

Advanced Container CI/CD Workshop Labs

Table of Contents

Lab 1 - Explore Environment

Explore OpenShift Environment

https://console.ocpws.kee.vizuri.com:8443
Username: student-x
Password: workshop1!

You have 4 projects created for you.

- Customer Development
  - customerdb
- Customer Test
  - customerdb
- Customer Prod
  - customerdb
- CICD
  - anchore
  - anchoredb
  - jenkins
  - nexus
  - sonardb
  - sonar
  - sonarqube

Explore Jenkins

http://jenkins-student-x-cicd.apps.ocpws.kee.vizuri.com/

Username: student-x
Password: workshop1!

Explore Nexus

http://nexus-student-x-cicd.apps.ocpws.kee.vizuri.com

Explore Quay Registry

https://registry.kee.vizuri.com/repository/

Username: student-x
Password: workshop1!

Explore SonarQube

http://sonarqube-student-x-cicd.apps.ocpws.kee.vizuri.com

Username: admin
Password: admin

Explore Gogs (git repositories)

http://gogs.apps.ocpws.kee.vizuri.com/

Username: student-x
Password: workshop1!

Repositories:

- customer-service - SpringBoot REST Web Service utilized as demo project to orchestrate through our CI/CD process.

Lab 2 - Configure Jenkins Plugins

Install Jenkins Plugins

In Jenkins, navigate to **Manage Jenkins**.

Choose **Manage Plugins**.

Choose the **Available** tab.

Install the following Plugins:

- Anchore Container Image Scanner
- Sonar Quality Gates Plugin
- SonarQube Scanner for Jenkins
- xUnit plugin
- Gogs

Choose **Install with Restart**.

Configure Kubernetes Cloud

The Kubernetes Cloud plugin allows for the running of Kubernetes/OpenShift PODs as Jenkins JNLP Slaves

The OpenShift Jenkins Template configures a Kubernetes Cloud configuration for the current OpenShift environment. It provides two out-of-the-box Kubernetes Pod Templates to be Jenkins Slaves; maven and nodejs.

Configure Podman Kubernetes Pod Template

We will be using podman to build our container images so we need to include a new Kubernetes Pod Template that includes the podman binary.

The Dockerfile for the podman image can be found here:

https://github.com/Vizuri/openshift-cicd-podman-jenkins-slave

This container extends the OpenShift Maven image and just adds the podman binary.

In Jenkins, navigate to the **Manage Jenkins** -> **Configure System**. Scroll down to the **Cloud->Kubernetes** section.

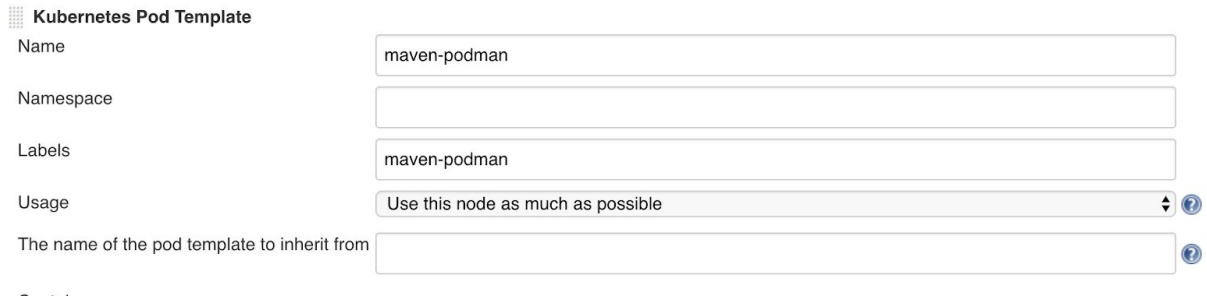
Notice the provided configuration.

Let's add our Podman Kubernetes Pod Template.

Click on the **Add Pod Template** button and choose **Kubernetes Pod Template**.

Enter the following values:

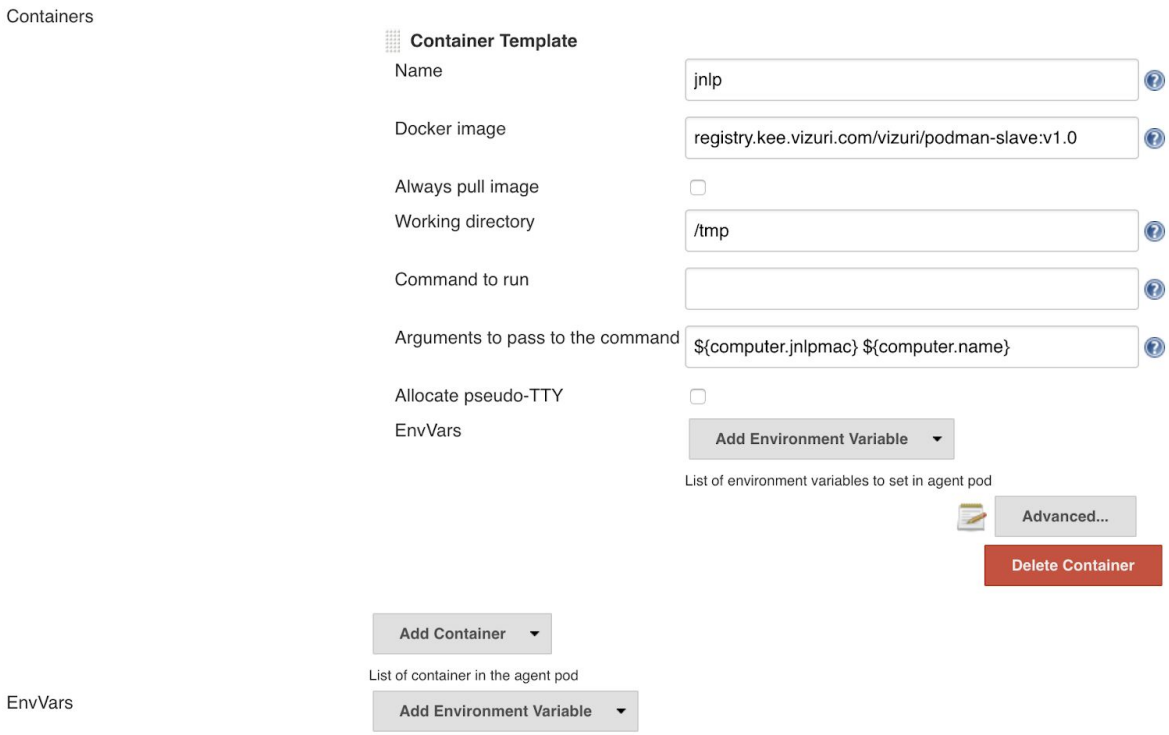
- Name: maven-podman
- Labels maven-podman



Click on the **Add Container** button and choose **Container Template**.

