

CI/CD with OpenShift Pipelines



Estimated time needed: 45 minutes

Welcome to the hands-on lab for **CI/CD with OpenShift Pipelines**. In this lab, you will create a CI/CD workflow using the OpenShift Pipelines.

Learning Objectives

After completing this lab, you will be able to:

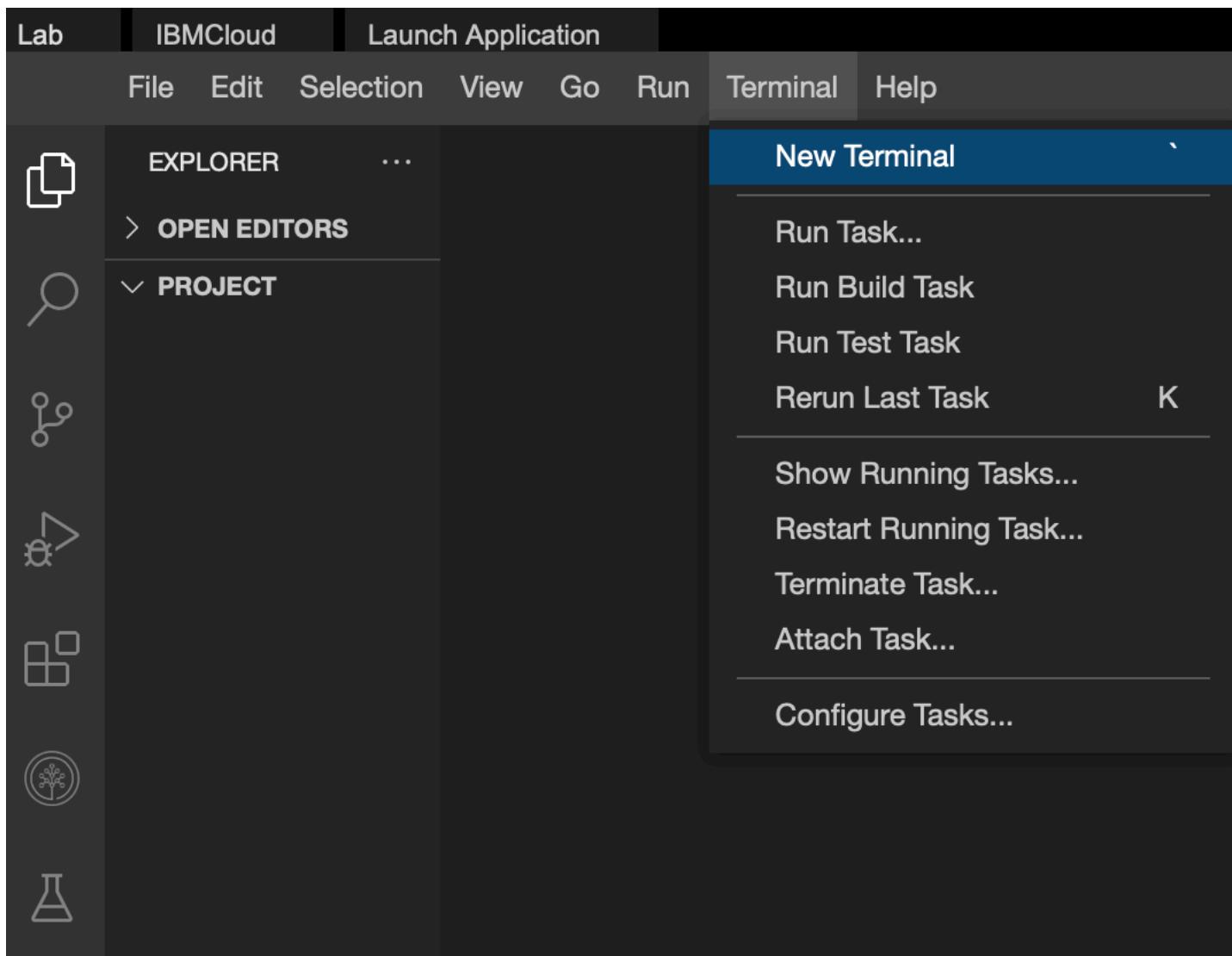
- Create a CI/CD workflow using the OpenShift Pipelines
- Add parameters to tasks created using OpenShift Pipelines
- Add a workspace and persistant volume claim in the OpenShift UI
- Add tasks that clone the GitHub repository, lint the source code, run unit tests and finally deploy the application to the OpenShift cluster

Set Up the Lab Environment

You have a little preparation to do before you can start the lab.

Open a Terminal

Open a terminal window by using the menu in the editor: Terminal > New Terminal.



In the terminal, if you are not already in the `/home/project` folder, change to your project folder now.

```
cd /home/project
```

You can use the following command to ensure you are connected to an OpenShift cluster:

```
oc config current-context
```

You should see something like:

```
captainfed01-context
```

You are now ready to continue installing the **Prerequisites**.

