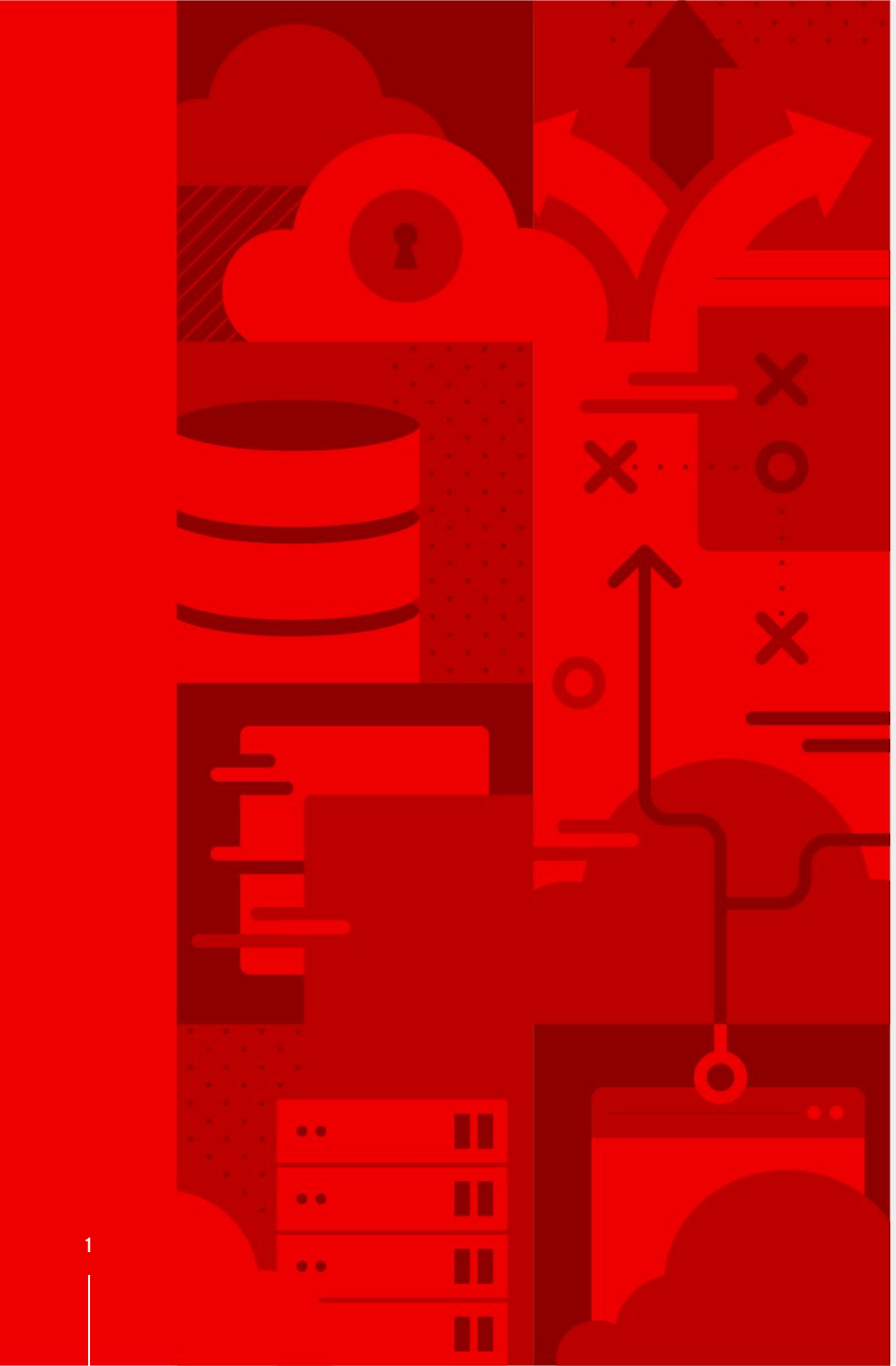


# CI/CD on OpenShift

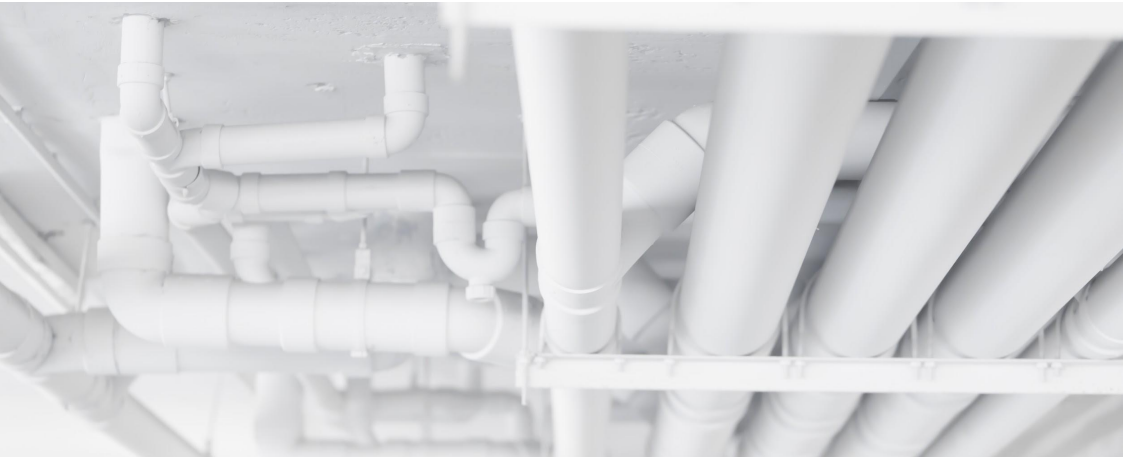
## Traditional and Cloud-Native Pipelines

Wanja Pernath
EMEA Partner Enablement Manager, OpenShift & MW



Red Hat

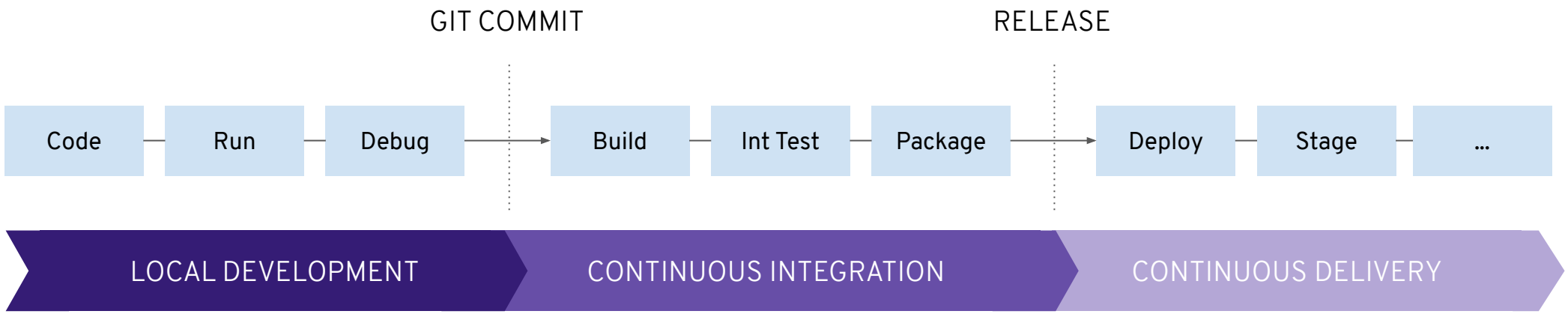
# What is CI/CD?





Red Hat

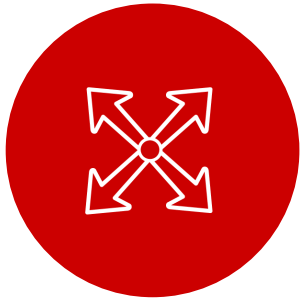
# Continuous Integration and Continuous Delivery (CI/CD)



# 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 |

# 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 overheard |
| Plugins shared across CI engine | Pipelines fully isolated from each other |
| Plugin dependencies with undefined update cycles | Encapsulating library and platform dependencies |
| No interoperability with Kubernetes resources | Native Kubernetes resources |
| Admin manages persistence | Platform manages persistence |
| Config baked into CI engine container | Configured via Kubernetes ConfigMaps |

Jenkins

TEKTON



Red Hat

# Traditional vs Cloud-Native CI/CD

## Traditional CI/CD

- Monolithic
- Central governance
- Existing investments

## Cloud-Native CI/CD

- Serverless
- Cross-functional teams
- Kubernetes-native

# Traditional vs Cloud-Native CI/CD

## Traditional CI/CD

- Monolithic
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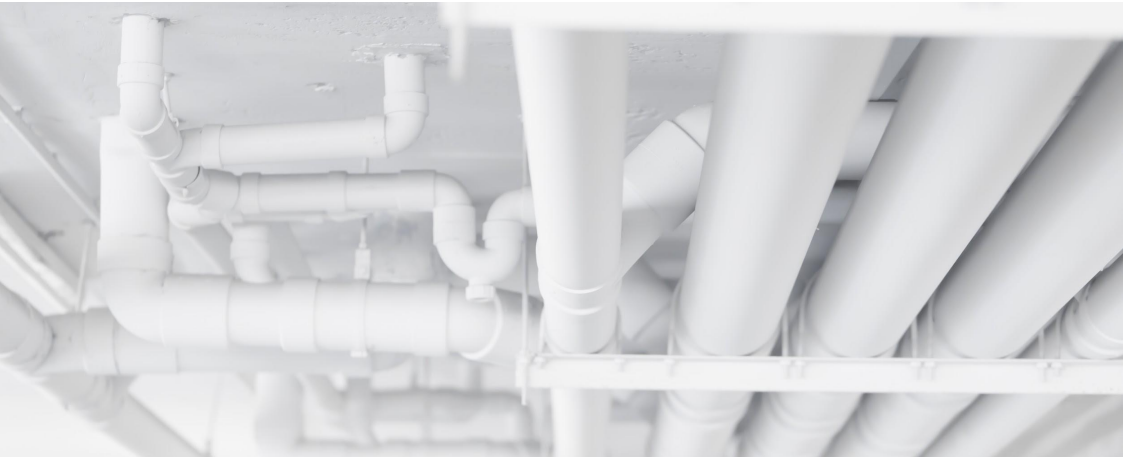
OpenShift

