



# Extend Your Kubernetes With the Power of Open Source

What value do you get by attending this talk?

# Who am I?

@AnnieTalvasto  
CMO at VSHN

- CNCF Ambassador
- Azure MVP
  
- Kubernetes & CNCF meetup co-organizer
- Startup-coach
- Co-host of Cloudgossip podcast - [cloudgossip.net](http://cloudgossip.net)



# Agenda

- Introduction
- Considerations
- Why open source
- Projects
- Wrap up

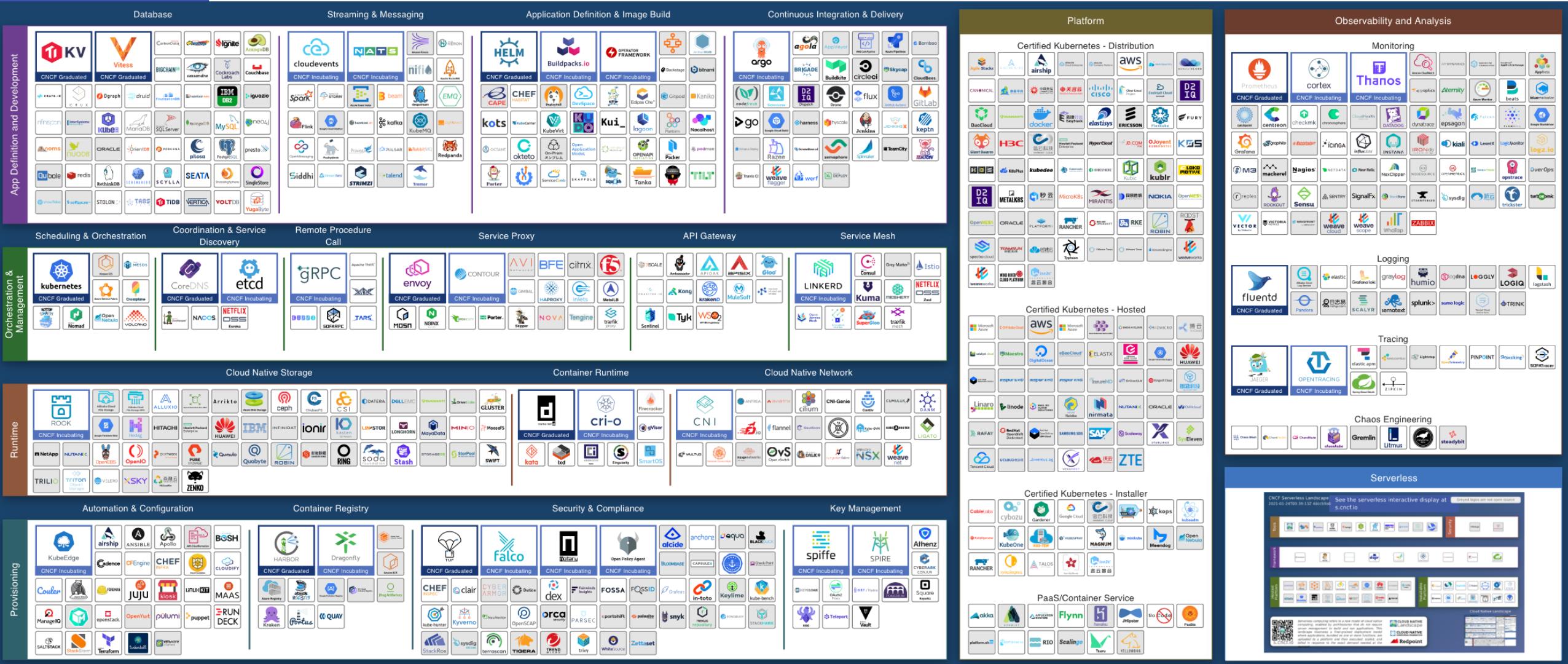


# CLOUD NATIVE COMPUTING FOUNDATION

Building sustainable ecosystems  
for cloud native software.

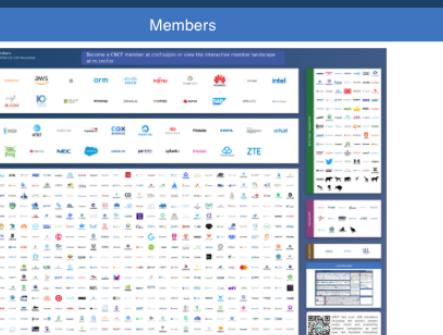


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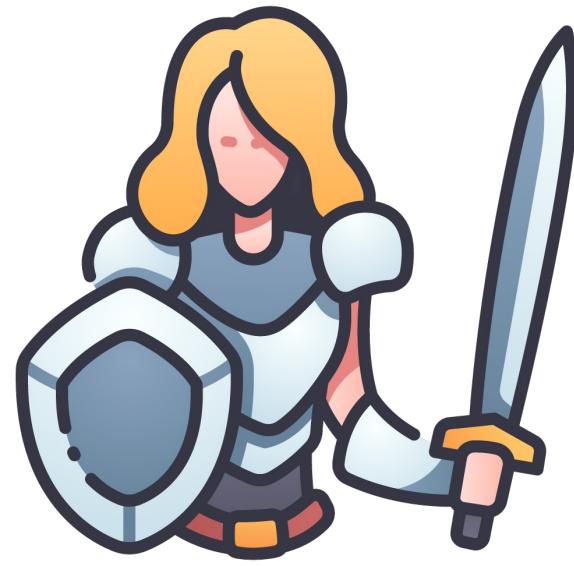
This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

Special



# Project levels

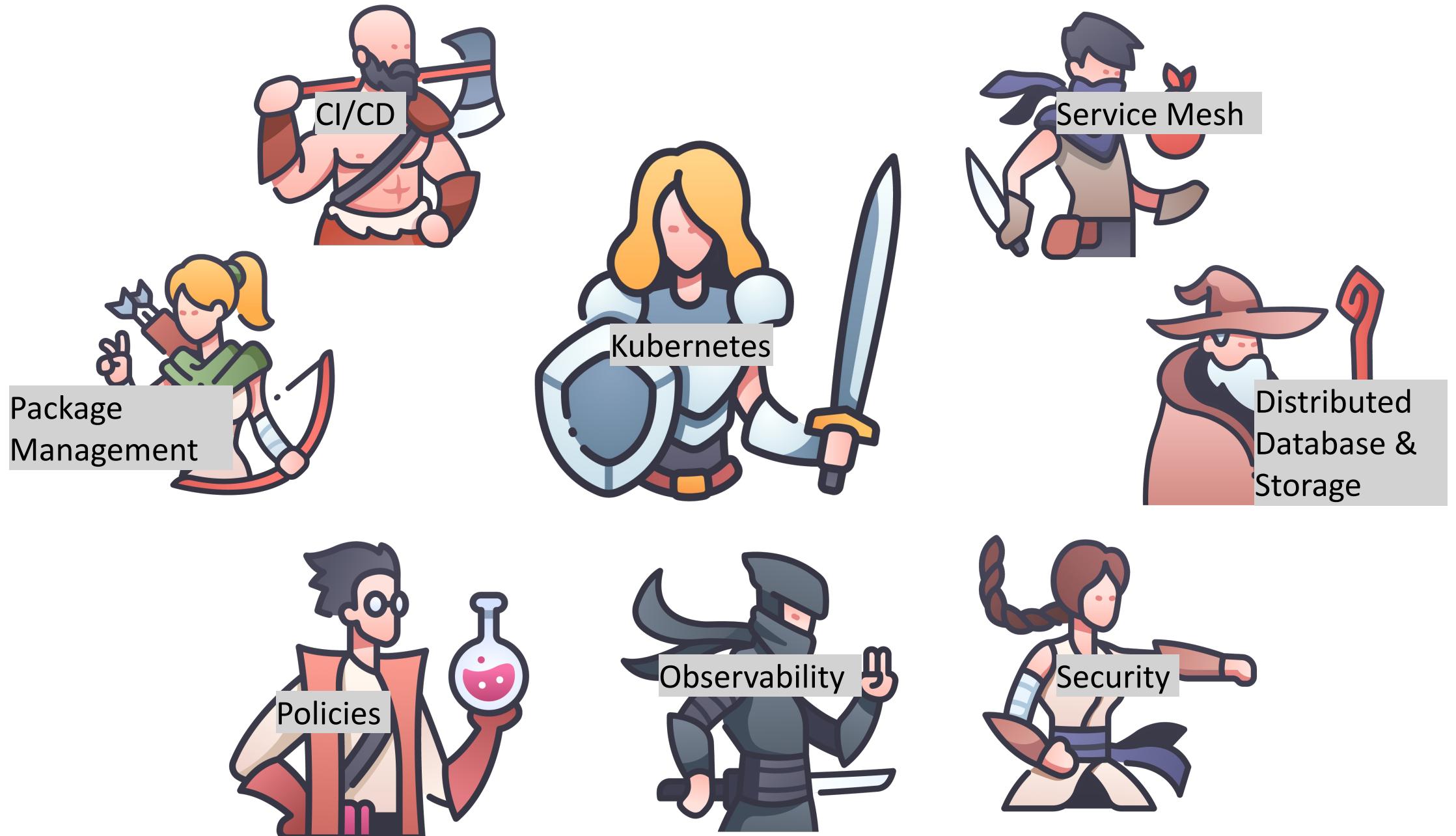




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# Considerations

- Think about the ideal platform
- Design the platform
- Design the delivery process
- Find the right Kubernetes features and addons



# Why open source

- Cost
- Community
- Customizability
- Transparency & Security
- Innovation & rapid evolution



## CLOUD NATIVE TRAIL MAP

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### HELP ALONG THE WAY

#### A. Training and Certification

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For companies that don't offer cloud native services externally [cncf.io/enduser](https://cncf.io/enduser)

### WHAT IS CLOUD NATIVE?

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These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

The Cloud Native Computing Foundation seeks to drive adoption of this paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects. We democratize state-of-the-art patterns to make these innovations accessible for everyone.

