Software Production Engineering Assignment

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Contents

1. Problem Statement

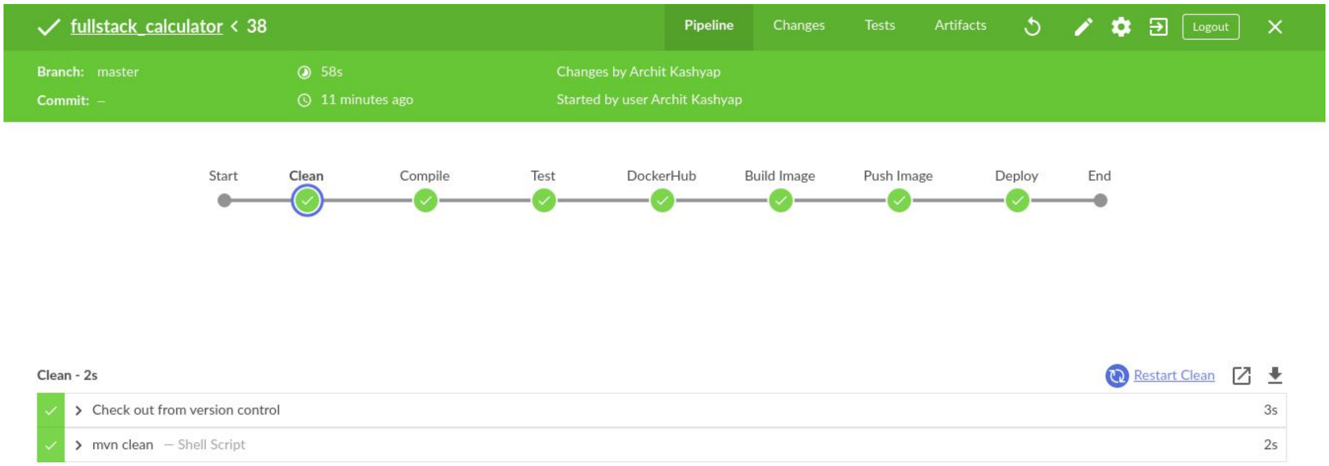
Make a terminal based calculator application with basic operation such as addition, subtraction, multiplication, etc. Use different DevOps tools to create a pipeline for various stages of the Software Development Life cycle.

2. Tools Used

- GitHub
- Jenkins - open source automation tool for continuous integration
- Maven - tool used for building and managing any Java-based project.
- JUint - unit testing framework for the Java programming language.
- Docker - tool designed to make it easier to create, deploy, and run applications by using containers.
- Rundeck

3. Pipeline

The pipeline is built using Jenkins in which the BlueOcean plugin is used to create the pipeline using Jenkins configuration file which contains the details of all the stages in the pipeline. The pipeline is triggered by using GitHub webhooks.



Branch: master
Commit: –
58s
11 minutes ago
Changes by Archit Kashyap
Started by user Archit Kashyap