Jenkins

TEKTON

# OpenShift Pipelines





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# OpenShift Pipelines

Kubernetes-native declarative Pipelines with Tekton

Serverless CI/CD with no single server to share and maintain

Run pipelines in isolated containers with all required dependencies

Standard and portable to any Kubernetes platform

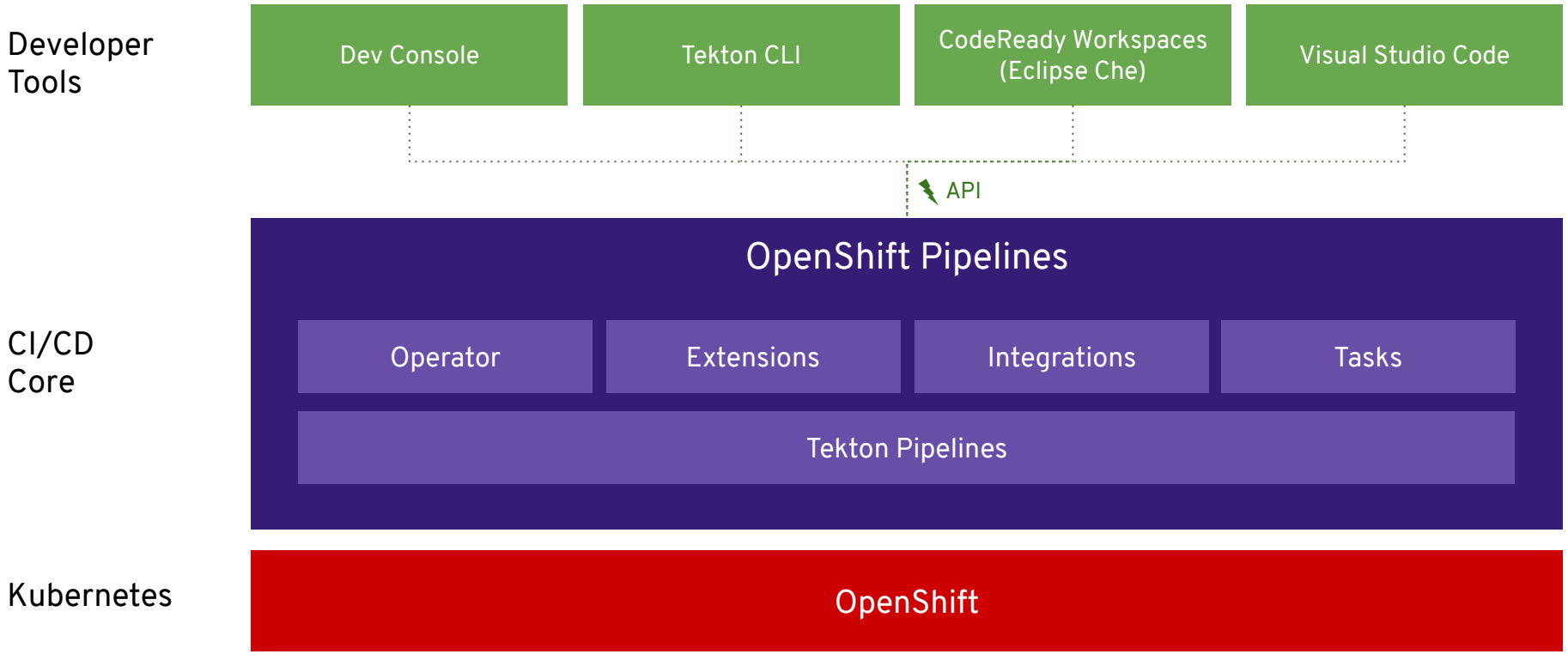
Web, CLI, and Visual Studio Code and IDE plugins


An open-source project for providing a  set of shared and standard components for building Kubernetes-style CI/CD systems

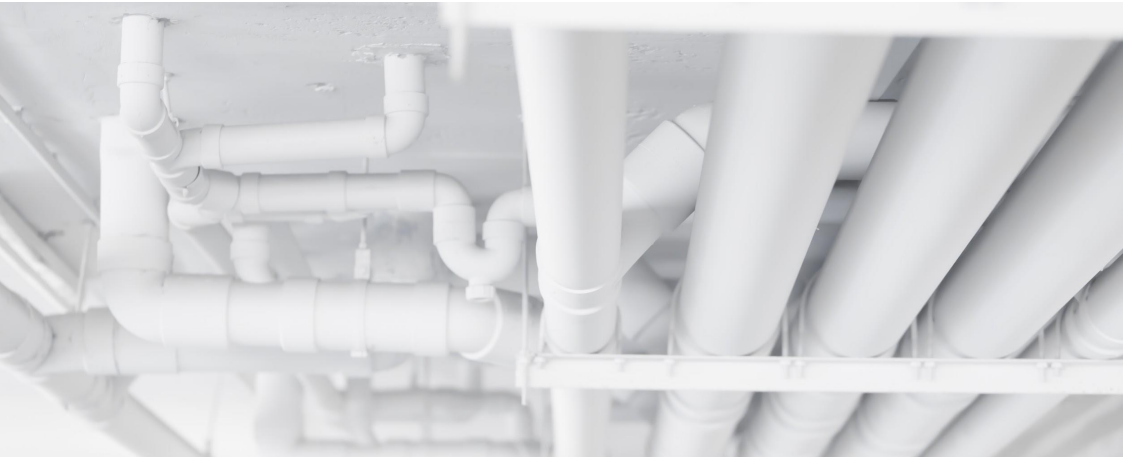

Governed by the Continuous Delivery Foundation

Contributions from Google, Red Hat, Cloudbees, IBM, Pivotal and many more

# OpenShift Pipelines Architecture



# Tekton Deep Dive





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# Tekton Concepts

## Step

Run commands in a container with volumes, env vars, etc

## Pipeline Resource

Inputs and outputs to tasks and pipelines (git, image, etc)

## Condition

An check that can determine if a task should be executed

## Task

A list of steps that run sequentially in the same pod

## Task Run

An invocation of a task with inputs and outputs

## Catalog

An collection of reusable tasks

## Pipeline

A graph of tasks executed in a certain order

## Pipeline Run

An invocation of a pipeline with inputs and outputs

## Triggers

A Tekton sub-project to start pipelines based on events

# Steps

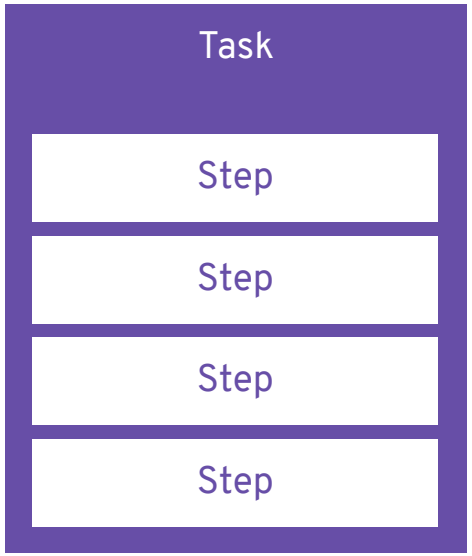
- Run command or script in a container
- Kubernetes container spec
  - Env vars
  - Volumes
  - Config maps
  - Secrets

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

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

# Task

- Defines a unit of work to be executed
- A list of steps to run sequentially
- Step containers run in the task pod
- Has inputs, outputs and parameters
- `Workspaces` and `results` for sharing data
- Can run independent of pipelines



