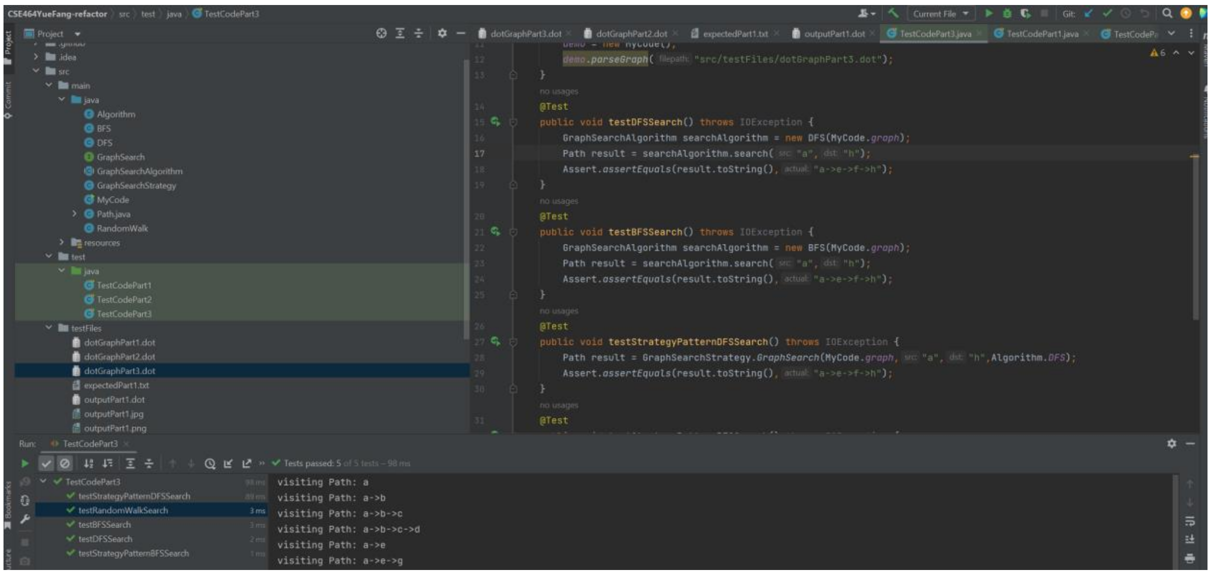
Yue Fang
ASUID: 1215500923

Java -version : java11

Jgrapht -version: 1.5.0

The input file for requirement is src/testFiles/dotGraphPart3.dot

A test case is offered to test the part3, so all the output results should be included in this test case. Just need to click the run button to see the test results.



```java
        demo.parseGraph( filepath: "src/testFiles/dotGraphPart3.dot");
    }
    no usages
    @Test
    public void testDFSSearch() throws IOException {
        GraphSearchAlgorithm searchAlgorithm = new DFS(MyCode.graph);
        Path result = searchAlgorithm.search( src: "a", dst: "h");
        Assert.assertEquals(result.toString(), actual: "a->e->f->h");
    }
    no usages
    @Test
    public void testBFSSearch() throws IOException {
        GraphSearchAlgorithm searchAlgorithm = new BFS(MyCode.graph);
        Path result = searchAlgorithm.search( src: "a", dst: "h");
        Assert.assertEquals(result.toString(), actual: "a->e->f->h");
    }
    no usages
    @Test
    public void testStrategyPatternDFSSearch() throws IOException {
        Path result = GraphSearchStrategy.GraphSearch(MyCode.graph, src: "a", dst: "h",Algorithm.DFS);
        Assert.assertEquals(result.toString(), actual: "a->e->f->h");
    }
    no usages
    @Test
```

