Tekton in Action with Red Hat OpenShift Pipelines

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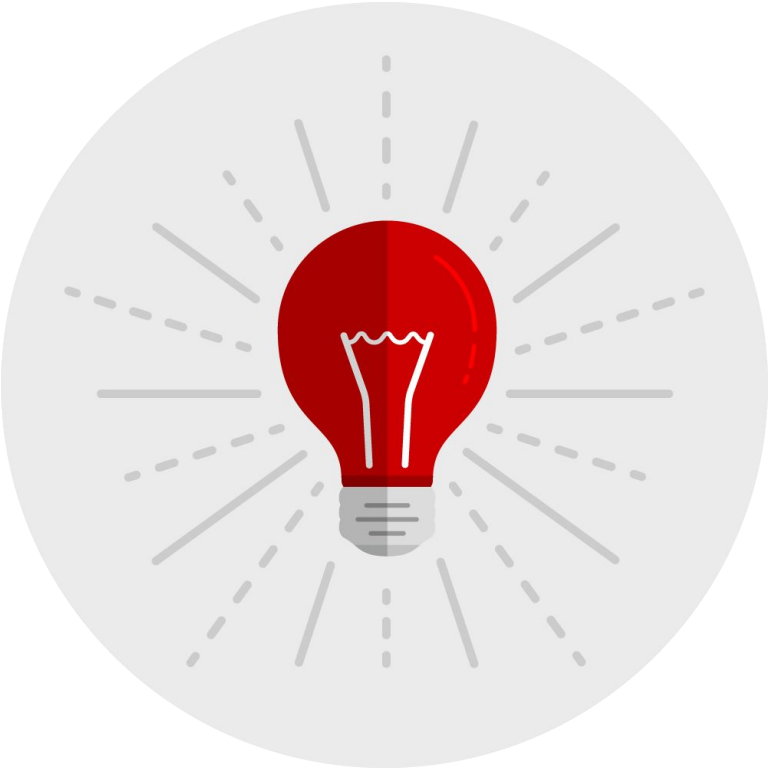
AGENDA

- OpenShift
- What is CI/CD?
- Cloud Native CI/CD
- OpenShift Pipelines
- Tekton components
- Tekton in action



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

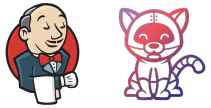
OpenShift

A Comprehensive DevOps Platform for Hybrid Cloud

Build container images from source code using Kubernetes tools

Traditional and Kubernetes-native CI/CD

Declarative GitOps for multi-cluster continuous delivery



OpenShift Builds | **OpenShift Pipelines** | **OpenShift GitOps**

OpenShift

Product Manager: Siamak Sadeghianfar

CD.FOUNDATION

CLOUD NATIVE COMPUTING FOUNDATION

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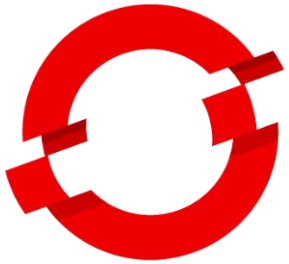
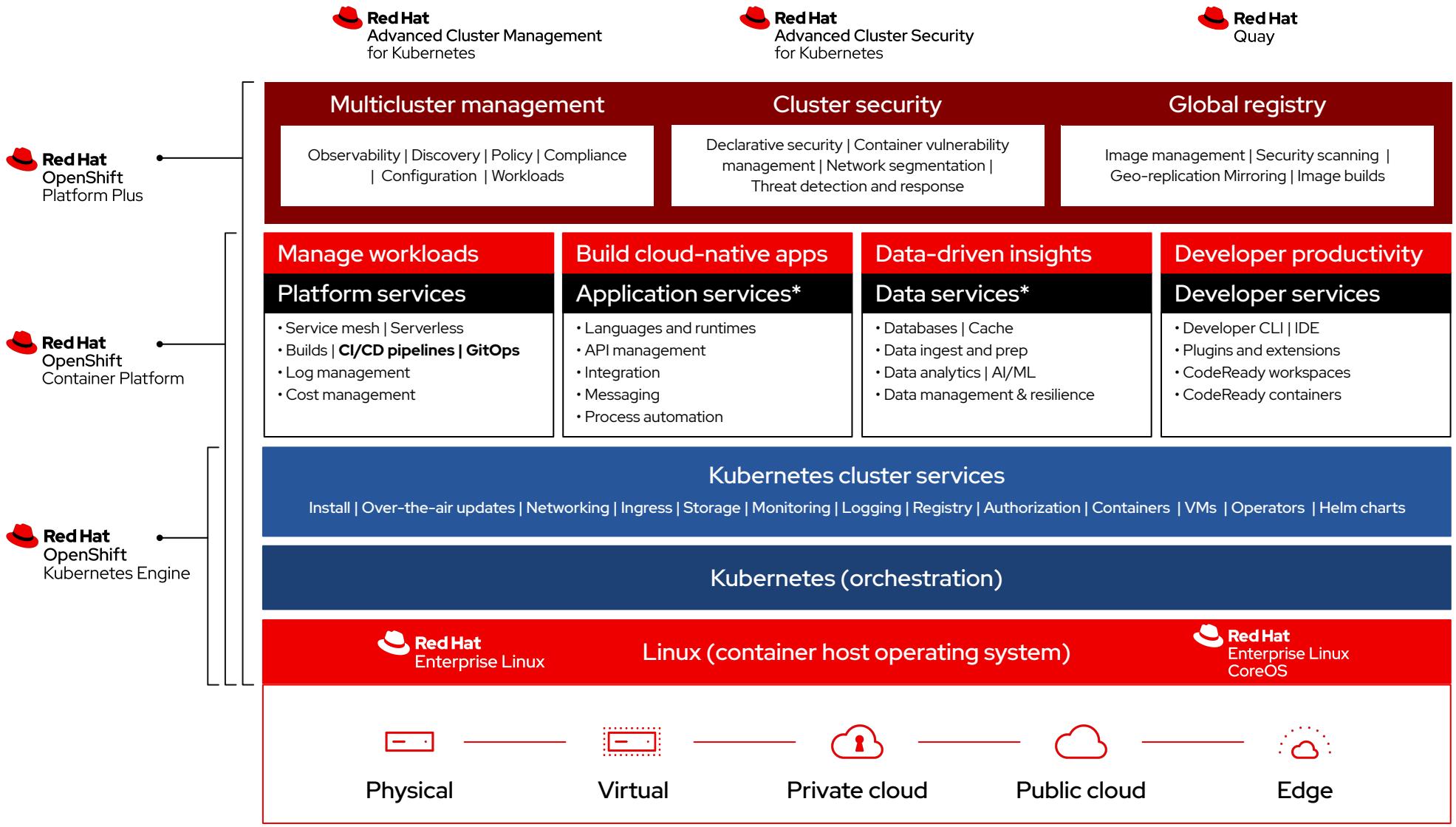


Red Hat OpenShift

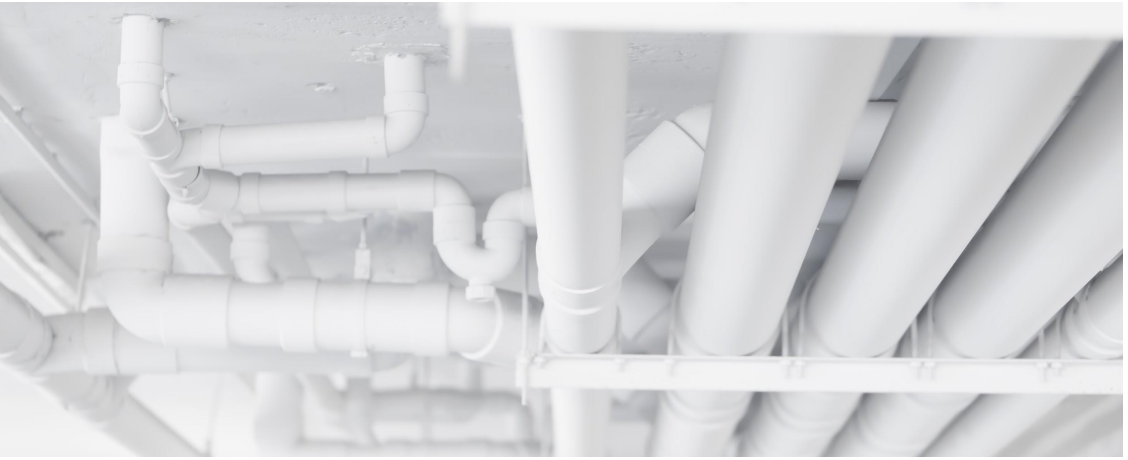
A secure and enterprise-grade container application platform based on **Kubernetes** for traditional and cloud-native applications