[l.cncf.io](https://l.cncf.io)

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### 1. CONTAINERIZATION

- Commonly done with Docker containers
- Any size application and dependencies (even PDP-11 code running on an emulator) can be containerized
- Over time, you should aspire towards splitting suitable applications and writing future functionality as microservices

### 3. ORCHESTRATION & APPLICATION DEFINITION

- Kubernetes is the market-leading orchestration solution
- You should select a Certified Kubernetes Distribution, Hosted Platform, or Installer: [cncf.io/ck](https://cncf.io/ck)
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### 5. SERVICE PROXY, DISCOVERY, & MESH

- CoreDNS is a fast and flexible tool that is useful for service discovery
- Envoy and Linkerd each enable service mesh architectures
- They offer health checking, routing, and load balancing



### 7. DISTRIBUTED DATABASE & STORAGE

When you need more resiliency and scalability than you can get from a single database, Vitess is a good option for running MySQL at scale through sharding. Rook is a storage orchestrator that integrates a diverse set of storage solutions into Kubernetes. Serving as the 'brain' of Kubernetes, etcd provides a reliable way to store data across a cluster of machines. TiKV is a high performance distributed transactional key-value store written in Rust.



### 9. CONTAINER REGISTRY & RUNTIME

Harbor is a registry that stores, signs, and scans content. You can use alternative container runtimes. The most common, both of which are OCI-compliant, are contained and CRI-O.



### 2. CI/CD

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### 6. NETWORKING, POLICY, & SECURITY

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### 8. STREAMING & MESSAGING

When you need higher performance than JSON-REST, consider using gRPC or NATS. gRPC is a universal RPC framework. NATS is a multi-modal messaging system that includes request/reply, pub/sub and load balanced queues. CloudEvents is a specification for describing event data in common ways.



### 10. SOFTWARE DISTRIBUTION

If you need to do secure software distribution, evaluate Notary, an implementation of The Update Framework.



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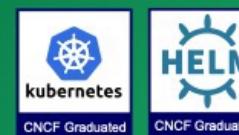
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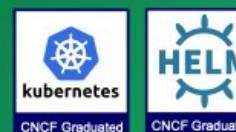
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CNCF Incubating

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# Argo

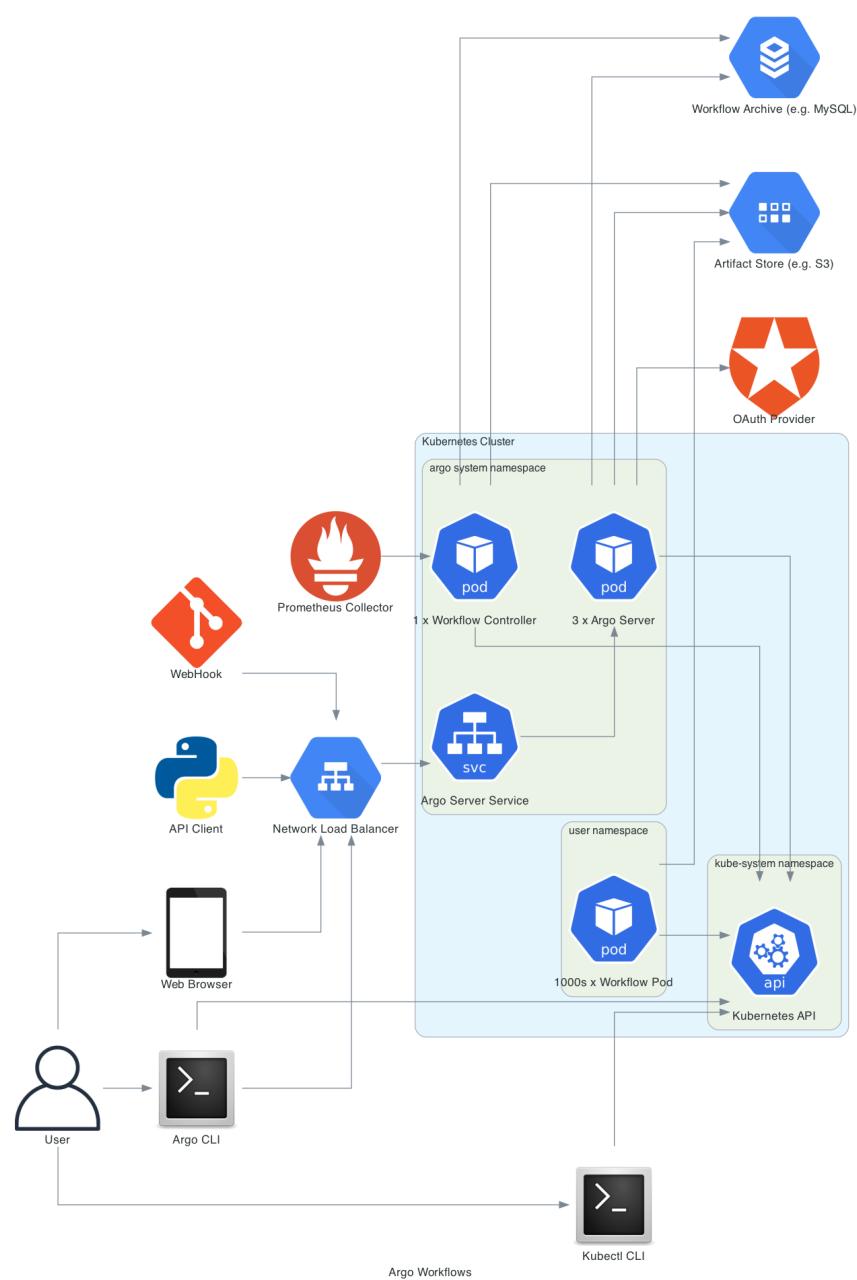
Get work done with Kubernetes



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# What is Argo?

- Argo Workflows
- Argo CD
- Argo Rollouts
- Argo Events



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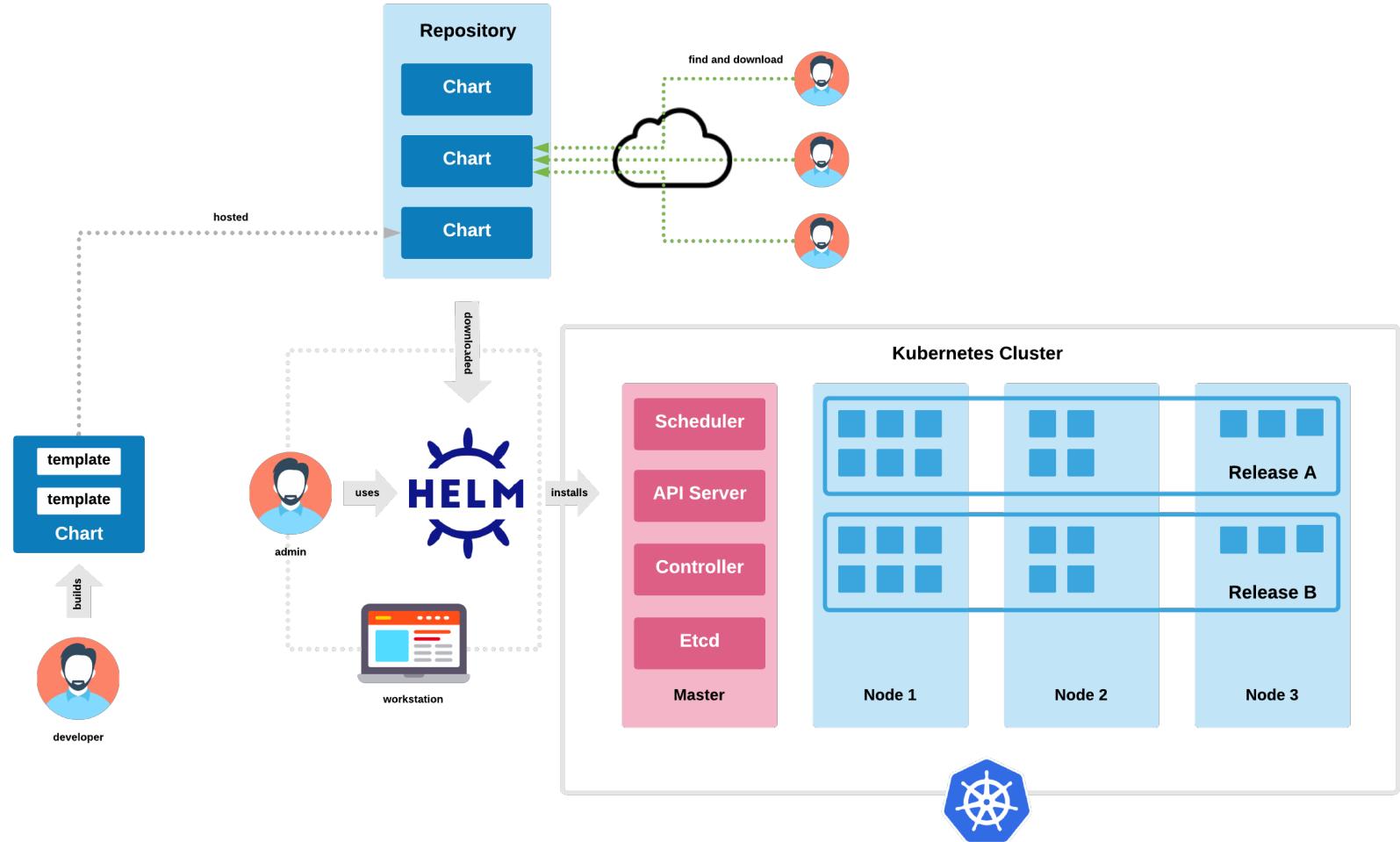
# Helm