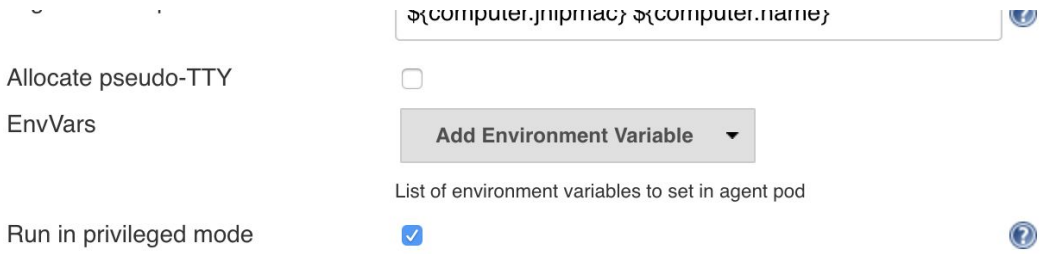
Enter the following values:

- Name: jnlp
- Docker Image: registry.kee.vizuri.com/vizuri/podman-slave:v1.0
- Working directory: /tmp
- Command to run: <EMPTY>
- Arguments to pass to the command: ${computer.jnlpmac} ${computer.name}



Click the **Advanced Button** to see more options.

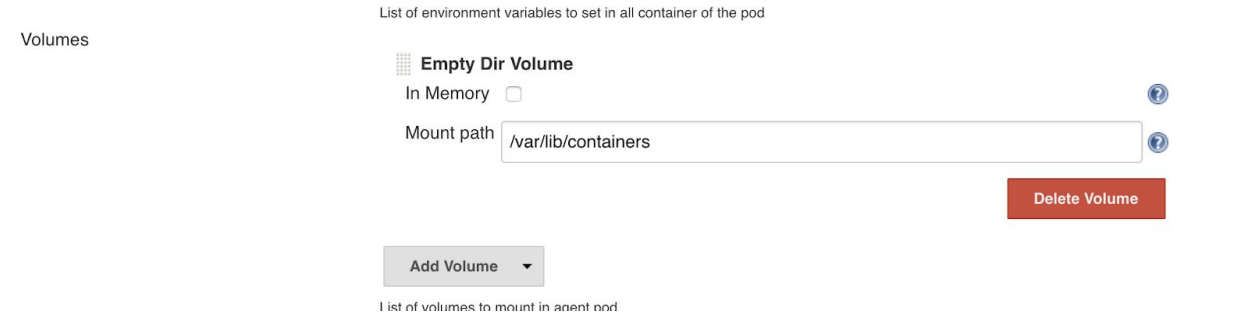
Check the **Run in privileged mode** button.



Click the **Add Volume** button and choose **Empty Dir Volume**.

Enter the following values:

- Mount path: /var/lib/containers



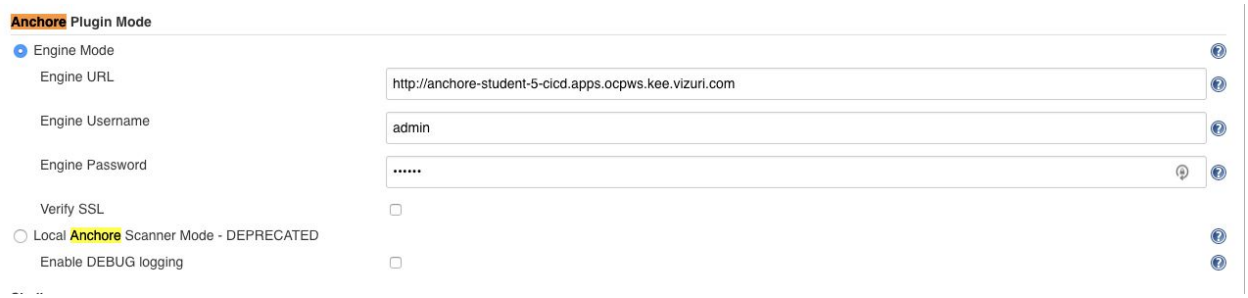
Save your changes.

Configure Anchore Plugin

In Jenkins, navigate to the **Manage Jenkins -> Configure System**. Scroll down to the **Anchore Plugin Mode** section.

Enter the following values:

- Engine URL: http://anchore-student-x-cicd.apps.ocpws.kee.vizuri.com
- Engine Username: admin
- Engine Password: foobar



Click Save

Configure SonarQube Plugins

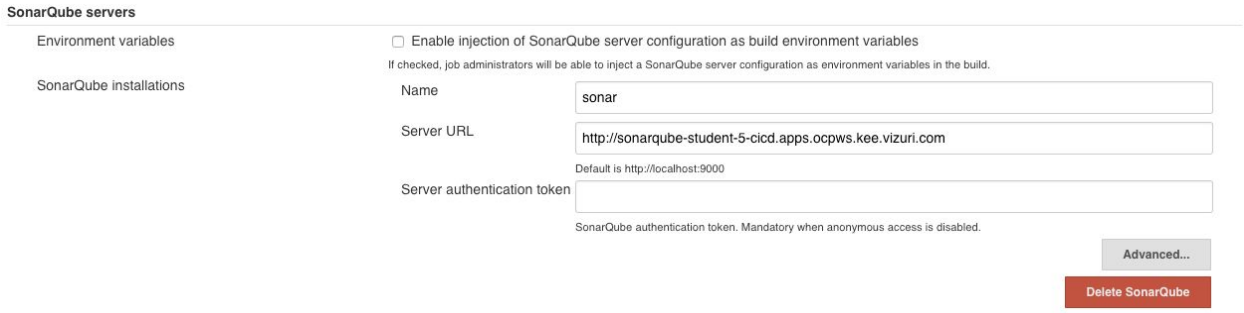
In Jenkins, navigate to the **Manage Jenkins -> Configure System**.

