

A vertical red bar on the left side of the slide contains various white and dark red icons representing technology and infrastructure. These include a cloud with a keyhole, a database cylinder, a server rack, a computer monitor, a large upward-pointing arrow, and several 'X' and 'O' symbols connected by lines, suggesting a workflow or process.

Continuous Delivery and GitOps on OpenShift

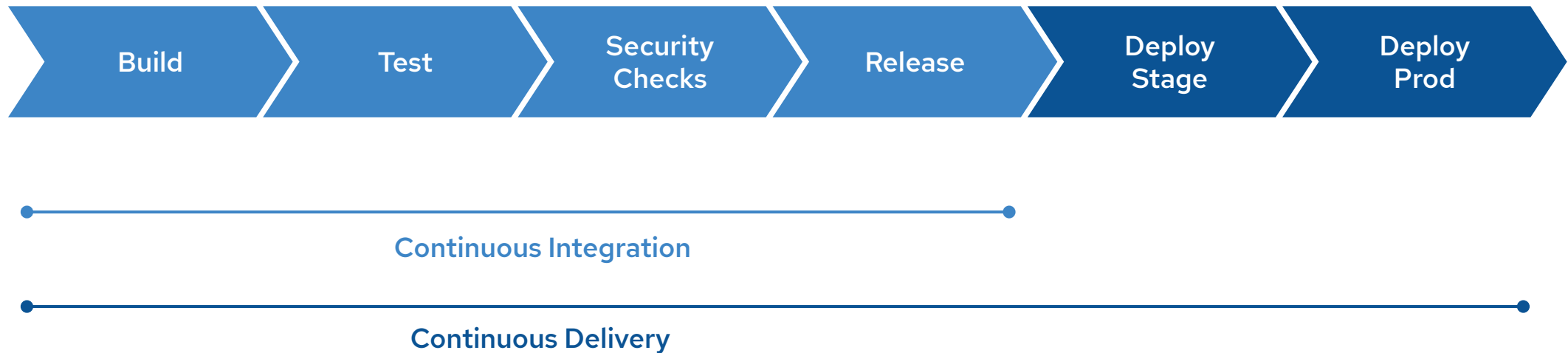
Christian Hernandez
Technical Marketing Manager



DevOps is the key to meet the
insatiable demand for delivering quality
applications rapidly

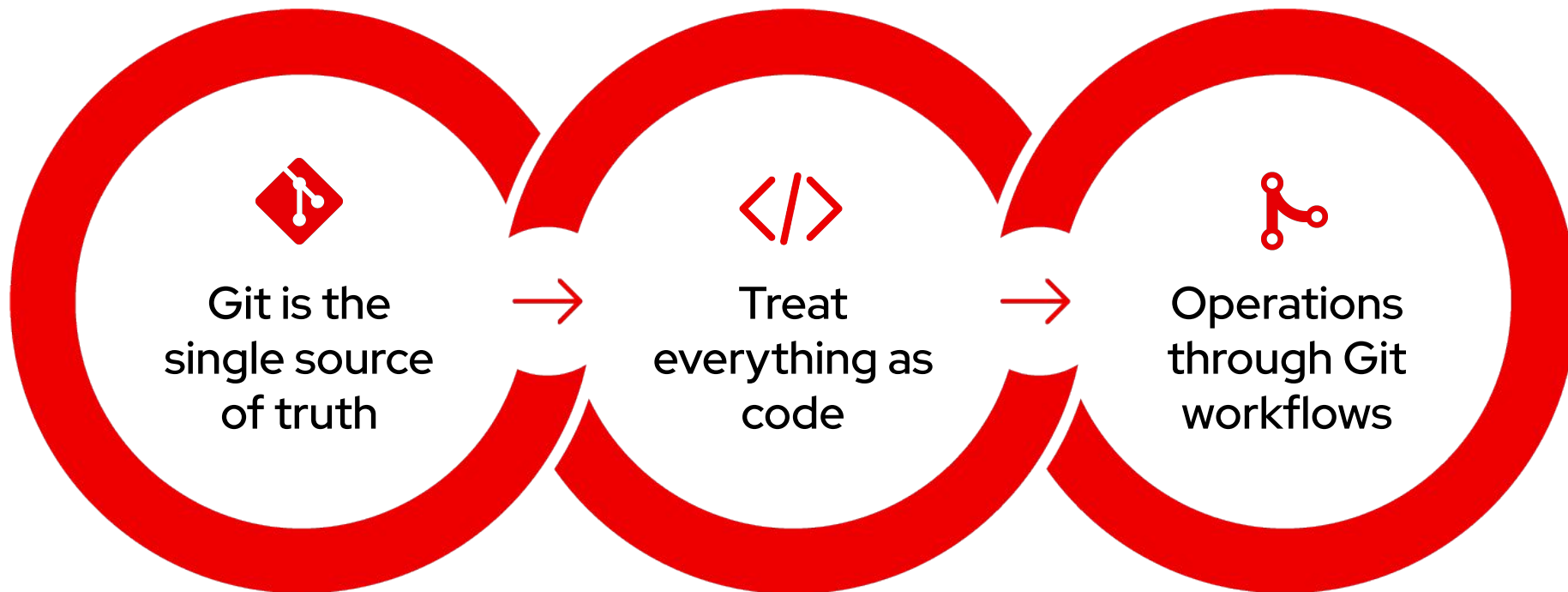
Continuous Integration(CI) & Continuous Delivery (CD)

