
KubeCon
CloudNativeCon
North America 2023

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Real World Knative: Success Stories from Production Environment

Andrew Senetar

CoreWeave

Norris Sam Osarenkhoe

SVA

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Red Hat

Ricardo Rocha

CERN

Adolfo Garcia Veytia

ChainGuard

Knative is more than Serverless

Automatic scale on demand for cloud native Containers

Serverless Platform for Kubernetes

Simplified

Knative as ~~opinionated~~ Kubernetes for Application Developers

Event Driven Platform for Kubernetes

Knative by default, Kubernetes when you must

Today we will learn…

1. Use Case
2. Knative for What
3. Why knative

CoreWeave

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Andrew Senetar

Senior Infrastructure Engineer

CoreWeave - Knative Usage

CoreWeave provides Knative Serving as a managed offering to customers serving GPU accelerated inference.

- Large language models (LLMs)
- Image generation

Knative Serving provides simplified deployment and scaling since it includes management and configuration of:

- Ingress
- TLS certs
- Concurrency based scaling and load balancing
- Scale to/from zero
- Ability to buffer momentary surges in traffic

OUR CLIENTS

AI DUNGEON

NovelAI

CHAI

CoreWeave - Control Plane Challenges

Activators

- Opted to manually scale vs HPA
- Increased per activator capacity
- Dashboards to monitor at both cluster wide and per revision

Ingress

Istio

- Original Ingress used, without service mesh
- As things scaled Istio became less reliable

Istio more “complicated” than what is needed for Ingress

- Kourier
- Better scaling*
- Simple deployment and easier to debug

Bugs

- Activator: not detecting pod readiness in some cases (patched in v1.12)
- Kourier: slow startup time in larger clusters
- Istio: delay in new services becoming routable

CoreWeave - KService Challenges

Poorly Optimized Containers

- Inference containers tend to be large
- Pulling models from remote services (Hugging Face etc.)
- Long time from for container to be ready (3+ minutes)
- Not handling request cancelation

KService Misconfiguration

- Incorrect container concurrency
- Non-optimal autoscaler parameters

Learnings

- Internal docs for support ops to help differentiate between customer misconfiguration and control plane issues
- Public docs for best practice (inference focused)

Norris Sam Osarenkhoe

DevOps Architect

SVA SYSTEM VERTRIEB ALEXANDER GMBH

SVA - Eventing Usage

Knative-Eventing @SVA System Vertrieb Alexander GmbH

(Goal)

A big, magic ***Event-Mesh*** for developers that ”just works”.

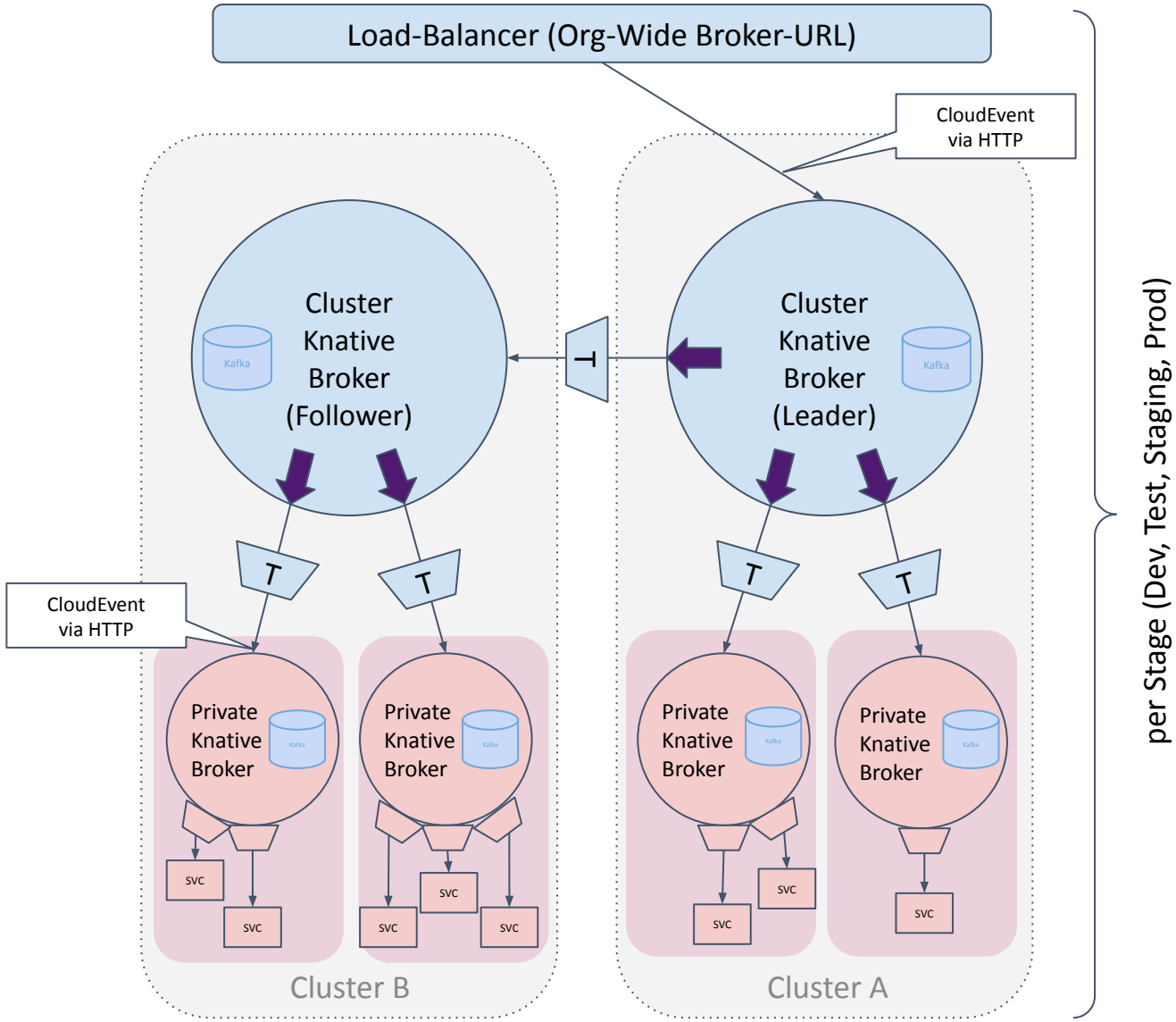
(Why)