OpenShift Platform Plus

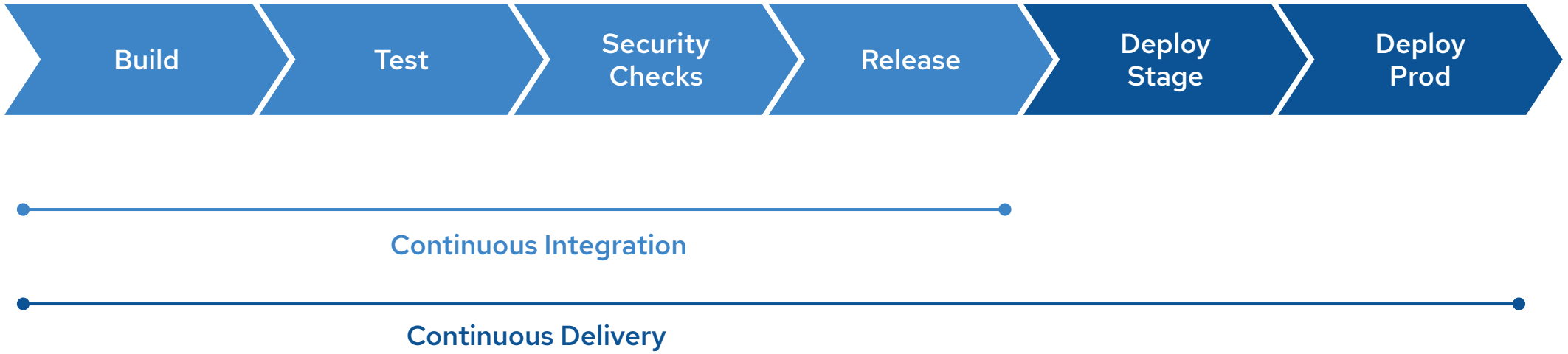


* Red Hat OpenShift® includes supported runtimes for popular languages/frameworks/databases. Additional capabilities listed are from the Red Hat Application and Data Services portfolio.

What is CI/CD?



Continuous Integration & Continuous Delivery



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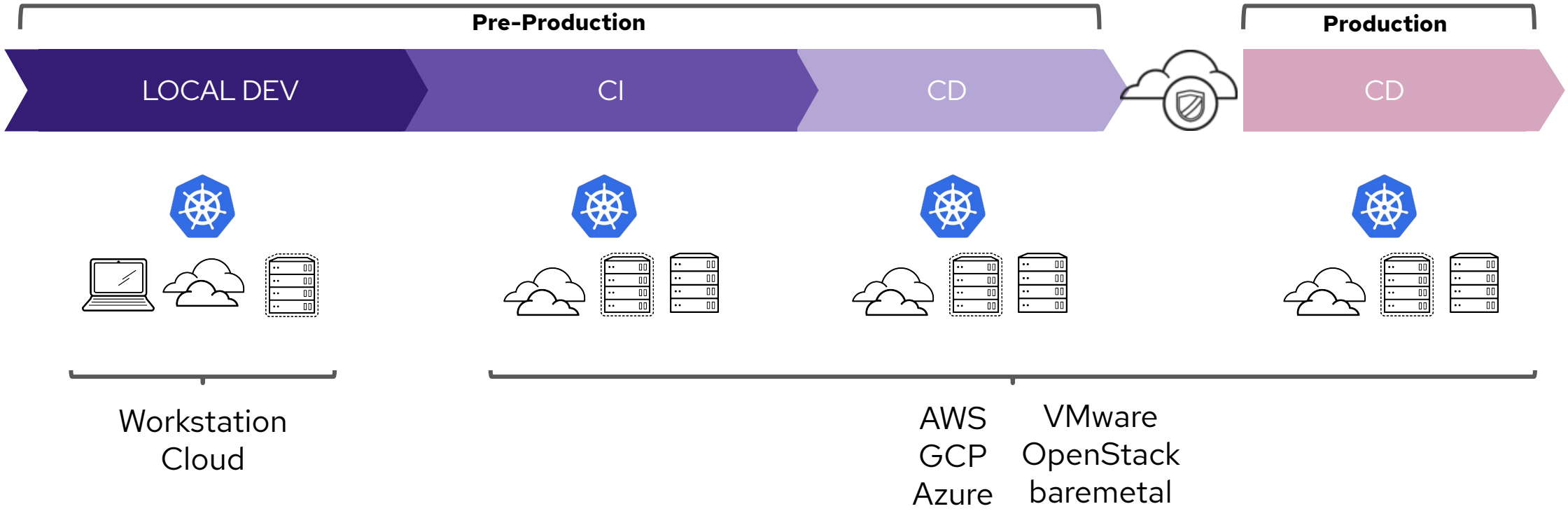
Fact: Kubernetes is the target platform



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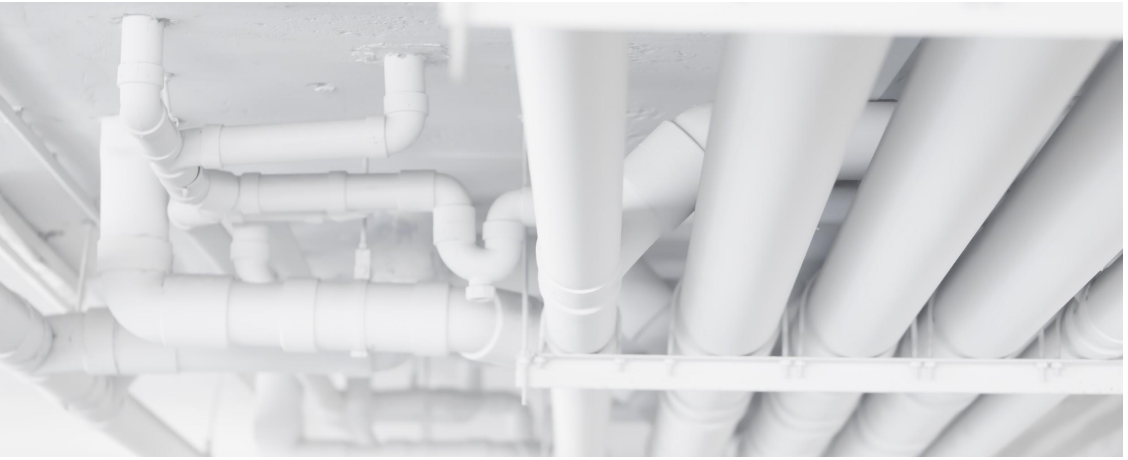
One Continuous Delivery

Multiple Clouds

Multiple Platforms

DEVELOPMENT	CONTINUOUS INTEGRATION	CONTINUOUS DELIVERY
 Workstation	 Kubernetes	 Kubernetes Azure AWS GCP VMware OpenStack baremetal
 Kubernetes		

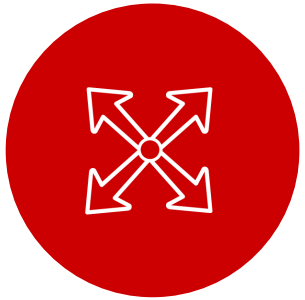
Cloud Native CI/CD



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

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Why Cloud-Native CI/CD?

