Managing complex workloads in a Kubernetes native environment - simply and at scale

Jay Ryan - Solutions Architect
@jaywryan

Red Hat

About Me!

Jay Ryan

Account Solutions Architect @Red Hat

@jaywryan

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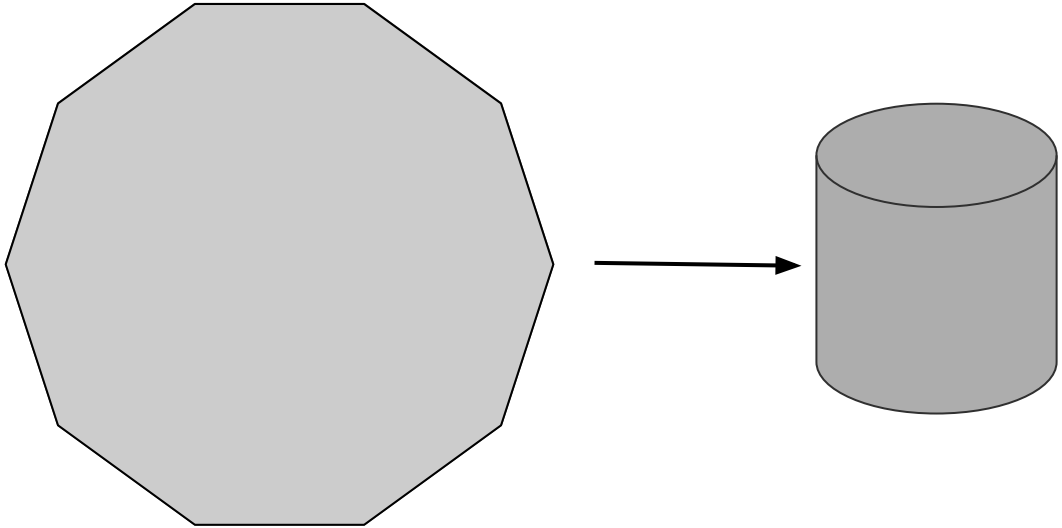
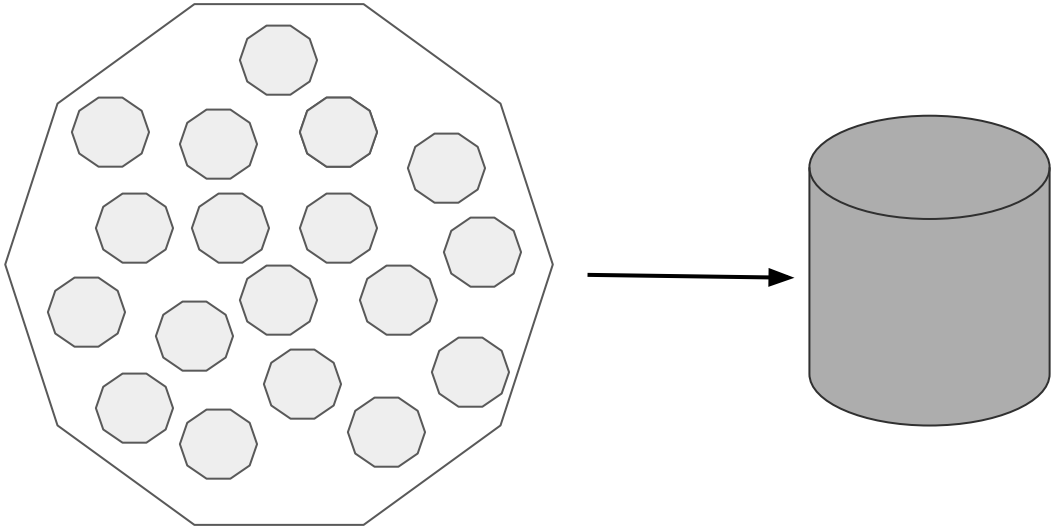
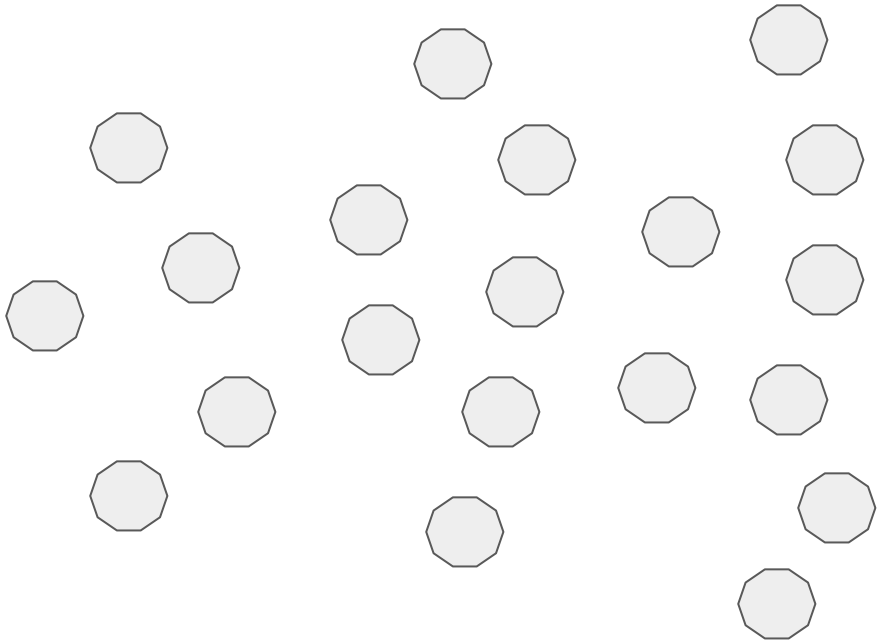
The Application