The package manager for  
Kubernetes.



# What is Helm?

- Manage complexity
- Easy updates
- Simple sharing
- Rollbacks



Source: <https://cloudacademy.com/course/introduction-to-helm-1034/helm-architecture/>

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# Prometheus

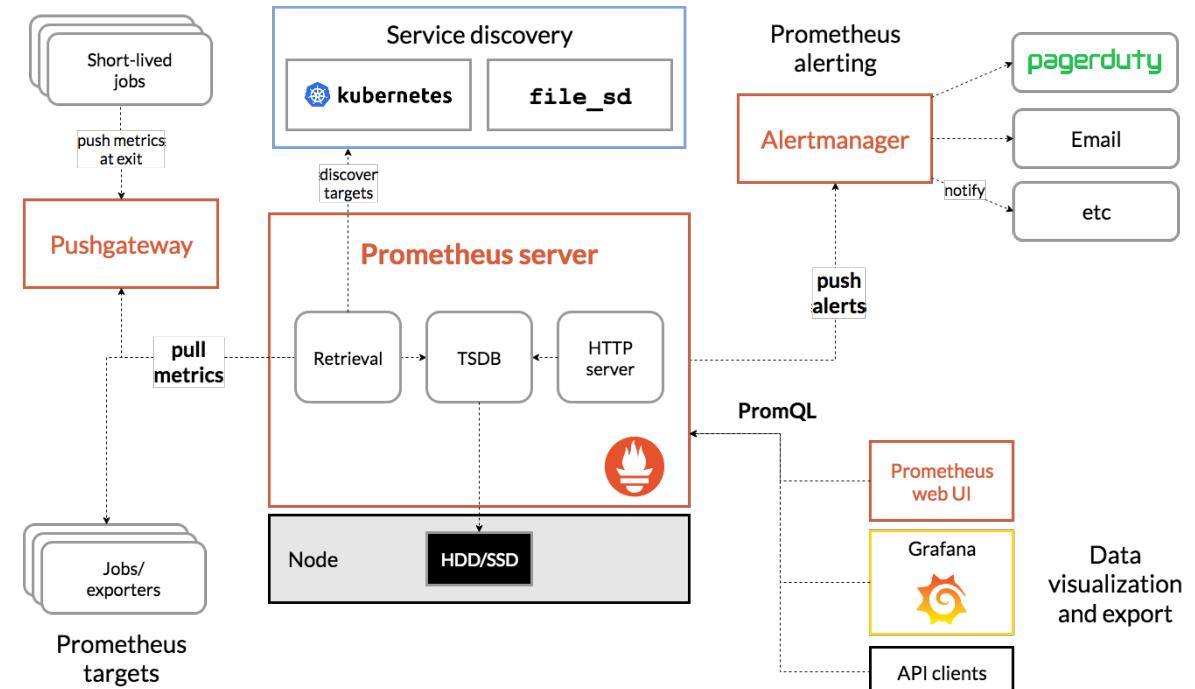
Power your metrics and alerting with the leading open-source monitoring solution.



# Prometheus

# What is Prometheus?

- Powerful monitoring and Alerting
- Scalability and High Performance
- Flexible data model and instrumentation
- Rich ecosystem and integrations
- Open source and active community



Source: <https://prometheus.io/docs/introduction/overview/>

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# Linkerd

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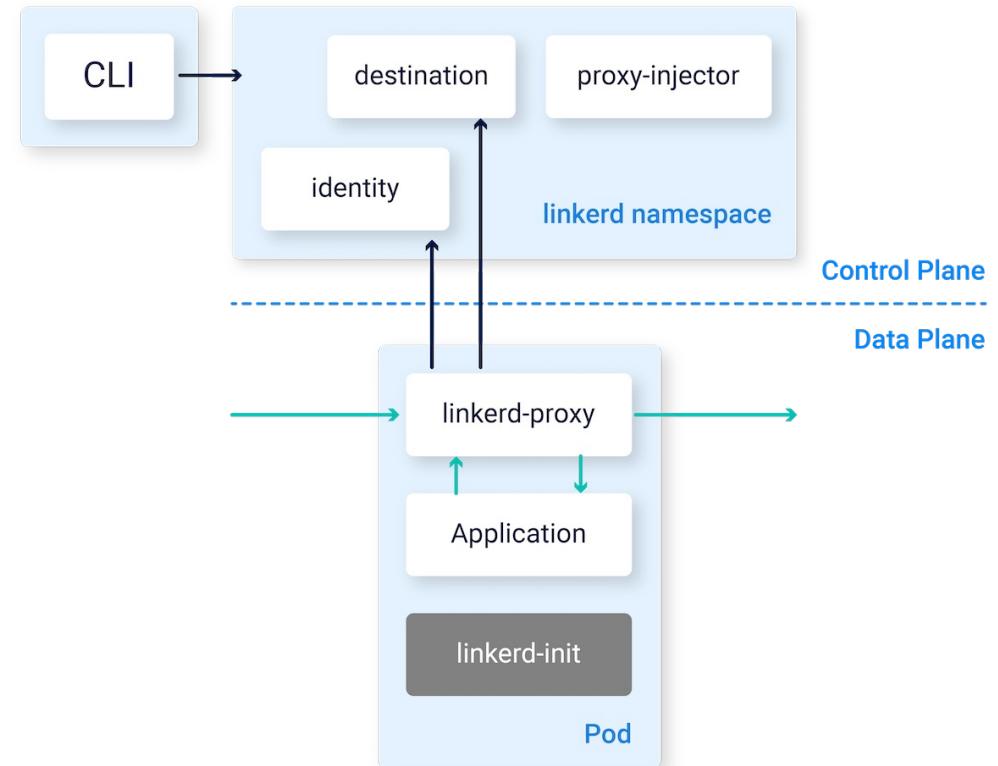


# LINKERD

@AnnieTalvasto

# What is Linkerd?

- Thriving open source community
- Simple, minimalist design
- Deep Runtime Diagnostics
- Ultralight and ultra fast
- Installs in seconds with zero config
- Actionable service metrics



Source: <https://linkerd.io/2.14/reference/architecture/>

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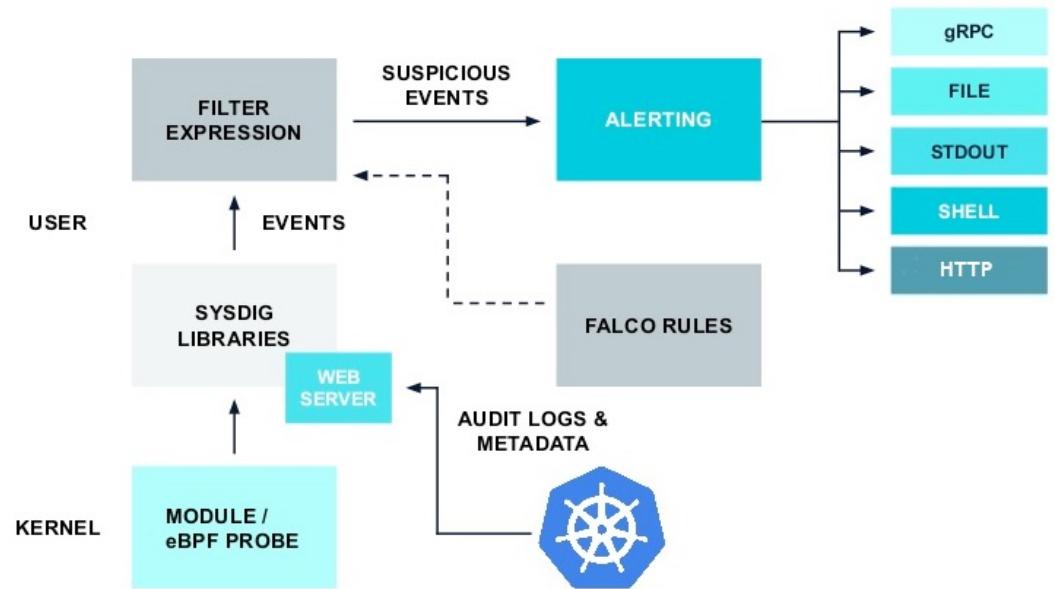
Falco, the cloud-native runtime security project, is the de facto Kubernetes threat detection engine



# What is Falco?

- Runtime security tool
- Uses system calls to secure and monitor a system
- Falco ships with a default set of rules that check the kernel for unusual behavior

## Falco extended architecture



Source: <https://falco.org/blog/extend-falco-outputs-with-falcosidekick/>

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implementation like Jaeger



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To enable more flexible networking, use a CNI-compliant network project like Calico, Flannel, or Weave. Open Policy Agent (OPA) is a general-purpose policy engine with uses ranging from authorization and admission control to data filtering. Falco is an anomaly detection system for cloud native.