Traditional CI/CD	Cloud-Native CI/CD
Designed for Virtual Machines	Designed for Containers and Kubernetes
Requires 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

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TEKTON

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

CD.FOUNDATION

Governed by the Continuous Delivery Foundation

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

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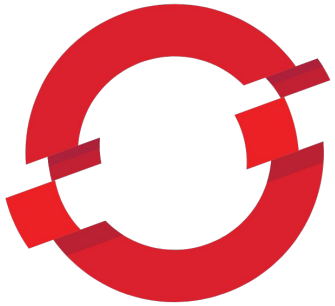
Composable

Declarative

Reproducible

Cloud Native



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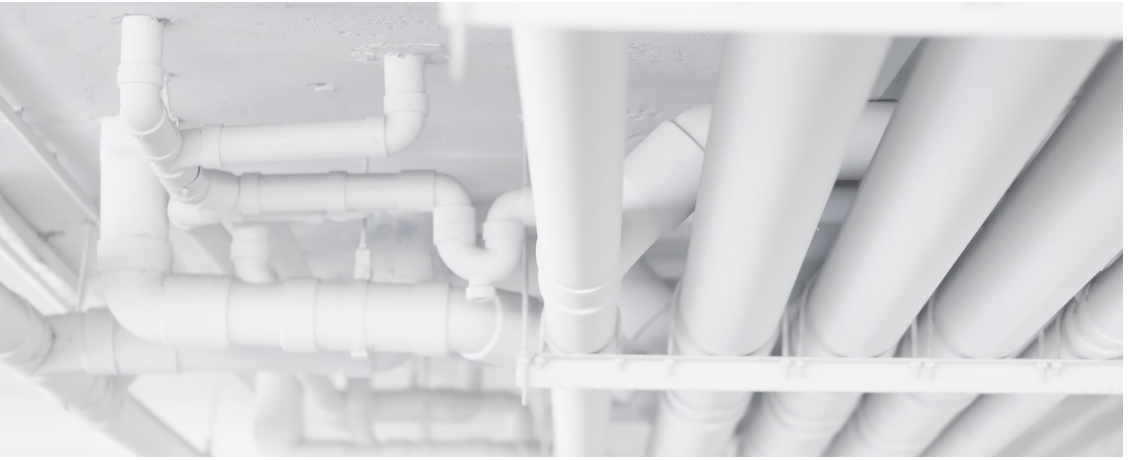
OpenShift Pipelines



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

Powered by 

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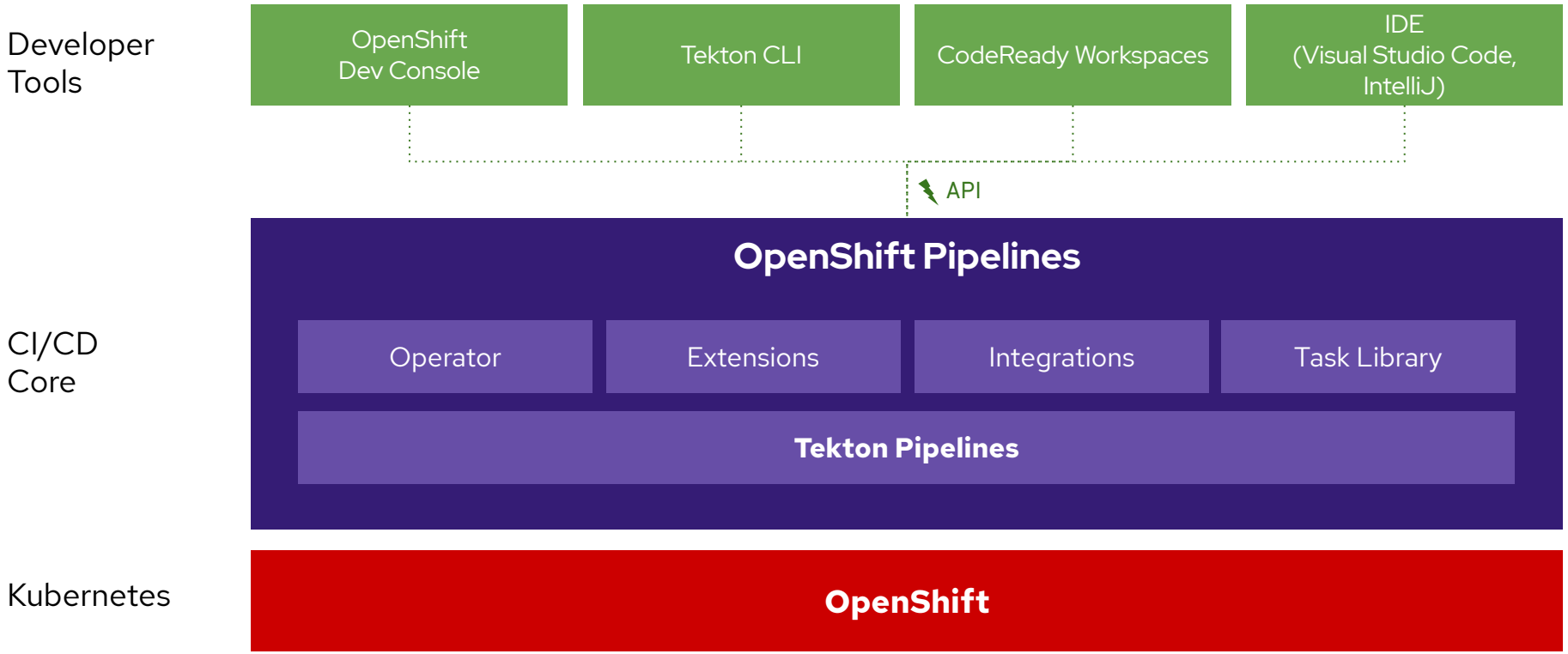
OpenShift Pipelines



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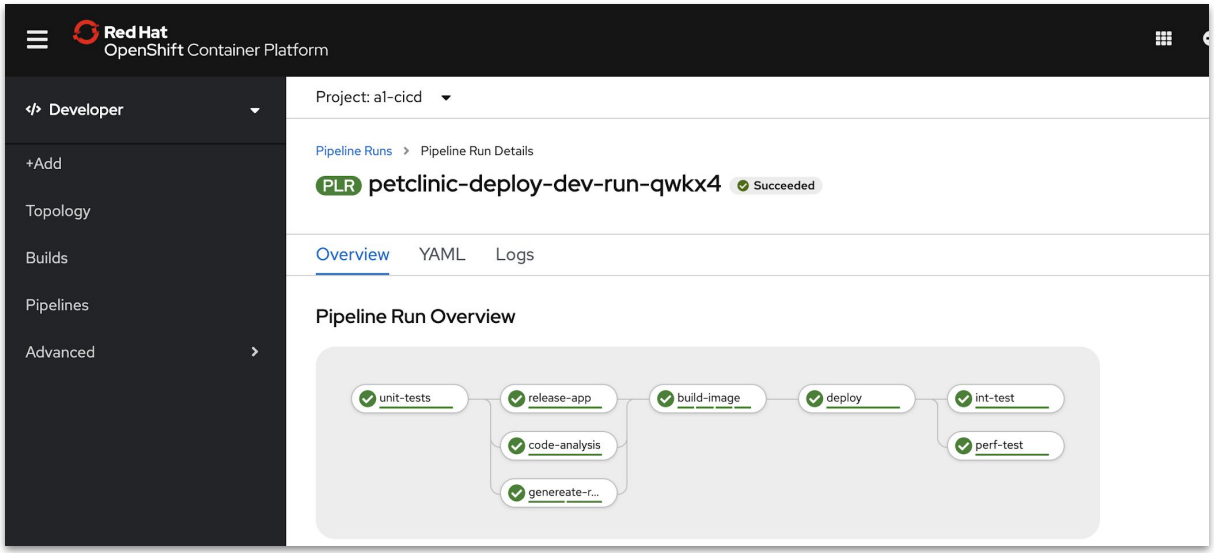
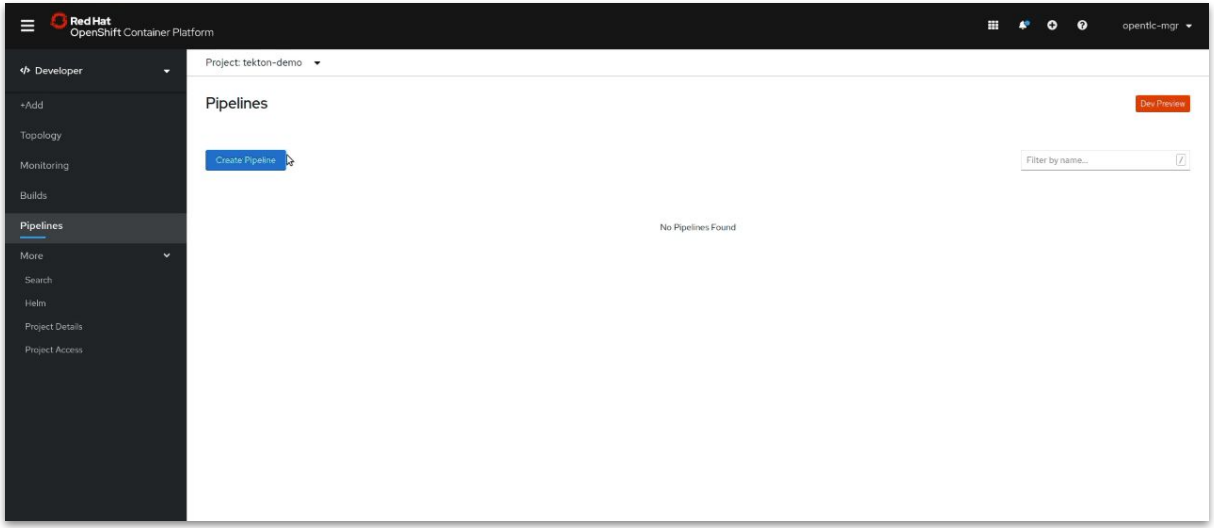
OpenShift Pipelines