Optional

If working in the terminal becomes difficult because the command prompt is very long, you can shorten the prompt using the following command:

```
export PS1="[\\033[01;32m]\\u\\[\\033[00m\\]: \\[\\033[01;34m\\]\\W\\[\\033[00m\\]]\\$ "
```

Prerequisites

This lab requires installation of the tasks introduced in the previous labs. To be sure, apply the previous tasks to your cluster before proceeding. Reissue these commands:

Establish the Tasks

First create an empty file called `tasks.yaml` in the root folder:

```
touch tasks.yaml
```

Open the `tasks.yaml` file and add the following yaml content.

[Open `tasks.yaml` in IDE](#)

```
---  
apiVersion: tekton.dev/v1beta1  
kind: Task  
metadata:  
  name: cleanup  
spec:  
  description: This task will clean up a workspace by deleting all the files.  
  workspaces:  
    - name: source  
  steps:  
    - name: remove  
      image: alpine:3  
    env:  
      - name: WORKSPACE_SOURCE_PATH  
        value: ${workspaces.source.path}  
  workingDir: ${workspaces.source.path}  
  securityContext:  
    runAsNonRoot: false  
    runAsUser: 0  
  script: |  
    #!/usr/bin/env sh  
    set -eu  
    echo "Removing all files from ${WORKSPACE_SOURCE_PATH} ..."  
    # Delete any existing contents of the directory if it exists.  
    #  
    # We don't just "rm -rf ${WORKSPACE_SOURCE_PATH}" because ${WORKSPACE_SOURCE_PATH} might be "/"  
    # or the root of a mounted volume.  
    if [ -d "${WORKSPACE_SOURCE_PATH}" ] ; then  
      # Delete non-hidden files and directories  
      rm -rf "${WORKSPACE_SOURCE_PATH:?}/*"  
      # Delete files and directories starting with . but excluding ..  
      rm -rf "${WORKSPACE_SOURCE_PATH?}./[!..]*"  
      # Delete files and directories starting with .. plus any other character  
      rm -rf "${WORKSPACE_SOURCE_PATH?}/*?*"  
    fi  
---  
apiVersion: tekton.dev/v1beta1  
kind: Task  
metadata:  
  name: nose  
spec:  
  workspaces:  
    - name: source  
  params:  
    - name: args  
      description: Arguments to pass to nose  
      type: string  
      default: "-v"  
  steps:  
    - name: nosetests  
      image: python:3.9-slim  
      workingDir: ${workspaces.source.path}  
      script: |  
        #!/bin/bash  
        set -e  
        python -m pip install --upgrade pip wheel  
        pip install -r requirements.txt  
        nosetests ${params.args}
```

Make sure you save the file. Next, apply the tasks to your OpenShift Cluster:

```
kubectl apply -f tasks.yaml
```

Check that you have all of the previous tasks installed:

```
oc get tasks
```

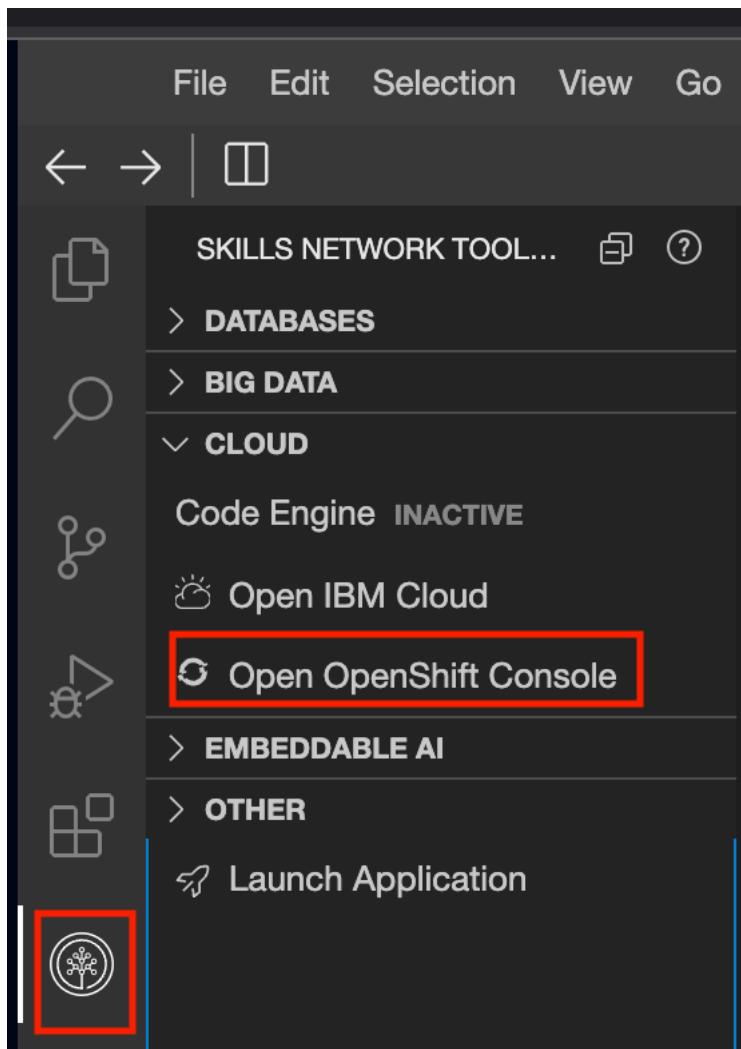
You should see the output similar to this:

NAME	AGE
cleanup	5h42m
nose	5h42m

Step 1: Create PersistentVolumeClaim

You also need a PersistentVolumeClaim (PVC) to use as a workspace. You can use the OpenShift Administrator perspective to create the PVC.