Scroll down to the **SonarQube** servers section.

Click the **Add SonarQube** button.

Enter the following values:

- Name: sonar
- Server URL: http://sonarqube-student-x-cicd.apps.ocpws.kee.vizuri.com

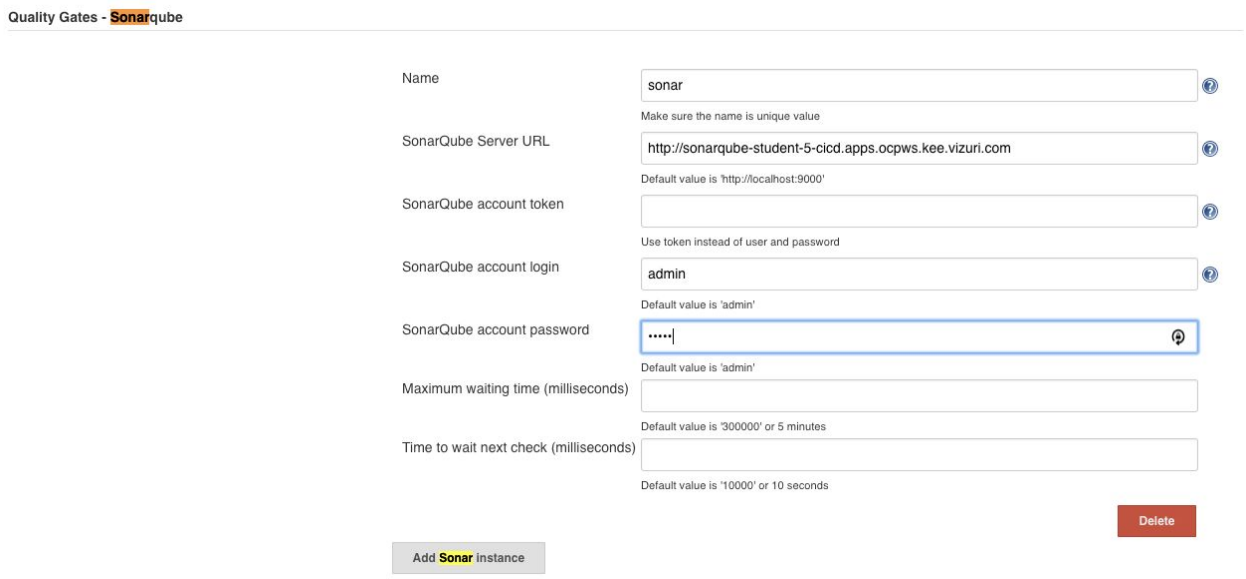


Scroll down to the **Quality Gates - SonarQube** section.

Click the **Add Sonar Instance** button.

Enter the following values:

- Name: sonar
- SonarQube Server URL: http://sonarqube-student-x-cicd.apps.ocpws.kee.vizuri.com
- SonarQube account login: admin
- SonarQube account password: admin



Click the **Save** button.

Configure SonarQube Jenkins WebHook.

Login into your SonarQube Server.

http://sonarqube-student-x-cicd.apps.ocpws.kee.vizuri.com

Click the **Login** button and enter

Username: admin
Password: admin

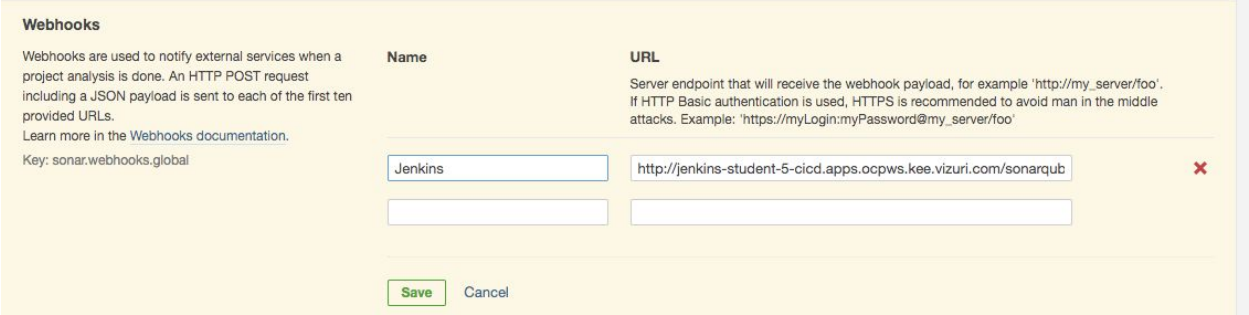
And press the **Login** button.

Click **skip this tutorial** on the pop-up.

Click on **Administration** and then choose **WebHooks**.

Enter the following values:

- Name: Jenkins
- URL: http://jenkins-student-x-cicd.apps.ocpws.kee.vizuri.com/sonarqube-webhook/



Click **Save**.

Lab 3 - Build Java Pipeline

In this lab, you will create a Jenkins Pipeline Job that checks out a SpringBoot microservice code and builds a Jar archive.

Create Jenkinsfile for Build

Log into the Gogs git Repository.

http://gogs.apps.ocp-nonprod-01.kee.vizuri.com

Username: student-x
Password: workshop1!

Click on the **customer-service** repository.

