JENKINS CONTAINER DEPLOYMENT ON DOCKER

ABSTRACT

This guide provides basic instructions to deploy Jenkins with various plugins for Continuous Integration (CI) and Continuous Delivery (CD) workflows in a virtualized environment. It leverages the Docker container platform to support deployment in either a cloud or local information system environment.

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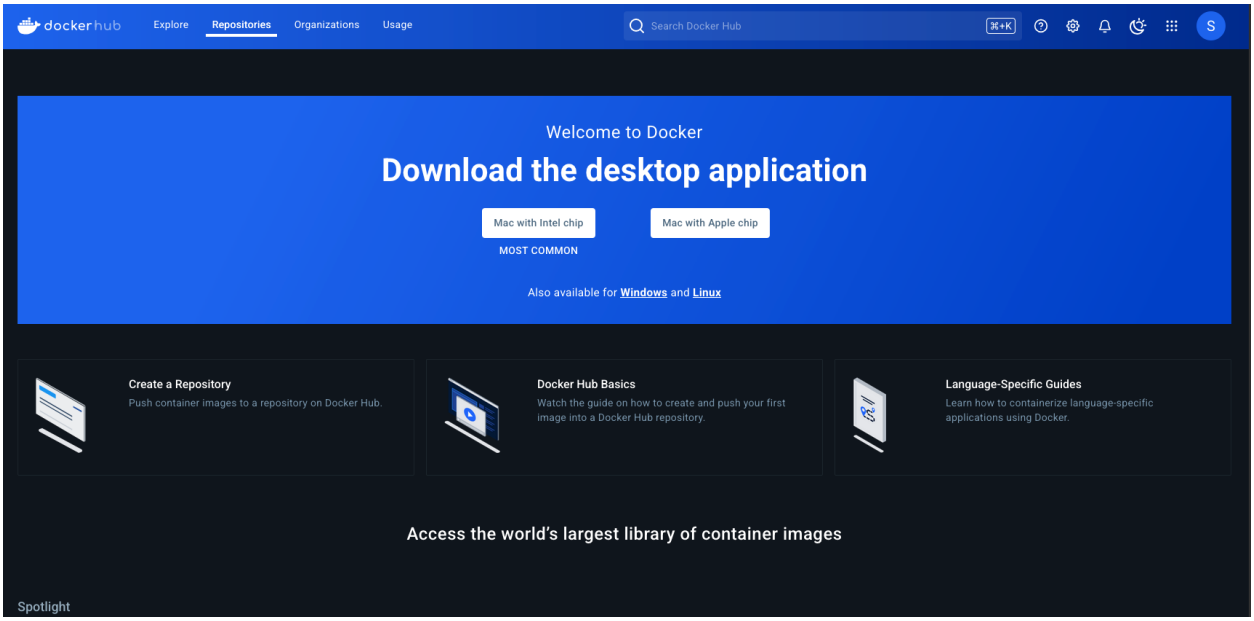
Docker Software Installation

Pre-requisites:

- Docker and Docker-compose installed via command-line using your operating system package installation software (e.g. Homebrew https://brew.sh/ for MacOS/Linux or Chocolatey https://chocolatey.org/ for Windows)
- Docker Desktop https://www.docker.com/products/docker-desktop/ to provide a graphical user interface. This is especially a good application to use if you are new to containers and Docker.
- A docker account to interact with docker services like Docker Hub, https://app.docker.com/login.

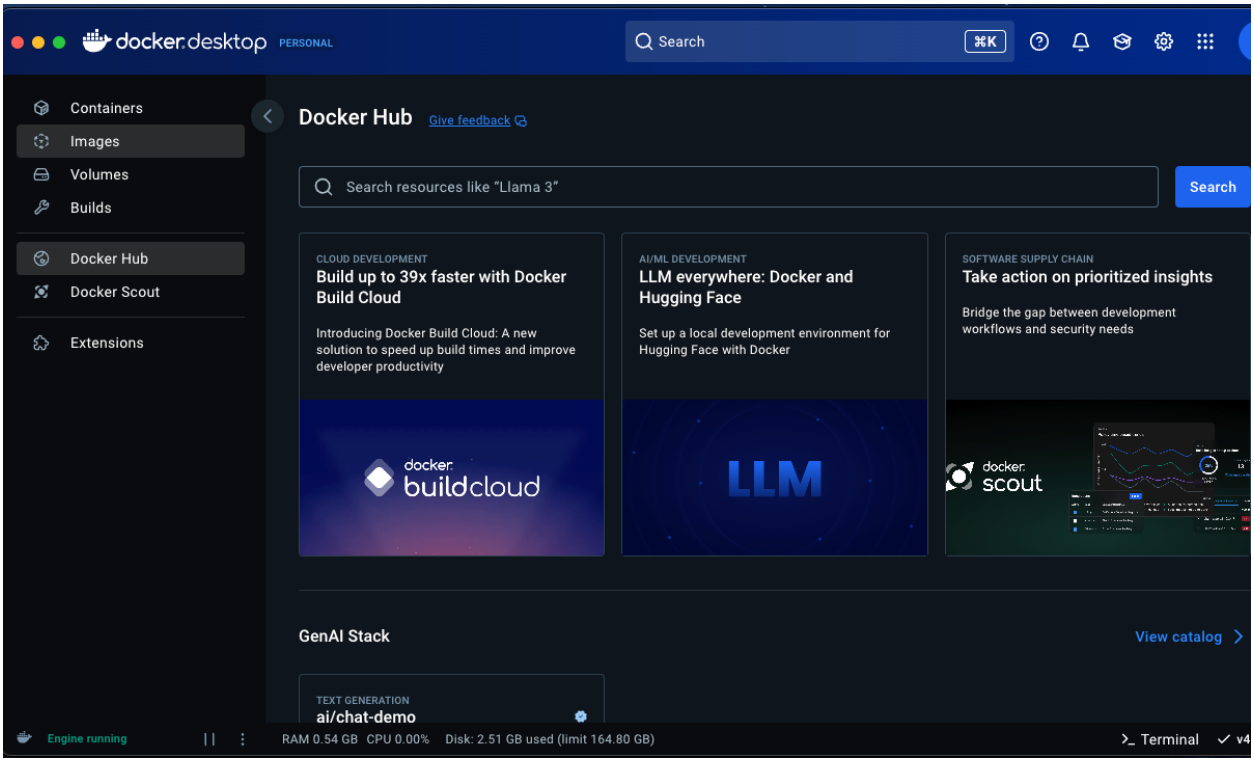
Note: To get familiar with Docker and running containers on docker Reference: https://www.docker.com/get-started/

1. Create an account on Docker Hub. https://hub.docker.com/



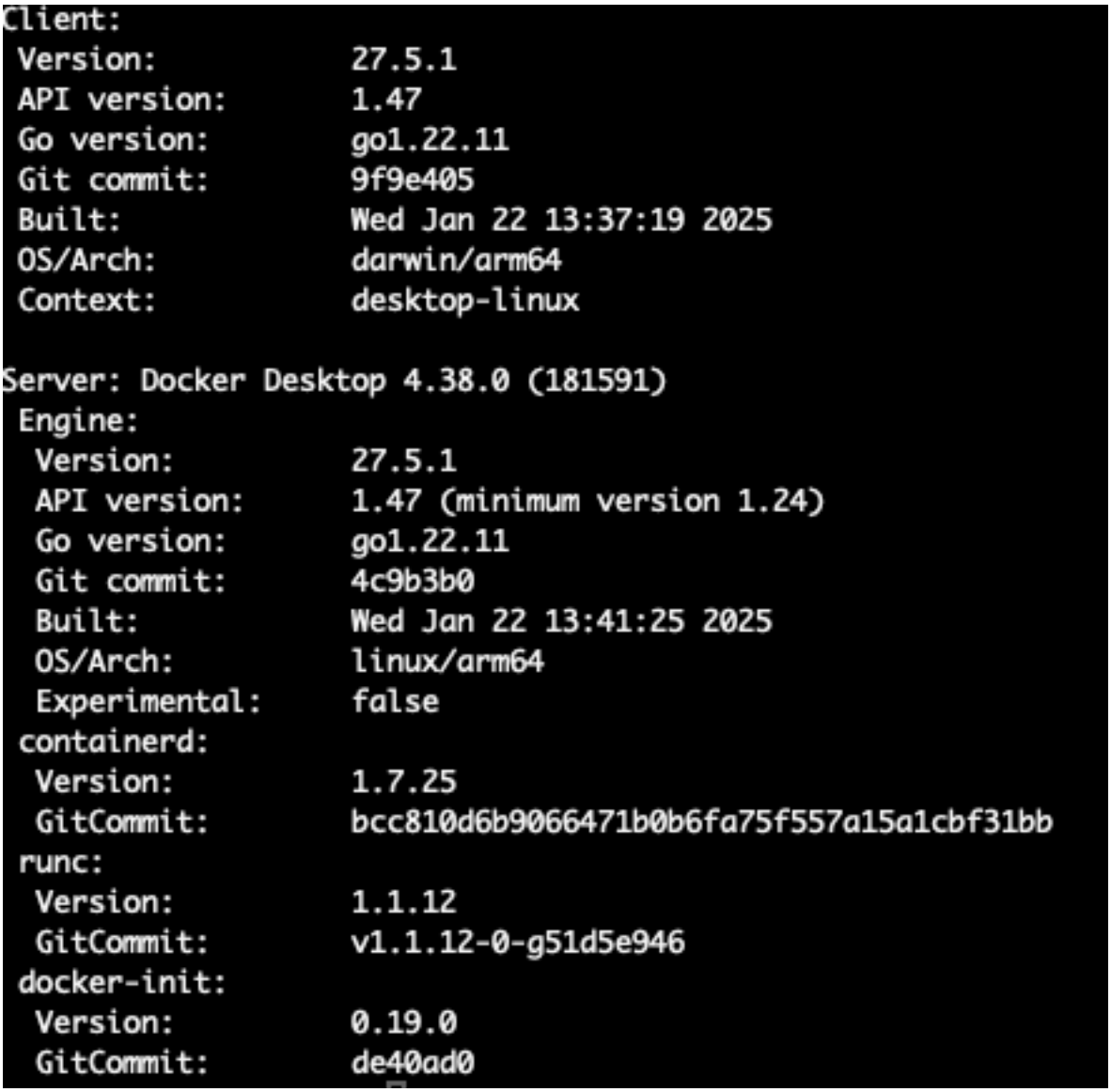
2. Once you have created an account on Docker Hub, download the docker desktop application for your operating system. Installing the Docker desktop application will include docker-compose as well. You will use Docker Hub to upload and download container images you create over time as you work with docker and containers.

3. Verify docker desktop is installed. After installing the docker desktop application, start the docker desktop application and login to your docker hub account using the docker application.



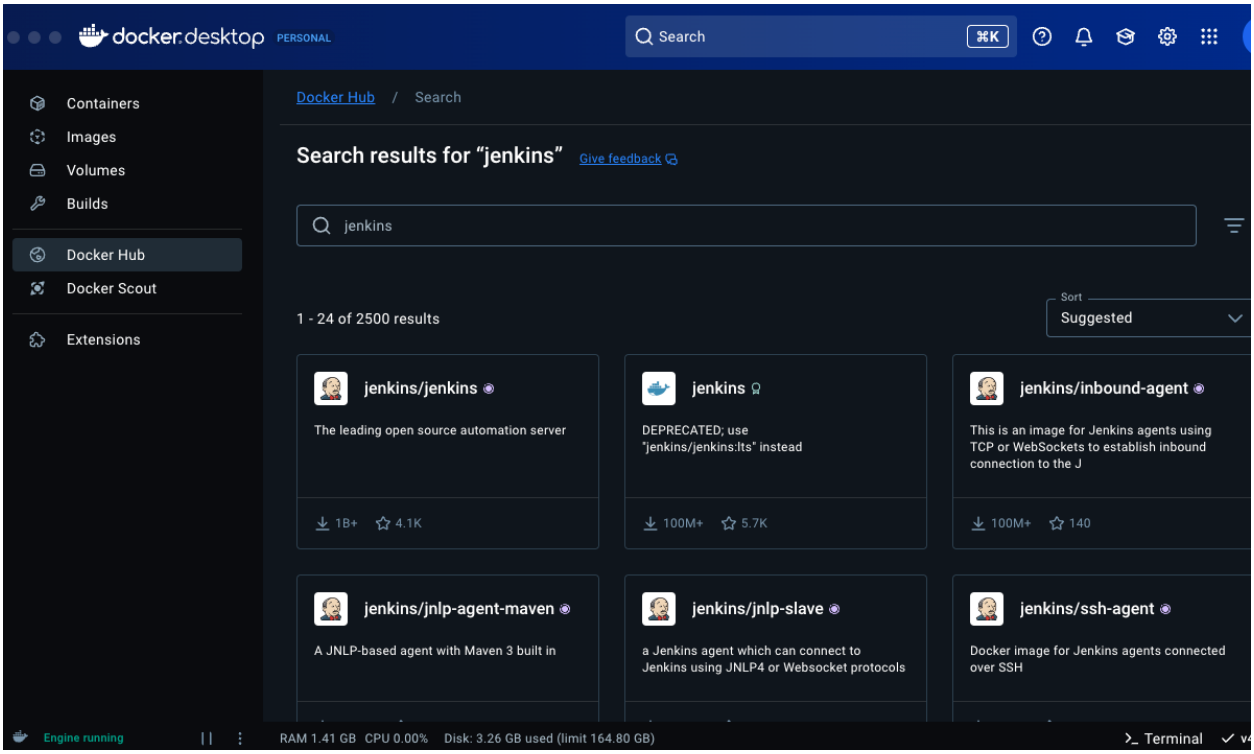
4. Verify docker command line works. **Note**: This is being run on MacOS. You should see similar output on a Linux or Windows based operating system.

$ docker version



Deploy a Jenkins Container

1. Search for the official Jenkins container image on Docker Hub using either Docker Desktop application or docker command line.



// Docker Command Line Example.

Note: You will see a long list of Jenkins images, but you will use the one named inventory/jenkins or jenkins/jenkins:lts. The "lts" is the long-term support version.

$ docker search Jenkins

```
NAME                          DESCRIPTION                                     STARS     OFFICIAL
jenkins/jenkins               The leading open source automation server       4085
jenkins                       DEPRECATED; use "jenkins/jenkins:lts" instead   5696      [OK]
jenkins/inbound-agent         This is an image for Jenkins agents using TC…   140
jenkins/jnlp-agent-maven      A JNLP-based agent with Maven 3 built in        10
jenkins/jnlp-slave            a Jenkins agent which can connect to Jenkins…   157
jenkins/ssh-agent             Docker image for Jenkins agents connected ov…   60
jenkins/slave                 base image for a Jenkins Agent, which includ…   50
jenkins/agent                 This is a base image, which provides the Jen…   74
jenkins/ssh-slave             A Jenkins slave using SSH to establish conne…   41
jenkins/jnlp-agent-ruby                                                       1
jenkins/jnlp-agent-docker                                                     11
jenkins/jnlp-agent-python     A JNLP-based agent with Python built in         4
jenkins/jnlp-agent-node                                                       1
```

2. In docker desktop select pull and the image will be downloaded to your information system. Once downloaded you should see it listed in the Docker Desktop application images inventory.

   Note: you can do the same from the command line:

```
$ docker pull jenkins/jenkins
Using default tag: latest
latest: Pulling from jenkins/jenkins
fa8785a0cbfc: Download complete
70ae892edd2c: Download complete
e228c44fff3b: Download complete
e474a4a4cbbf: Download complete
40375a76d092: Download complete
154b66b7ce12: Download complete
eeeada77dafa: Download complete
764eeac48f0c: Download complete
25617dd6d7e8: Download complete
03bb4613691f: Download complete
793748ac1b11: Download complete
8c3f2fecd07d: Download complete
Digest: sha256:119e9decb712ec14aace4343ac4203ef2ba4d6cb7dbcb5387c76b85b29dd15fd
Status: Downloaded newer image for jenkins/jenkins:latest
docker.io/jenkins/jenkins:latest
```

3. Log into the Docker Hub via the command line. You should see a similar result below. You can use either GitBash (on windows) or the terminal (on MacOS or Linux).