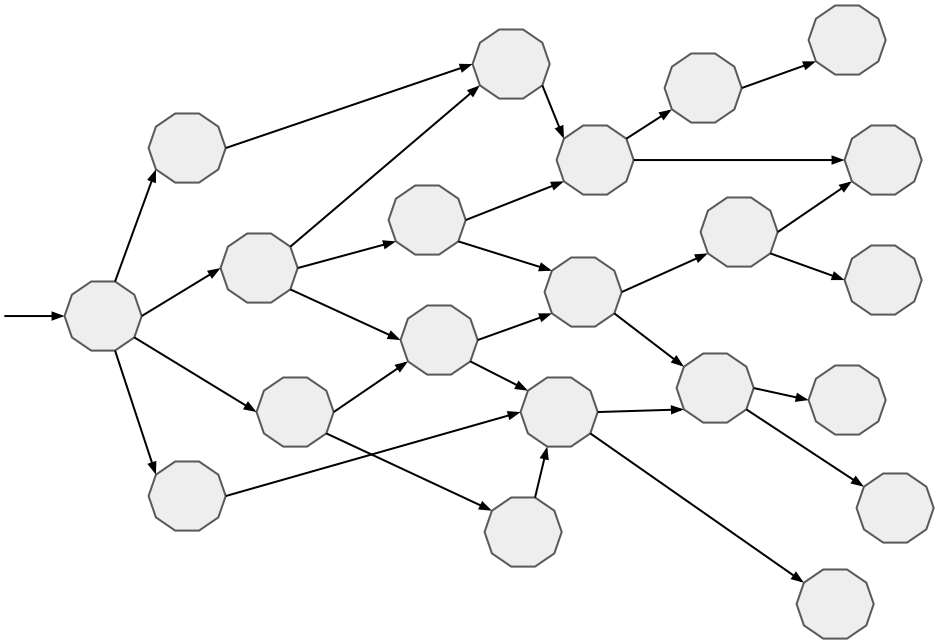
Modules



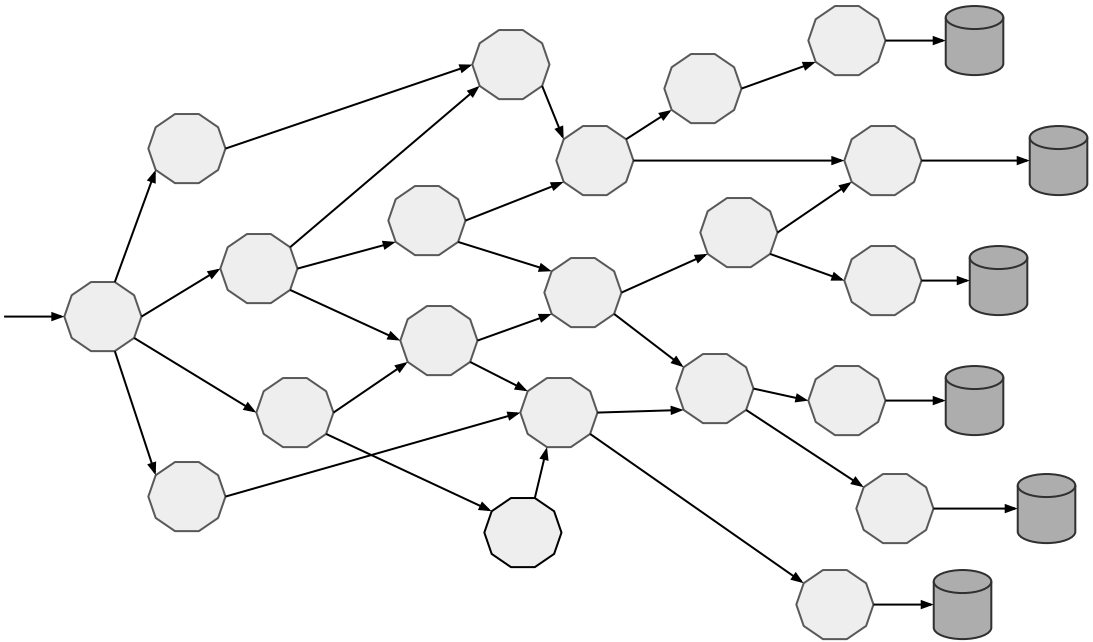
Microservices



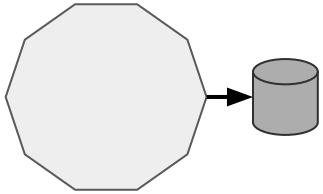
Network of Services



Microservices own their Data

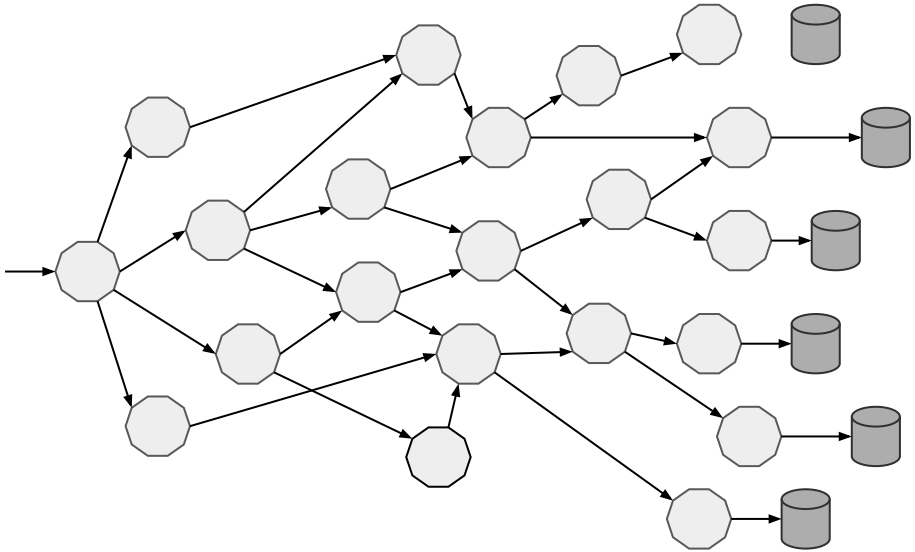


Old School



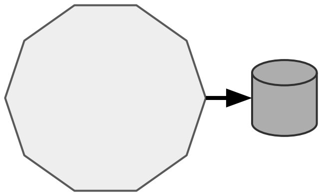
Love Thy Mono

New School



OPENSHIFT

Old School



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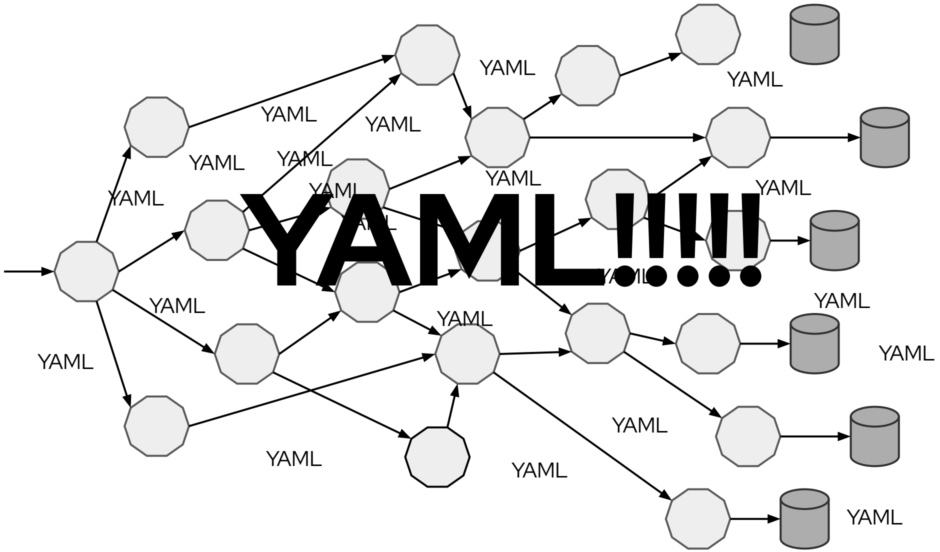