Create a new file in the root of the customer-service repository called Jenkinsfile with the following contents.

```
#!/usr/bin/groovy

def app_name = "customer";
def nexusUrl = "http://nexus-student-x-cicd.apps.ocpws.kee.vizuri.com";
def release_number;

node ("maven-podman") {
```

```
        stage('Checkout') {
                echo "In checkout"
                checkout scm

                if(BRANCH_NAME ==~ /(release.*)/) {
                        def tokens = BRANCH_NAME.tokenize( '/' )
                        branch_name = tokens[0]
                        branch_release_number = tokens[1]
                        release_number = branch_release_number
                }
                else {
                        sh (
                                        script: "mvn -B help:evaluate
-Dexpression=project.version | grep -e '^[^\\[]' > release.txt",
                                        returnStdout: true,
                                        returnStatus: false
                                        )
                        release_number = readFile('release.txt').trim()
                        echo "release_number: ${release_number}"
                }
        }

        stage('Build') {
                echo "In Build"
                sh "mvn -s configuration/settings.xml -Dnexus.url=${nexusUrl}
-DskipTests=true -Dbuild.number=${release_number} clean install"
        }

        stage ('Unit Test') {
                sh "mvn -s configuration/settings.xml -Dnexus.url=${nexusUrl}
-Dbuild.number=${release_number} test"
                junit "target/surefire-reports/*.xml"

                step([$class: 'XUnitBuilder',
                        thresholds: [
                                [$class: 'FailedThreshold', unstableThreshold: '1']
                        ],
                        tools: [
                                [$class: "JUnitType", pattern: "target/surefire-reports/*.xml"]
                        ]])
        }
```

```
}
```

Configure Jenkins Job to Build Code

Log into Jenkins.

http://jenkins-student-x-cicd.apps.ocpws.kee.vizuri.com/

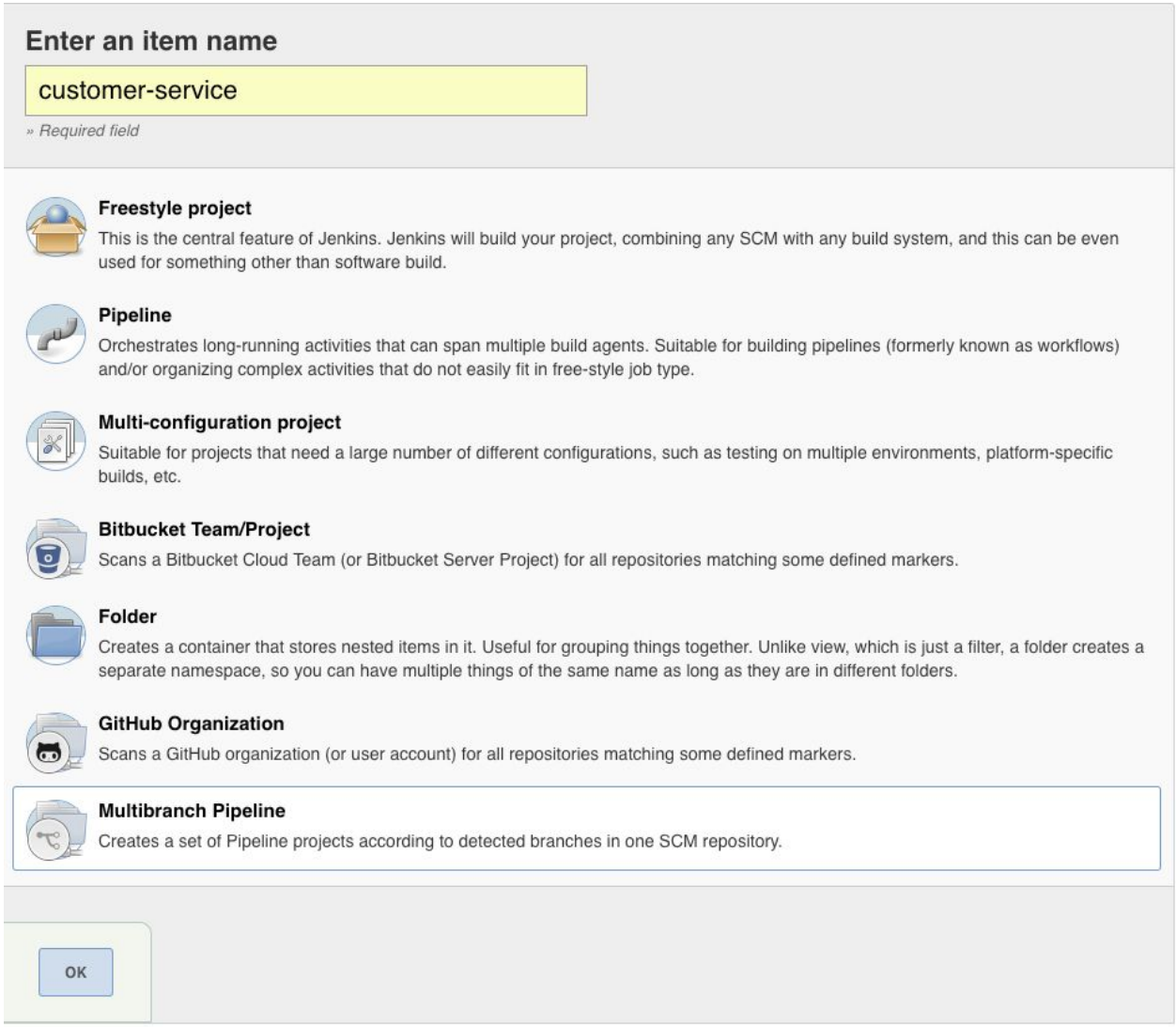
Username: student-x
Password: workshop1!

Click on **New Item**.

Enter the following values:

Enter an Item Name: customer-service

Choose: Multibranch pipeline

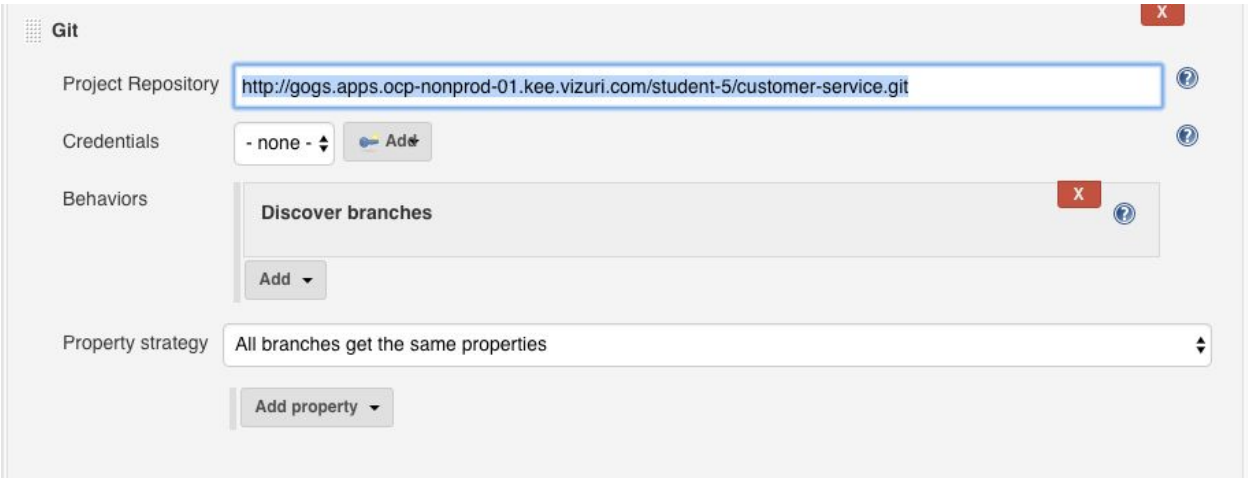


Click **OK** to Create the customer-service project.