- 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





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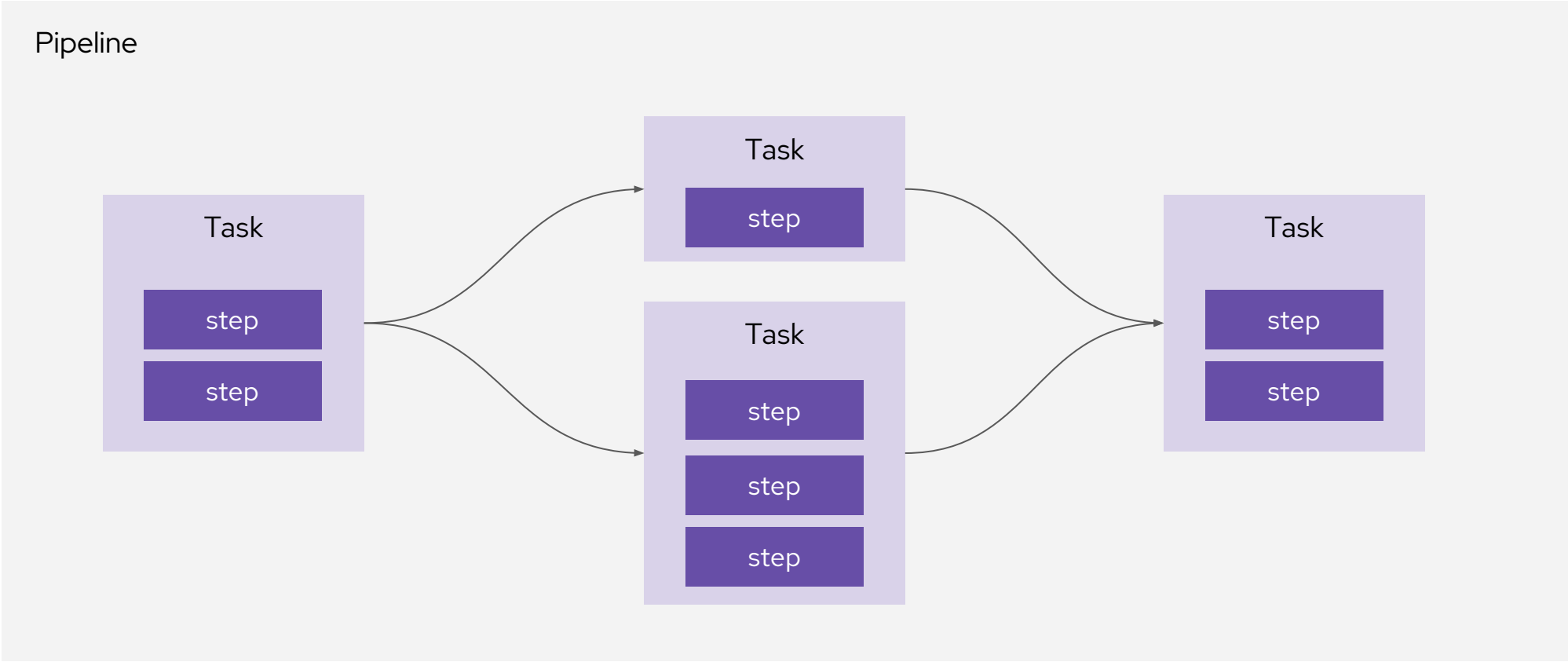
Tekton Concepts



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
    ...
```

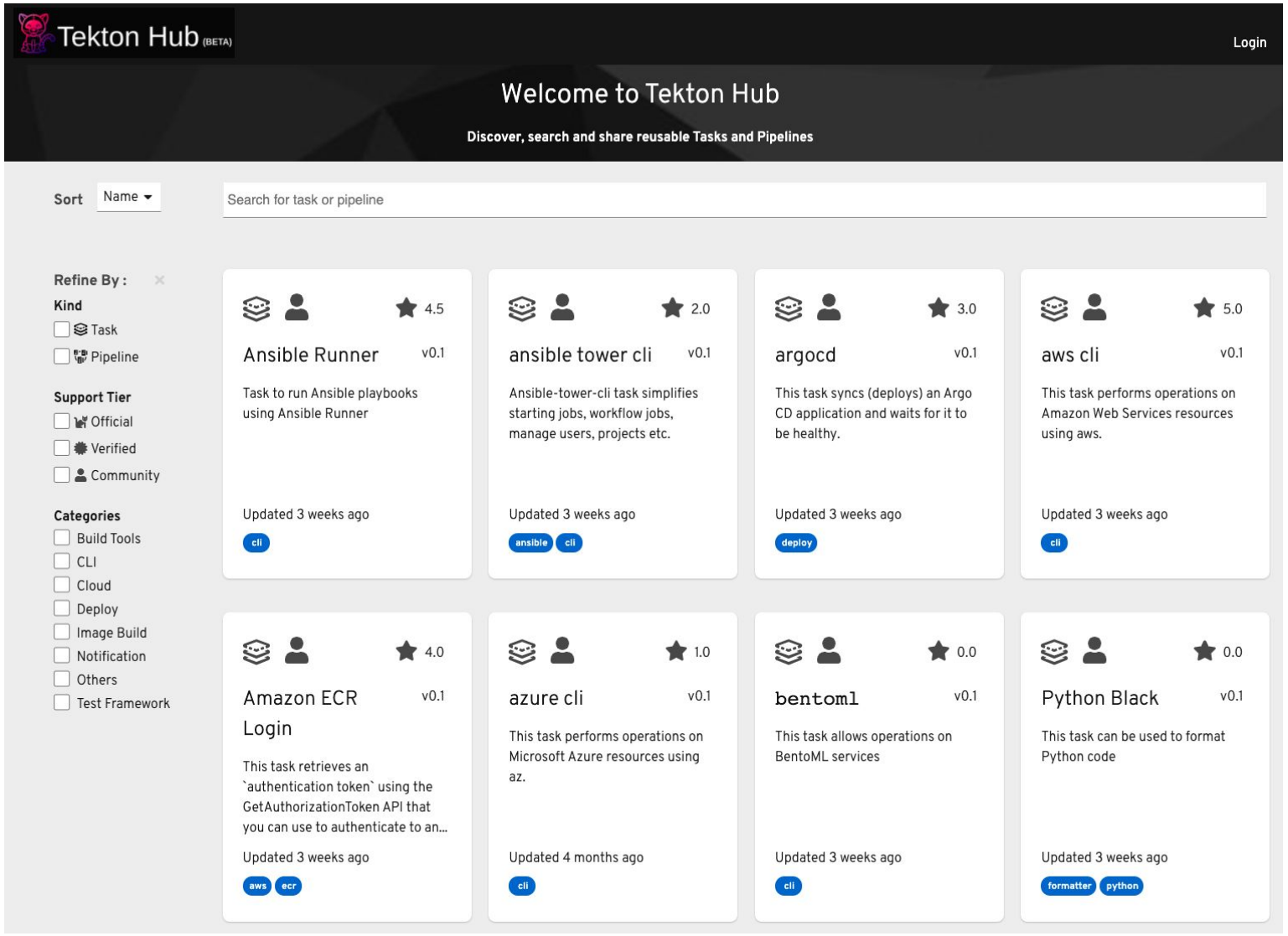
Tekton Concepts: Task

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

```yaml
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



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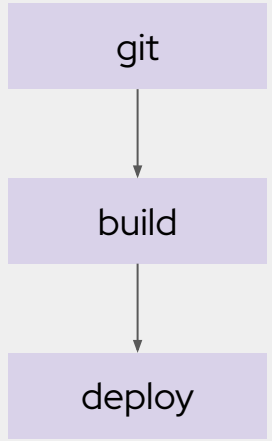
Tekton Concepts: `Pipeline`

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

```yaml
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"]
```