A key DevOps principle for automation, consistency and reliability



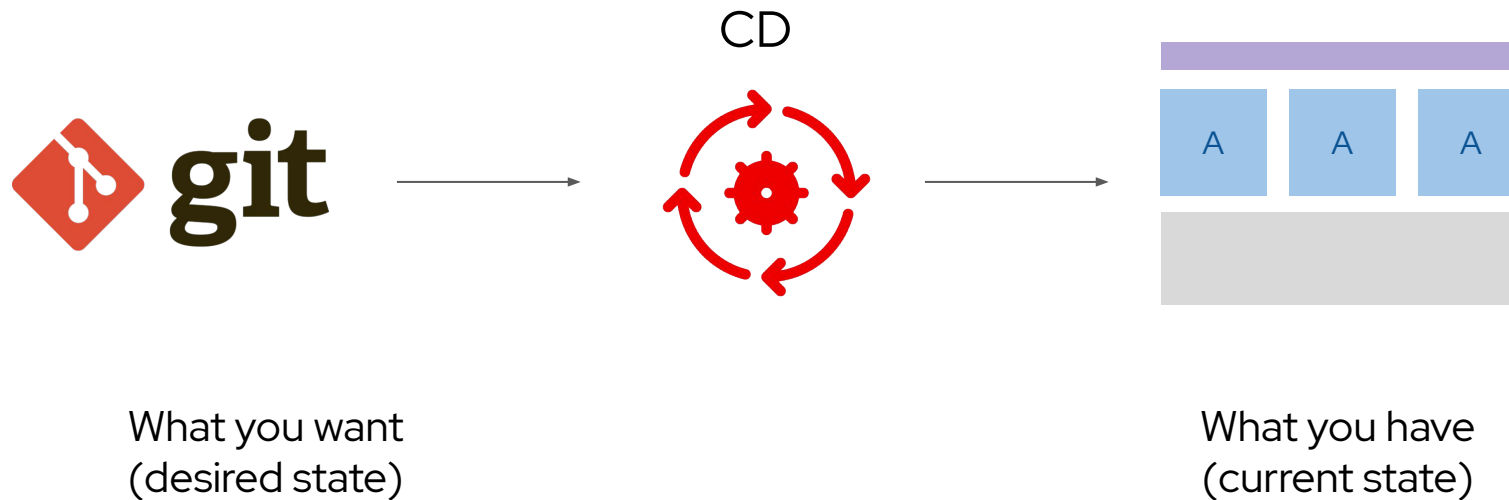
What is GitOps?

An developer-centric approach to Continuous Delivery and infrastructure operation



GitOps Workflow

a declarative approach to application delivery



Why GitOps?