   // Docker login via command line example

   $ docker login Authenticating with existing credentials... Login Succeeded

4. Once you have successfully logged into docker, run the following command: docker run -p 8080:8080 -p 50000:50000 -v jenkins_home:/var/jenkins_home jenkins/jenkins:lts-jdk11

   Note: This is telling docker to perform the following tasks (in no specific order):

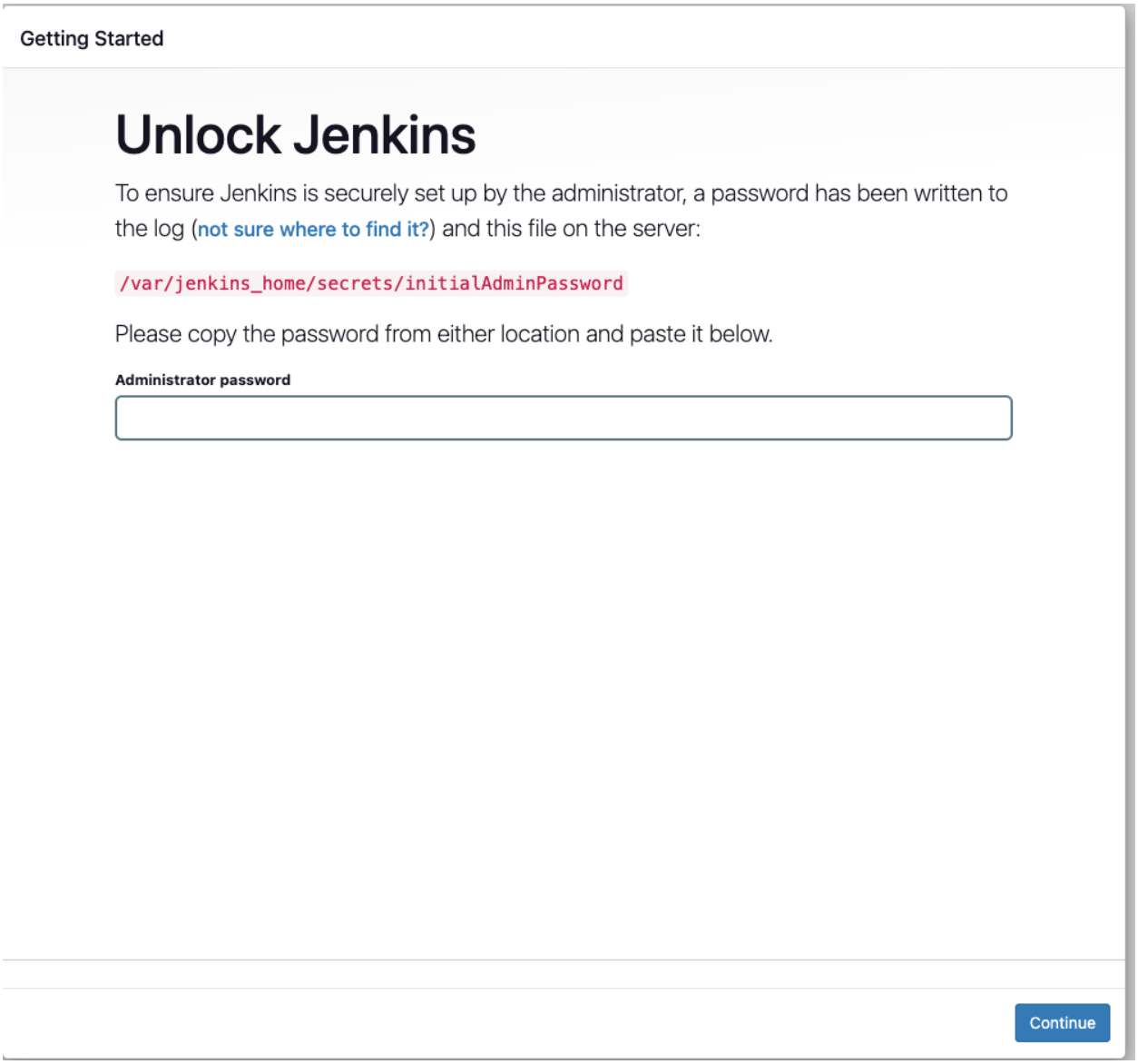
   - Create a container running on the information system
   - Map the computer that docker is running on to ports 8080 and 50000.
   - Create a folder named <jenkins_home> and map it to the containers folder </var/jenkins_home>.
   - Use the source image named jenkins:lts-jdk11

     // Docker run example

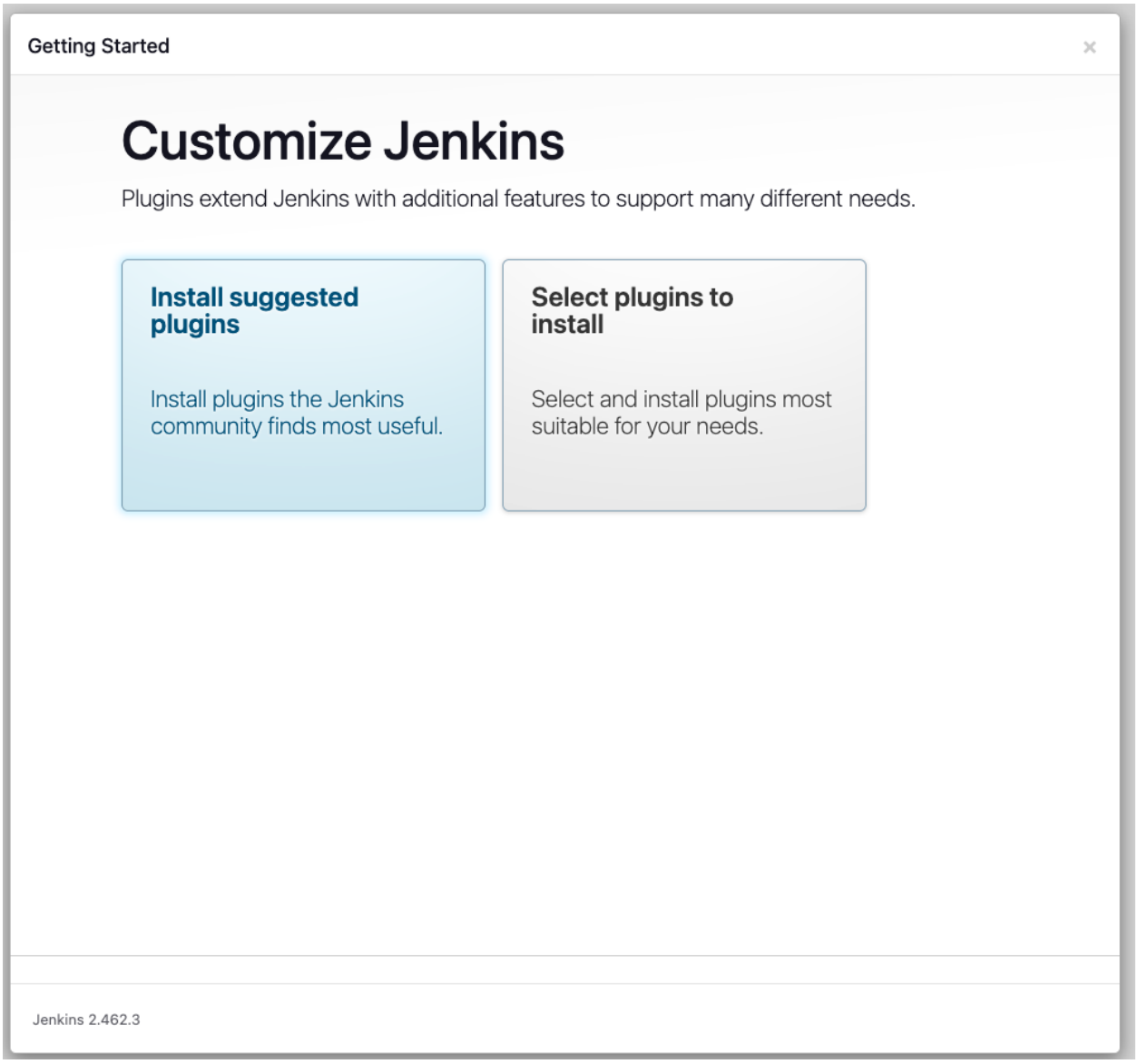
```
$ docker run -p 8080:8080 -p 50000:50000 -v jenkins_home:/var/jenkins_home jenkins/jenkins:lts-jdk11
Unable to find image 'jenkins/jenkins:lts-jdk11' locally
lts-jdk11: Pulling from jenkins/jenkins
8bbe33c1a45d: Download complete
f62c370bc989: Download complete
75d89130f4e0: Download complete
4760cf60c6e6: Download complete
6a4c33872faf: Download complete
5e0034fcdff5: Download complete
39252305a35d: Download complete
ec694b08d3fc: Download complete
6d11c181ebb3: Download complete
4a9739527a50: Download complete
a9af1892fb19: Download complete
1b4ed656dd0a: Download complete
Digest: sha256:6aa6c6bd7da914bf5333305c8102cb26965ea4b227e37f4269315725a2b0cd81
Status: Downloaded newer image for jenkins/jenkins:lts-jdk11
Running from: /usr/share/jenkins/jenkins.war
webroot: /var/jenkins_home/war
```

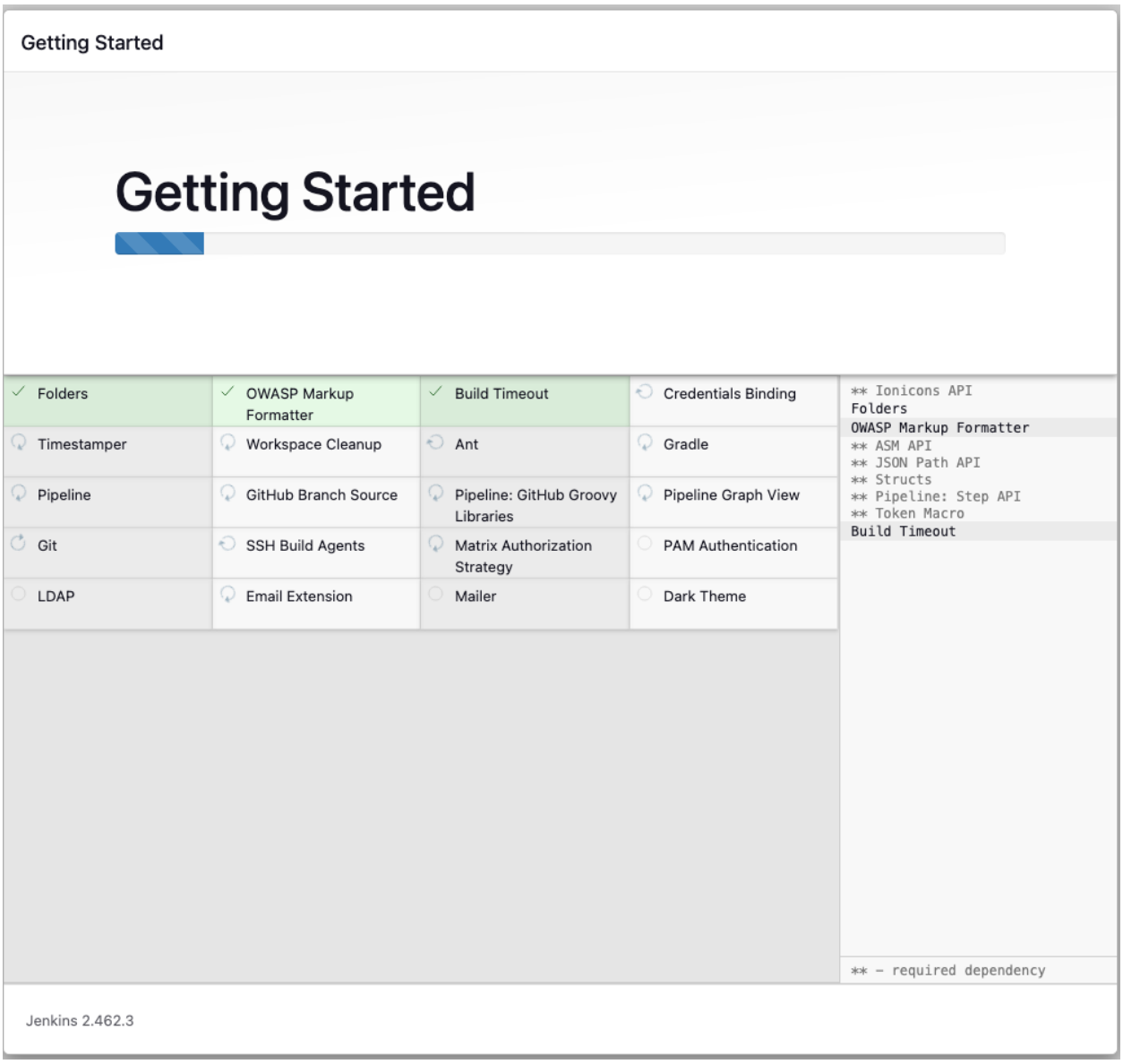
5. Locate the password created during the Jenkins container's initial startup. The password location will be in /var/jenkins_home/secrets/InitialAdminPassword

6. Access Jenkins via a web browser at the following URL: http://localhost:8080.
   Note: You will need the password you should have seen in the command line to login the Jenkins web portal.

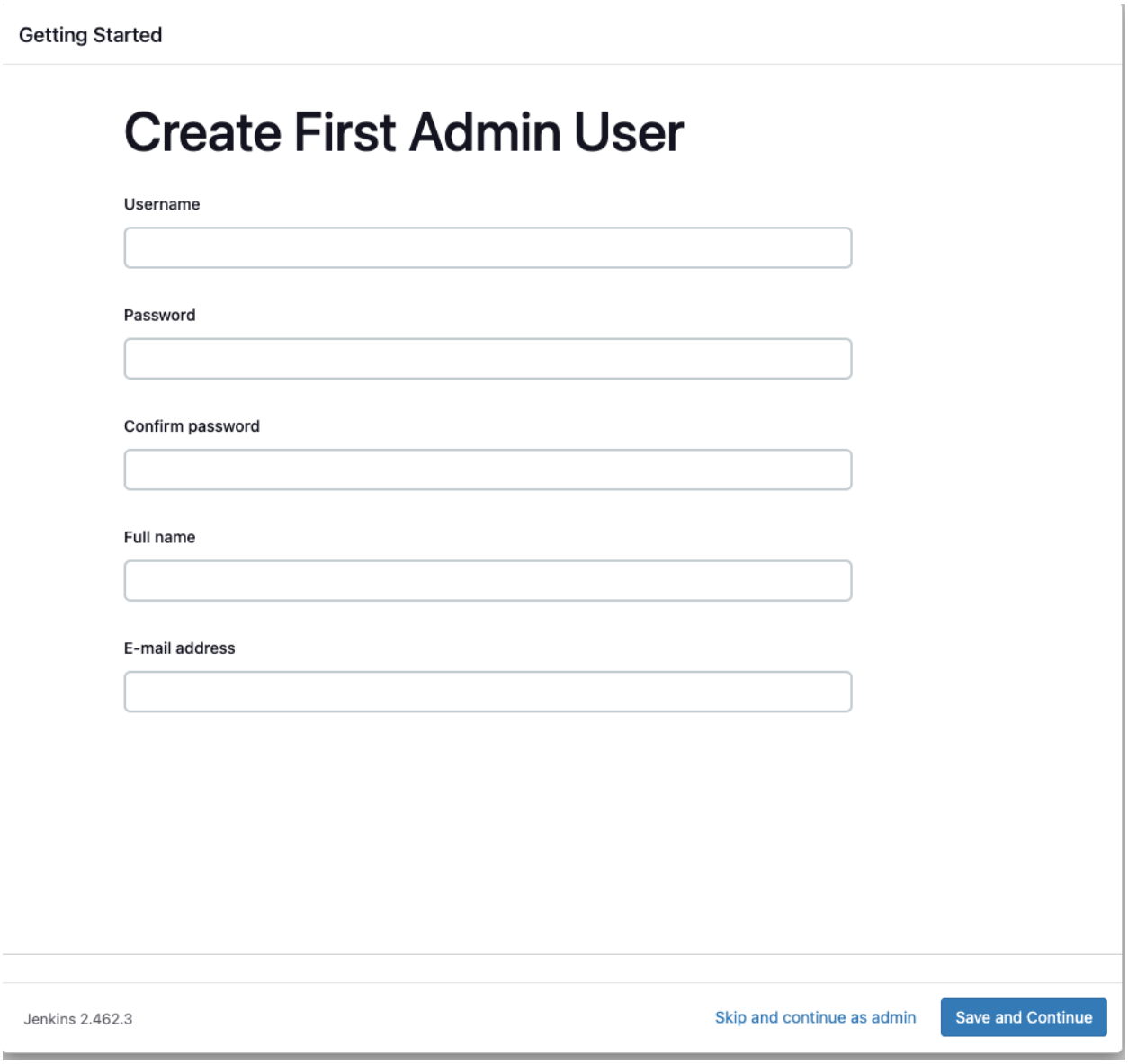


7. Select the recommended Jenkins plugins. This can take some time to finish. You will install additional plugins after the initial setup of Jenkins.

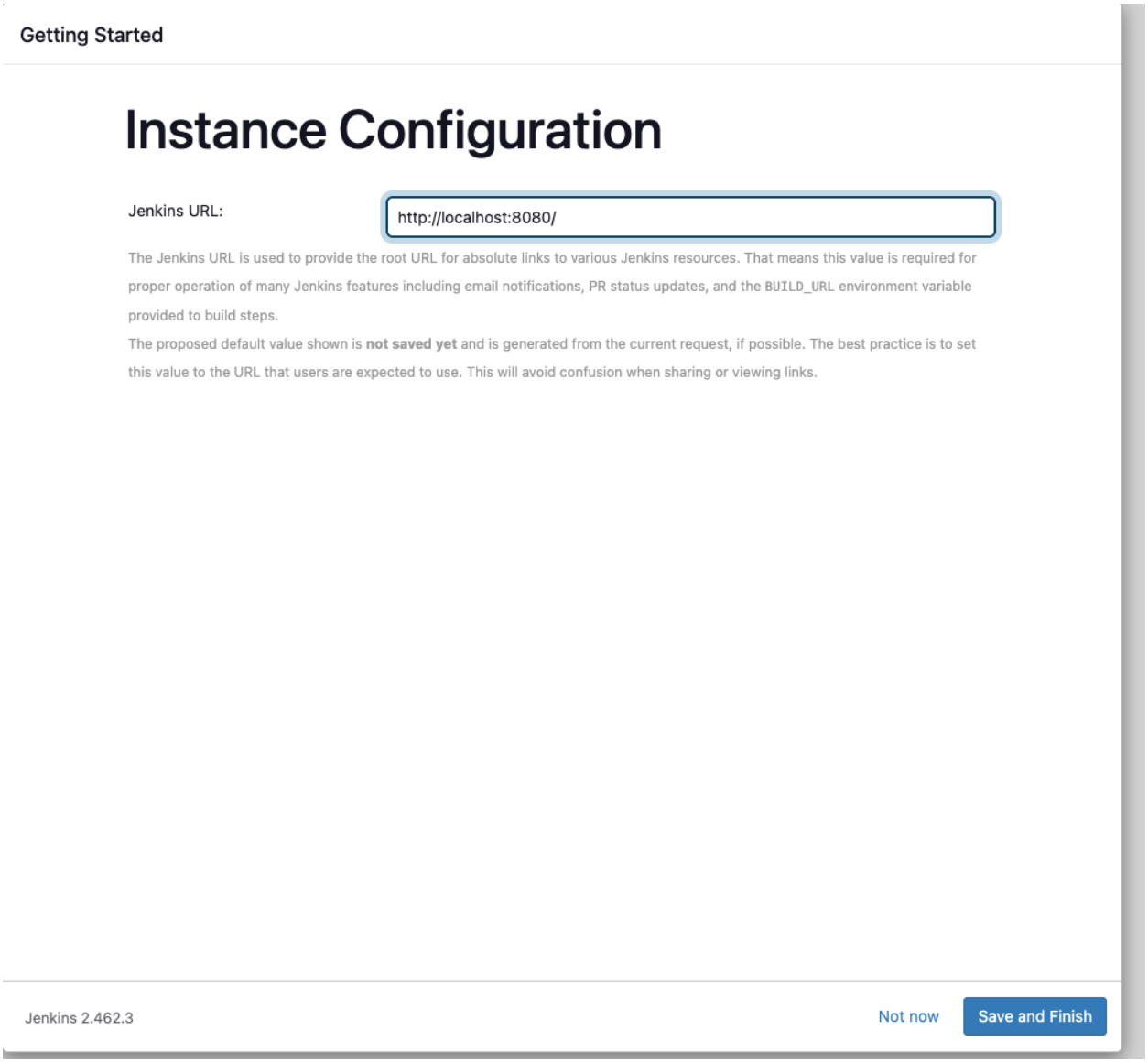



Getting Started
Getting Started
Folders
OWASP Markup Formatter
Build Timeout
Credentials Binding
Timestamper
Workspace Cleanup
Ant
Gradle
Pipeline
GitHub Branch Source
Pipeline: GitHub Groovy Libraries
Pipeline Graph View
Git
SSH Build Agents
Matrix Authorization Strategy
PAM Authentication
LDAP
Email Extension
Mailer
Dark Theme
** Ionicons API
Folders
OWASP Markup Formatter
** ASM API
** JSON Path API
** Structs
** Pipeline: Step API
** Token Macro
Build Timeout
** - required dependency
Jenkins 2.462.3

