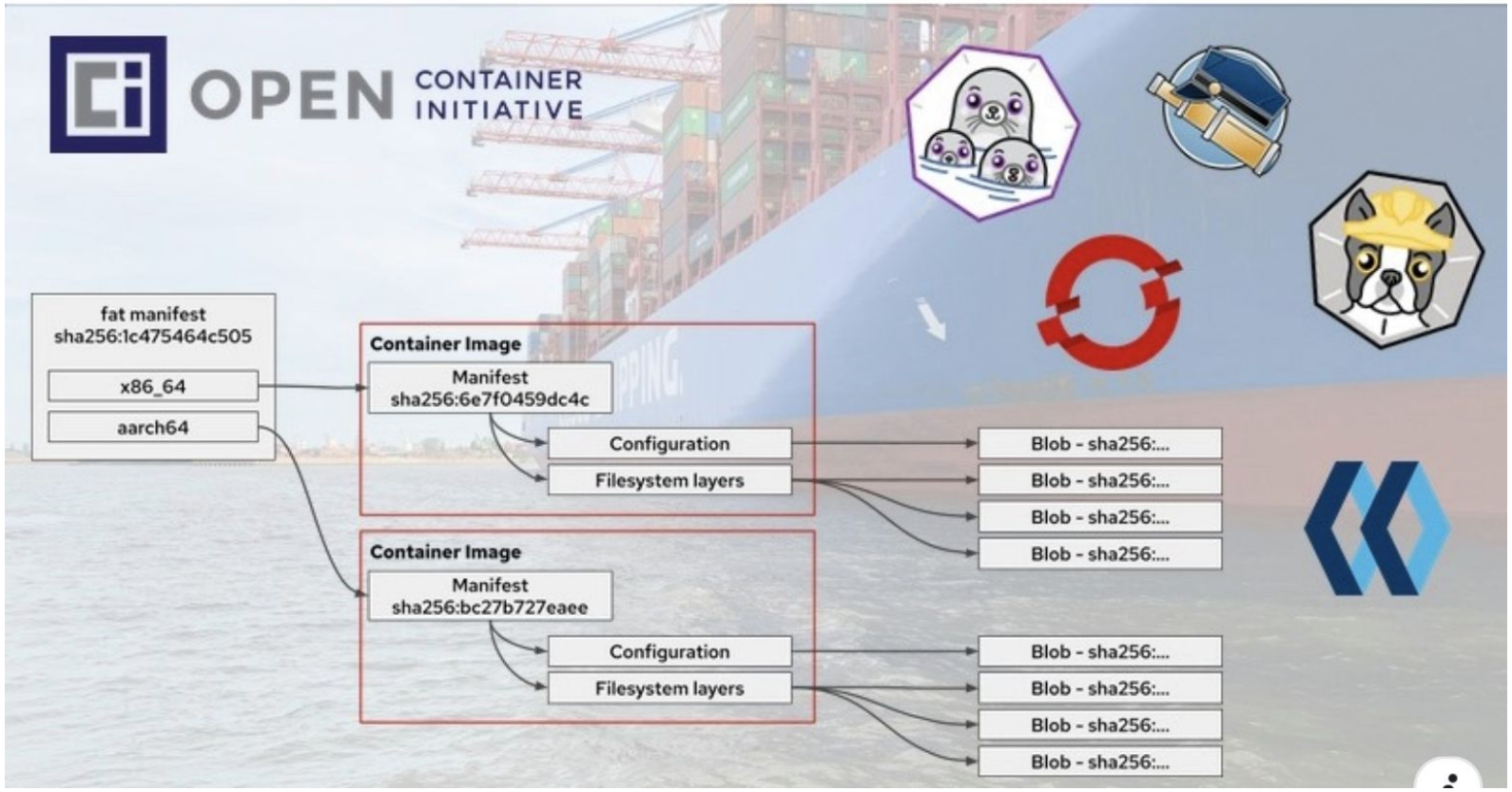
Multi Architecture Containers



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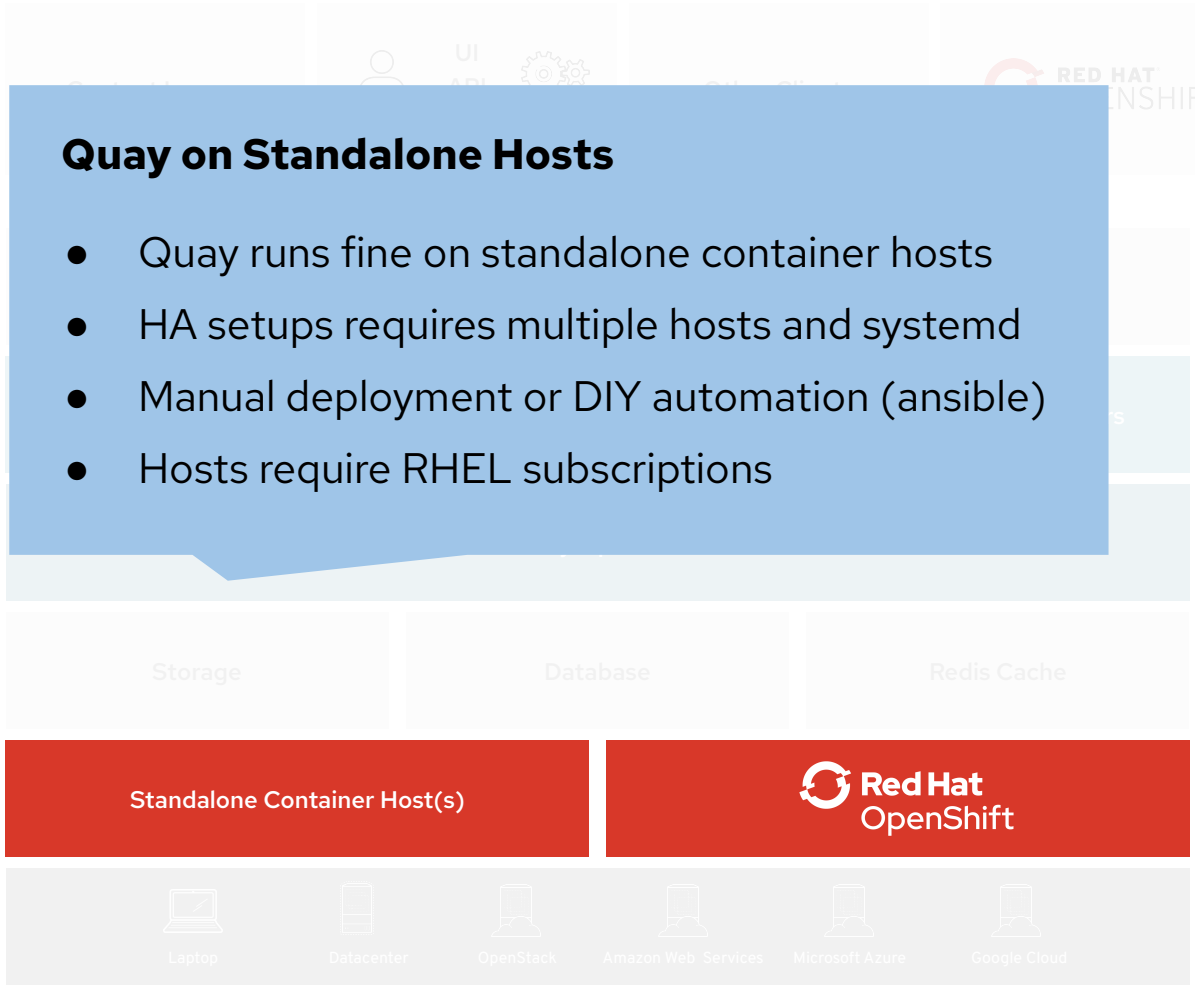
Prerequisite: Container Runtime or Orchestration



Quay on Standalone Hosts

- Quay runs fine on standalone container hosts
- HA setups requires multiple hosts and systemd
- Manual deployment or DIY automation (ansible)
- Hosts require RHEL subscriptions

Benefits of running Quay on OpenShift:

- Run Quay where you run all other container workloads and services
- Seamless deployment and day2 management of Red Hat Quay via the Quay operator and OLM
- Leverage all orchestration and management capabilities of Red Hat OpenShift incl. Operator Lifecycle Mgt (OLM), monitoring, dashboards, ...
- Quay can run on OpenShift infra nodes (no further subscriptions required)