Standard Workflow

Familiar tools and Git workflows from application development teams

Enhanced Security

Review changes beforehand, detect configuration drifts, and take action

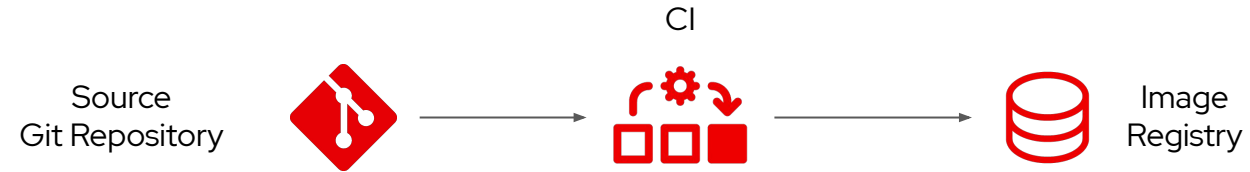
Visibility and Audit

Capturing and tracing any change to clusters through Git history

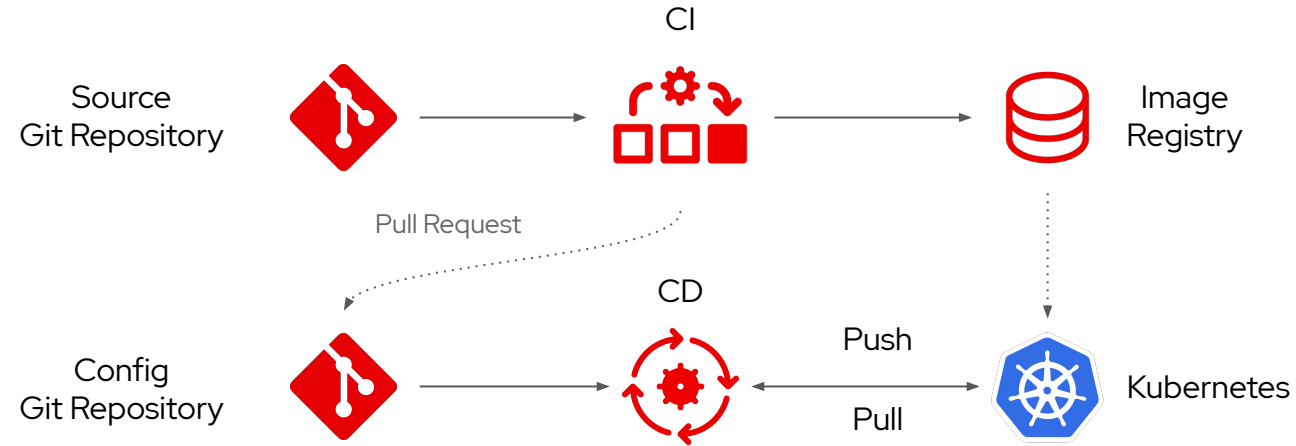
Multi-cluster consistency

Reliably and consistently configure multiple Kubernetes clusters and deployment

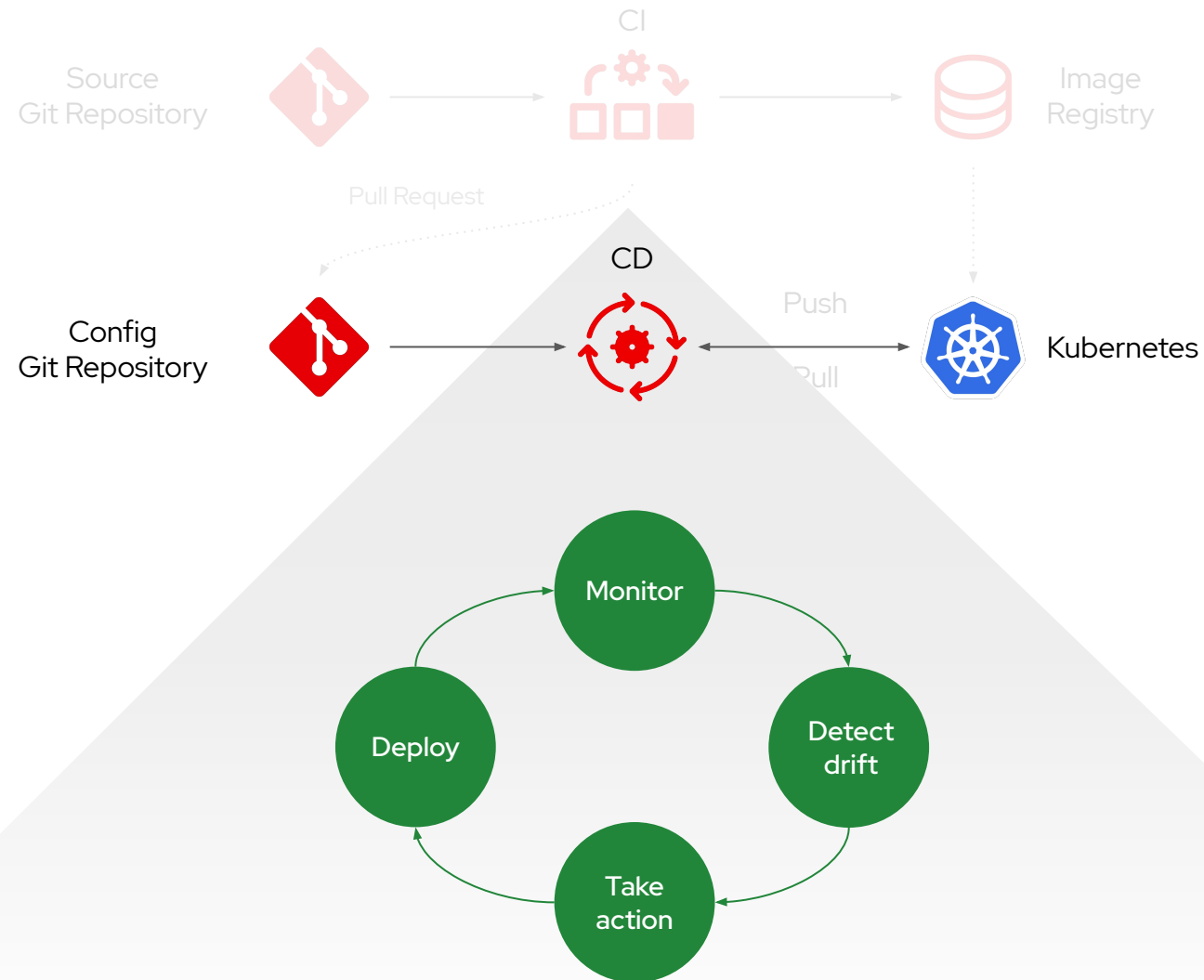
The GitOps Application Delivery Model



The GitOps Application Delivery Model



The GitOps Application Delivery Model



Continuous Integration & Continuous Delivery



OpenShift Build

Automate building container images using Kubernetes tools

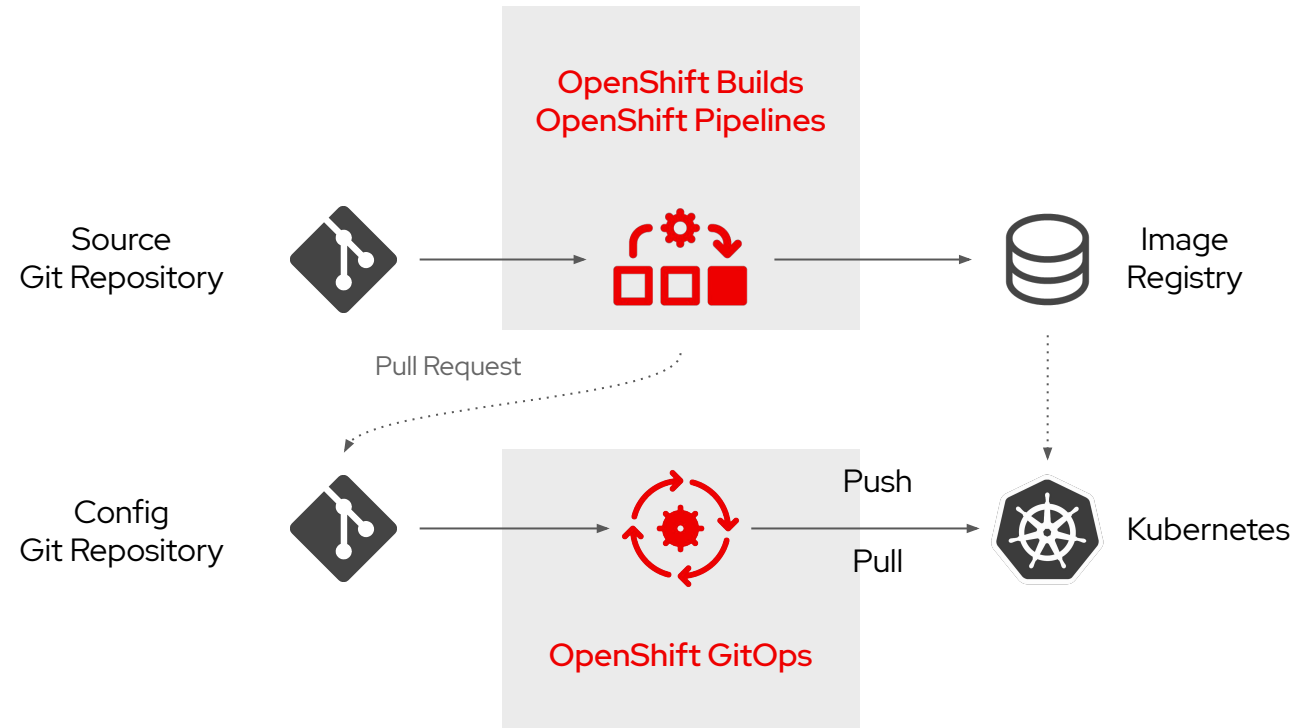
OpenShift Pipelines

Kubernetes-native on-demand delivery pipelines

OpenShift GitOps

Declarative GitOps for multi-cluster continuous delivery

The GitOps Application Delivery Model on OpenShift



OpenShift Builds

Automate building container images
using Kubernetes tools

OpenShift Builds



Kubernetes-native image build

A Kubernetes-native way to building container images on OpenShift which is portable across Kubernetes distros