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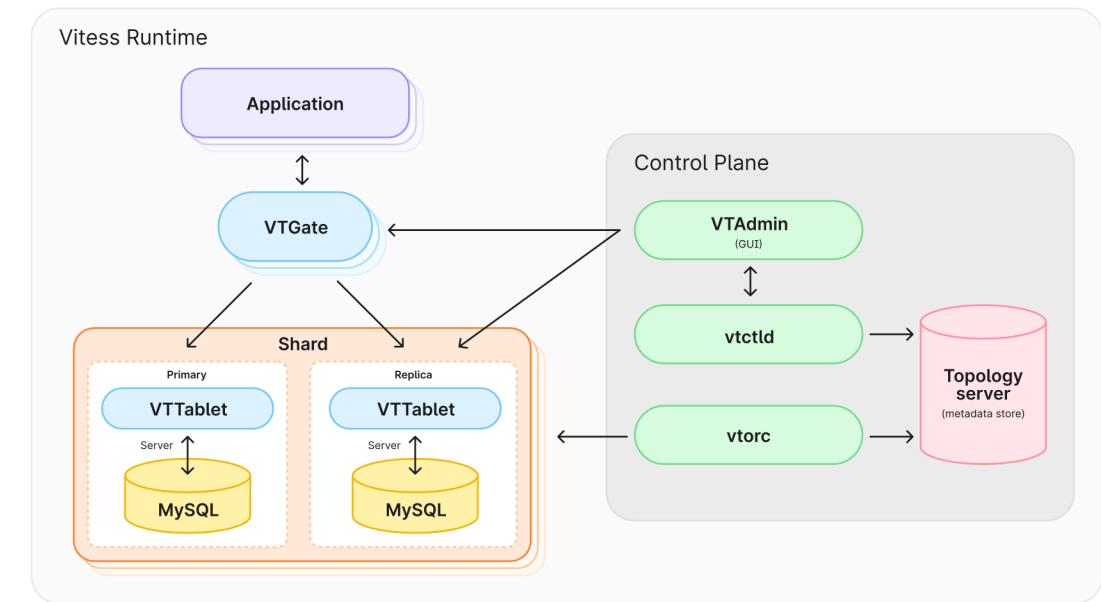
# Vitess

Scalable. Reliable. MySQL-  
compatible. Cloud-native.  
Database.



# What is Vitess?

- Horizontal scalability for MySQL
- Automated sharding and resharding
- SQL compatibility and transparency
- High availability and failover
- Cloud-Native and dynamic environments
- Database operations simplification



Source: <https://vitess.io/docs/17.0/overview/architecture/>

## B. Consulting Help

If you want assistance with Kubernetes and the surrounding ecosystem, consider leveraging a Kubernetes Certified Service Provider

[cncf.io/kcsp](https://cncf.io/kcsp)

## C. Join CNCF's End User Community

For companies that don't offer cloud native services externally

[cncf.io/enduser](https://cncf.io/enduser)

## WHAT IS CLOUD NATIVE?

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

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## 5. SERVICE PROXY, DISCOVERY, & MESH

- CoreDNS is a fast and flexible tool that is useful for service discovery
- Envoy and Linkerd each enable service mesh architectures
- They offer health checking, routing, and load balancing



implementation like Jaeger



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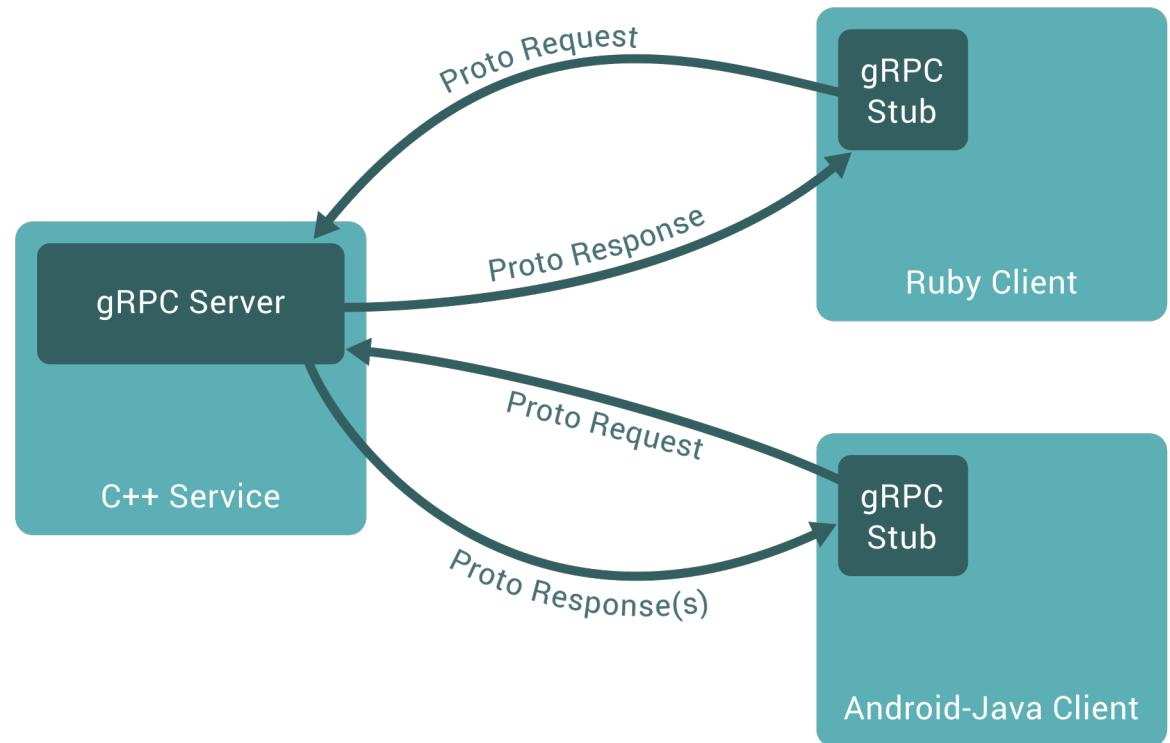
# gRPC

