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OPENSHIFT CI/CD

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Objectives

- OpenShift CI/CD
- OpenShift Builds and OpenShift GitOps
- OpenShift Pipelines and Tekton
- The OpenShift Pipeline Operator
- Pipeline Triggers with Webhooks

CI/CD in OpenShift

- OpenShift provides the following CI/CD solutions
    - OpenShift Builds
    - OpenShift Pipelines
    - OpenShift GitOps
    - External CI/CD, e.g. Jenkins, GitHub Actions
- We will briefly look at OpenShift Builds, GitHub Actions and GitOps, but will focus on OpenShift Pipelines.

BUILDS, ACTIONS AND GITOPS

OpenShift Builds

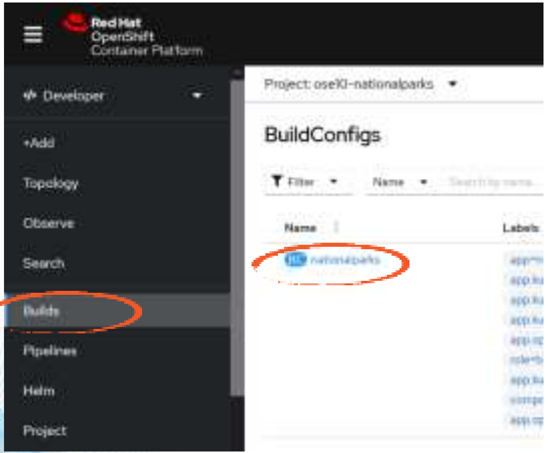
- OpenShift Builds facilitate creating cloud-native apps using a **declarative build process**.
- The build process can be defined in a YAML file that you use to create a BuildConfig object.
  - The definition includes attributes like build triggers, input parameters and source code.
- When deployed the BuildConfig object typically builds a runnable image and pushes it to a container image registry.

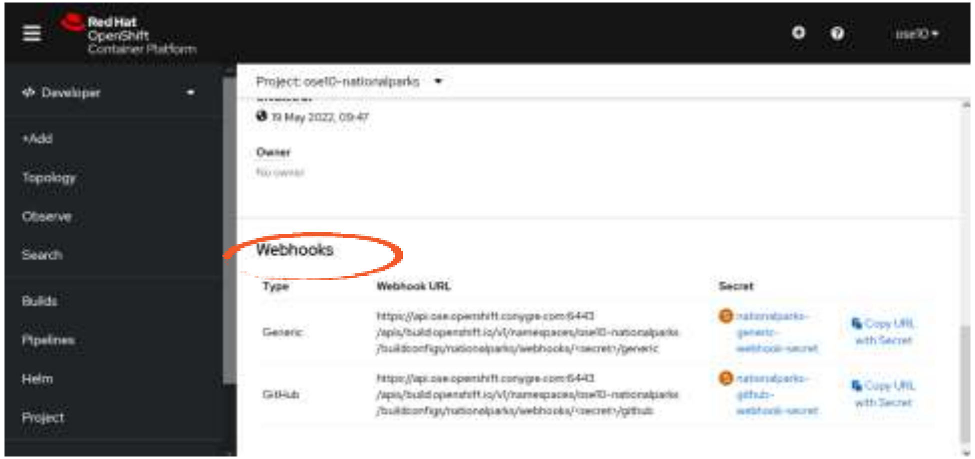
OpenShift Build Strategies

- OpenShift 4.11 Builds supports
  - **Docker build**: Buildah is used to build a container image from a Dockerfile.
  - **Source-to-Image (s2i)**: This produces a ready-to-run image by injecting application source into a container image and assembling a new image.
  - **Custom build**: This gives you the flexibility to customize your own build process.

OpenShift Build Triggers

- OpenShift BuildConfigs are provisioned to accept Webhooks out of the box.
- The Payload URL can be found at the bottom of the BuildConfig details:





19 May 2022, 09:47

Owner
No owner

Webhooks

Type	Webhook URL	Secret	
Generic	https://api.ose.openshift.conygre.com:6443/apis/build.openshift.io/v1/namespaces/ose10-nationalparks/buildconfigs/nationalparks/webhooks/<secret>/generic	nationalparks-generic-webhook-secret	Copy URL with Secret
GitHub	https://api.ose.openshift.conygre.com:6443/apis/build.openshift.io/v1/namespaces/ose10-nationalparks/buildconfigs/nationalparks/webhooks/<secret>/github	nationalparks-github-webhook-secret	Copy URL with Secret