YAML

YAML

Looking back at my dev career

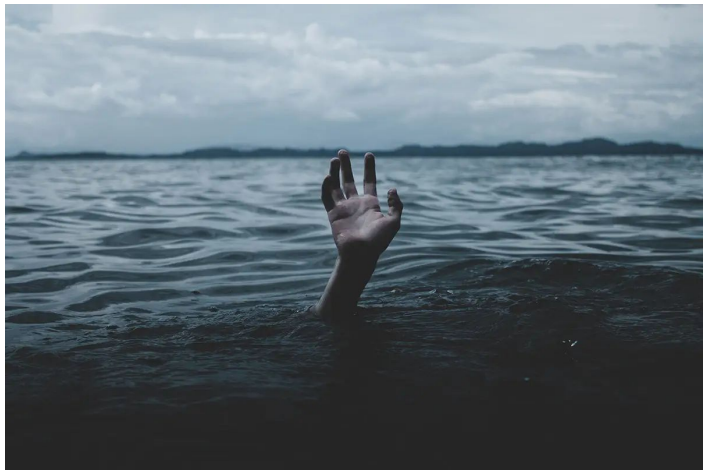
Cognitive Load

Year (Approx)	App Architecture	Infra / Fabric	My (Developer) Responsibility	Developer Control Planes
2000	Monolith	In-house tin	Code	IDE, CVS, deploy portal
2005	Monolith / SOA	In-house / c… cloud	Code, ship, [limited run]	IDE, Mercurial, Jenkins, [PXE, bash, Puppet]
2010	Monolith	Heroku / CF	Code, run	IDE, Git, Heroku CLI, Heroku UI, New Relic UI
2015	Microservices	Cloud	Code, ship, run	IDE, Git, Docker Hub, Jenkins+plugins, AWS Console, bash, Terraform, Chef…
2020	Microservices++	K8s	Full lifecycle (code, ship, run)++	IDE, Git, K8s

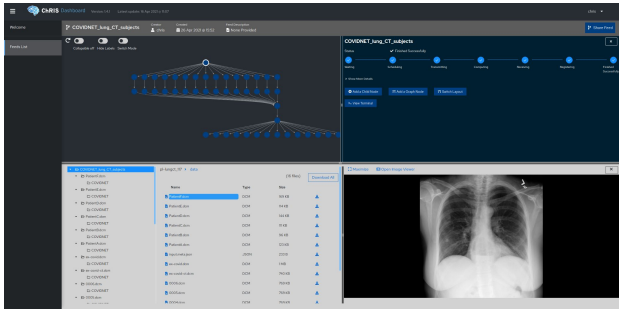
https://www.cncf.io/blog/2022/07/01/devops-vs-sre-vs-platform-engineering-the-gaps-might-be-smaller-than-you-think/

Complexity is killing software developers

The growing complexity of modern software systems is slowly killing software developers. How can you regain control, without losing out on the best these technologies have to offer?



https://www.infoworld.com/article/3639050/complexity-is-killing-software-developers.html



Essential Complexity – complexity required to create business value (domain specific)

Accidental Complexity – complexity brought on by humans. New tools and features, team organization, turnover, skills and & documentation deficiencies, problem solving(AKA technical debt creation)

CNCF Cloud Native Landscape

2019-07-12T03:51:02Z 024e93b

Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at l.cncf.io

Greyed logos are not open s

App Definition and Development

Database

Streaming & Messaging

Application Definition & Image Build

Continuous Integration & Delivery

Orchestration & Management

Scheduling & Orchestration

Coordination & Service Discovery

Remote Procedure Call

Service Proxy

API Gateway

Service Mesh

Runtime

Cloud-Native Storage

Container Runtime

Cloud-Native Network

Provisioning

Automation & Configuration

Container Registry

Security & Compliance

Key Management

Public

Cloud

l.cncf.io

This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path

CLOUD NATIVE COMPUTING FOUNDATION

CLOUD NATIVE Landscape

Redpoint Amplify

Kubernetes Certified Service Provider

Special

Platform

Certified Kubernetes - Distribution

Certified Kubernetes - Hosted

Certified Kubernetes - Installer

PaaS/Container Service

Observability and Analysis

Monitoring

Logging

Tracing

Chaos Engineering

Serverless

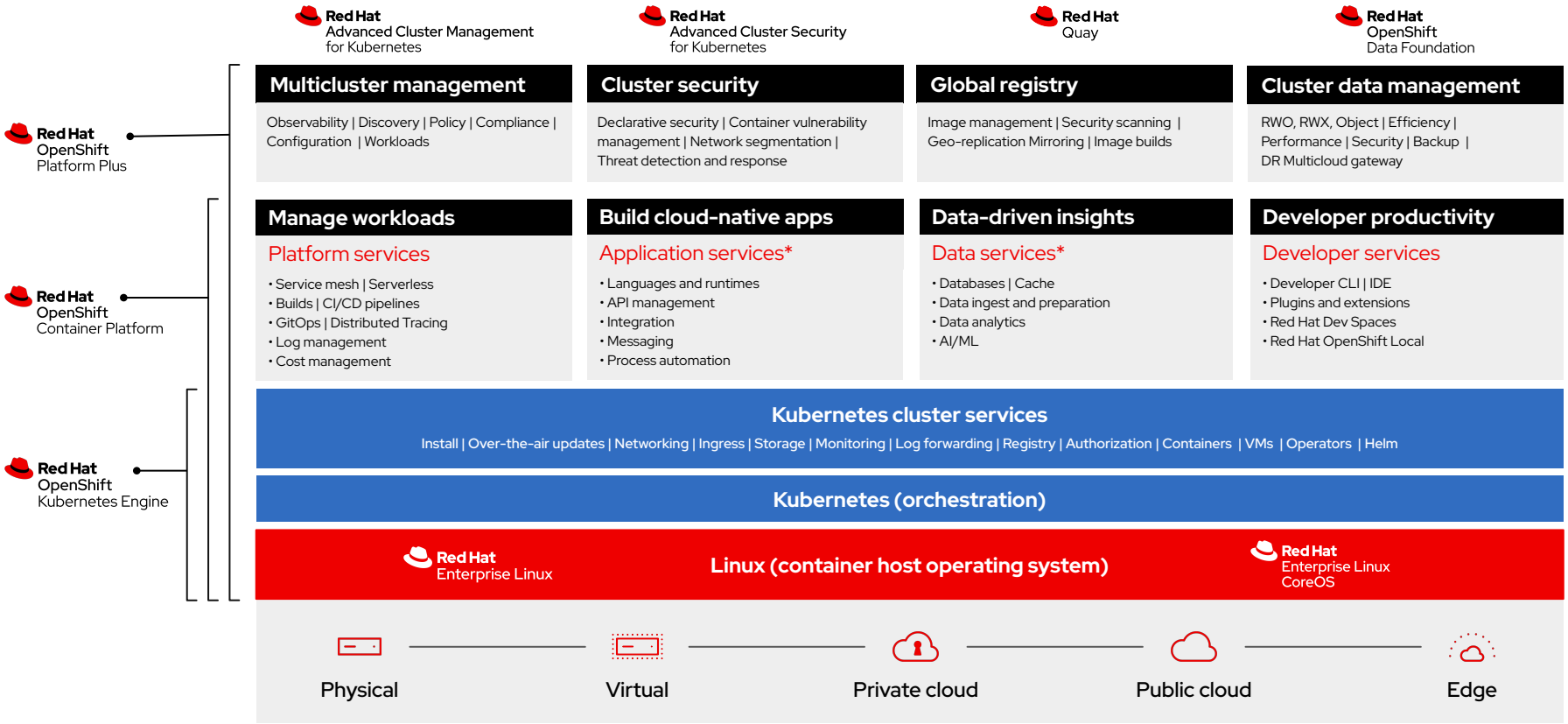
Kubernetes Training Partner

Kelsey Hightower
@kelseyhightower

Kubernetes is a platform for building platforms. It's a better place to start; not the endgame.