Quick and **Scalable** integration and decoupling of applications, especially for read-heavy business cases.

Cost-efficiency because of centralizing cross-cutting concerns.

(Requirements)

Works On-Prem, Multiple Stages, Multiple Clusters per Stage, Custom CA, Firewalls, Self-Service via Namespace, Organization-wide Event-Streams, Private Event-Streams (Project, Business Unit, Namespace …), Cloud-Native



SVA - Eventing Challenges

Knative-Eventing @SVA System Vertrieb Alexander GmbH

Setup:

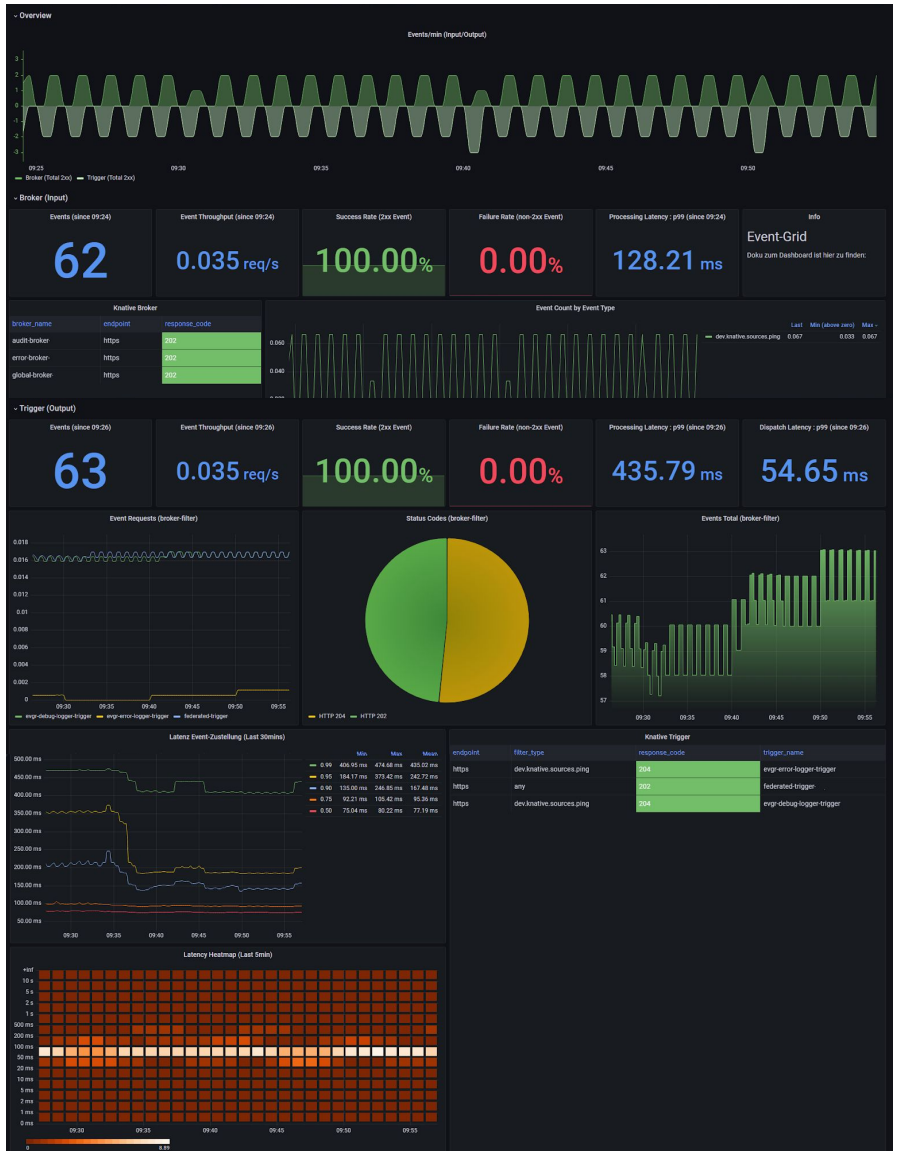
- Binding with underlying **Persistence** (Kafka, RabbitMQ, …) and scalability factors not very clear.
- **Sparse Docs** for some details (e.g. default to Port 80 for K8s “Callable” DuckType)
- No “official” way of injecting **Custom CA** certs to some Data Plane components.

Usage:

- Challenging **Conceptual Onboarding** for developers:
  Event Response Codes, Idempotency, Dead Letter Sinks.
- Securing **Event Delivery**.
- End-2-End **Observability** for users.
- Default **Grafana Dashboards** are very Administrator / Ops focused.