Open the OpenShift console using the **Open OpenShift Console** under the **Skills Network Toolbox** menu.



The lab should open the **Developer** perspective for the OpenShift console in a new tab.

**Developer**[+Add](#)[Topology](#)[Search](#)[Builds](#)[Pipelines](#)[Helm](#)[Project](#)[ConfigMaps](#)[Secrets](#)

Projects > Project details

PR sn-labs-captainfedo1[Overview](#)[Details](#)[YAN](#)**Details**[View](#)**Name**

sn-labs-captainfedo1

Requester

No requester

Labels

kubernetes.io/metadata.name=sn-labs-captainfedo1

learnersandbox=true

name=sn-labs-captainfedo1

[View all](#)**Description**

No description

Inventory

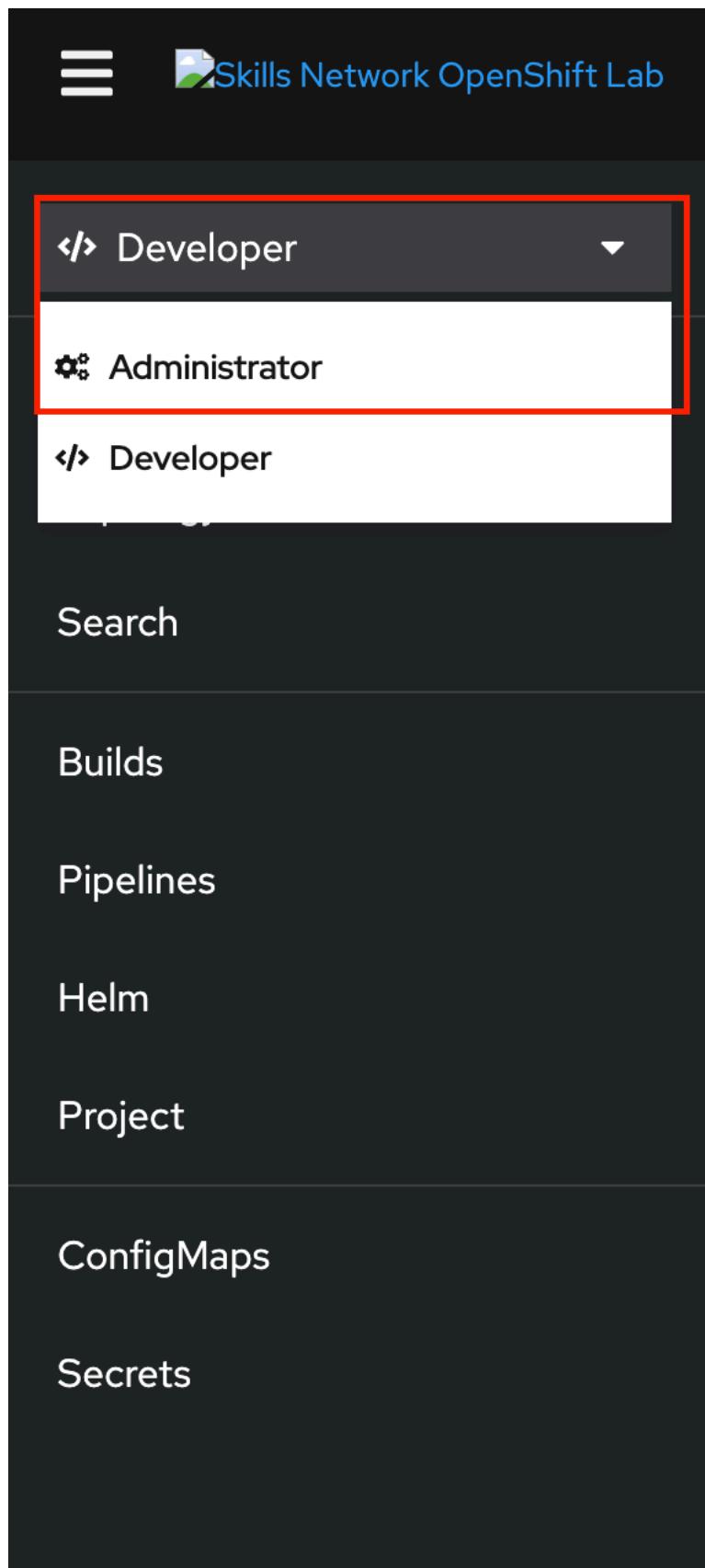
1 Deployment

0 DeploymentConfigs

0 StatefulSets

2 Pods

Open the **Administrator** perspective using the drop down on the left side of the screen.



Once the page switches to the Administrator view, click **Storage** and **PersistentVolumeClaims**.

 Administrator

Home >

Operators >

Workloads >

Networking >

Storage ▾

PersistentVolumeClaims

StorageClasses

VolumeSnapshots

VolumeSnapshotClasses

Builds >

Pipelines >

User Management >

Administration >

Projects

 Filter ▾

Name ▾

Name ↕

PR sn-labs-captainfedo1

Note: If you encounter an error when opening OpenShift and accessing the Persistent Claim value, please close the OpenShift window and then reopen it.