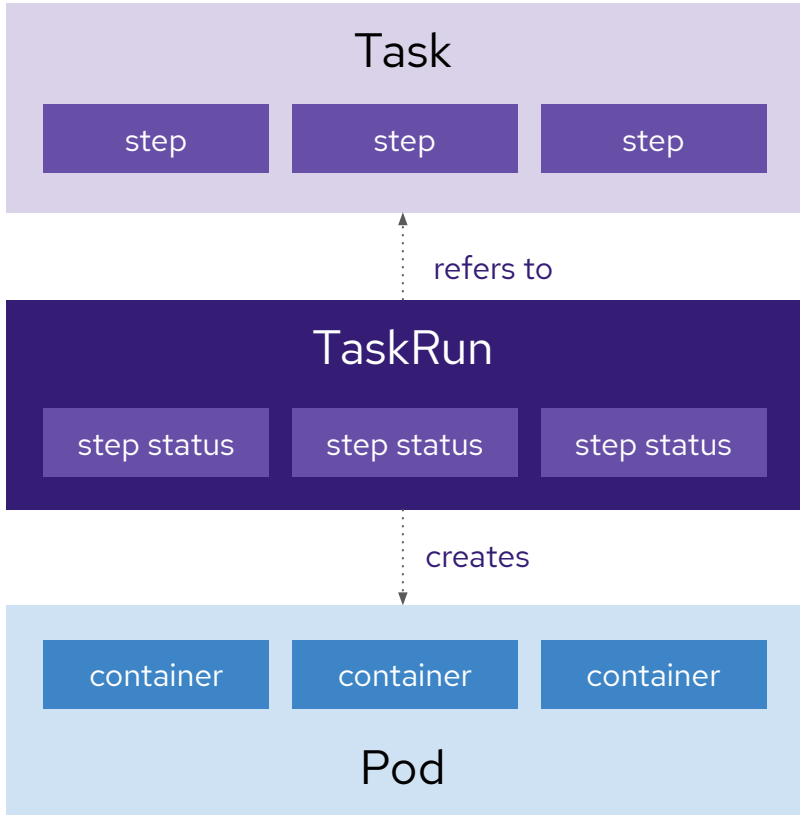

**Example Tasks:** Maven Install, AWS CLI, Kubectl Deploy, Security Scan, etc

# Maven Task Example

```yaml
kind: Task
metadata:
name: maven
spec:
 params:
   - name: goal
     type: string
     default: package
 steps:
   - name: mvn
     image: maven:3.6.0-jdk-8-slim
     command: [ mvn ]
     args: [ $(params.goal) ]
```

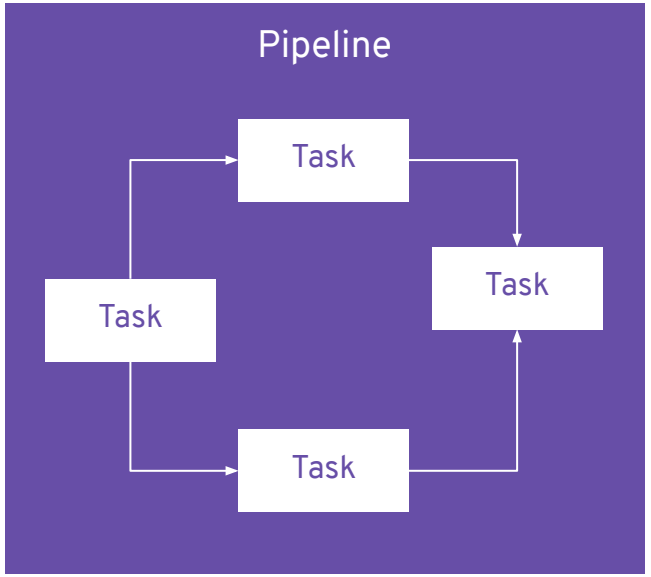
# TaskRun

- Runs a Task to completion in a pod
- References or embeds a Task spec
- Provides input to Tasks
  - Parameters
  - Resources
  - Service account
  - Workspaces
- Contains execution status and metadata



# Pipeline

- Define Tasks execution order (graph)
- Inputs and parameters
- Retries tasks
- Conditional task execution
- Workspaces for sharing data between tasks
- Reusable across projects



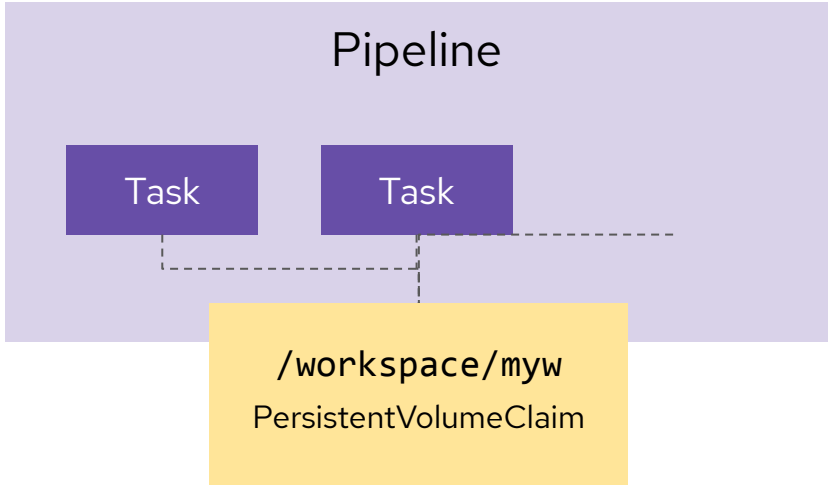
# Sharing Data Between Tasks

**Task: `results`**

- Task exposes data as variables
- Suitable for small pieces of data
- Examples: commit id and branch name

**Task: `workspaces`**

- Shared volumes between tasks
  - Persistent volumes
  - Config maps
  - Secrets
- Suitable for large data
- Examples: code, binaries, reports



# Conditions

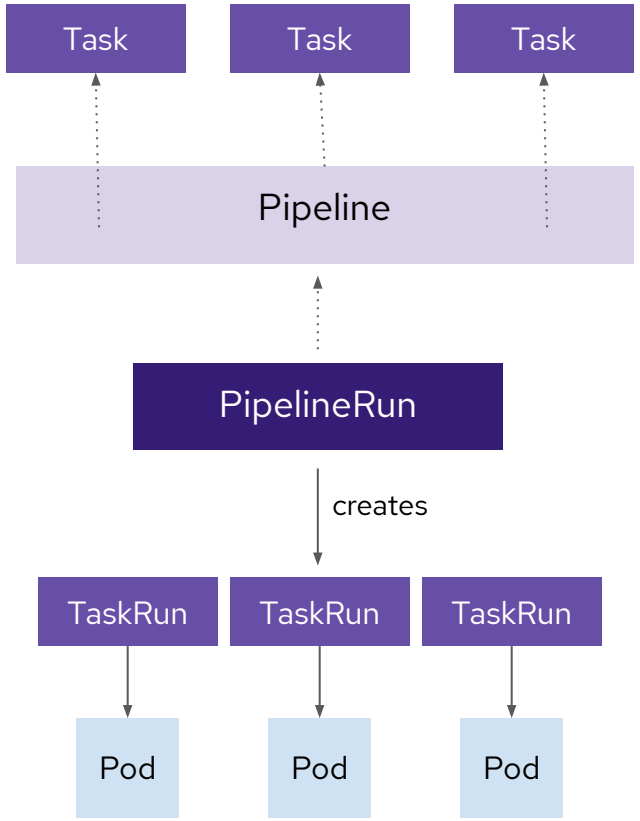
- Defines a single checks
- Used in conditional tasks
- Parameterized
- Command run in container
  - True: exit code - 0
  - False: non-zero exit code

```yaml
kind: Condition
metadata:
name: deployment-exists
spec:
  params:
  - name: appName
  check:
    image: openshift-cli
    script: oc get deployment $(params.app)
```

```yaml
kind: Pipeline
spec:
  tasks:
  - name: run-tests
    taskRef: { image: ui-test-runner }
    conditions:
    - conditionRef: deployment-exists
      params:
        - {name: appName, value: api }
```

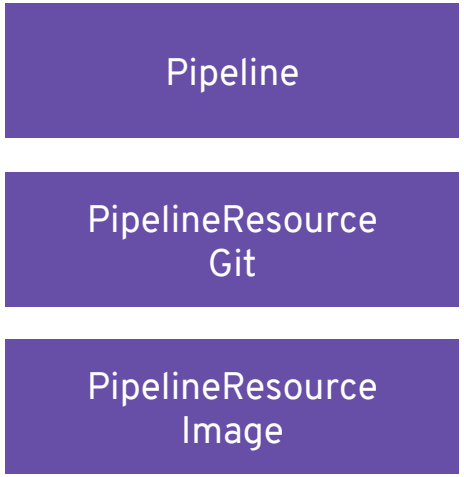
# PipelineRun

- Runs a pipeline to completion
- References or embeds a Pipeline spec
- Creates TaskRuns to execute Tasks in the Pipeline
- TaskRun pods may get scheduled on different node
- Provides inputs and params to pipeline
- Provides volumes for declared pipeline workspaces