Under Branch Sources, click **Add source->Gi**t.

Enter the following values:

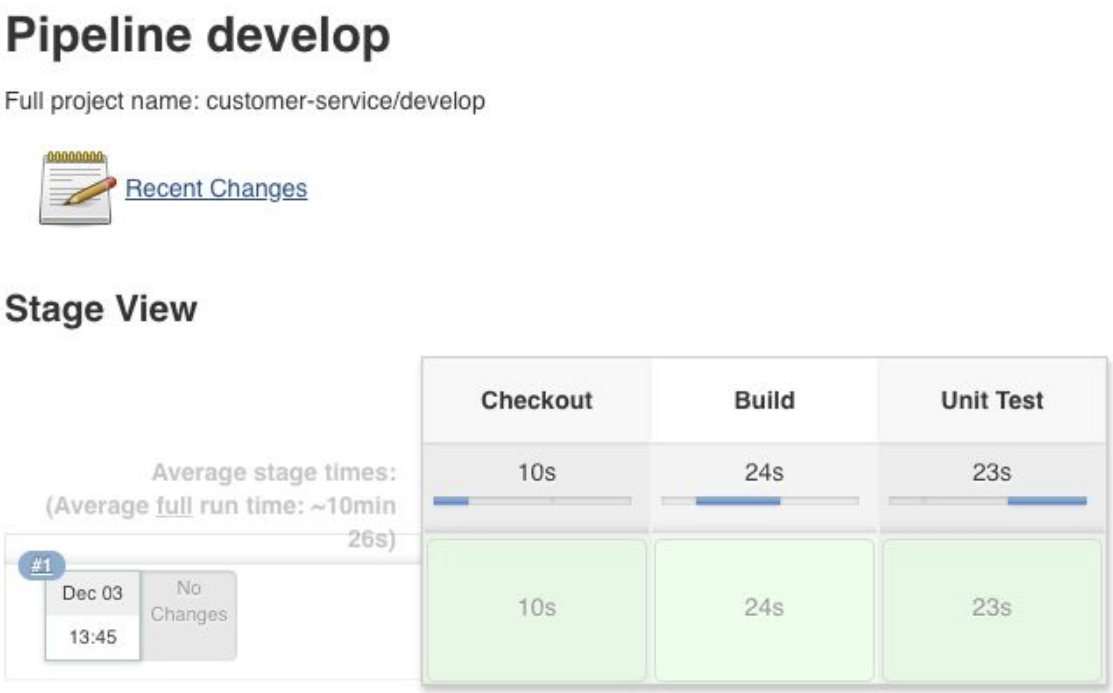
Project repository:
http://gogs.apps.ocp-nonprod-01.kee.vizuri.com/student-x/customer-service.git



Click **Save**.

This will trigger a build of you develop branch. Navigate to **customer-service->develop** to see the status of the build.

The Job should execute three stages; Checkout, Build and Unit Test.



Lab 4: Add SonarQube Code Analysis

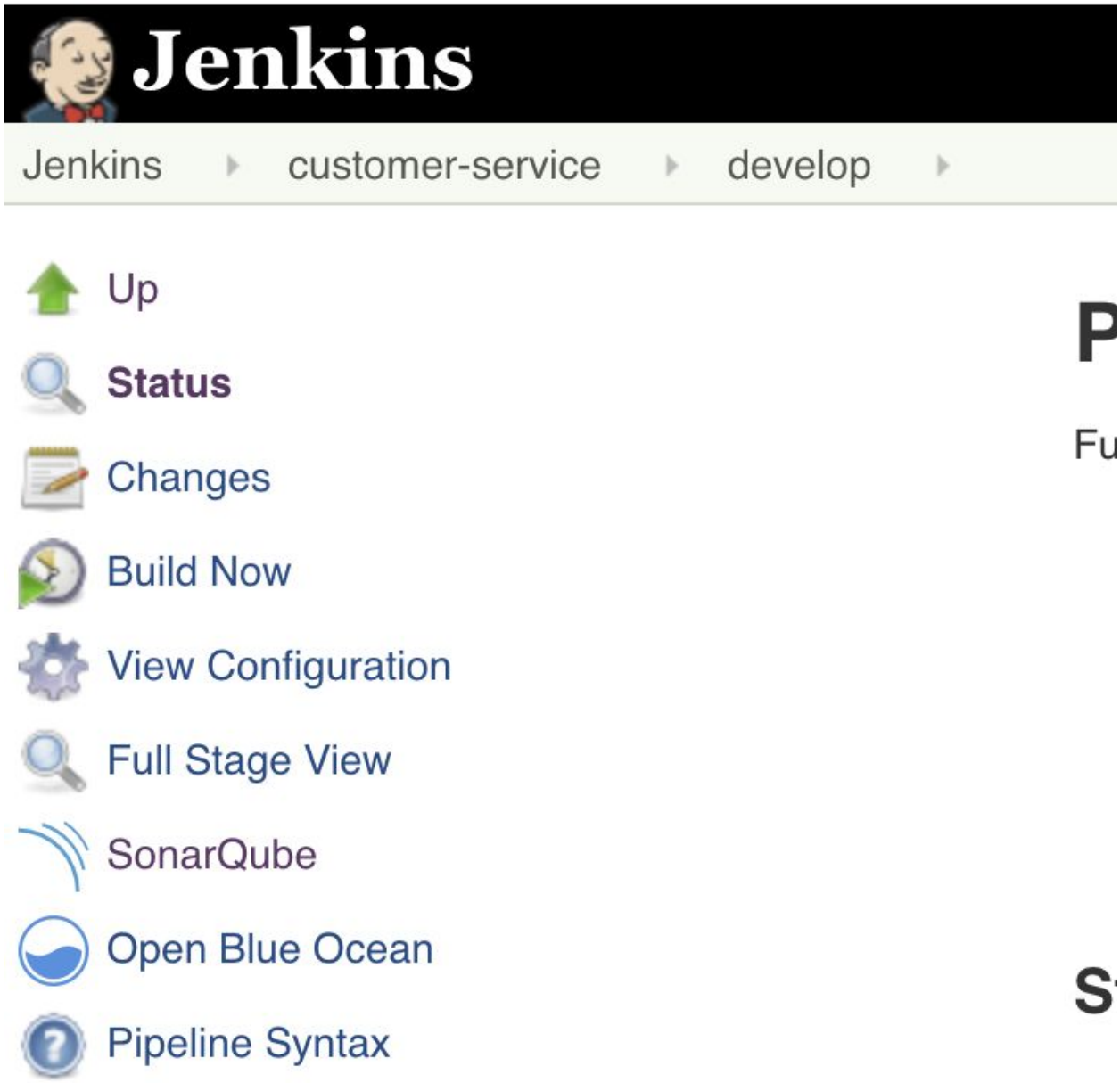
SonarQube analyzes the source code for common issue and test coverage.