Supports multiple build strategies

Choose the build strategy that fits best your applications and skills: source-to-image, Dockerfile, and Cloud-Native Buildpacks

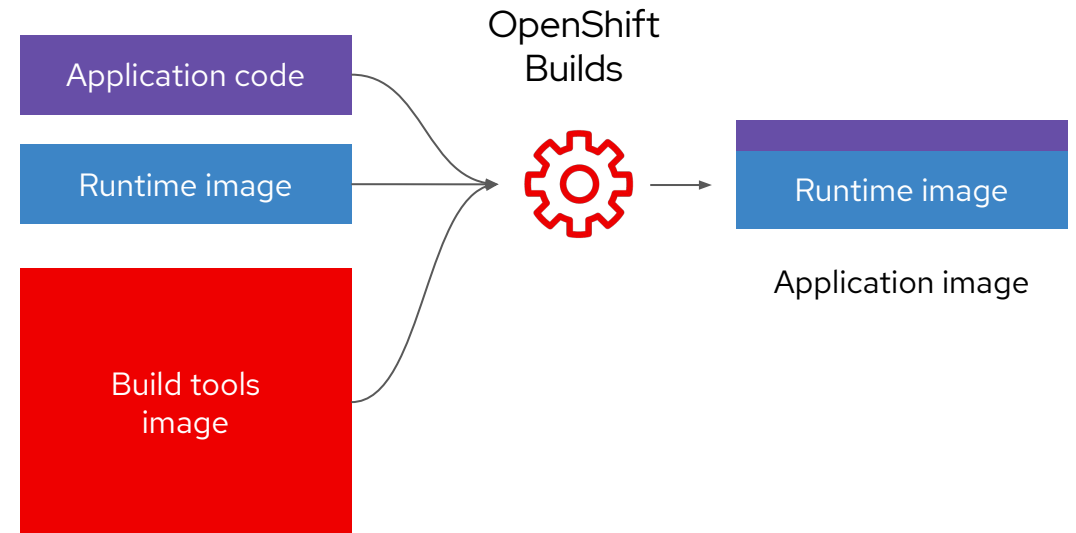


Extend with additional build strategies

Extend to use community Kubernetes builds strategies or your own custom builds

OpenShift Builds

- Build images on OpenShift and Kubernetes
- Use Kubernetes builds tools
 - Source-to-Image
 - Buildpacks
 - Buildah
 - Kaniko
 - ...more
- Create lean application images
- Extend with your own build tools
- Based on Shipwright open-source project



OpenShift Builds

Cloud-Native Buildpacks

```
kind: Build
metadata:
  name: myapp-buildpack
spec:
  source:
    url: https://github.com/myorg/myapp
  strategy:
    name: buildpacks-v3
  builder:
    image: paketobuildpacks/builder:full
  output:
    image: quay.io/myorg/myapp:v1
```

Source-to-Image (S2I)

```
kind: Build
metadata:
  name: myapp-s2i
spec:
  source:
    url: https://github.com/myorg/myapp
  strategy:
    name: source-to-image
  builder:
    image: registry.redhat.io/openjdk/openjdk-11-rhel8
  output:
    image: quay.io/myorg/myapp:v1
  runtime:
    image: docker.io/openjdk:11-jre-slim
```

OpenShift Pipelines

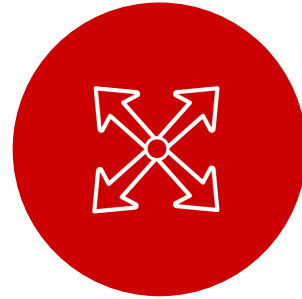
Kubernetes-native on-demand delivery
pipelines

What is Cloud-Native CI/CD?



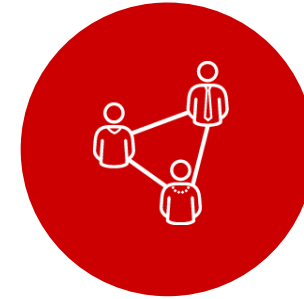
Containers

Built for container apps and runs on Kubernetes



Serverless

Runs serverless with no CI/CD engine to manage and maintain



DevOps

Designed with microservices and distributed teams in mind

Why Cloud-Native CI/CD?

Traditional CI/CD	Cloud-Native CI/CD
Designed for Virtual Machines	Designed for Containers and Kubernetes
Require IT Ops for CI engine maintenance	Pipeline as a service with no Ops overhead
Plugins shared across CI engine	Pipelines fully isolated from each other
Plugin dependencies with undefined update cycles	Everything lifecycled as container images
No interoperability with Kubernetes resources	Native Kubernetes resources
Admin manages persistence	Platform manages persistence
Config baked into CI engine container	Configured via Kubernetes ConfigMaps

OpenShift Pipelines



Built for Kubernetes

Cloud-native pipelines taking advantage of Kubernetes execution and , operational model and concepts



Scale on-demand

Pipelines run and scale on-demand in isolated containers, with repeatable and predictable outcomes



Secure pipeline execution

Kubernetes RBAC and security model ensures security consistently across pipelines and workloads