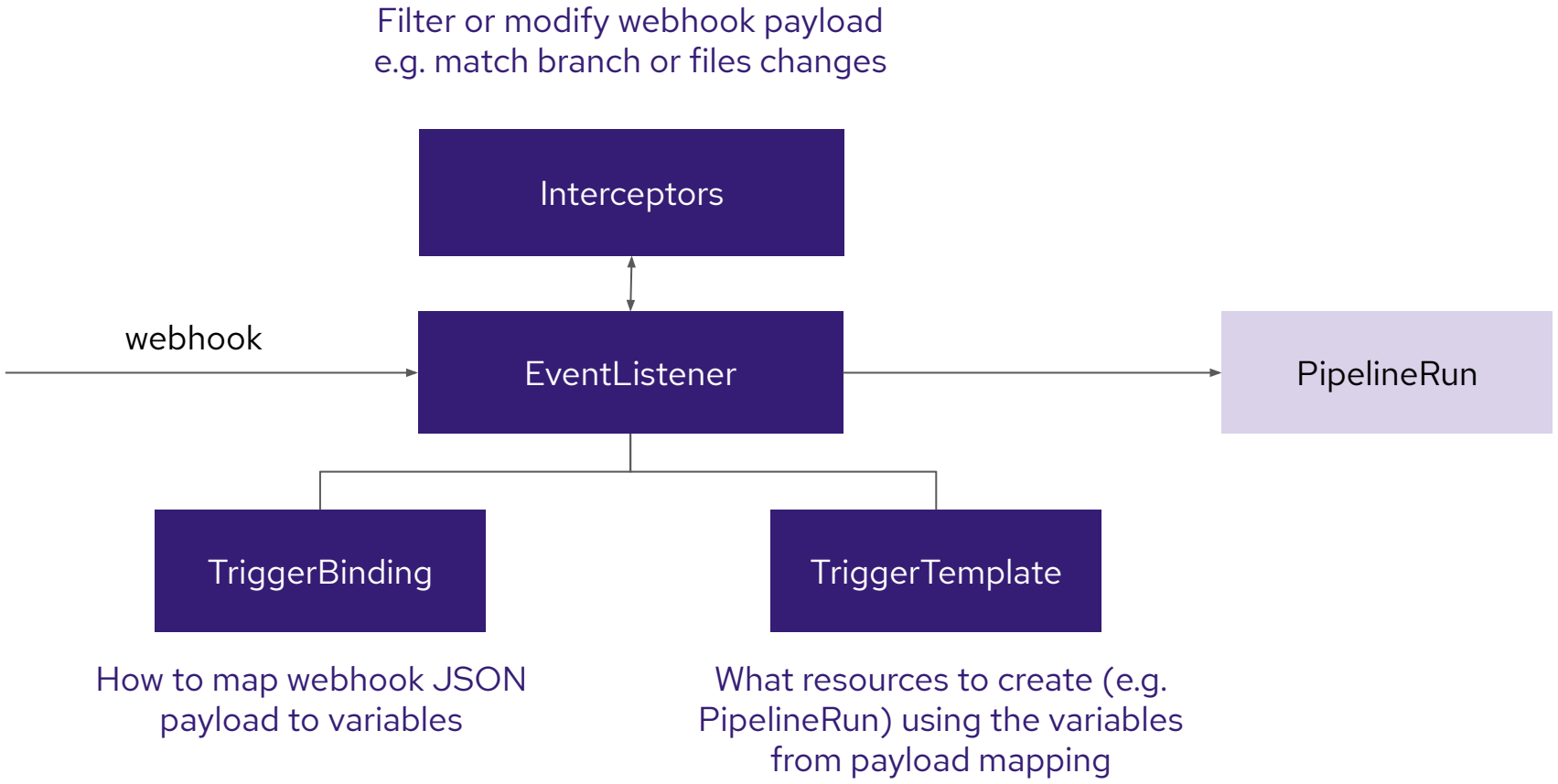
# PipelineResource

- Inputs and outputs of tasks and pipelines
  - git repository
  - image in a registry
  - cluster credentials
  - storage
  - ...and mo
- Decoupled from pipeline definition
- Reusable across pipelines



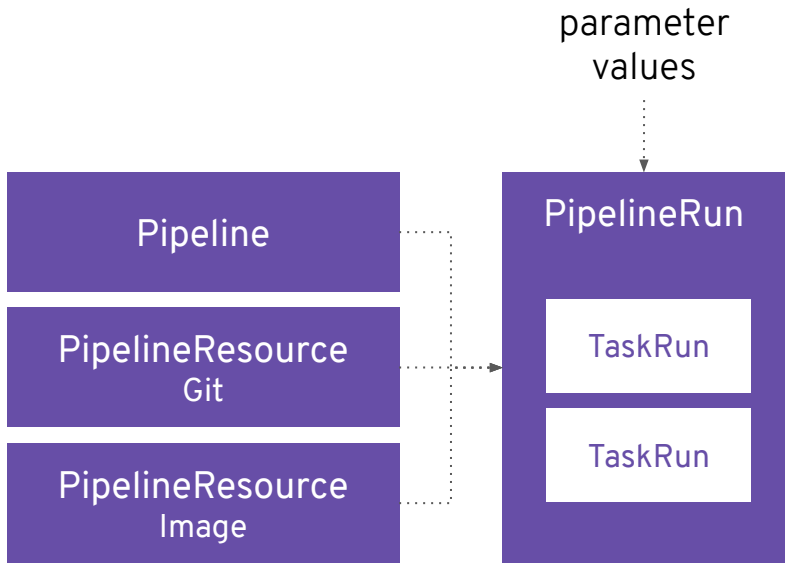
# Triggers

Run pipelines based on events like HTTP webhooks on commit, pull request, etc



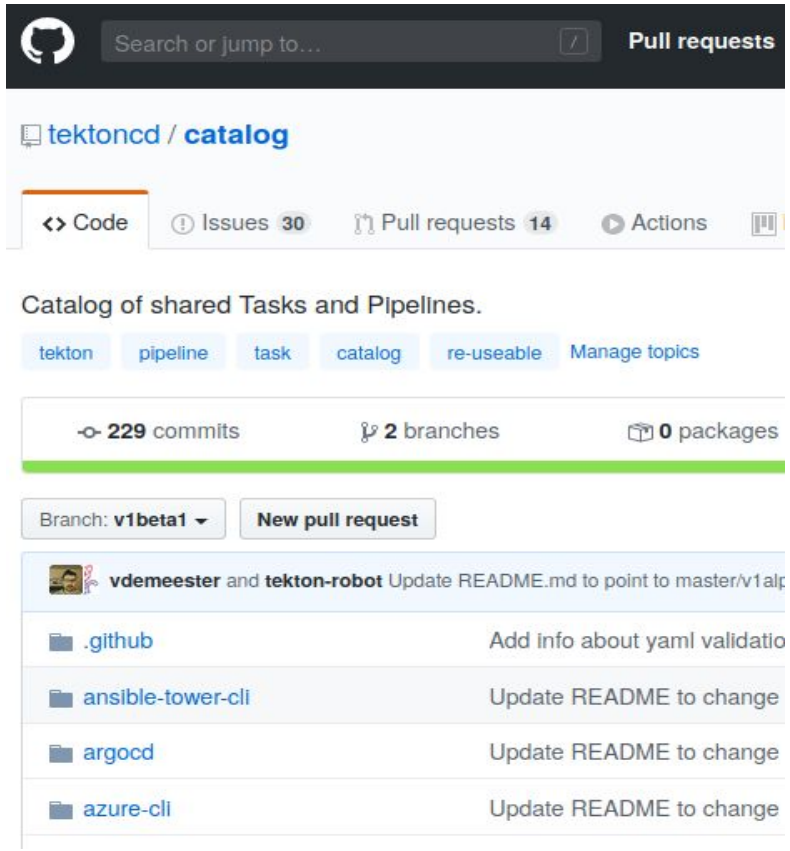
# TaskRun and PipelineRun

- Runtime CRDs
- Invocation of Task and Pipeline
- Reference tasks and pipelines
- Provide inputs, outputs and params



# Task Catalog

- Catalog of reusable Tasks
  - Image build: buildah, kaniko, jib, buildpacks, etc
  - Source-to-Image: Java, Python, Go, Ruby, etc
  - Language specific: maven, gradle, go, ...
  - More to come soon
- Import and compose pipelines
- Available catalogs
  - tektoncd/catalog
  - openshift/pipelines-catalog



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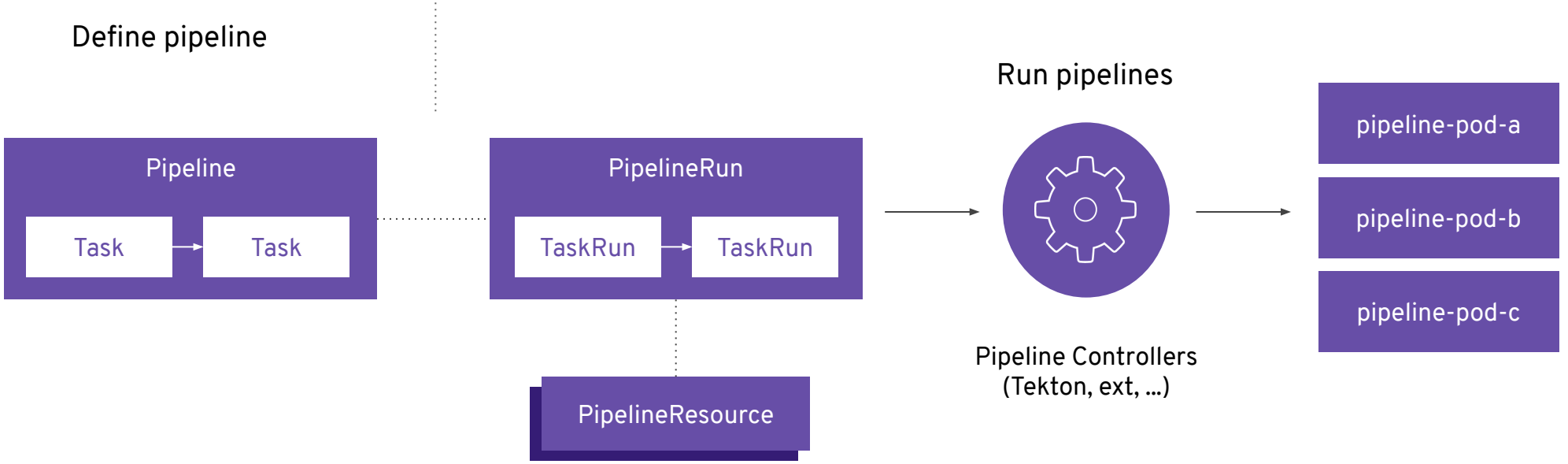
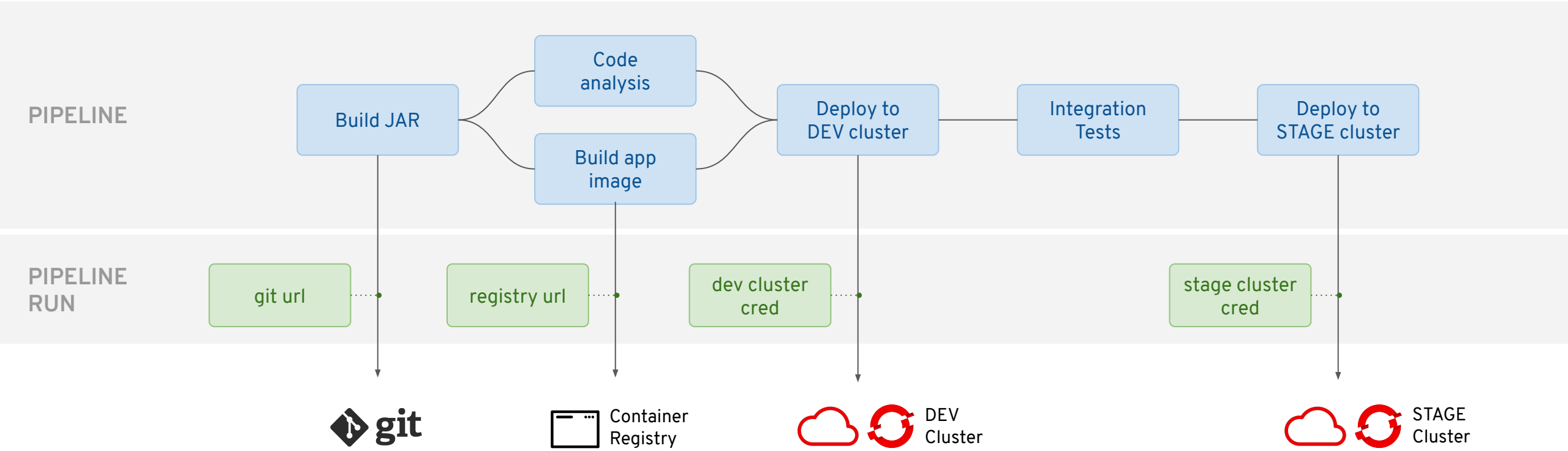
# OpenShift Pipelines Architecture



