SWE 261P Project: Part 4. Continuous Integration

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Abstract

Jsoup is an open-source HTML parser project used by 99026 repositories from GitHub.There are 97 contributors building and maintaining it continuously. In this report, we will apply the Github Actions to simulate the continuous integration for Jsoup. In this part of the project, automated build configuration was added to the forked Jsoup repository to set up Continuous Integration testing to ensure the system builds and integration. A newly added build file for CI can be found in the following Github link: Github

1 Introduction

Continuous integration(CI) is a DevOps software development practice that regularly merges code changes from multiple contributors into a central repository, where builds and tests are then automatically run[7]. It facilitates the agile process and is more like a cultural shift that incorporates testing activities into all stages, in terms of software design, development, and deployment processes, of the agile project life cycle[5].The major purposes of continuous integration are to address and fix bugs faster, improve software quality, and release new software features and updates quicker[2]. Nowadays, continuous integration is a critical practice that enables organizations to build and deliver their applications and services with high velocity at a faster speed, and therefore enable them to satisfy their customers better and compete in the market more effectively[6]. In this part of the project, we will applying Continuous Integration testing system using GitHub Actions.

2 Implementation

2.1 Tool: GitHub Actions

GitHub Actions was used to add Continuous Integration into the forked Jsoup project. GitHub Actions is a convenient platform for automating build, test, and deployment pipelines[4]. Beside, the platform can provide multiple virtual environments with different computer systems and programming languages to run the projects.

2.2 Create a Workflow

A workflow in GitHub Actions is a configurable automated process made up of one or more jobs that's defined by the users. [3] In order to apply the GitHub Actions Workflow in the repository, following steps were taken:

- Create workflows directory: Add a **.github/workflows** directory in repository on GitHub.This can also be done by choosing one of the template configuration files provided in the GitHub Actions page.
- in the **.github/workflows** directory, create a file named Build.yml with content in Listing 1.

2.3 Configuring Workflow

To configure GitHub Action workflow, the following configuration file has been defined and placed in the **.github/workflows** directory.

Listing 1: CI configuration file

```
name: Build
  on:
    push:
      branches:
        - master
    pull_request:
```

```
jobs:
  test:
    runs-on: ${{ matrix.os }}
    strategy:
      matrix:
        os: [ubuntu-latest, windows-latest, macOS-latest]
        # choosing to run a reduced set of LTS, current, and next, to balance coverage and
            execution time
        java: [8, 11, 17]
      fail-fast: false
    name: Test JDK ${{ matrix.java }}, ${{ matrix.os }}
    steps:
      - name: Checkout
        uses: actions/checkout@v2

      - name: Set up JDK ${{ matrix.java }}
        uses: actions/setup-java@v2
        with:
          java-version: ${{ matrix.java }}
          distribution: 'temurin'
          cache: 'maven'

      - name: Maven Compile
        run: mvn -X compile -B --file pom.xml

      - name: Maven Test
        run: mvn -X test -B --file pom.xml

      - name: Maven Verify
        run: mvn -X verify -B --file pom.xml
```

The above YML file configures the GitHub Actions so that the included commands get triggered when a change is pushed to the master branch of the repository. Each time when the master branch gets updated, the GitHub Actions platform will be called to run the jobs defined under the **jobs** fields.

A job named **test** was configured and added. Under this job, **matrix** defines the operating systems and java versions to use for the automated build tests. It initially defined the **matrix** about the operating systems and java versions. Then it sets a **fail-fast** field to **false** so that the the workflow doesn't stop even if any of the jobs in the matrix fails. Then it chooses which version would be used on GitHub-hosted runners. Finally, it compiles, runs the tests, and verifies the whole project based on the **run** commands.

3 Results and Conclusion

The above Continuous Integration platform was integrated into the forked JSoup repository. In GitHub, we can see that the workflow is created and registered, as shown in Figure 1. Then, a commit was made and it successfully triggered the jobs for the continuous integration.
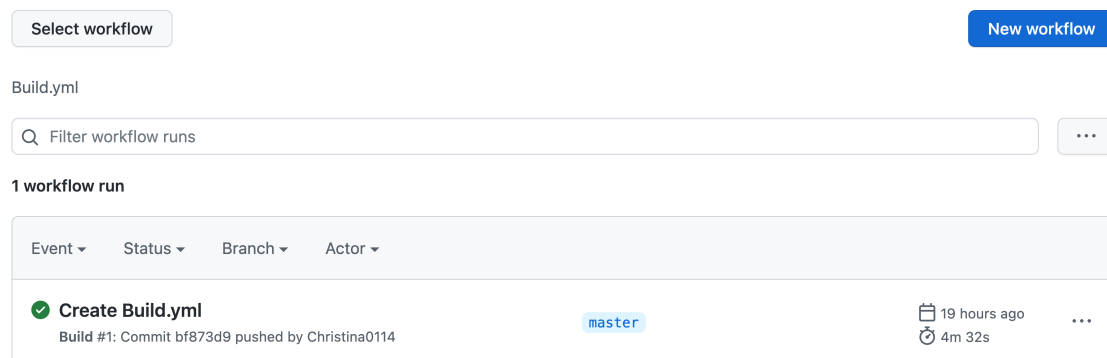

Figure 1: CI Result in GitHub Actions Page

Figure 2 shows additional details about this Continuous Integration task. Total nine jobs are passed with no errors, which all matches the matrix in the configuration file, shown in the Listing 1.

Figure 2: Details for Workflow

Now, the new automated build configuration has been tested, it can be used in the future to automatically run the tests whenever a new commit is made. This will ensure that all the commits into the master branch keeps the build properly.

References

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