A high performance, open  
source universal RPC  
framework



# What is gRPC?

- Efficient communication
- Language-agnostic APIs
- Bidirectional Streaming



Source: <https://vitess.io/docs/17.0/overview/architecture/>

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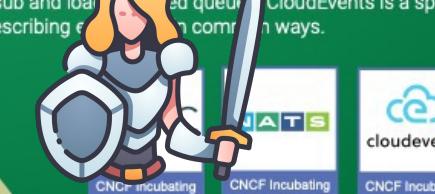
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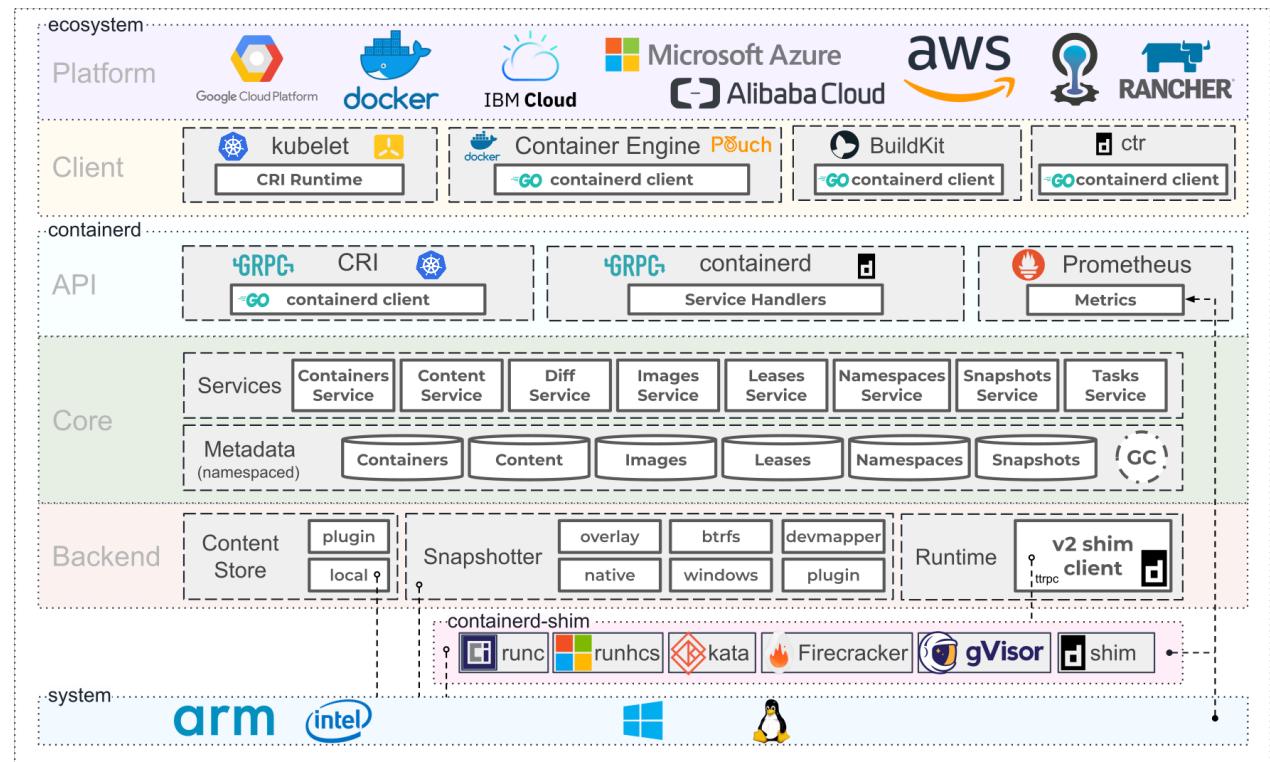
# Containerd

An industry-standard  
container runtime with an  
emphasis on simplicity,  
robustness and portability



# What is Containerd?

- Lightweight and focused
- Interoperability and standardization
- Customization and extensibility



Source: <https://containerd.io>

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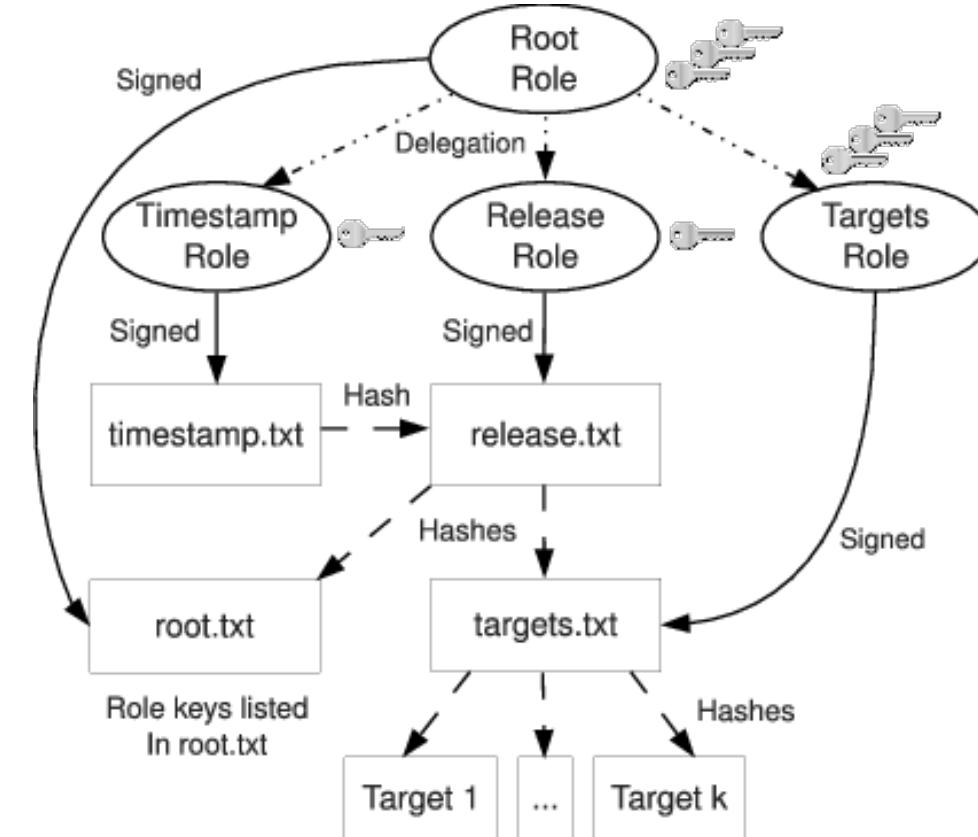
# The Update Framework (TUF)

A framework for securing software  
update systems



# What is TUF?

- Software supply chain security
- Multi-layered security
- Flexibility and compatibility



Source: [https://www.researchgate.net/figure/Overview-of-roles-and-files-in-TUF-when-used-with-a-software-update-system-that-does-not\\_fig1\\_221609850](https://www.researchgate.net/figure/Overview-of-roles-and-files-in-TUF-when-used-with-a-software-update-system-that-does-not_fig1_221609850)

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Container Orchestration

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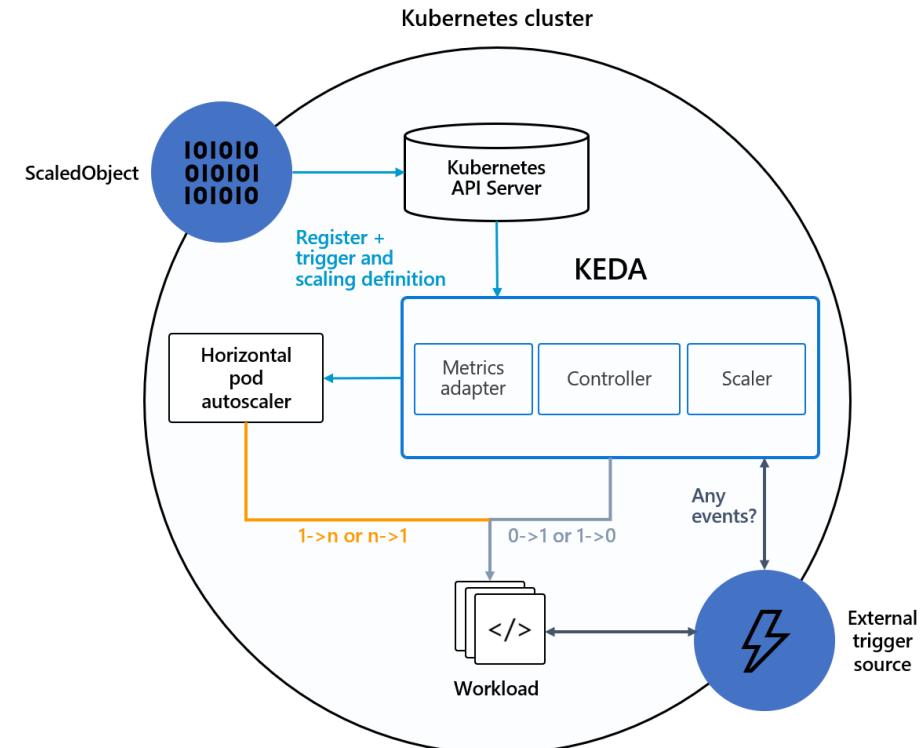
# Keda

Kubernetes Event-driven  
Autoscaling. Application  
autoscaling made simple.



