Using GitHub Actions - Setting up workflow

Estimated time needed: 30 minutes

Welcome to the hands-on lab for **Using GitHub Actions - Setting up workflow**. In this part, you will build a workflow in a GitHub repository using GitHub Actions. You will create an empty workflow file in Step 1 and add events and a job runner in the following steps. You will subsequently finish the workflow in the next lab called **Using GitHub Actions - Part 2**. Ensure you finish this lab completely before starting part 2.

Learning Objectives

After completing this lab, you will be able to:

- Create a GitHub workflow to run your CI pipeline
- Add events to trigger the workflow
- Add a job to the workflow
- Add a job runner to the job
- Add a container to the job runner

Prerequisites

You will need the following to complete the exercises in this lab:

- A basic understanding of YAML
- A GitHub account
- An intermediate-level knowledge of CLIs

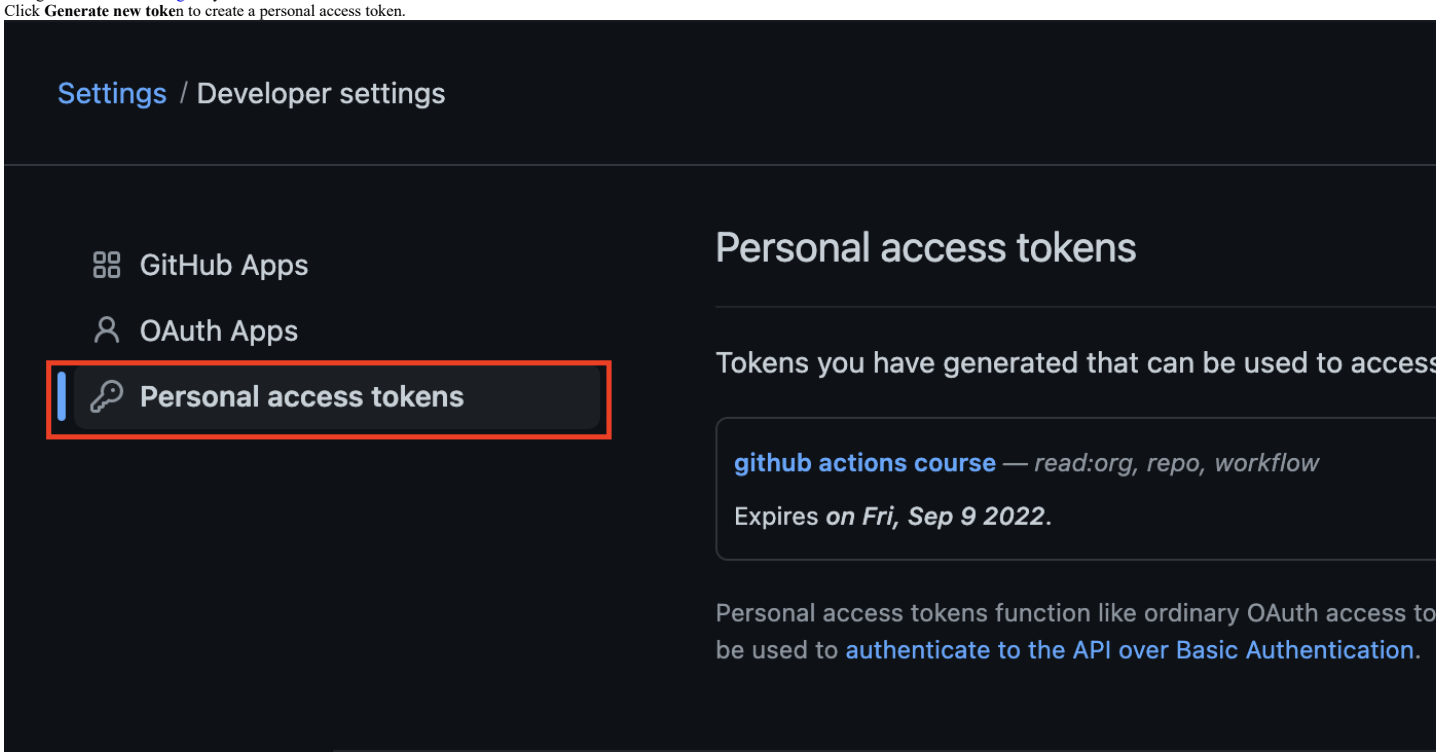
Generate GitHub Personal Access Token

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

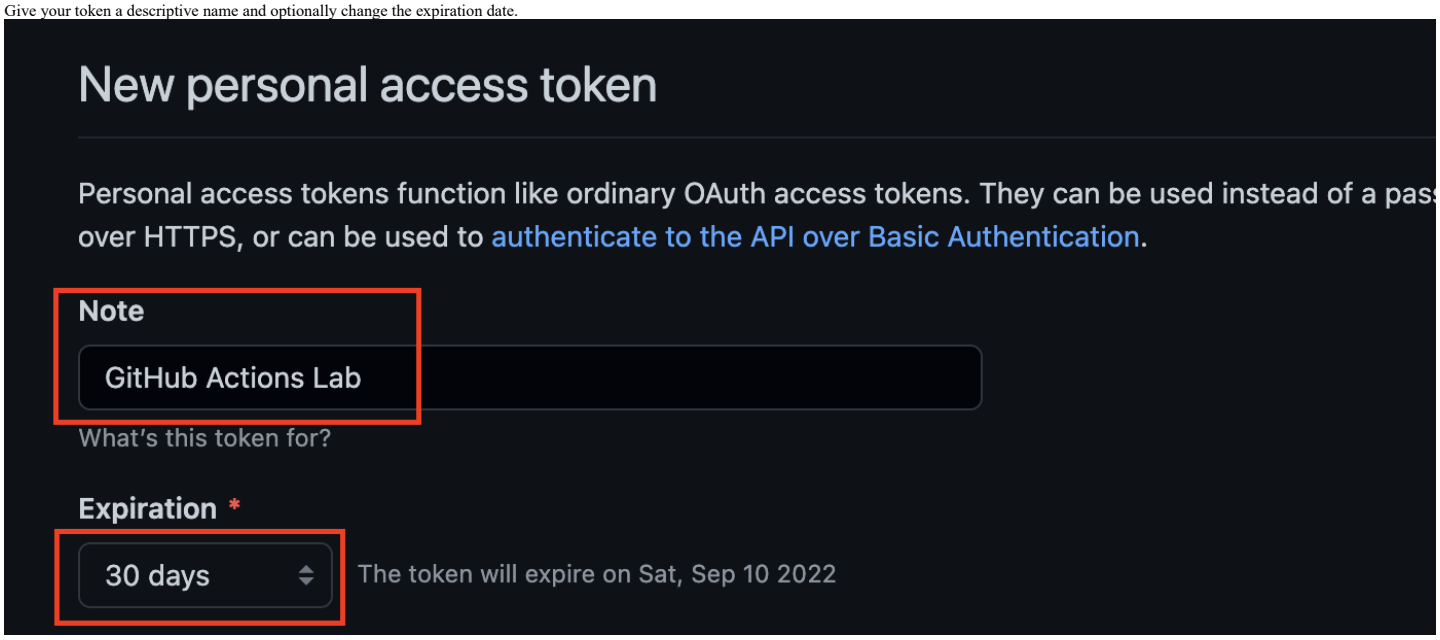
Generate a Personal Access Token

You will fork and clone a repo in this lab using the `gh` CLI tool. You will also push changes to your cloned repo at the end of this lab. This requires you to authenticate with GitHub using a `personal access token`. Follow the steps here to generate this token and save it for later use:

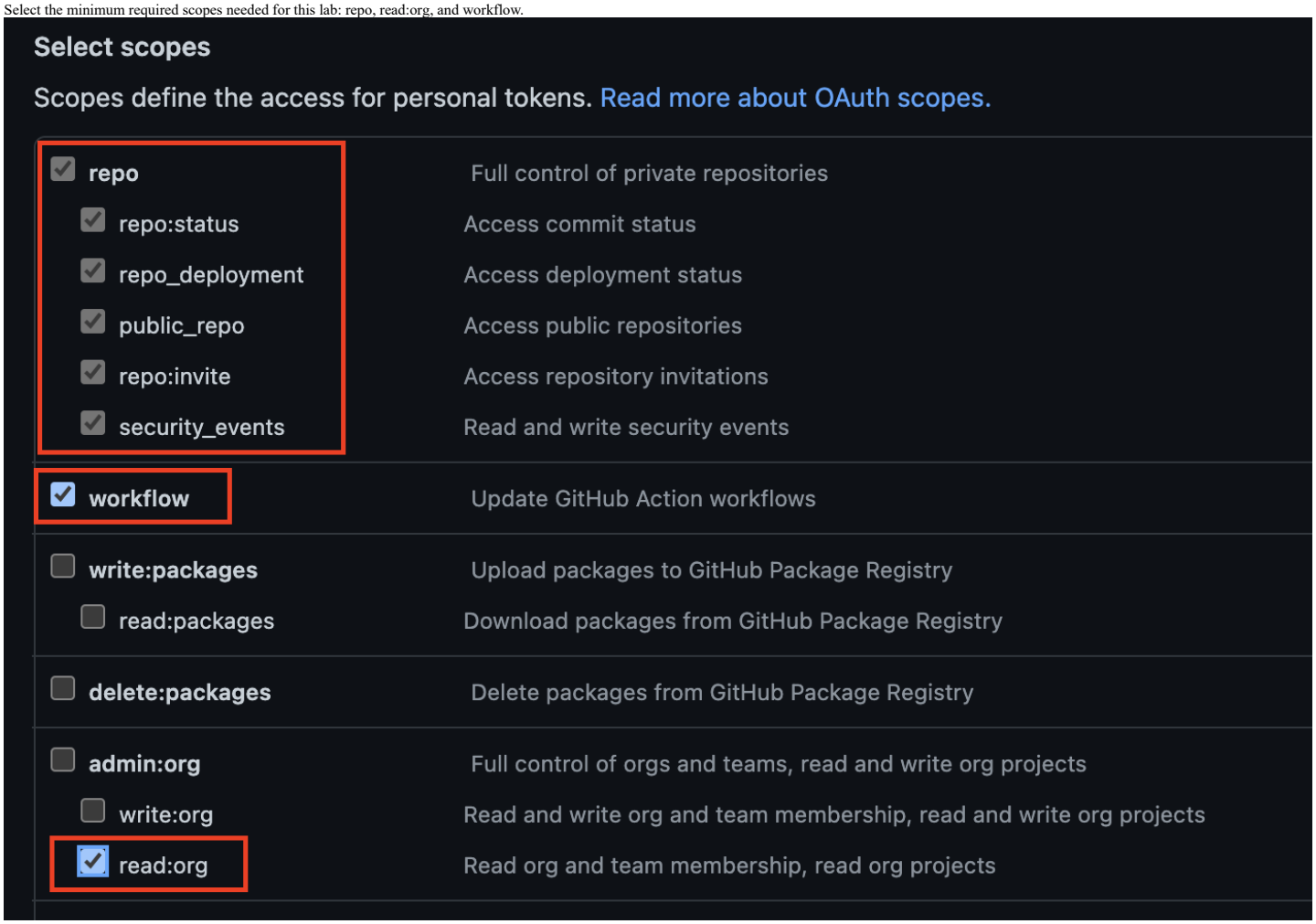
1. Navigate to GitHub Settings of your account.
2. Click **Generate new toke**n to create a personal access token.