Operations:

- Using **GitOps** to deploy and configure Knative, the reconciler sometimes “hangs” if changes are made too quickly on too many resources while the reconciliation loop is still running.
- **Error Messages** are not always very descriptive. E.g. hidden char in Secret or wrong Secret just leads to EOF errors.
- Very rare: We had a “ghost” **Trigger** after upgrading one cluster and Knative.



SVA - Eventing Recommendations

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Knative-Eventing @SVA System Vertrieb Alexander GmbH

Setup:

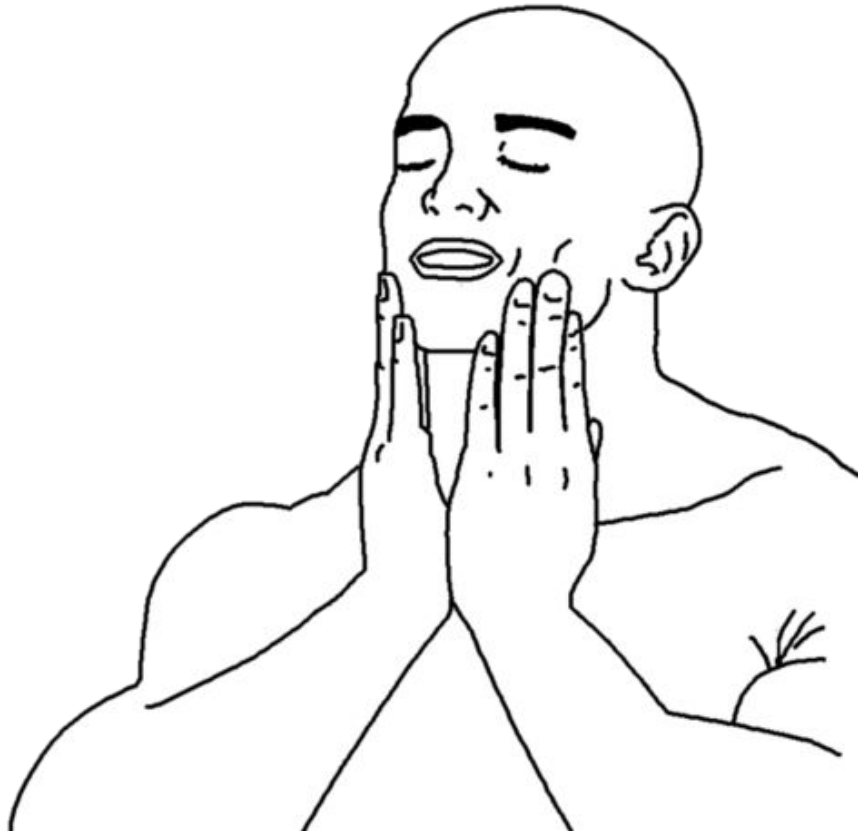
- Break your Knative Installation as much as possible through **Load and Chaos Tests**. Learn from it.
- **Compliance**: Think about access (AuthN before Broker and Consumers), custom CAs, Firewalls, Audit & Logging, Service Levels
- Automate everything and enable **Self-Service**.

Usage:

- **Developer Experience (DX) is key**. Knative itself has a solid architecture and clean interfaces, but depending on your users, they might need additional tools and help.

Operations:

- Keep an **Issue-Log**. Our Template: Root Cause, Assumption, Solution, Ticket-Link
- If you don't manage the underlying Infra and K8s: Work very closely with them. **Optimize Workflows** if responsibilities are shared.
- Choose your **Log-Levels** wisely (Do you really need to log every accepted Event?)
- A good, unified **Observability Plane** is a MUST!



Use Case Study on CNCF

Case Study:

https://bit.ly/sva-knative-eventing

CERN

Ricardo Rocha

Computing Engineer

CNCF TOC / TAB

CERN - Knative Usage

Longtime users of Knative for inference, also via Kubeflow

Integration with GPUs, Nvidia MIG, …

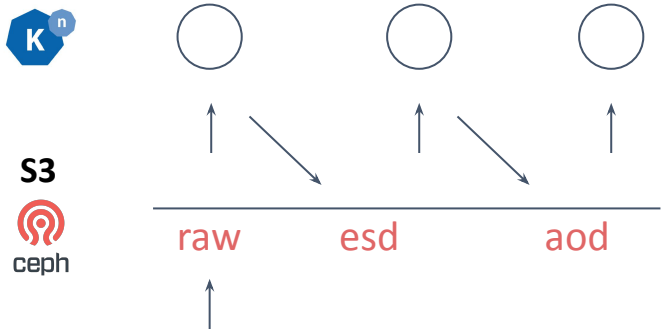
Versioning, rollouts and rollback, auto scaling

Model Servers + NEW MODEL SERVER

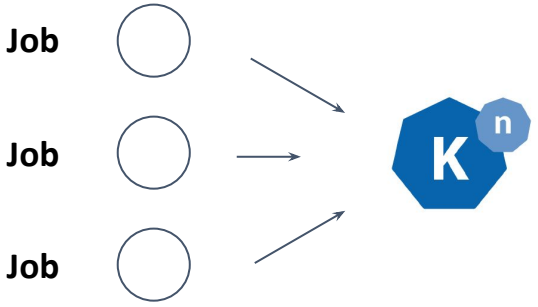
Status	Name	Age	Predictor	Runtime	Protocol	Storage URI
✓	flowers	4 minutes ago	Tensorflow	1.14.0		gs://kfserving-samples/models/tensorflow/flo...
	pmml-demo	4 minutes ago	PMML	v0.5.1		https://raw.githubusercontent.com/openscorin...
✓	sklearn-iris	4 minutes ago	SKLearn	0.2.1	v2	gs://seldon-models/sklearn/iris
✓	torchserve	4 minutes ago	PyTorch	0.3.0	v1	gs://kfserving-examples/models/torchserve/i...
✓	xgboost-iris	4 minutes ago	XGBoost	0.2.1	v2	gs://kfserving-samples/models/xgboost/iris