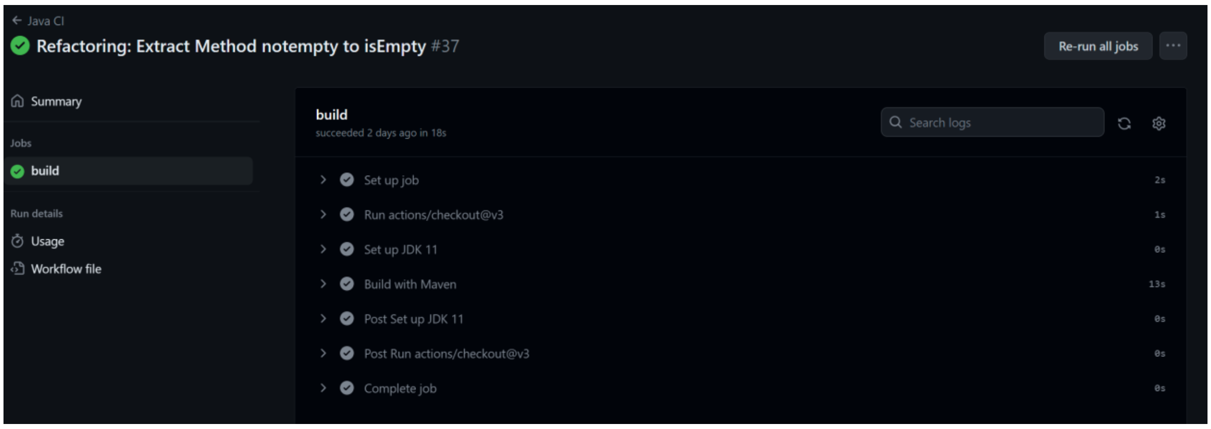
Tests passed: 5 of 5 tests – 98 ms

```
TestCodePart3                     98 ms
  testStrategyPatternDFSSearch    89 ms
  testRandomWalkSearch            3 ms
  testBFSSearch                   3 ms
  testDFSSearch                   2 ms
  testStrategyPatternBFSSearch    1 ms
```

```
visiting Path: a
visiting Path: a->b
visiting Path: a->b->c
visiting Path: a->b->c->d
visiting Path: a->e
visiting Path: a->e->g
```

requirement 1: I perform 5 refactoring, specifically as follows:

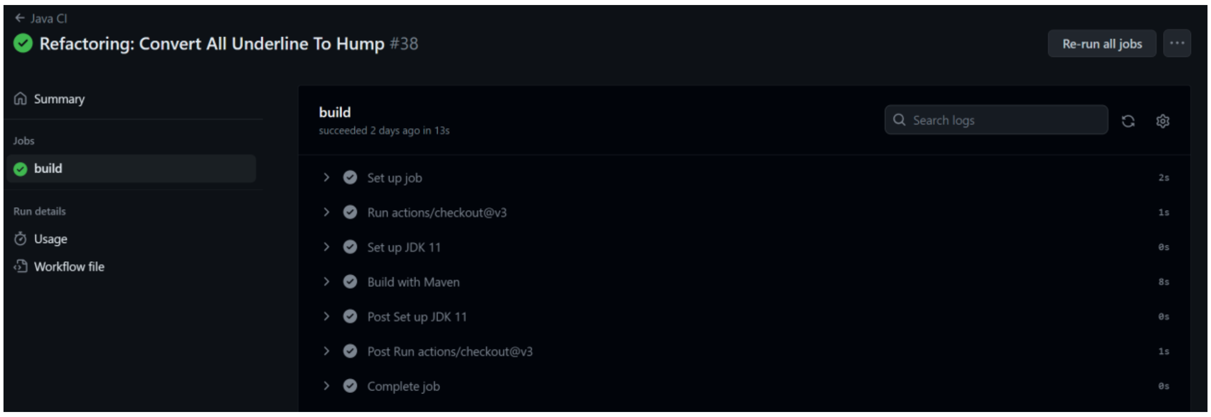
1. Refactoring: Extract Method notempty to isEmpty
- Type: Extract Method
- Reason: The original method name notempty is negative, and it is better to use a positive method name. Therefore, notempty is refactored to isEmpty.
- Commit Link: https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/a110443edb35fd3bbd237f8bd0ce025109a72432


← Java CI
Refactoring: Extract Method notempty to isEmpty #37
Re-run all jobs
Summary
Jobs
build
Run details
Usage
Workflow file

build
succeeded 2 days ago in 18s

```
Set up job                     2s
Run actions/checkout@v3        1s
Set up JDK 11                  0s
Build with Maven               13s
Post Set up JDK 11             0s
Post Run actions/checkout@v3   0s
Complete job                   0s
```