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OpenShift GitOps

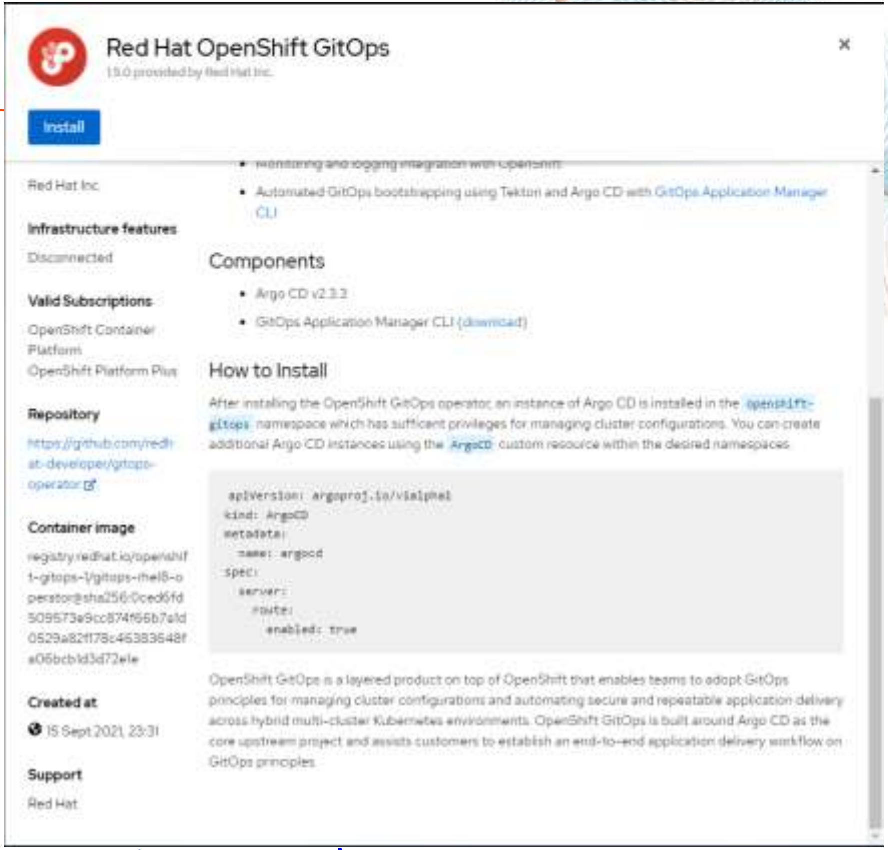
- GitOps is a declarative way to implement continuous deployment for cloud native applications.
- The Git repository becomes the sole source of truth
    - The workflow pushes changes to the repository through testing, staging and production.
    - You only need to update the repository, GitOps does everything else.

OpenShift GitOps Repositories

- OpenShift GitOps always has at least two repositories
  - Application repository with the source code
  - Environment configuration repository defining the desired state of the application
- Together these repositories contain a declarative description of the infrastructure you need in your environment.
- OpenShift uses Argo CD to maintain cluster resources.
  - Argo CD is an open-source declarative tool for CI/CD

Enabling OpenShift GitOps

- OpenShift GitOps is enabled through an Operator on the OperatorHub.
- Once installed you can log into the Argo CD UI and create an Argo CD GitOps application.



Red Hat OpenShift GitOps

1.5.0 provided by Red Hat Inc.

Install

- Monitoring and logging integration with OpenShift
- Automated GitOps bootstrapping using Tekton and Argo CD with GitOps Application Manager CLI

Red Hat Inc

Infrastructure features

Disconnected

Valid Subscriptions

OpenShift Container Platform

OpenShift Platform Plus

Repository

https://github.com/redhat-developer/gitops-operator

Container image

registry.redhat.io/openshift-gitops-1/gitops-rhel8-operator@sha256:0ced6fd509573a9cc874f66b7a1d0529a82f178c46383648fa05bcb1d3d72e1e

Created at

15 Sept 2021, 23:31

Support

Red Hat

Components

- Argo CD v2.3.3
- GitOps Application Manager CLI (download)

How to Install

After installing the OpenShift GitOps operator, an instance of Argo CD is installed in the `openshift-gitops` namespace which has sufficent privileges for managing cluster configurations. You can create additional Argo CD instances using the `ArgoCD` custom resource within the desired namespaces.