Different experiments with **eventing for internal workflows**

Physics Event Reconstruction



GitLab CI

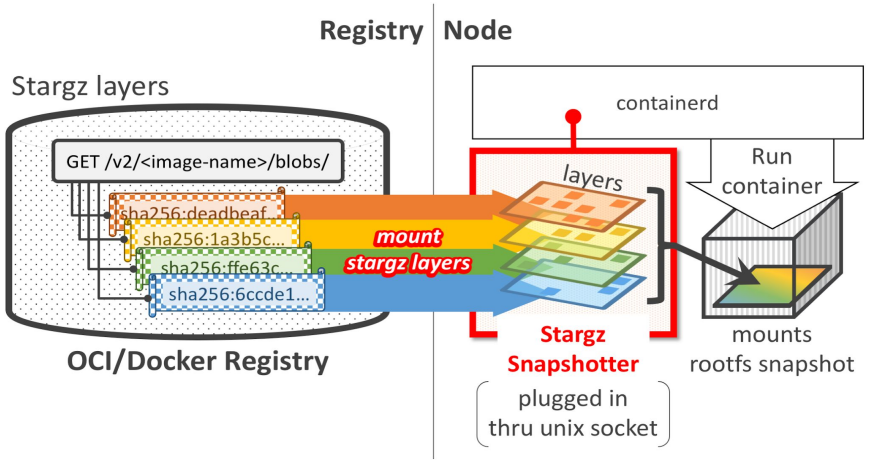


CERN - Knative Challenges

Cold starts for very large images (~18GB), image distribution

→ Remote snapshotter (estargz) in containerd

mode	pulling time	RAM Containerd/ stanpshotter	Ingress on node	execution time workload
native	3m37s	257MB	5.84GB	7m15s
esgz	16s	1360MB	0.84GB	8m14s



Learned **Istio for this specific use case**, but knowledge not spread internally

Serving in **remote, air-gapped environments**

CERN - Knative Needs

Larger, bigger use cases bring new needs

- AI / ML often builds on **external weights and data** (cold start v2)
- **Very large models**, single inference on multiple GPUs

Efficient **sharing and concurrency of scarce resources**

- Particularly for GPUs, partitioning, slicing, memory sharing, DRA

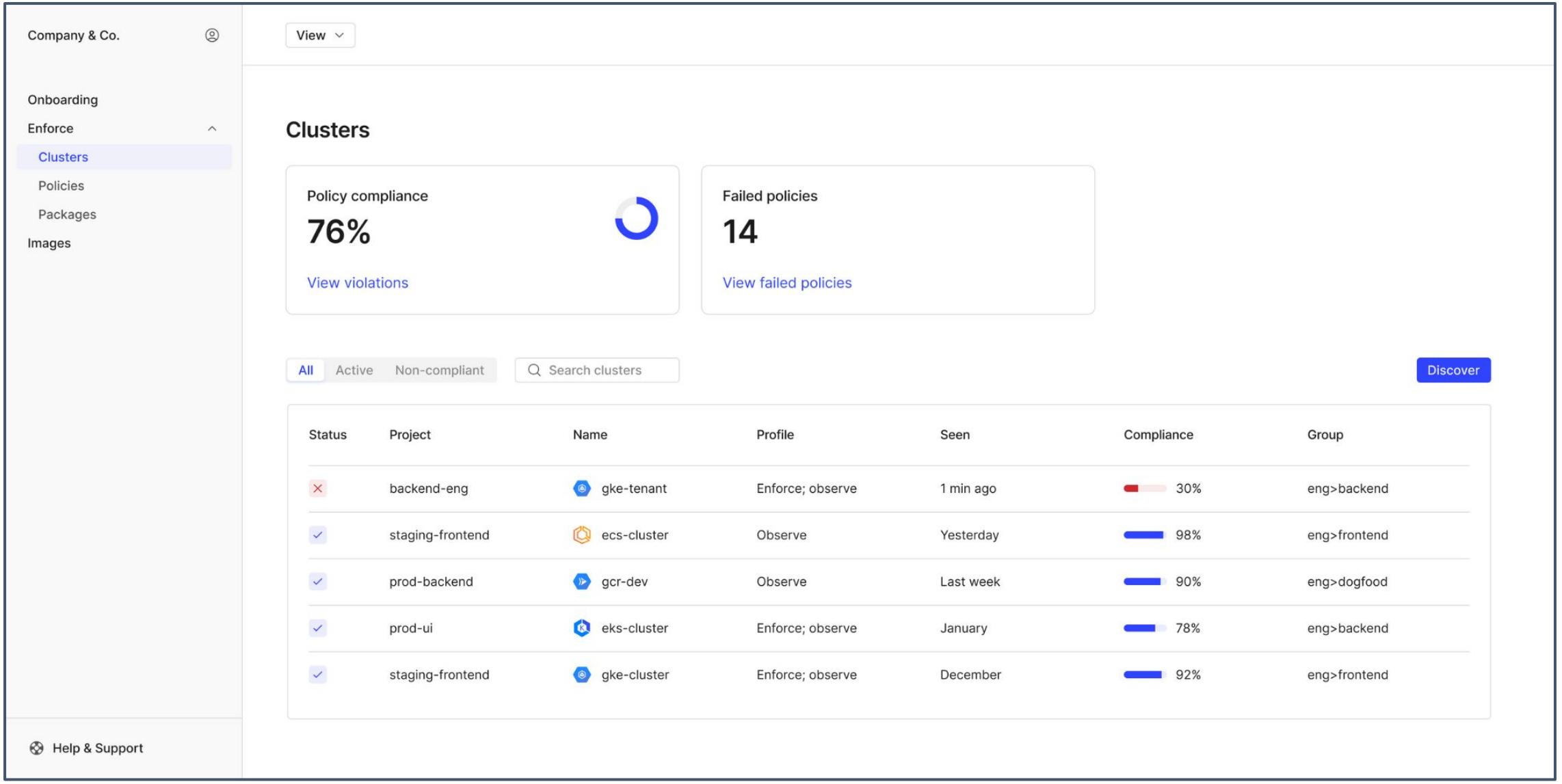
Multi-cluster serving, bursting and scaling to external resources