# What is Keda?

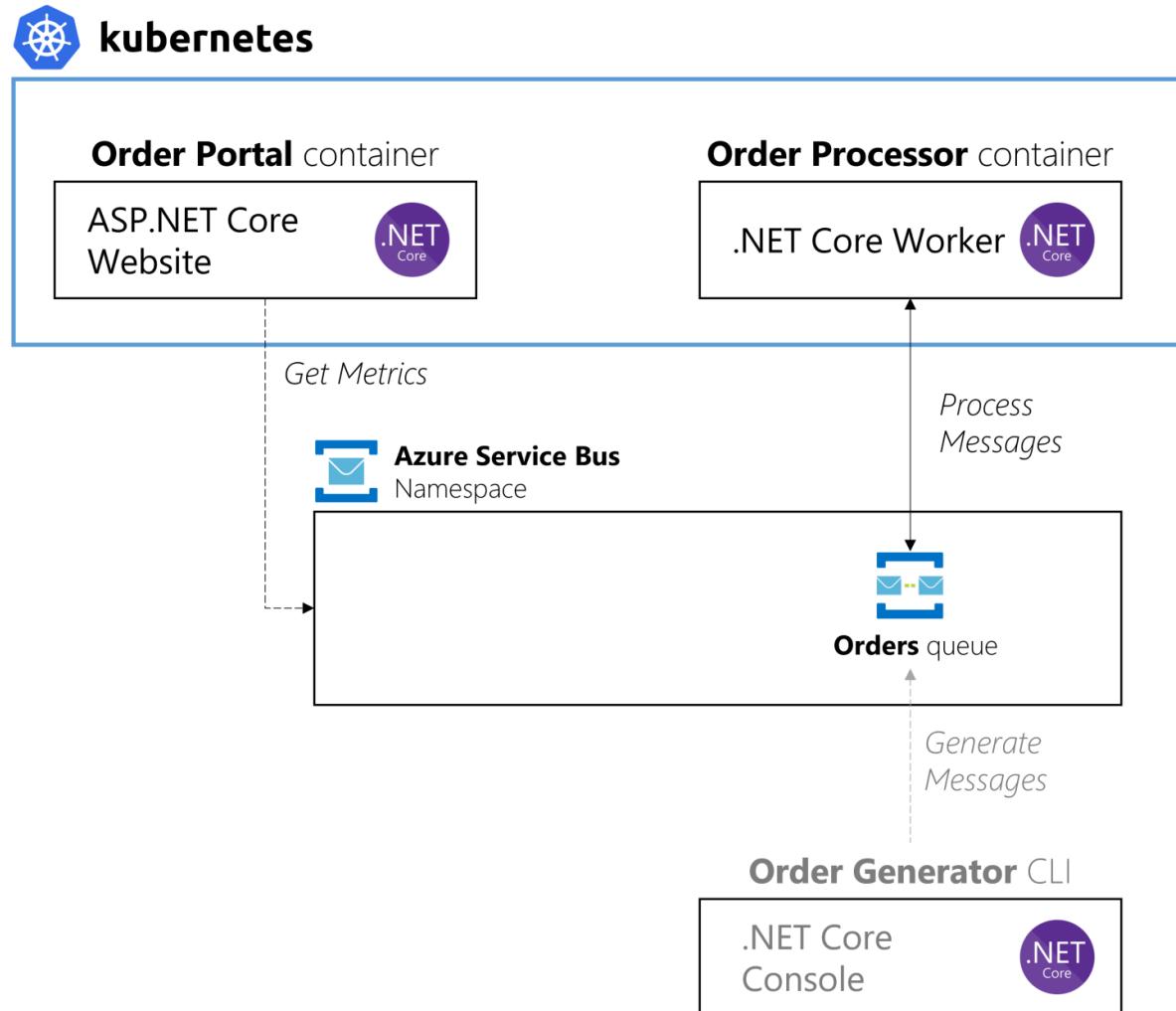
- Default Kubernetes Scaling is not well suited for event driven applications, kubernetes is more for resource based scaling (CPU and memory).
- Keda: Event driven scale controlling that can run inside any kubernetes cluster.



Source: <https://keda.sh/docs/2.10/concepts/>

# Demo

KEDA:  
Scaling .NET  
Core worker  
with Azure  
Service Bus



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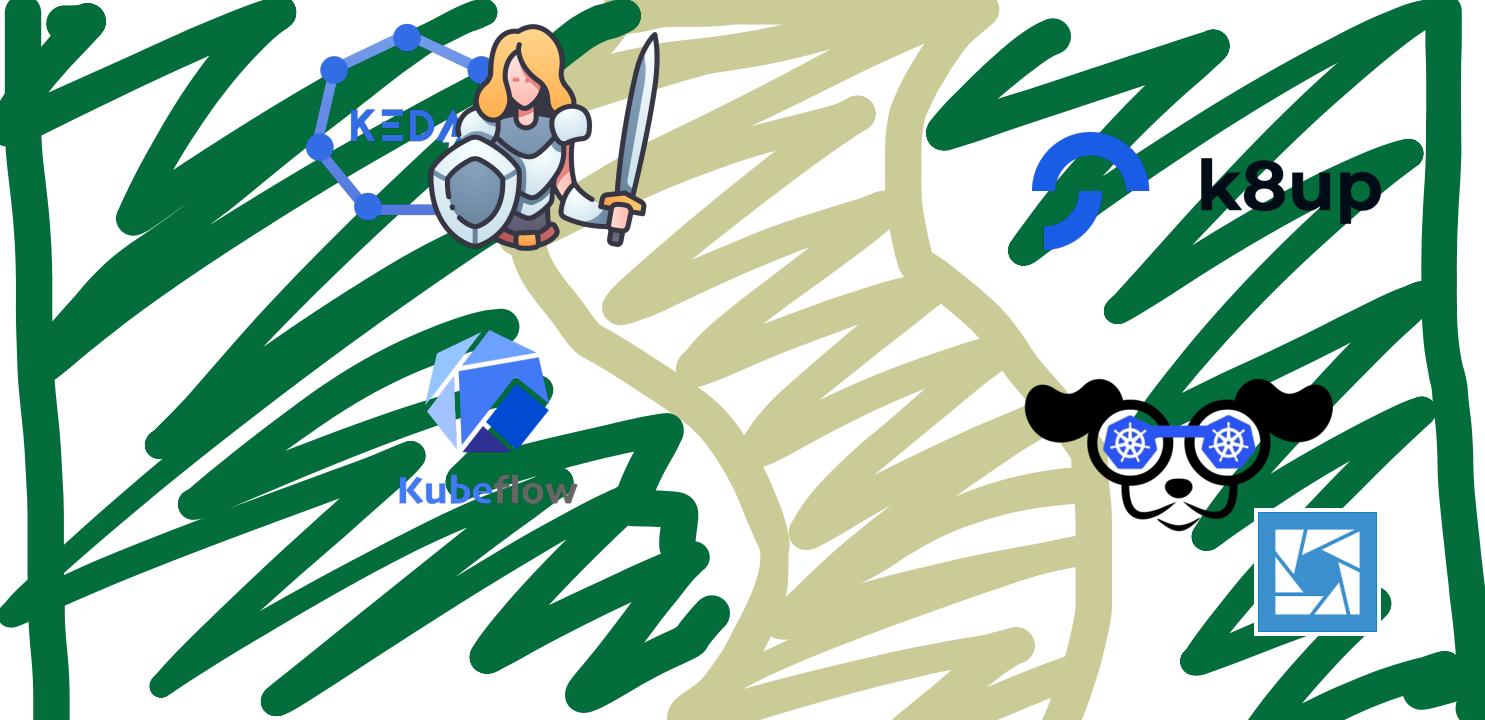
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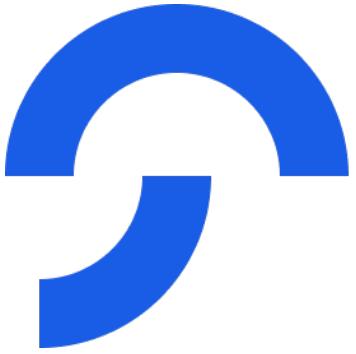
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# k8up