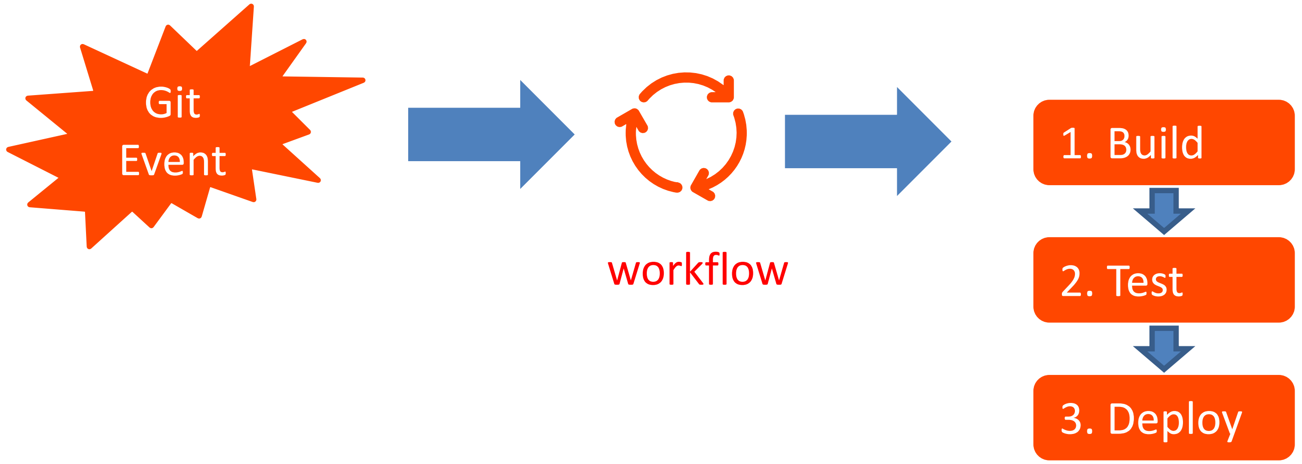
```
apiVersion: argoproj.io/v1alpha1
kind: ArgoCD
metadata:
  name: argocd
spec:
  server:
    route:
      enabled: true
```

OpenShift GitOps is a layered product on top of OpenShift that enables teams to adopt GitOps principles for managing cluster configurations and automating secure and repeatable application delivery across hybrid multi-cluster Kubernetes environments. OpenShift GitOps is built around Argo CD as the core upstream project and assists customers to establish an end-to-end application delivery workflow on GitOps principles.

https://github.com/siamaksade/openshift-gitops-getting-started

External CI/CD: GitHub Actions, Jenkins etc

- Event-driven automation tasks hooked into a git repo
- Triggered by events in the repo
- All happens *outside* of OpenShift - drives OpenShift deployment



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OPENSHIFT PIPELINES

OpenShift Pipelines

- OpenShift integrates a cloud native solution for CI/CD based on the open source Tekton project.
- Tekton
  - Runs on the same Kubernetes backbone as OpenShift
  - Has a set of custom k8s resources that give you the building blocks for your CI/CD pipelines.

Tekton

- Tekton building blocks are called **steps.**
- You collect Tekton steps into **tasks**, such as test, build and deploy.
- Tasks are organised into **pipelines**, which are tasks ordered either sequentially or concurrently.