Clean - 2s

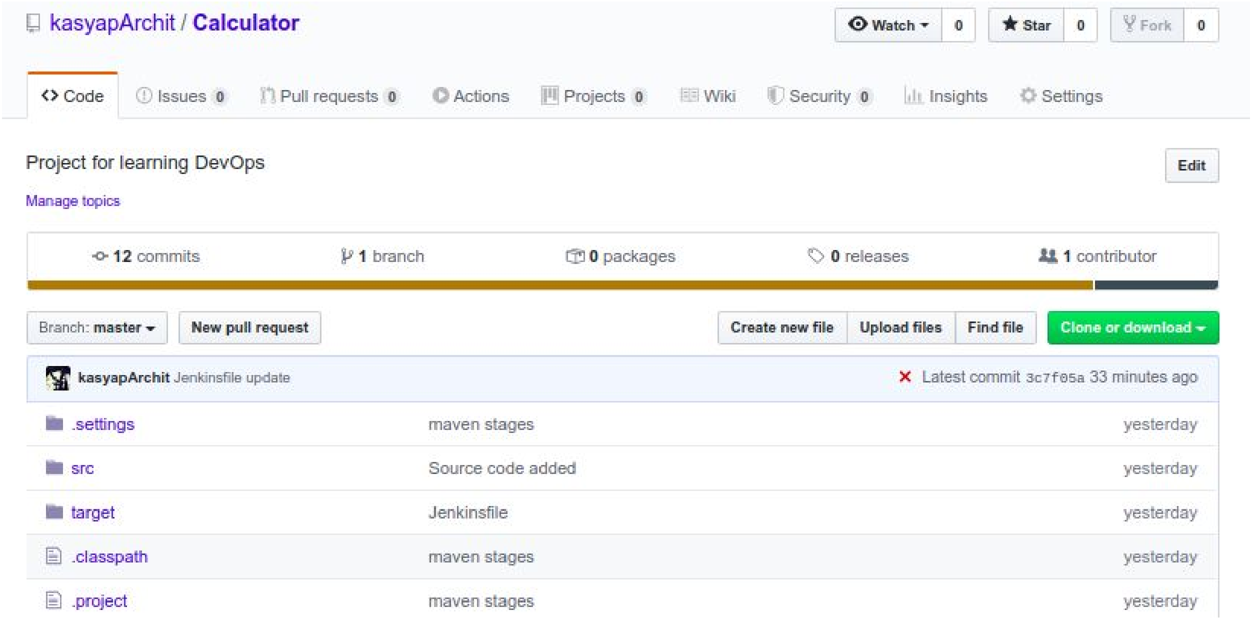
Check out from version control	3s
mvn clean — Shell Script	2s

4. Maven

- At first we create Maven project hierarchy and pom.xml file in the main directory of the project using the following command

```
$ mvn archetype:generate -DgroupId=com.calculator
-DartifactId=Calculator -DarchetypeArtifactId=mav
```

- We add the respective source code and the testing code in the respective folders.
- We push the project to a remote repository on GitHub