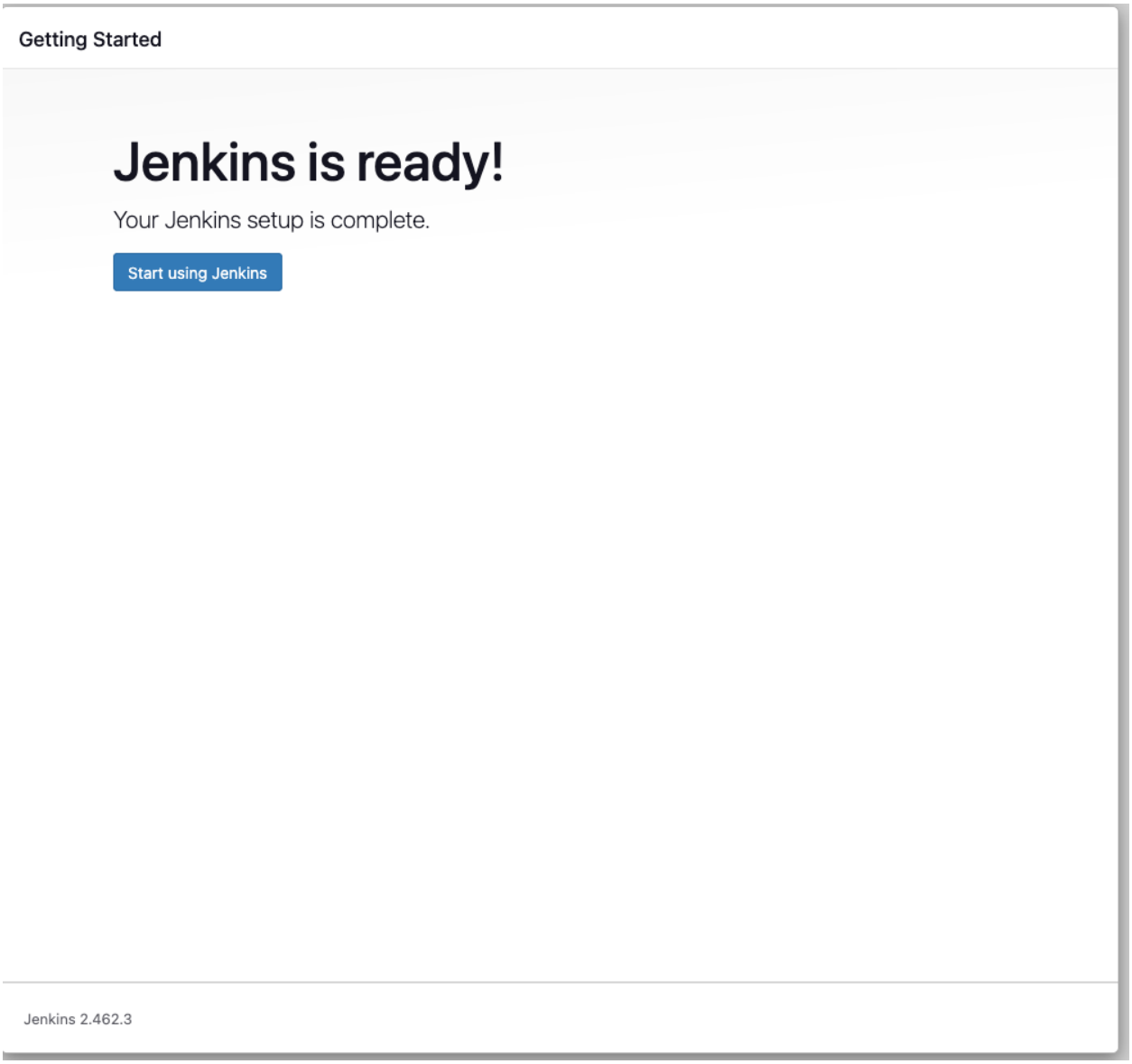
8. Create a new user account. Document the username and password you created during this step.



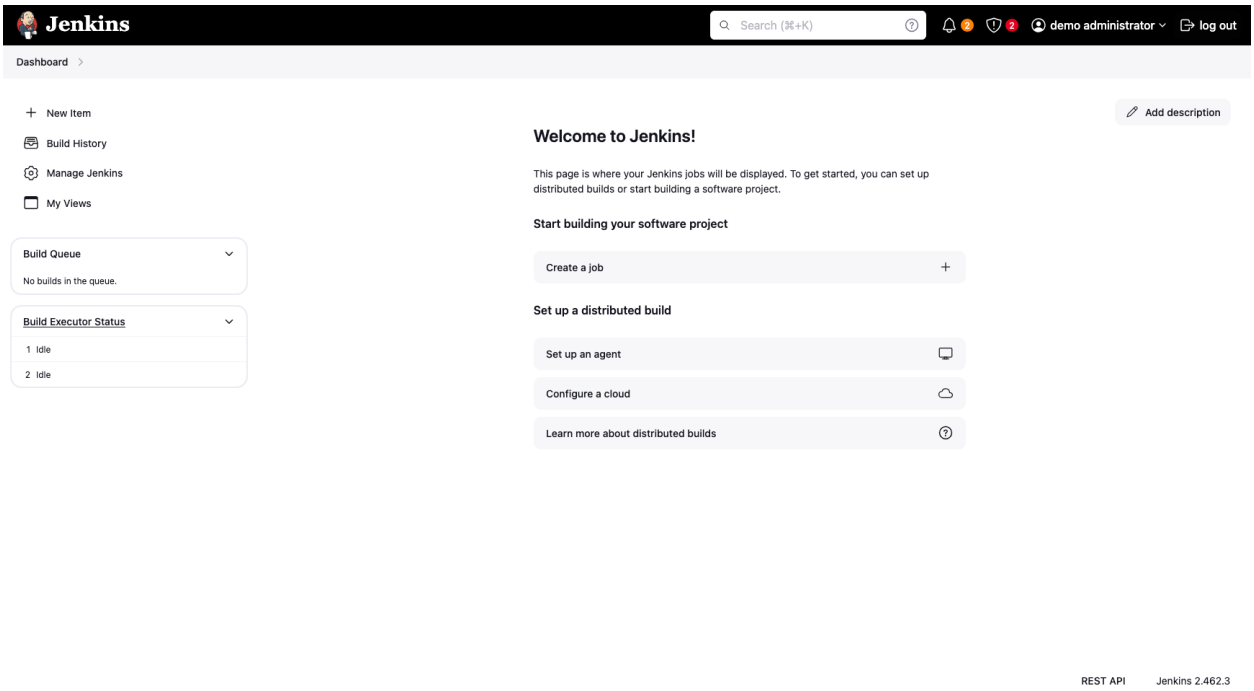
9. Set URL that you want jenkins to listen on. In this example that is http://localhost:8080.



10. If successful you should see the message "Jenkins is ready!" Select the "start using jenkins" button.



11. You should see a page stating, "Welcome to Jenkins!".



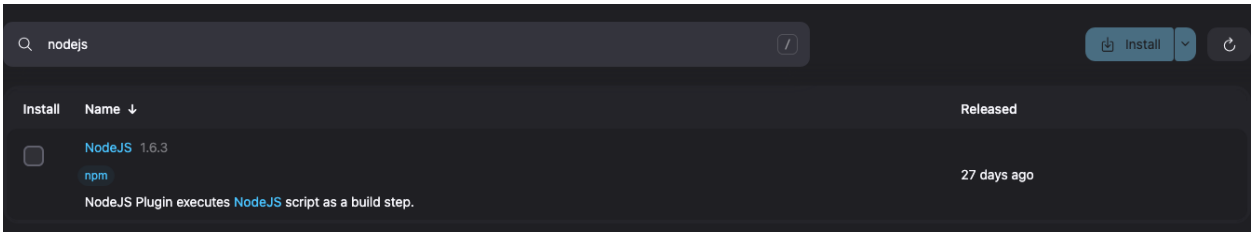
Advanced Jenkins Plugin Installation

Install additional plugins in the Jenkins software.

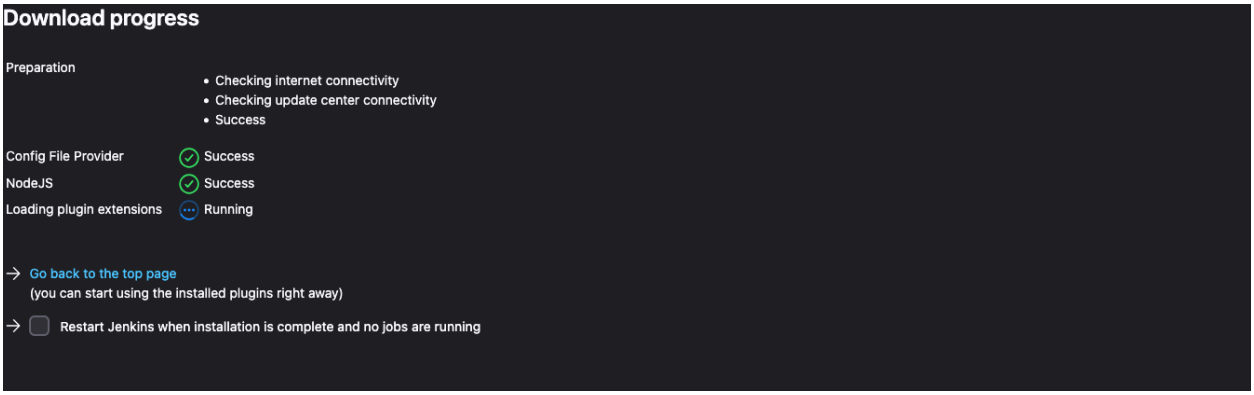
1. From the Dashboard, Clouds, install a plugin -- On the left-side of the webpage select available

2. In search window type the following keywords: AWS, GitHub, Google, GCP, SNYK, security, SonarQube, Terraform, Ansible, Docker, and Pipeline.

   After you input each search keyword, you should see a list of available plugins, for example input of keyword NodeJS, should show at least one available plugin (if it has not already been installed)



For each plugin you select the “install checkbox” to the left of the plugin you want installed in Jenkins and select the “Install” button on the upper right of the webpage.

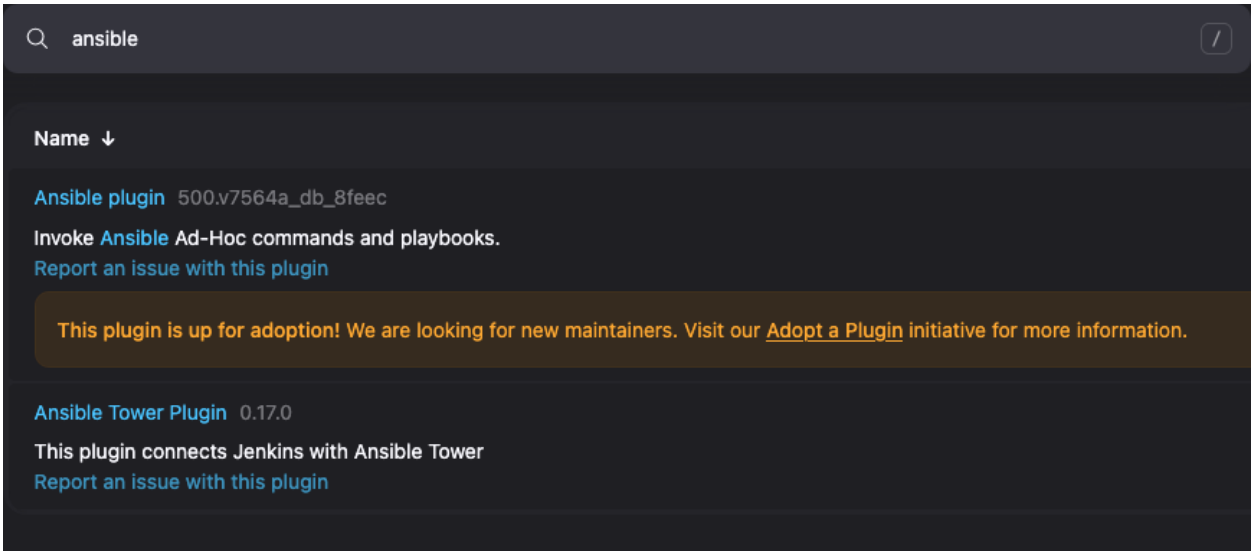


Specific plugins to select for the basic Jenkins will include plugins and associated software to support various CI/CD workflows including security scanners and various opensource and commercial software used in development, security and operational processes.

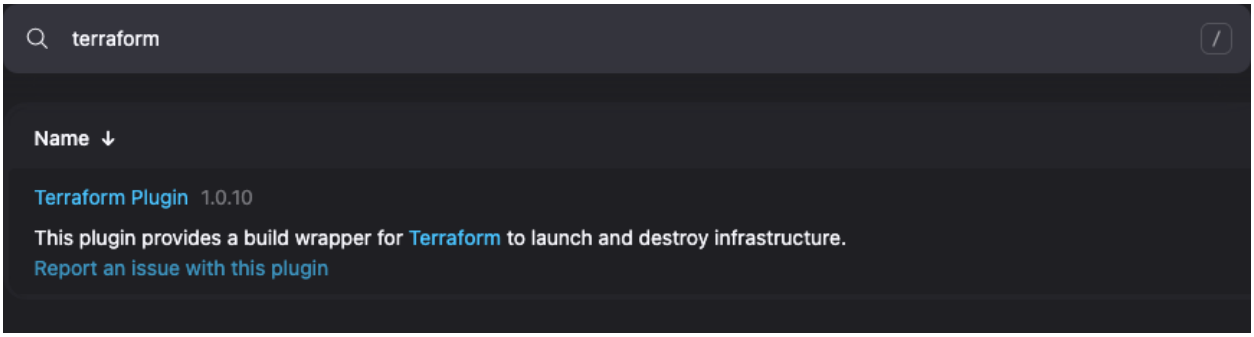
Not all use of each plugin or associated software will be demonstrated in this document as its purpose is to guide you to do a setup of the software to use from basic to advanced projects.

The minimum plugins are presented in screenshot format. Once you have selected and successfully installed these plugins your installation should look like the screenshot's below:

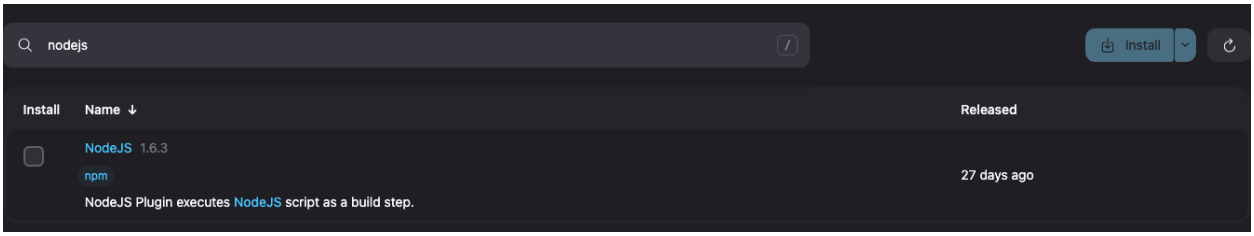
Ansible Plugins



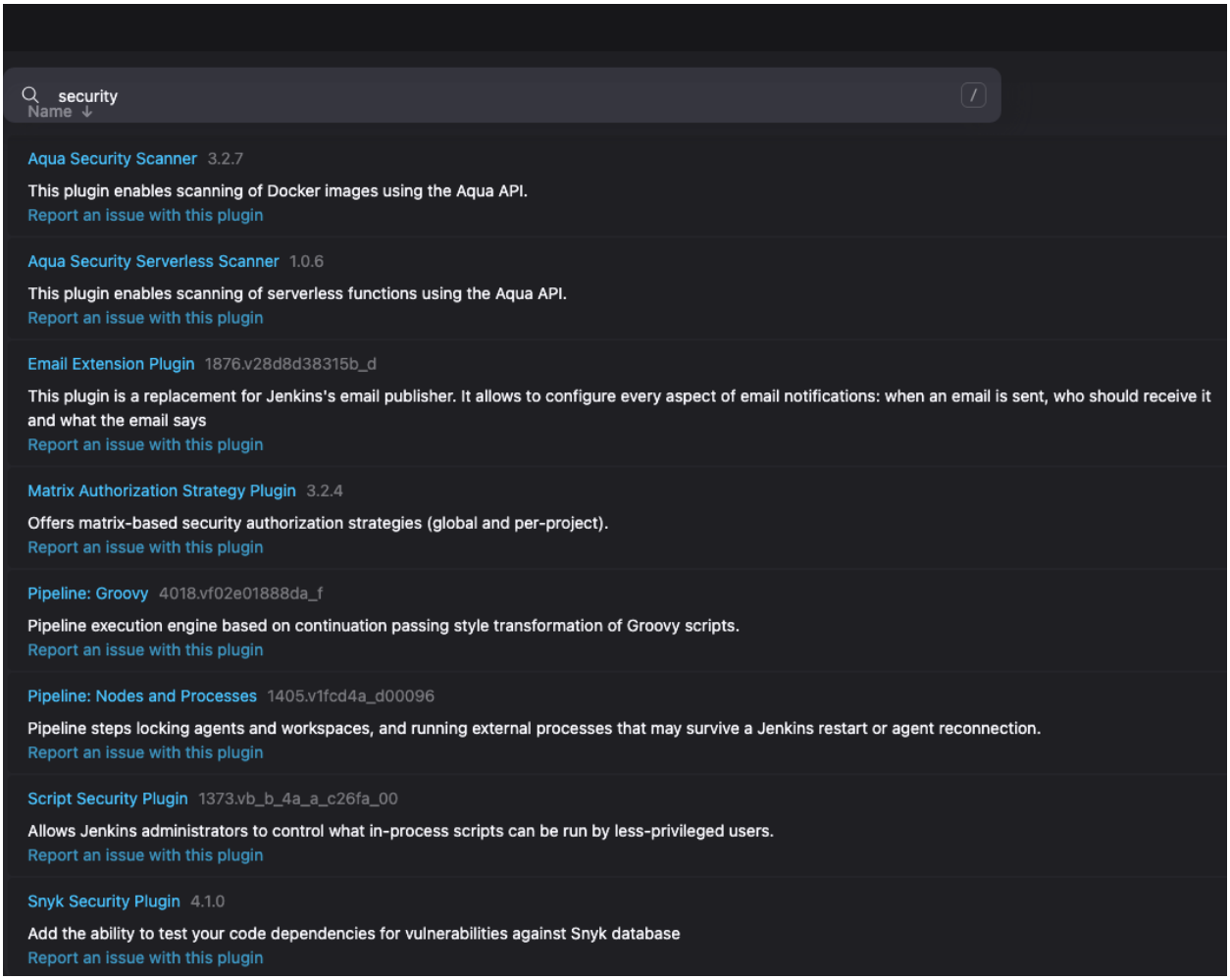
Terraform Plugins



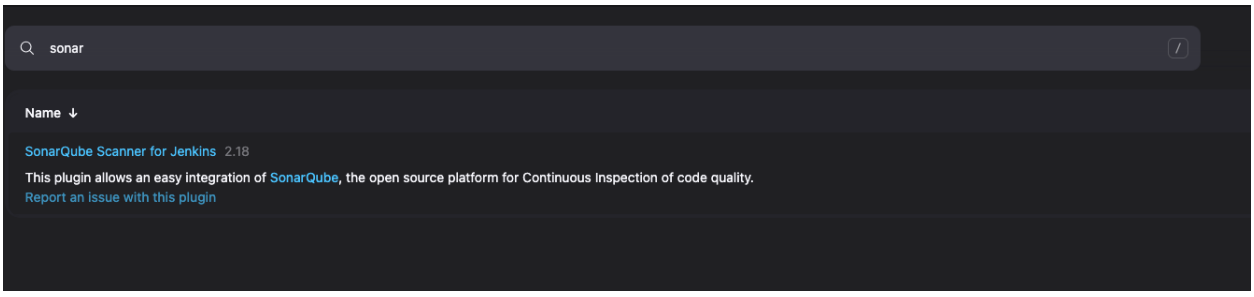
NodeJS Plugin



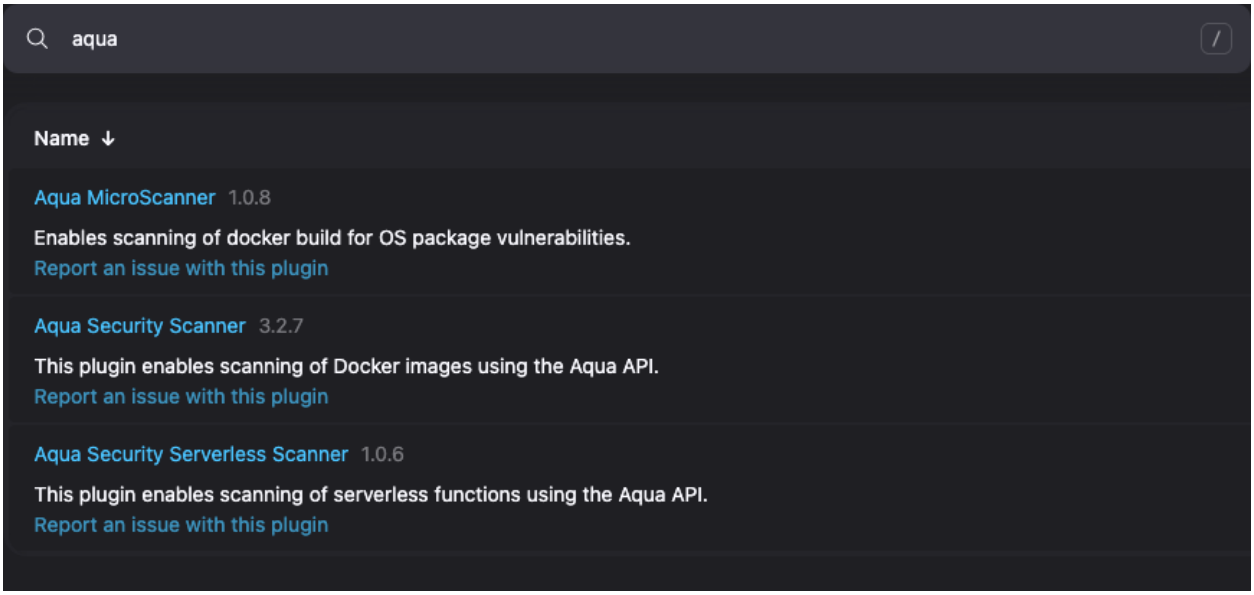
Security Plugins



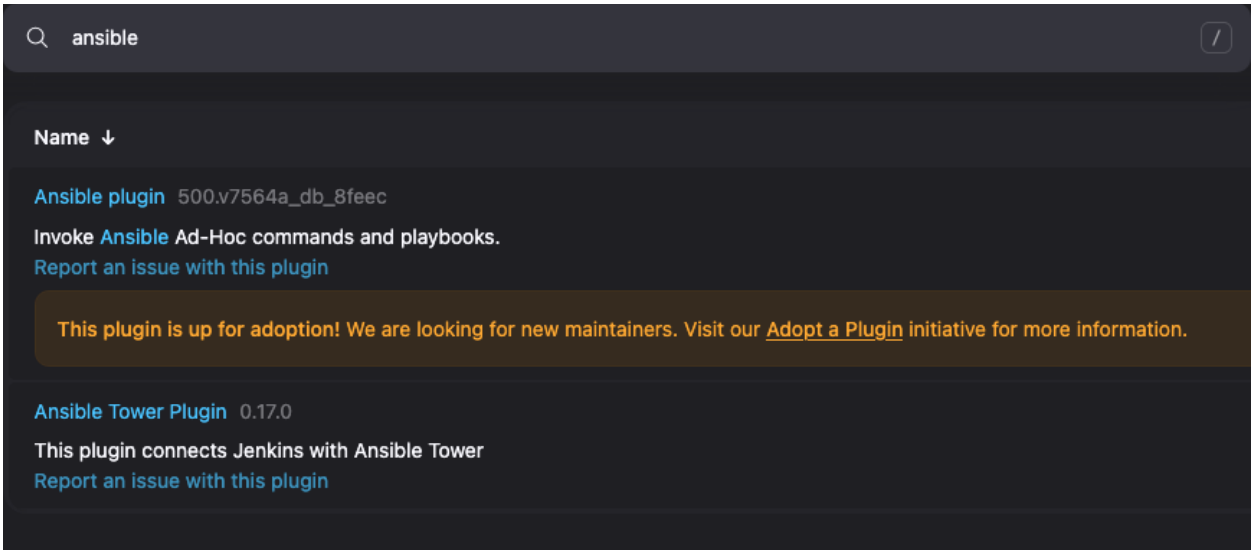
SonarQube Plugins



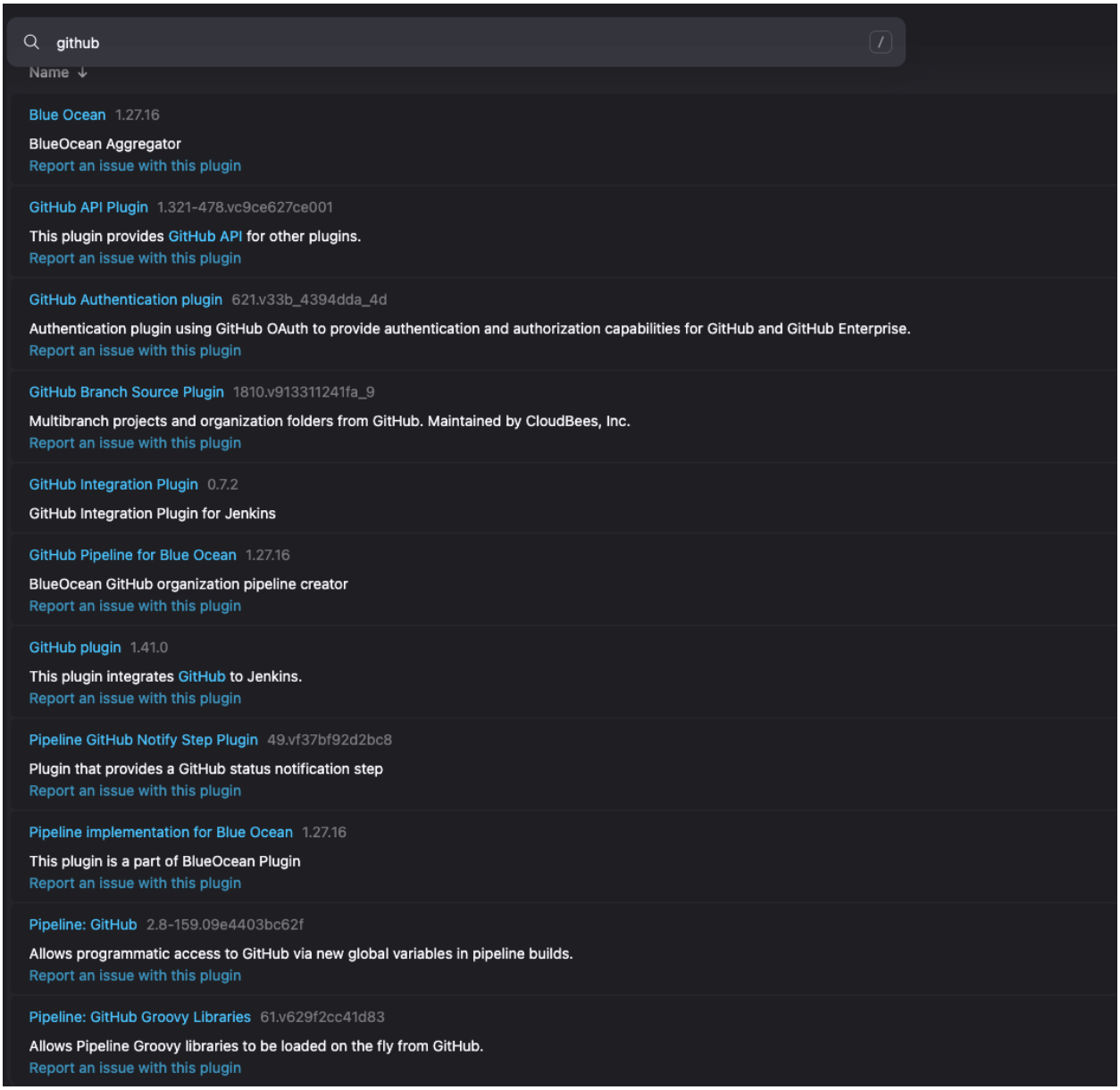
Aqua Plugins



Ansible Plugins



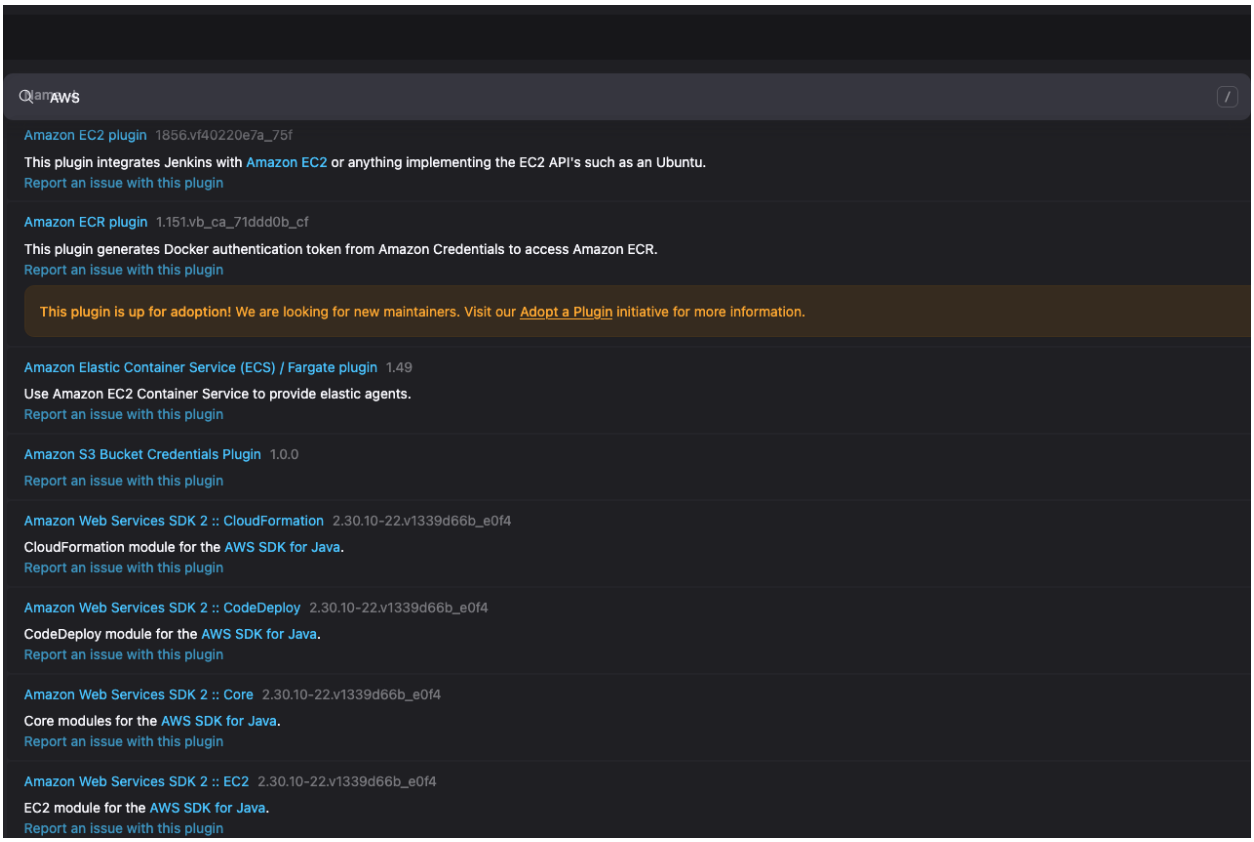
GitHub Plugins

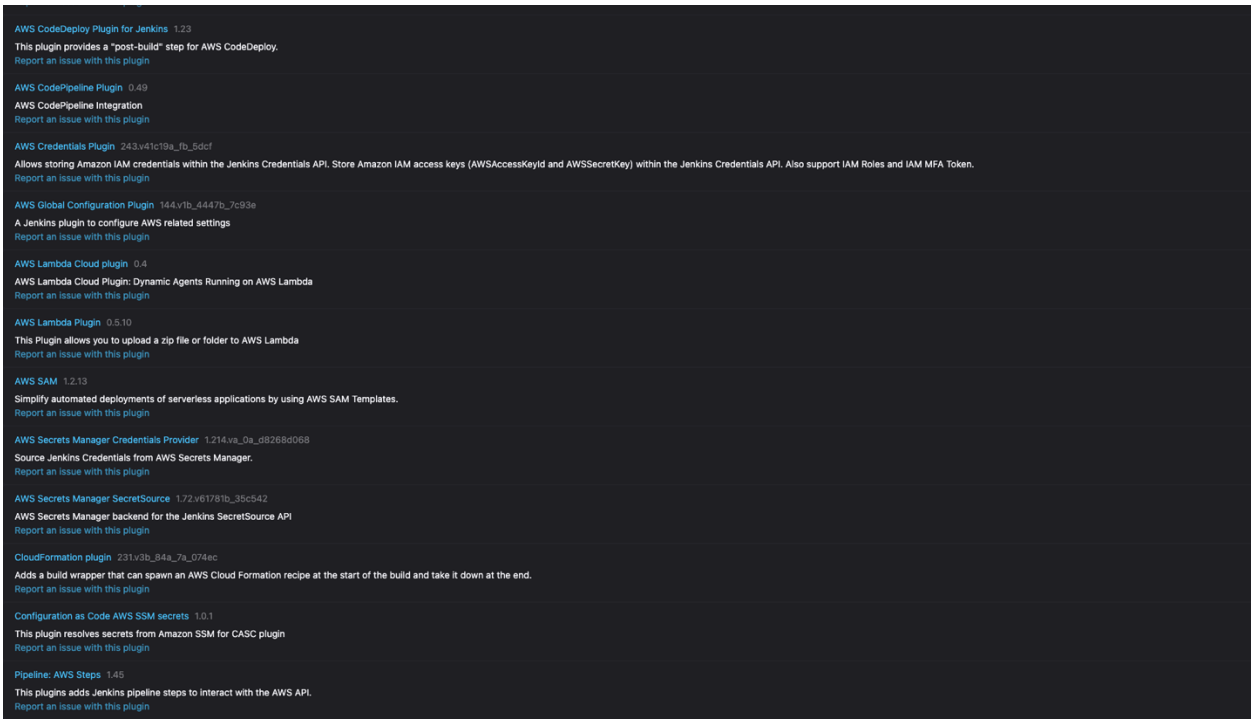


Amazon Web Services Plugins

For AWS there will be a significant number of plugins that will end up being installed either by the initial plugin steps and as you install other plugins. The list of plugins is provided, but a more detailed screenshot is also provided to help ensure you have all the plugins you may need for your projects.