Click [Create PersistentVolumeClaim](#) to create a new PVC:



Administrator

Home

Operators

Workloads

Networking

Storage

PersistentVolumeClaims

StorageClasses

VolumeSnapshots

VolumeSnapshotClasses

Project: sn-labs-captainfedo1

PersistentVolumeClaim

Next, fill out the form as follows:

- StorageClass: skills-network-learner
- PersistentVolumeClaim name: oc-lab-pvc
- Size: 1GB

Create PersistentVolumeClaim

StorageClass

 skills-network-learner

StorageClass for the new claim

PersistentVolumeClaim name *

oc-lab-pvc

A unique name for the storage claim within the project

Access mode *

- Single user (RWO) Shared access (RWX) Read only (ROX)

Permissions to the mounted drive

Size *

-

1

+

GiB

▼

Desired storage capacity

- Use label selectors to request storage

PersistentVolume resources that match all label selectors will be considered for bind

Volume mode *

- Filesystem Block

Create

Cancel

Finally, click Create to create the PVC. Once the PVC is created, you should see the details. Notice the **Status is Pending**. It takes a few minutes for the PVC to complete. You don't have to wait for this to finish as it will most likely be in place by the time you need it in the pipeline.



Administrator

Home

Operators

Workloads

Networking

Storage

PersistentVolumeClaims

StorageClasses

VolumeSnapshots

VolumeSnapshotClasses

Builds

Pipelines

User Management

Administration

Project: sn-labs-captainfedo1

PersistentVolumeClaims > Persistent

PVC **oc-lab-pvc** PE

[Details](#) [YAML](#) [Events](#)

PersistentVolumeClaim details

Name

oc-lab-pvc

Namespace

NS **sn-labs-captainfedo1**

Labels

No labels

Annotations

0 annotations edit

Label selector

No selector

Created at

⌚ Aug 27, 2023, 11:25 AM

Owner

Owner

No owner

Step 2: Create a new Pipeline

Now that you have a PVC in place, the next step is start working on the pipeline. First, go back to the **Developer** perspective.

The screenshot shows the OpenShift web interface. On the left, a sidebar menu is open, showing the 'Administrator' perspective selected. A red box highlights the 'Developer' perspective, which is also listed in the menu. The main content area shows a 'PersistentVolumeClaims' list with one item: 'oc-lab-pvc'. The 'Details' tab is selected. Key details shown include a large blue circle indicating '1 GiB Total' storage capacity. The 'Name' field is set to 'oc-lab-pvc'. Navigation links for 'Details', 'YAML', and 'Events' are visible at the top of the main content area.

Project: sn-labs-captainfedor1

PersistentVolumeClaims > PersistentVolumeClaim

PVC **oc-lab-pvc** Bound

Details YAML Events

PersistentVolumeClaim details

1 GiB Total

Name
oc-lab-pvc

Next, click **Pipelines** on the left panel and create a new pipeline.



Developer ▾

+Add

Topology

Search

Builds

Pipelines

Helm

Project

ConfigMaps

Secrets

Project: sn-labs-captainfedo1 ▾

Pipelines

[Pipelines](#)[Repositories](#)

You are presented with the pipeline builder. Ensure you have **Pipeline Builder** selected in **Configure Via** and enter **ci-cd-pipeline** as the name of your pipeline.

**</> Developer****+Add****Topology****Search****Builds****Pipelines****Helm****Project****ConfigMaps****Secrets****Project: sn-labs-captainfed01**

Pipeline builder

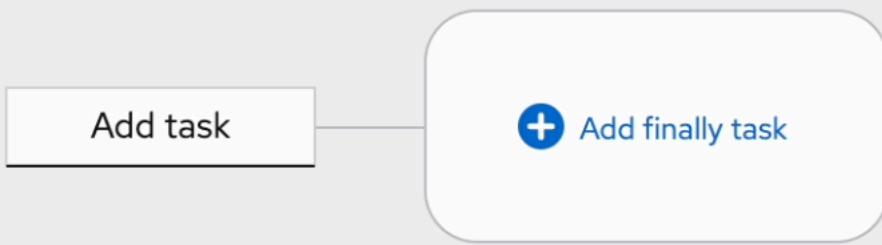
Configure via: Pipeline builder**Name ***

ci-cd-pipeline

Tasks *

Add task

Before you create your first task, let's add a workspace to your pipeline. Scroll to the bottom of the page and add a new workspace with the name `output`. This workspace will be used to clone the code.



Parameters

No parameters are associated with this Pipeline.

[+ Add parameter](#)

Resources

No resources are associated with this pipeline.

[+ Add resource](#)

Workspaces i

Name *

output

Optional workspace

[+ Add workspace](#)

[Create](#)

[Cancel](#)

Great! We can now start adding tasks to your pipeline.