Full list of tested and supported configurations can be found inside the Red Hat Quay Tested Integrations Matrix: https://access.redhat.com/articles/4067991

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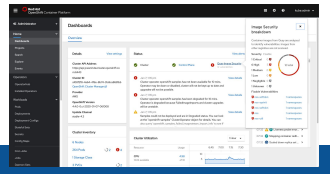
Red Hat Quay works best with OpenShift

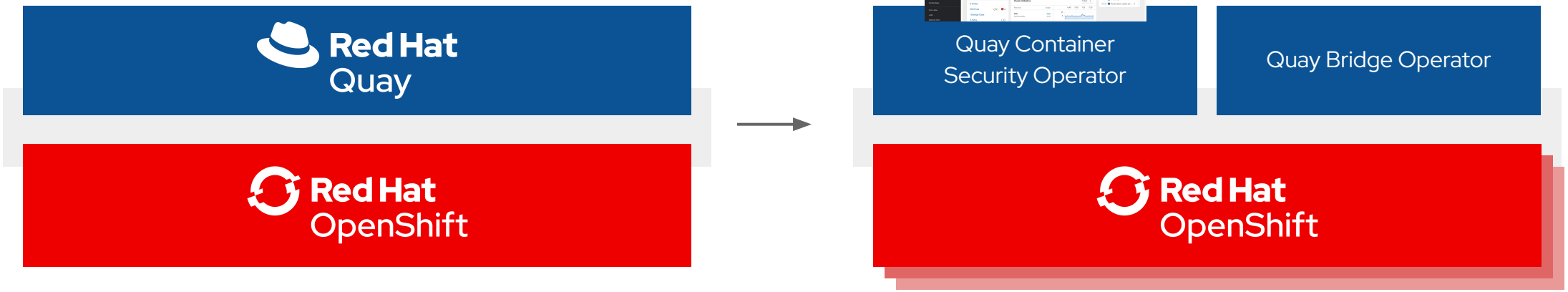
Red Hat Quay runs on any infrastructure but **runs best on OpenShift**

The **Quay Operator** ensures seamless deployment and management of Quay running on OpenShift

CSO brings Quay / Clair vulnerability data into the OpenShift Console



The **Quay Bridge Operator** ensures seamless integration and user experience for using Quay **with** OpenShift



Quay serves content to **one or many OpenShift clusters**, wherever they're running.

With or without using the OpenShift internal registry but leveraging all OpenShift capabilities.