Chainguard

Adolfo Garcia Veytia

Staff Open Source Engineer

Knative: The Core of Chainguard

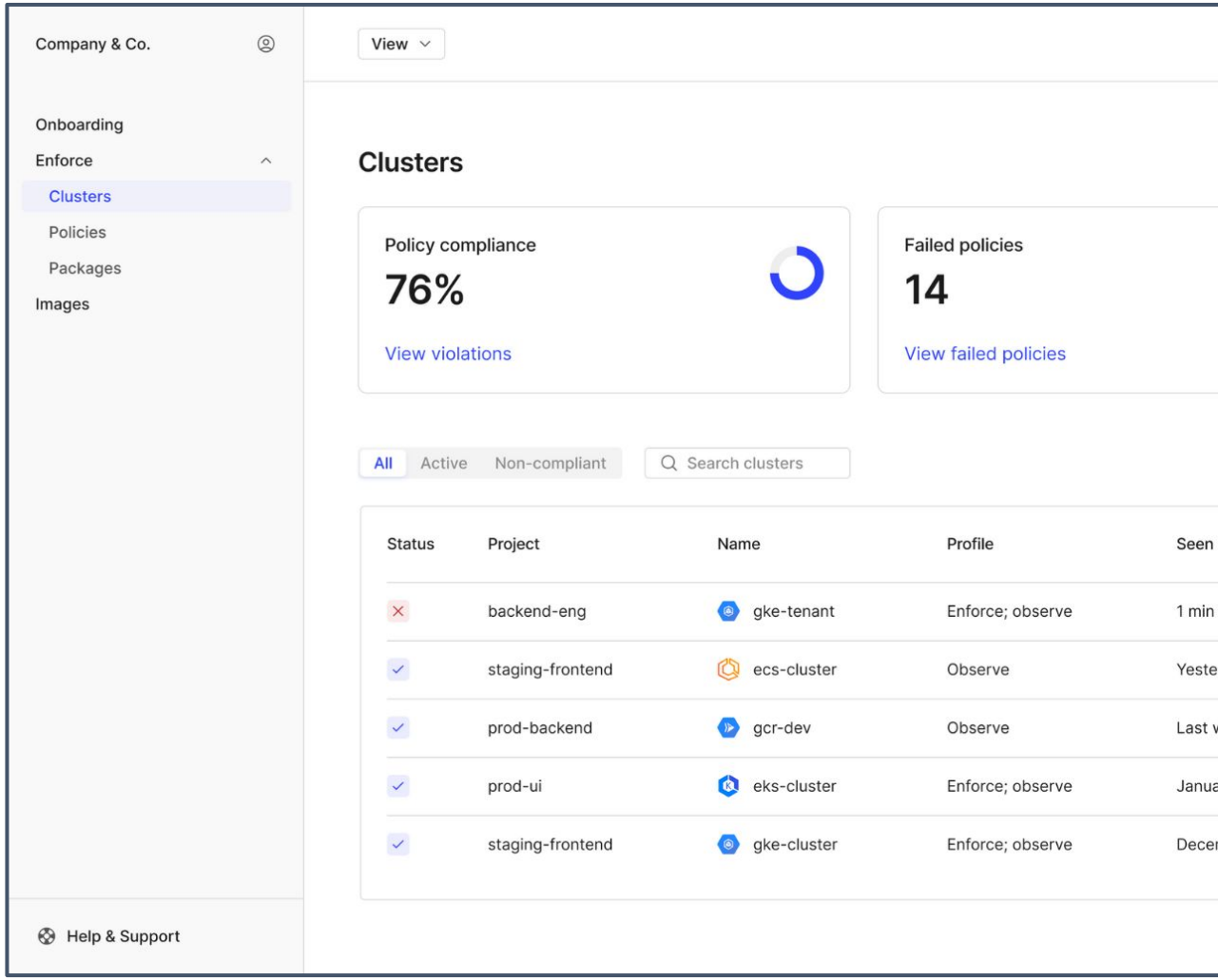


Knative: The Core of Chainguard

Serving in Chainguard Enforce

Knative serving powers all microservices behind Chainguard Enforce.

- 95% of workloads run as Knative services. The only exceptions are when we rely on upstream configurations.
- Chainguard has practically no raw deployments.