Step 3: Add the cleanup task

You were asked to apply a `tasks.yaml` file that contained the `cleanup` and the `nose` tasks. You can confirm the tasks are installed by using the following command:

```
oc get tasks
```

You should see the output similar to this:

NAME	AGE
cleanup	5h42m
nose	5h42m

If you don't see both of these tasks, go back to the `Prerequisites` step and make sure you apply the `tasks.yaml` file.

You will create the first task in this step. Click **Add Task** in the builder UI to open the `Add task ...` dialog.

Project: sn-labs-captainfedo1 ▾

Pipeline builder

Configure via: Pipeline builder YAML view

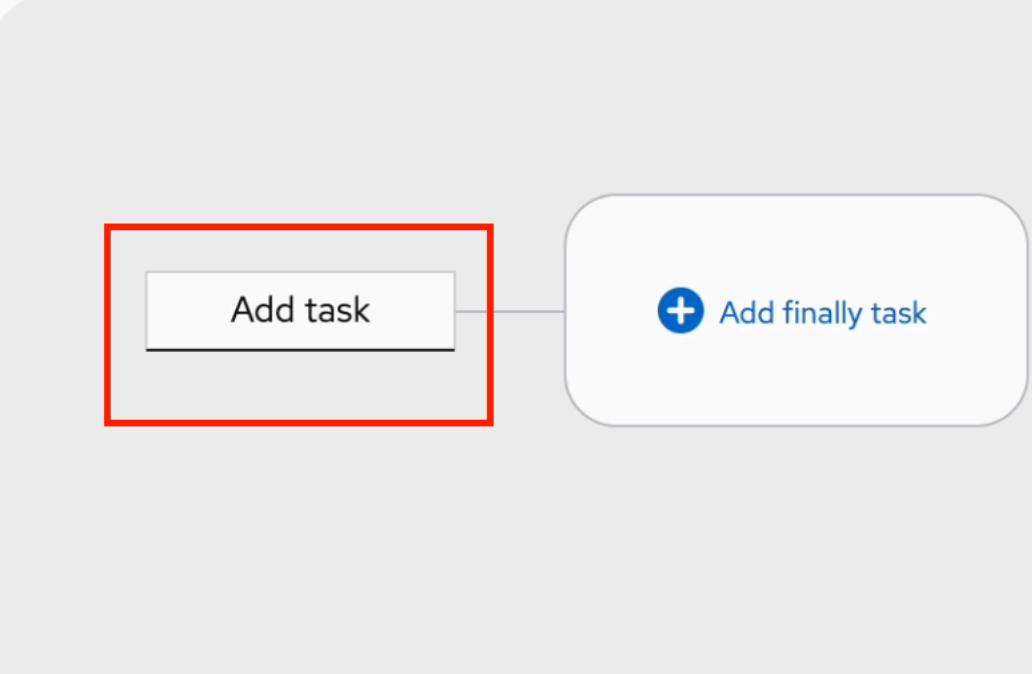
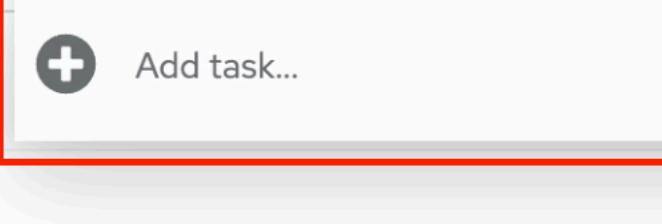
Name *

ci-cd-pipeline

Tasks *

Add task

Add finally task



Type `cleanup` to see the task you installed earlier from the yaml file. Click **Add** to use the task in the builder.

Pipeline builder

Configure via: Pipeline builder YAML view

Name *

ci-cd-pipeline

Tasks *

 clean

 boskos-release

Community

Cloud

clean

 cleanup

Red Hat

Red Hat

Add

This t

 orka-full

Community

Cloud

 Add task

 orka-teardown

Community

Cloud

Parameters

This should install your first task. You will notice the red exclamation mark on the task. This means the task has not been completely configured yet. Click on the task to open the task flyout. Change the workspace to **output**.

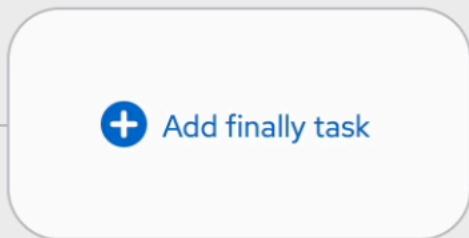
Pipeline builder

Configure via: Pipeline builder YAML view

Name *

ci-cd-pipeline

Tasks *



You should see the exclamation mark go away and **Create** enabled. Click **Create** to finish creating the task in the pipeline.

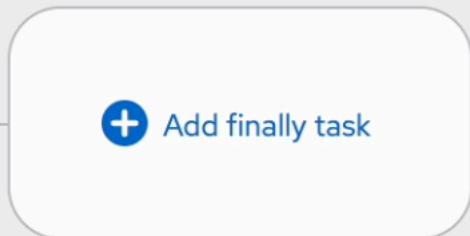
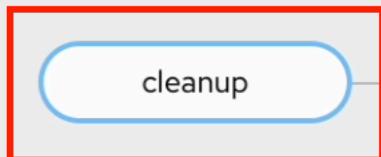
Pipeline builder

Configure via: Pipeline builder YAML view

Name *

ci-cd-pipeline

Tasks *



Parameters

No parameters are associated with this Pipeline.