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Benefits of running Quay on OpenShift

- **Zero to Hero** - Simplified deployment of Quay and associated components means that you can starting using the product immediately
- **Scalability -** Leverage cluster compute capacity to manage expected demand
- **Simplified Networking** - Diverse ingress options using well established patterns for any application deployed on the platform
- **Centralized configuration management** - Configurations stored in etcd provide a centralized source of truth
- **Repeatability** - Consistency regardless of the number of replicas of Quay / Clair
- **Expanded Options** - Additional solutions that are specifically designed to take advantage of an OpenShift deployment

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Quay Sizing Recommendations

- Scalability of Quay is one of its key strengths since the same code base runs on a developer laptop with a PoC sizing, as a typical mid-size deployment with ~2,000 users serving content to dozens of kubernetes clusters up to thousands of clusters world-wide (Quay.io)
- As for any other product there are no “typical sizing recommendations” since sizing heavily depends on a multitude of factors (no of users / images / concurrent pulls and pushes, etc.)
- **Stateless** components can be **scaled-out** (will cause more load on backend services though)
  - Auto-scaling on k8s deployments currently tech-preview, future via Quay operator
  - Note: Scaling out stateless components will add load to stateful components
- **Minimum** requirements as documented in the Quay Product Docs:
  - Quay: min 4GB, recommended 6GB, 2 or more vCPUs
  - Clair: recommended 2GB RAM, 2 or more vCPUs
  - Clair database requirements for security metadata: min 200MB
  - Storage depends on no of images, recommended min 30GB

Quay Sample Sizings

Note: Those are sample sizings of existing Quay deployments. Whether a specific deployment runs fine with the same metrics depends on too many other factors as well not shown here.

Metric	Minimum Setup	Mid/Large Setup	XXXXL (Quay.io)
No of Quay containers by default	1	4	15
No of Quay containers max at scale-out	N/A	8	30
No of Clair containers by default	1	3	10
No of Clair containers max at scale-out	N/A	6	15
No of mirroring pods[1] (to mirror 100 repos)	1	5-10	N/A
Database sizing		4-8 Cores / 6-32 GB RAM	32 cores 244GB, 1+ TB disk
Storage Backend Sizing	10-20 GB	1 - 20 TB	50+ TB up to PB
Redis Cache Sizing[2]		2 Cores / 2-4 GB RAM	4 cores / 28 GB RAM
Underlying node sizing (phys or virtual)	2-4 Cores / 6 GB RAM	4-6 Cores, 12-16 GB RAM	Quay: 13 cores 56GB RAM Clair: 2 cores 4 GB RAM

[1] see repository mirroring section for further details on sizing & related recommendations

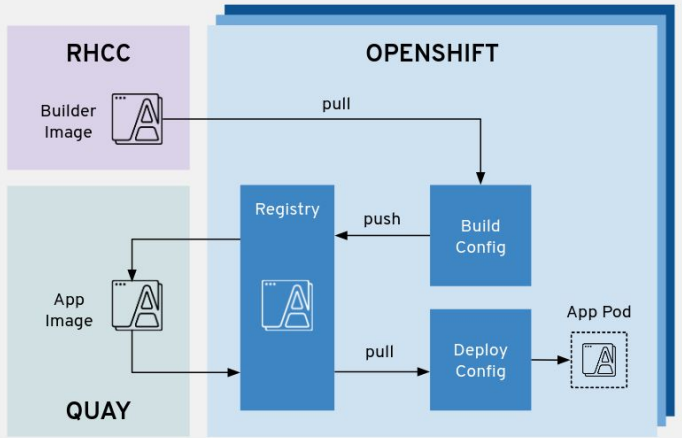
[2] since Redis cache is only used for Quay builders the sizing can be very tiny if builders aren't used

Using Quay With or Without Internal Registry

- Quay can be used as an external registry in front of an entire OpenShift cluster with its registry
- Quay also can be used directly without using the internal registry which requires a couple of changes (secrets, build and deployment configs) which are **partially** done automatically by QBO

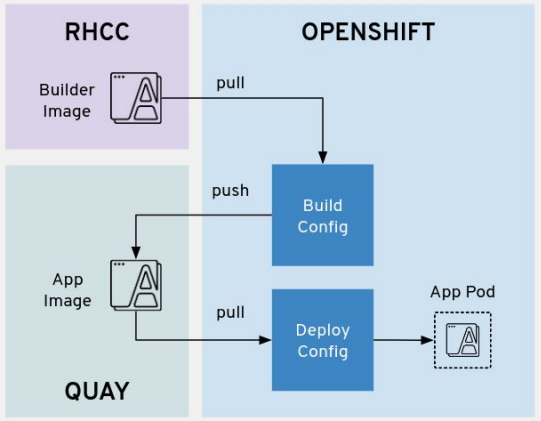
Quay as Upstream Registry with OpenShift

- Images pulled from Quay into the integrated OpenShift registry
- Images are pushed to the integrated OpenShift registry, and synced externally with Quay



Quay as OpenShift Registry

- Images are pushed directly by builds to Quay
- Images are pulled directly from Quay