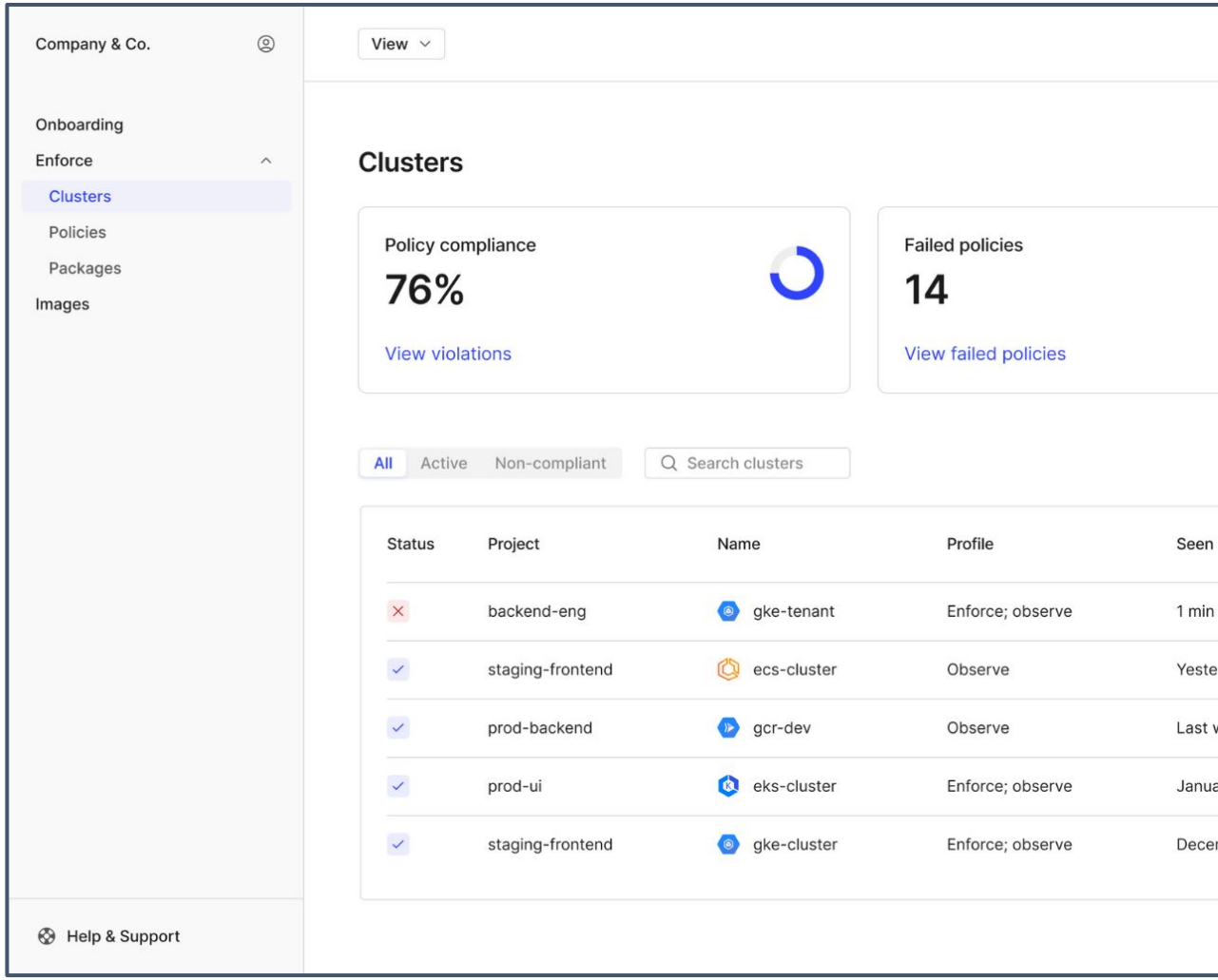
Knative: The Core of Chainguard

Eventing in Chainguard Enforce

Knative Eventing is used as the comm channel to react whenever there is a supply chain security event in our customers' clusters.

Examples:

- Vulnerability scans on customer workloads.
- Lifecycle notifications from our admission controller.