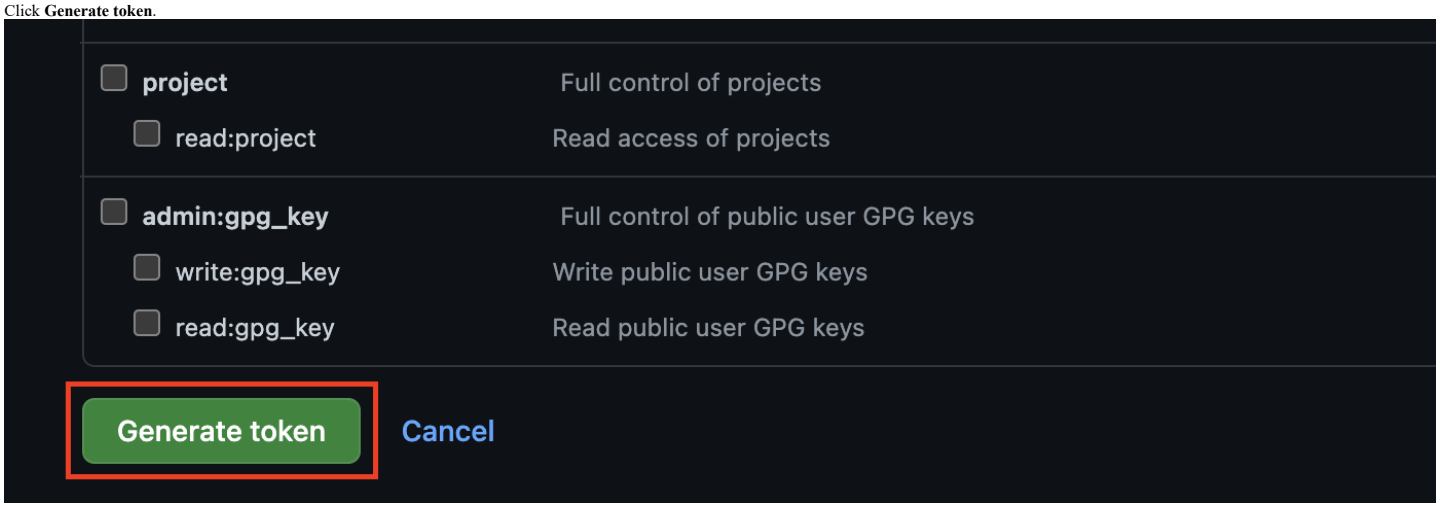
3. Give your token a descriptive name and optionally change the expiration date.