Tekton

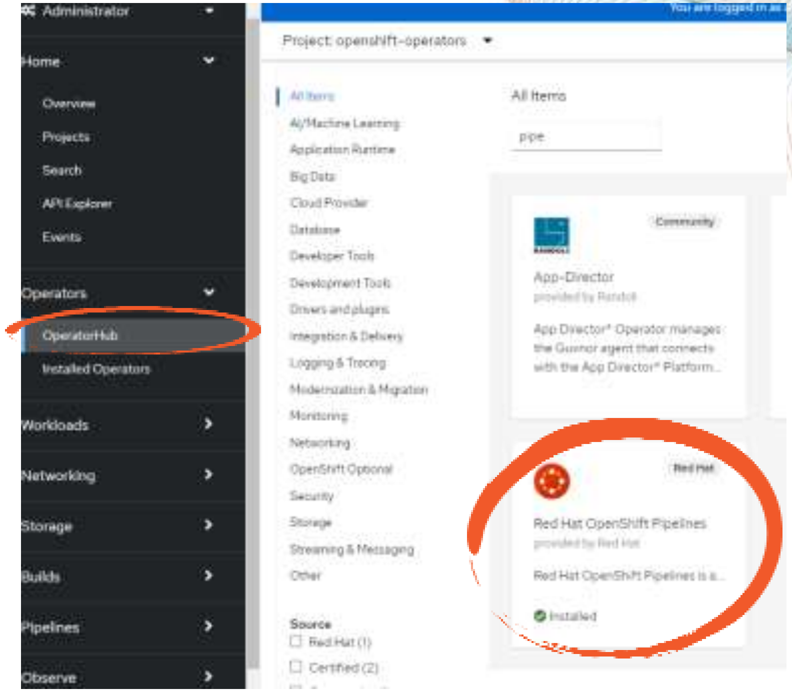
- Pipelines are triggered through a **trigger template**, that is designed to respond to various events, such as a git push.
- The events are registered by an **event listener**, which interfaces with the trigger template.
- Each of the concepts (step, task, pipeline, trigger template, event lister) are just files (yaml format)
    - They can be put into source control
    - They can be easily reused.

Tekton Workspaces

- Tekton collects its CI/CD data into workspaces.
- These use a native k8s storage concept called a persistent volume claim.
    - Usually defined in the trigger templates, along with secrets and authorization.
- OpenShift Pipelines *is* Tekton
    - The two terms are used interchangeably in OpenShift documentation.

OpenShift Pipelines Operator

- OpenShift OperatorHub is a catalogue of available Operators
  - This contains OpenShift extensions and tools for a variety of common activities
- The Red Hat OpenShift Pipelines Operator has been installed from here



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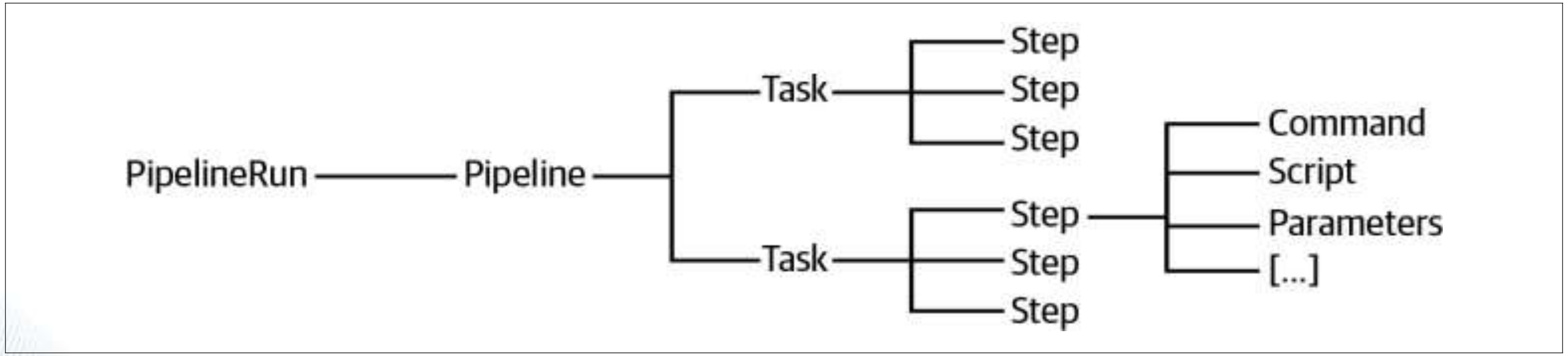
Tekton in OpenShift

- In the Developer perspective of the Web Console:
  - You can create pipeline tasks
  - You can assemble tasks into pipelines
  - You can run and monitor pipelines.
- You can do the same in the command line using a tool called `tkn`
  - Download it from the ? menu on the Console

Tekton in OpenShift

- Tekton uses a TriggerTemplate object coupled with an EventListener object to trigger automatic runs. OpenShift uses the same mechanism.
- Remember a step is a sequence of commands to achieve a specific goal, like building a container image.