# Tekton Pipeline Example






TASK | PIPELINE RESOURCE

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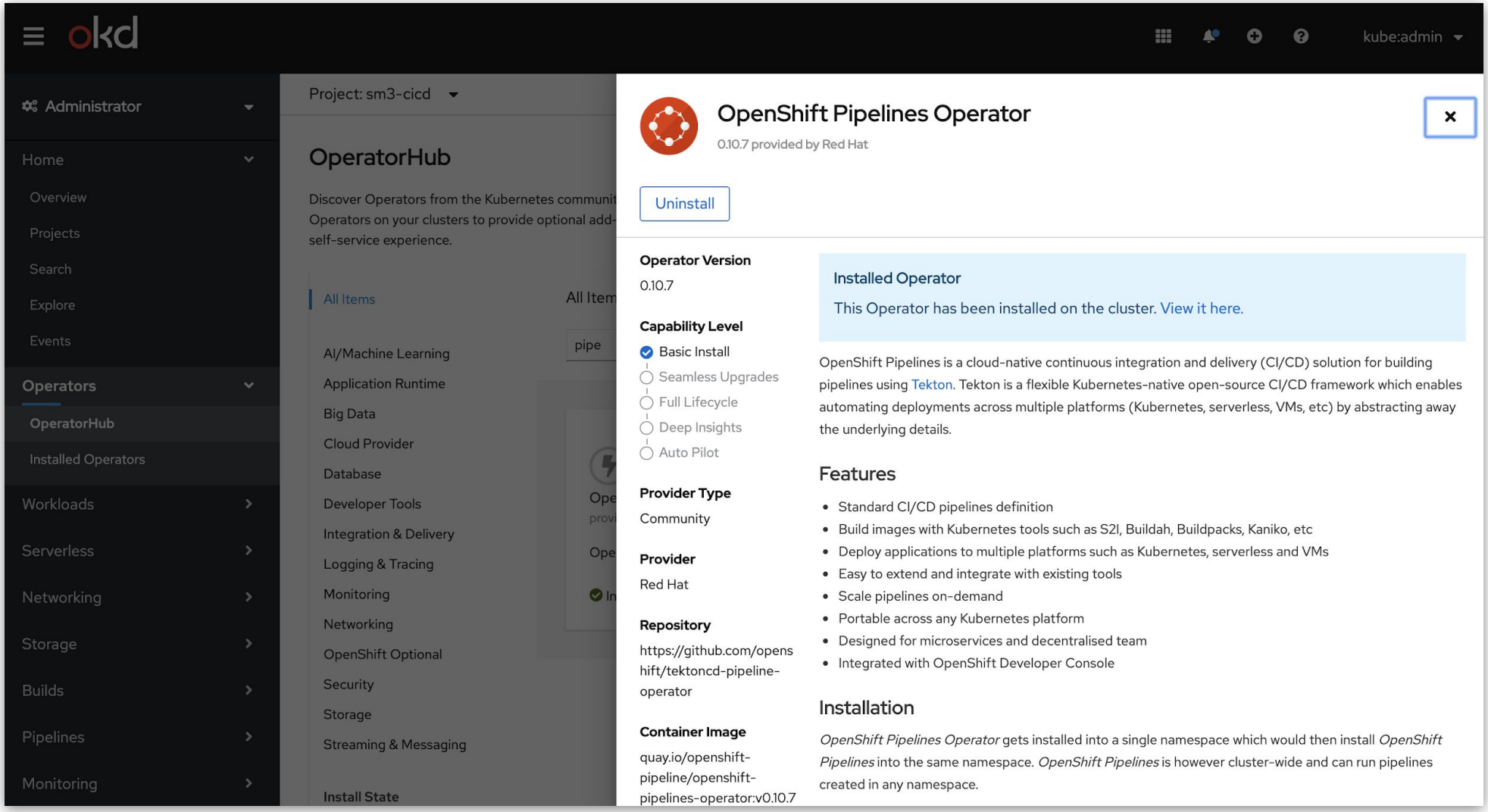
# Install OpenShift Pipelines Operator