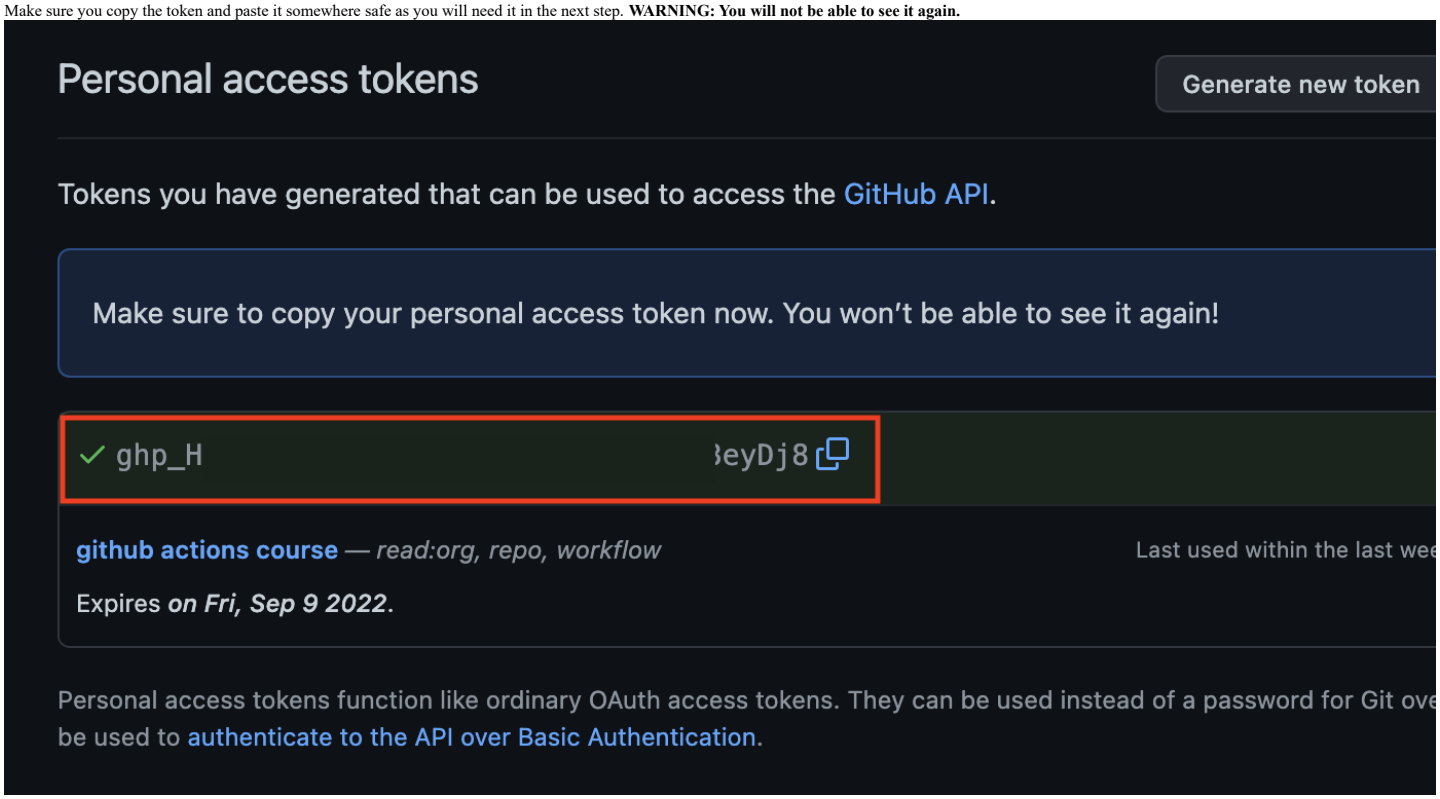
4. Select the minimum required scopes needed for this lab: repo, read:org, and workflow.



5. Click **Generate token**.



6. Make sure you copy the token and paste it somewhere safe as you will need it in the next step. **WARNING: You will not be able to see it again.**



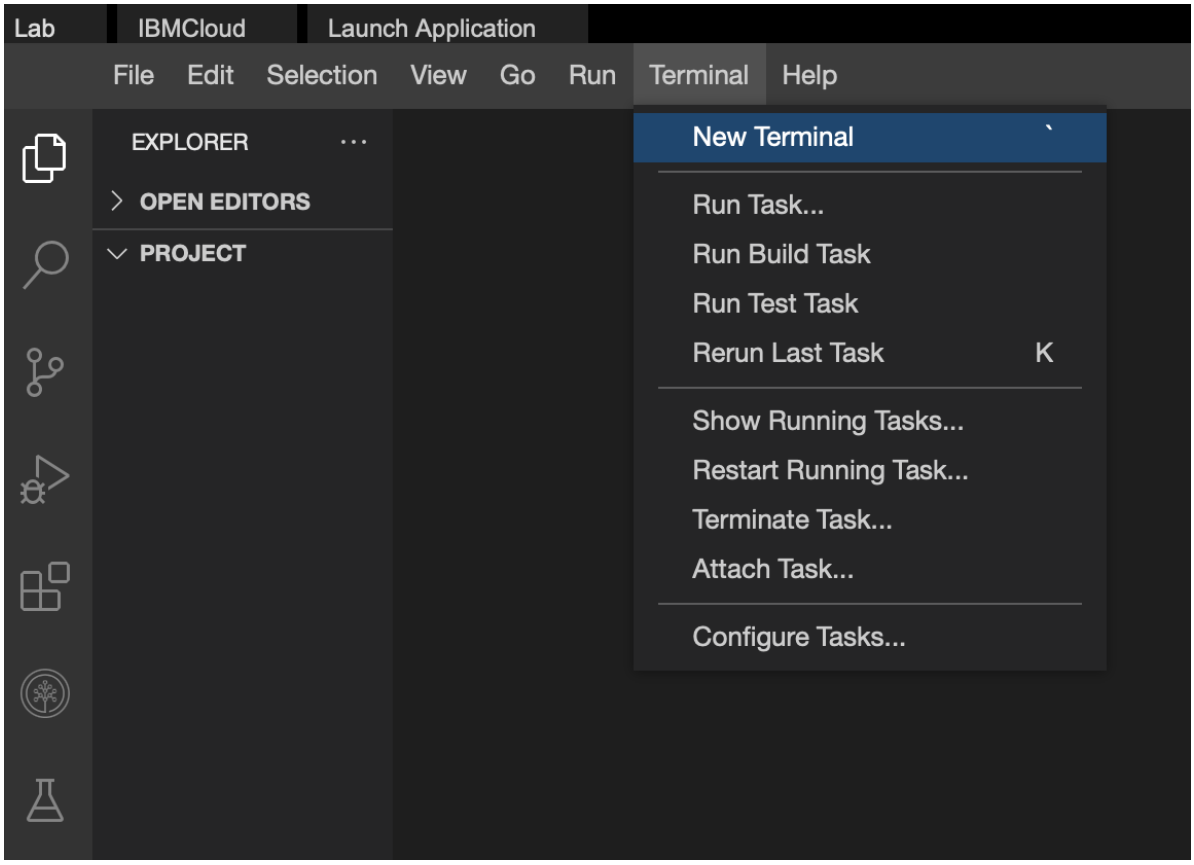

```
Warning: Keep your tokens safe and protect them like passwords.
```