4:04 PM · Nov 27, 2017 · Twitter Web Client

Red Hat open hybrid cloud platform



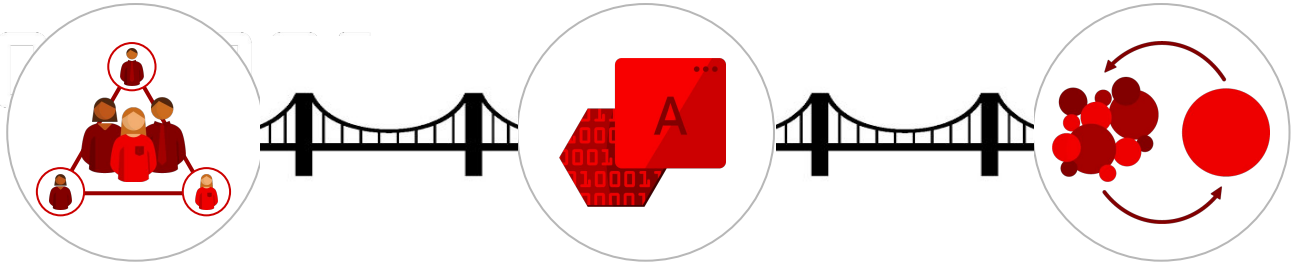
* Red Hat OpenShift® includes supported runtimes for popular languages/frameworks/databases. Additional capabilities listed are from the Red Hat Application Services and Red Hat Data Services portfolios.
** Disaster recovery, volume and multicloud encryption, key management service, and support for multiple clusters and off-cluster workloads requires OpenShift Data Foundation Advanced

So, i've got some kubernetes...how do I build a platform?

Red Hat

Platforms Provide People the Space to Practice Growth Together

SocioTechnical Construct



People

Behavior Change

Motivated & Engaged

Shared Understanding

Platforms

Technology

Community - Shared Purpose

Center for Innovation & Scale

Practices

Customer-centric

Open & Transparent

Collaborative

What do the users want?

“Developers just want to write Java/Node/Python/C# web/api code and get everything else out of the way
Developers just want to write ML models, Python code and get everything else out of the way
Developers just want to write data processing code using dbt, airflow, spark and get everything else out of the way
Developers just want to write Tekton custom tasks and ArgoCD code and get everything else out of the way
Developers just want to write Kubernetes automations
Developers just want to write Terraform automations
Developers just want to write Cloud Formation automations
Developers just want to write Ansible playbooks”

- Burr Sutter

What do the users want?

“We hate to be pushed”

If you build it **THEY WON’T COME.** SPEAK to your developers - include them early and often - empower them to contribute and take ownership.

“Abstract, don’t restrict”

“Build golden paths not cages” - Daniel Bryant

“I want to understand the why”

Devs need to understand how what they do fits into the big picture

https://humanitec.com/blog/top-10-fallacies-in-platform-engineering

How do we do it?

make the ‘right’ thing easy

Sane defaults, tested patterns, and compliant by default. Development teams need be involved in this process

fast feedback loops

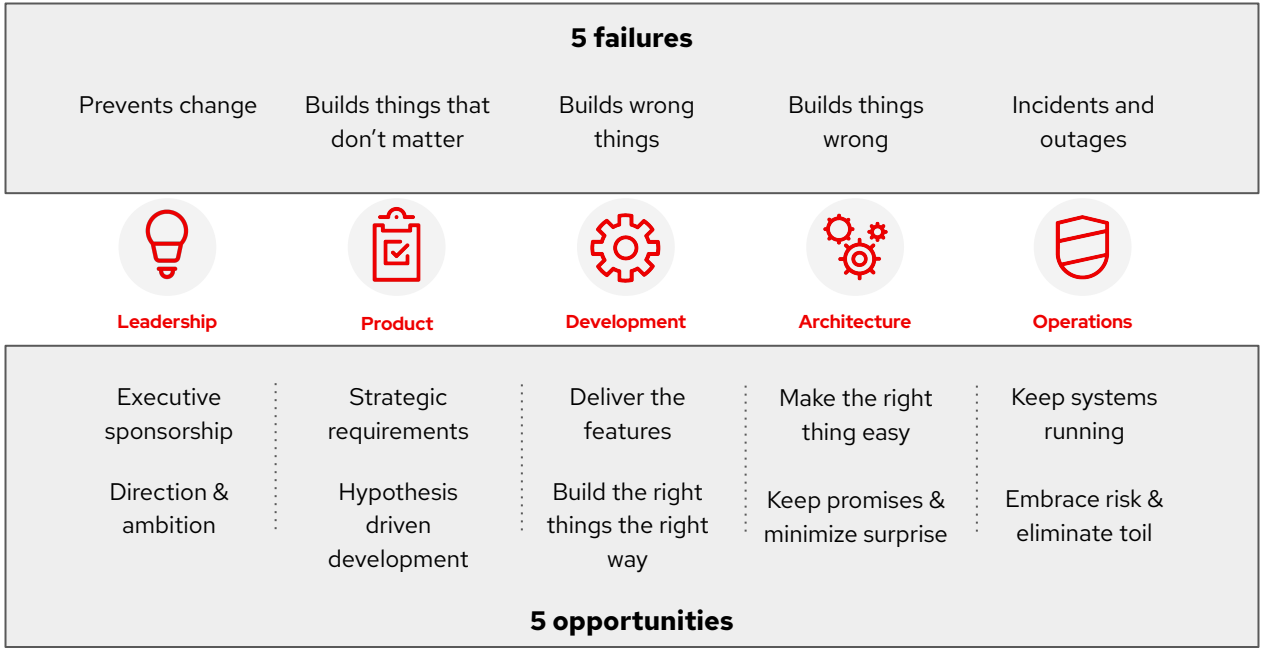
A trusted community is vital to create an environment to fail in and to get feedback from. MVPs and short development cycles are key here.

measure adoption vs workloads

Engaged and contributing teams are the better metric. Teams training others, sharing code, and participating in community are of high value.

How do we do it?

Introducing the 5 elements



What are the components of a platform strategy?

Buy then Build

Identify the technology components that best meet your organization's needs then customize incrementally to create differentiation