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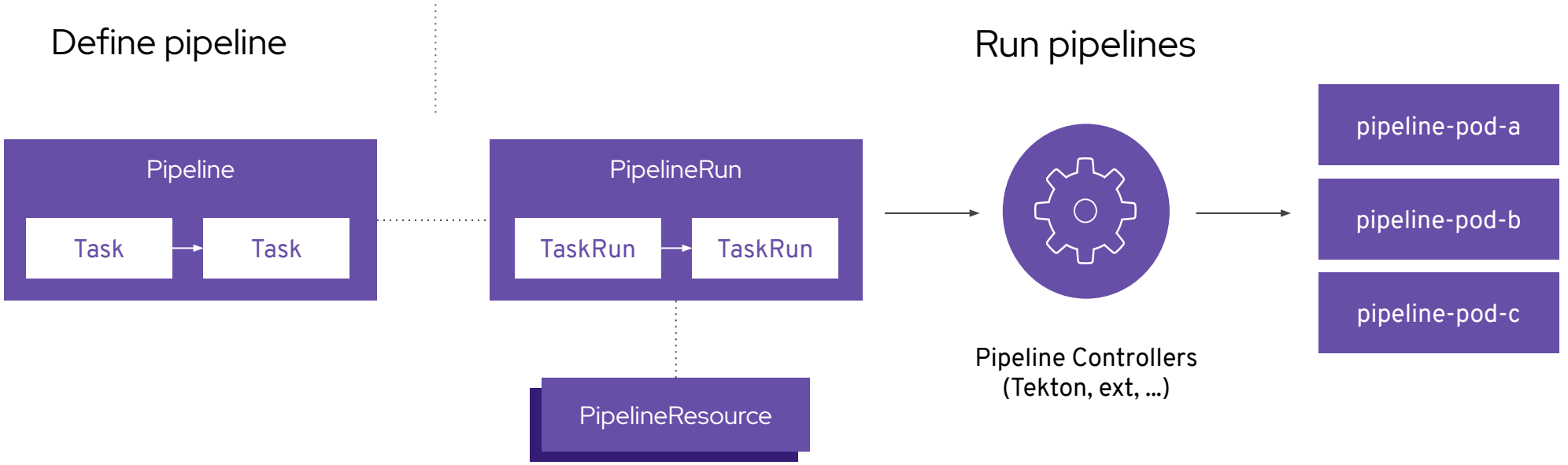
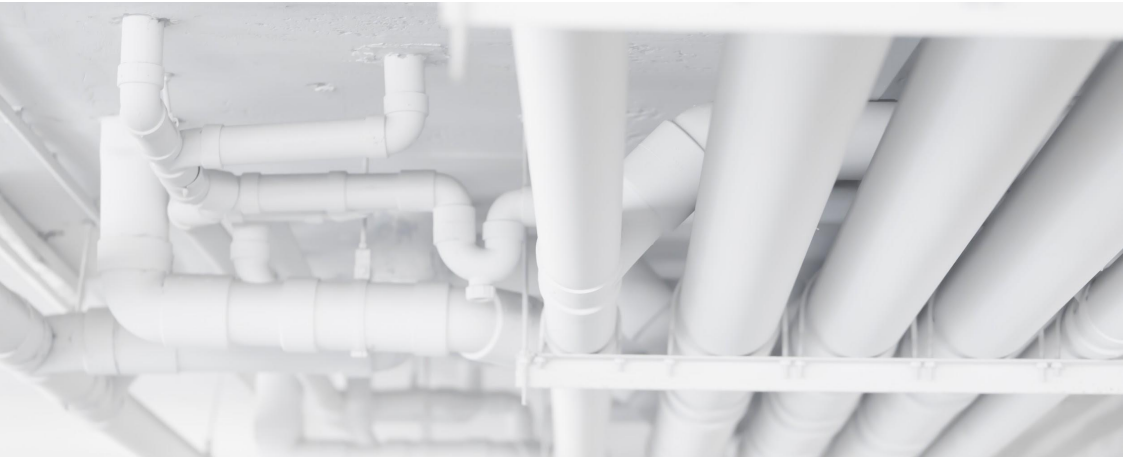
OpenShift Pipelines Architecture



Migrate from Jenkins to Tekton



Jenkins Pipeline

```
pipeline {
 stages {
   stage('Git Clone') {
     steps { ... }
   }
   stage('Build App') {
     steps { ... }
   }
   stage('Test') {
     steps { ... }
   }
   stage('Code Analysis') {
     steps { ... }
   }
 }
}
```

Tekton Pipeline

```
kind: Pipeline
spec:
 tasks:
 - name: git-clone
 - name: build-app
 - name: test
 - name: code-analysis
```

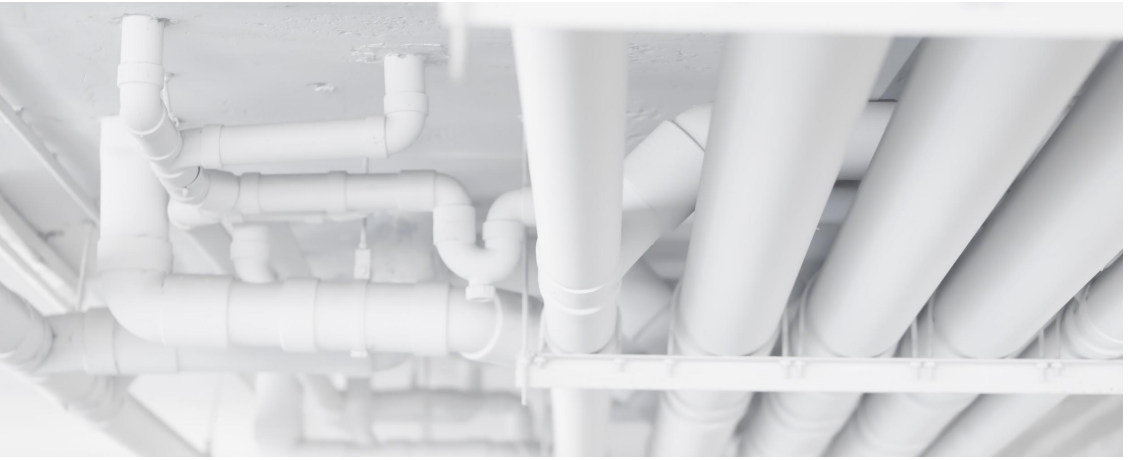
Jenkins Pipeline

```
pipeline {

 agent {
   label 'maven'
 }

 stages {
   stage ('Clone') {
     git url: 'https://github.com/...'
   }
   stage ('Build App') {
     withMaven(maven: 'maven-3') {
       sh "mvn clean verify"
     }
   }
   ...
}
```