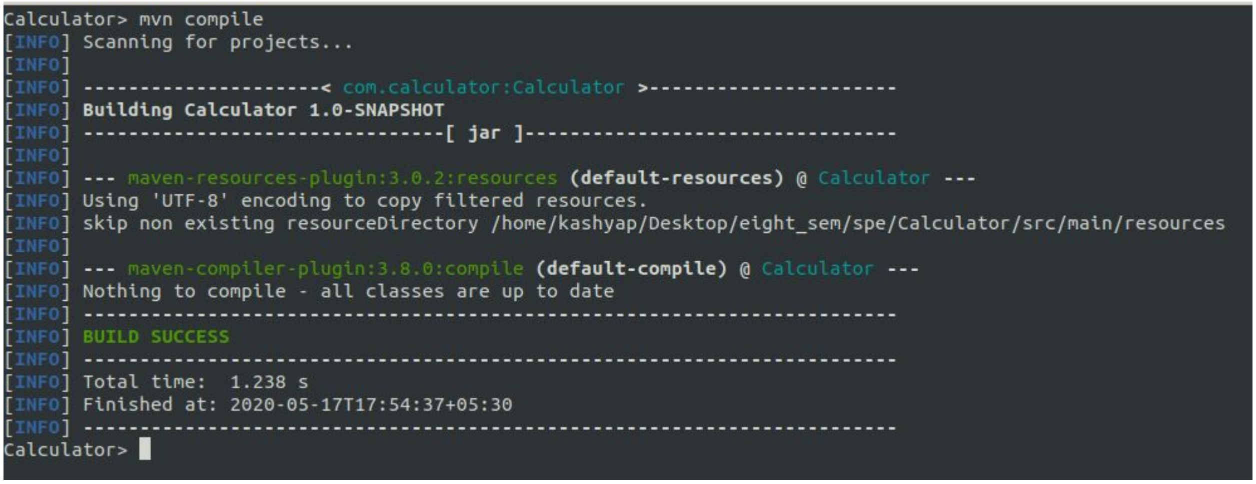
Project for learning DevOps

12 commits · 1 branch · 0 packages · 0 releases · 1 contributor

kasyapArchit Jenkinsfile update ✕ Latest commit 3c7f05a 33 minutes ago

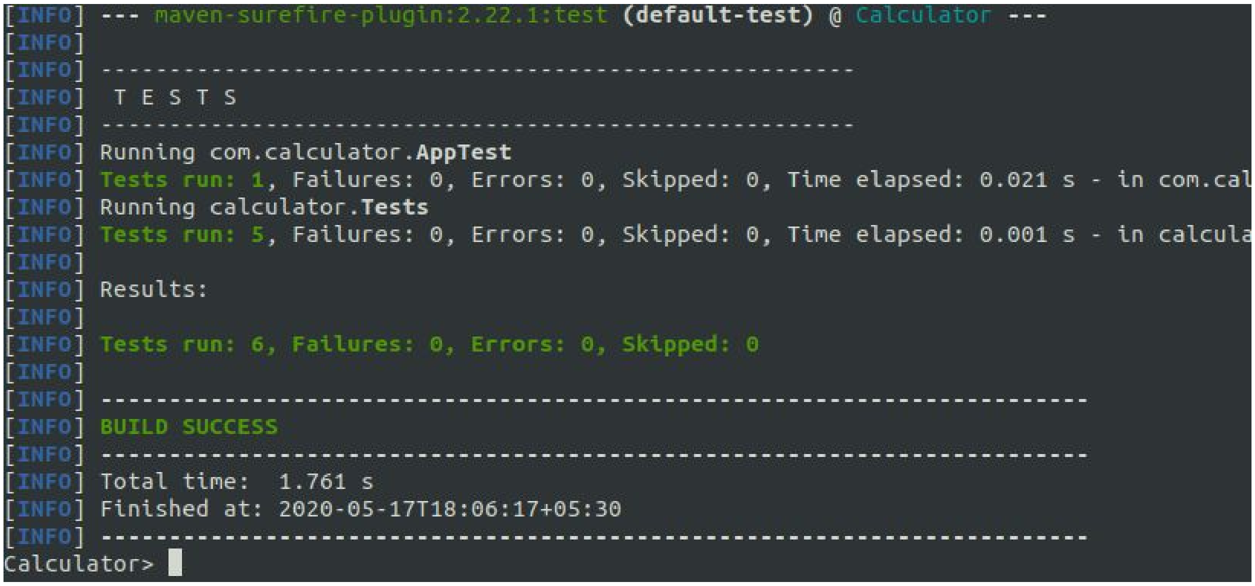
.settings	maven stages	yesterday
src	Source code added	yesterday
target	Jenkinsfile	yesterday
.classpath	maven stages	yesterday
.project	maven stages	yesterday

- We use Maven to build the source code, at first the clean command deletes the project hierarchy and the compile command creates a new project hierarchy.



```
Calculator> mvn compile
[INFO] Scanning for projects...
[INFO]
[INFO] ---------------------< com.calculator:Calculator >----------------------
[INFO] Building Calculator 1.0-SNAPSHOT
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- maven-resources-plugin:3.0.2:resources (default-resources) @ Calculator ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/kashyap/Desktop/eight_sem/spe/Calculator/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.0:compile (default-compile) @ Calculator ---
[INFO] Nothing to compile - all classes are up to date
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  1.238 s
[INFO] Finished at: 2020-05-17T17:54:37+05:30
[INFO] ------------------------------------------------------------------------
Calculator> █
```

- Now we test the code using JUnit tests.



```
[INFO] --- maven-surefire-plugin:2.22.1:test (default-test) @ Calculator ---
[INFO]
[INFO] -------------------------------------------------------
[INFO]  T E S T S
[INFO] -------------------------------------------------------
[INFO] Running com.calculator.AppTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.021 s - in com.cal
[INFO] Running calculator.Tests
[INFO] Tests run: 5, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in calcula
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 6, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  1.761 s
[INFO] Finished at: 2020-05-17T18:06:17+05:30
[INFO] ------------------------------------------------------------------------
Calculator>
```