Team Adoption before Workloads

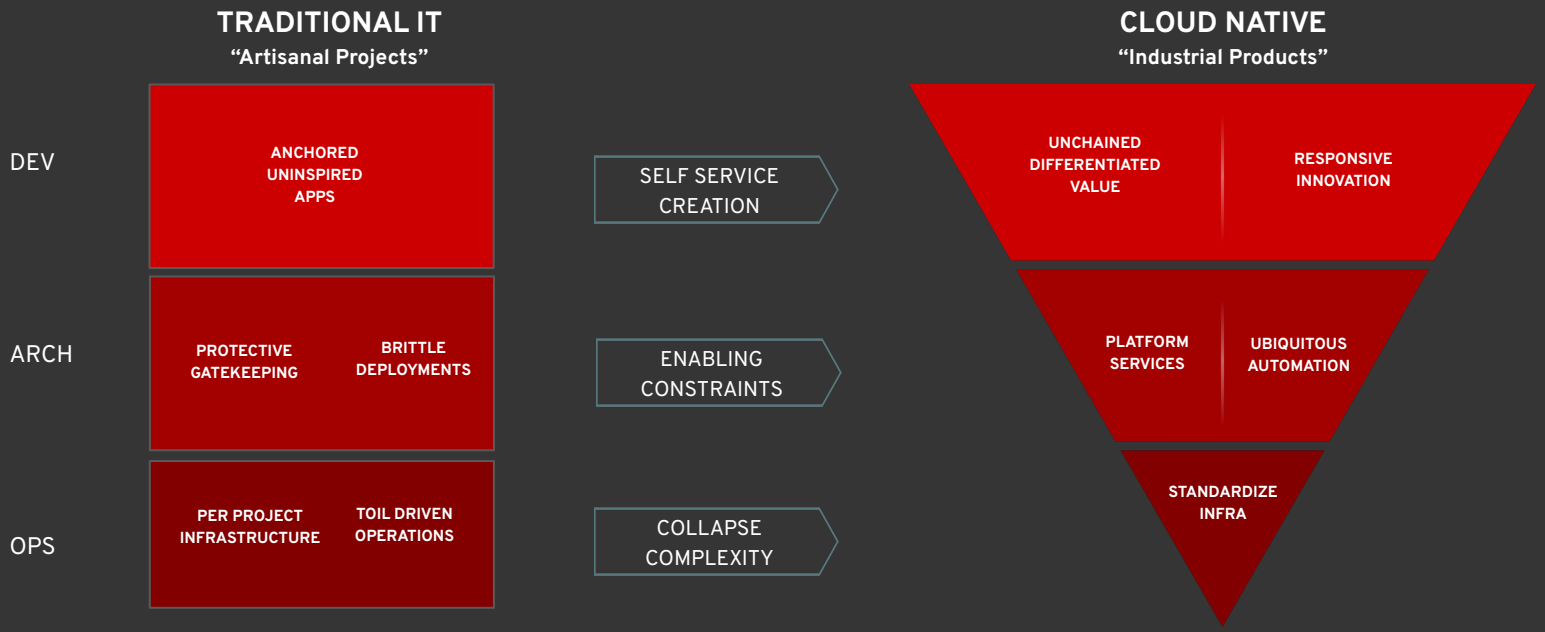
Prioritize the human aspects, look to help the teams transition and their workloads will follow

Experiential Collaboration by the Community

Prepare to invest as a enabling team to instill an experiential 'build-together' culture, a partnership between all elements of an organization

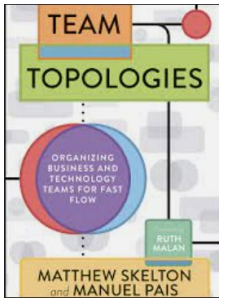
Where do I start?

The Cloud Native Organization



High Performing Organizations

Built on the Shoulders of High Performing Teams



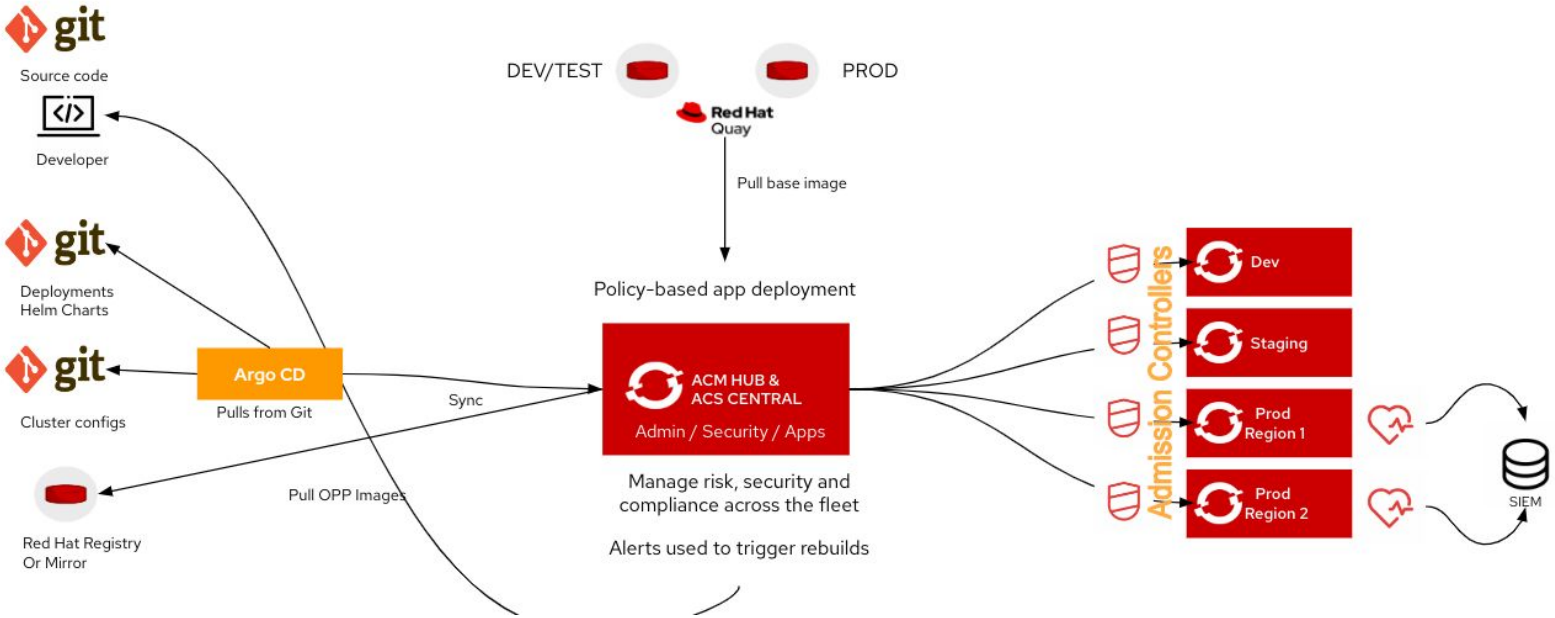
Red Hat

GitOps

GitOps is a set of practices that leverages Git workflows to manage infrastructure and application configurations. By using Git repositories as the source of truth, it allows the DevOps team to store the entire state of the cluster configuration in Git so that the trail of changes are visible and auditable.

Run and Manage

Workloads are Comprised of Running Applications that Were Built, Tested, & Deployed Earlier



ArgoCD

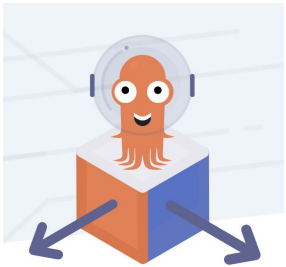
Argo CD is a declarative, GitOps continuous delivery tool for Kubernetes.