Edit the Jenkinsfile for the customer-service project and add the following two stages to the build pipeline.

```
        stage ('Unit Test') {
                sh "mvn -s configuration/settings.xml -Dnexus.url=${nexusUrl}
-Dbuild.number=${release_number} test"
                junit "target/surefire-reports/*.xml"

                step([$class: 'XUnitBuilder',
                        thresholds: [
                                [$class: 'FailedThreshold', unstableThreshold: '1']
                        ],
                        tools: [
                                [$class: "JUnitType", pattern: "target/surefire-reports/*.xml"]
                        ]])
        }

        stage('SonarQube Analysis') {
                withSonarQubeEnv('sonar') { sh "mvn -s configuration/settings.xml
-Dnexus.url=${nexusUrl} -Dbuild.number=${release_number}  sonar:sonar" }
        }


        stage("Quality Gate"){
                timeout(time: 1, unit: 'HOURS') {
                        def qg = waitForQualityGate()
                        if (qg.status != 'OK') {
                                error "Pipeline aborted due to quality gate failure: ${qg.status}"
                        }
                }
        }
```

Rebuild Project.

Once complete, notice the SonarQube link on the left navigation. You can click this to see the results of the analysis.



Lab 5: Publish Build Artifact

The next step in the process is to publish the build artifact in our Nexus Repository.

Add the following stage to the Jenkins file.

```
        stage('Deploy Build Artifact') {
                sh "mvn -s configuration/settings.xml -DskipTests=true
-Dbuild.number=${release_number} -Dnexus.url=${nexusUrl} deploy"
        }
```

If you navigate to your nexus repository, you will see a snapshot version of the jar file in the maven-snapshots folder.

Lab 6: Container Build

Now we are going to build our container and publish it to our enterprise registry (Quay).

We will be using podman to build our container.

Add the following variables to the top of the Jenkinsfile.

```
def imageBase = "registry.kee.vizuri.com";
def imageNamespace = "student_x";
def registryUsername = "student-x"
def registryPassword = "workspace1!"
```

Add the following steps to the Jenkinsfile.

```
        def tag = "${release_number}"

        if (BRANCH_NAME ==~ /(develop|release.*)/) {
                stage('Container Build') {
                        sh "podman build -t
${imageBase}/${imageNamespace}/${app_name}:${tag} ."
                }

                stage("Container Push") {
                        if (BRANCH_NAME ==~ /(develop|release.*)/) {
                                sh "podman login -u ${registryUsername} -p
${registryPassword} ${imageBase}"
                                sh "podman push
${imageBase}/${imageNamespace}/${app_name}:${tag}"
                        }
```

```
        }
    }
```

If you log into the Quay registry, you will see your image.

https://registry.kee.vizuri.com/repository
Username: student-x
Password: workshop1!

Click on the customer repository then browse the tags. Notice the Security Scan tag. The image is queued for scanning. Once complete you will see the results of the scan.