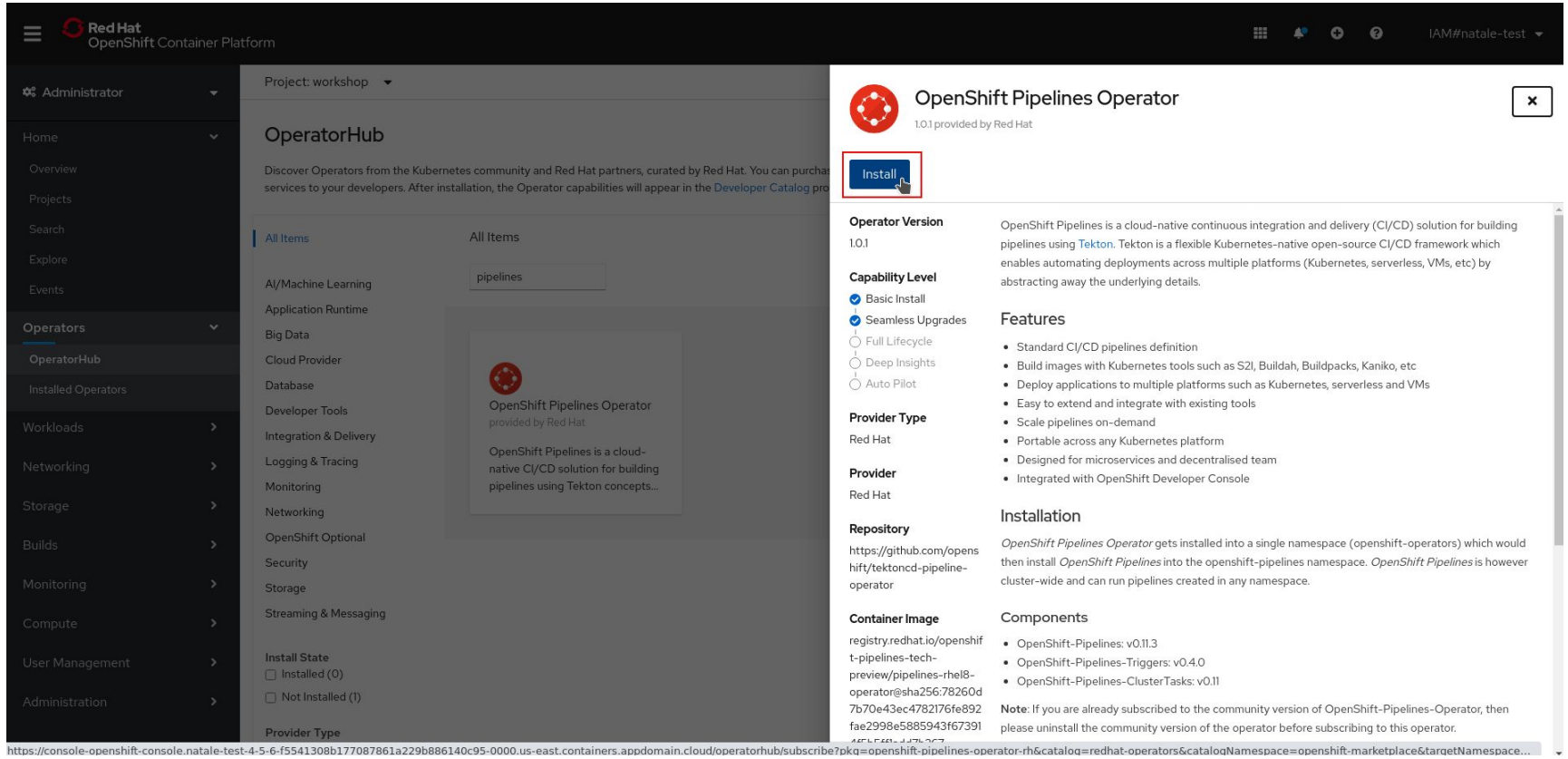
Tekton Pipeline

```
kind: Pipeline
spec:
 tasks:

 - name: git-clone
   taskRef:
     name: git-clone
   params:
   - name: url
     value: https://github.com/...
   workspaces:
   - name: app-workspace
     workspace: app-source

 - name: build-app
   taskRef:
     name: maven
   params:
   - name: GOALS
     value: ["clean", "verify"]
   runAfter:
     - git-clone
   workspaces:
   - name: app-workspace
     workspace: app-source
```

Tekton in action



Install Pipeline via OperatorHub marketplace



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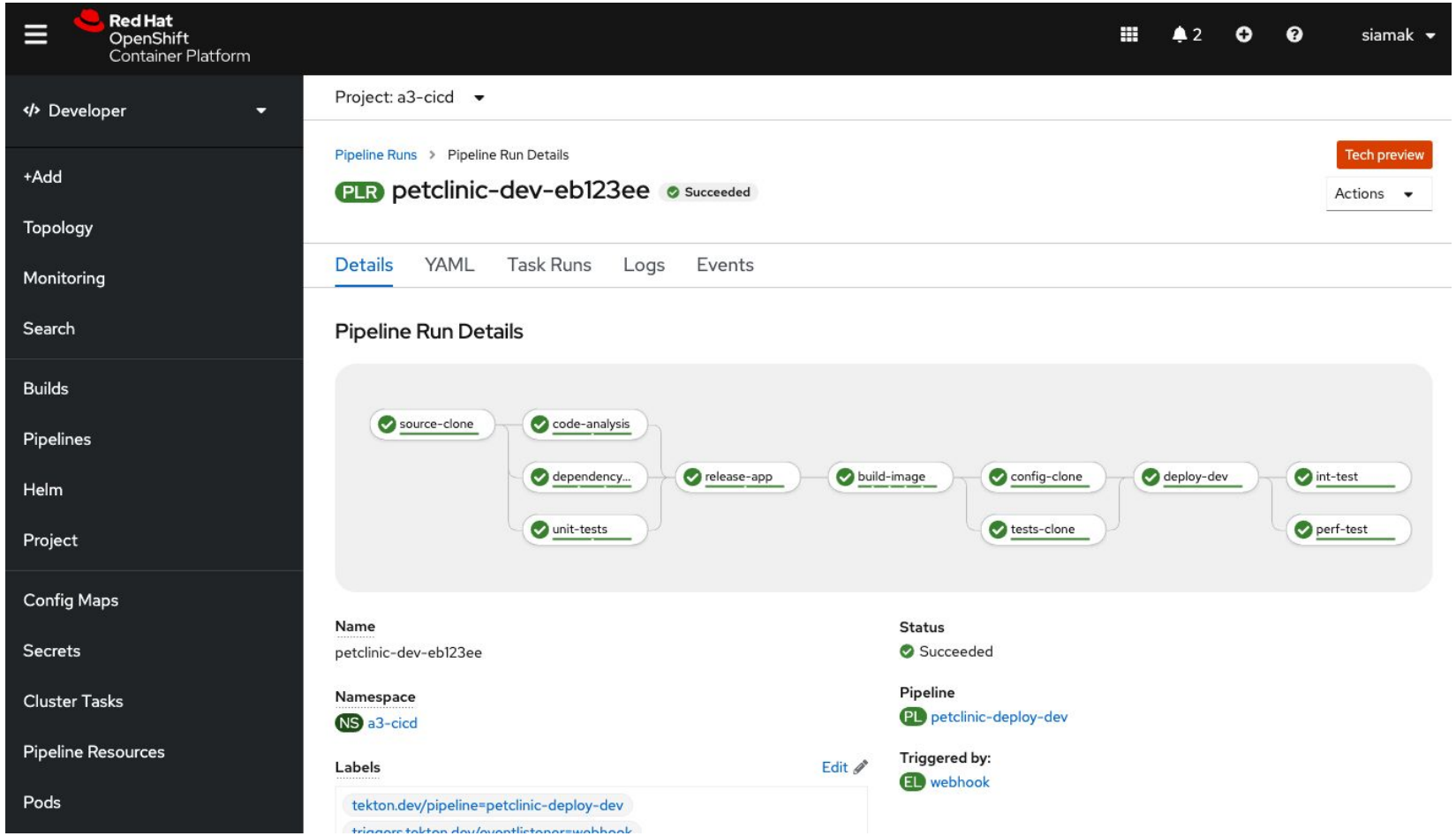
Run Pipelines



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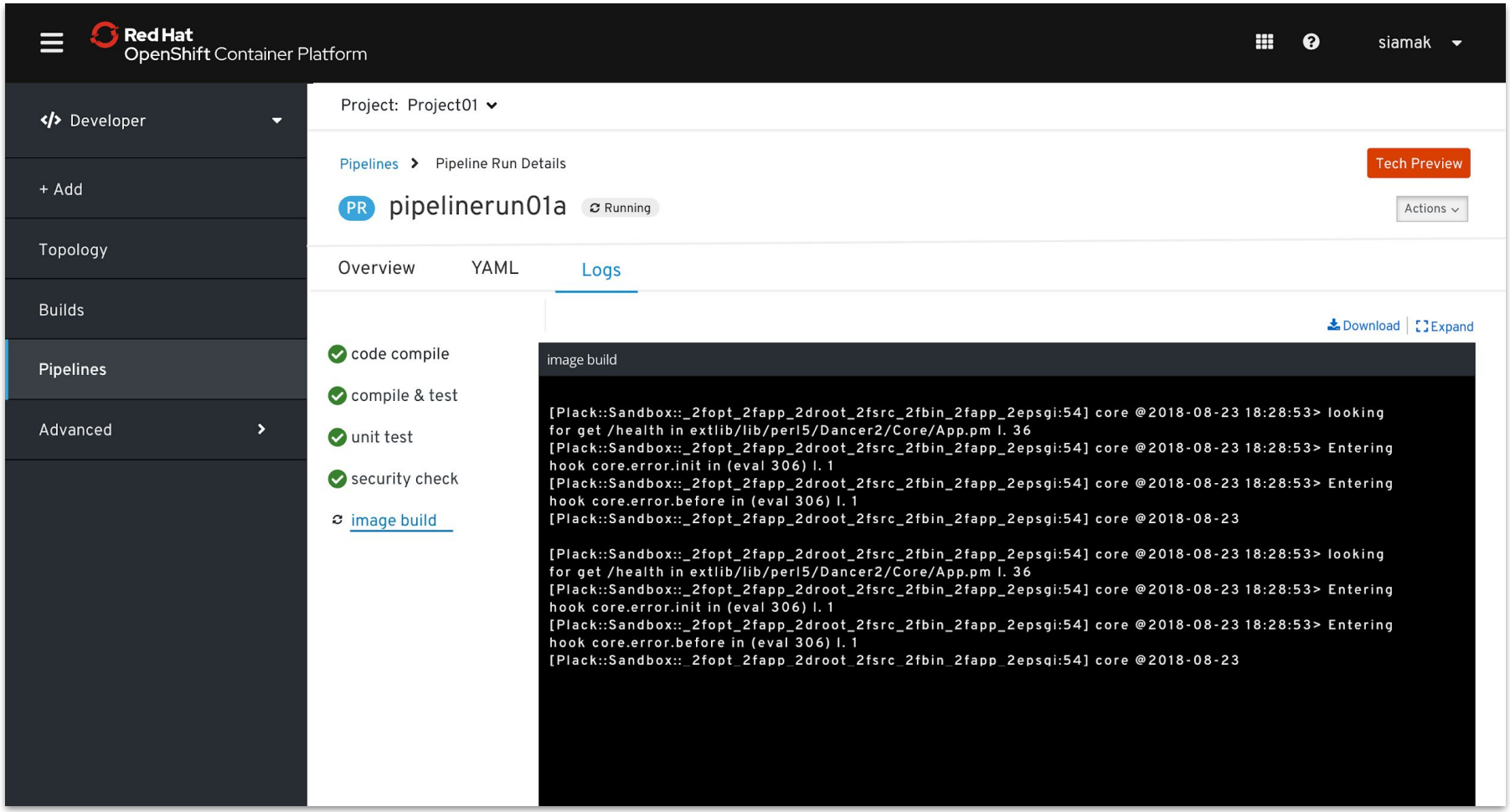
Check logs of running pipelines