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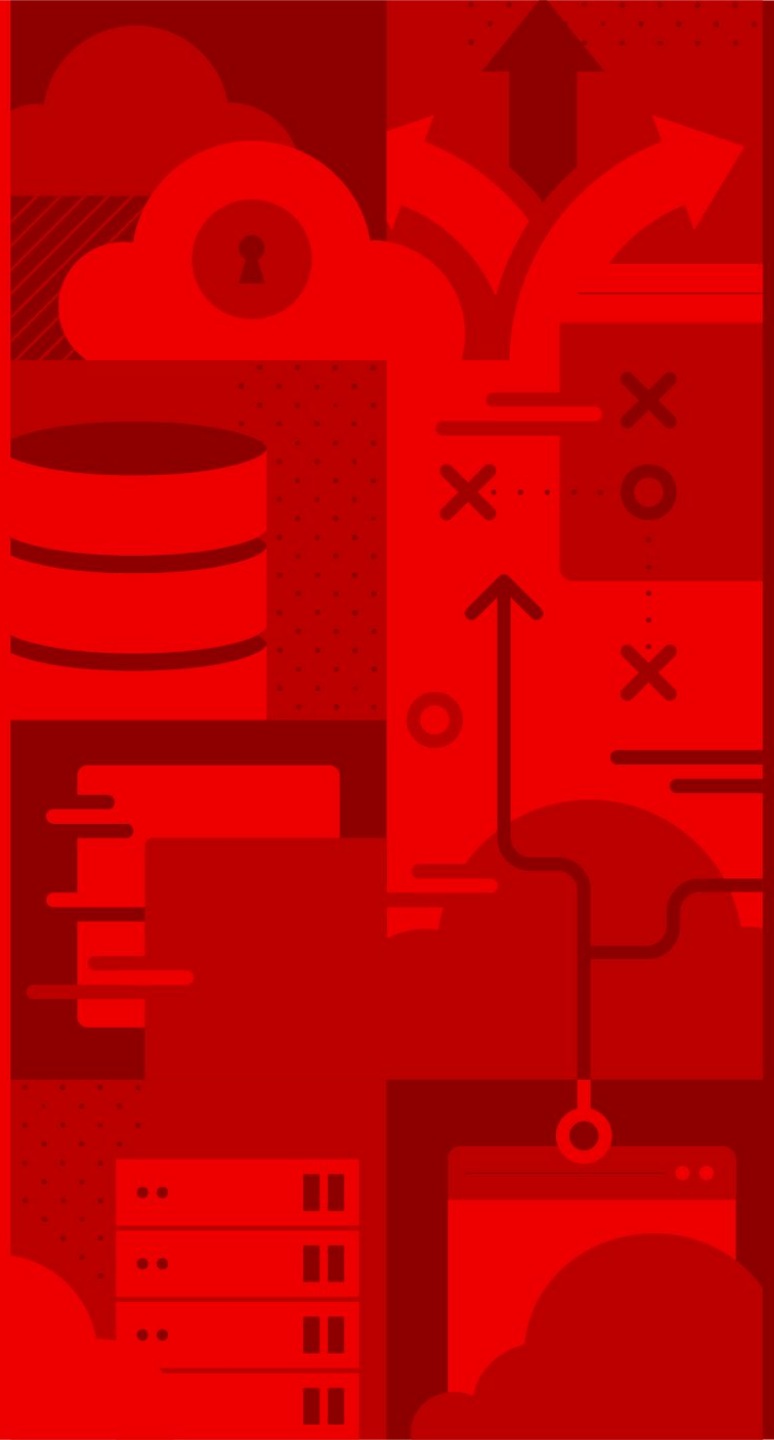

Built-In Vulnerability Scanning via Clair

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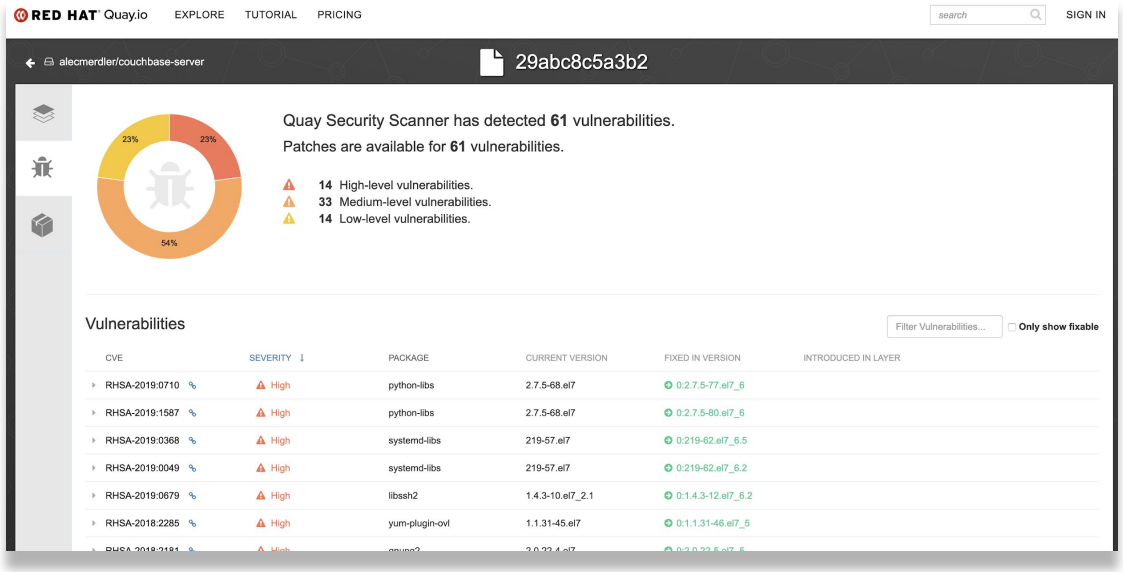
Clair Overview

- Clair is an open source tool for static analysis of vulnerabilities in application containers
- Developed by CoreOS for Quay and it's massive scale usage at Quay.io
- Used by various other projects and third party products
- Upstream Repositories: https://github.com/quay/clair