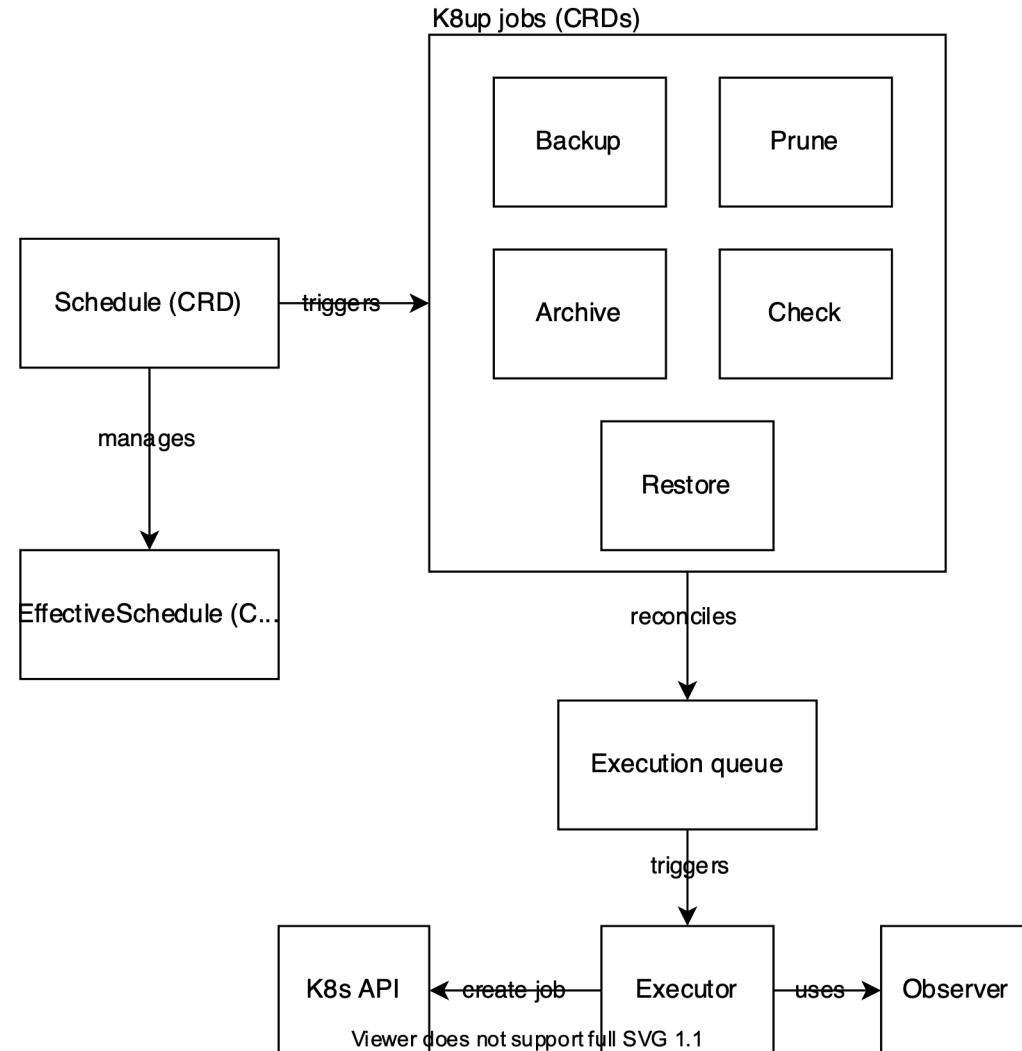
Kubernetes Backup  
Operator



# k8up

# K8up

○ X



Source: <https://k8up.io/k8up/1.2/explanations/architecture.html>

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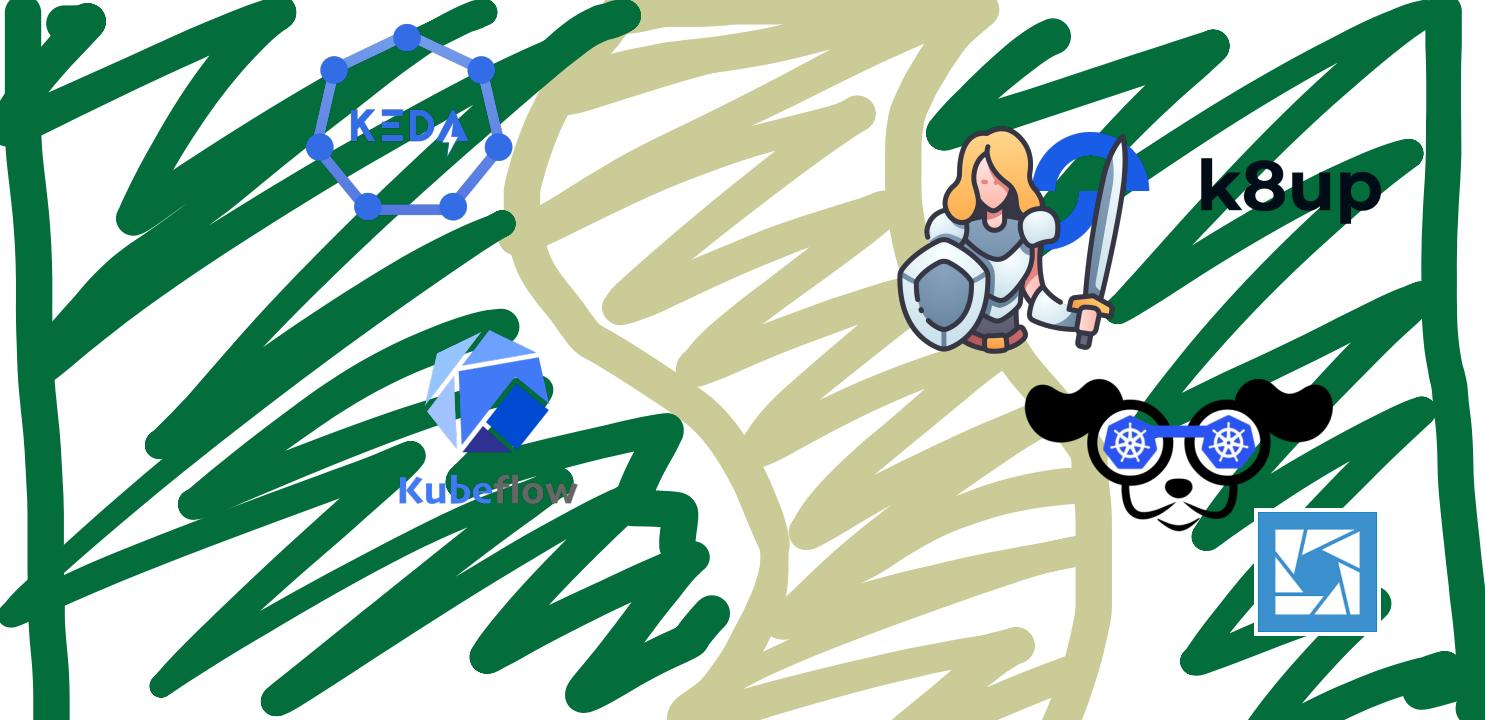
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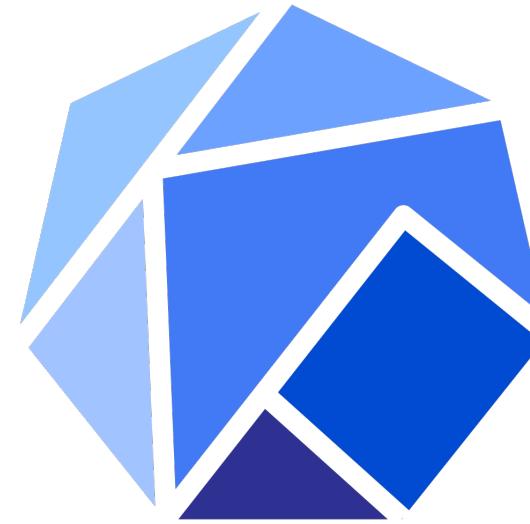
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# Kubeflow

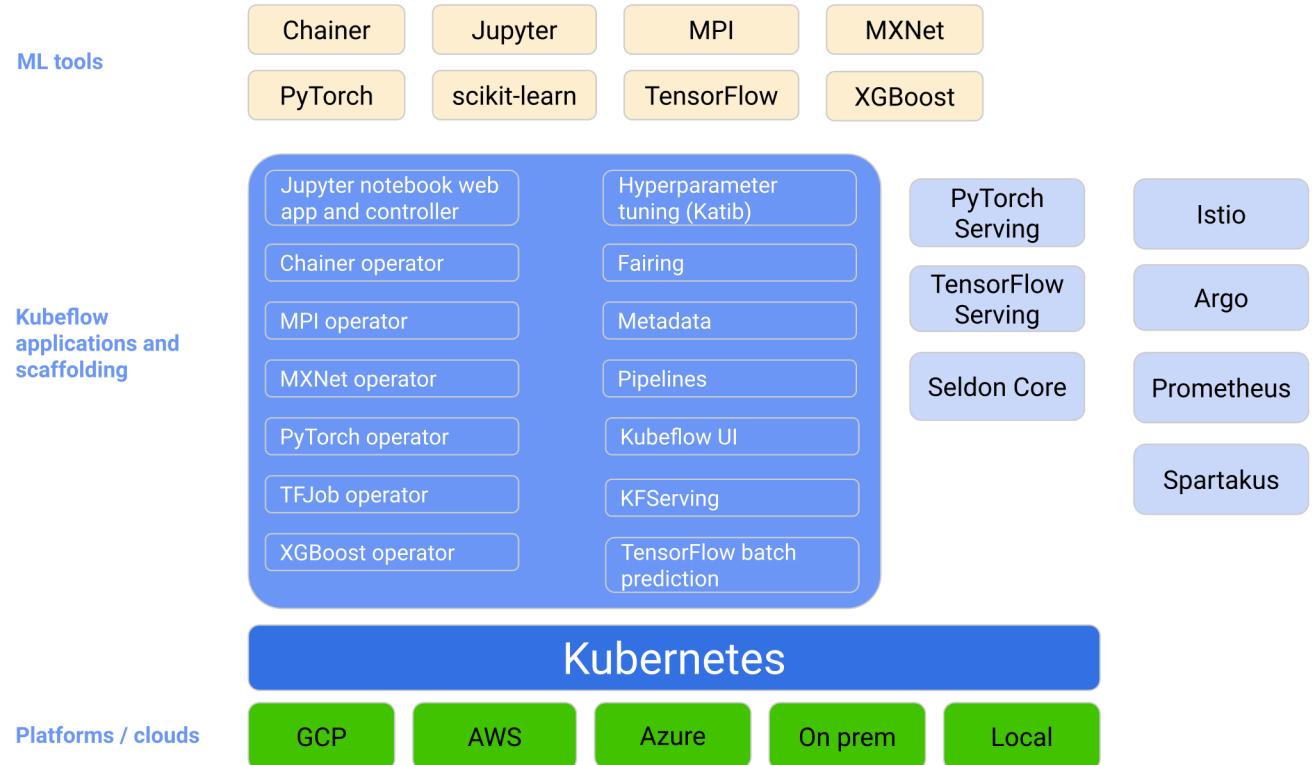
The machine learning  
toolkit for Kubernetes.