- AWS Plugins:
  - AWS Credentials Pipeline
  - AWS Steps
  - Amazon EC2
  - Amazon Elastic Container Service (ECS)/Fargate
  - AWS CodeDeploy
  - AWS Lambda
  - Amazon S3 Bucket Credentials
  - AWS Codebuild
  - AWS CodePipeline
  - AWS Secrets Manager Secret
  - Source Configuration as Code AWS SSM secrets
  - CloudFormation
  - AWS SAM

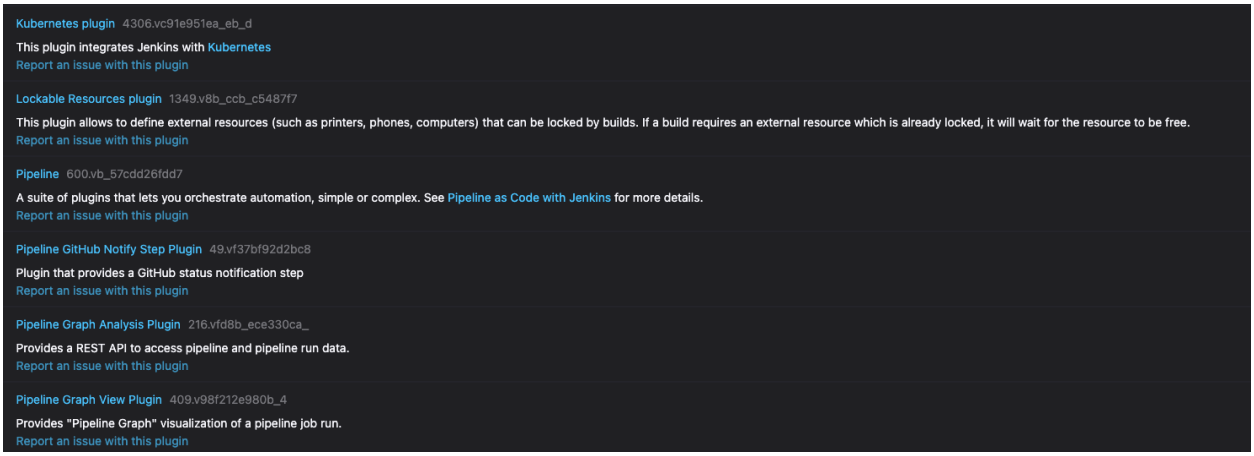

Q aws /
Amazon EC2 plugin 1856.vf40220e7a_75f
This plugin integrates Jenkins with Amazon EC2 or anything implementing the EC2 API's such as an Ubuntu.
Report an issue with this plugin
Amazon ECR plugin 1.151.vb_ca_71ddd0b_cf
This plugin generates Docker authentication token from Amazon Credentials to access Amazon ECR.
Report an issue with this plugin
This plugin is up for adoption! We are looking for new maintainers. Visit our Adopt a Plugin initiative for more information.
Amazon Elastic Container Service (ECS) / Fargate plugin 1.49
Use Amazon EC2 Container Service to provide elastic agents.
Report an issue with this plugin
Amazon S3 Bucket Credentials Plugin 1.0.0
Report an issue with this plugin
Amazon Web Services SDK 2 :: CloudFormation 2.30.10-22.v1339d66b_e0f4
CloudFormation module for the AWS SDK for Java.
Report an issue with this plugin
Amazon Web Services SDK 2 :: CodeDeploy 2.30.10-22.v1339d66b_e0f4
CodeDeploy module for the AWS SDK for Java.
Report an issue with this plugin
Amazon Web Services SDK 2 :: Core 2.30.10-22.v1339d66b_e0f4
Core modules for the AWS SDK for Java.
Report an issue with this plugin
Amazon Web Services SDK 2 :: EC2 2.30.10-22.v1339d66b_e0f4
EC2 module for the AWS SDK for Java.
Report an issue with this plugin

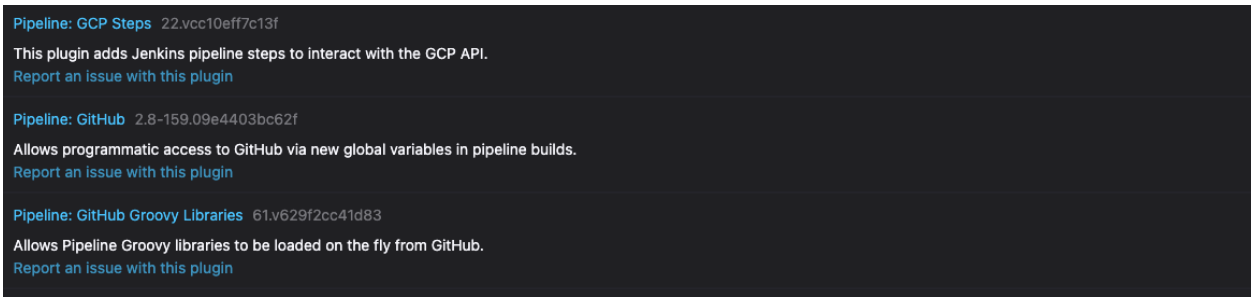

AWS CodeDeploy Plugin for Jenkins 1.23
This plugin provides a "post-build" step for AWS CodeDeploy.
Report an issue with this plugin
AWS CodePipeline Plugin 0.49
AWS CodePipeline Integration
Report an issue with this plugin
AWS Credentials Plugin 243.v41c19a_fb_5dcf
Allows storing Amazon IAM credentials within the Jenkins Credentials API. Store Amazon IAM access keys (AWSAccessKeyId and AWSSecretKey) within the Jenkins Credentials API. Also support IAM Roles and IAM MFA Token.
Report an issue with this plugin
AWS Global Configuration Plugin 144.v1b_4447b_7c93e
A Jenkins plugin to configure AWS related settings
Report an issue with this plugin
AWS Lambda Cloud plugin 0.4
AWS Lambda Cloud Plugin: Dynamic Agents Running on AWS Lambda
Report an issue with this plugin
AWS Lambda Plugin 0.5.10
This Plugin allows you to upload a zip file or folder to AWS Lambda
Report an issue with this plugin
AWS SAM 1.2.13
Simplify automated deployments of serverless applications by using AWS SAM Templates.
Report an issue with this plugin
AWS Secrets Manager Credentials Provider 1.214.va_0a_d8268d068
Source Jenkins Credentials from AWS Secrets Manager.
Report an issue with this plugin
AWS Secrets Manager SecretSource 1.72.v61781b_35c542
AWS Secrets Manager backend for the Jenkins SecretSource API
Report an issue with this plugin
CloudFormation plugin 231.v3b_84a_7a_074ec
Adds a build wrapper that can spawn an AWS Cloud Formation recipe at the start of the build and take it down at the end.
Report an issue with this plugin
Configuration as Code AWS SSM secrets 1.0.1
This plugin resolves secrets from Amazon SSM for CASC plugin
Report an issue with this plugin
Pipeline: AWS Steps 1.45
This plugins adds Jenkins pipeline steps to interact with the AWS API.
Report an issue with this plugin

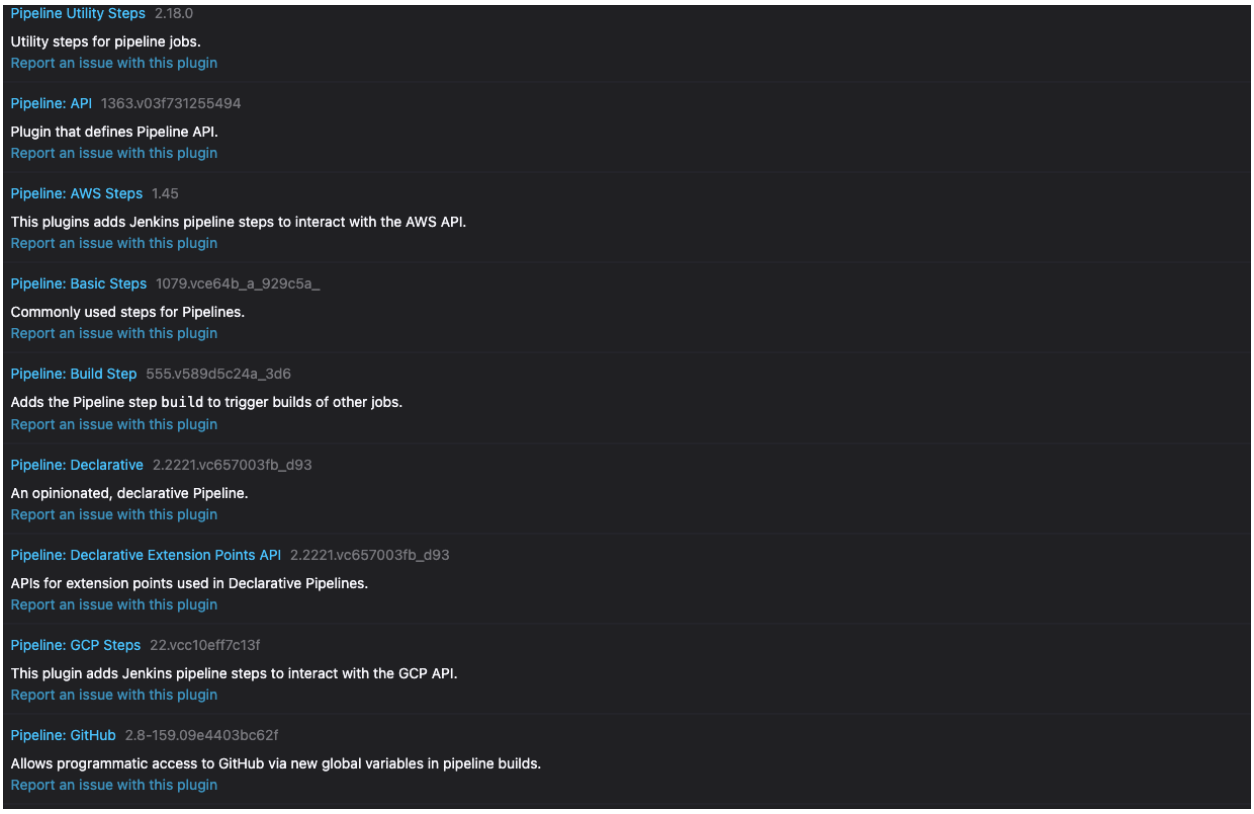
Pipelines Plugins

Note: Various plugins with the keyword pipeline will end up in your list of available and installed plugins as you work through selecting plugins for your jenkins installation. You should have the following plugins selected for installation when using the pipeline keyword.

- Kubernetes plugin
- Pipeline
- Pipeline GitHub Notify Step Plugin
- Pipeline Utility Steps
- Pipeline: AWS Steps
- Pipeline: Build Step
- Pipeline: GitHub
- Pipeline: Groovy
- Pipeline: MultiSteps

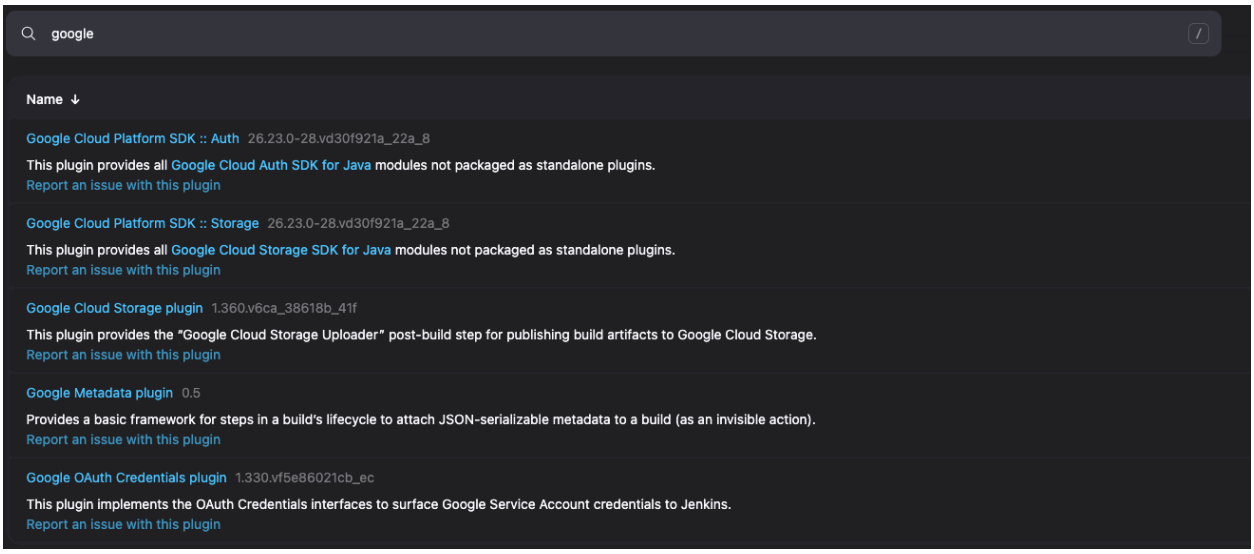


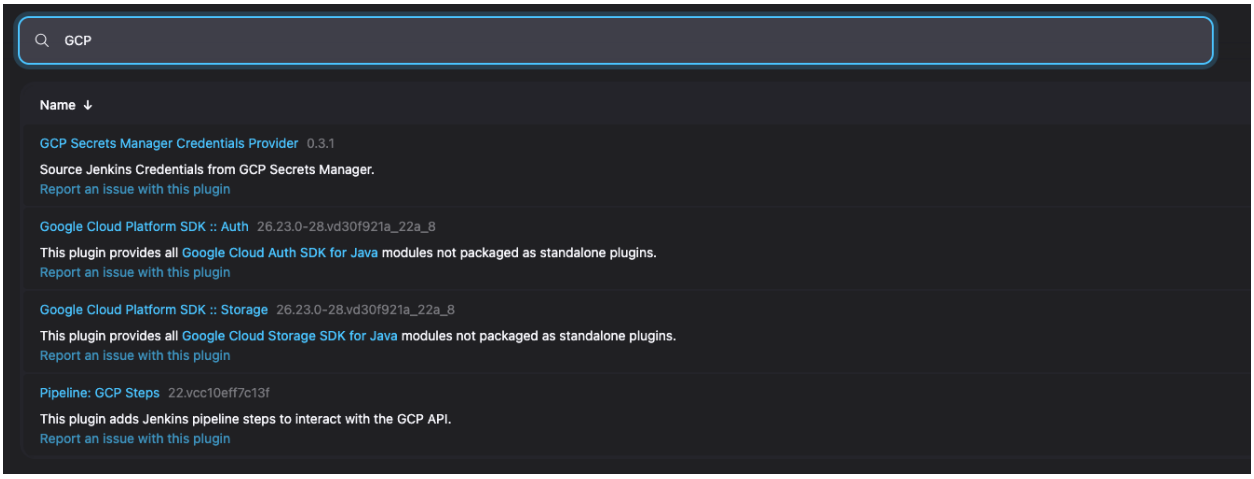




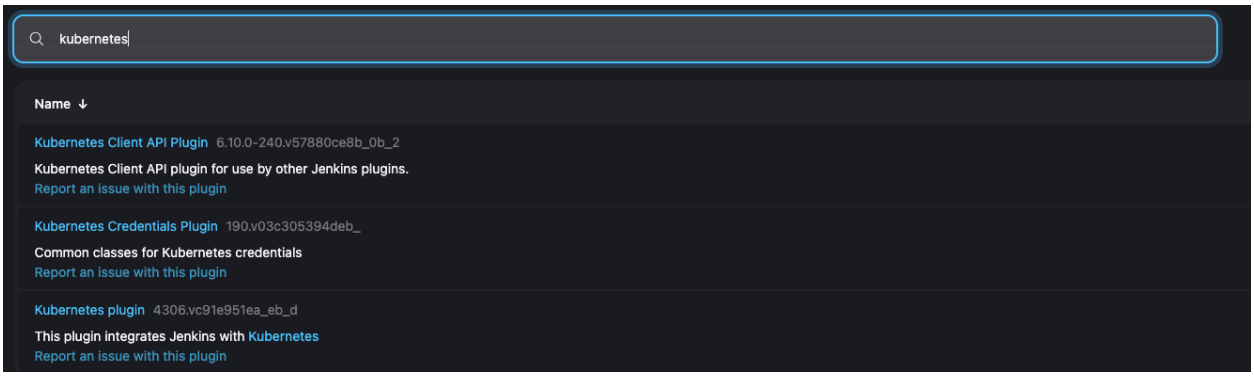
Google and GCP Plugins

For the Google Cloud Platform we will use two keywords, “Google” and “GCP” to obtain our plugin list.





Kubernetes Plugins



Jenkins Advanced Software Installation

This section covers additional software that will need to be installed either via command-line or via Jenkins Web Console. The software installation we will perform at this point will be to support Amazon Web Services Command Line Interface (AWS CLI) and HashiCorp's Terraform Infrastructure as Code software.

In this guide I present commands as they would be run inside of a container. If you are using this guide in a virtual machine or physical Linux system than you will preface each command with "sudo".

** We login as root because this is a docker container and the jenkins user does not have a password setup. A more secure method would be to login the container as root, create a password for user jenkins, then disconnect from the container and reconnect as user jenkins.

1. Start Docker desktop or docker command line. In this example we will use the Docker Desktop application. Pressing the start button in the Docker Desktop application.

2. Connect to the jenkins container as user root.

   $ docker exec -it --user root bash

3. Install AWS CLI and patch the Jenkins container.

   $ sudo apt update && sudo apt install -y awscli

4. Verify AWS CLI is installed.

   $ aws –version

   ```
   root@c7f749e1cc85:/# su - jenkins
   jenkins@c7f749e1cc85:~$ id
   uid=1000(jenkins) gid=1000(jenkins) groups=1000(jenkins)
   jenkins@c7f749e1cc85:~$ aws --version
   aws-cli/2.24.0 Python/3.12.6 Linux/6.12.5-linuxkit exe/aarch64.debian.12
   jenkins@c7f749e1cc85:~$
   ```

5. Install additional software packages

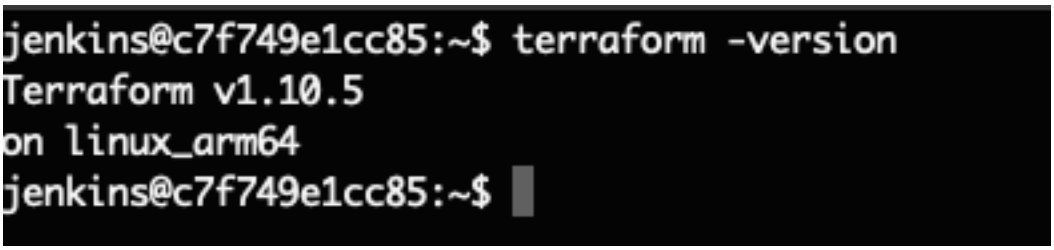
   $ sudo apt-get install -y wget curl git unzip gnupg software-properties-common

6. Install Terraform

    a. $ sudo wget -O- https://apt.releases.hashicorp.com/gpg | sudo gpg --dearmor | sudo tee /usr/share/keyrings/hashicorp-archive-keyring.gpg > /dev/null
    b. $ sudo gpg --no-default-keyring --keyring /usr/share/keyrings/hashicorp-archive-keyring.gpg --fingerprint
    c. $ sudo echo "deb [signed-by=/usr/share/keyrings/hashicorp-archive-keyring.gpg] https://apt.releases.hashicorp.com $(lsb_release -cs) main" | sudo tee /etc/apt/sources.list.d/hashicorp.list
    d. sudo apt update
    e. sudo apt-get install terraform

7. Verify terraform is installed.

    $ terraform -version



Modified Jenkins Container Image Creation

Here we will create an image of this container as we have significantly modified it to support our Jenkins deployment.

1. Stop the jenkins container.
2. Run the following command on your local system where you have Docker installed to commit a new docker container image of the jenkins container.

    $ docker commit jenkins-terraform

    Note: You should see a new container image in Docker Desktop with the name you provided. It will be much larger than the original Jenkins container due to the software packages that were installed.