Pipeline Steps: Command

- A pipeline Step consists of a either a command or a script along with a set of parameters.
- For example, consider the command:

```
- name: generate               Name of the command
 command:
   - s2i                       Utility to run (Source-to-Image here)
   - build                     Utility subcommand
   - $(params.PATH_CONTEXT)    Set the PATH_CONTEXT parameter to the given image
   - registry.access.redhat.com/redhat-openjdk-18/openjdk18-openshift
   - '--image-scripts-url'     Argument for the s2i build subcommand
   - 'image:///usr/local/s2i'
```

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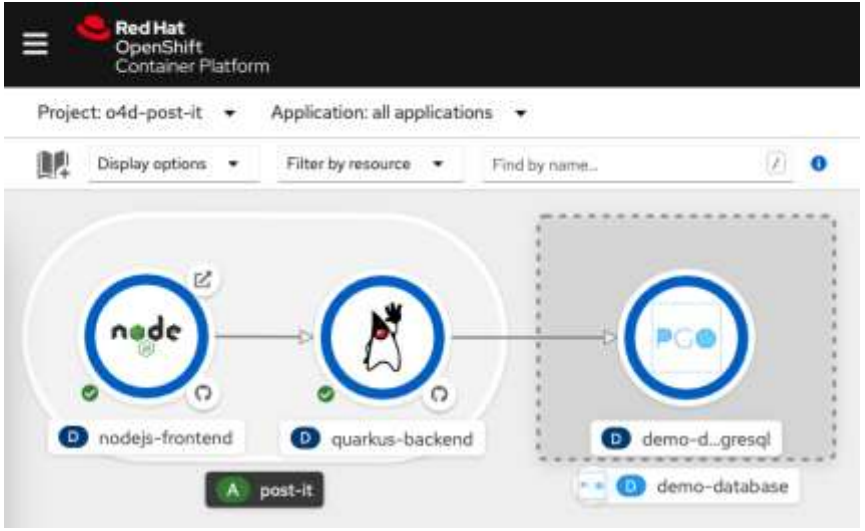
Pipeline Steps: Script

- Suppose several operations must be run to achieve a specific Step, then a Script is a better option.
- A script puts an executable script inline.
- For example in this script the python3 interpreter is invoked to run the subsequent commands.

```
- name: lint-markdown
 script:|-
   #!/usr/bin/env python3
   …
```

Demo Example: A Cloud-Ready Notes Application

- This is a more sophisticated application that should eventually include a database (not demoed).