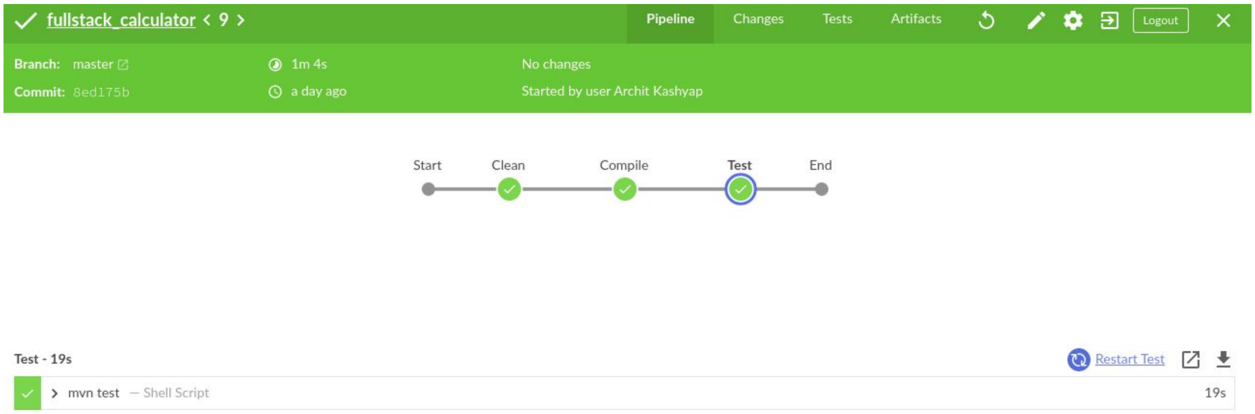
5. Jenkinsfile

This file contains the details of each stage in the pipeline.

5.1 Maven (Clean, Compile and Test)

```
stages
   {
   stage('Clean') {
     steps {
       sh 'mvn clean'
     }
   }
   stage('Compile') {
     steps {
       sh 'mvn compile'
     }
   }
   stage('Test') {
     steps {
       sh 'mvn test'
     }
   }
```

- After this the pipeline looks like following:



✓ fullstack_calculator < 9 >

Branch: master

Commit: 8ed175b

1m 4s

a day ago

No changes

Started by user Archit Kashyap

Test - 19s

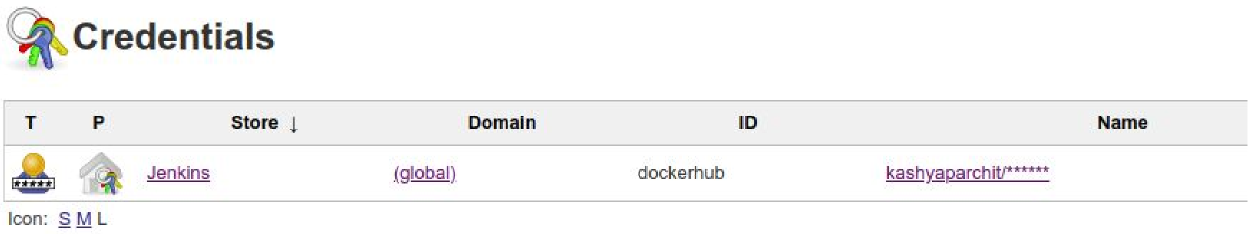
✓ > mvn test — Shell Script 19s

5.2 Docker

- We install docker and give jenkins and rundeck required permissions

```
$ sudo groupadd docker
$ sudo usermod -aG docker $USER
$ sudo usermod -aG docker jenkins
$ sudo usermod -aG docker rundeck
$ newgrp docker
```

- We make an account in DockerHub and create a new repository and connect it to GitHub.
- In the Jenkins we add the DockerHub credentials.