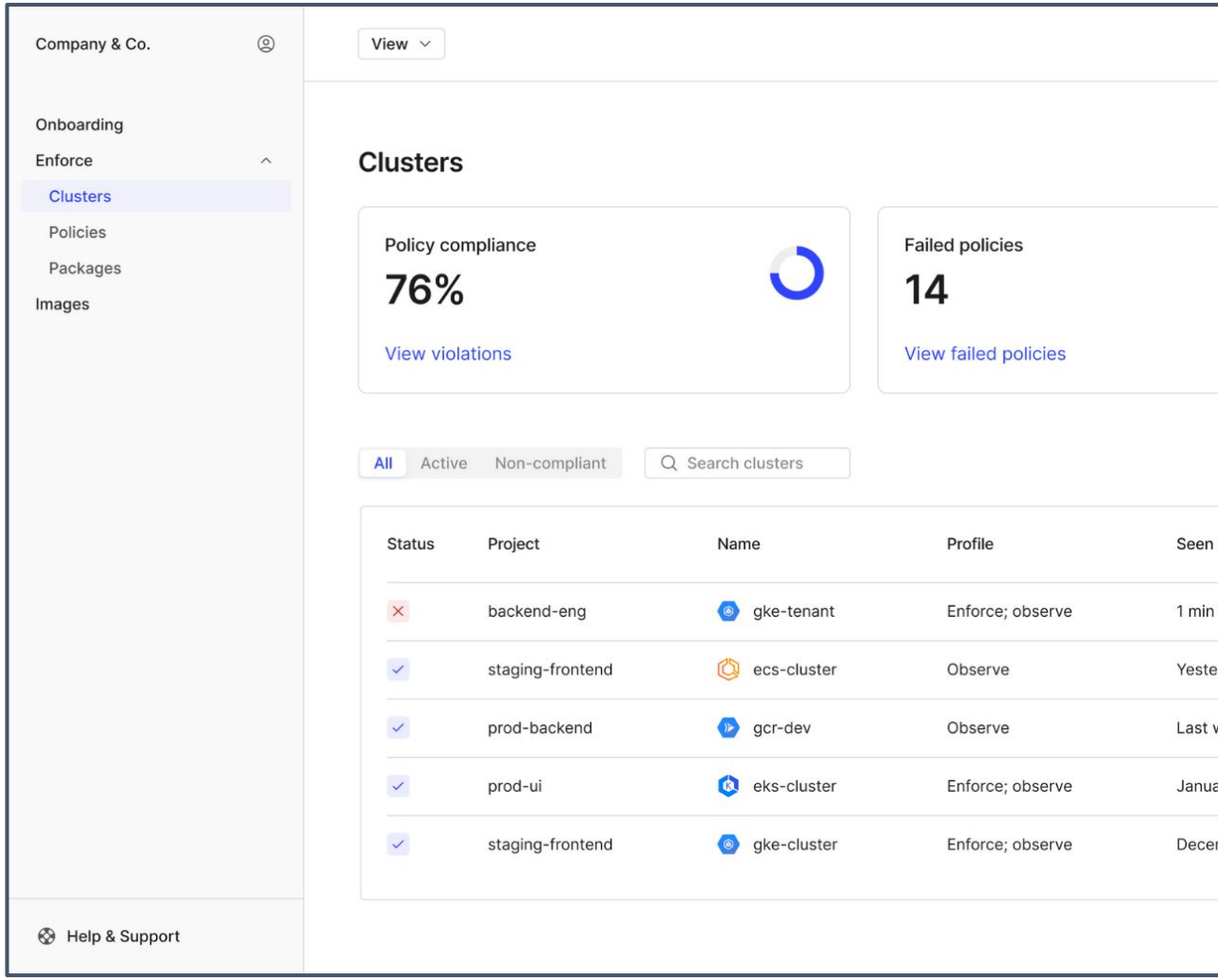


Knative: The Core of Chainguard

Controller Framework

The Chainguard Enforce agent continuously observes running workloads.

Built using Knative Controller Framework.



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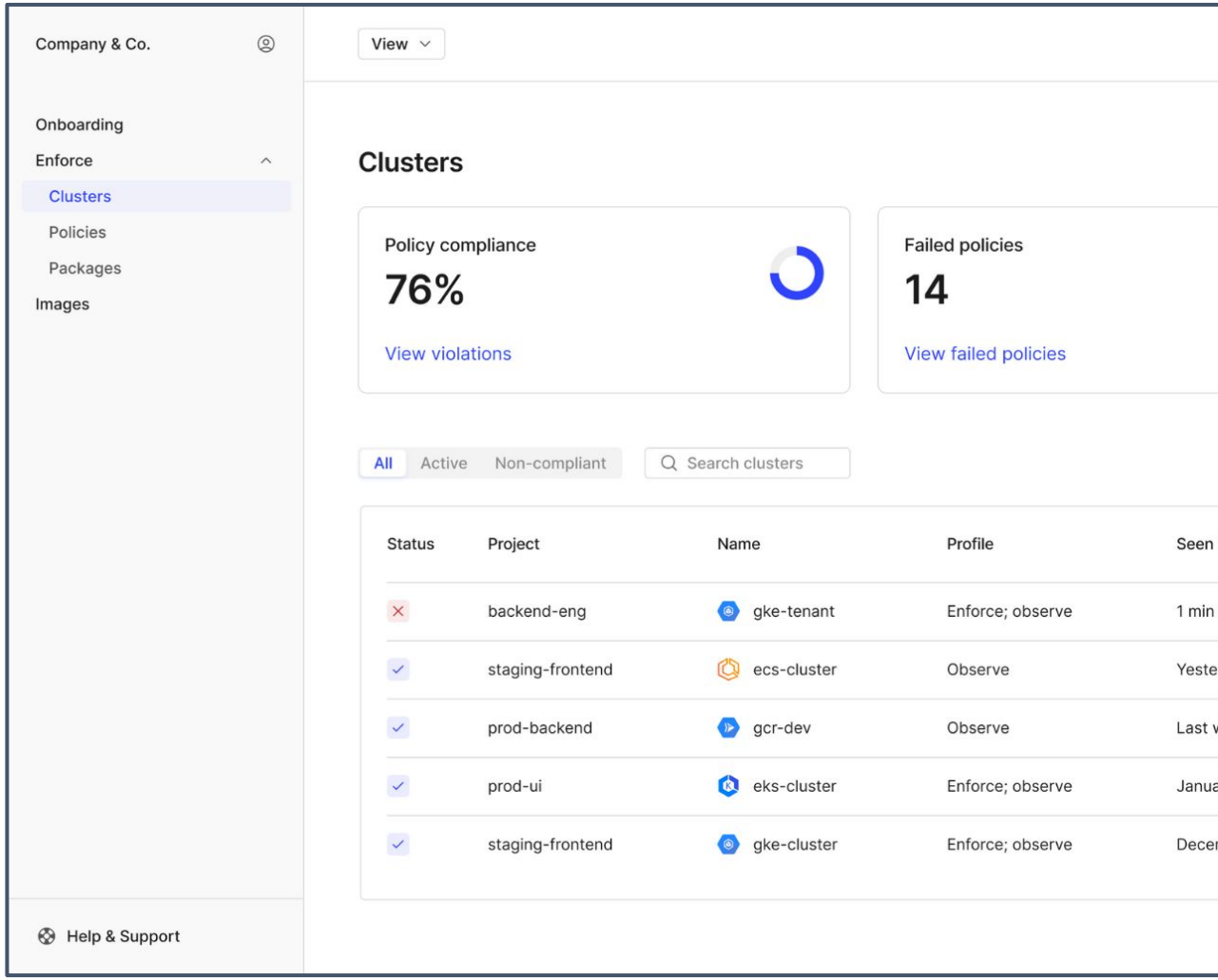