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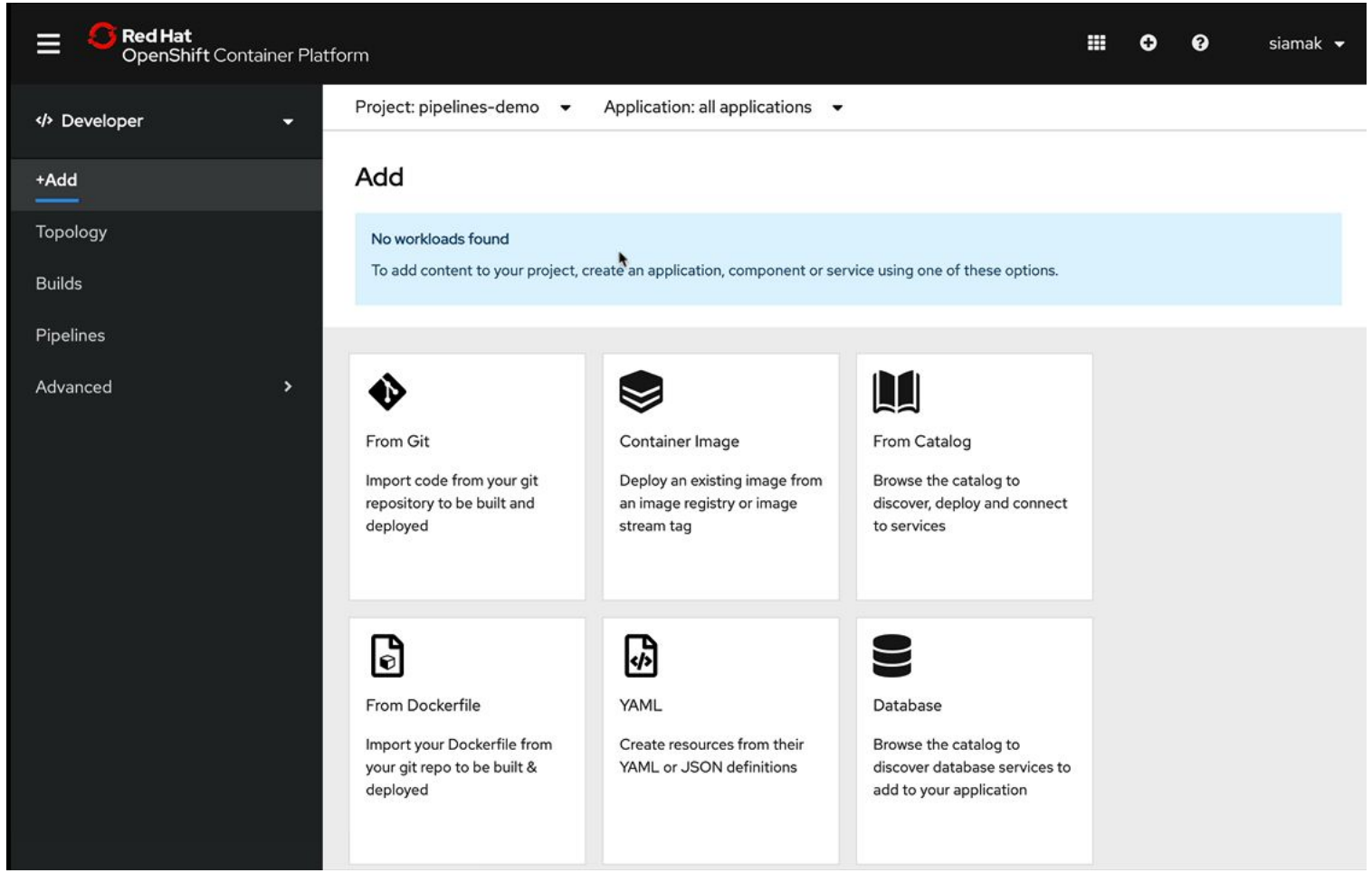
Create apps with Pipelines



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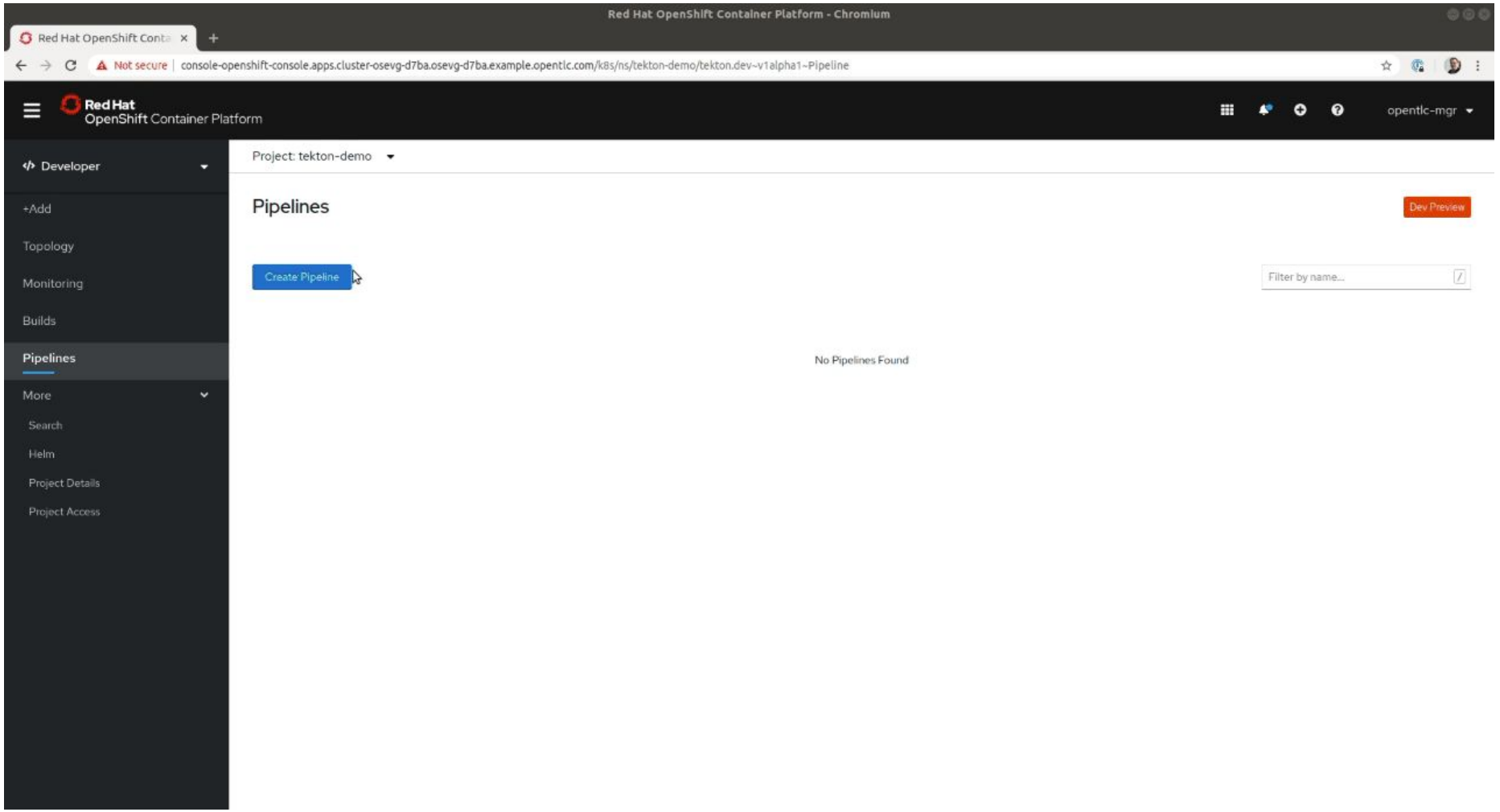
Create Pipelines with Pipeline UI