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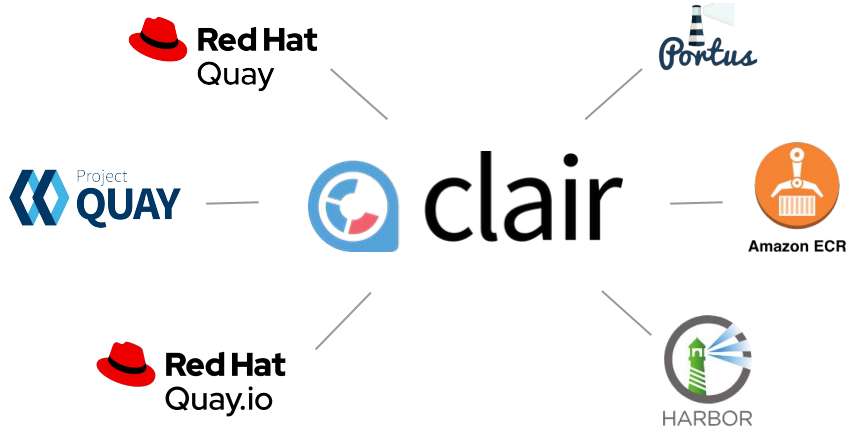
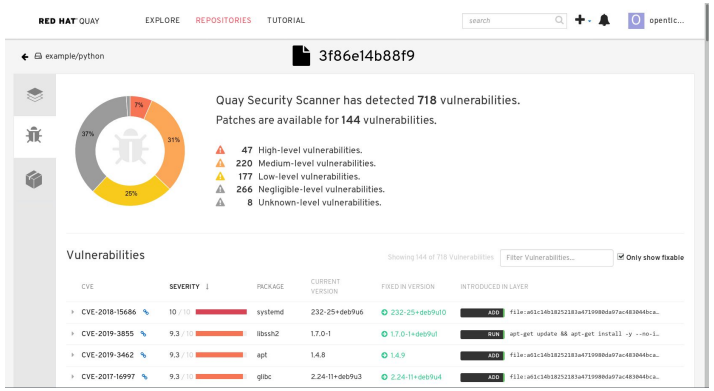
clair v4





Clair v4 (Tech Preview with Quay 3.3)

Clair v4 is the newest version of Clair after a massive refactoring in order to make several big enhancements possible. This includes:

- Support for programming language package managers (3.3: python)
- immutable data model & new manifest-oriented API
- Refocus on latest container specifications (OCI) (Content addressability)

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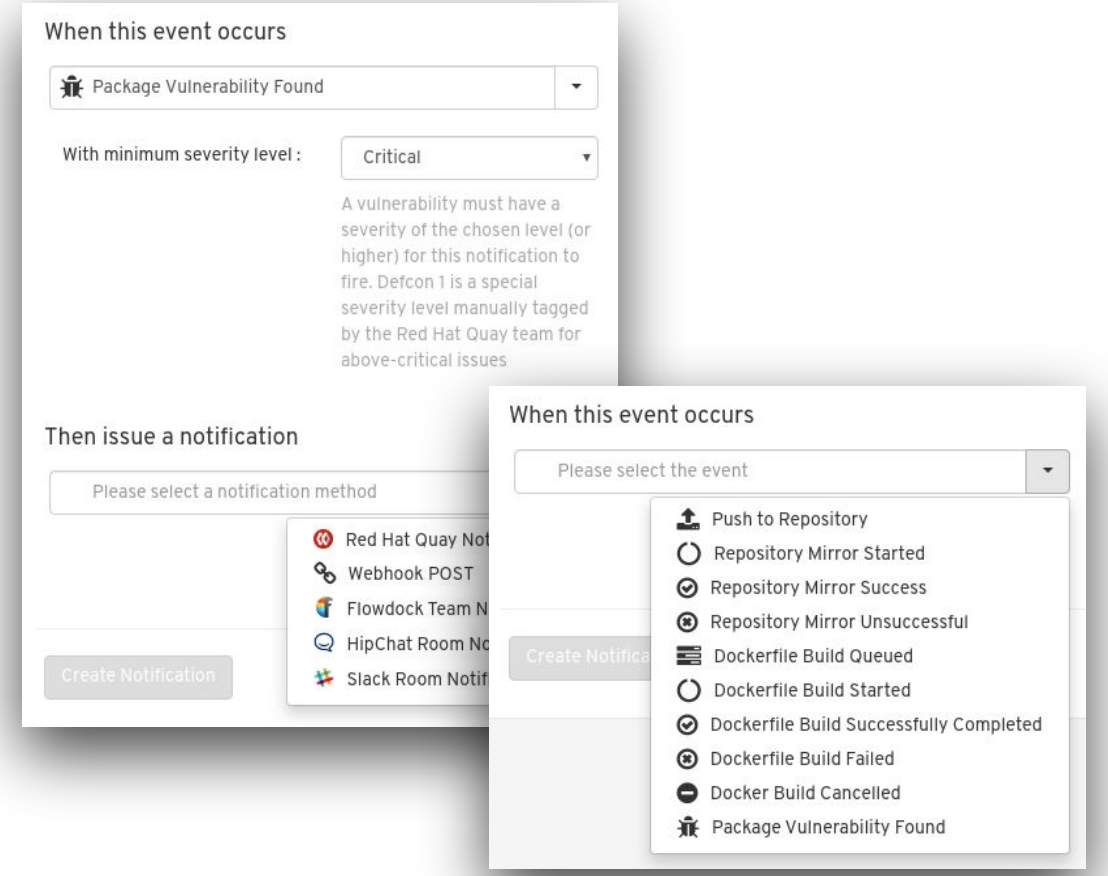
Notifications for Vulnerabilities found by Clair

