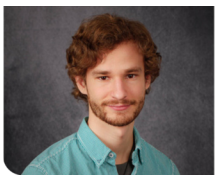
Infrahub meets K8s

Single Source of Truth for Scalable Kubernetes Configuration Management

Graduate



Simon Linder

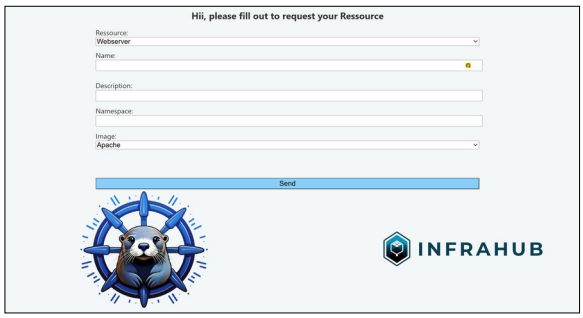
Ramon Stutz

Initial Situation: In modern infrastructure environments, declarative configuration and GitOps practices are key to achieving scalability, consistency, and traceability. Tools like ArgoCD or FluxCD enable automated deployment of manifests stored in Git, allowing clusters to continuously reconcile with their defined state. However, these workflows typically assume that all manifests are already written and maintained manually. In more complex setups, teams aim to define infrastructure using higher-level, custom schemas that reflect relationships and business logic - then generate manifests automatically. This creates a need for a structured source of truth that models the infrastructure and produces deployable resources dynamically. Without this bridge, organizations still face friction between abstract infrastructure design and automated cluster operations. As a result, teams often rely on brittle, custom-built pipelines that are hard to maintain and do not scale well across environments.

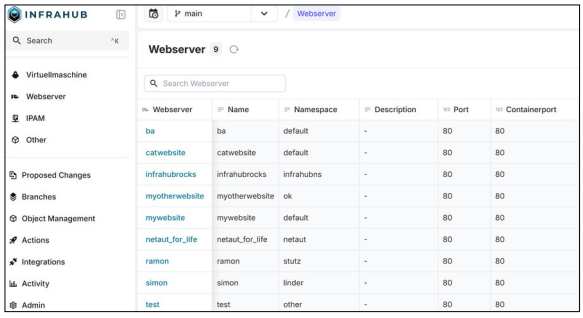
Objective: The goal of the project was to close this gap and enable a fully automated path from infrastructure modeling to Kubernetes deployment. We used Infrahub as our central source of truth, where infrastructure is structured and version-controlled. While Infrahub models and stores the desired state, it does not deploy it. To address this, we developed a custom Kubernetes Operator called Vidra. Vidra monitors the desired state mapped in Infrahub and ensures that the manifests are automatically applied to the Kubernetes cluster. It continuously reconciles the declared state with the runtime environment, bringing GitOps principles into the cluster layer without relying on external tools. This ensures a direct, reliable, and traceable deployment workflow.

Result: Vidra enables automated deployment of manifests from Infrahub to Kubernetes, ensuring configuration changes are promptly and consistently applied across the cluster. This reduces manual intervention and significantly improves operational reliability. By following GitOps principles, Vidra guarantees continuous reconciliation and full traceability of all deployment actions.

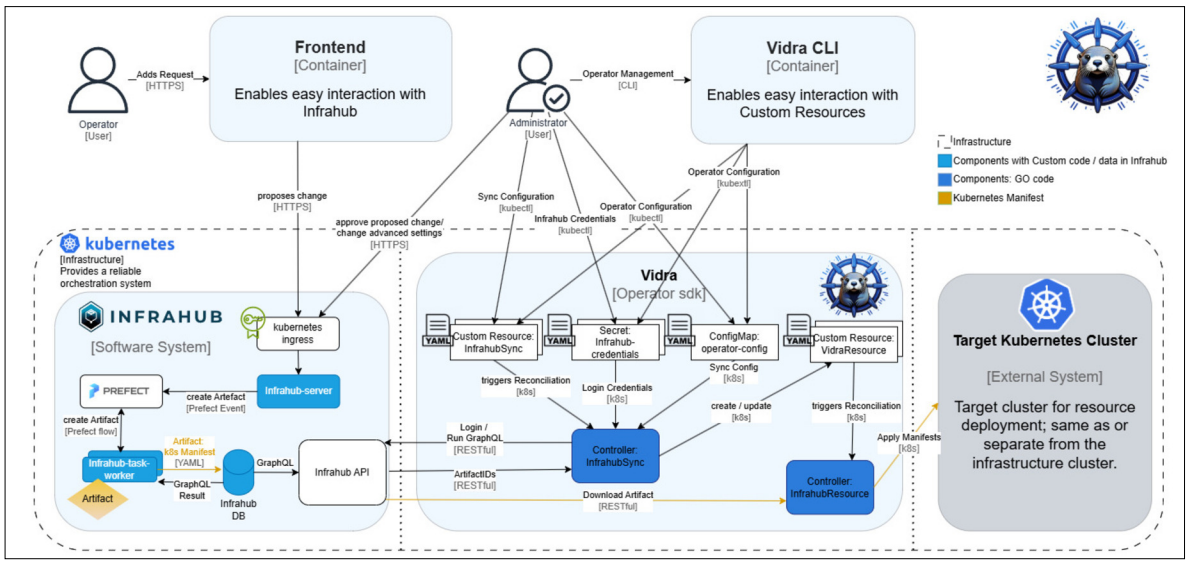
Frontend for the User to create an object
Own presentment



Infrahub UI showing all Webserver which were created
Own presentment



C3 Architecture Design
Own presentment



Advisors
Urs Baumann, Jan Untersander

Co-Examiner
Damien Garros, OpsMill, Paris

Subject Area
Network and Cloud Infrastructure