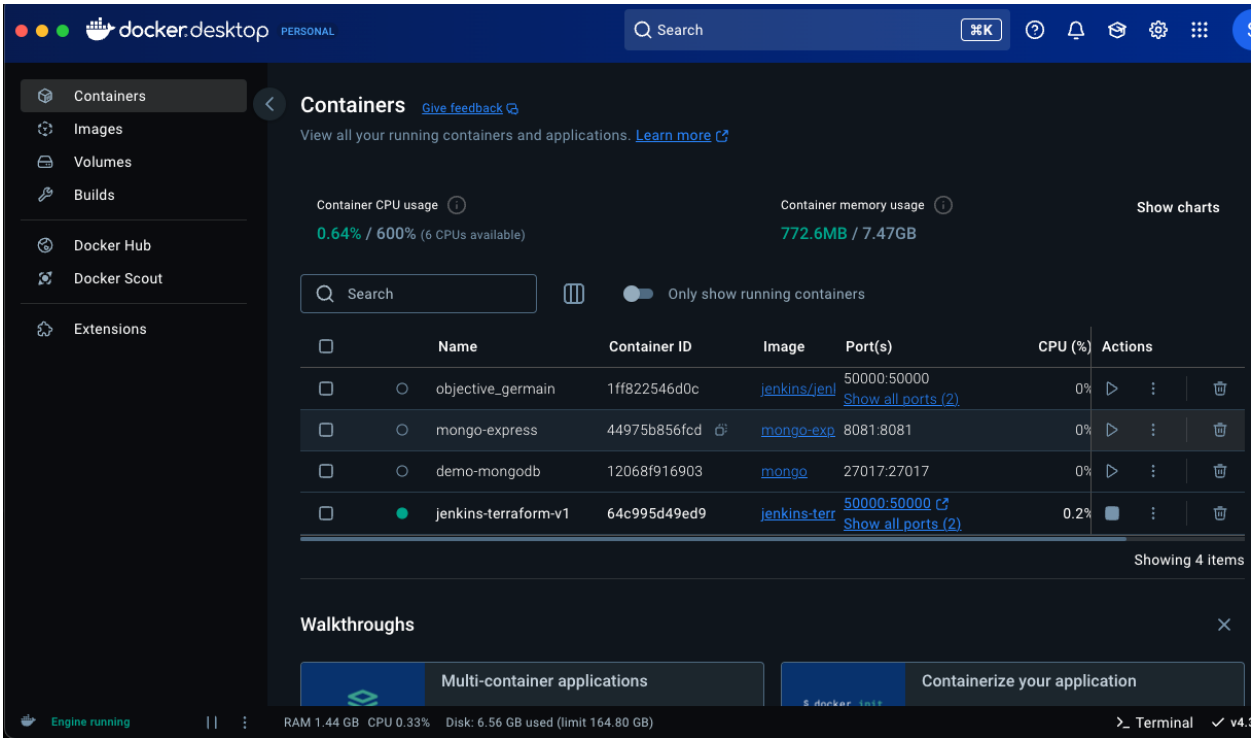
3. Start the new container using the following commands:

    docker run --name=jenkins-terraform-v1 \
    -p 8080:8080 \

-p 50000:50000 \
-v jenkins_home:/var/jenkins_home \
jenkins-terraform

Note: In this example I named the container "jenkins-terraform-v1". You can name it according to what you use in your DevOps environment.

4. Connect to the new container via either Docker Desktop or via command-line. Here we will use the Docker Desktop application. The objective is to verify it is up and running and listening on the ports you specified in your startup command.



5. Access the jenkins container via a web browser application and input the username and password from your previous Jenkins container as the account information is stored in your jenkins_home directory.

Jenkins Service Credentials Setup

We need to provide Jenkins to be able to access a given service platform to run commands that we task Jenkins to perform. In this example we will provide Jenkins with account information for AWS. You will create these credentials in the AWS IAM dashboard.

Jenkins AWS IAM Credential

1. Logon to AWS web console and go to the IAM dashboard.
2. You will create an IAM user with programmatic access and *NOT* AWS management console access.

   > It is *HIGHLY* recommended to *NOT* select the provide user access to AWS Management Console option for these service accounts.

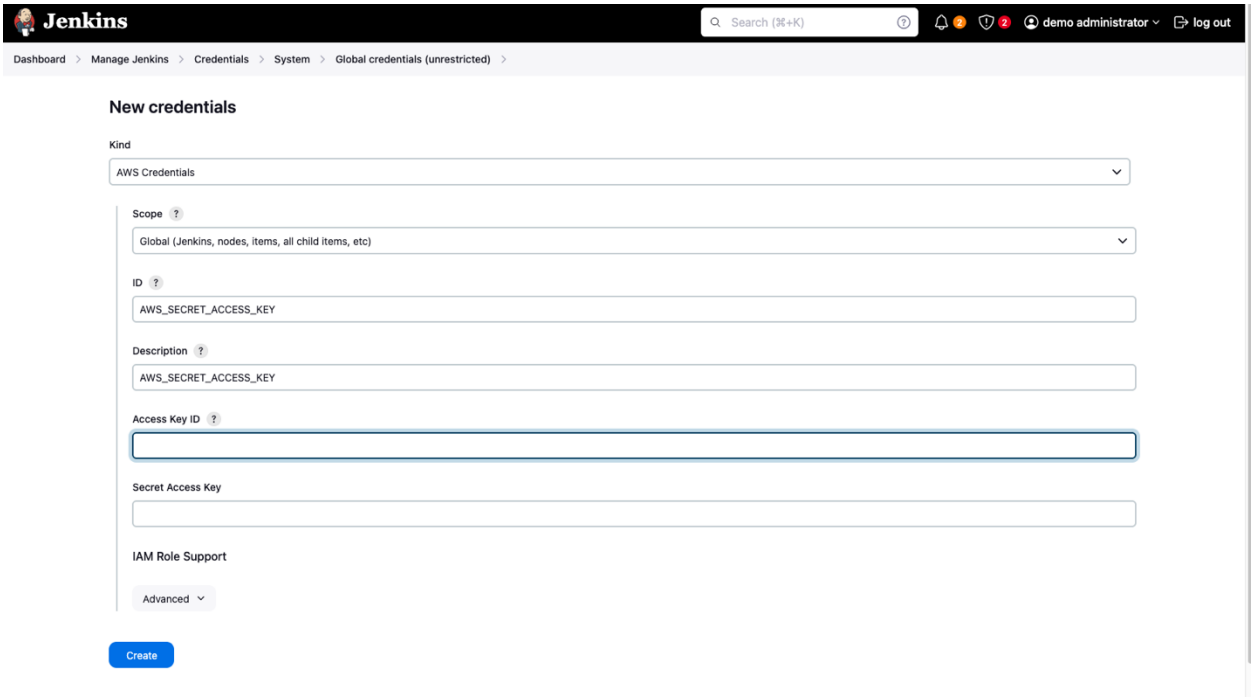
3. Select Users.
4. Select "Create User"
5. Input a Username.
6. Select Next.
7. Select Attach Policies directly.
8. Search and select policies that Jenkins will need to perform pipeline functions in AWS. You need to know the specific policies that Jenkins will need to perform actions in your AWS environment. You
9. Select next.
10. At the "Review and create step" you need to verify you have set the required permissions and you can add Tags.

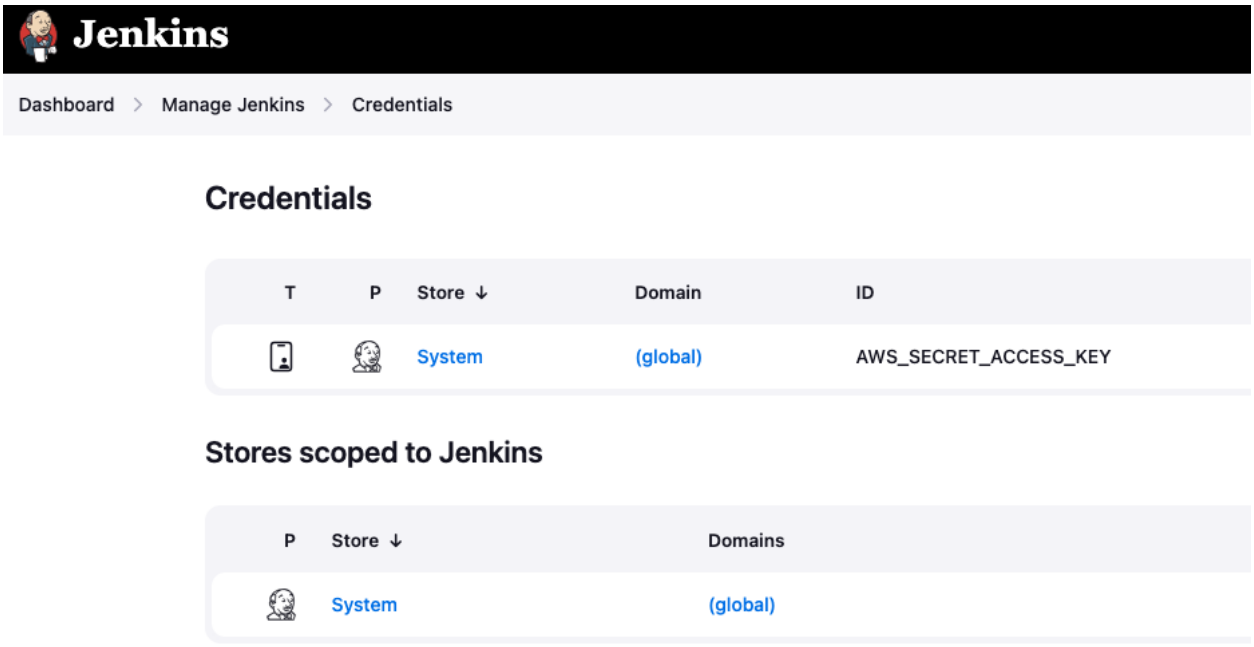
11. Select Create User, then select create access key. Your access key and secret key will be displayed. Copy and securely store the Access Key and Secret Access Key.

Add Credentials to Jenkins

1. Go to the Jenkins dashboard and select "Manage Jenkins"
2. Select Credentials > System > Global credentials (unrestricted).
3. Select New credentials.
4. In "Kind" click on the down arrow and select "AWS Credentials". **Note**: Do not change the default "Scope" setting.

    - In the ID field, add the name AWS_SECRET_ACCESS_KEY.
    - In the Description field, add the name AWS_SECRET_ACCESS_KEY.
    - In the Access Key ID field, input the access key id from your AWS IAM for the jenkins service.
    - In the Secret Access Key field, input the AWS secret key. Once finished you should have a new credentials record in Jenkins.



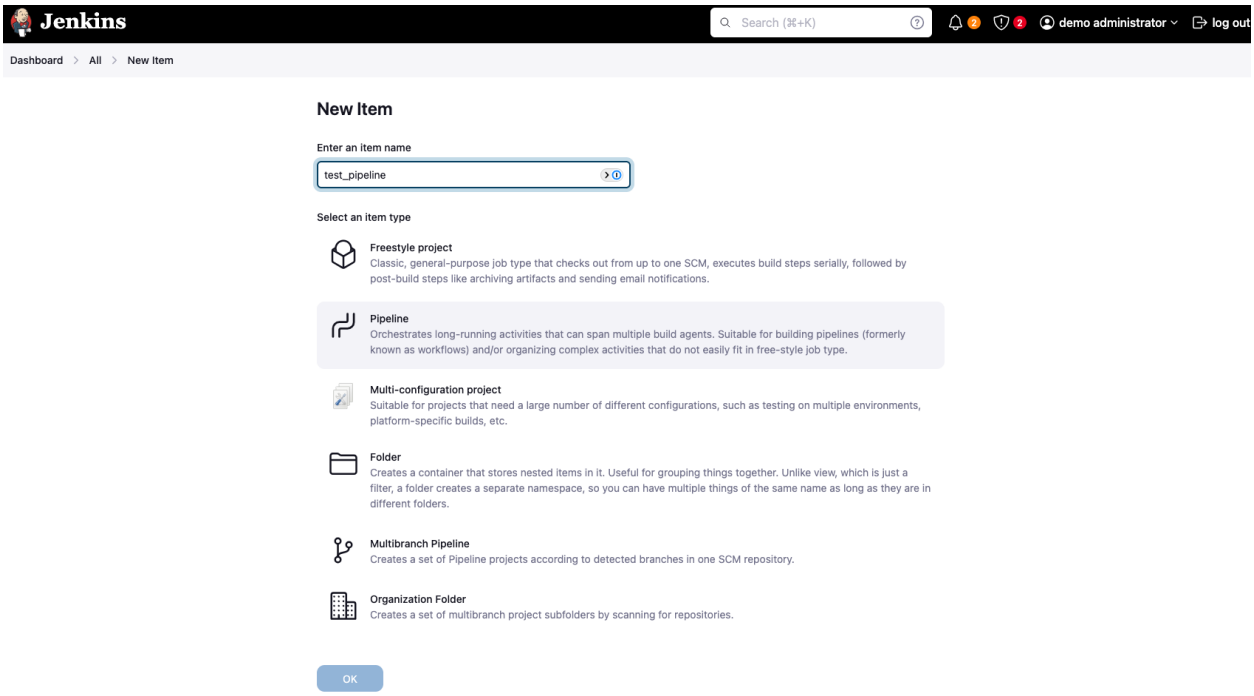


Create a Jenkins Pipeline

We will create a Jenkins Pipeline that will perform tasks in AWS based on what is in a GitHub repository. You should use a repository that you know works before assigning it to Jenkins to avoid any troubleshooting issues if the deployment does not run as expected.

Perform the following steps to create the pipeline in Jenkins:

- Select Dashboard > All > New Item
- Enter an item name, for example "test_pipeline".
- Select Pipeline, then okay.
- Select the pipeline name you entered and then select Configuration.
- Select Advanced Project Options.
- Under "Definition" select Pipeline script from SCM.
- Under SCM click the dropdown and select "Git".
- Under Repositories input the URL to the GitHub repository you intend to use with Jenkins.
- Select branch and change to the name in the GitHub repository. In this example that is "main"
- Select "Save".
- Go back to the Jenkins Dashboard.
- In the GitHub repository you will need to add a Jenkinsfile to the repo you selected. This will ensure that Jenkins uses the desired workflow in the pipeline.


Jenkins
Search (⌘+K)
2
2
demo administrator
log out
Dashboard
All
New Item
New Item
Enter an item name
test_pipeline
Select an item type
Freestyle project
Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.
Pipeline
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.
Multi-configuration project
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.
Folder
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.
Multibranch Pipeline
Creates a set of Pipeline projects according to detected branches in one SCM repository.
Organization Folder
Creates a set of multibranch project subfolders by scanning for repositories.
OK

Setup Jenkins File

At this stage we will be setting up a Jenkins file that will be used to deploy a basic AWS Virtual Private Cloud, with a EC2 instance. Software installation of Docker will be made on the EC2 instance, and a Nginx container will be installed and setup on port 8080 and be accessible via the internet. This will help get an understanding of how a Jenkins file works to support CI/CD and other projects regardless of the complexity of the architecture.

For this guide the Jenkins file is located at https://github.com/statuc30721/jenkins_terraform_pipeline/blob/main/Jenkinsfile.

The Jenkins file will need to be modified to be used in your environment. You will need to edit the file in a code editor (e.g. Microsoft Visual Studio Code) or an editor you are familiar with. I have provided screenshots of the pipeline to help visualize what should occur as Jenkins processes the instructions to perform the deployment leveraging terraform.

```
pipeline {
    agent any
    environment {
        AWS_REGION = 'us-east-1'
        ACTION = "${params.ACTION}"
    }

    parameters {
            choice (name: 'ACTION',
                                        choices: [ 'plan', 'apply', 'destroy'],
                                        description: 'Run terraform plan / apply / destroy')
    }


    stages {
        stage('Set AWS Credentials') {
            steps {
                withCredentials([[
                    $class: 'AmazonWebServicesCredentialsBinding',
                    credentialsId: 'AWS_SECRET_ACCESS_KEY'
                ]]) {
                    sh '''
                    echo "AWS_ACCESS_KEY_ID: $AWS_ACCESS_KEY_ID"
                    aws sts get-caller-identity
                    '''
                }
            }
        }
        stage('Checkout Code') {
            steps {
                git branch: 'main', url: 'https://github.com/statuc30721/jenkins_terraform_pipeline'
            }
        }
        stage('Initialize Terraform') {
            steps {
                sh '''
                terraform init
                '''
            }
        }
```

```
        stage('Plan Terraform') {
                when { anyOf
                {
                        environment name: 'ACTION', value: 'plan';
                                                environment name: 'ACTION', value: 'apply'

                }
            }

            steps {
                withCredentials([[
                    $class: 'AmazonWebServicesCredentialsBinding',
                    credentialsId: 'AWS_SECRET_ACCESS_KEY'
                ]]) {
                    sh '''
                    export AWS_ACCESS_KEY_ID=$AWS_ACCESS_KEY_ID
                    export AWS_SECRET_ACCESS_KEY=$AWS_SECRET_ACCESS_KEY
                    terraform plan -out=tfplan
                    '''
                }
            }
        }
        stage('Apply Terraform') {
                when { anyOf
                {
                                                environment name: 'ACTION', value: 'apply'

                }
            }


            steps {
                input message: "Approve Terraform Apply?", ok: "Deploy"
                withCredentials([[
                    $class: 'AmazonWebServicesCredentialsBinding',
                    credentialsId: 'AWS_SECRET_ACCESS_KEY'
                ]]) {
                    sh '''
                    export AWS_ACCESS_KEY_ID=$AWS_ACCESS_KEY_ID
                    export AWS_SECRET_ACCESS_KEY=$AWS_SECRET_ACCESS_KEY
                    terraform apply -auto-approve tfplan
                    '''
                }
            }
        }
         stage('Destroy Terraform') {
             when { anyOf
                {
                    environment name: 'ACTION', value: 'destroy'

                }
             }


             steps {

                 script {
                     def IS_APPROVED = input(
                         message: "Destroy Deployed Project ?!",
                         ok: "Yes",
                         parameters: [
                                 string(name: 'IS_APPROVED', defaultValue: 'No', description: 'Think again!!!')
                             ]
                         )
                         if (IS_APPROVED != 'Yes') {
                             currentBuild.result = "ABORTED"
                             error "User destruction cancelled"
                         }


                     withCredentials([[
                         $class: 'AmazonWebServicesCredentialsBinding',
                         credentialsId: 'AWS_SECRET_ACCESS_KEY'
                     ]]) {
                         sh '''
                         export AWS_ACCESS_KEY_ID=$AWS_ACCESS_KEY_ID
                         export AWS_SECRET_ACCESS_KEY=$AWS_SECRET_ACCESS_KEY
                         terraform destroy -auto-approve
                         '''
                     }
                 }
             }
         }


    }
}
```

This guide requires a working repository so to reduce the amount of troubleshooting it is recommended to select a working repository that leverages terraform. You then will only need to upload your modified Jenkins file to the repository and run the pipeline builds from within Jenkins.