Credentials

T	P	Store ↓	Domain	ID	Name
		Jenkins	(global)	dockerhub	kashyaparchit/******

Icon: S M L

- Now we make the "Dockerfile" as follows:

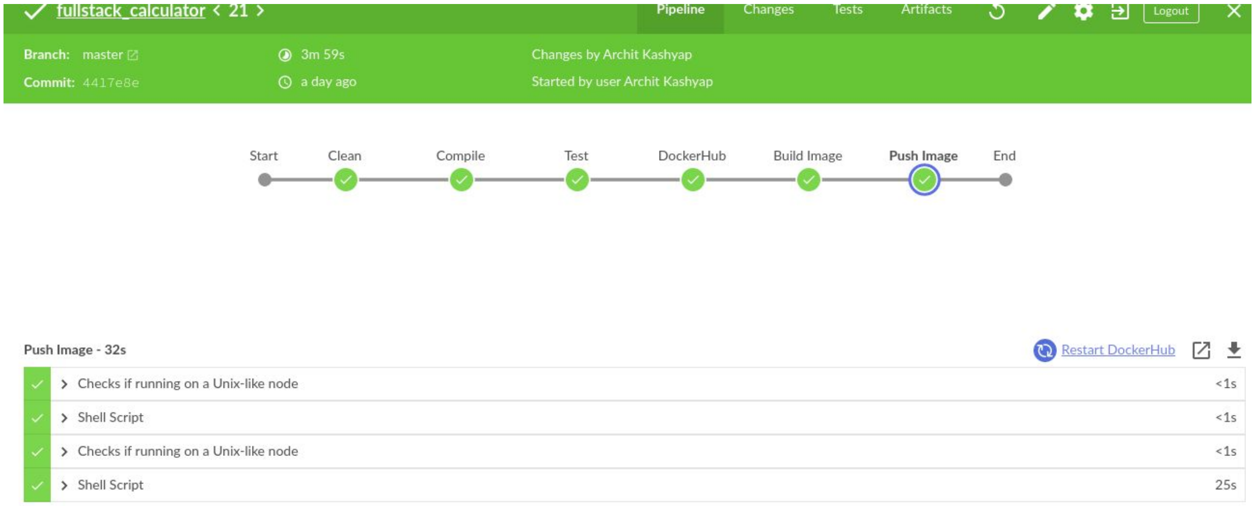
```
FROM maven:3.6.3-jdk-11 as builder
WORKDIR /build
COPY pom.xml .

COPY src/ /build/src/
RUN mvn install

# Step : Package image
FROM openjdk:11-jre

COPY --from=builder /build/target/Calculator-1.0-SNAPSHOT.jar .

CMD java -cp Calculator-1.0-SNAPSHOT.jar:/build/target/classes/
calculator.Calculator
```

- Also we update the "Jenkinsfile" for the next stages in the pipeline

```
stage('DockerHub') {
       stages{
         stage('Build Image') {
           steps{
             script {
               dockerImage = docker.build registry +
":$BUILD_NUMBER"
             }
           }
         }
         stage('Push Image') {
           steps{
             script {
```

```
      docker.withRegistry( '', registryCredential ) {
       dockerImage.push()
      }
     }
    }
   }
  }
}
```

- The result is as follows:



Branch: master

Commit: 4417e8e

3m 59s

a day ago

Changes by Archit Kashyap

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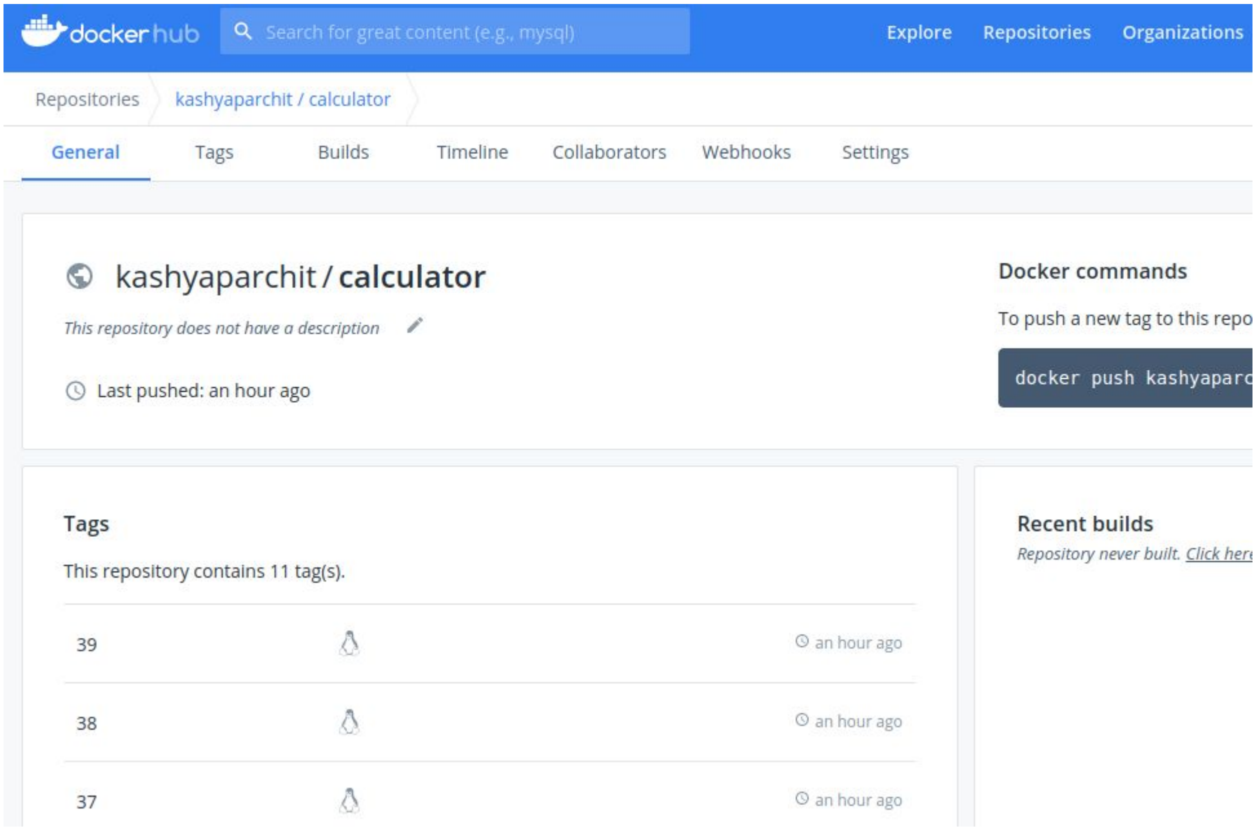
Push Image - 32s

```
✓ > Checks if running on a Unix-like node   <1s
✓ > Shell Script                            <1s
✓ > Checks if running on a Unix-like node   <1s
✓ > Shell Script                            25s
```



kashyaparchit / **calculator**

This repository does not have a description

Last pushed: an hour ago

Docker commands

To push a new tag to this repo

```
docker push kashyaparc
```

Tags

This repository contains 11 tag(s).

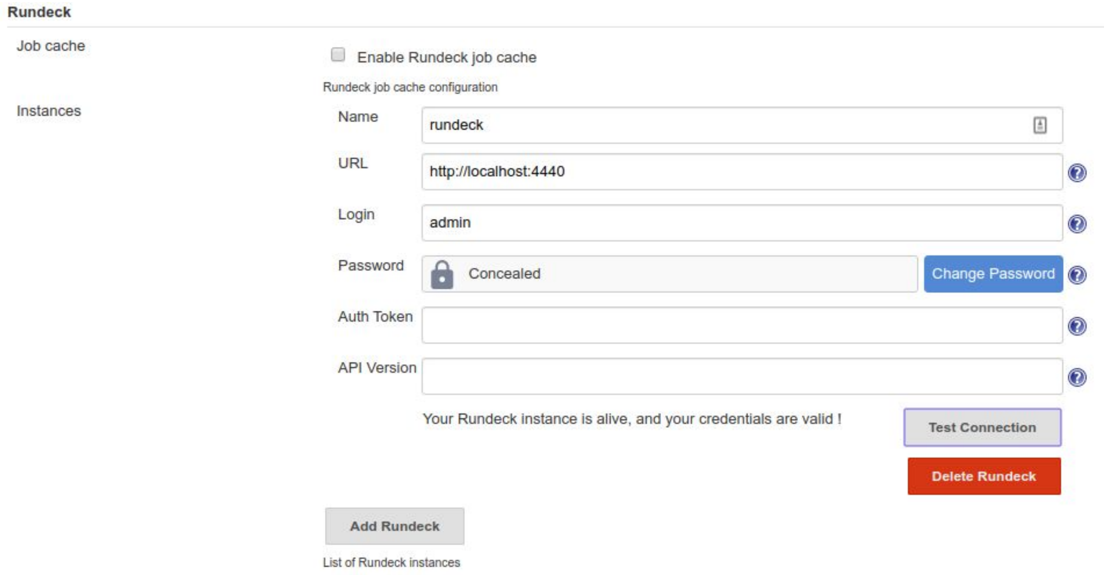
39	an hour ago
38	an hour ago
37	an hour ago