Argo is not only CD

Modules

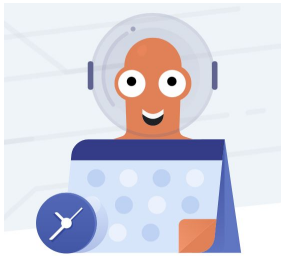
Workflow

Kubernetes-native workflow engine supporting DAG and step-based workflows



Rollout

Advanced Kubernetes deployment strategies such as Canary and Blue-Green made easy



Events

Event based dependency management for Kubernetes

ArgoCD Kubernetes Objects Generator

Manifests and third-party integrations

Helm

Helm uses a packaging format called charts. A chart is a collection of files that describe a related set of Kubernetes resources

Kustomize

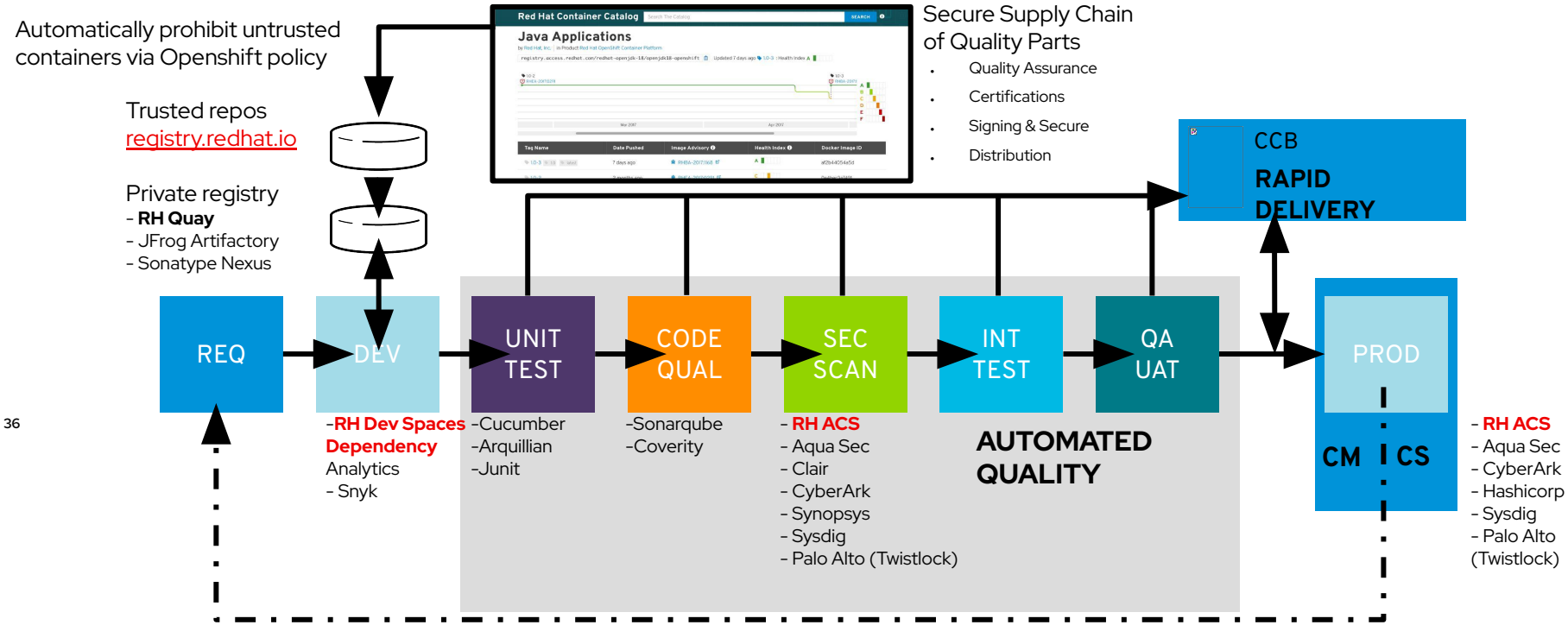
Template-free way to customize application configuration that simplifies the use of off-the-shelf applications

Kubernetes Manifests

Plain text kubernetes object located in YAML or JSON format

Your gold paved road

Automated quality and security: because you can't inspect quality into a product



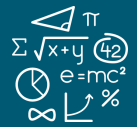
Source:
Red Hat Container Catalog: Java Applications
More about the Container Health Index

Red Hat

Kubernetes-native day 2 management

OPERATOR FRAMEWORK

Flexible app architectures



No reinvention of core concepts

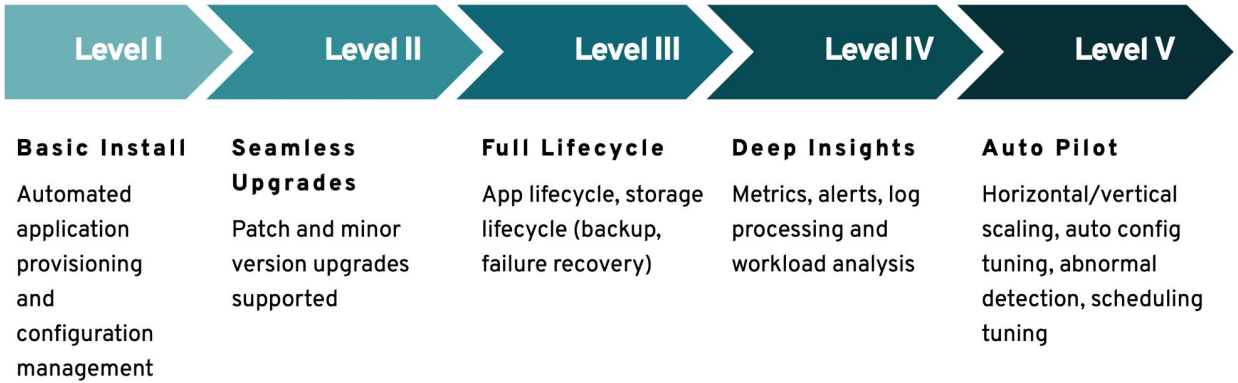
Uniform deploy and debug

Truly hybrid

Operators codify operational knowledge and workflows to automate life-cycle management of containerized applications with Kubernetes

OPERATOR CAPABILITY LEVELS

Operators come in different maturity levels in regards to their lifecycle management capabilities for the application or workload they deliver. The capability models aims to provide guidance in terminology to express what features users can expect from an Operator.



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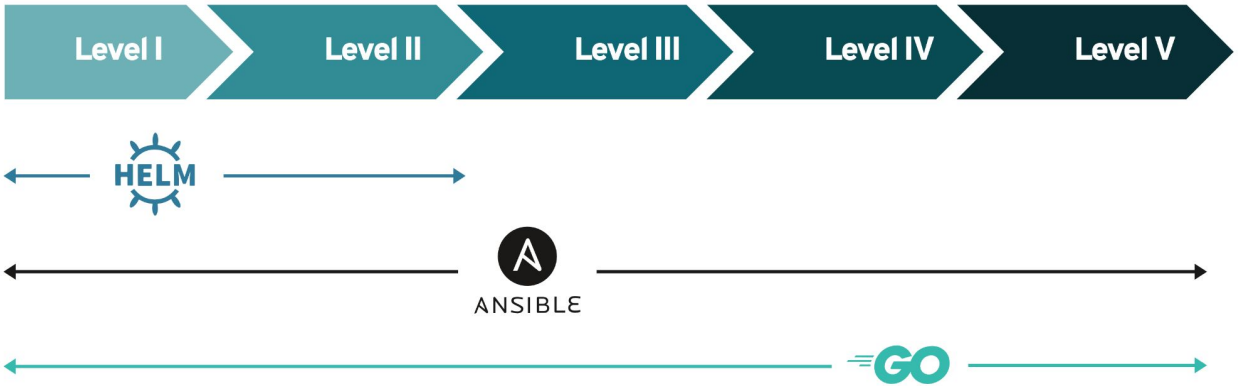
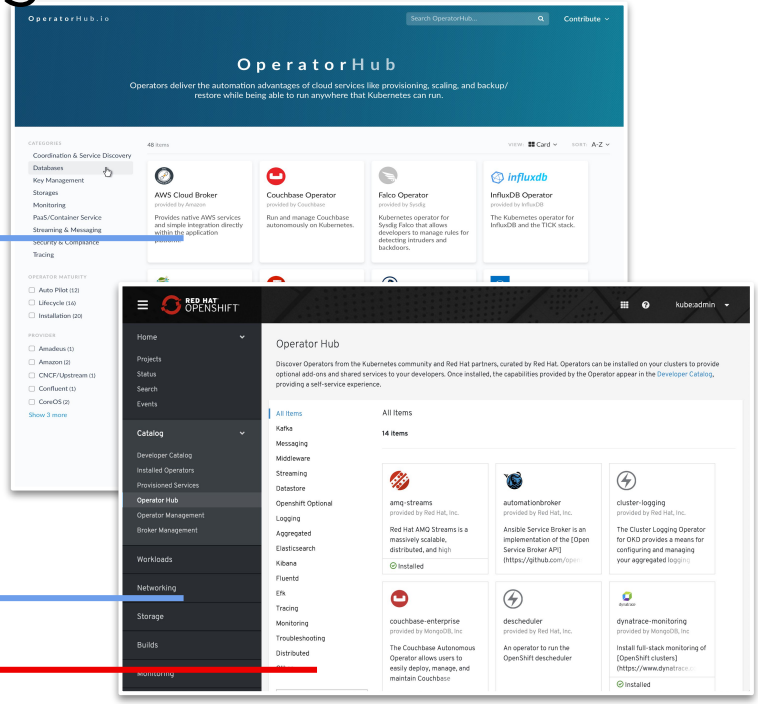