[Add parameter](#)

[Create](#)

[Cancel](#)

You should now see your pipeline with the one task you just added.

PL ci-cd-pipeline

Details

Metrics

YAML

PipelineRuns

Parameters

Re

Pipeline details

cleanup



Name

ci-cd-pipeline



Namespace

NS sn-labs-captainfedor1

Labels

Edit

No labels

Step 4: Run the Pipeline

Now that you have a pipeline with the one cleanup step, let's see how you can run this pipeline. Click **Pipelines** on the left bar, if you are not already on the pipelines page. Click on **ci-cd-pipeline** pipeline. You can now use the **Actions** dropdown on the left to run the pipeline.

Project: sn-labs-captainfedo1 ▾

Pipelines ➔ Pipeline details

PL ci-cd-pipeline

Details

Metrics

YAML

PipelineRuns

Parameters

Re

Pipeline details

cleanup



Name

ci-cd-pipeline

Namespace

NS sn-labs-captainfedo1

OpenShift brings up the **Start Pipeline** dialog box. Ensure that you pick the following:

- output: PersistentVolumeClaim
- select a PVC: oc-lab-pvc

Click **Start** after you have filled out the form.

Start Pipeline

Workspaces

output *

PersistentVolumeClaim

PVC oc-lab-pvc

Advanced options

- › [Show credential options](#)

Name

ci-cd-pipeline

You should see the pipeline running on the next page. You can click on the task name to see the logs for a particular task. Alternatively, you can click on the **Logs** tab:

Project: sn-labs-captainfedo1 ▾

PipelineRuns ➔ PipelineRun details

PLR **ci-cd-pipeline-rie4q7**  Running

Details

YAML

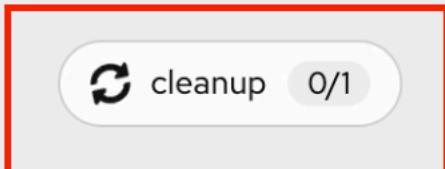
TaskRuns

Parameters

Logs

Events

PipelineRun details



Name

ci-cd-pipeline-rie4q7

Namespace

NS **sn-labs-captainfedo1**

Labels

Edit

tekton.dev/pipeline=ci-cd-pipeline

You can see the detailed logs and also have an option to download them. You will see the task on the right turn green, if it completes successfully.

PLR ci-cd-pipeline-rie4q7 ✓ Succeeded
[Details](#) [YAML](#) [TaskRuns](#) [Parameters](#) [Logs](#) [Events](#)

The screenshot shows the 'Logs' tab of a pipeline run. On the left, a list of tasks is shown with a red box around the first task, 'cleanup'. On the right, the log output for this task is displayed in a large black box with a red border. The log output reads:

```

cleanup
STEP-REMOVE
Removing all files from /workspace/sou

```

Congratulations! You created a pipeline from scratch and added the cleanup tasks on it. You then ran the pipeline and viewed the logs. This first task was explained in detail as an example. The lab is now asking you to finish the rest of the tasks in this pipeline on your own. Don't worry! You will be given appropriate hints and you have the option of reaching out to your peers or course TAs in the forums if you get stuck. Good luck!

Step 5: Add the Git Clone task

You are asked to use the `git-clone` in-built task to clone the GitHub code into your pipeline.

Your Task

1. Open the pipeline in edit mode. Select Pipeline from the left menu, select the pipeline name, and go to Actions -> Edit Pipeline. See hint for a screenshot.
2. Add a new task after the cleanup task in the pipeline from previous step. Hover over the step to display the + buttons. Use the + button on the right of the task to add a task instead of using the `Add finally task` link. See hint for a screenshot.
3. Look for the RedHat `git-clone` task and add it to the placeholder task.
4. Click on the red exclamation on the task or the task card to open the configure task flyout. Configure the `git-clone` task as follows:
 - o `url: https://github.com/ibm-developer-skills-network/wtecc-CI_CD_PracticeCode`
 - o `workspace.output: output`
5. Save the pipeline.
6. Run the pipeline.
7. Check the logs to see if there are issues with the pipeline.

Hint

- Click here for a hint.

Check your Solution

- Click here for the solution.

Step 6: Add the Flake8 task

You are asked to use the `Flake8` in-built task to lint the source code. As part of this task, you will configure the task with specific arguments.

Your Task

1. Open the pipeline in edit mode.
2. Add a new task after the `git-clone` task in the pipeline from previous step.
3. Look for the `Flake8` task from the community.
4. Install and add it to the placeholder task.
5. Click on the red exclamation on the task or the task card to open the configure task flyout. Configure the `Flake8` task as follows:
 - o `image: python:3.9-slim`
 - o `arg: --count`
 - o `arg: --max-complexity=10`
 - o `arg: --max-line-length=127`
 - o `workspace.source: output`
6. Save the pipeline.
7. Run the pipeline.
8. Check the logs to see if there are issues with the pipeline.

Hint

► Click here for a hint.

Check your Solution

► Click here for the solution.