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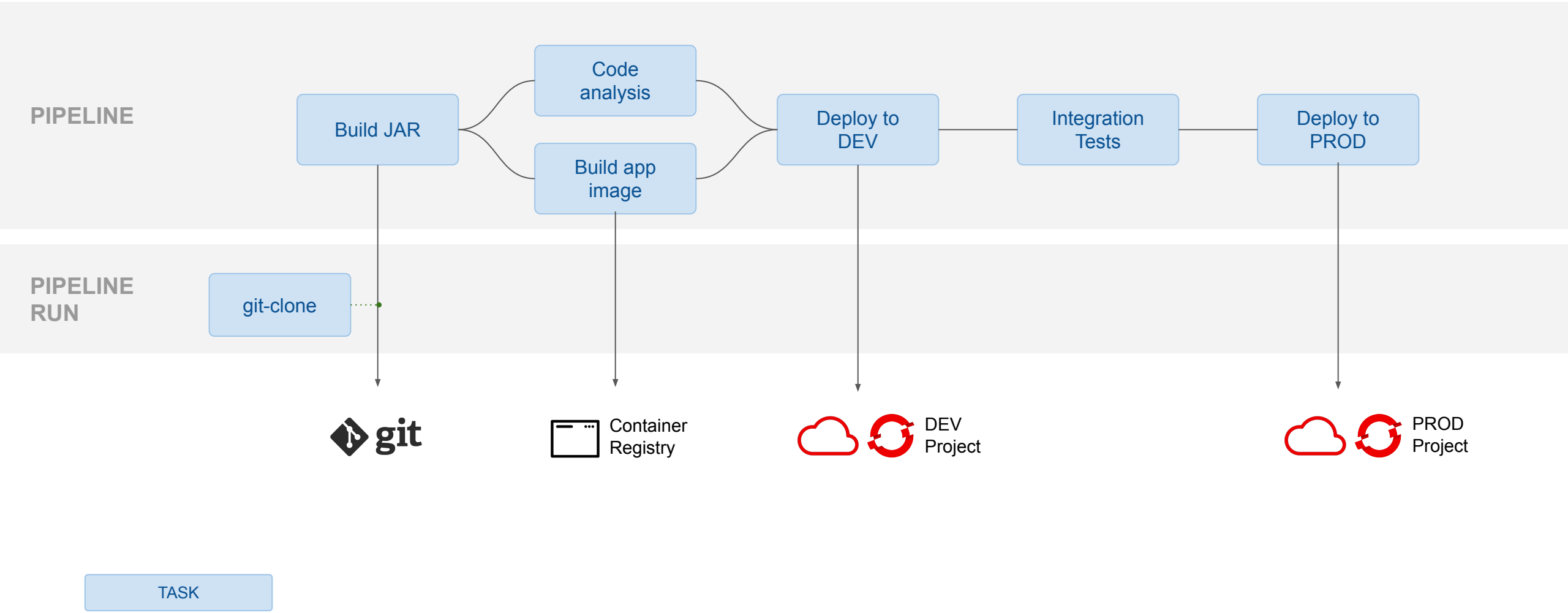
OpenShift Pipeline Example



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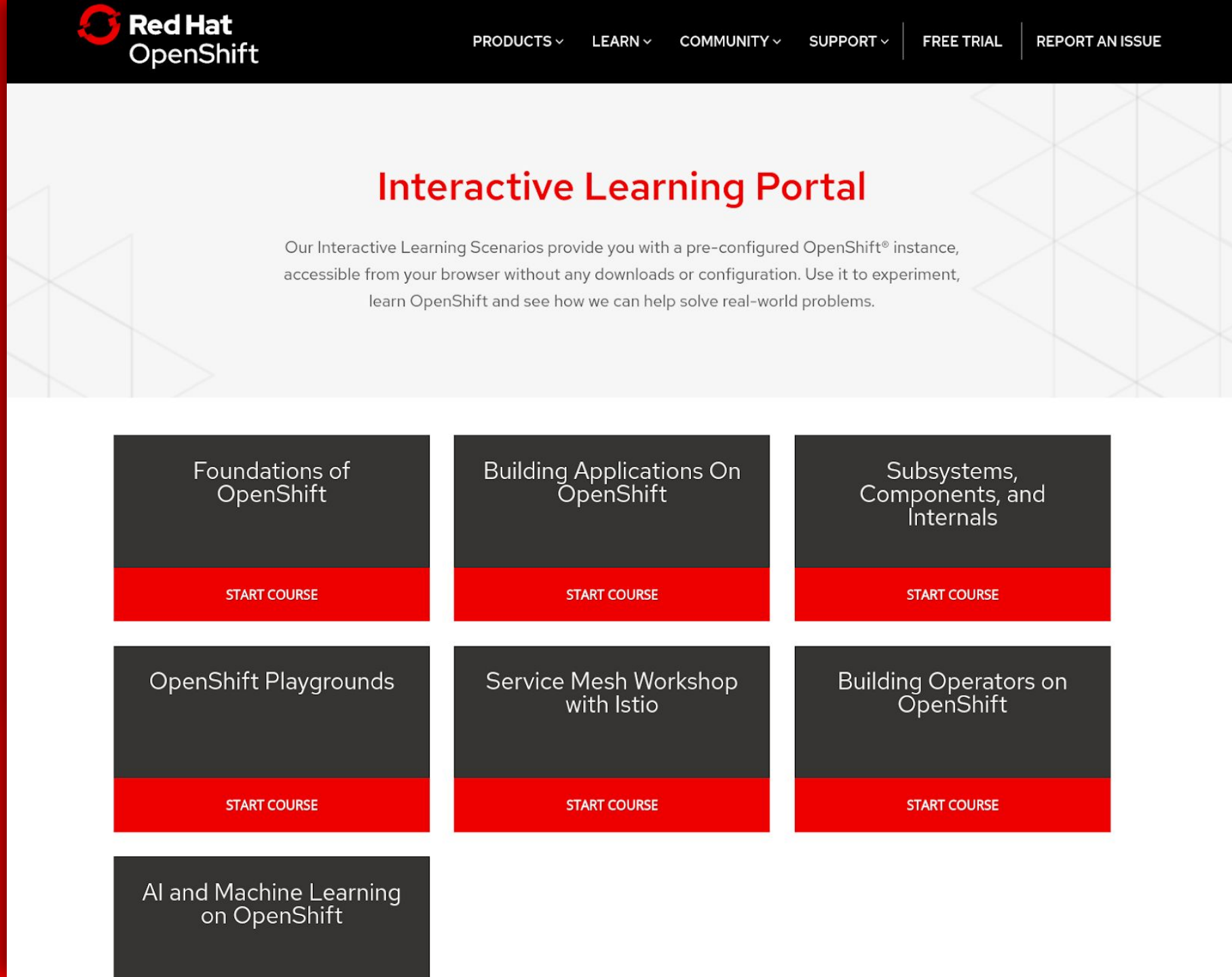

Deploy Pipeline

The Kubernetes service deployment Pipeline could be created using the comman

```
kubectl apply -n tektontutorial -f svc-deploy.yaml
```

We will use the Tekton cli to inspect the created resources

```
tkn pipeline ls
```

The above command should list one Pipeline as shown below:

```
NAME           AGE              LAST RUN   STARTED   DURATION
svc-deploy   4 seconds ago   ---        ---       ---        --
```

TIP

Use the command **help** via `tkn pipeline --help` to see more options

Run Pipeline

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