Knative: The Core of Chainguard

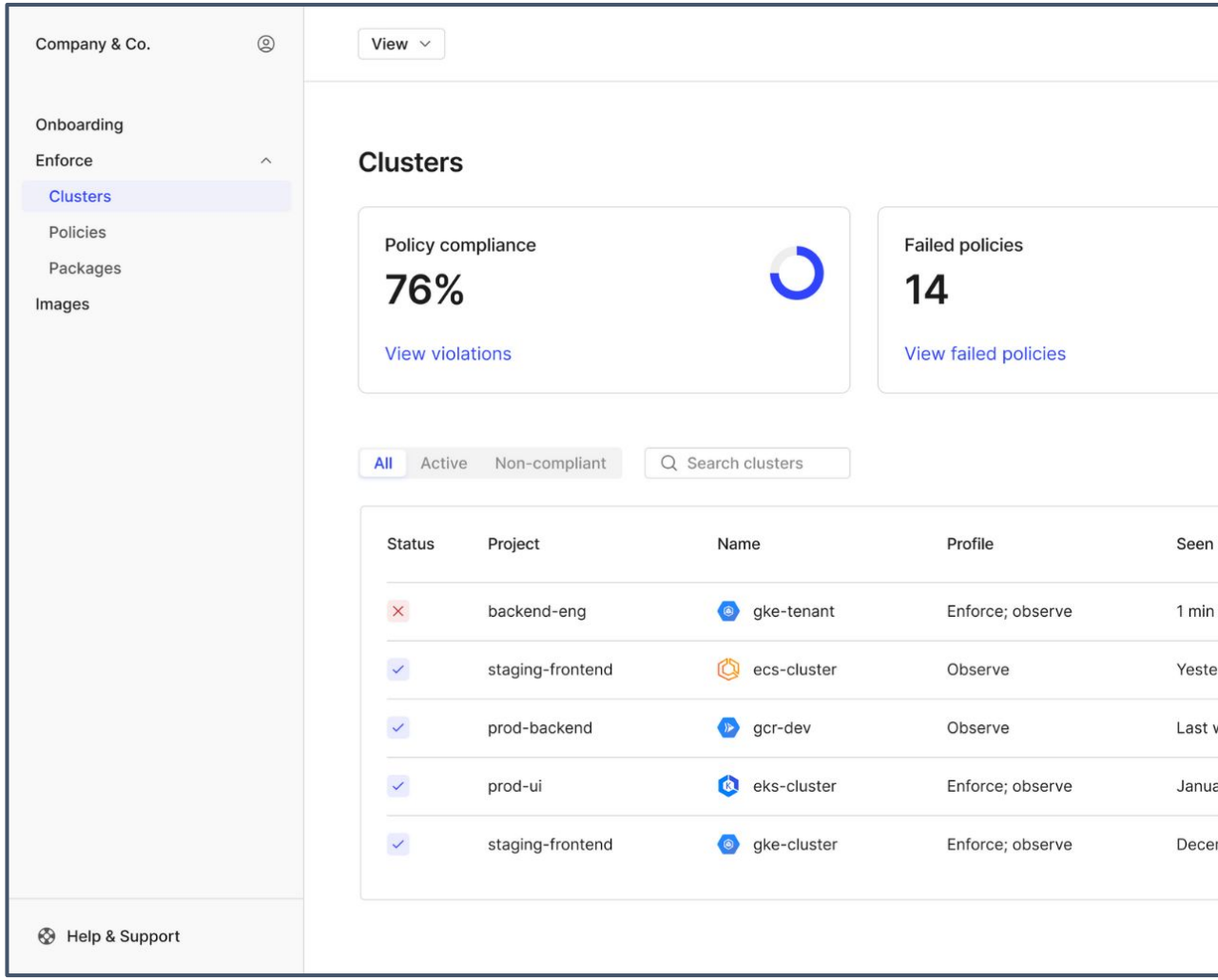
Challenges

Ooh RabbitMQ…

Low maintainer count shows up.

- Lack of documentation
- Difficult to get advice
- PR reviews, issue investigation

Complex backend powering a simpler system



Q & A

Try Knative for yourself & connect with us

Learn more with our tutorial on https://knative.dev/

We're now on CNCF Slack! Introduce yourself on #knative, or join one of the working groups:

- #knative-documentation
- #knative-eventing
- #knative-functions
- #knative-serving
- #knative-security
- #knative-productivity

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