Step 7: Add the Nose task

The next step is to add the `nose` task for unit testing the source code of the application.

Your Task

1. Open the pipeline in edit mode.
2. Add a new task after the `Flake8` task in the pipeline from previous step.
3. Look for the `nose` task.
4. Install and add it to the placeholder task.

Note: If you encounter an error stating: missing workspaces, kindly run the following command in the terminal window to install flake8:
`tkn hub install task flake8`

You should then see this:

```
[theia: project]$ tkn hub install task flake8
Task flake8(0.1) installed in sn-labs-lavanyar namespace
[theia: project]$ █
```

5. Click on the red exclamation on the task or the task card to open the configure task flyout. Configure the `nose` task as follows:
 - o `workspace.source: output`
6. Save the pipeline.
7. Run the pipeline.
8. Check the logs to see if there are issues with the pipeline.

Check your Solution

► Click here for the solution.

Step 8: Add the buildah task

The next step is to add a task to create an image from the GitHub source code. You will use the `buildah` in-built task to perform this action.

Your Task

1. Open the pipeline in edit mode.
2. Add a new task after the `nose` task in the pipeline from previous step.
3. Look for the `buildah` task from RedHat.
4. Install and add it to the placeholder task.
5. You will need the namespace of your lab environment for one of the arguments. You can obtain this by using the command line terminal and using the `echo $SN_ICR_NAMESPACE` command in the lab terminal.

`echo $SN_ICR_NAMESPACE`
6. Click on the red exclamation on the task or the task card to open the configure task flyout. Configure the `buildah` task as follows:
 - o `image: $(params.build-image)`
 - o `workspace.source: output`

7. Click on the main page to close the flyout. Add the following parameter and the default value to the pipeline:

- parameter.name: build-image
- parameter.default: image-registry.openshift-image-registry.svc:5000/SN_ICR_NAMESPACE/tekton-lab:latest.
- Replace SN_ICR_NAMESPACE with the value above.

8. Save the pipeline.

9. Run the pipeline.

10. Check the logs to see if there are issues with the pipeline.

Hint

► Click here for a hint.

Check your Solution

► Click here for the solution.

Step 9: Deploy Application

Next, you will create a task to deploy the image you created to the lab OpenShift cluster. You will use the `openshift-client` task to execute the `oc deploy` command with the image you built in the previous step.

Your Task

1. Open the pipeline in edit mode.
2. Add a new task after the `buildah` task in the pipeline from the previous step.
3. Look for the `openshift-client` task from RedHat.
4. Install and add it to the placeholder task.
5. Click on the red exclamation on the task or the task card to open the configure task flyout. Configure the task with the following
 - display name: deploy
 - SCRIPT: `oc create deployment $(params.app-name) --image=$(params.build-image) --dry-run=client -o yaml | oc apply -f -`
6. Click on the main page to close the flyout. Add the following parameter and the default value to the pipeline:
 - parameter.name: app-name
 - parameter.default: cicd-app.
7. Save the pipeline.
8. Run the pipeline.
9. Check the logs to see if there are issues with the pipeline.

Hint

► Click here for a hint.

Check your Solution

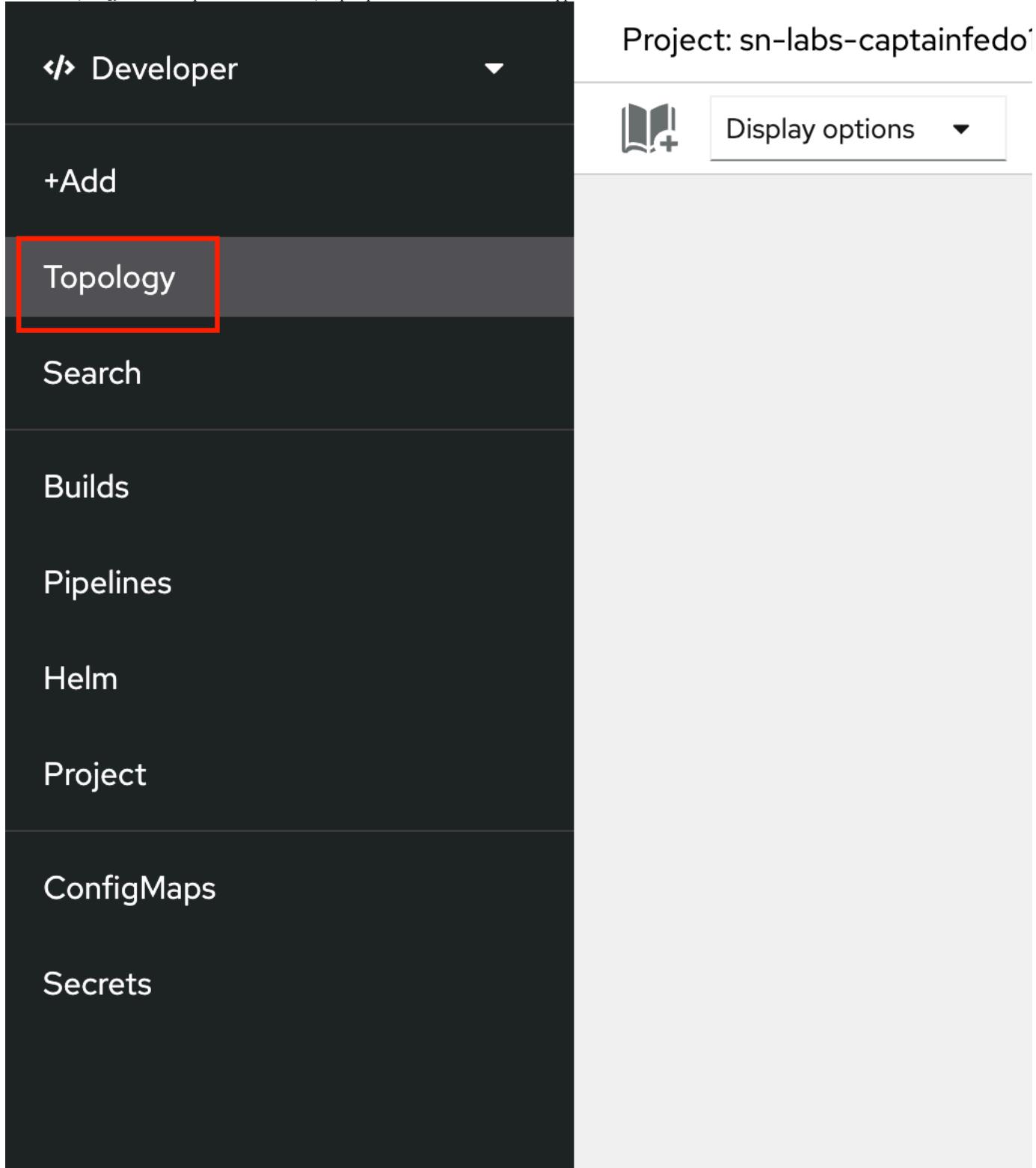
► Click here for the solution.