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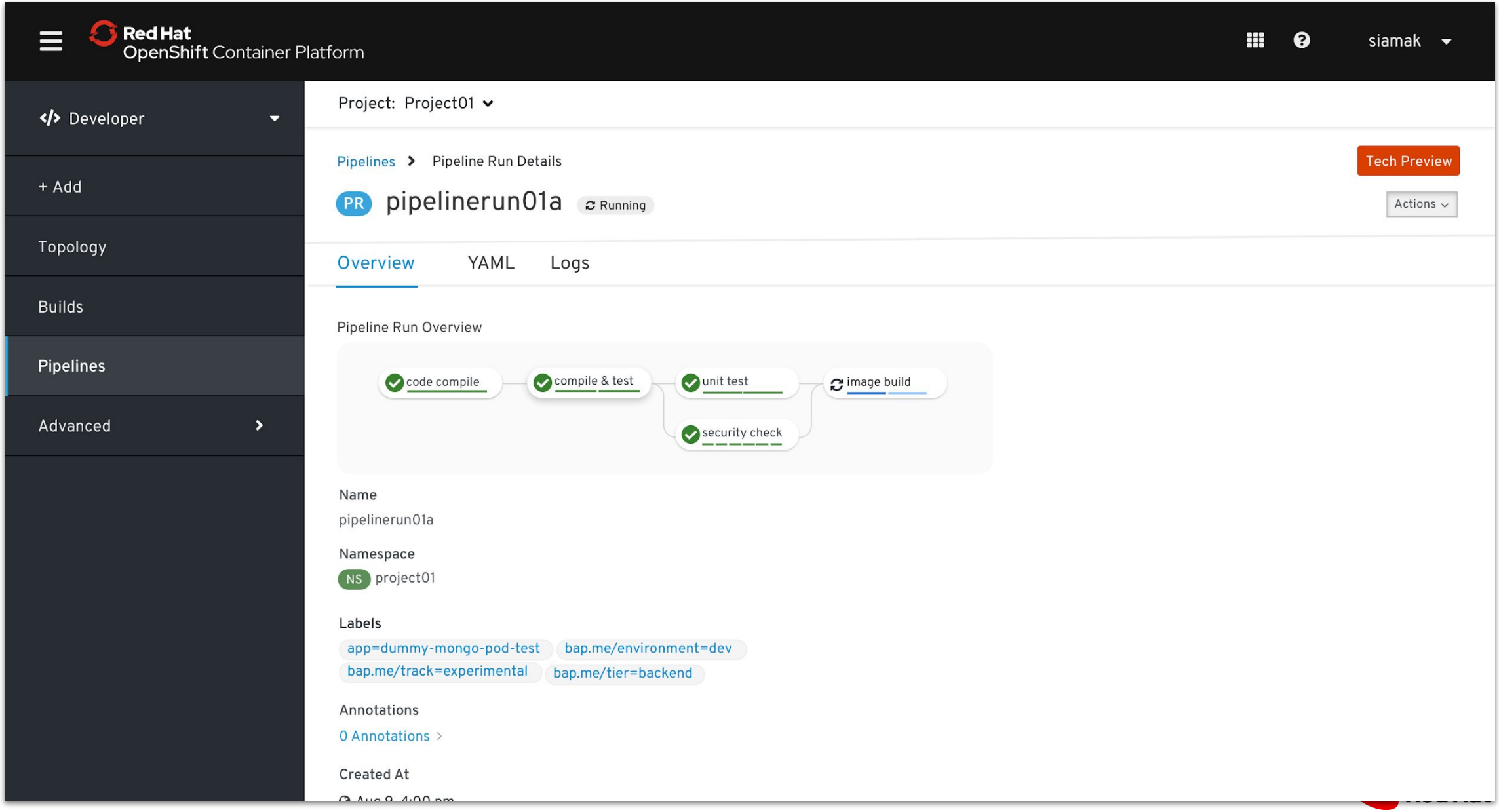
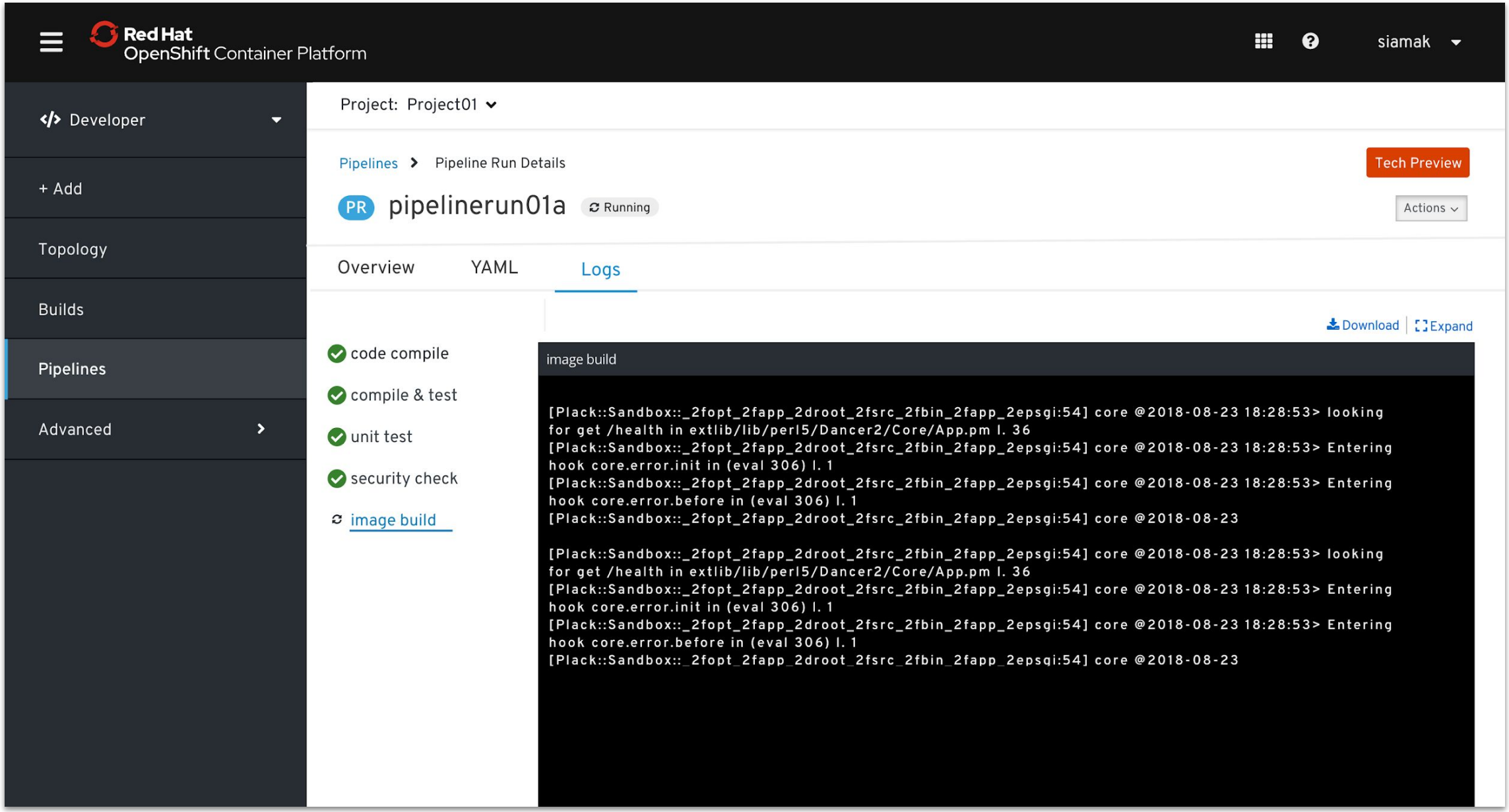

Red Hat
OpenShift Container Platform
siamak
Developer
+ Add
Topology
Builds
Pipelines
Advanced
Project: Project01
Pipelines
Pipeline Run Details
Tech Preview
PR
pipelinerun01a
Running
Actions
Overview
YAML
Logs
Pipeline Run Overview
code compile
compile & test
unit test
image build
security check
Name
pipelinerun01a
Namespace
NS
project01
Labels
app=dummy-mongo-pod-test
bap.me/environment=dev
bap.me/track=experimental
bap.me/tier=backend
Annotations
0 Annotations
Created At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Project: Project01
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Pipeline Run Details
Tech Preview
PR
pipelinerun01a
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Overview
YAML
Logs
Download
Expand
code compile
compile & test
unit test
security check
image build
image build
[Plack::Sandbox::_2fopt_2fapp_2droot_2fsrc_2fbin_2fapp_2epsgi:54] core @2018-08-23 18:28:53> looking for get /health in extlib/lib/perl5/Dancer2/Core/App.pm l. 36
[Plack::Sandbox::_2fopt_2fapp_2droot_2fsrc_2fbin_2fapp_2epsgi:54] core @2018-08-23 18:28:53> Entering hook core.error.init in (eval 306) l. 1
[Plack::Sandbox::_2fopt_2fapp_2droot_2fsrc_2fbin_2fapp_2epsgi:54] core @2018-08-23 18:28:53> Entering hook core.error.before in (eval 306) l. 1
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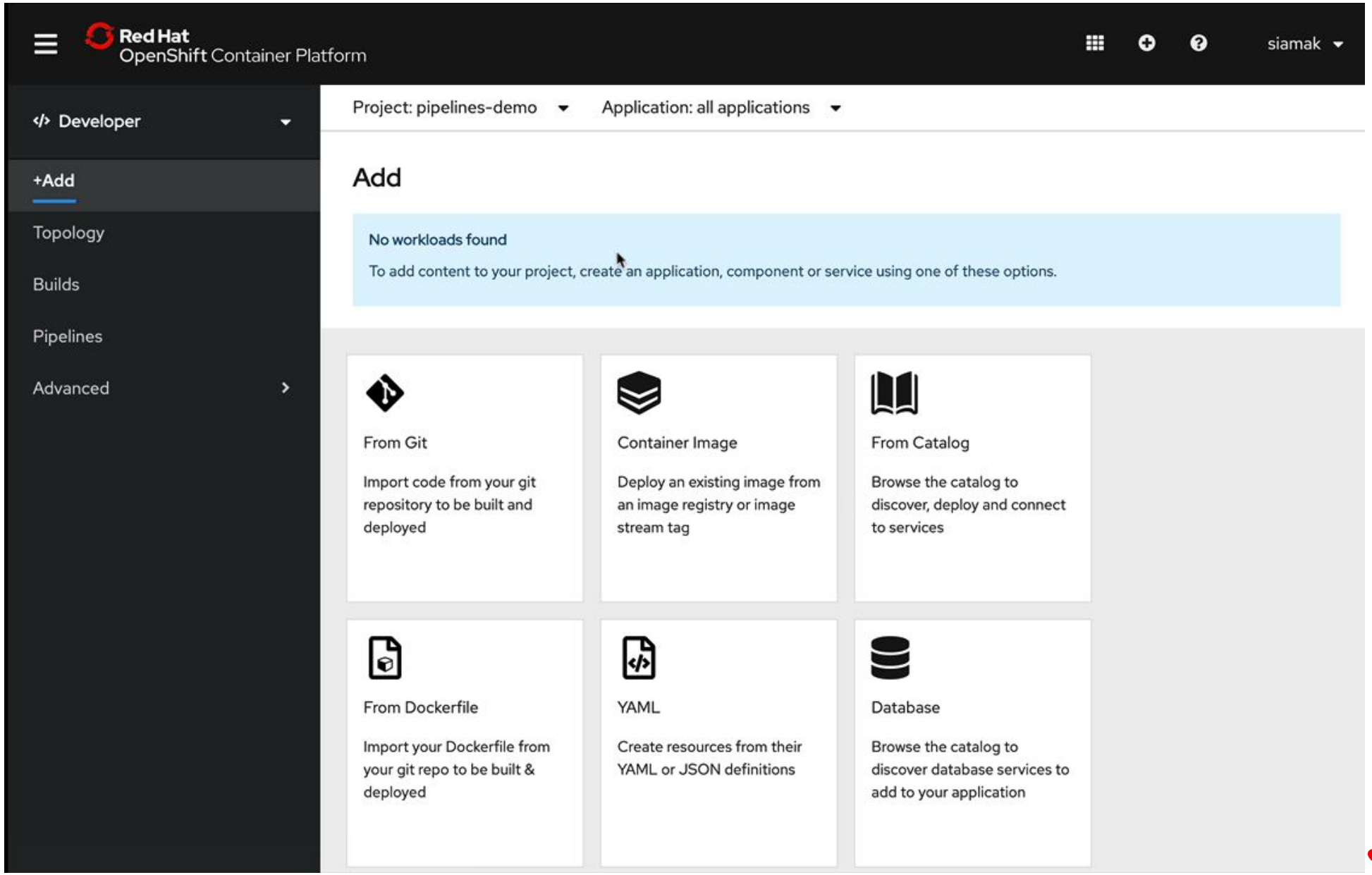
[Plack::Sandbox::_2fopt_2fapp_2droot_2fsrc_2fbin_2fapp_2epsgi:54] core @2018-08-23 18:28:53> Entering hook core.error.before in (eval 306) l. 1
[Plack::Sandbox::_2fopt_2fapp_2droot_2fsrc_2fbin_2fapp_2epsgi:54] core @2018-08-23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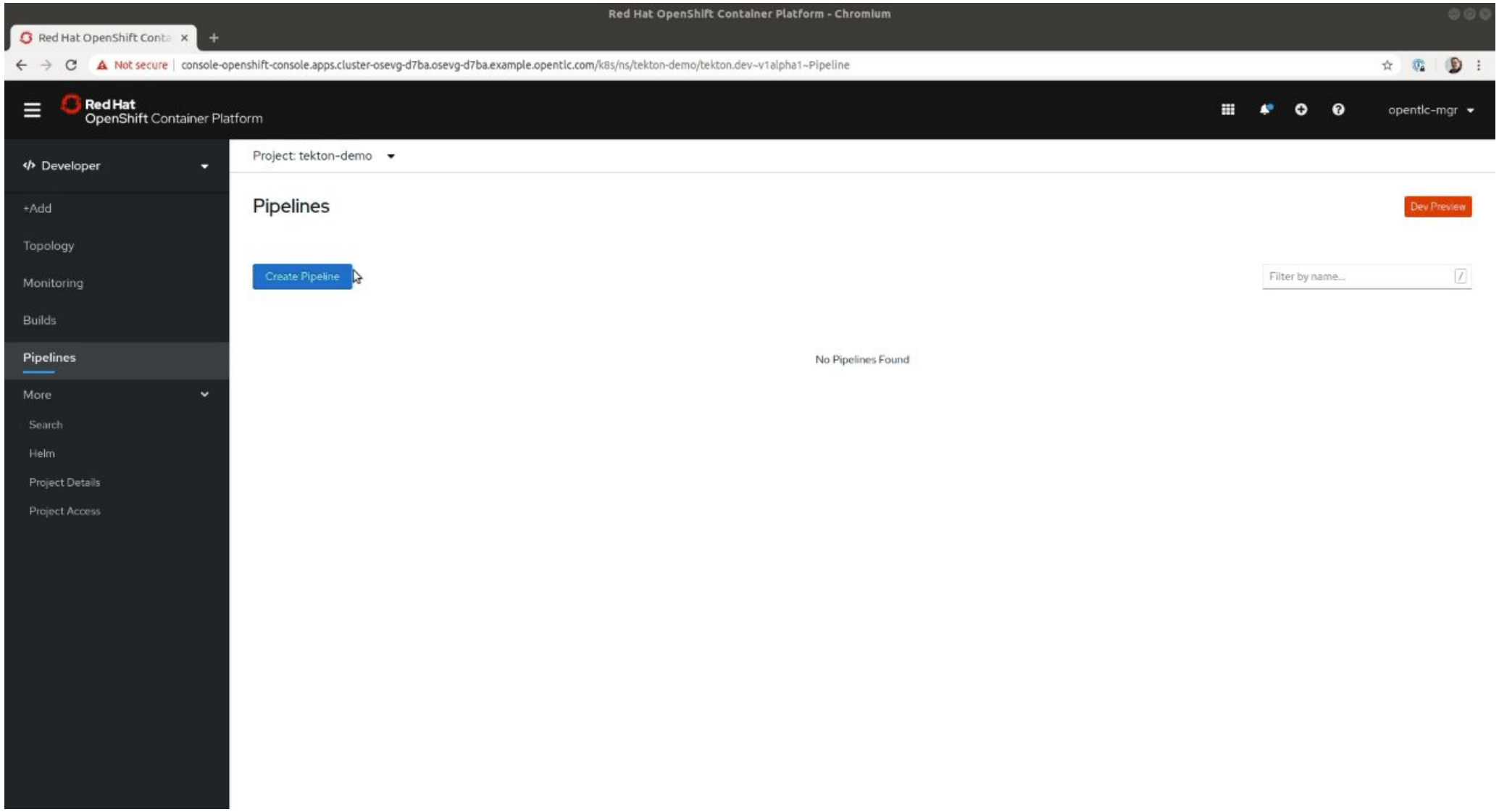
OpenShift Container Platform
siamak
Developer
Project: pipelines-demo
Application: all applications
+Add
Topology
Builds
Pipelines
Advanced
Add
No workloads found
To add content to your project, create an application, component or service using one of these options.
From Git
Import code from your git repository to be built and deployed
Container Image
Deploy an existing image from an image registry or image stream tag
From Catalog
Browse the catalog to discover, deploy and connect to services
From Dockerfile
Import your Dockerfile from your git repo to be built & deployed
YAML
Create resources from their YAML or JSON definitions
Database
Browse the catalog to discover database services to add to your application