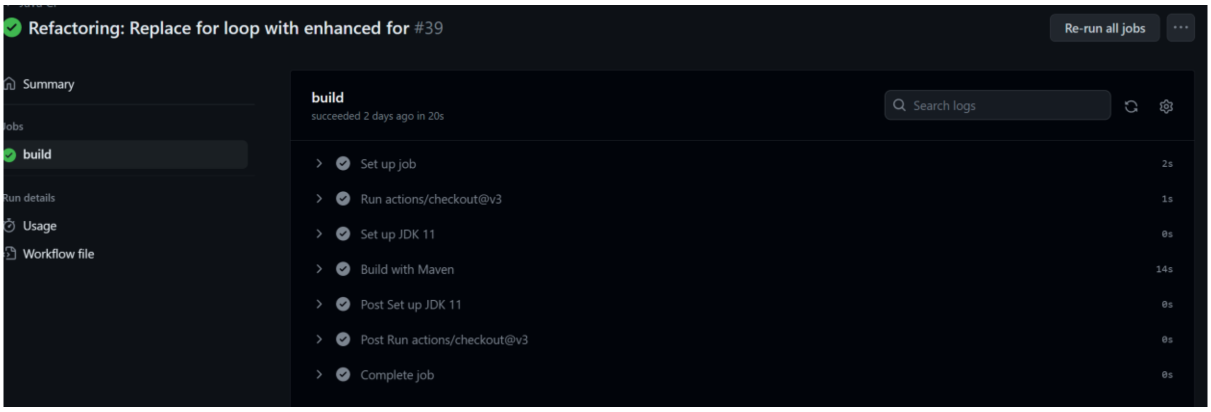
2. Refactoring: Convert All Underline To Hump
- Type: Rename
- Reason: To conform with the naming conventions used in Java where camelCase **is** the preferred naming style for method names and variable names. This makes the code more readable and easier to understand.
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/06c8d9c9ceaf1bd142a026496b4fa3ae6b619b87


← Java CI
Refactoring: Convert All Underline To Hump #38
Re-run all jobs
Summary
Jobs
build
Run details
Usage
Workflow file

build
succeeded 2 days ago in 13s

```
Set up job                     2s
Run actions/checkout@v3        1s
Set up JDK 11                  0s
Build with Maven               8s
Post Set up JDK 11             0s
Post Run actions/checkout@v3   1s
Complete job                   0s
```

3. Refactoring: Replace for loop with enhanced for
- Type: Readability
- Reason: The enhanced for loop is a more concise and readable way to iterate over arrays or collections compared to a traditional for loop. It eliminates the need for index variables and reduces the potential for off-by-one errors. Additionally, it can make the code easier to maintain and understand by removing unnecessary details and focusing on the actual iteration logic.
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/e82b559b477fb7745217c5068b82888d2a0f5633