Operator Hub and certified Operators

- OperatorHub.io launched by Red Hat, AWS, Microsoft and Google
- OpenShift Operator Certification
- OperatorHub integrated into OpenShift 4



COMMUNITY OPERATORS

OPENSHIFT CERTIFIED OPERATORS

Red Hat

Operator Hub and certified Operators

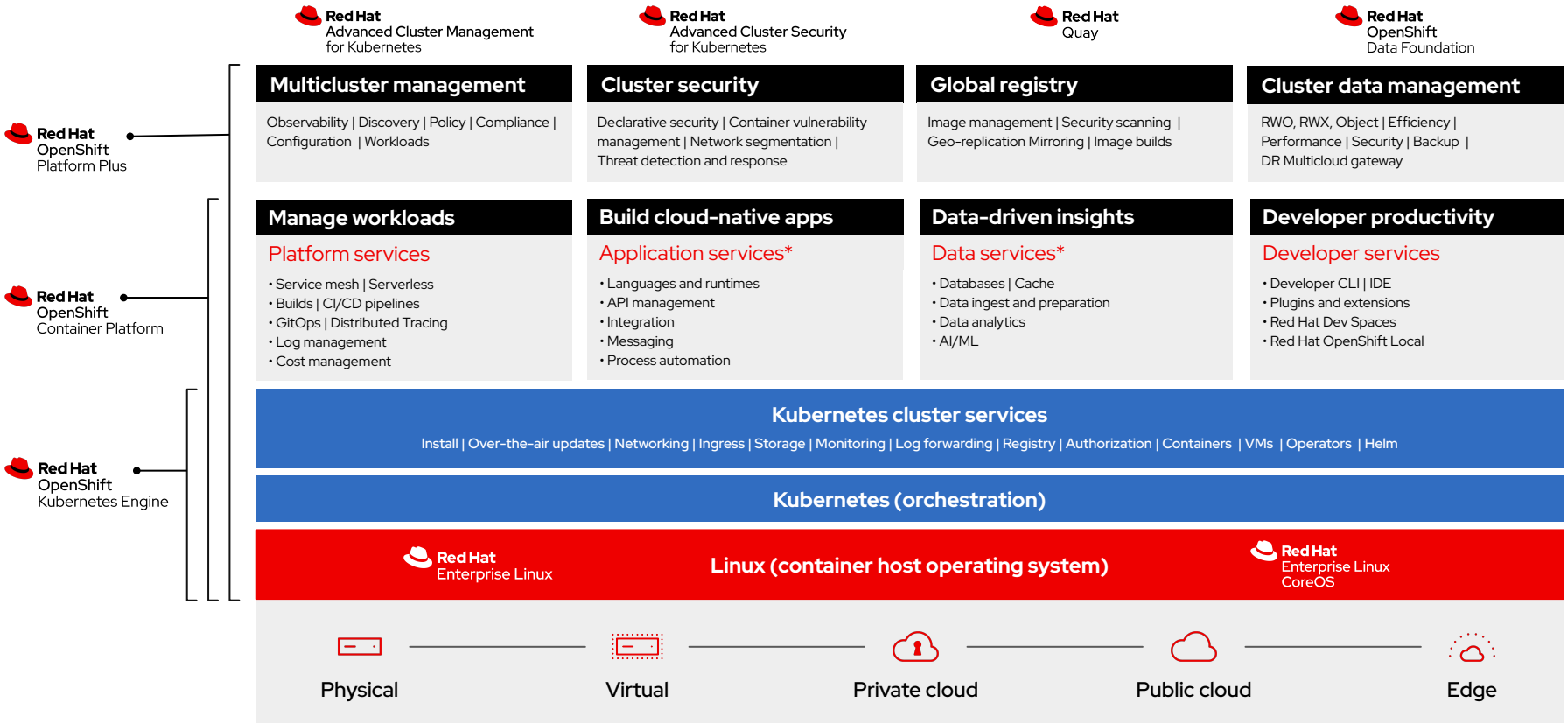
Red Hat

PGO is developed with many years of production experience in automating Postgres management on Kubernetes, providing a seamless cloud native Postgres solution to keep your data always available.

- **PostgreSQL Cluster Provisioning**: Create, Scale, & Delete PostgreSQL clusters with ease, while fully customizing your Pods and PostgreSQL configuration!
- **High-Availability**: Safe, automated failover backed by a distributed consensus based high-availability solution. Uses Pod Anti-Affinity to help resiliency; you can configure how aggressive this can be! Failed primaries automatically heal, allowing for faster recovery time. You can even create regularly scheduled backups as well and set your backup retention policy
- **Disaster Recovery**: Backups and restores leverage the open source pgBackRest utility and includes support for full, incremental, and differential backups as well as efficient delta restores. Set how long you want your backups retained for. Works great with very large databases!
- **Monitoring**: Track the health of your PostgreSQL clusters using the open source pgMonitor library.
- **Clone**: Create new clusters from your existing clusters or backups with efficient data cloning.
- **TLS**: All connections are over TLS. You can also bring your own TLS infrastructure if you do not want to use the provided defaults.
- **Connection Pooling**: Advanced connection pooling support using pgBouncer.
- **Affinity and Tolerations**: Have your PostgreSQL clusters deployed to Kubernetes Nodes of your preference. Set your pod anti-affinity, node affinity, Pod tolerations and more rules to customize your deployment topology!
- **Full Customizability**: Crunchy PostgreSQL for Kubernetes makes it easy to get your own PostgreSQL-as-a-Service up and running and fully customize your deployments, including:
    - Choose the resources for your Postgres cluster: container resources and storage size. Resize at any time with minimal disruption.
    - Use your own container image repository, including support `imagePullSecrets` and private repositories
    - Customize your PostgreSQL configuration

and much more!