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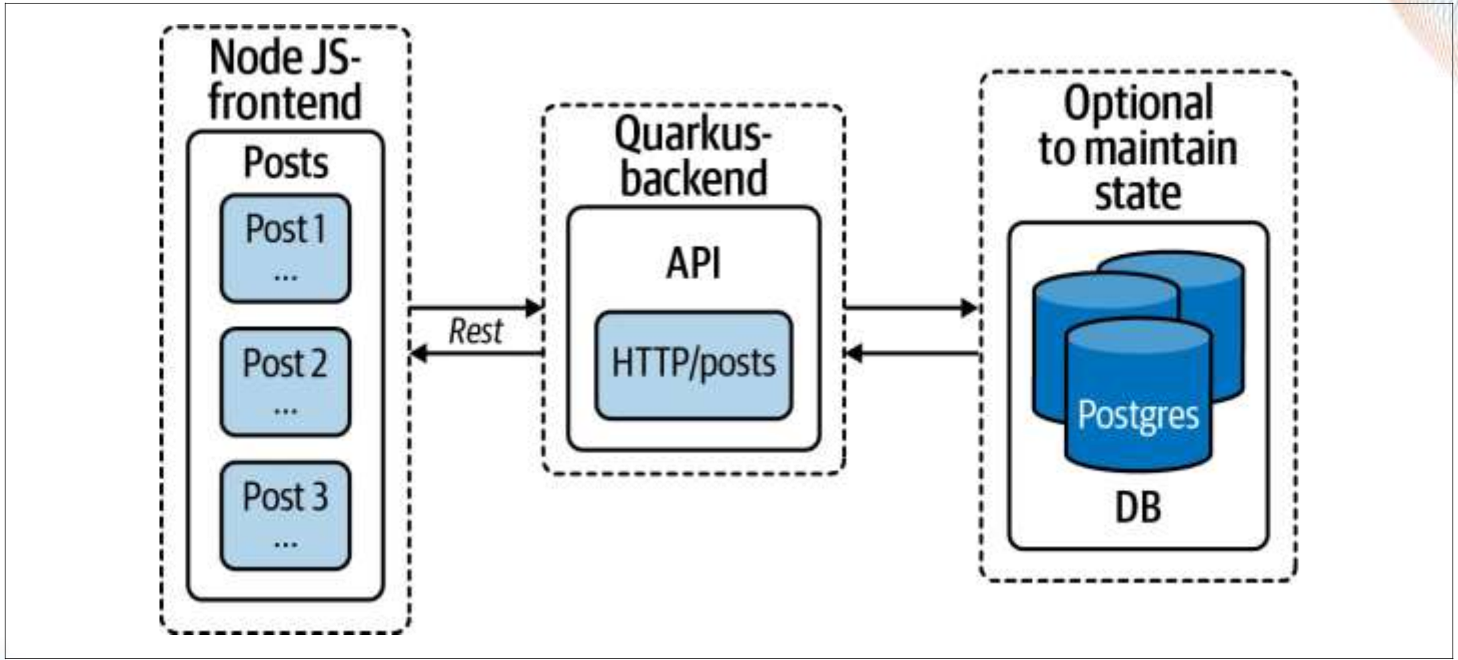
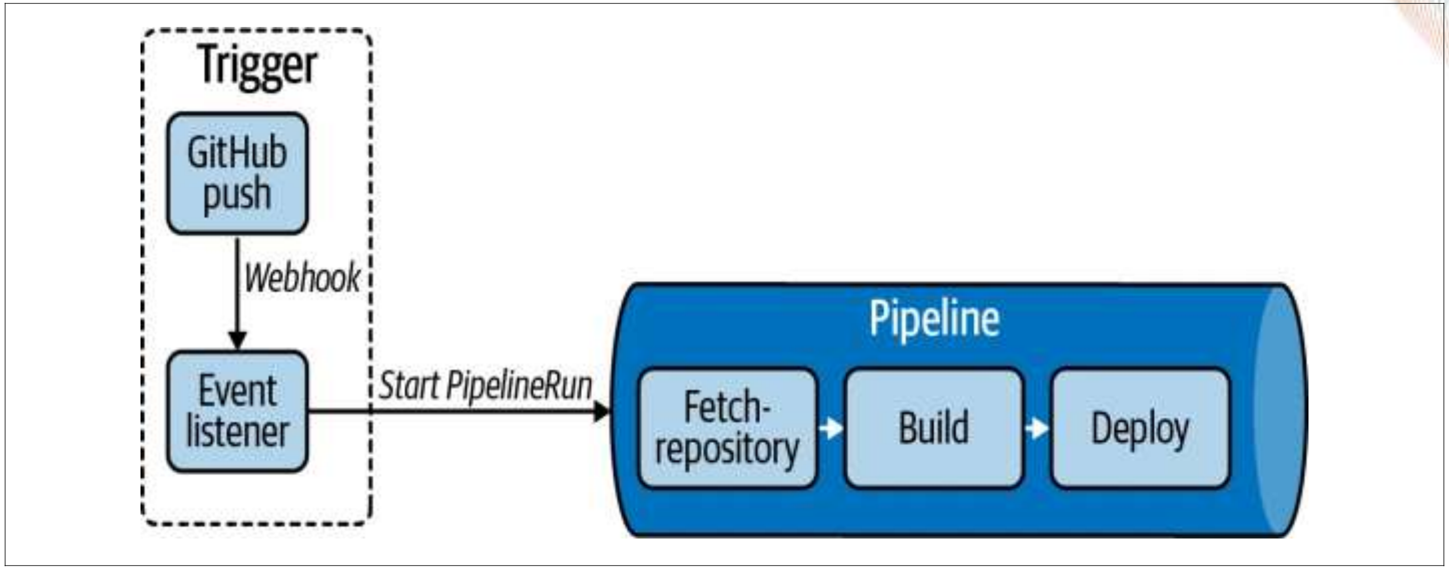
Demo Example : A Cloud-Ready Notes Application

- The example is a simple note board
  - Each note is a title and content
- A database can be connected, which will allow you to maintain and manage prior posts.
- The frontend is written in Node.js and uses React.
  - We won’t be editing this, we can deploy straight from GitHub.
- The backend is written using Quarkus (a k8s-native Java stack)

Application Topology



Pipeline Configuration



Demo Application

- We’ll work this through together on the OpenShift cluster!

Demo Summary

- In this demo we:
    - Used the Pipelines operator to create a build Pipeline for an application.
    - Configured a Pipeline Trigger to respond to a GitHub push event.
    - Demonstrated an automatic pipeline run in response to the webhook event.

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Lab Exercise 2

- Do your own Pipeline deployment!

Summary

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Questions and Comments?

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