Refactoring: Replace for loop with enhanced for #39

Re-run all jobs

Summary

Jobs

build

Run details

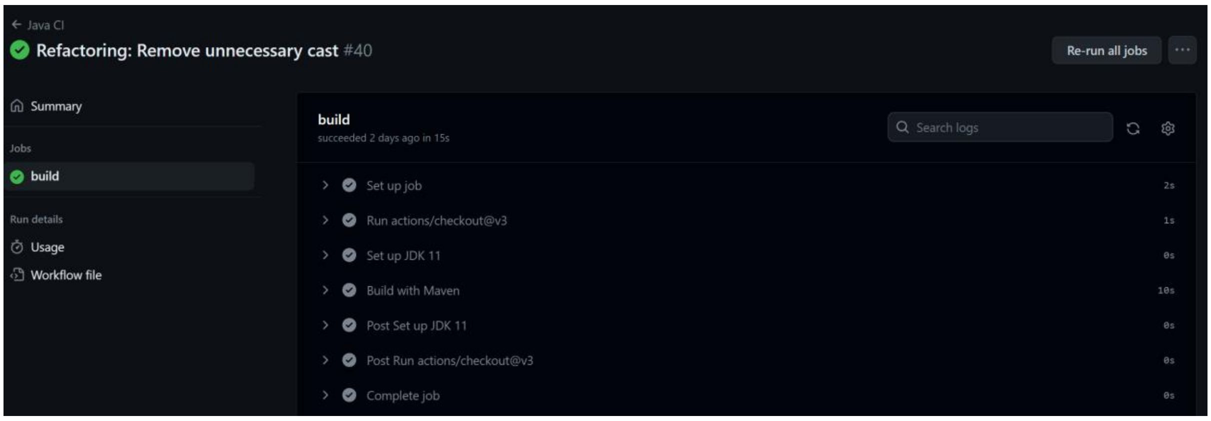
Usage

Workflow file

build
succeeded 2 days ago in 20s

```
Set up job                        2s
Run actions/checkout@v3           1s
Set up JDK 11                     0s
Build with Maven                  14s
Post Set up JDK 11                0s
Post Run actions/checkout@v3      0s
Complete job                      0s
```

4. Refactoring: Remove unnecessary cast
- Type: Readability and Performance
- Rreason: the type of temp.getPath() is string, declaring it as an object is not necessary
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/84f9f712c979cb4fd7e714cefff30e12d8403d2b



← Java CI

Refactoring: Remove unnecessary cast #40

Re-run all jobs

Summary

Jobs

build

Run details

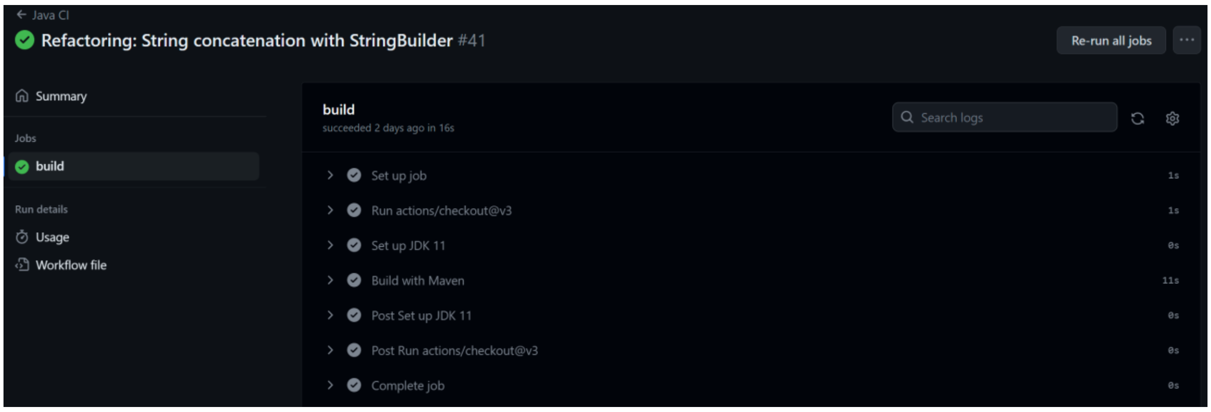
Usage

Workflow file

build
succeeded 2 days ago in 15s

```
Set up job                        2s
Run actions/checkout@v3           1s
Set up JDK 11                     0s
Build with Maven                  10s
Post Set up JDK 11                0s
Post Run actions/checkout@v3      0s
Complete job                      0s
```

5. Refactoring: String concatenation with StringBuilder
- Type: Performance
- Reason: The reason for using StringBuilder instead of the string concatenation operator is that the concatenation operator creates a new string object each time it is used. This can result in many objects being created in memory, which can impact performance and memory usage. In contrast, the StringBuilder class creates a single buffer that can be appended to, resulting in fewer objects being created.
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/9a2965514fabc2b9b9ac4cc09d57d8519a7b3e96