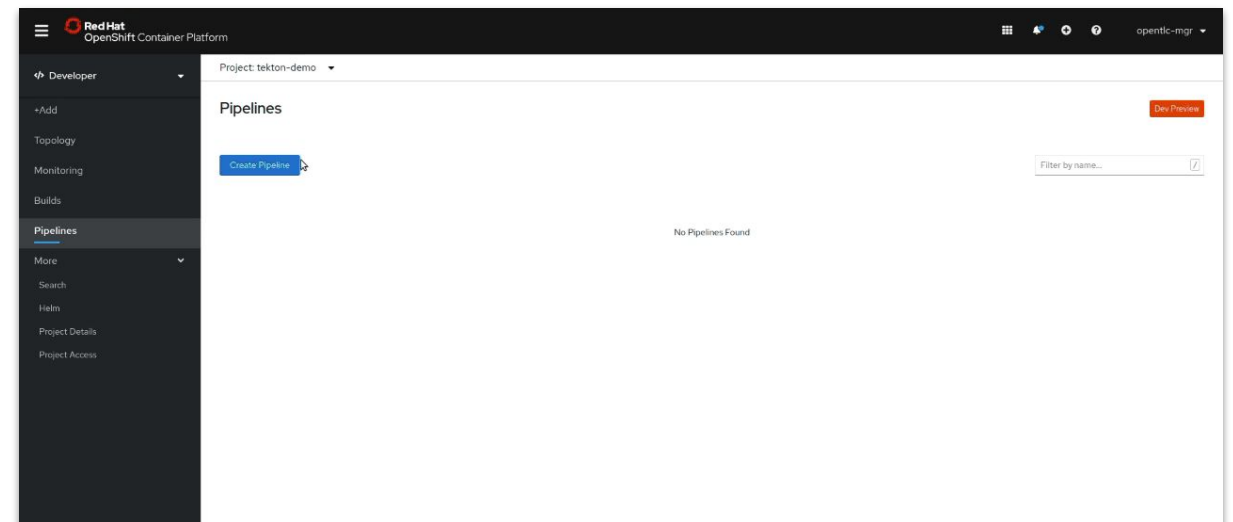
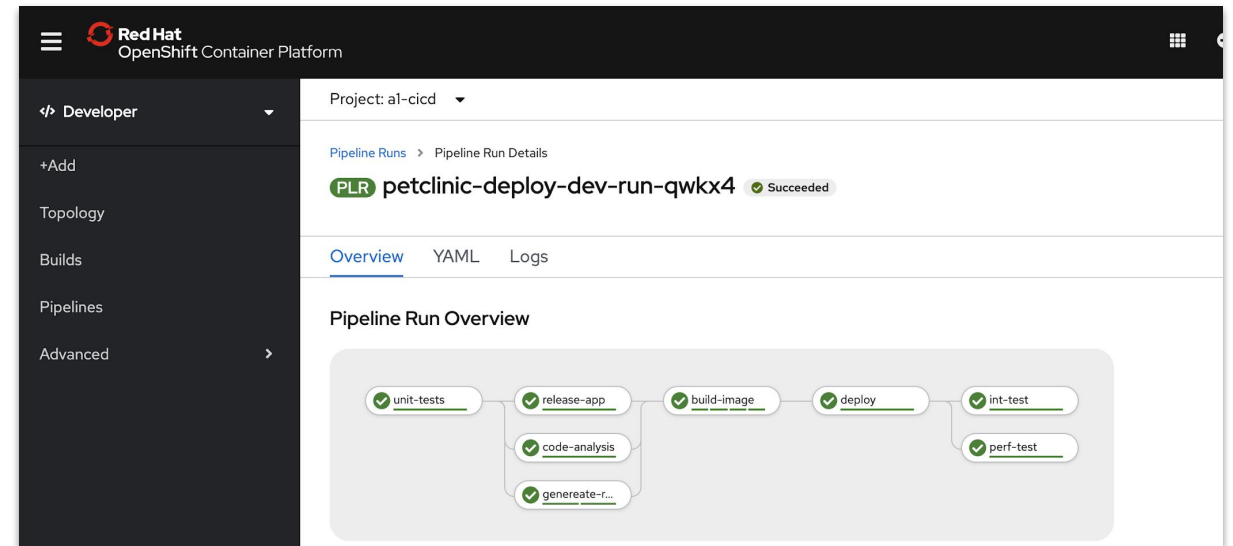