If you lose this token at any time, repeat the above steps to regenerate the token.

Fork and Clone the Repository

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.

```
1. 1
1. cd /home/project
```

Copied! Executed!

Authenticate with GitHub

Run the following command to authenticate with GitHub in the terminal. You will need the `GitHub Personal Token` you created in the previous step.

```
1. 1
1. gh auth login
```

Copied! Executed!

You will be taken through a guided experience as shown here:

```
What account do you want to log into? GitHub.com
What is your preferred protocol for Git operations? HTTPS
Authenticate Git with your GitHub credentials.
How would you like to authenticate GitHub CLI? Paste an authentication token.
Paste your authentication token: ****************************************
You will be logged into GitHub as your account user.
```

After you have authenticated successfully, you will need to fork and clone this GitHub repo in the terminal. You will then create a workflow to trigger GitHub Actions in your forked version of the repository.

Fork and Clone the Reference Repo

```
1. 1
1. gh repo fork ibm-developer-skills-network/wtecc-CICD_PracticeCode --clone=true
```

Copied! Executed!

Your output should look similar to the image below:

```
theia@theia-tapasm:/home/project$ gh repo fork ibm-developer-skills-network/wtecc-CICD_Practice
true
! oyesidhu/wtecc-CICD_PracticeCode already exists
Cloning into 'wtecc-CICD_PracticeCode'...
remote: Enumerating objects: 37, done.
remote: Counting objects: 100% (37/37), done.
remote: Compressing objects: 100% (28/28), done.
remote: Total 37 (delta 4), reused 35 (delta 4), pack-reused 0
Unpacking objects: 100% (37/37), done.
Updating upstream
From https://github.com/ibm-developer-skills-network/wtecc-CICD_PracticeCode
 * [new branch]      Adding-github-actions -> upstream/Adding-github-actions
 * [new branch]      main                  -> upstream/main
✓ Cloned fork
```

Important: Pull Request

When making a pull request, make sure that your request is merging with your fork because the pull request of a fork will default to come back to this repo, not your fork.

Change to the Lab Folder

Once you have cloned the repository, change to the directory named `wtecc-CICD_PracticeCode`

```
1. 1
1. cd wtecc-CICD_PracticeCode
```

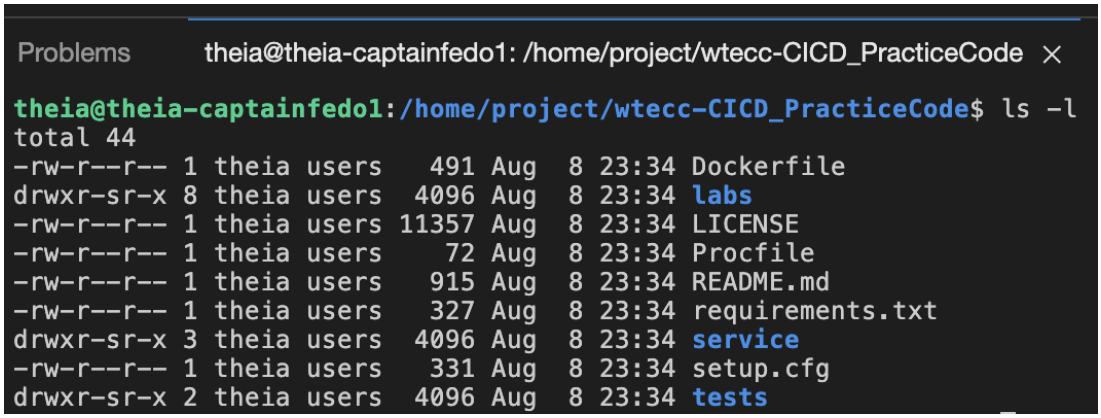
Copied! Executed!