Recent builds

Repository never built. Click here

5.3 Deploy

This is the last stage of the project and for this stage we use Rundeck. We add the Rundeck configuration to Jenkins



Rundeck

Job cache

□ Enable Rundeck job cache

Rundeck job cache configuration

Instances

Name: rundeck

URL: http://localhost:4440

Login: admin

Password: Concealed

Auth Token:

API Version:

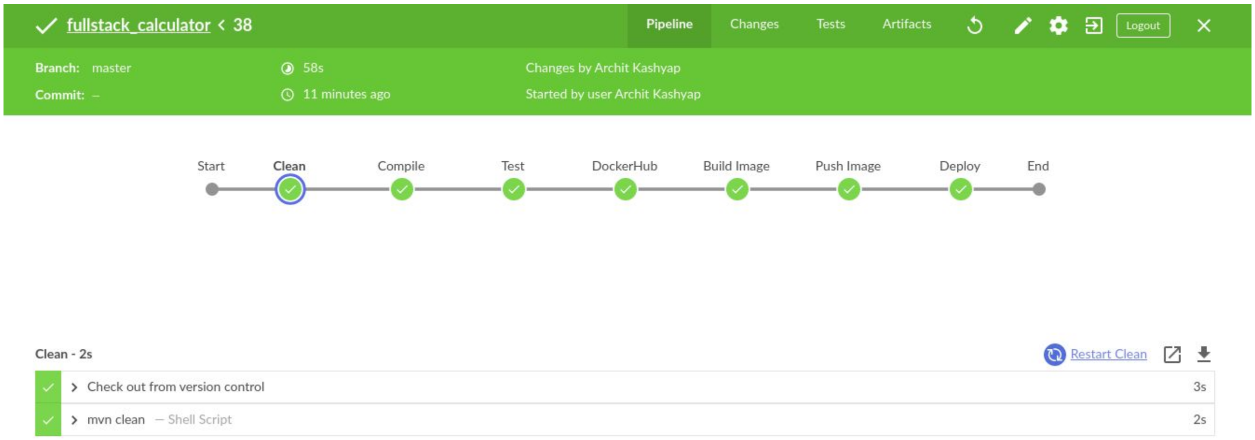
Your Rundeck instance is alive, and your credentials are valid !

List of Rundeck instances

- Now we update the "Jenkinsfile" for the last stage:

```
stage('Deploy') {
     agent any
     steps {
       script {
         step([$class: "RundeckNotifier",
         rundeckInstance: "rundeck",
         options: """BUILD_VERSION=$BUILD_NUMBER""",
         jobId: "e1434470-304d-44d0-84c3-b2ea0111ccb7"])
       }
     }
   }
```

- The result is as follows:



✓ fullstack_calculator < 38

Branch: master
Commit: –

58s
11 minutes ago

Changes by Archit Kashyap
Started by user Archit Kashyap

Clean - 2s

✓	> Check out from version control	3s
✓	> mvn clean — Shell Script	2s

6. Repositories

- GitHub Repository
- DockerHub Repository