Repository Revision

1. Clone the repository to your local system using git.

   ```
   $ git clone <repository_url>
   ```

2. Open the Jenkins file in an editor and make the following revisions:

   Line 4: Change the AWS region to the region you want to deploy your project (e.g. eu-west-1).

   Lines 20, 53, 76 and 113: Change the credential ID with what you created in the AWS IAM portal and set in the Jenkins credential step.

   Line 31: Update the URL with what the actual repository you will be using for your Jenkins pipeline project.

   Save the file and push the updated Jenkins file to your repo.

   git add .
   git commit -m "<input your commit message>"
   git push

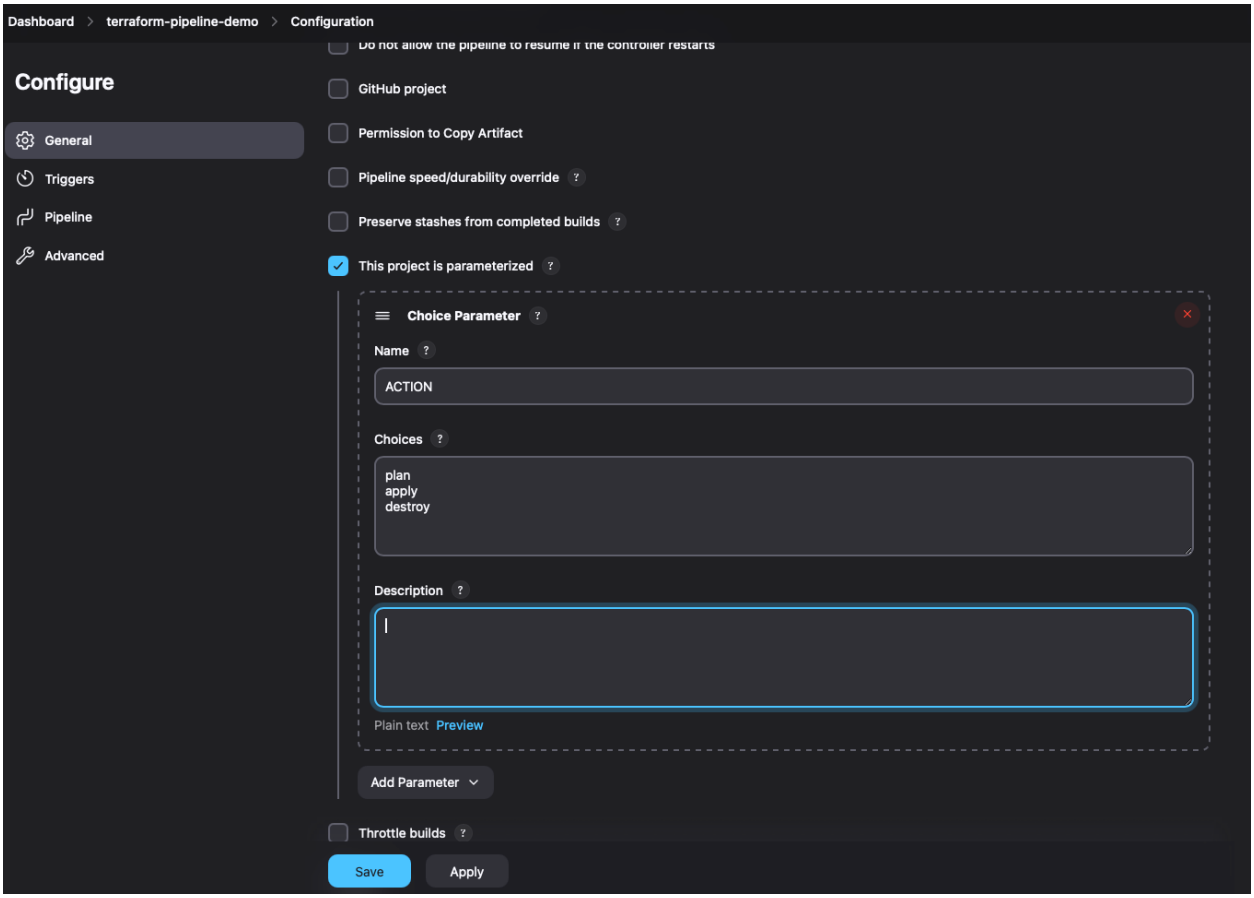
Note: At this point you should have a working Jenkins file located with your repository.

Create a Jenkins Pipeline with Terraform Choices

In this setup we will create a Jenkins pipeline leveraging the Jenkins file you cloned and revised. The file provides three choices for input to Terraform; Plan, Apply and Destroy. When selecting the destroy option you will be required to perform additional steps to get this to work.

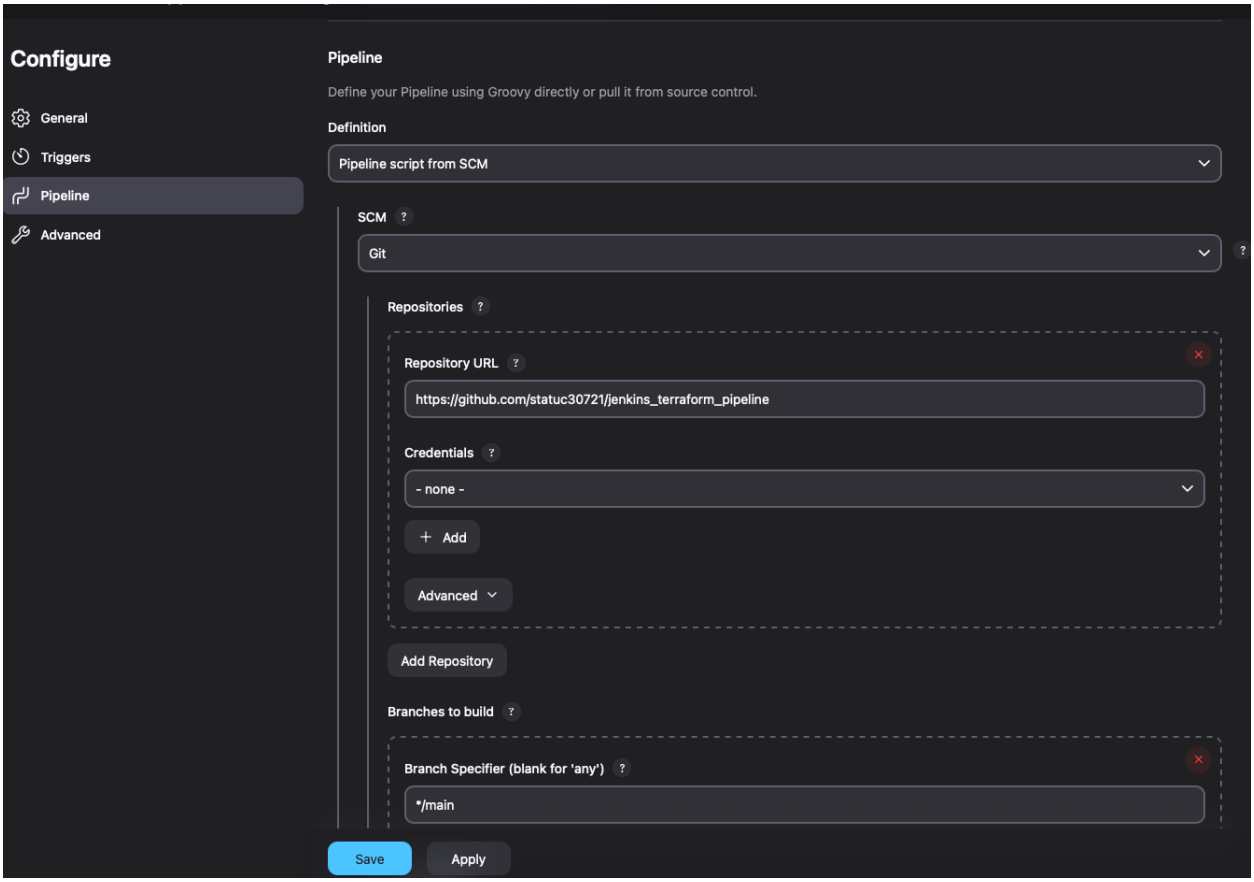
Pipeline Creation

1. Return to the Jenkins Dashboard.
2. Click New Item.
3. Enter a name in the item name field.
4. Select Pipeline and click OK.
5. At the pipeline configuration screen select configuration [Dashboard > pipeline name > Configuration]
6. Input a description of your pipeline (optional).
7. Scroll down the page, and select the box “This project is parameterized”
    a. Select “Add Parameter” and select “Choice”.
    b. In the “Name” field input ACTION
    c. In the “Choices” field input one row at a time
        - plan
        - apply
        - destroy



8. Scroll down to the Pipeline section.
9. Under Definition, select the dropdown “Pipeline script from SCM”.
10. Under SCM select “Git”.

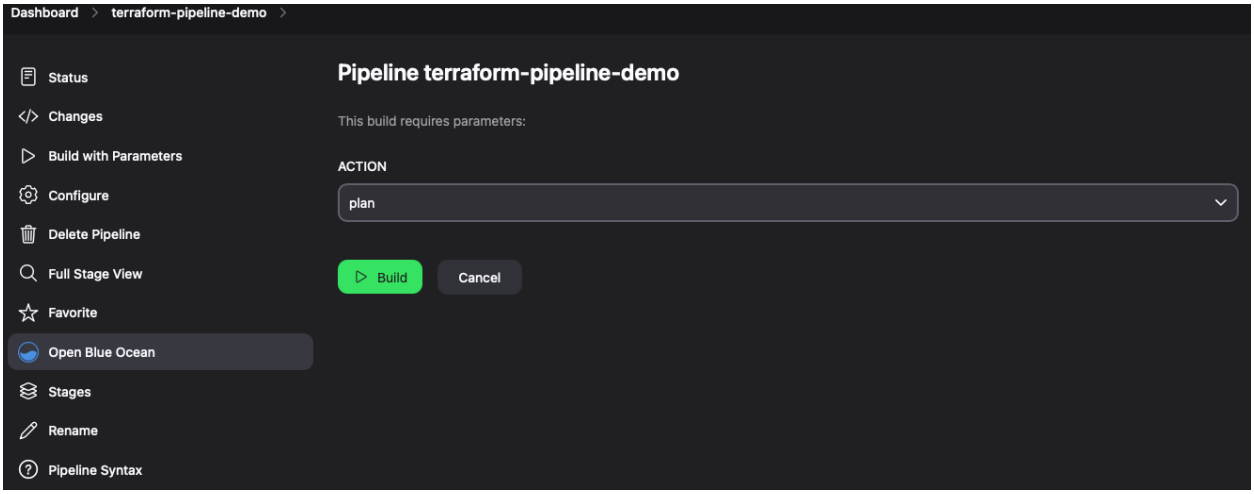
11. Under Repository URL input the URL of the GitHub repository that you will be using that has your Jenkins file.
12. Change the branch from master to the branch you intend to use in your pipeline.
13. Select “Save”.



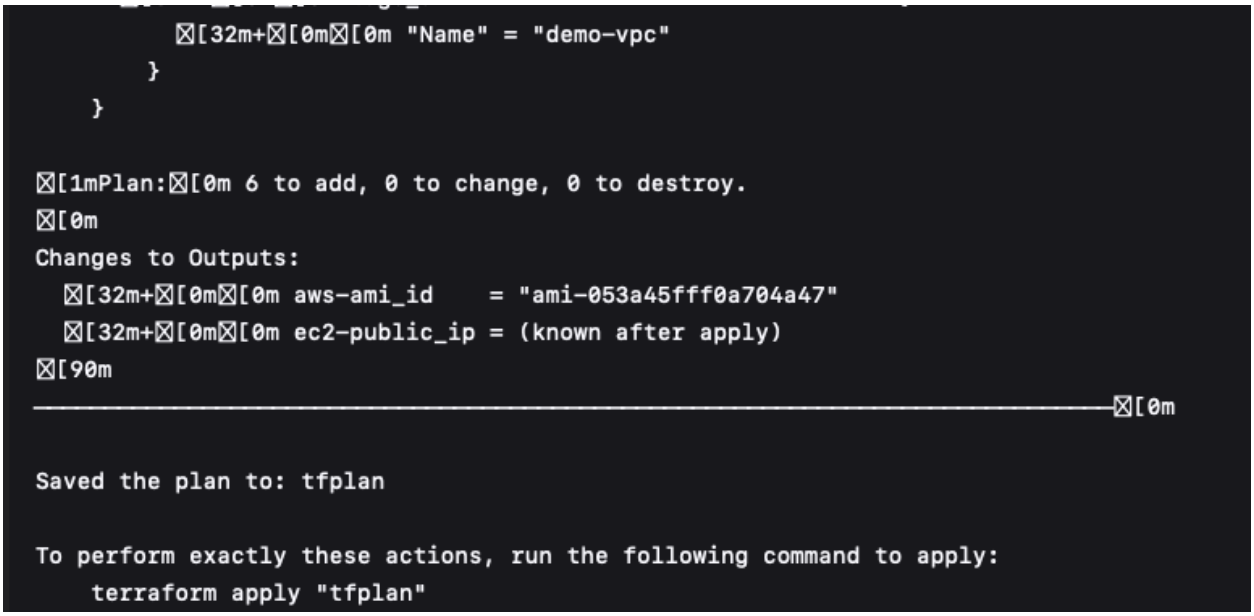
Run Jenkins Pipeline

Return to the Jenkins dashboard and select the pipeline you want to run.

- Select "Build Now" on the left side menu.
- In this pipeline we have parameters so you will be presented with options you input when setting up the pipeline parameters.
- Our first test run we will run a “Plan” build.



Here we see a console output for terraform plan. Nothing else will occur since the Jenkins file states that we will only run a “terraform plan” and display an output. I added the option to allow a more “pleasant” view of terraforms output as by default in Jenkins it looks like the screenshot below:

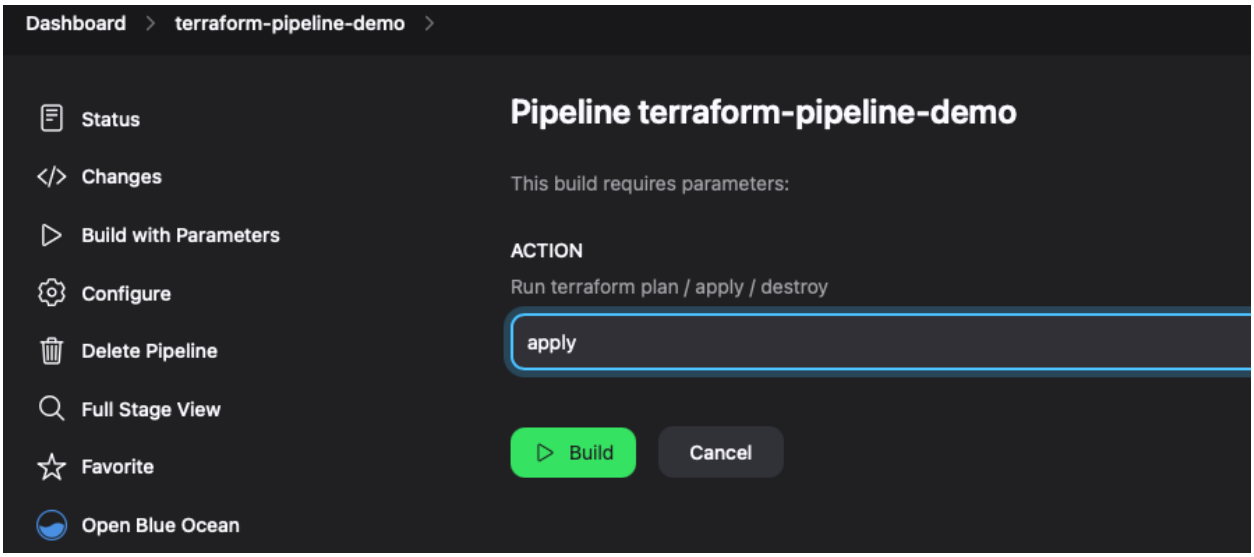


What we should be able to do is review our plan before we make any changes to our build. So, I added the option to read the resulting output file as pictured below:

```
  # aws_vpc.myapp-vpc will be created
  + resource "aws_vpc" "myapp-vpc" {
      + arn                                  = (known after apply)
      + cidr_block                           = "10.0.0.0/16"
      + default_network_acl_id               = (known after apply)
      + default_route_table_id               = (known after apply)
      + default_security_group_id            = (known after apply)
      + dhcp_options_id                      = (known after apply)
      + enable_dns_hostnames                 = (known after apply)
      + enable_dns_support                   = true
      + enable_network_address_usage_metrics = (known after apply)
      + id                                   = (known after apply)
      + instance_tenancy                     = "default"
      + ipv6_association_id                  = (known after apply)
      + ipv6_cidr_block                      = (known after apply)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "demo-vpc"
        }
      + tags_all                             = {
          + "Name" = "demo-vpc"
        }
    }

Plan: 6 to add, 0 to change, 0 to destroy.
```

If everything looks correct, then we can proceed to deploy the project by selecting the option of “Apply”. In this parameter the Jenkins file instructs Jenkins to perform both a “terraform plan” and “terraform apply”. So, if you already know you want to apply a revision you have made in your repository you can select the “apply” option.



Following selecting apply you will see your changes and if they meet your requirements than you click “Deploy”. If something is wrong or you don’t want to apply changes, then select “Abort”.

```
Plan: 6 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  + aws-ami_id    = "ami-053a45fff0a704a47"
  + ec2-public_ip = (known after apply)
[Pipeline] }
[Pipeline] // withCredentials
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Apply Terraform)
[Pipeline] input
Approve Terraform Apply?
Deploy or Abort
```

Select “Deploy” and then either monitor the logs from within Jenkins as the steps are completed or go to your AWS console and verify your deployment worked. In Jenkins if the deployment was successful, you should see a display like the screenshot from a terraform pipeline.