List the contents of this directory to see the artifacts for this lab.

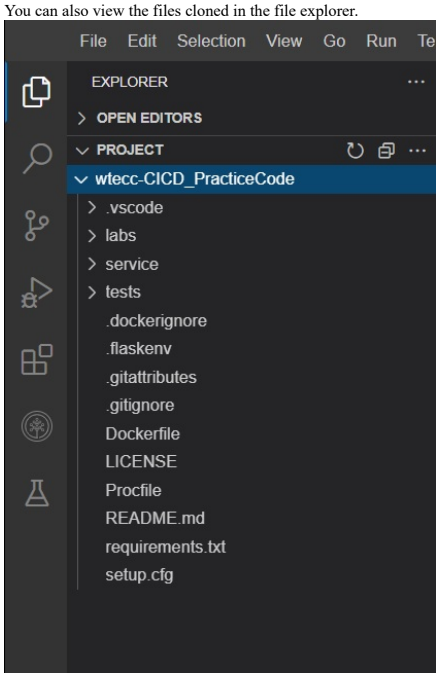
```
1. 1
1. ls -l
```

Copied! Executed!

The directory should look like the listing below:



You can also view the files cloned in the file explorer.



You are now ready to start the lab.

Optional

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

```
1. 1
1. export PS1="[\[\033[01;32m\]\u\[\033[00m\]: \[\033[01;34m\]\W\[\033[00m\]]\$ "
```

Copied! Executed!

Step 1: Create a Workflow

To get started, you need to create a workflow yaml file. The first line in this file will define the name of the workflow that shows up in GitHub Actions page of your repository.

Your Task

1. Open the terminal and ensure you are in the `wtecc-CICD_PracticeCode` directory.

▼ Click here for a hint.

```
1. 1
1. cd /home/project/wtecc-CICD_PracticeCode
```

Copied! Executed!

2. Create the directory structure `.github/workflows` and create a file called `workflow.yml`.

▼ Click here for a hint.

```
1. 1
2. 2
1. mkdir -p .github/workflows
2. touch .github/workflows/workflow.yml
```

Copied! Executed!

3. Every workflow starts with a name. The name will be displayed on the Actions page and on any badges. Give your workflow the name `CI workflow` by adding a `name:` tag as the first line in the file.

▼ Click here for a hint.

```
1. 1
1. name: {insert name here}
```

Copied!

Open **workflow.yml** in IDE

Double-check that your work matches the solution below.

Solution

▼ Click here for the answer.
Replace the workflow.yml file with the code snippet below. You can also copy relevant parts of the code. Be sure to indent properly:

```
1. 1

1. name: CI workflow
```

Copied!

Step 2: Add Event Triggers

Event triggers define which events can cause the workflow to run. You will use the `on:` tag to add the following events:

- Run the workflow on every push to the main branch
- Run the workflow whenever a pull request is created to the main branch.

Your Task

1. Add the `on:` keyword to the workflow at the same level of indentation as the `name:`.

▼ Click here for a hint.

```
1. 1
1. on:
```

Copied!

2. Add `push:` event as the first event that can trigger the workflow. This is added as the child element of `on:` so it must be indented under it.

▼ Click here for a hint.

```
1. 1
2. 2
1. on:
2.   {insert first event name here}:
```

Copied!

3. Add the `"main"` branch to the push event. You want the workflow to start every time somebody pushes to the main branch. This also includes merge events. You do this by using the `branches:` keyword followed by a list of branches either as `[]` or `-`

▼ Click here for a hint.

```
1. 1
2. 2
3. 3
1. on:
2.   push:
3.     branches: [ {insert branch name here} ]
```

Copied!

4. Add a `pull_request:` event similar to the push event you just finished. It should be triggered whenever the user makes a pull request on the main branch.

▶ Click here for a hint.

Double-check that your work matches the solution below.

Solution

▼ Click here for the answer.
Replace the workflow.yml file with the code snippet below. You can also copy relevant parts of the code. Be sure to indent properly:

```
1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7

1. name: CI workflow
2.
3. on:
4.   push:
5.     branches: [ "main" ]
6.   pull_request:
7.     branches: [ "main" ]
```

Copied!

Step 3: Add a Job

You will now add a job called `build` to the workflow file. This job will run on the `ubuntu-latest` runner. Remember, a job is a collection of steps that are run on the events you added in the previous step.

Your Task

1. First you need a job. Add the `jobs:` section to the workflow at the same level of indentation as the `name` (i.e., no indent).

   ▼ Click here for a hint.

   ```
   1. 1
   1. jobs:
   ```

   Copied!

2. Next, you need to name the job. Name your job `build:` by adding a new line under the `jobs:` section.

   ▼ Click here for a hint.

   ```
   1. 1
   2. 2
   1. jobs:
   2.     {insert job name here}:
   ```

   Copied!

3. Finally, you need a runner. Tell GitHub Actions to use the `ubuntu-latest` runner for this job. You can do this by using the `runs-on:` keyword.