# Pipeline Builder to compose Pipelines from Task library





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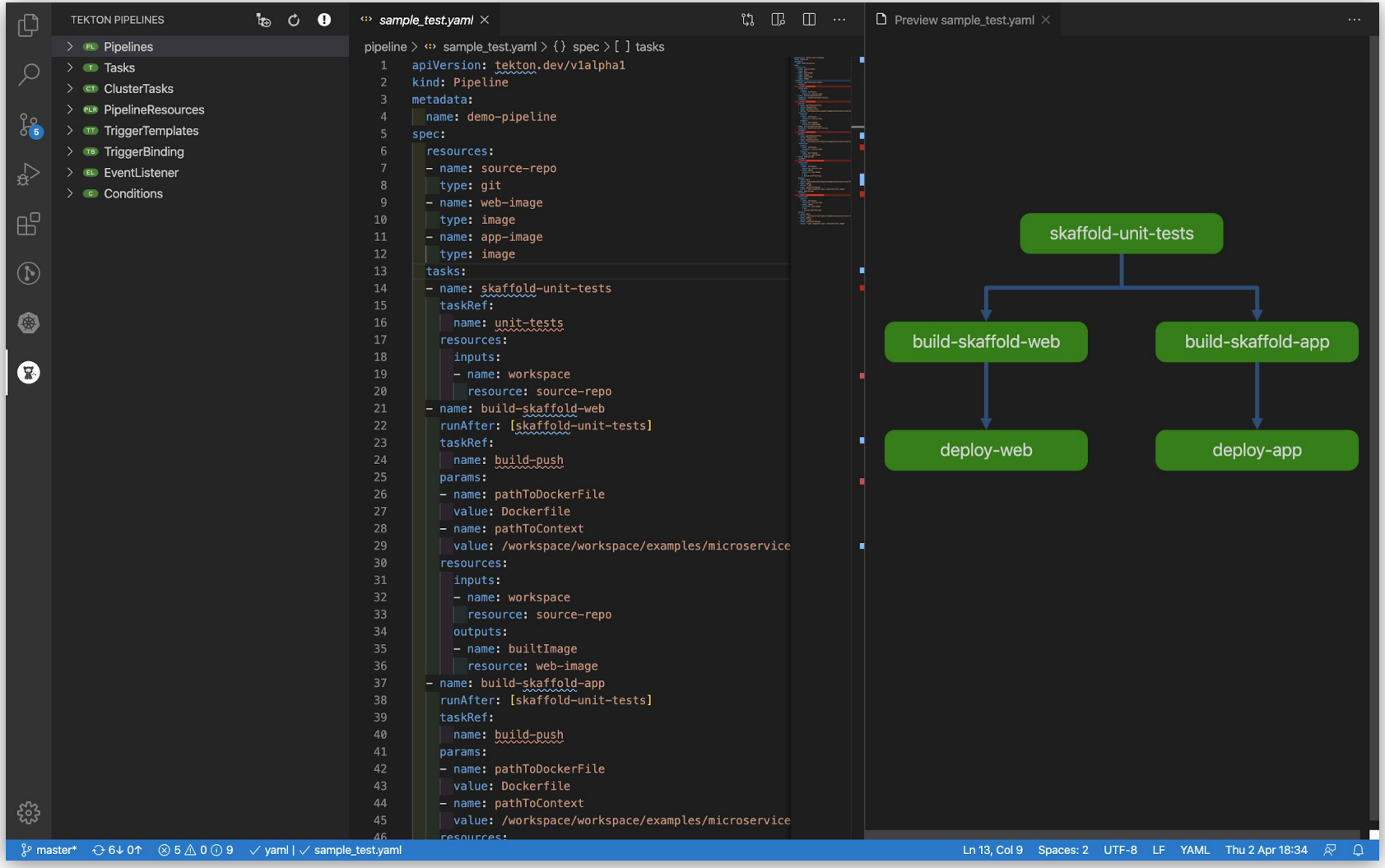
# Manage Pipelines with Tekton CLI

# Tekton Pipelines VS Code Extension



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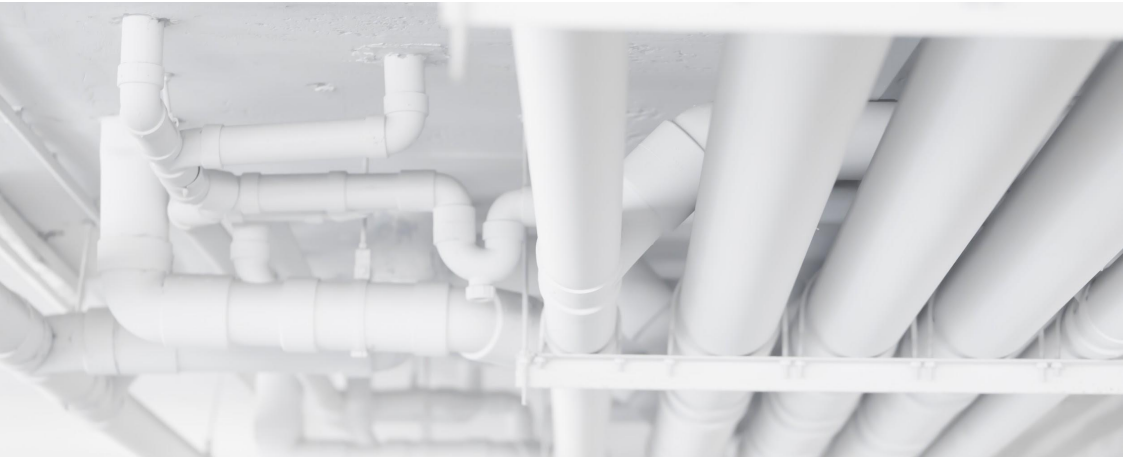
# Roadmap





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# What does it mean for Jenkins?