Flexible and powerful

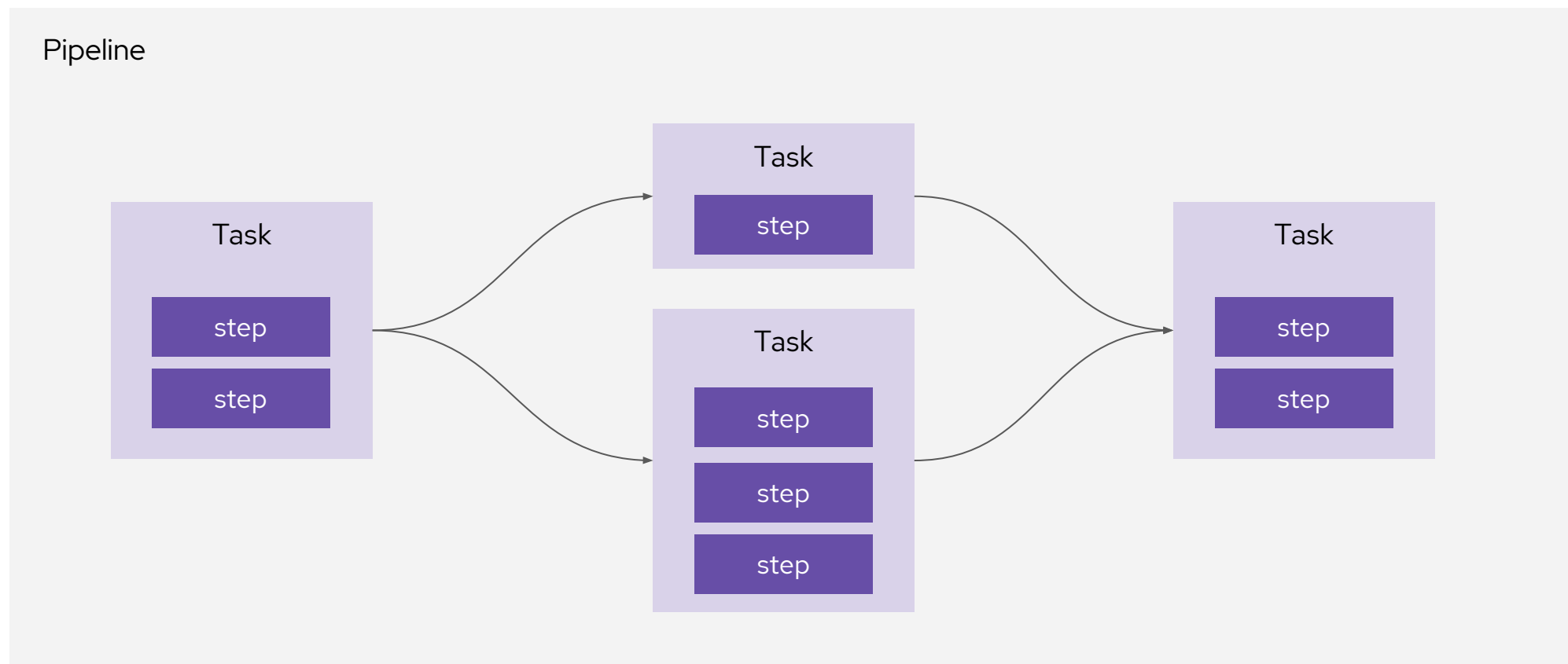
Granular control over pipeline execution details on Kubernetes, to support your exact requirements

OpenShift Pipelines

- Based on Tekton Pipelines
- Kubernetes-native declarative CI/CD
- Pipelines run on-demand in isolated containers
- No central server to maintain! No plugin conflicts!
- Task library and integration with Tekton Hub
- Secure pipelines aligned with Kubernetes RBAC
- Visual and IDE-based pipeline authoring
- Pipeline templates when importing apps
- Automated install and upgrades via OperatorHub
- CLI, Web, VS Code and IntelliJ plugins



Tekton Concepts



Tekton Concepts: step

- Run command or script in a container
- Kubernetes container spec
 - Env vars
 - Volumes
 - Config maps
 - Secrets

```
- name: build
  image: maven:3.6.0-jdk-8-slim
  command: ["mvn"]
  args: ["install"]
```

```
- name: parse-yaml
  image: python3
  script: |-
    #!/usr/bin/env python3
    ...
```

Tekton Concepts: Task

- Performs a specific task
- List of steps
- Steps run sequentially
- Reusable

```
kind: Task
metadata:
  name: buildah
spec:
  params:
    - name: IMAGE
  steps:
    - name: build
      image: quay.io/buildah/stable:latest
      command: ["buildah"]
      args: ["bud", ".", "-t", "${params.IMAGE}"]
    - name: push
      image: quay.io/buildah/stable:latest
      script: |
        buildah push ${params.IMAGE} docker://${params.IMAGE}
```

Tekton Hub

Search, discover and
install Tekton Tasks

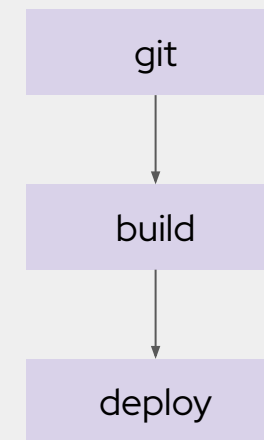
The screenshot displays the Tekton Hub (BETA) interface. At the top, there's a dark header with the Tekton Hub logo and a 'Login' button. Below the header, a large banner reads 'Welcome to Tekton Hub' and 'Discover, search and share reusable Tasks and Pipelines'. The main content area features a search bar and a 'Sort' dropdown set to 'Name'. On the left, a 'Refine By' sidebar allows filtering by 'Kind' (Task, Pipeline), 'Support Tier' (Official, Verified, Community), and 'Categories' (Build Tools, CLI, Cloud, Deploy, Image Build, Notification, Others, Test Framework). The main grid shows eight task cards, each with a star rating, version number, description, update date, and tags. The tasks are: Ansible Runner (4.5 stars, v0.1), ansible tower cli (2.0 stars, v0.1), argocd (3.0 stars, v0.1), aws cli (5.0 stars, v0.1), Amazon ECR Login (4.0 stars, v0.1), azure cli (1.0 stars, v0.1), bentoml (0.0 stars, v0.1), and Python Black (0.0 stars, v0.1).

Task Name	Rating	Version	Update Date	Tags
Ansible Runner	4.5	v0.1	Updated 3 weeks ago	cli
ansible tower cli	2.0	v0.1	Updated 3 weeks ago	ansible, cli
argocd	3.0	v0.1	Updated 3 weeks ago	deploy
aws cli	5.0	v0.1	Updated 3 weeks ago	cli
Amazon ECR Login	4.0	v0.1	Updated 3 weeks ago	aws, ecr
azure cli	1.0	v0.1	Updated 4 months ago	cli
bentoml	0.0	v0.1	Updated 3 weeks ago	cli
Python Black	0.0	v0.1	Updated 3 weeks ago	formatter, python

Tekton Concepts: Pipeline

- A graph of Tasks: concurrent & sequential
- Tasks run on different nodes
- Task execution logic
 - Conditional
 - Retries
- Share data between tasks