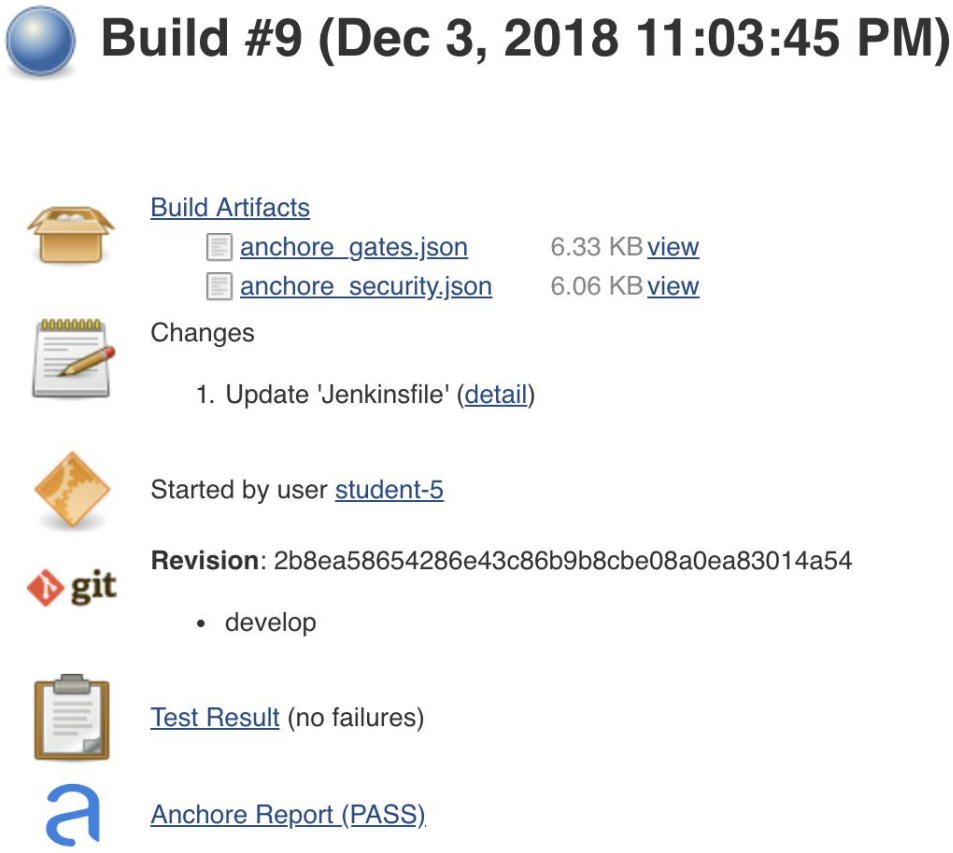
Lab 7: Scan Container Image

In the next step, we will scan the newly created image for issues and known vulnerabilities. We will be using the Jenkins Anchore Image Scanner for this task.

Add the following lines to the Jenkinsfile.

```
        if (BRANCH_NAME ==~ /(develop|release.*)/) {
            stage('Container Scan') {
                writeFile file: 'anchore_images', text:
"${imageBase}/${imageNamespace}/${app_name}:${tag} Dockerfile"
                anchore engineRetries: '800', name: 'anchore_images'
            }
        }
```

Once complete, you will see the Anchore Report Link associated with the build.



Lab 8: Deploy Image to OpenShift

Add configuration to Deploy the image to OpenShift.

Configure Jenkins OpenShift Client Plugin.

Get Jenkins Service Account Token from OpenShift to be used by the OpenShift Client Plugin.

Log into the OpenShift Console.

https://ocpws.kee.vizuri.com:8443

Navigate to the CICD Project.

Choose **Resources -> Secrets**

Locate one of the two jenkins-token-XXXXX secrets.

Click to view the secret
Click on **Reveal the Secret** to see the values.

Copy the value of the Token to be used below.

In Jenkins, click on **Manage Jenkins -> Configure System**.

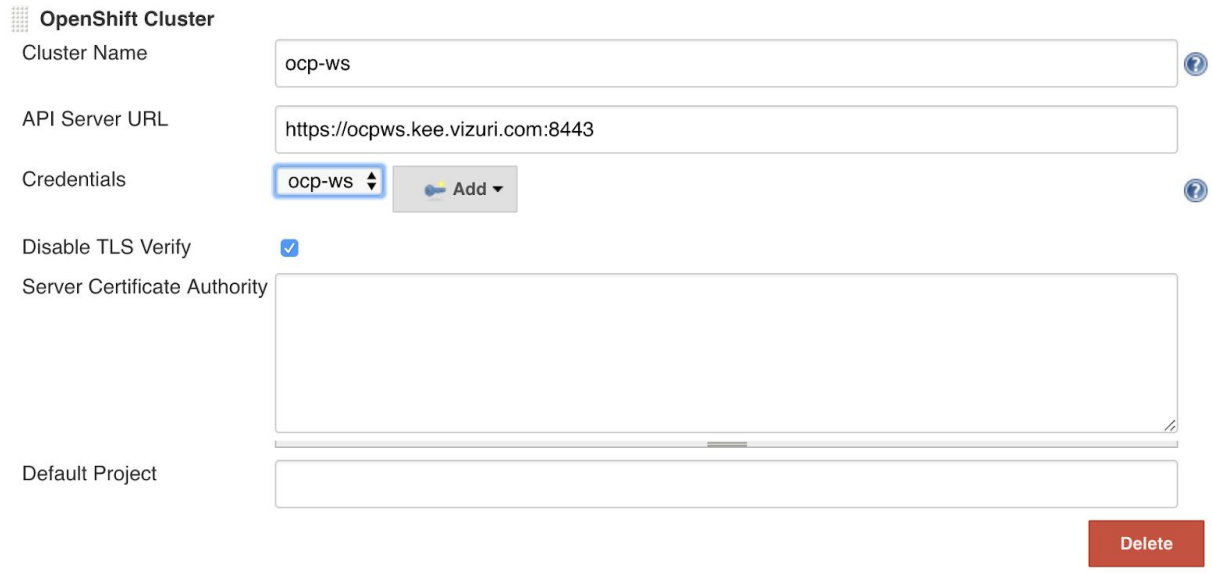
Scroll down to the OpenShift Client Plugin Section. Press the **Add OpenShift Cluster** button and choose **OpenShift Cluster**.

Enter the following values:

- Cluster name: ocp-ws
- API Server URL: https://ocpws.kee.vizuri.com:8443
- Disable TLS Verify: Check
- Credentials: Click Add and Select Jenkins to Create new Credentials.
    - Kind: OpenShift Token for OpenShift Client Plugin
    - ID: ocp-ws
    - Token: Past token retrieved above.

Click **Add** to create the new credential.

Select the new credential in the credentials drop down.



Click **Save** to update the Jenkins Plugin.

Update Jenkinsfile

Add the following variables to the top of your Jenkinsfile.

```
def ocp_cluster = "ocp-ws"
def ocpDevProject = "student-x-customer-dev"
def ocpTestProject = "student-x-customer-test"
def ocpProdProject = "student-x-customer-prod"
```

The add the following to the bottom of the Jenkinsfile.