- **Quay triggers different notifications for various repository events** (depends on enabled features)
- This includes the event type **“Package Vulnerability Found”**
- Additional Filter can be applied for **Severity Level**
- **Various Notification Methods**
- Custom Notification Title (optional)



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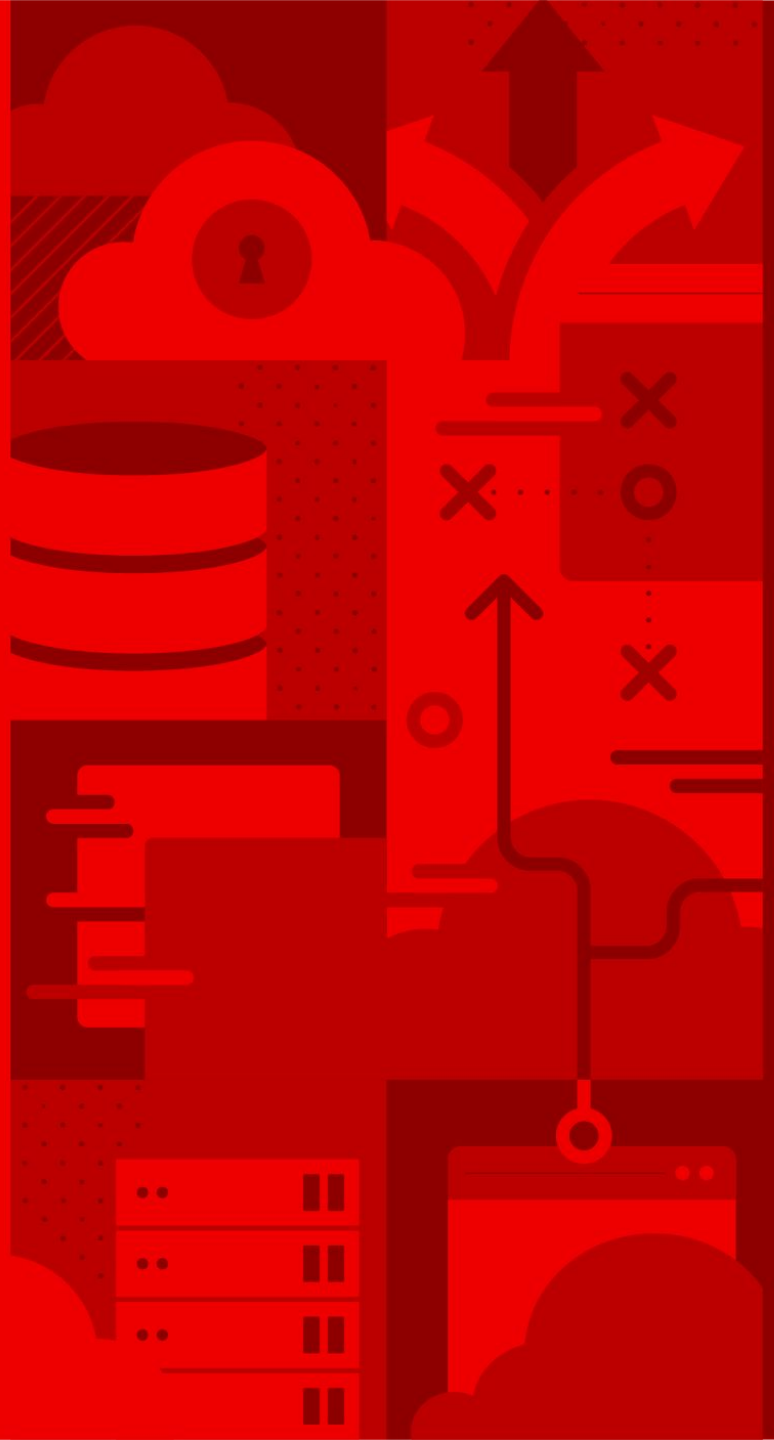
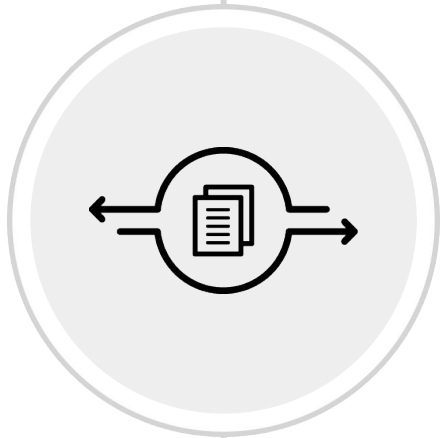
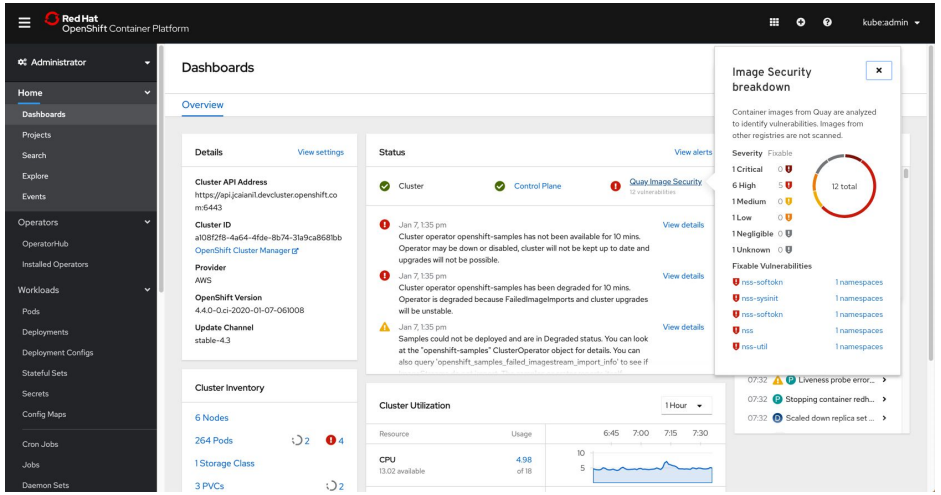