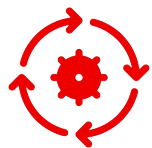
```
kind: Pipeline
metadata:
  name: deploy-dev
spec:
  params:
    - name: IMAGE_TAG
  tasks:
    - name: git
      taskRef:
        name: git-clone
        params: [...]
    - name: build
      taskRef:
        name: maven
        params: [...]
        runAfter: ["git"]
    - name: deploy
      taskRef:
        name: knative-deploy
        params: [...]
        runAfter: ["build"]
```



OpenShift GitOps

Declarative GitOps for multi-cluster
continuous delivery

OpenShift GitOps



Multi-cluster config management

Declaratively manage cluster and application configurations across multi-cluster OpenShift and Kubernetes infrastructure with Argo CD



Automated Argo CD install and upgrade

Automated install, configurations and upgrade of Argo CD through OperatorHub



Opinionated GitOps bootstrapping

Bootstrap end-to-end GitOps workflows for application delivery using Argo CD and Tekton with GitOps Application Manager CLI

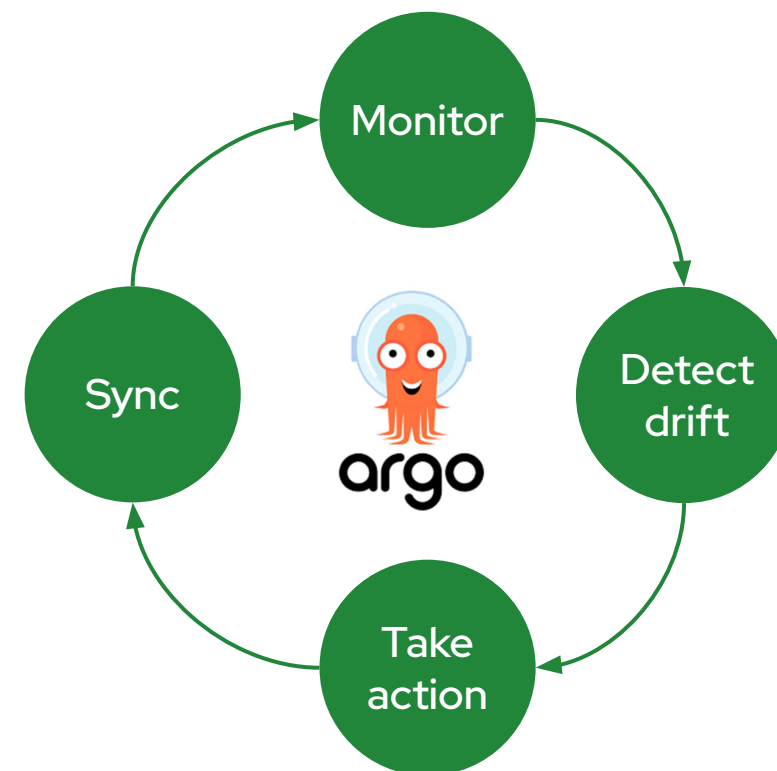


Deployments and environments insights

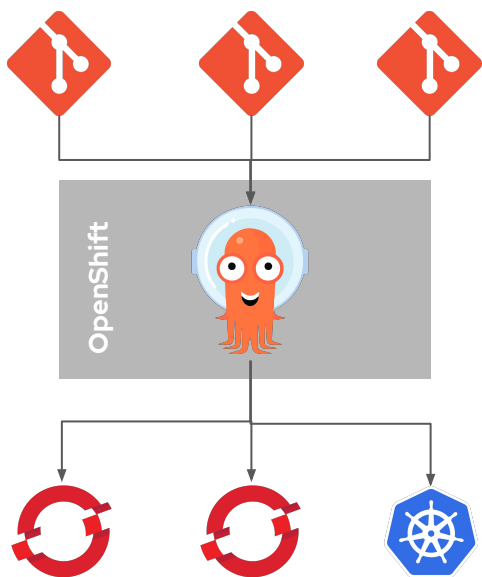
Visibility into application deployments across environments and the history of deployments in the OpenShift Console

Argo CD

- Cluster and application configuration versioned in Git
- Automatically syncs configuration from Git to clusters
- Drift detection, visualization and correction
- Granular control over sync order for complex rollouts
- Rollback and rollforward to any Git commit
- Manifest templating support (Helm, Kustomize, etc)
- Visual insight into sync status and history

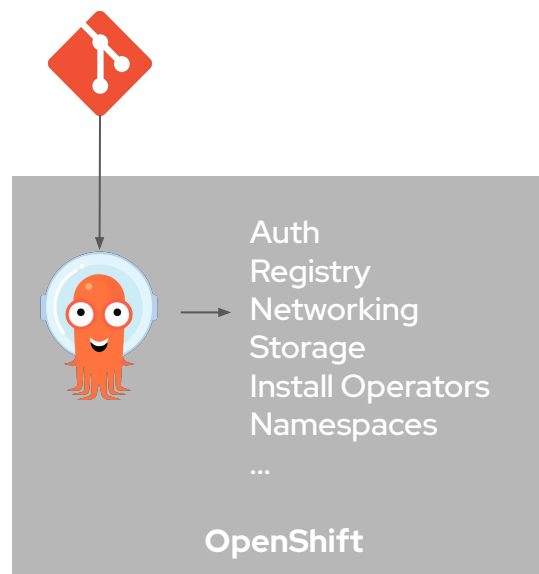


Flexible Deployment Strategies



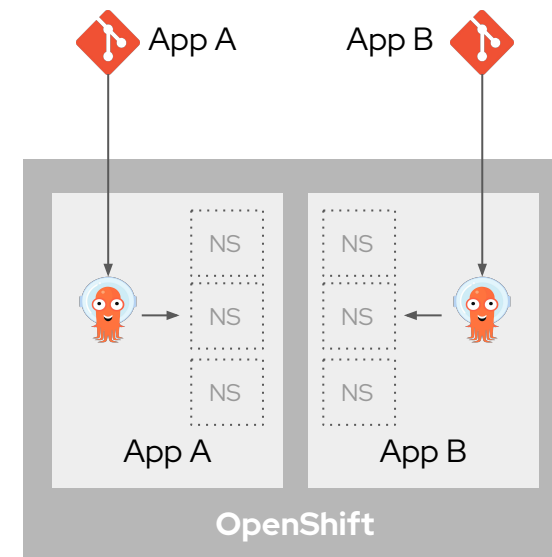
Central Hub (Push)