Step 10: Validate Application

You have done all the hard work! Let's confirm if the application was deployed.

Your Tasks

1. Click on Topology on the left panel in the Developer perspective. You should see two applications on the canvas.



2. Click on the one called cicd-app to open the flyout. Click on logs.

Application: All applications

Filter by resource Name Find by name... / i

D opensh...onsole : cicd-app :

D c

c

Details

Pods

P c 7

Services

No Ser

The screenshot shows a web-based application management interface. At the top, there's a header with a dropdown, the text "Application: All applications", and various search/filter options like "Filter by resource", "Name", and "Find by name...". Below the header, two service icons are displayed: "opensh...onsole" and "cicd-app". The "cicd-app" icon is enclosed in a red rectangular box, indicating it's selected or highlighted. Each service icon has a blue circular badge with a white letter "D" and a vertical ellipsis button. To the right of the main content area, there are several vertical panels: one with a bell icon, another with "D c" and "c", and sections for "Details", "Pods" (with a partial view of a table showing "P c 7"), and "Services" (with the message "No Ser").

3. You should see a message `SERVICERUNNING` in the logs indicating the application was deployed successfully and is running.

Pods > Pod details

P cicd-app-7b7cf6b5d5-h4mx5 Running

Details

YAML

Environment

Logs

Events

Term



Log streaming...



tekton-lab

Current log



8 lines

```
1 [2023-08-30 23:30:28 +0000] [1] [INFO] Starting gu...
2 [2023-08-30 23:30:28 +0000] [1] [INFO] Listening a...
3 [2023-08-30 23:30:28 +0000] [1] [INFO] Using worker...
4 [2023-08-30 23:30:28 +0000] [7] [INFO] Booting worke...
5 [2023-08-30 23:30:29 +0000] [INFO] [log_handlers] ...
6 [2023-08-30 23:30:29 +0000] [INFO] [__init__] ***>
7 [2023-08-30 23:30:29 +0000] [INFO] [__init__] ***>
8 [2023-08-30 23:30:29 +0000] [INFO] [__init__] ***>
```

Conclusion

Congratulations! You have just created a CI/CD workflow using OpenShift Pipelines without writing a single line of code!

In this lab, you learned how to use the OpenShift UX and the Pipelines feature. You learned how to install the task locally using the Tekton CLI and how to modify your pipeline in the UX to reference the task and configure its parameters. You also learned how to create default parameters for your pipeline. Finally, you now know how to create a PersistentVolumeClaim using the UX.

Next Steps

Congratulations on successfully completing this lab! Your dedication and effort have paid off, and you're now equipped with the skills and knowledge to tackle the exciting final project of this course. This project will be a culmination of all that you've learned, allowing you to put your newfound expertise into practice.

If you are interested in continuing to learn about Kubernetes and containers, you can get your own [free Kubernetes cluster](#) and your own free [IBM Container Registry](#).

Author(s)

Skills Network

Other Contributor(s)

Change Log

Date	Version	Changed by	Change Description
2023-08-27	0.1	UL	Initial version created

Date	Version	Changed by	Change Description
2023-08-31	0.2	Anita Narain	ID Review
2023-09-01	0.3	Mercedes Schneider	QA Review
2023-09-04	0.4	UL	Added toggles for hint and solutions
2023-09-04	0.4	UL	Clarified instructions on how to configure all tasks

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