**Kubeflow**

# What is Kubeflow?

- End-to-End ML workflow
- Scalability and resource management
- Reproducibility and collaboration



Source: <https://www.kubeflow.org/docs/started/architecture/>

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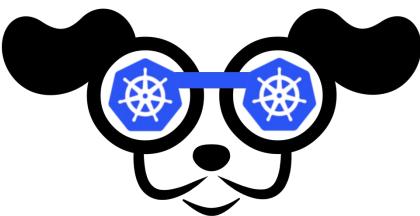


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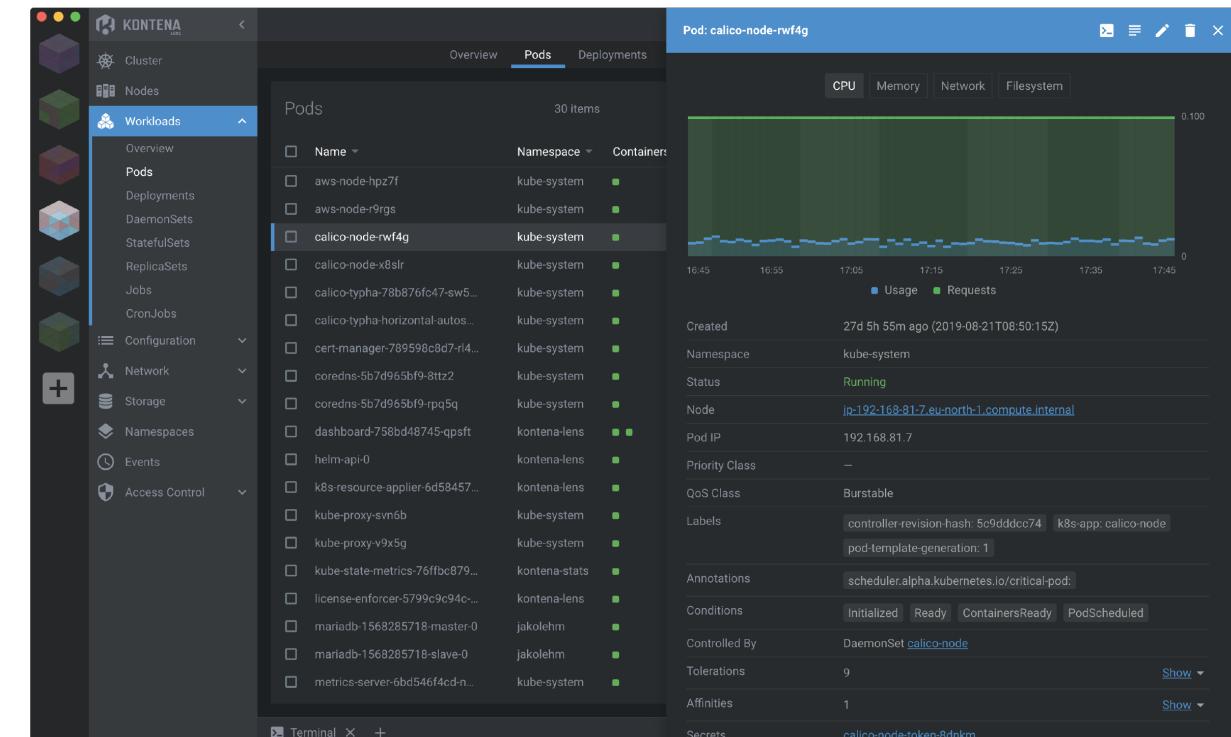
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# K9s



# Lens



@AnnieTalvasto

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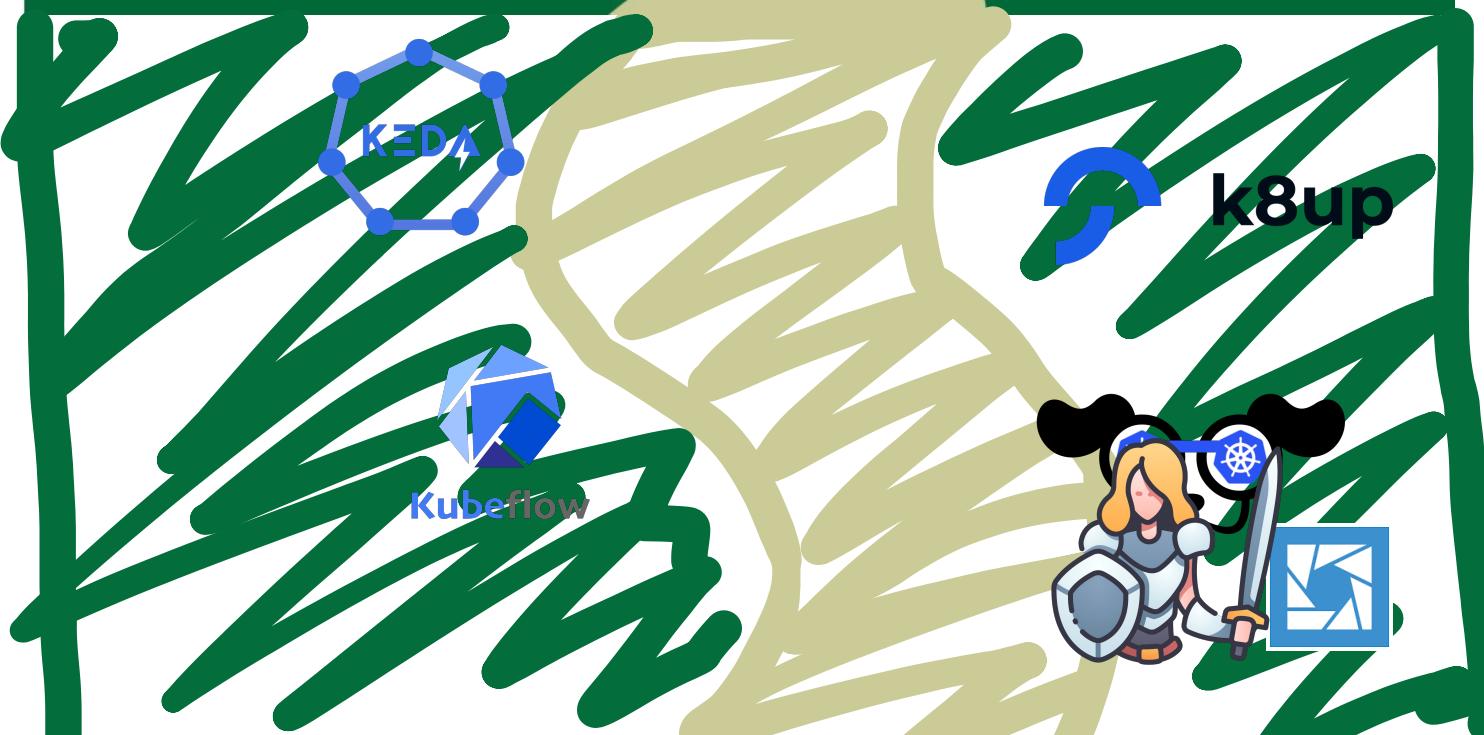
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# Wrap up

- Argo
- Helm
- Prometheus
- Linkerd
- Falco
- Vitess
- Container d
- TUF
- Keda
- K8up
- Kubeflow
- Lens & k9s

# Learn more

Links and slides: [github.com/annietalvasto](https://github.com/annietalvasto)

CNCF landscape: <https://landscape.cncf.io>

CNCF Trail map:  
<https://github.com/cncf/trailmap>

Session: Kubernetes in 2023

- <https://youtu.be/kGrpLKNi4ZI?si=Uk5um0j2awMnjlQd>

## Projects

<https://argoproj.github.io>

<https://helm.sh>

<https://prometheus.io>

<https://linkerd.io>

<https://falco.org>

<https://vitess.io>

<https://grpc.io>

<https://containererd.io>

<https://theupdateframework.io>

<https://keda.sh>

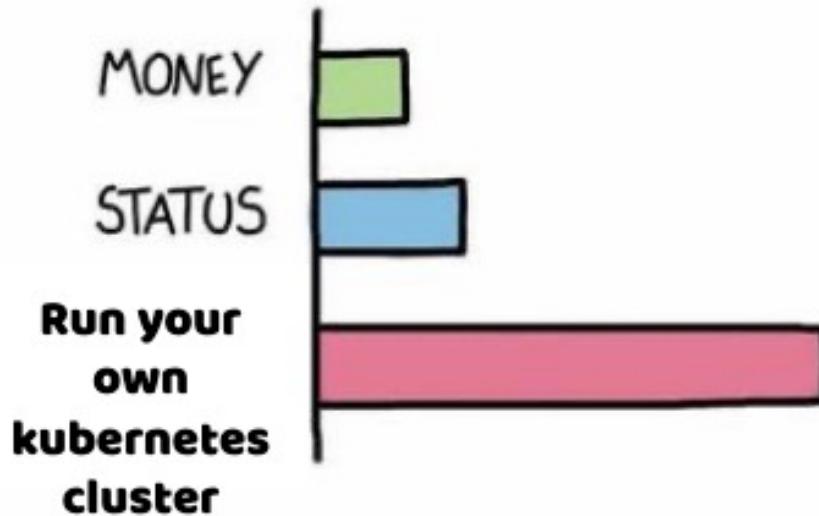
<https://k8up.io/k8up/2.7/index.html>

<https://k9scli.io>

<https://k8slens.dev>

## WHAT GIVES PEOPLE FEELINGS OF POWER

Thank you!



@iannotanartist...

@AnnieTalvasto