A central Argo CD pushes Git repository content to remote OpenShift and Kubernetes clusters



Cluster Scoped (Pull)

A cluster-scope Argo CD pulls cluster service configurations into the OpenShift cluster



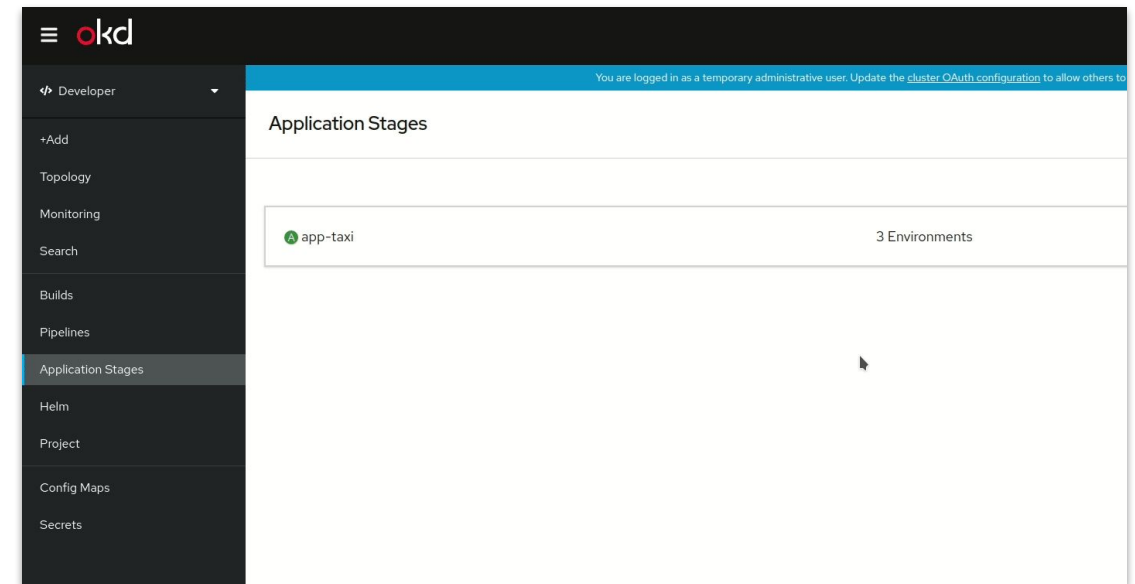
Application Scoped (Pull)

An application scoped Argo CD pulls application deployment and configurations into app namespaces

GitOps Application Manager CLI

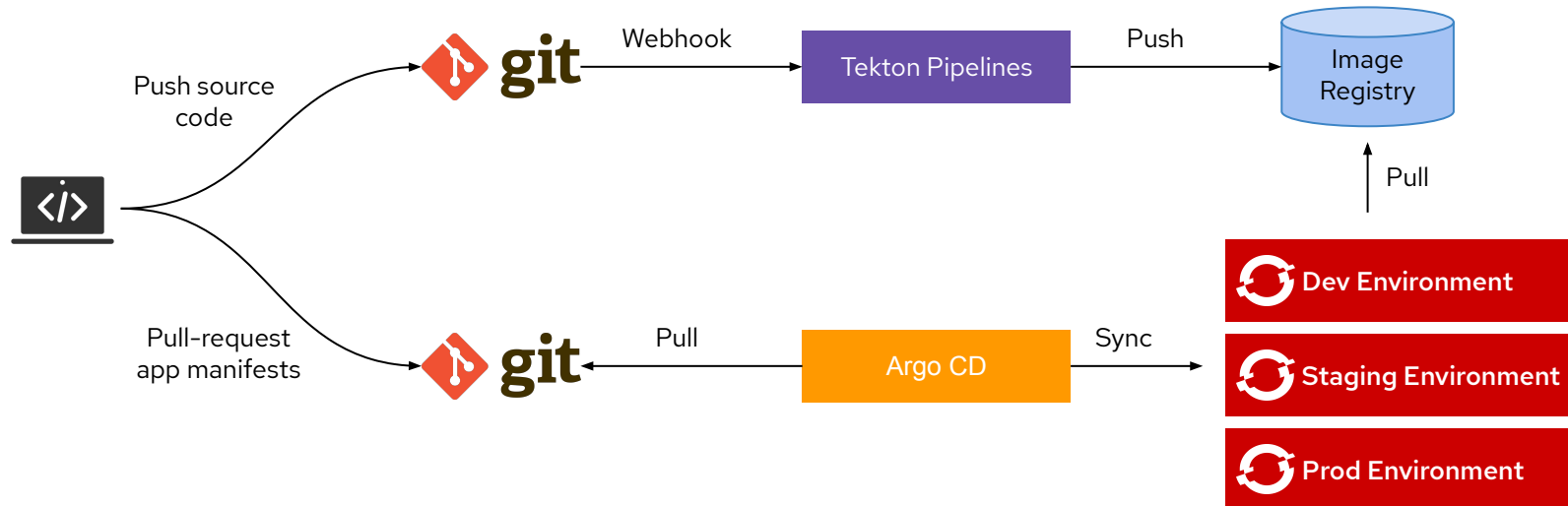
- Bootstraps Git repos for GitOps
- Configures deployment environments
- Configures webhooks for Tekton Pipelines for CI
- Configures Argo CD for deployment to environments
- Kustomize for environment-specific configs
- Integration with secret managers

```
$ kam bootstrap  
$ kam environment add stage
```



GitOps Application Manager CLI

```
$ kam bootstrap
```



Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.



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