   ▼ Click here for a hint.

   ```
   1. 1
   2. 2
   3. 3
   1. jobs:
   2.   build:
   3.     runs-on: {insert runner name here}
   ```

   Copied!

Double-check that your work matches the solution below.

Solution

▼ Click here for the answer.
Replace the workflow.yml file with the code snippet below. You can also copy relevant parts of the code. Be sure to indent properly:

```
 1. 1
 2. 2
 3. 3
 4. 4
 5. 5
 6. 6
 7. 7
 8. 8
 9. 9
10. 10
11. 11
```

```
 1. name: CI workflow
 2.
 3. on:
 4.   push:
 5.     branches: [ "main" ]
 6.   pull_request:
 7.     branches: [ "main" ]
 8.
 9. jobs:
10.   build:
11.     runs-on: ubuntu-latest
```

Copied!

Step 4: Target Python 3.9

It is important to consistently use the same version of dependencies and operating system for all phases of development including the CI pipeline. This project was developed on Python 3.9, so you need to ensure that the CI pipeline also runs on the same version of Python. You will accomplish this by running your workflow in a container inside the GitHub action.

Your Task

1. Add a `container:` section under the `runs-on:` section of the build job, and tell GitHub Actions to use `python:3.9-slim` as the image.

Hint

▼ Click here for a hint.

```
1. 1
2. 2
3. 3
4. 4
```

```
1. jobs:
2.   build:
3.     runs-on: ubuntu-latest
4.     container: {insert container name here}
```

Copied!

Double-check that your work matches the solution below.

Solution

▼ Click here for the answer.
Replace the workflow.yml file with the code snippet below. You can also copy relevant parts of the code. Be sure to indent properly:

```
 1. 1
 2. 2
 3. 3
 4. 4
 5. 5
 6. 6
 7. 7
 8. 8
 9. 9
10. 10
11. 11
12. 12
```

```
1. name: CI workflow
```

```
2.
3. on:
4.   push:
5.     branches: [ "main" ]
6.   pull_request:
7.     branches: [ "main" ]
8.
9. jobs:
10.   build:
11.     runs-on: ubuntu-latest
12.     container: python:3.9-slim
```

Copied!

Step 5: Save Your Work

It is now time to save your work back to your forked GitHub repository.

Your Task

1. Configure the Git account with your email and name using the `git config --global user.email` and `git config --global user.name` commands.

   ▼ Click here for a hint.

   Open the terminal and configure your email:

   ```
   1. 1
   1. git config --global user.email "you@example.com"
   ```

   Copied!

   Open the terminal and configure your user name

   ```
   1. 1
   1. git config --global user.name "Your Name"
   ```

   Copied!

2. The next step is to stage all the changes you made in the previous exercises and push them to your forked repo on GitHub.

   ▼ Click here for a hint.

   You can use the following commands to commit your changes to staging and then push to your forked repository:

   ```
   1. 1
   2. 2
   3. 3
   1. git add -A
   2. git commit -m "COMMIT MESSAGE"
   3. git push
   ```

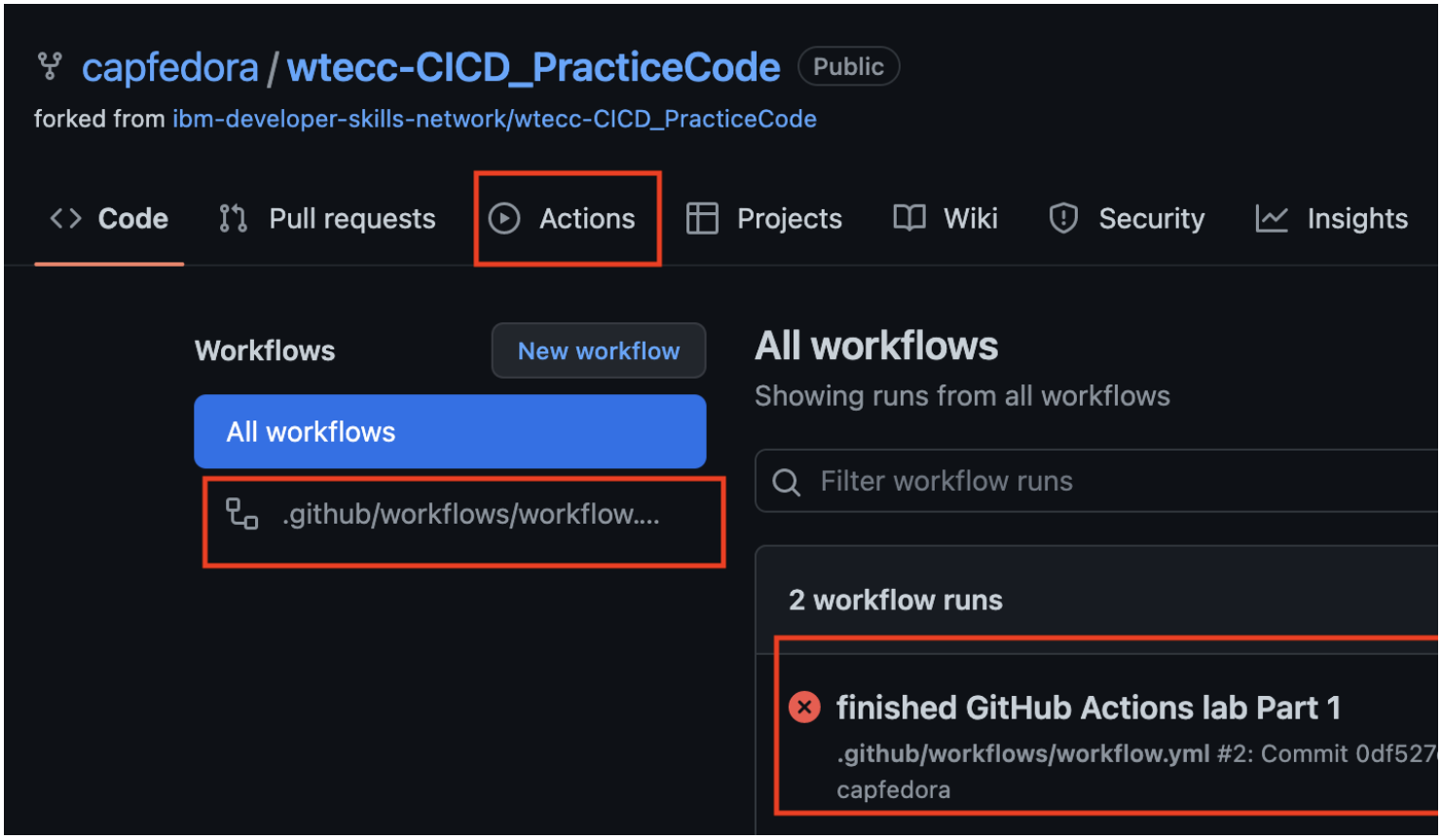
   Copied! Executed!