Container Security Operator and OpenShift Console Integration





RED HAT® QUAY

Scans images running on OpenShift and exposes data via API

clair

Red Hat OpenShift Container Platform

Operator monitors pod objects and updates vulnerability data

Container Security Operator - Vulnerability Data in OpenShift

Operator which runs on OpenShift and fetches vulnerability from Quay / Clair if Kubernetes pod objects change

Synchronous Updates of vulnerability information

Prerequisite to leverage / show vulnerability data in OpenShift Console

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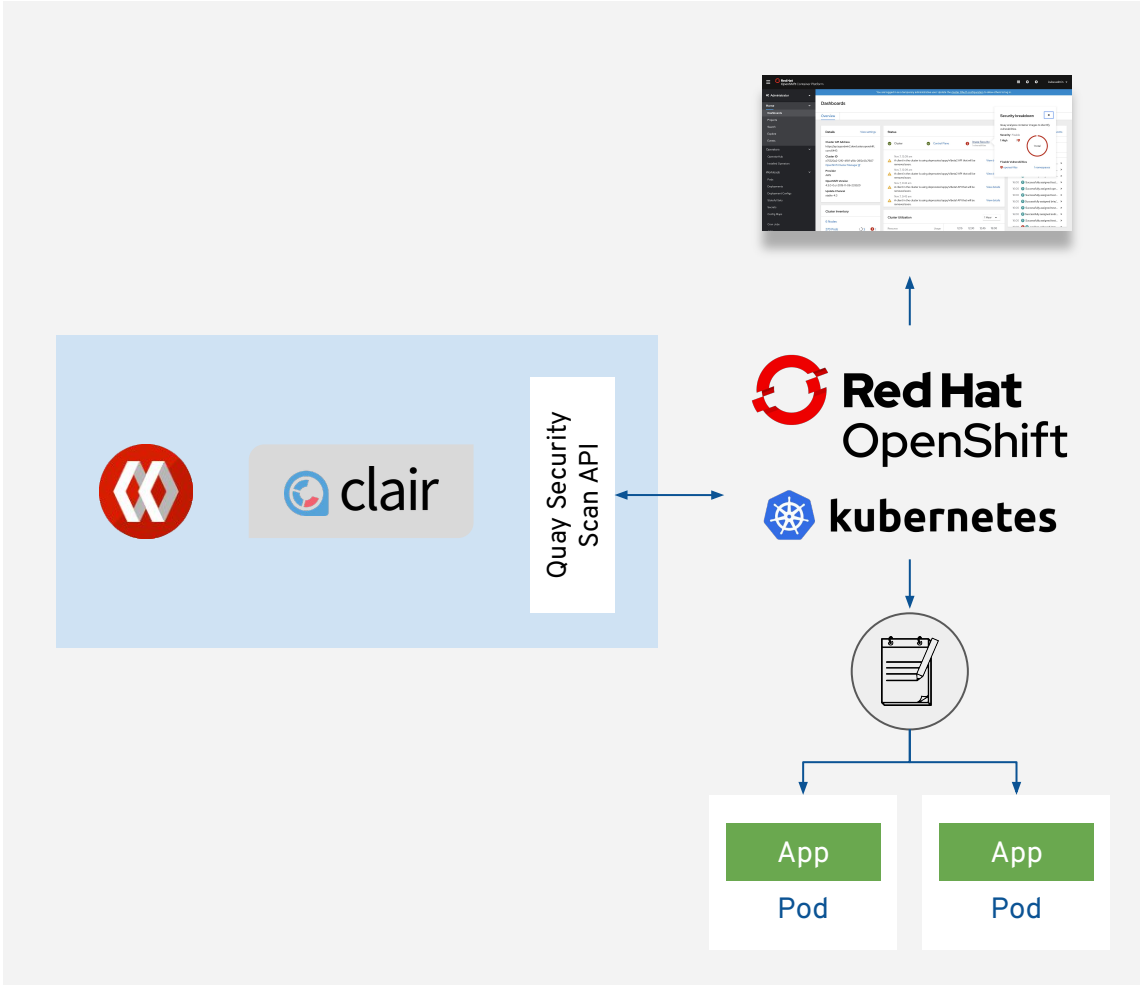
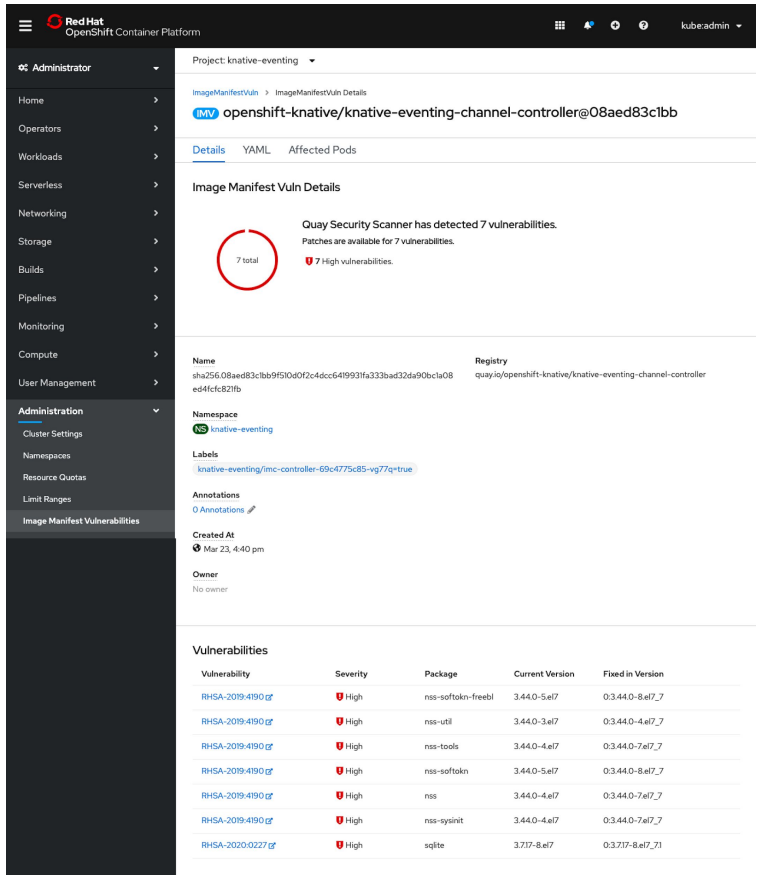
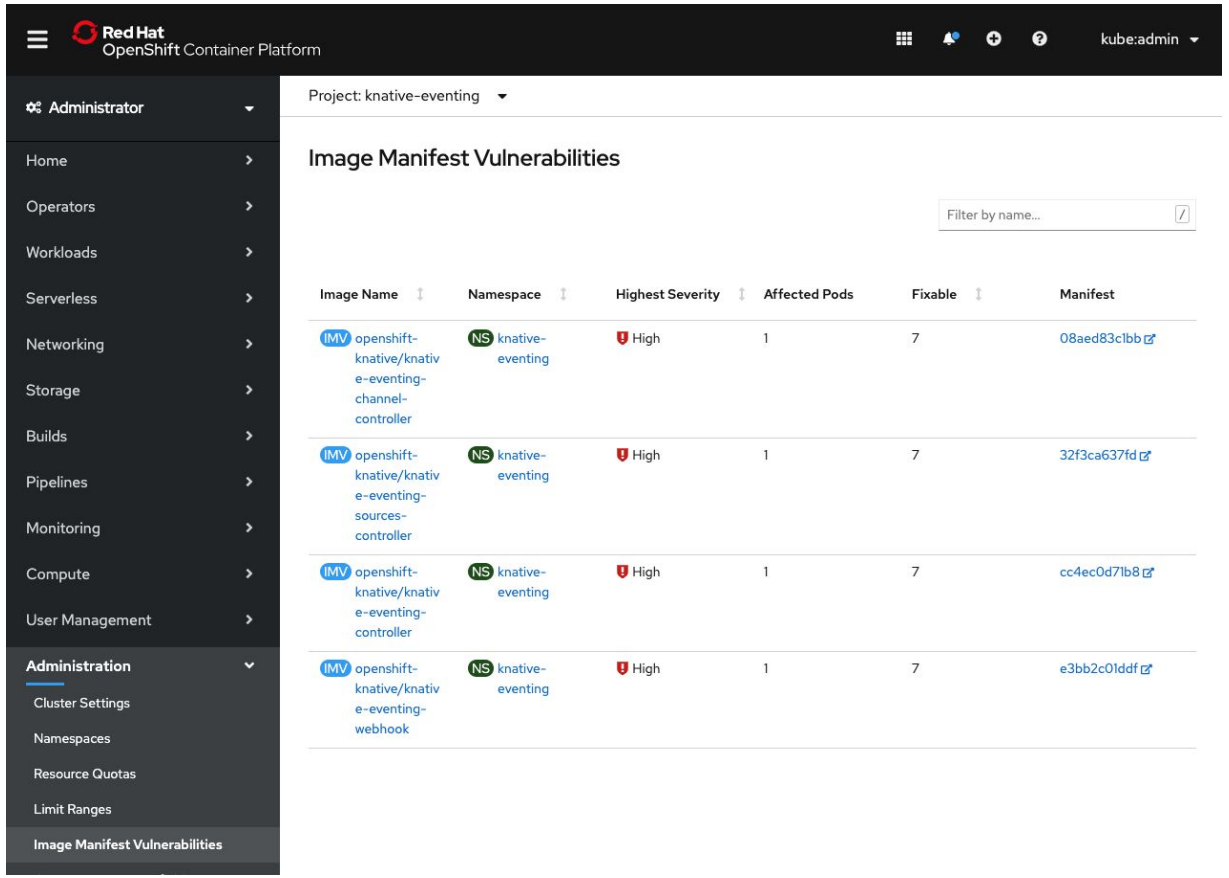
Container Security Operator (CSO)



- Container Security Operator (CSO) runs on OpenShift and watches pod objects
- Pod object changes triggering a data fetch from Quay/Clair and stores vulnerability information in CRs (by image manifest ID)
- CRs gets deleted if pod gets deleted
- Configurable interval to update vulnerability data from Quay / Clair (default: 5min)
- Data available via k8s CLI / APIs
- Supposed to be used by partner security products as well (consistent data ingress)

OpenShift Console Vulnerability Information Enhancements





Learn more about the new views which have been added to the OpenShift Console as part of OCP 4.4:
https://www.openshift.com/blog/4.4-openshift-not-on-my-watch-image-vulnerabilities-list

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