Red Hat open hybrid cloud platform



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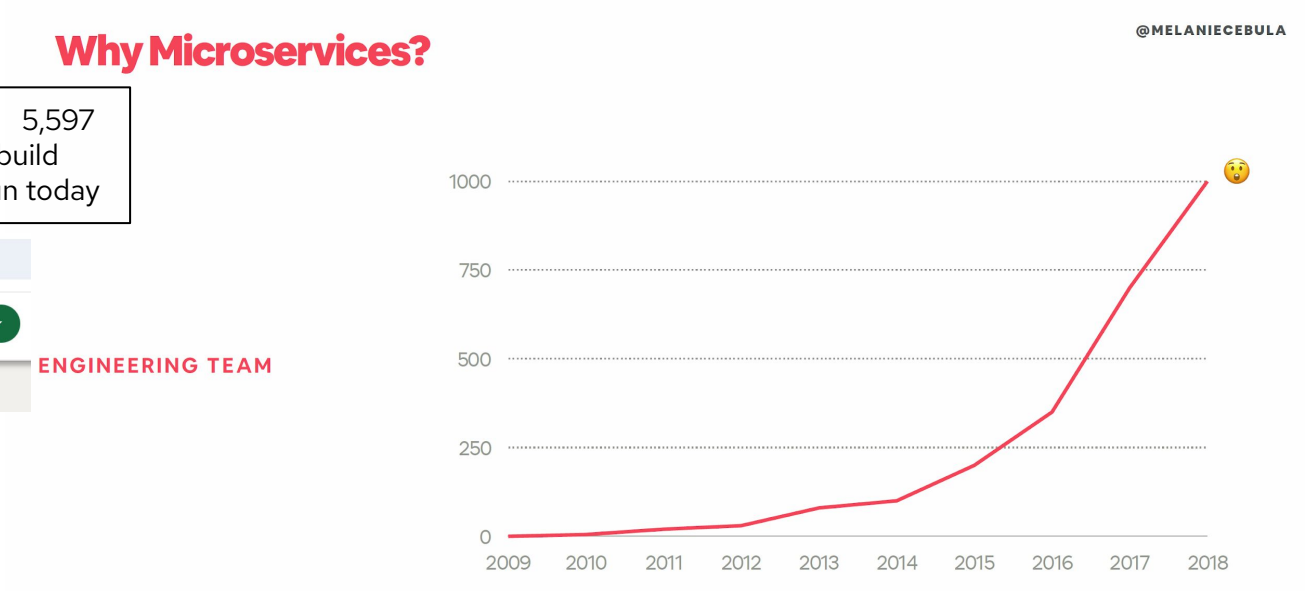
** Disaster recovery, volume and multicloud encryption, key management service, and support for multiple clusters and off-cluster workloads requires OpenShift Data Foundation Advanced

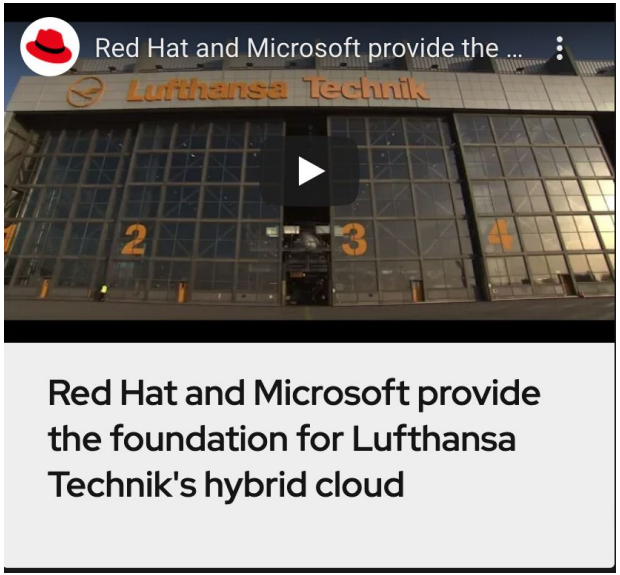
AirBnB built a cloud native platform

"to support over 1000 engineers concurrently configuring and deploying over 250 critical services to Kubernetes"
https://www.infoq.com/news/2019/03/airbnb-kubernetes-workflow/

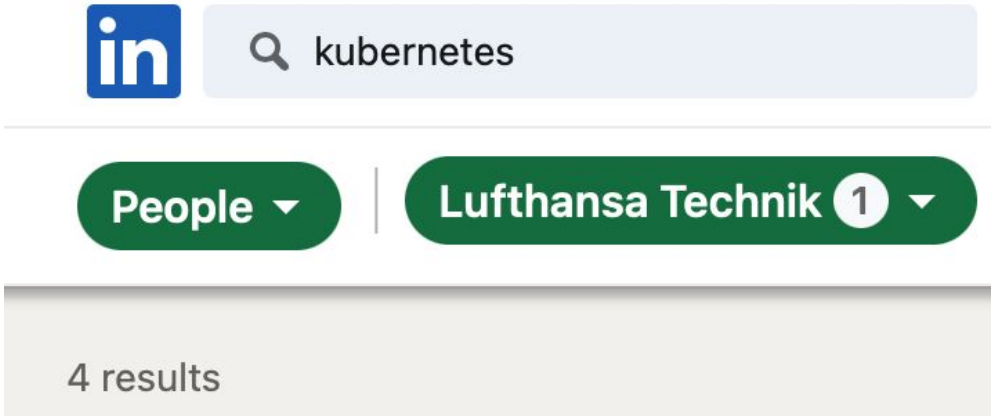


https://qconlondon.com/london2019/presentation/develop-hundreds-kubernetes-services-scale-airbnb

Red Hat customer Lufthansa Technik



https://www.redhat.com/en/success-stories/lufthansa-technik



4 of 26 000 employees, Kubernetes in LinkedIn profile

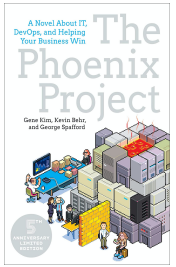
Red Hat Global Transformation Office (GTO)

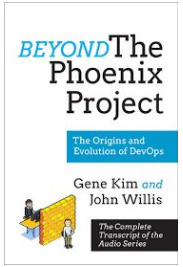
Andrew Clay Shafer
VP, Global Transformation
Founder: Puppet, DevOpsDays,
Author Web Operations
IT Optimizer | Change Agent
Founder | Organizer
@littleidea

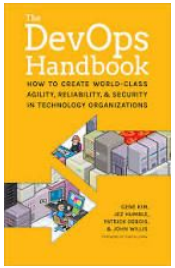
Kevin Behr
Sr Dir, Global Transformation
Author, Phoenix Project, Visible Ops
CIO, CTO
IT Strategist | Speaker
Enterprise CXO Advisor
@kevinbehr

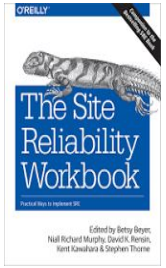
John Willis
Sr Dir, Global Transformation
Author, DevOps Handbook,
Beyond the Phoenix Project
CIO, CTO
IT Strategist | Founder
Speaker | Author
@botchagalupe

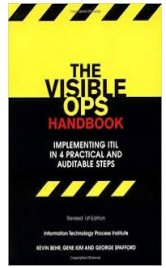
Jabe Bloom
Sr Dir, Global Transformation
CSTO, CTO
SocioTechnical Systems | Speaker
Critical Irritant | Transition Designer
@cyetain











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Thanks!

Jay Ryan

@jaywryan

jay.ryan@redhat.com

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