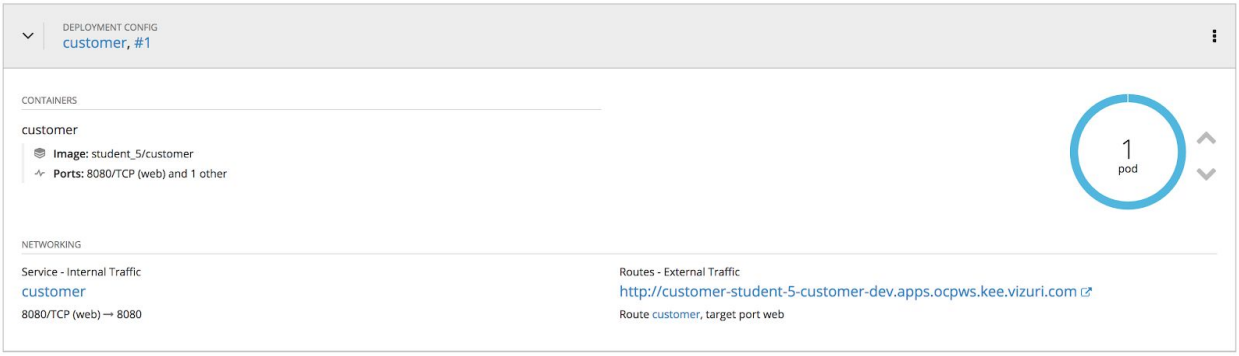
```
        if (BRANCH_NAME ==~ /(develop)/) {
                def ocp_project = ocpDevProject;
                stage("Deploy Openshift ${ocp_project}") {
                        openshift.withCluster( "${ocp_cluster}" ) {
                                openshift.withProject( "${ocp_project}" ) {
                                        def dc = openshift.selector("dc", "${app_name}")
                                        if(!dc.exists()) {
                                                dc = openshift.newApp("-f
https://raw.githubusercontent.com/Vizuri/openshift-cicd-pipeline/master/templates/springboot-
dc.yaml -p IMAGE_NAME=${imageBase}/${imageNamespace}/${app_name}:${tag} -p
```

```
APP_NAME=${app_name} -p DATABASE_HOST=customerdb -p DATABASE_DB=customer
-p DATABASE_USER=customer -p DATABASE_PASSWORD=customer").narrow("dc")
                                        }
                                        else {
                                                def dcObject = dc.object()
                                                dcObject.spec.template.spec.containers[0].image
= "${imageBase}/${imageNamespace}/${app_name}:${tag}"
                                                openshift.apply(dcObject)
                                        }

                                        def rm = dc.rollout()
                                        rm.latest()
                                        timeout(5) {
                                                def latestDeploymentVersion =
openshift.selector('dc',"${app_name}").object().status.latestVersion
                                                def rc = openshift.selector('rc',
"${app_name}-${latestDeploymentVersion}")
                                                rc.untilEach(1){
                                                        def rcMap = it.object()
                                                        return
(rcMap.status.replicas.equals(rcMap.status.readyReplicas))
                                                }
                                        }
                                }
                        }
                }
        }
```

Return to the customer-service develop job and trigger a build.

Once finished, you can log into OpenShift and navigate to the Customer Development project. You should now have a customer POD running.

Other Resources



Lab 9: Full Pipeline From Shared Library

In this lab, you will build a complete CI/CD pipeline. It builds Feature, Develop and Release Branch Jobs and Orchestrates a release from Dev->Test->Prod.

Review Pipeline Library Functions.

Browse openshift-cicd-pipeline github repository.

https://github.com/Vizuri/openshift-cicd-pipeline

Navigate to src -> com -> vizuri -> openshift.

Review the functions in PipelineSteps.groovy.

Next review the Pipeline defined in JavaDeliveryPipeline.groovy.

Update Jenkinsfile

Now back your Jenkinsfile to Jenkinsfile.BAC.

Update the Jenkins File with the following contents.

```
#!/usr/bin/groovy
@Library('github.com/vizuri/openshift-cicd-pipeline@master')
```

```
def javaDeliveryPipeline = new com.vizuri.openshift.JavaDeliveryPipeline();


javaDeliveryPipeline {
        ocpAppSuffix = 'apps.ocpws.kee.vizuri.com'
        imageNamespace = 'student_x';
        registryUsername = 'student-x'
        imageBase = 'registry.kee.vizuri.com'
        registryUsername = 'student-x'
        registryPassword = 'workshop1!'
        app_name = 'customer'
        ocp_dev_cluster = 'ocp-ws'
        ocp_dev_project = 'student-x-customer-dev'
        ocp_test_cluster = 'ocp-ws'
        ocp_test_project = 'student-x-customer-test'
        ocp_prod_cluster = 'ocp-ws'
        ocp_prod_project = 'student-x-customer-prod'
}
```

Configure Gogs Jenkins WebHook

Log into Gogs

http://gogs.apps.ocp-nonprod-01.kee.vizuri.com
Username: student-x
Password: workshop1!

Select the customer-service project.

Click on the **Settings** link in the top right.

Choose **Webhooks.**

Click **Add Webhook** and select **Gogs**.

Enter the following values.

Payload URL:
http://jenkins-student-x-cicd.apps.ocp-ws.kee.vizuri.com/gogs-webhook/?job=customer-service

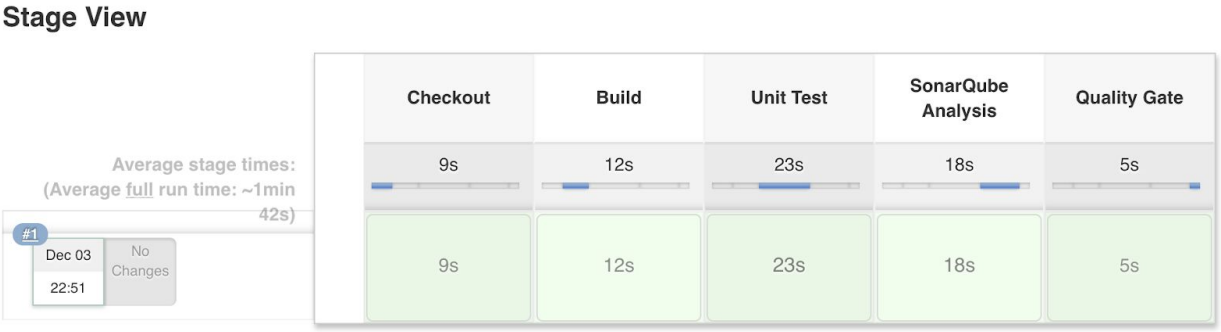
Click **Save.**

Test Feature Branch

Create a new branch called feature/Feature-1 in the Gogs Repository.

Watch build trigger a new Feature build.

The following steps will be executed.



Test Develop Branch

Create a Pull Request and merge the Feature Branch into the Develop Branch.

This will trigger the Develop branch build and deploy to development.

Release Develop Branch

Create a release branch called release/1.0

This will trigger a release pipeline.