← Java CI

Refactoring: String concatenation with StringBuilder #41

Re-run all jobs

Summary

Jobs

build

Run details

Usage

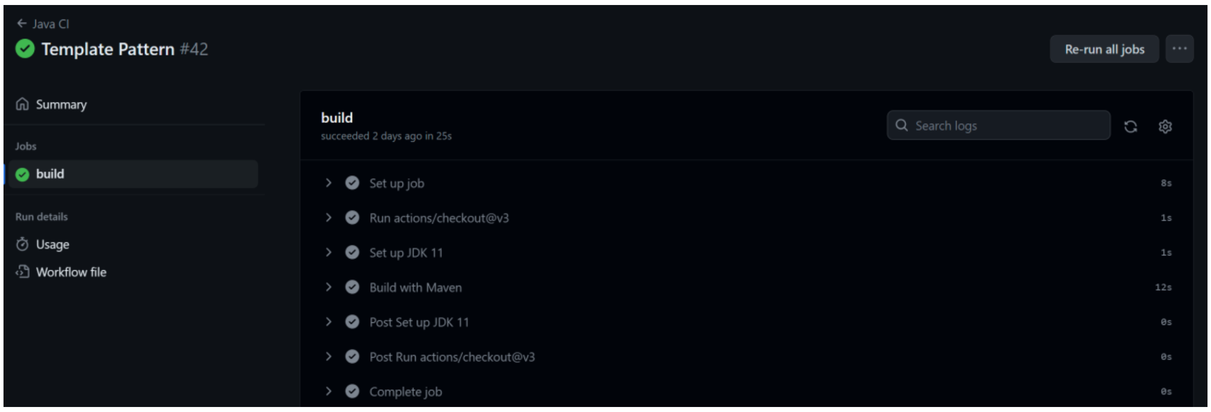
Workflow file

build
succeeded 2 days ago in 16s

```
> Set up job                        1s
> Run actions/checkout@v3           1s
> Set up JDK 11                     0s
> Build with Maven                 11s
> Post Set up JDK 11                0s
> Post Run actions/checkout@v3      0s
> Complete job                      0s
```

requirement 2: implementation details are as follows

- Explain: the GraphSearchAlgorithm is an abstract class that defines the basic structure of the search algorithm using a graph. It has an abstract method addNodeToQueue and addNeighborsToQueue, which subclasses BFS and DFS implement to provide their specific implementations.   The search method in the GraphSearchAlgorithm class provides the overall structure of the search algorithm using the template method pattern. It initializes a queue and a set of visited nodes and adds the start node to the queue. It then enters a loop that dequeues the next path, checks if the last node in the path has already been visited, adds it to the visited nodes set, and checks if it is the destination node. If it is, it returns to the path. Otherwise, it adds the neighbors of the current node to the queue using the addNeighborsToQueue method if they have not been visited before. The BFS and DFS classes extend the GraphSearchAlgorithm class and implement the addNodeToQueue and addNeighborsToQueue methods based on the specific requirements of each search algorithm. In particular, BFS adds nodes to the end of the queue, while DFS adds them to the front of the queue. Also, BFS uses a FIFO queue to traverse the graph while DFS uses a LIFO stack.
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/a592994c853182059ecc740102655cc0e137c69b


← Java CI

Template Pattern #42

Re-run all jobs

Summary

Jobs

build

Run details

Usage

Workflow file

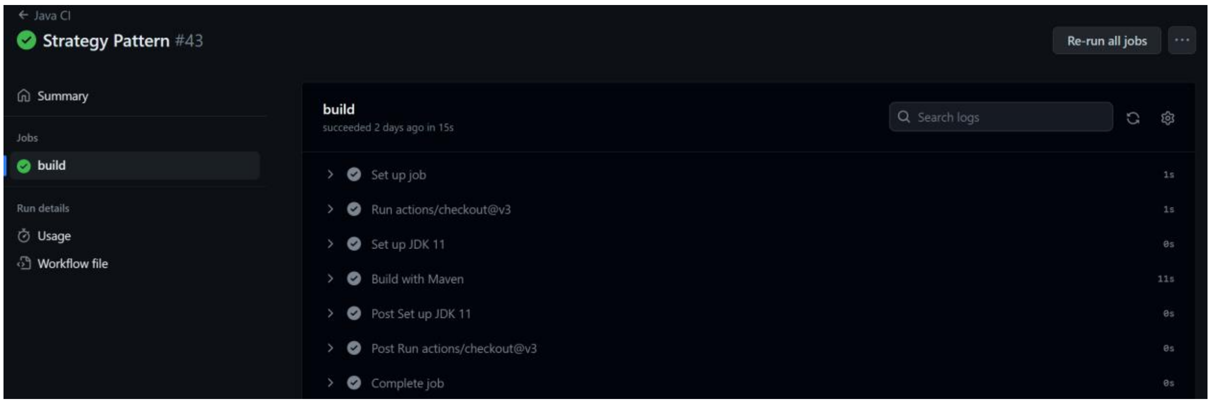
build
succeeded 2 days ago in 25s

```
> Set up job                        8s
> Run actions/checkout@v3           1s
> Set up JDK 11                     1s
> Build with Maven                 12s
> Post Set up JDK 11                0s
> Post Run actions/checkout@v3      0s
> Complete job                      0s
```