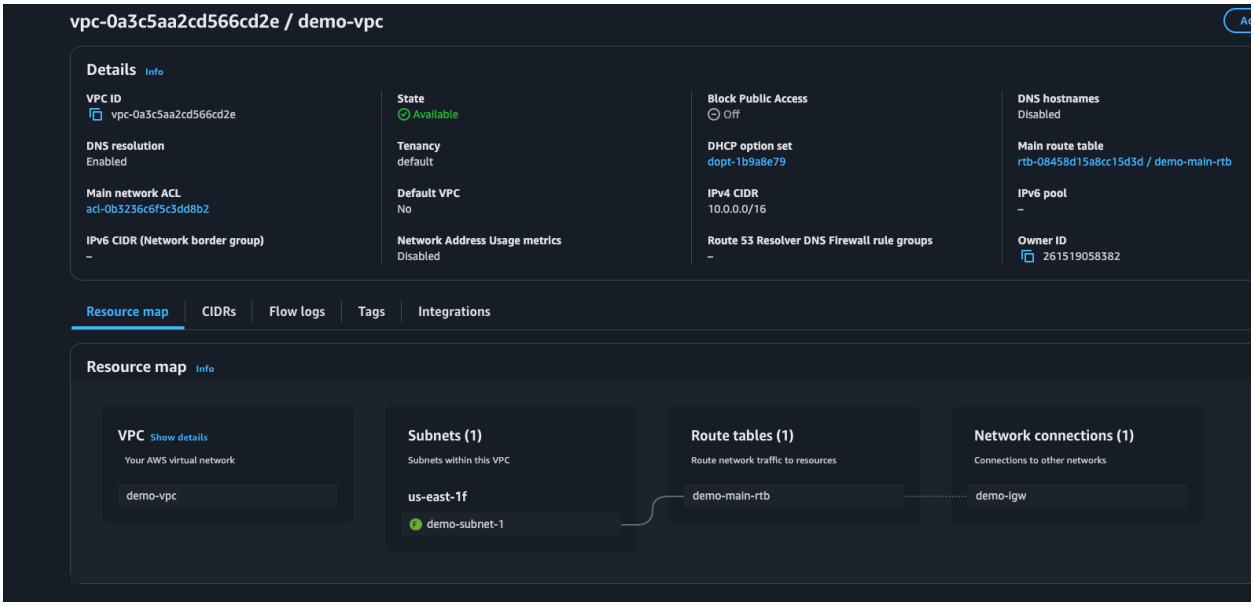
Here we have selected the “Deploy” option and per the console output Jenkins has successfully deployed the repository project leveraging terraform.

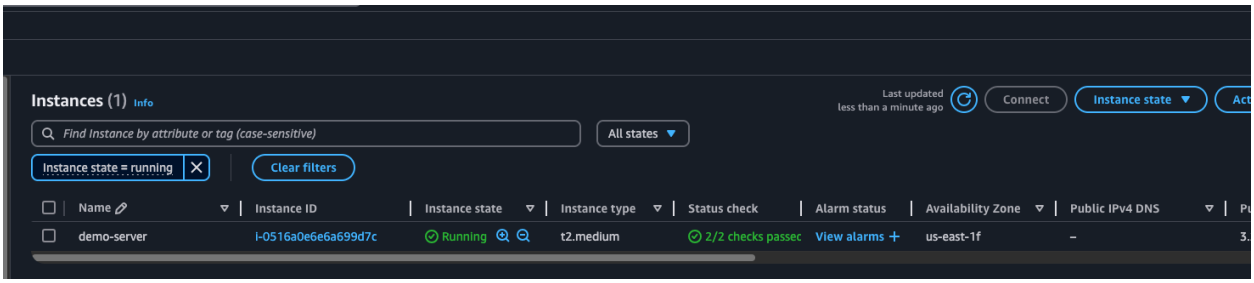
```
Apply complete! Resources: 6 added, 0 changed, 0 destroyed.
⌧[0m⌧[0m⌧[1m⌧[32m
Outputs:

⌧[0maws-ami_id = "ami-053a45fff0a704a47"
ec2-public_ip = "3.230.135.241"
[Pipeline] }
[Pipeline] // withCredentials
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Destroy Terraform)
Stage "Destroy Terraform" skipped due to when conditional
[Pipeline] getContext
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

We visit our AWS console and verify that our project did deploy as expected. In this repository we should see the following:

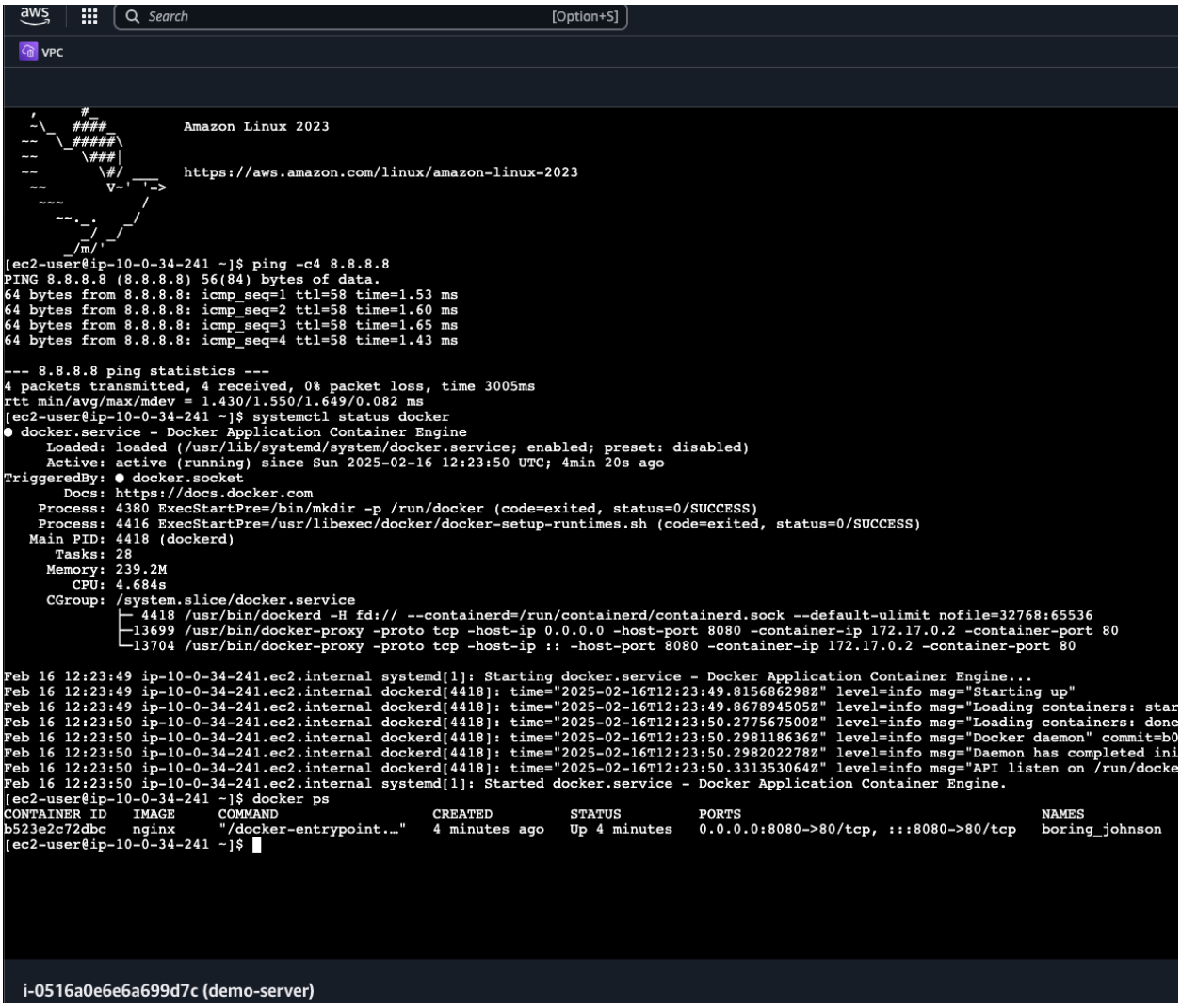
- One Virtual Private Cloud (VPC)
- One EC2 Virtual Machine Instance
- Services: Docker deployed and running on the EC2 instance. Nginx container deployed on the EC2 instance running under docker.
- Nginx container accessible via the internet at the provided public ip address presented in the Jenkins console output.

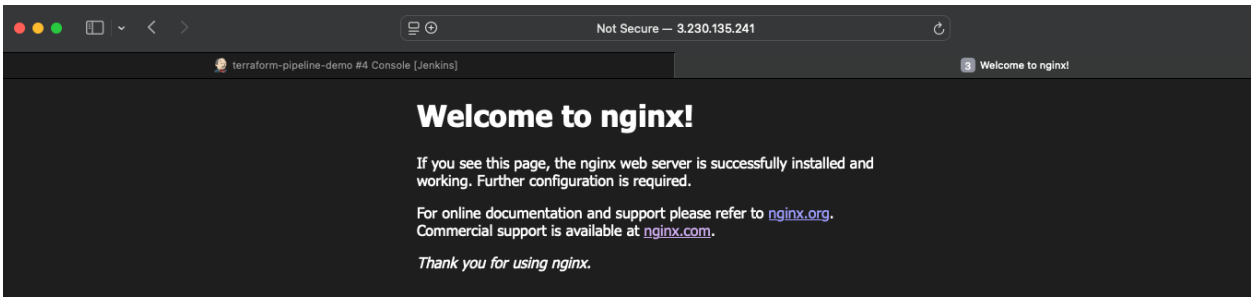





```
Apply complete! Resources: 6 added, 0 changed, 0 destroyed.
⌧[0m⌧[0m⌧[1m⌧[32m
Outputs:

⌧[0maws-ami_id = "ami-053a45fff0a704a47"
ec2-public_ip = "3.230.135.241"
```





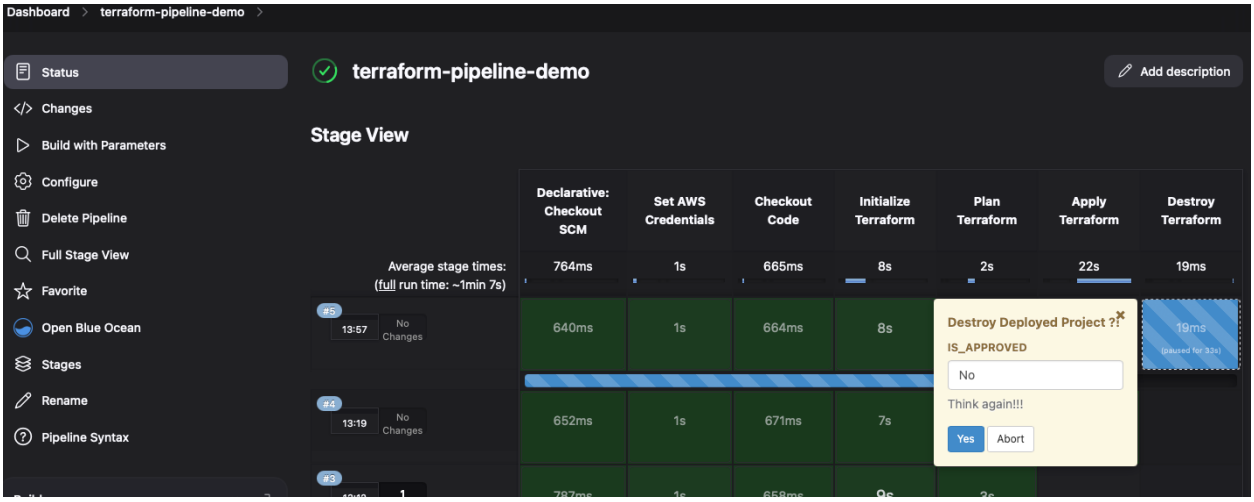
At this stage you now have a working Jenkins deployment that can run terraform and support various CI/CD workflows.

Terraform Destroy Deployed Project

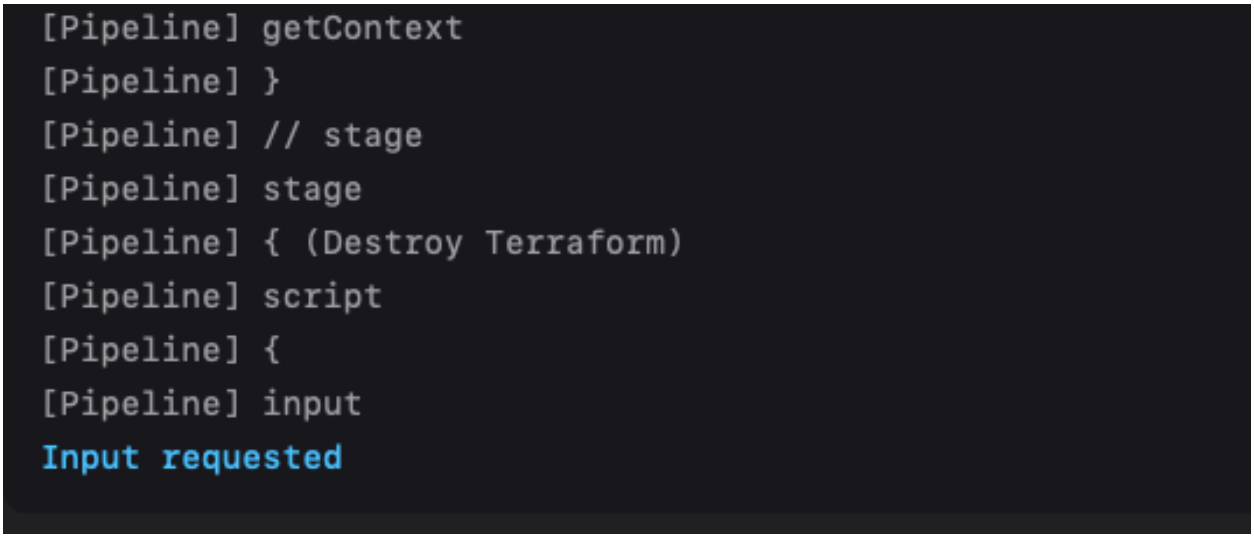
Our final step is to cleanup this guides demonstration project. To do this we will have Jenkins perform the “terraform destroy” action.

WARNING: As a reminder terraform destroy will destroy your deployed project completely. Please be certain this is what you want as it can’t be stopped from within Jenkins unlike when using Terraform Enterprise.

1. Select the Jenkins pipeline and under “ACTION”, select the dropdown to “destroy”.
2. Select the “Build” button.
3. You will be presented with the option to destroy your deployed project.

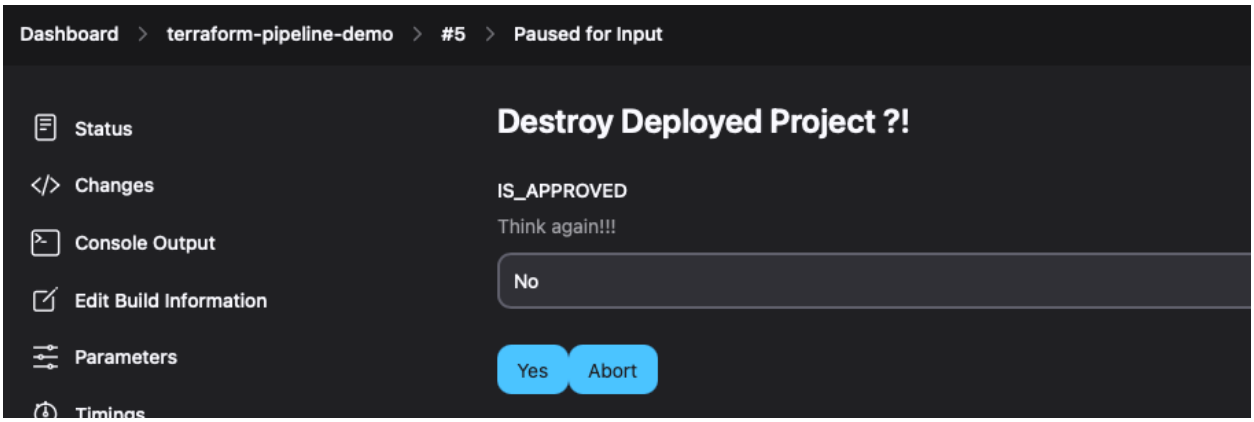


4. If you are in the console of Jenkins, you will see the message “Input requested”. Select the word “input requested”. It will take you to the “Paused for Input” section of the pipeline.

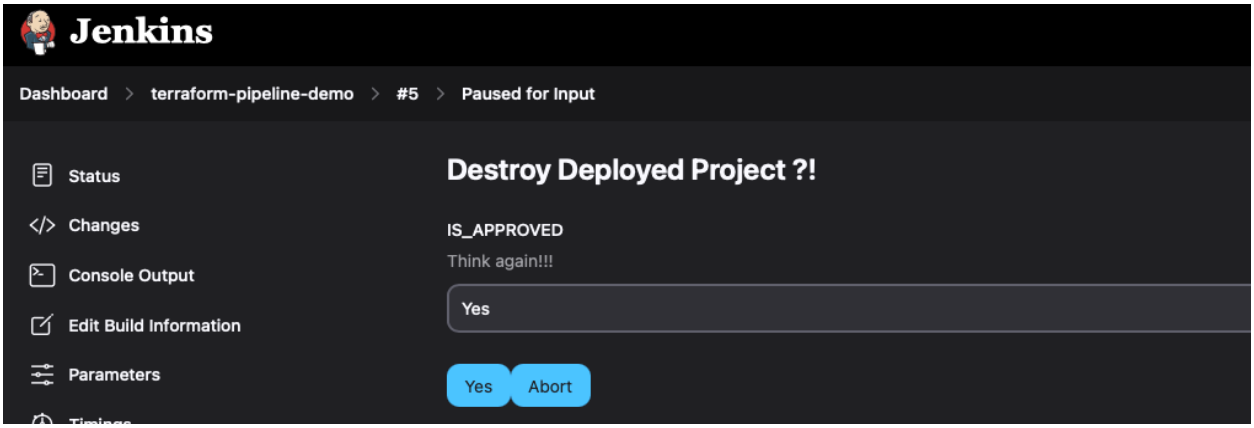


Note: The Jenkins file is set to “No” by default for *SAFETY*.

If you are sure you want to destroy your project, then at the “Paused for Input” you will have to change the option from “No” to “Yes” and then select the “Yes” button. Just selecting the “Yes” button will not override the value in the dialog box.



Option changed from “No” to “Yes” to proceed with destruction of the project.



After inputting “Yes” and selecting the “Yes” button, you will be taken to the Jenkins console output where you can monitor the destruction of the project.

```
⌧[0m⌧[1maws_default_security_group.default-sg: Destruction complete after 0s⌧[0m
⌧[0m⌧[1maws_subnet.myapp-subnet-1: Destruction complete after 1s⌧[0m
⌧[0m⌧[1maws_vpc.myapp-vpc: Destroying... [id=vpc-0a3c5aa2cd566cd2e]⌧[0m⌧[0m
⌧[0m⌧[1maws_vpc.myapp-vpc: Destruction complete after 1s⌧[0m
⌧[0m⌧[1m⌧[32m
Destroy complete! Resources: 6 destroyed.
⌧[0m
[Pipeline] }
[Pipeline] // withCredentials
[Pipeline] }
[Pipeline] // script
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

You should check in your AWS environment that the destruction was successful.