## Jenkins

OpenShift continues to ship and support Jenkins images and plugins to simplify the Jenkins experience

## Jenkins build strategy

Direct use of `Jenkinsfiles` on Jenkins is recommended, because the Pipeline build strategy is in maintenance mode.

```
kind: "BuildConfig"
spec:
  strategy:
    jenkinsPipelineStrategy
```

# What does it mean for OpenShift Builds?

## OpenShift Builds

a feature-rich mechanism for building images with S2I, Dockerfiles or custom builds

## Tekton Tasks

a portable mechanism for building images on Kubernetes with S2I, Dockerfile, Kaniko, JIB, buildpacks and more

Features
Robustness



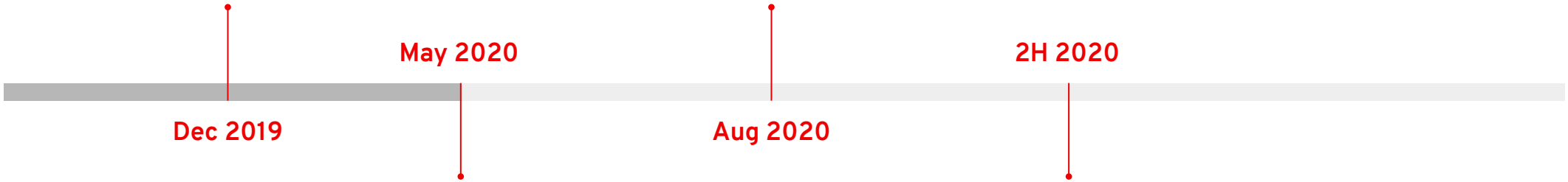
Portability
Extensibility

### Dev Preview 4

Webhooks
Default tasks
RBAC UX improvements (cont.)
Tekton CLI (more commands)
VSCode Plugin (cont.)
Console Dev (view, graph, logs)

### OpenShift Pipelines 1.1 (TP2)

Improve concurrent writes to workspace
Auto-create PVC for workspaces
Emit k8s events for task lifecycle
Knative pipeline templates
Tetkon Hub & Catalog launch
Tekton CLI - hub commands
Console - workspace support
Console - trigger support
VS Code - start pipeline wizard
VS Code - hub integration




### OpenShift Pipelines 1.0 (TP1)

Webhook event filtering
More tasks in the catalog
Console - generate pipelines
Console - task snippets
Console - pipeline builder
Workspace and sharing artifacts
Tekton CLI (more commands)
VSCode Plugin (cont.)

### OpenShift Pipelines GA

Config-as-code
Disconnected install
Proxy support
Additional tasks
Image stream support
Support for finally clauses
Enhanced pipeline resources
Console - catalog integration

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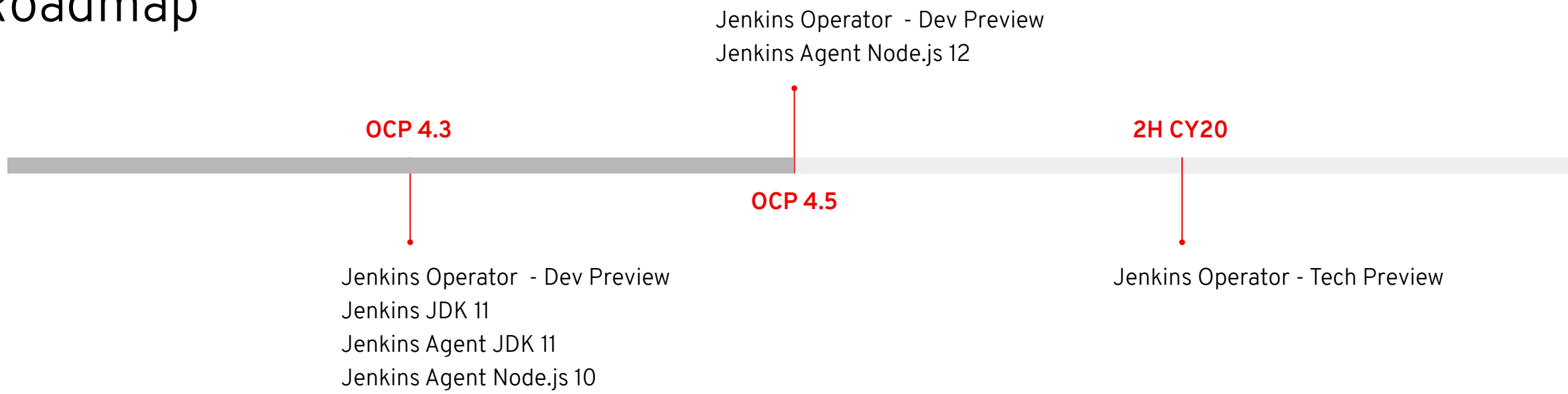
# Jenkins Roadmap



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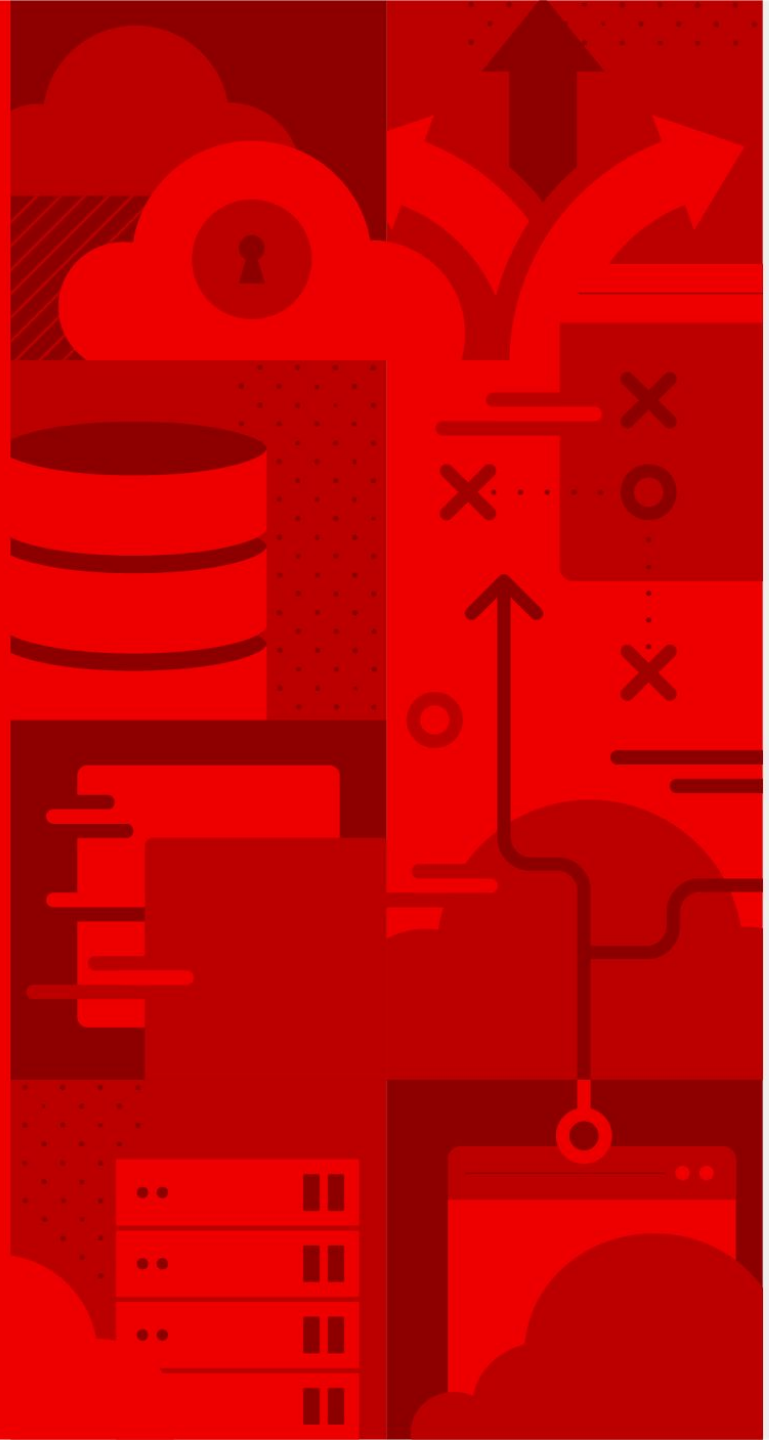

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