requirement 3: implementation details are as follows

- Explain: The main interface GraphSearch provides the search method to search for a path

between two nodes in the graph. The GraphSearchAlgorithm is an abstract class that implements the GraphSearch interface and provides the common functionality for both BFS and DFS algorithms. It has an abstract method addNodeToQueue that is implemented by its concrete subclasses to add the first node to the search queue, and another abstract method addNeighborsToQueue that is implemented to add the neighbors of a node to the search queue. The search method is implemented by the GraphSearchAlgorithm and performs the actual search using the given algorithm.The GraphSearchStrategy class acts as a factory that creates an instance of GraphSearchAlgorithm based on the selected algorithm. It takes in the graph, source and destination nodes, and the selected algorithm as input and returns the path between the source and destination nodes using the selected algorithm. It uses a switch statement to choose between BFS and DFS and creates an instance of the corresponding algorithm. The BFS and DFS classes are concrete subclasses of GraphSearchAlgorithm that implement the addNodeToQueue and addNeighborsToQueue methods based on their respective algorithms. BFS implements breadth-first search algorithm by adding the nodes to the queue in a breadth-first manner. DFS implements depth-first search algorithm by adding the nodes to the queue in a depth-first manner.
- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/220781fe498d6f7e12067bb5ca0e248689d929cc



Strategy Pattern #43

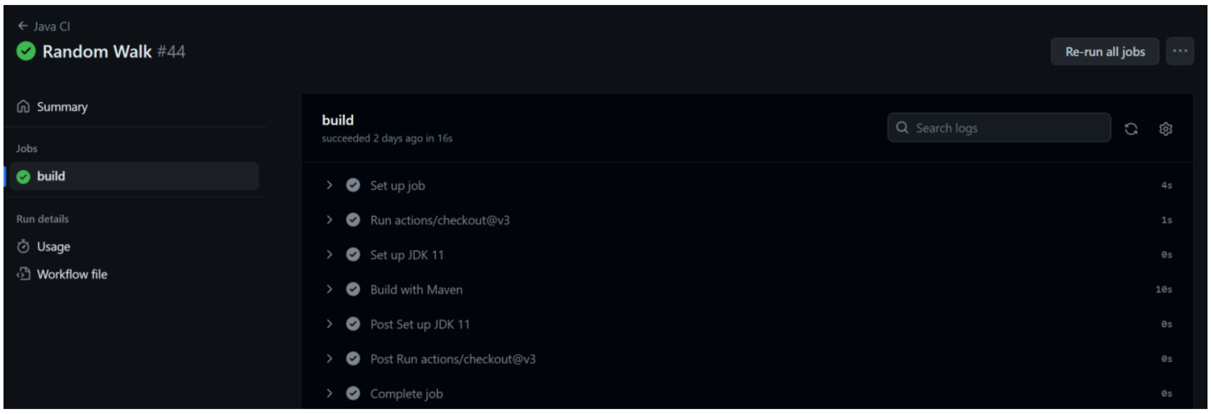
build

build
succeeded 2 days ago in 15s

```
> Set up job                       1s
> Run actions/checkout@v3          1s
> Set up JDK 11                    0s
> Build with Maven                11s
> Post Set up JDK 11               0s
> Post Run actions/checkout@v3     0s
> Complete job                     0s
```

requirement 4: implementation details are as follows

- Commit Link:
https://github.com/AttackBlueSteel/CSE464YueFang/pull/1/commits/f8be8502d07d01b5bacc8e5776174f06bc811bb7



← Java CI

Random Walk #44

Re-run all jobs

Summary

Jobs

build

Run details

Usage

Workflow file

build

succeeded 2 days ago in 16s

```
Set up job                          4s
Run actions/checkout@v3             1s
Set up JDK 11                       0s
Build with Maven                   10s
Post Set up JDK 11                  0s
Post Run actions/checkout@v3        0s
Complete job                        0s
```

requirement 5: pull request:

- Commit Link: https://github.com/AttackBlueSteel/CSE464YueFang/pull/1