Your output should look similar to the image below:

Solution

```
theia@theia-captainfedo1:/home/project/wtecc-CICD_PracticeCode$ git config --global user.email "[redacted]
theia@theia-captainfedo1:/home/project/wtecc-CICD_PracticeCode$ git config --global user.name "[redacted]
theia@theia-captainfedo1:/home/project/wtecc-CICD_PracticeCode$ git add -A
theia@theia-captainfedo1:/home/project/wtecc-CICD_PracticeCode$ git commit -m "finished workflow file"
[main c362045] finished workflow file
 1 file changed, 24 insertions(+)
 create mode 100644 .github/workflows/workflow.yml
theia@theia-captainfedo1:/home/project/wtecc-CICD_PracticeCode$ git push
Counting objects: 5, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (5/5), 746 bytes | 373.00 KiB/s, done.
Total 5 (delta 1), reused 0 (delta 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
To https://github.com/capfedora/wtecc-CICD_PracticeCode.git
   03977e9..c362045  main -> main
```

You are done with part 1 of the lab, however if you were to look at the `Actions` tab in your forked repository, you will notice the GitHub action was triggered and has failed. The action was triggered because you `pushed` code to the `main` branch of the repository. It failed as you have not finished the workflow yet. You will add the remaining steps in part 2 of the lab so the workflow runs successfully. You can ignore this error at this time.



Conclusion

Congratulations! In this lab, you started building your Continuous Integration pipeline. This pipeline will run automatically when you commit your code to the GitHub repository based on the events described in the workflow.

You successfully created a GitHub Actions workflow and added an empty job. You can now proceed to extend the CI pipeline by adding steps to build dependencies, test your code, and report test coverage.

Author(s)

Tapas Mandal

Other Contributor(s)

Captain Fedora
John Rofrano

Change Log

Date	Version	Changed by	Change Description
2022-06-19	0.1	Tapas Mandal	Created new instructions for CI/CD project
2022-06-21	0.2	Tapas Mandal	Adding few improvements as per review comments
2022-08-05	0.3	Beth Larsen	Initial QA pass
2022-08-11	0.4	Captain Fedora	Revised version with new instructions and fixes
2022-08-12	0.5	Steve Ryan	ID Review
2022-08-12	0.4	Captain Fedora	Fixes from ID Review
2022-08-15	0.6	Beth Larsen	Second QA pass
2022-08-15	0.7	Steve Ryan	Fixed all ‘workflow.yml’ instances
2022-08-15	0.8	Steve Ryan	Fixed all missing periods
2022-08-15	0.9	John Rofrano	Added minor additions for clarity
2022-08-15	1.0	Steve Ryan	Final minor typo fixes
2022-08-15	1.1	Captain Fedora	Renamed images
2022-08-15	1.2	Captain Fedora	Split the lab into part 1 and part 2
2022-08-15	1.3	Captain Fedora	Added save your work step
2022-08-23	1.4	Beth Larsen	QA pass on part 1
2023-02-17	1.5	Lavanya Rajalingam	Updated screenshot for listing files through File Explorer
2023-03-15	1.6	Lavanya Rajalingam	Updated SN logo